October 20-22, 2016
Seoul, Korea

19th ISRRT World Congress
23rd EACRT & 51st KRTA Annual Meeting

October 20-22, 2016
Seoul, Korea
WELCOME MESSAGE

It gives me immense pleasure to host the 19th International Society of Radiographers and Radiological Technologists, World Congress (ISRRT 2016), incorporating the 23rd East Asia Conference of Radiological Technologists and 51st KRTA Annual Meeting in Seoul, Korea. On behalf of the Korean Radiological Technologists Association (KRTA) and 40,000 Korean radiologists, I extend a warm welcome to you.

Last year, the KRTA celebrated its 50th anniversary. The beginning of Korean radiology history started with the Korean Rontgen Association in 1913 when the X-ray generator was introduced to Korea for the first time. Then, following many difficult situations such as the Korean War, the KRTA was officially established with 300 radiologists in 1965. Since the beginning, members have worked hard and made many sacrifices and now the KRTA has grown into more than 40,000 members with an assembly. Nowadays, we promote not only public health, but also radiation technology research and development, perform technical training abroad, and socialize through the global exchange of information among our members. For these reasons, we have grown beyond Asia with the association advancing to the levels of the developed countries of the world. Thus, I am very proud to host the International Society of Radiographers and Radiological Technologists (ISRRT) this year.

Over its 55-year history since the first ISRRT world congress in 1962, many have shared their thoughts and hard work through this event, which have contributed to the growth and development of radiological technology and research. It is my wish that ISRRT 2016 takes its place in history alongside our finest congresses reflecting the highly rewarding educational and networking experience that exemplifies the mission of ISRRT.

Once again, I would like to extend my sincere appreciation to the representatives from each country society and all the participants of ISRRT 2016. I also encourage you to take this opportunity to explore the many facets of Seoul and to experience the unique Korean culture.

I hope you enjoy your time at ISRRT 2016 and your stay in Seoul, Korea.

Yong Moon LEE
President,
Korean Radiological Technologists Association
WELCOME MESSAGE

On behalf of the Organizing Committee, and all of those involved in preparing the 19th International Society of Radiographers and Radiological Technologists, World Congress (ISRRT 2016), I wish to extend a warm-hearted welcome to all our participants. It is my great honor to host ISRRT 2016, incorporating the 23rd East Asia Conference of Radiological Technologists and 51st KRTA Annual Meeting in Korea.

A comprehensive overview of the most recent developments in the field of radiology as well as the latest technologies and applications will be featured. 606 abstracts have been submitted from 46 countries which will make for rich and informative scientific programs. The programs are organized into 12 topical areas and divided into 70 sessions of 378 oral and 224 poster presentations. Under the theme of “We are RTs,” we have planned various sessions and events such as the hospital tour, ‘We are RTs’ session, and Asian Forum which will be offered to broaden and enrich our experience.

I hope the stimulating scientific program and ample networking opportunities we have assembled will be of great benefit to all of us. I very much believe the ultimate success of the program is dependent on all of you who have actively taken part and contributed your valuable input.

I would like to convey my sincere gratitude to the international members for their invaluable support and to the members of the ISRRT 2016 organizing committee for their tremendous efforts in making this ISRRT series a success. Also, my sincere gratitude to all the sponsors, for their generous support of ISRRT 2016, can never be expressed enough.

In the hope you find the scientific program and exhibition both engaging and constructive, I wish you all a rewarding time, and that your visit to Seoul will last as a pleasant memory.

Thank you for your participation and welcome to ISRRT 2016.

Younggi CHO
Chairman,
Organizing Committee of
19th ISRRT World Congress
WELCOME MESSAGE

The ISRRT represents over 500,000 members from 94 member countries as the global voice of Radiography. The ISRRT has a proud tradition of hosting meetings of outstanding academic standard, together with great social interaction. This meeting will be no different - the variety of stimulating programs will afford the delegates the opportunity to network and to learn and share experiences with each other. I am assured that this conference will provide for the various specialties to come together to share information on the latest developments in our field. This interaction will most certainly help to advance our profession and will be the stepping stone to adopting advanced techniques and skills on the latest developments in our ever-evolving field.

At this dynamic and trend-setting meeting, we will most certainly strive to achieve one of the ISRRT objectives; to advance the science and practice of radiography and allied subjects by the promotion of improved standards of education and of research in the technical aspects of radiation medicine and radiation protection.

World Radiography Day will be celebrated internationally on 8 November 2016 by Radiographers/Radiological Technologists shortly after this congress. The theme for this year is, "Quality Assurance: The Radiographer Takes a Central Role," which illustrates the important role that all of us play in our areas of practice.

Radiographers have important responsibilities in the diagnosis and treatment of disease as we partner with others in healthcare to care for our patients. Let us share the importance of this role with all the participants. This important event will not only enhance the knowledge and skills of radiographers but also allow us to experience the warm hospitality of the KRTA for a socially enjoyable event.

Do take some time out to enjoy the beautiful city of Seoul the capital of Korea - ‘gushing with tradition and rich in culture’.

Fozy Peer

Fozy PEER
President,
International Society of Radiographers and Radiological Technologists
ORGANIZING COMMITTEE

PRESIDENT OF KRTA
Yong Moon LEE
Korean Radiological Technologists Association

CHAIRMAN OF 19th ISRRT WORLD CONGRESS
Younggi CHO
Jeonbuk National University Hospital

PROGRAM COMMITTEE
CO-CHAIRS
Ji Sook NOH
Chosun University Hospital

Hyun-Yong LEE
Catholic University of Pusan

SECRETARY
Yang-Sub LEE
Asan Medical Center

Seung Chul KIM
Korean Radiological Technologists Association

PUBLIC RELATIONS COMMITTEE
CHAIR
Seok Tae KIM
DanKook University Hospital

SECRETARY
Ik Pyo LEE
Kyuunghee University Hospital at Gangdong

TECHNICAL EXHIBITION COMMITTEE
CHAIR
Dae Keon SEO
Asan Medical Center

SECRETARY
Dae Hyun KANG
Korea University Ansan Hospital

Gwang Won LEE
Jeonbuk National University Hospital

Yong Ho SONG
Seoul National University Hospital
ORGANIZING COMMITTEE

FINANCE COMMITTEE

CHAIR
Yoon Hee JANG
Songlim Medical Co. Ltd.

SECRETARY
Dong Kook KIM
Guro Sungsim Hospital

SECRETARY
Jae Hee LEE
Seoul National University Hospital

Gyoo Seol SHIN
Kyung Hee University Hospital at Gang-Dong

Young Joo LEE
Yonsei University Health System Severance Hospital

Hwa Hyun BACK
Korea University Medical Center Anam Hospital

Seon Wook YANG
Asan Medical Center

Pyong Kyo KIM
Catholic University Yoeuido St. Mary's Hospital

Jin Hee Jeon
KRTA
# PROGRAM AT A GLANCE

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**Registration**

- **MR Imaging 1**
- **CT Imaging 1**
- **Radiation Dose & Reduction 1**
- **General Radiographic Imaging 1**

**Coffee Break**

- **MR Imaging 2**
- **CT Imaging 2**
- **Radiation Dose & Reduction 2**
- **General Radiographic Imaging 2**

**Lunch**

**Asian Forum**

- **Opening Ceremony & Hutchinson Lecture & Welcome Reception**

- **Break**

**Pre-Congress Workshop I**
- Education

**Pre-Congress Workshop II**
- Radiation Protection
# PROGRAM AT A GLANCE

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Guerbet Korea |
| 09:00 | Break |
| 10:00 | Break |
| 11:00 | Break |
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| 14:00 | Break |
| 15:00 | Break |
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| 17:00 | Break |
| 18:00 | Break |
| 19:00 | Break |
| 20:00 | Break |
| 21:00 | Break |

- **MR**: MR Imaging
- **RT**: Radiation Therapy
- **SO**: Sonography
- **ST**: Student Session
- **BI**: Breast Imaging
- **ED**: Education
- **CT**: CT Imaging
- **GR**: General Radiographic Imaging
- **RD**: Radiation Dose & Reduction
- **MM**: Management (QA & QI)
- **IR**: Interventional Radiology
- **NM**: Nuclear Medicine

- **Coffee Break**
- **Luncheon Symposium**
- **Korean Junior RT & Student Symposium**

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### 08:00
- **MR Imaging 3**
- **CT Imaging 3**
- **Radiation Dose & Reduction 3**
- **Student Session 1**
- **Management (QA & QI) 1**
- **Student Session 2**

### 09:00
- **MR Imaging 4**
- **CT Imaging 4**
- **Radiation Dose & Reduction 4**
- **Education 1**
- **Management (QA & QI) 2**

### 10:00
- **MR Imaging PL1**
- **CT Imaging 5**
- **Radiation Dose & Reduction PL1**
- **Education 2**
- **Management (QA & QI) PL1**

### 11:00
- **Coffee Break**

### 12:00
- **Luncheon Symposium
Guerbet Korea**

### 13:00
- **MR Imaging 5**
- **CT Imaging 6**
- **Radiation Dose & Reduction 5**
- **Student Session 3**
- **Nuclear Medicine 1**
- **Radiation Therapy 1**

### 14:00
- **General Radiographic Imaging 3**
- **CT Imaging 7**
- **Interventional Radiology 1**
- **Breast Imaging 1**
- **Nuclear Medicine 2**
- **Radiation Therapy 2**

### 15:00
- **Coffee Break**

### 16:00
- **General Radiographic Imaging 4**
- **CT Imaging 8**
- **Interventional Radiolog 2**
- **Sonography 1**
- **Nuclear Medicine PL1**
- **Radiation Therapy PL1**

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### Key Abbreviations:
- **MR**: MR Imaging
- **RT**: Radiation Therapy
- **SO**: Sonography
- **ST**: Student Session
- **BI**: Breast Imaging
- **ED**: Education
- **CT**: CT Imaging
- **GR**: General Radiographic Imaging
- **RD**: Radiation Dose & Reduction
- **MM**: Management (QA & QI)
- **IR**: Interventional Radiology
- **NM**: Nuclear Medicine
PROGRAM AT A GLANCE

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<td>Closing Ceremony</td>
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<td>Gala Dinner</td>
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FLOOR PLAN

2F
- 201 (Only Oct. 22)
  - Sonography
  - We are RTs
  - Interventional Radiology
- 208
  - Pre-Workshop
  - Asian Forum
  - Student Session
  - Korean Junior RT
  & Student Symposium
  - Radiation Therapy
  - Management (QA & QI)
- 203A
  - Radiation Dose & Reduction
  - Student Session
  - Education
  - Breast Imaging
  - Sonography
- 203B
  - General Radiographic Imaging
  - Management (QA & QI)
  - Nuclear Medicine
- 203
  - Pre-Workshop
  - Education
  - Breast Imaging

1F
- 104
  - CT Imaging
  - Radiation Dose & Reduction
  - Interventional Radiology
  - Nuclear Medicine
- 103
  - CT Imaging
  - General Radiographic Imaging
  - Opening
  - Hutchinson Lecture
  - Welcome Reception
  - Closing
  - Gala Dinner
- 102
  - MR Imaging
  - General Radiographic Imaging
CONGRESS INFORMATION

REGISTRATION 1F
Registration will be open from Oct. 20 to 22 in the 1st floor lobby at the below times:

- Oct. 20 (Thu) 08:00 - 19:00
- Oct. 21 (Fri) 08:00 - 18:00
- Oct. 22 (Sat) 08:00 - 19:00

Registration fees include:
- Delegate & Student: All Scientific Sessions, Luncheon Symposia, Congress Kit, Opening Ceremony, Welcome Reception, Coffee Breaks, Exhibition and Closing Ceremony
- Accompanying person: Access to Opening Ceremony, Welcome Reception, Coffee Breaks, Exhibition and Closing Ceremony

BADGE POLICY & BARCODE SCANNING
For security purposes, wearing the badge is required for admission to all areas during the congress. All participants are required to scan their badge to enter each session room.

CONGRESS BAG
A congress bag will be given to each fully registered participant containing the following materials: Program & Abstract Book, gift, and several brochures.

CERTIFICATE OF ATTENDANCE
After the congress you may download the certificate of attendance from ‘My page’ of the online registration system or request one from the secretariat by email. Or, you may receive it from the onsite registration desk starting from the afternoon of each day.

CLOAKROOM AND LOST & FOUND
You may store your luggage in the cloakroom (1F). Should you lose or find anything, please visit the cloakroom for assistance.

LUNCHEON SYMPOSIUM
Luncheon symposium sessions will take place in room 101-103 on Oct. 21-22 by ‘GUERBET KOREA’ (10/21) and ‘SAMSUNG’ (10/22). Lunch boxes (sandwich) will be served on a first-come, first-served basis. You may also easily find restaurants serving various cuisines as well as a food court in the basement of COEX Mall (B1).

COFFEE BREAKS
Coffee will be served in the ‘ISRRT 2016 Café Lounge’ in the 2nd floor lobby and in Exhibition Rooms (101, 105) during coffee breaks. Please help yourself.

INTERNET
An internet lounge is located in the front area of the registration desk (1F). All participants may use the computers and internet from 08:30 to 18:00.
* Free COEX public Wifi will be available in the center.

ORAL PRESENTATION & FILE SUBMISSION
All presenters are asked to submit their presentation files to the preview room at least 1 hour before the scheduled presentation.
IBM computers with Windows and MS Office (English version) will be provided. The use of a Macintosh computer with our beam projector may result in technical problems. If you would like to use your Mac, please visit the preview room in advance to check the system to avoid inconveniences.
- Place: 1F (Beside Room 103)
- Operation Times: August 20(Thu) - 21(Fri) 08:00- 18:00
  August 22(Sat) 07:30 - 16:15
CONGRESS INFORMATION

POSTERS
Posters will be displayed in two separate areas (1F & 2F). Posters should be posted by 08:30 and dismantled after 18:00 on the allotted date. The Secretariat will not be held liable for any lost or damaged posters. All poster presenters are encouraged to be at their poster panels for discussion at break times during the congress.

- Affixation: Oct. 20, 09:00 - 18:00
  Oct. 21, 08:00 - 09:00
- Removal: Oct. 22, 16:15 - 17:00

INFORMATION / TOUR DESK
General information about the congress will be available at the information desk in the main lobby area (1F).

INSURANCE
The organizers will not be responsible for medical, travel or personal claims. Participants are strongly advised to take out an insurance policy covering all areas: health, accident, loss of luggage, etc. If you need any assistance, please ask the secretariat for assistance.

ACCESS TO COEX

Line No.2 Samseong Station: Use the passage directly connected from exit 5 or 6 to Coex mall through the Millennium Plaza

Line No.9 Bongeunsa Station: Take exit #7 and use the direct passage connected to Asem Plaza to enter Coex Mall

Line No.7 Cheongdam Station: Take exit 2 and walk straight for 20 minutes on foot. Access Coex Mall through the ASEM Square
CONGRESS INFORMATION

AIRPORT TRANSPORTATION (FROM COEX)

Transportation To Incheon International Airport
By Limousine
Bus No. #6006 #6103 #6704
Bus Station Samseong Station City Airport 2F Coex Intercontinental Hotel
Exit 7
By Taxi approximately 60 min / KRW 50,000
By Subway Bongeunsa Station (line #9) → Gimpo Airport Station, transfer to subway line ‘Incheon Airport Railroad’ → Incheon International Airport Station

Transportation To Gimpo International Airport
By Limousine
Bus No. #6104 #6000
Bus Station City Airport 2F Samseong Station Exit 5
By Taxi approximately 60 min / KRW50,000
By Subway Bongeunsa Station (line #9) → Gimpo Airport Station

CONGRESS ACCOMMODATIONS (AROUND COEX)

USEFUL PHONE NUMBERS
1588-5644: Volunteer Interpreters (19 languages)
1339: Medical Emergency
112: Police
119: Emergencies for Fire, Rescue & Hospital Services
120: Dasan Call Center (General Information)
1330: Korea Travel Hotline (Specific information about travel and general interpretation service in English)
SOCIAL PROGRAM

OPENING · HUTCHINSON LECTURE
WELCOME RECEPTION

October 20 (Thu), 18:00 - 20:30
Room 103, 1F

Start ISRRT 2016 with an opening introduction and ceremony by the chairman and eminent guests. It is the best way to kick off the congress!

* Traditional Korean performances and a full-course dinner will be served.

CLOSING CEREMONY

October 22 (Sat), 16:15 - 17:00
Room 103, 1F

Review the highlights and achievements of the congress. At the close, the up-coming ISRRT 2018 will be announced.

HOSPITAL TOUR

October 21 (Fri), 14:00 - 18:30
5 Major Korean Hospitals

It will be a great opportunity to not only learn about radiation skills and their technical systems but also share knowledge with radiologists. Participants will visit one of the 5 major hospitals in Korea.

* A shuttle for each hospital will leave punctually from the shuttle bus stop, north gate.

GALA DINNER

October 22 (Sat), 18:30 - 20:30
Room 103, 1F

It will be a great opportunity to not only learn about radiation skills and their technical systems but also share knowledge with radiologists. Participants will visit one of the 5 major hospitals in Korea.

* Traditional attire is recommended.
* Pop Band and Buffet will be served.
SPECIAL EVENTS

ASIAN FORUM
Oct. 20, 14:00 - 16:00  |  Rm. 208
This forum is designed to encourage progress in cooperation among Asian countries. Representatives from 6 Asian countries will present their fundamental systems, regulations, certificates, and status. It will help us understand how systems, regulations, etc. improve radiological treatment, research and education in each country.
- Tan Chek WEE (President of SSR, Singapore / Regional Director Asia/Australasia, ISRRT)
- Haihong FU (President-Elect of CSIT, China)
- Yasuo NAKAZAWA (President of JART, Japan)
- Chiung-Wen KUO (President of TWSRT, Taiwan)
- Sala UBOLCHAI (President of TSRT, Thailand)
- Yongmoon LEE (President of KRTA, Korea)
* Attendance is mainly focused on Asian participants but not closed to non-Asian country participants.

KOREAN JUNIOR RT & STUDENT SYMPOSIUM (KOREAN)
Oct. 21, 10:45 - 12:40  |  Rm. 208
This program is to help Korean job seekers find work abroad due to the difficult unemployment situation in Korea. Discussion with Korea radiological technologists who work abroad will guide you through the current employment conditions of different countries.
"Current Employment Conditions, Education, Feature, Pros and Cons of Working Abroad" will be discussed in Korean.
- Chong Hwan CHOE, Ph.D. (White Memorial Medical Center, USA)
- Chul Hee KIM, RT (TTSH (SSR), Singapore)
- Mark Kumlyong CHUN, RT (Northern Lights Regional Health Centre / Alberta Health Service, Canada)
- Dang NAMGUNG, RT (Waitemata Board (North Shore Hospital), New Zealand)

"We are RTs" SESSION
Oct. 22, 12:00 - 12:40, 14:00 - 15:00  |  Rm. 201
Under the theme of "We are RTs," this session will highlight their current status, work environment, and how they manage their work in various countries. We hope sharing our situations will foster further cooperation with each other.
- Tosca BRIDGES (Education Coordinator, Kaiser Permanente School of Allied Health Sciences/John Muir Health, USA)
- Peachy S. LUNA (Public Relations Officer, Philippine Assoc of Radiologic Technologists, Inc., Philippines)
- Huy NGUYEN (Acting Deputy Director, Ballarat Health Services, Australia)
- Karren FADER (CAMRT President, Canada)
- Reshma MAHEEPAT (SRTT President, Trinidad and Tobago)
- Amphai URAIVEROTCHANAKORN (Faculty of Medicine Siriraj Hospital, Mahidol University, Thailand)
- Stewart WHITLEY (ISRRT Treasurer, UK)

FACEBOOK PHOTO CONTEST
Under theme "We’re RTs," capture your special moments and memories spent with your colleague at ISRRT 2016. You are encouraged to upload your favorite congress photos to the ISRRT 2016 Facebook page (https://www.facebook.com/isrrt2016/) during the congress. Outstanding photos will be awarded to the winners in closing ceremony. 1st Prize: USD250, 2nd Prize: USD 150, 3rd Prize: USD 100 (Three 3rd place prizes will be awarded.)

EXHIBITION VISITOR LUCKY DRAW
Participate and win nifty prizes! Fill in the Lucky Draw coupon (in your congress kit) with stamps from all the exhibition booths, and then drop it in the coupon box on either Oct. 21 or Oct. 22! The drawing will be held at 17:00 on the 21st and 16:00 on the 22nd.
AWARDS & FUNDS

BEST ABSTRACT AWARDS
The ISRRT 2016 organizing committee will present ‘Best Abstract Awards’ to around 20 outstanding oral & poster abstracts. All winners will be announced onsite and plaques will be awarded during the closing ceremony.
* Winners are requested to attend the closing ceremony on Oct. 22.

TRAVEL SUPPORT FUND
The “Travel Support Fund” was created to assist radiographers and medical radiation technologists from lower and middle income countries, as defined by the World Bank, to participate in the 2016 ISRRT World Congress. The fund has been provided by ISRRT, UK Society of Radiographers, Canadian Association of Medical Radiation Technologists (CAMRT), American Society of Radiologic Technologists (ASRT) and New Zealand Institute of Medical Radiation Technology (NZIMRT) and covers the cost of return airfare and $200 for ground transportation and incidentals. Recipients at ISRRT 2016 are listed in alphabetical order.
- Nuran AKYURT (Turkey)
- Sam ALI (Uganda)
- Vivian Della ATUWO-AMPOH (Ghana)
- Akintade DARE (Nigeria)
- Chris DOUDOO (Ghana)
- Ishani sarangika WASALA HERATH (Sri Lanka)
- Hilda MASHA (Kenya)
- Stephen Samson MKOLOMA (Tanzania)
- Catherine Wangui MUCHUKI (Kenya)
- Loan Tran Thi NGOC (Vietnam)
- Mark C. OKEJI (Nigeria)
- Charles OMONDI (Kenya)
- Abert Dayor PIERSSON (Ghana)
- Aziagba Dogbevi ROBERT (Togo)
- Bansal SUBHASH (India)
- Khin Maung TIN (Myanmar)
- Vitharan Gamage WIMALSEN (Sri Lanka)
- Emmanuel WORLALI (Ghana)

EACRT TRAVEL SUPPORT FUND
The EACRT is pleased to present the travel fund to participants coming from EACRT area, with special emphasis on underdeveloped countries. The following are recipients of this year’s fund.
- Rolando Banares (Philippines) supported by TWSRT
- T. D. Hettiarachchi (Sri Lanka) supported by KRTA
OPTIONAL TOUR PROGRAMS

A tour desk will operate at the info/tour desk. Explore the beauty of the city and experience the harmony of the old and new in Seoul, Korea.

**SEOUL SYMBOLIC MORNING**
08:30 - 14:00
Morning Accompanying Person Tour
N Seoul Tower is an iconic landmark in Seoul. It has been loved by visitors since opening in 1980. Situated at the top of Namsan Mountain, it provides a 360 degree view of Seoul.

**STORYTELLING OF MUSEUM**
08:30 - 14:00
Morning Accompanying Person Tour
Seoul Museum of History presents the root of Seoul, the life of Seoul people and the changes of modern Seoul in a permanent exhibition with a diverse set of donated collections testifying the history and culture of Seoul.

**CHARMING KOREA**
08:30 - 14:00
Afternoon Accompanying Person Tour
A Hanok Village dating back to the 14th century, it consists of hundreds of traditional homes called Hanok, many of which today are cultural centers, traditional museums, restaurants and tea houses.

**KOREAN FOLK VILLAGE**
13:00 - 18:00
Afternoon Accompanying Person Tour
This best folk village in the nation is also an exciting and fun cultural theme park. It’s a popular destination for both tourists and locals. Visitors learn about the lives of the different social classes as you walk through the replicas of peasants, noble men and scholars’ homes. It feels like a trip in a time machine back to the 1800’s.
Charters Symonds is cited as the first to use an indwelling tube in 1885. The tubes were made of boxwood, ivory or gum elastic and strings were used to fix the tube in place. One end of each string was attached to the moustache or strapped behind the ear. After that, different kinds of indwelling tubes with no external fixation such as Celestin tube and the Wilson Cook tube have been devised. I also had used the Wilson Cook tube for patients with inoperable esophageal cancer before I devised an expandable metallic stent. It was really difficult to place the tube in the narrowed esophagus because the outer diameter of its delivery system was 25 mm.

I read an article on self-expandable Z-stent which deeply impressed me. I was so excited that I ended up visiting Drs. Wright and Wallace at MD Anderson Cancer Center in Houston for one month right after RSNA in 1988. Dr. Wright showed me how to make the Z-stent. After returning home with several instruments to make a Z-stent, I set up a small machinery shop at the corner of my office and indulged myself in devising esophageal stents for patients with esophageal cancer day and night.

In 1991, we described the first covered metallic stent placement in the esophagus. We placed the z-stent with two barbs in 8 patients with an unresectable malignant stricture under local anesthesia. There was no esophageal rupture or stent migration. Although the Z-stent with two barbs had larger internal diameter than the conventional tubes, it needed a much lower profile delivery system because of the advantage of compression. However, it was difficult to remove the stent because of the barbs. To overcome those problems, we designed the second generation. Instead of barbs, we made the proximal and distal part of the stent 6 mm wider than the middle part. We placed the stent in 119 patients with a malignant or a benign stricture with use of a 13-mm polyethylene tube. The esophageal perforation rate was 0% in expandable stents and 10 to 11% in conventional tubes.

In 1997, we designed a polyurethane covered retrievable expandable z-stent. To make the stents removable, we attached two drawstrings to the upper inner margin of the stents. We placed the stent with use of a 9-mm PTFE tube. To remove the stent, we passed a dilator and sheath over a guide wire into the proximal stent lumen, and replaced the dilator with a hook wire. After grasping the nylon drawstring with the hook, we withdrew the hook wire into the sheath to collapse the stent. The entire assembly was then removed together. We placed the stent in 21 patients with a malignant or benign stricture.

Since then, we have developed 5 more generations of esophageal stents using nitinol wires to improve the flexibility of the stent and to decrease the size of stent delivery system.

Seven Tips on Doing Research from Personal Experience
1. Build up close relationship with patients
2. Try to do collaborative research
3. Find mentors to keep in touch with them
4. Train new scholars and cooperate with them
5. Study English and Chinese
6. Always thank your spouse and family
PLENARY SPEAKERS

Naoki KODAMA
Japan Association of Radiological Technologists, Japan

Education
- 4/1995 - 3/1999: Suzuka University of Medical Science, Japan, B.S. in Health Science (Summa Cum Laude)
- 4/1999 - 3/2004: Nagaoka University of Technology, Japan, M.S., Ph.D. in Engineering (Magna Cum Laude)

Experience
- 4/2004-3/2006: Research Associate, Department of Medical Informatics, Takasaki University of Health and Welfare, Japan
- 4/2006-3/2009: Lecturer, Department of Medical Informatics, Takasaki University of Health and Welfare, Japan
- 4/2009-present: Associate Professor, Department of Medical Informatics, Takasaki University of Health and Welfare, Japan

Technical Qualification
- 4/1999: Radiological Technologist, 10/1999 Certified Radiation Protection Supervisor

Rob Davidson is the inaugural Professor in Medical Imaging at the University of Canberra, Australia. Rob has previously held roles as a Professor at Charles Sturt University and as an Associate Professor at RMIT University and at Curtin University.

Rob recently joined the University of Canberra to develop programs in medical imaging and medical ultrasound. Rob’s current research focus is on dose/image quality in planar x-ray and CT and in digital image processing.

Currently Rob supervises 4 PhD and 3 Masters by Research students. Rob has over 60 peer review publications/referred proceedings; has an adjunct professorial appointment at RMIT University and has been a visiting Professor in Fiji, Kuwait, Taiwan and Canada. He is currently an Associate Editor of the Journal of Medical Imaging and Radiation Sciences, is on the Editorial Board of the Journal of Medical Radiation Science and is a past Editor-in-Chief of The Radiographer.

Philippe GERSON qualified as a radiographer in 1981 at the hospital Hotel Dieu. Philippe became Chief Radiographer in 1990. In 2007 He has been nominated as manager of radiology, nuclear medicine and functional explorations departments.

Since 2015, he is the manager of all the paramedical staff (radiographers, nurses, lab tech etc ...) of Hotel Dieu Hospital Philippe was ISRRT’s council member for France between 1995 and 2010 – ISRRT vice president for Europe and Africa since 2010 and has been very active in Africa and Vietnam by organizing several ISRRT workshops and conferences. He is also the vice president of the French radiographers association AFPPF.
PLENARY SPEAKERS

Haihong FU
Chinese Society of Imaging Technology, China

Yu-Chun LIN
Taiwan Society of Radiological Technologist, Taiwan

Jeong Min LEE
Seoul National University Hospital, Korea

Yu-Chun Lin received the Ph.D. degrees in Electrical Engineering in 2013 from the Chang Gung University, Taiwan. He received the degree of BSc and MSc in Medical Imaging and Radiological Sciences in National Yang-Ming University, Taiwan.

He has been working as a radiological technologist since 1998 and is currently the manager of MRI center in department of radiology, Chang Gung Memorial Hospital.

He is also currently the director of Taiwan Society of Radiological Technologists (TWSRT) and the adjunct assistant professor in Department of Medical Imaging and Radiological Sciences, Chang Gung University. Dr. Lin has been continuing researches in developing quantitative MRI techniques for preclinical studies and clinical applications.

Professor Jeong Min Lee graduated from Chonbuk National University College of Medicine in 1990, and then completed Radiology Residency Training at the Chonbuk National University Hospital in 1995. From 1998–2002, he then became Fellow, and Assistant Professor of Radiology at the Chonbuk National University Graduate School of Medicine. In 2002, he moved to Seoul National University College of Medicine. He is currently Professor, and a chief radiologist in abdominal imaging and nonvascular intervention section of radiology department at Seoul National University Hospital. Professor Lee was Visiting Professor of Radiology, Iowa University Hospitals and Clinics (2007–2008). Professor Lee has also received a number of awards: The Certificate of Merit Award, RSNA 2002; Best scientific presentation award, ECR 2005; Korean Radiological Society Best Academic Paper Award; SNUH SCI Best Award; and the Korean Radiological Society Best Scientific Impact Award 2015. He has published more than 290 scientific articles in international journals, and is on the Editorial Board of a number of journals including Radiology, AJR, KJR WJGE and Liver Cancer. His main scientific interests include abdominal diagnostic and non-vascular interventional radiology.
PLENARY SPEAKERS

PhD Seung C, Kim is began his nuclear medical science career at the Ewha womans university Mok-Dong hospital South Korea in 1994 to 2009.

Since 2009, he took on roles in education completing at the college of Choon Hae and Song Ho in Korea. He is in charge of legislation director in KRTA and general affairs director of KSRS, An-Arm medical law association.

Also I am educating Radiology of college or university in Korea. He is joining medical center with school to the future of Radiology education.

Seung Chul Kim
Korean Radiological Technologists Association, Korea

Dr. Keon W. Kang, a nuclear medicine physician, is Professor & Chairman in the Department of Nuclear Medicine, Seoul National University College of Medicine. He served as a Radiation Safety Officer in Seoul National University Hospital.

He is a member of Committee 3 of International Commission on Radiological Protection (ICRP) since 2013. He is Secretary General in the Korean Association for Radiation Protection.

Keon Wook Kang
Seoul National University Hospital, Korea

Dr. Sung graduated Kyung Hee University School of Medicine, and radiology resident ship in same University Hospital. He was studying with exchange professor program to University of California, San Diego.

Now Professor and Chair of Thoracic Radiology, Department of Radiology, Kyung Hee University Hospital. Dr. Sung was Chair of Radiation Safety Committee, Korean Society of Radiology.

And now President of Korean Radiological Association of Public Health, and Chairman of Diagnostic Radiation Safety Management Advisory Committee of Centers for Disease Control and Prevention (CDC) of Korea.

He was principal investigator of nationwide survey of radiation dose in Korea. He worked for WHO International Workshop, September 2016, Korea.

Dong-Wook Sung
Kyung Hee University Hospital, Korea
PLENARY SPEAKERS

Doctor Sang Min Yoon is currently an associate professor of Department of Radiation Oncology at Asan Medical Center, University of Ulsan College of Medicine, Seoul, Korea, having been an assistant professor from 2009 to 2014 and a clinical instructor from 2007 to 2009 at Asan Medical Center, University of Ulsan College of Medicine.

He graduated Kyungpook National University College of Medicine in 1998, and went through the residency courses at Asan Medical Center from 2000-2004. He performed clinical fellowship at Asan Medical Center, Samsung Medical Center, and National Cancer Center, Korea from 2004 to 2007. He was also a visiting scholar at the University of California San Diego in USA from August 2013 to July 2014. He earned his master’s degree in 2003 and doctor’s degree in 2009 at University of Ulsan. He has published about 50 international scientific peer review papers in addition to 20 domestic scientific journals.

Chek Wee is currently working as the Senior Principal Radiation Therapist at the National University Cancer Institute, Singapore. She graduated with diploma in Radiotherapy from School of Radiography in Singapore and her Bachelor in Radiographic Studies with London South Bank University in 2004. She is also a certified medical dosimetrist with the Medical Dosimetry Board in United States and recently obtained her Master of Science in Radiotherapy Planning with Sheffield Hallam University.

Chek Wee has been active in the local and international radiography arena and is now serving as the President of the Singapore Society of Radiographers. Internationally, she is the Regional Director of the International Society of Radiographers and Radiological Technologists (ISRRT) for Asia and Australasia region. She was also appointed as the Visiting Fellow of the London South Bank University since 2015.
EXHIBITION

Accusen
Bayer Korea
Bracco
Canon Korea Business Solutions Inc.
Carestream Health Korea, Ltd.
Central Medical Service, Ltd.
DANY Trading Co., Ltd.
DaeHan Shield Engineering Co., Ltd.
DK Medical Solutions
Dongkook Pharm. Co., Ltd.
Elekta Limited
GE Healthcare Korea
Guerbet Korea
INFINITT Healthcare
ISRRT 2016 Souvenir
ISRRT 2018
ISRRT/AACRT
Nice Medica
PHILIPS
Samsung Electronics
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Siemens Healthcare Ltd.
SRS Technol & Chiyoda Technol
Taegu Radiological Technologists Association(TRTA)
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* ISRRT 2016 souvenir shop is on the second floor
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Nihon Medica
SCIENTIFIC PROGRAM

BREAST IMAGING
CT IMAGING
EDUCATION
GENERAL RADIOGRAPHIC IMAGING
INTERVENTIONAL RADIOLOGY
MANAGEMENT(QA & QI)
MR IMAGING
NUCLEAR MEDICINE
RADIATION DOSE & REDUCTION
RADIATION THERAPY
SONOGRAPHY
STUDENT SESSION

19th ISRRT World Congress
23rd EACRT & 51st KRTA Annual Meeting
October 20-22, 2016 Seoul, Korea
PRE-Congress 1: Education

Oct. 20 (Thu)

09:30 - 14:00  Theme: Exploring Innovative Education Practices  
Rm. 203

Chair: Maria LAW (ISRRT, Hong Kong, China)
Co-Chair: Jenny SIM (The University of Auckland, New Zealand)

9:30  Session 1: Simulation for Radiography Education
Moderator: Jenny SIM (The University of Auckland, New Zealand)

9:55 The Flipped Radiography Classroom
Hesta FRIEDRICH-NEL  
CUT, South Africa

10:20 Training the 21st Century Radiotherapy Professional: The Role of Computer Simulation
Andy BEAVIS  
VERT, UK

11:05 Practical Assessment Using Virtual Simulation
Kamy Mei-Yee YUEN / Tung Wah College, Hong Kong, Maria LAW / ISRRT, Hong Kong

11:25 Discussion
Moderator: Jenny SIM (The University of Auckland, New Zealand)

11:05-11:20 Break

Session 2: Clinical Training
Moderator: Hesta FRIEDRICH-NEL (CUT, South Africa)

11:20 An Innovative Approach to Monitoring and Evaluating Clinical Skills Using a Customized Online Learning Portfolio
Lori BOYD, John MCINERNEY  
Monash University, Australia

11:45 Developing Student Clinical Competency Online: Exploring the Online Learning Space
Jenny SIM  
The University of Auckland, New Zealand

12:10 Discussion
Moderator: Hesta FRIEDRICH-NEL (CUT, South Africa)

Session 3: Case-based Learning
Moderator: Maria LAW (ISRRT, Hong Kong, China)

12:25 iSAP: An innovative case based learning tool for medical imaging and radiation therapy
Marilyn BAIRD, Cynthia COWLING, Kirsten SCHLIEPHAKE  
Monash University, Australia

12:50 Discussion
Moderator: Maria LAW (ISRRT, Hong Kong, China)
PRE-Congress 2: Radiation Protection

Oct. 20 (Thu)

09:30 - 14:00

Theme: Facing Challenges of Radiation Protection in the 21st Century - ISoRT Response to “Bonn Call to Action”

Room: 208

Chair(s): Donna Newman (ISoRT, USA)
          Stewart Whitley (ISoRT, UK)

Session 1: Global look at Justification and Optimization

9:30
Global look at Justification and Optimization
Donna Newman
ISoRT, USA

9:55
Justification Pilot Project in Europe School's Smart Approach
Dimitris Katsifarakis
ISoRT, Greece

10:20
Discussion: How are Countries are Using Guideline in Their Every Day Practices
Stewart Whitley
ISoRT, UK

10:45 - 11:05
Break

Session 2: Communicating Radiation Risk in Paediatric Imaging

11:05
*Communicating Radiation Risk in Paediatric Imaging
- Information to Support Health Care Discussion about Benefit and Risk
- Overview of Free Downloadable Document
Donna Newman, Stewart Whitley
ISoRT, USA, UK

Session 3: Global Look at the Application of Radiation Protection in Clinical Practice

11:25
Radiation Protection, Local Perspective from UAE
Mohamed Mahmoud Abuzaid
University of Sharjah, UAE

11:50
Radiation Protection in Korea: Nuclear Medicine Technologist Clinical Experience
Gyehwan Kim
Seoul National University Hospital, Korea

12:15
The Radiologic Technologist Perspective - The Radiation Safety Advocate in the Cath Lab, USA Practice
Christopher Steelman
Medical University of South Carolina Children’s Hospital, USA

12:40
Discussion: How the Best Practice are Contributing to Radiation Protection
Donna Newman
ISoRT, USA
BREAST IMAGING

Oct. 21 (Fri)

15:45 - 16:45 BI 1: BREAST IMAGING 1

Chair(s)
Miyoung KIM (Dankook University Hospital, Korea)

15:45 The Clinical Application of Digital Breast Tomosynthesis (DBT)
BI1-1
Chun Wu ZHOU, Wen Wen FAN, Jun Feng SONG
Cancer Hospital Chinese Academy of Medical Sciences, China

15:55 The Comparison of the AGD with Using DBT and FFDM
BI1-2
Sun Hee CHO, Jeong hyeon HONG, Sung Suk BAE, Dong Sung KIM
Seoul National University Hospital, Korea

16:05 The Influence of Ethnicity on Mammographic Breast Density Pattern
BI1-3
Pushpa Thevi THEVI RAJENDRAN, Lili AZIAH, Vijayalakshmi KRISHNAPILLAI
Ampang Hospital, Malaysia

16:15 Optimized choice of Exposure Parameters in Digital Mammography
BI1-4
Yun LI, wen-fu LI, Li-Ming SONG, Daping DENG
Shandong cancer hospital affiliated to Shandong University, Shandong Academy of Medical Sciences, China

16:25 Breast Pathologies, One Day One Diagnosis
BI1-5
Sarah ID BAIROUK, Sonia ALIMI
Tenon Hospital PARIS, France

Oct. 22 (Sat)

15:15 - 16:15 BI 2: BREAST IMAGING 2

Chair(s)
Jenny SIM (The University of Auckland, New Zealand)

15:15 Estimation of Usefulness and Clarity of Two-dimensional Synthesized Mammography in Comparison with Full Field Digital Mammography in The Lesion of Micro-calcifications
BI2-1
Hye Won KIM, Yoo na KIM, Hye Jin LEE
Severance Hospital, Korea

15:25 Reliability Between Visual Assessment and Quantitative Analysis for Image Quality Evaluations Of Mammographic Accreditation Phantom Images In Digital Radiology
BI2-2
Mi Hwa LEE, Hong Ryang JUNG, Ho Chul KIM, Yong Sung PARK, Ik Pyo LEE
Kyung Hee University hospital at Gangdong, Korea

15:35 Comparison of The Measured and Estimated Effective Dose on Pediatric CT Scans: Phantom Study
BI2-3
Takanori MASUDA, Naoyuki IMADA, Yukari YAMASHITA, Yukie KOBAYASHI, Takayuki OKU
Tsuchiya general hospital, Japan
15:45  The Diagnostic Value of Diffusion Kurtosis MR Imaging In Breast Lesions and Its Correlation with Clinical Pathological Factors
B12-4  Jinkang LIU, Ge LI, Zeng XIONG, Hui ZHOU, Wei CHEN, Gaofeng ZHOU
Xiangya Hospital of Centre-south University, China

15:55  Using Artificial Neural Network to Predict Correlation of Pre-Mammography Questionnaire for Breast Cancer
B12-5  Hsiao-Ping WU, Ying-Chi TZENG, Hung-Wen CHIU
Taipei Medical University Graduate Institute of Biomedical Informatics, Taiwan

16:05  Correlation Between Mammographic Findings and Histopathology: A Case Study of African Women at A Private Hospital
B12-6  Simbarashe Terrence GASHIRAJ, Ellen Fungai MAGURANYANGA, Sindiso NLEYA
National University of Science and Technology, Zimbabwe
CT IMAGING

Oct. 20 (Thu)

14:00 - 15:00  CT 1: CT IMAGING 1  Rm. 104

Chair(s)  Zongrui ZHANG (Chinese Society of Imaging Technology, China)

14:00  Quantitative Evaluation of Coronary Artery Diameter: Effect of CT Scan Modes and Heart Rate
CT1-1  Jeong Hoon HWANG, Moon Chan KIM, Yoon Chul NAM, Jin Seok PARK, Jun Su KIM
Samsung Medical Center, Korea

14:10  Image Quality Of Whole Aortic Angiography With Low Contrast Flow Rate And Dual-Energy CT Non-Linear Blending Technique
CT1-2  Jie LIU
The First Affiliated Hospital of Zhengzhou University, China

14:20  Image Quality Evaluation of Virtual Monoenergetic Spectral in Two Dual Energy Computed Tomography Based on Noise Level
CT1-3  Yang ZHOU
The First Affiliated Hospital of Chongqing Medical University, China

14:30  Feasibility Study of Using Low-Concentration, Low-Dose and Low-Injection Rate of Contrast Medium in Portal Vein CT Angiography with Spectral CT
CT1-4  Ming YANG, Kun LUO, Jianming YU
Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, China

15:00-15:15  Break

15:15 - 16:15  CT 2: CT IMAGING 2  Rm. 104

Chair(s)  Philippe GERSON (ISRRT, France)

15:15  Knowledge-based Iterative Model Reconstruction: Effect on Image Quality in ECG-modulated Retrospective ECG-gated Coronary CTA
CT2-1  Hong Soo LEE, Jung sam KIM
Mokpo City Medical Center, Korea

15:25  Single Phase Intra-arterial CT Hepatic Angiography to Visualize Both Arterial Anatomy and Parenchyma Enhancement of Vascular Intrahepatic Tumour
CT2-2  Cornelio PADRE, Toow Chow WEI, Oliver Duculan LAROCO, Kwok Yew MUN, Muthupalani AYYAKANNU, Chong Soon HING, Kenneth Yeo Chye WHATTT, Lo Hoau GONG, Apoorva GOGNA
Singapore General Hospital, Singapore

15:35  Radiation Dose and Associated Exposure Parameters in Selected MDCT Scanners in Multiphase Scan of Abdomen- Pelvic Region: A Clinical Study.
CT2-3  Ishani Sarangika WASALA HERATH, Puvanasunthararajah SATHYATHAS, Amalaraj THANGARAJAH, Ayesh Lalinda JAYASINGHE
Nawaloka Hospitals Ltd, Sri Lanka
CT IMAGING

15:45 Analysis of Correlation Between Automatic Tube Current Control Technology and The Image Quality of Upper Abdominal CT Enhanced Scan
CT2-4 Zhenlin Li, Wanjiang Li
West China Hospital, Sichuan University, China

15:55 Comparison of CT Contrast Enhancement Effect Contrast Between Injection from Implanted Port System Capable of Contrast Injection and Peripheral Intravenous Injection
CT2-5 Katsunao SUZUKI, Toshio TAKE, Hiroyuki WATANABE, Masaru NITTA, Yasuo NAKAZAWA
Showa University Yokohama City Nothern Hospital, Japan

16:05 Estimation of Bone Mineral Density from Gray Value of Cone-Beam Computed Tomography
CT2-6 Hideki ISHIDa, Araki KAZUYUKI, Junko BANBA, Takashi MIYAZAKI, Yasuo NAKAZAWA
Showa University School of Dentistry, Japan

16:15-16:30 Break

Oct. 21 (Fri)

09:00 - 10:30 CT 3: CT IMAGING 3
Chair(s) Jae In CHANG (Asan Medical Center, Korea)

09:00 A Comparative Study on The Effectiveness of 3-Material Decomposition at Non-Contrast Phase and Arterial Phase of Liver Volumetry CT Using GSI
CT3-1 Sehwan KIM, Ki-baek LEE, So Yeon KIM, Asan Medical Center, Korea

09:10 Development and Application of The Laser Device for CT-guide PCNB
CT3-2 Min Cheol JEON, Jong Won PARK, Hyang Seob LEE, Myung Koo LEE, Sook Ja LEE
Chungnam National University Hospital, Korea

09:20 The Image Quality with Ultra Low Dose CT in Diagnosis of Solitary Pulmonary Nodules: A Pilot Study Using Spectral CT and Adaptive Statistical Iterative Reconstruction Algorithm
CT3-3 Funan WANG, Liuhong ZHU, Qihua CHENG, Gang GUO
Xiamen No.2 Hospital, China

09:30 The Feasibility Study of Brain CT Perfusion with 70KV Tube Voltage
CT3-4 Wanjiang LI, Zhenlin LI
West China Hospital, Sichuan University, China
CT IMAGING

09:40 Explore The Breathless after Heart Rate Changes and Time of Stable Heart Rate on The Quality of The Coronary CT
CT3-5 Chun_cai LUO, Qiang WANG, Li YANG
PLA General Hospital, China

09:50 Comparison of Abdominal CT Scan Using Iterative Reconstruction with Standard Filtered Back-Projection Algorithm
CT3-6 Yingming ZHAO
Anhui Provincal Hospital, China

10:00 Evaluation of Cardiac Function Analysis in Catheter Ablation Using ECG-gated CT
CT3-7 Hiroyuki YAMAMOTO, Masayuki KUMASHIRO
Kurashiki Central Hospital, Japan

10:10 Study of Using Low Tube Voltage Imaging in Coronary Artery CT-angiography
CT3-8 Hideki SHIBATA, Shinji FUKADA, Isao KOZAWA
Toyota Kosei Hospital, Japan

10:30-10:45 Break

10:45 - 11:45 CT 4: CT IMAGING 4
Chair(s) Boniface YAO (ISRRT, FRANCE)

10:45 Detectability of Urinary Stone Sizes and Compositions by Various Scanning Parameters in Dual Energy CT
CT4-1 Jun bong SHIN, Hyo Jun CHOI, Seung ok KIM
Catholic Kwandong University International ST. Mary’s Hospital, Korea

10:55 Image Quality of CT Angiography for Vascular Stenosis Depending on DFOV Size
CT4-2 Han Byeol JO, Jae HER Sang Boh SHIN, Mi Sub AHN, Jung Min KIM
Samsung Medical Center, Korea

11:05 To Assess The Feasibility and Value of Multiphasic Dynamic Scan Protocol in Aortic Dissection
CT4-3 Yike DIAO, Zhen-lin LI, Chun-yan LU, Xiao-hui ZHANG
West China Hospital of Sichuan University, China

11:15 The Value of The MSCT Angiography for Atypical Hemorrhagic Cerebrovascular Diseases
CT4-4 Chi QI, Yongshui LAN, Yilin XIONG
The Affiliated Hospital of Southwest Medical University, China

11:25 Computed Tomography of Pediatric Abdomen with Low Concentrated Contrast-Medium and Low Radiation Dose
CT4-5 Haoyan LI
Beijing Children’s Hospital, China

11:45-12.00 Break
CT IMAGING

12:00 - 12:40  CT 5: CT IMAGING 5  Rm. 103
Chairs: Kuang-Hua CHU (Central Taiwan University of Science and Technology, Taiwan)

12:00  A Novel Visualization Method of Preoperative Cardiac CT for Atrial Septal Occlusion: Minimum Intensity Projection and Fusion Volume Rendering Images
CTS-1  Yoshitaka NAKAMURA, Tatsunori SAHO, Jyoushin MATSUZAKI, Ryouji ICHINOSE
Kokura Memorial Hospital, Japan

12:10  Spectral Enhanced CT with ASIR Associated with Low-concentration Contrast: Investigation Of Image Quality and Detection in Rabbit VX2 Liver Tumor Models
CTS-2  Mingyue WANG
The First Affiliated Hospital of Zhengzhou University, China

12:20  Diagnostic Accuracy In Detecting Cerebral Aneurysm In Dual Source Computed Tomography Angiography (CTA) Compared to Digital Subtraction Angiography (DSA) at University Malaya Medical Centre
CTS-3  MOHAMMAD MUDZAKIR ZAINAL ALAM, Mohamed Nadzri MOHD YUSOFF, Khairul Azmi ABDUL KADIR
University Malaya Medical Centre, Malaysia

12:30  The Value Of CTP in The Comparison of Postoperative Cerebral Ischemia Between The Lateral Supraorbital Approach with Micro Traction to Intracranial Aneurysm Clipping and Conventional Aneurysm Clipping
CTS-4  Chi QI, YONGSHU LAN, Xinghu QIN
The Affiliated Hospital of Southwest Medical University, China

12:40-14:00  Lunch

14:00 - 15:30  CT 6: CT IMAGING 6  Rm. 103
Chairs: Chong Hwan CHOE (White Memorial Medical Center, USA)

14:00  A Study on Surface Absorbed Dose Reduction by Using Contrast Media and Normal Saline Solution
CT6-1  JOO SEONG KO
Jeonbuk National University Hospital, Korea

14:10  The Factors of Computed Tomography That Affect Extravasation Incidence: Retrospective Study
CT6-2  GUAN-JUNG PARK, Yong-Hwan JUNG, Soon-Ahn KWON, Kwan-Hong MIN
Seoul National University Bundang Hospital, Korea

14:20  CT Virtual Colonography with Carbon Dioxide Gas
CT6-3  Subhash Chand BANSAL, Lait Kumar GUPTA
Postgraduate Institute of Medical Education & Research, India

14:30  Optimize Patient Positioning Strategy to Minimize Streak Artifacts in Neck CT
CT6-4  Danni LI, Yaguang MA
Beijing Cancer Hospital, China
CT IMAGING

14:40 Comparative Analysis Study of Low Tube Voltage Using Different Iterative Reconstruction Technique on Image Quality of CCTA
CT6-5 Yaojun JIANG, Jianbo GAO, Jie LIU, Ping HOU, Yanbang LIAN
The First Affiliated Hospital of Zhengzhou University, China

14:50 The Study on Automatized Quantitative Analysis Method for Spatial and Low Contrast Resolution Assessment in CT Phantom Image Evaluation
CT6-6 KiBaek LEE, HoChul KIM
Asan Medical Center, Korea

15:00 Contrast-Detail Measurements in CT: A New Image Quality Evaluation Methodology
CT6-7 Rob DAVIDSON, Haney ALSLEEM, Marianne FLOOR, Roeland VAN DER BURGHT
Canberra University, Australia

15:30-15:45 Break

15:45 - 16:45 CT 7: CT IMAGING 7
Chair(s) Jeong Hoon HWANG (Samsung Medical Center, Korea)

15:45 The Study of Scatter Radiation in Computed Tomography (X-axis)
CT7-1 Ki Jin KIM, Bo Woo LEE, Jin Hoe LEE, Yeong Hak JO, Jeong Ho KIM, Kyoung Nam KO, Seung Young KIM, Hyo Sun PARK, Seong Ki KIM, Jae Cheon KIM and Dae Yeong SONG
Konyang University Hospital, Korea

15:55 The Influence of Noise Performance in Clinical CT FBP and Iterative Reconstruction Algorithm (iDose4) for Quantitative Analysis with Low Tube Voltage
CT7-2 Pil-Hyun JEON, Won-Hyeong LEE, Sung-Su JEON, Byungdu JO, Hee-Joung KIM
Wonju Severance Christian Hospital, Korea

16:05 Optimizing Iodine Dose in Different Iodine Concentration by Iodine Flow Rate in Simens Dual-source Computed Tomographic Coronary Angiography
CT7-3 Xiao YANG, Jian LI, Fang GAO, Na LI, ZHe LIU
Shaanxi province people’s hospital, China

16:15 Clinical Evaluation of CT Angiography for Aortic Valve Implantation (TAVI)
CT7-4 Fan YANG
West China Hospital of Sichuan University, China

16:45-17:00 Break

17:00 - 18:00 CT 8: CT IMAGING 8
Chair(s) Youl-Hun SEOUNG (Cheongju University of Korea, Korea)

17:00 Study on Waiting Time for CCTA(Coronary CT Angiography) after Oral Administration of Beta Blocker According to Heart Rate Level
CT8-1 Jong Hye KANG, Sang Woo LEE, Yeong Ran KIM
Asan Medical Center, Korea
CT IMAGING

17:10 Measurable Minimum Size of Region of Interest Under Gemstone Spectral Imaging Scanning: A Standard Water Phantom Based Study
CT8-2 Liuhong ZHU, Funan WANG, Qihua CHENG, Gang GUO
Xiamen No.2 Hospital, China

17:20 Effect of Motion-Correction Algorithm (Snapshot Freeze) on Image Quality Improvement at Different CT Value of Using Spectral CT Monochromatic Imaging
CT8-3 Yaojun JIANG, Jianbo GAO, Jie LIU, Ping HOU, Yanbang LIAN, Peijie LV
The First Affiliated Hospital of Zhengzhou University, China

17:30 Computed Tomography: The Effects of Patient Centring on Organ Dose
CT8-4 Bharti KATARIA
University Hospital Linkoping, Sweden

Oct. 22 (Sat)
14:00 - 15:00 CT 9: CT IMAGING 9
Chair(s) Zongrui ZHANG (Chinese Society of Imaging Technology, China)

14:00 Research on Dose Reduction and Image Quality by Changing Tracker Spot in Lower Extremity CT Angiography
CT9-1 Jun-cheol PARK, Chan-il JEON, Sung-Hyun LEE, kye-yeon PARK
Korea University Guro Hospital, Korea

14:10 A Study Of Using The Appropriate PSI<Pound Per Square Inch> To Prevent Extravasation in Blood Vessel During CT Scan
CT9-2 Kilsun UHHM, Soojung YOON, Soonykoo PARK, Jaesik LIM
Severance Hospital in Yonsei University Health System, Korea

14:20 Assessment of the Effect of Subject-focused and Organ-focused Isocenters on The Resolution of CT Scans
CT9-3 Yeonhee KIM, Seongju LEE, Sangjae YOO, Dongsung KIM
Seoul National University Hospital, Korea

14:30 Image Quality of Abdominal CT Scan Using Gemstone Spectral Imaging with or without Adaptive Statistical Iterative Reconstruction
CT9-4 Hsiao-Han TSAI, Ping-Chung PAO, Ying-Chi TSENG, Chi-Jen CHEN
Taipei Medical University Shuang Ho Hospital, Taiwan

14:40 Using The Virtual Colonoscopy for Far Eastern Memorial Hospital In Taiwan
CT9-5 Ruei-Chi LIN, Wan-Ting TSAI, Ho-Ching AI, Hsin-Te CHIAN, Yen-Jun LAI
Far Eastern Memorial Hospital, Taiwan

14:50 Discussion of Impact on Image Quality and Radiation Dose for Various Subject Position in Brain CT Scanning
CT9-6 So Ra LEE, Ha Young LEE, Ji Min KIM, Beom Jong SEO, Dae Cheol KWEON
Shinhin University, Korea
CT IMAGING

15:00-15:15  Break

15:15 - 16:15  CT 10: CT IMAGING 10  
               Chair(s)  Jae In CHANG (Asan Medical Center, Korea)

15:15  A Study on The Usefulness of the Lens Shielding Material In Brain CT Imaing  
       CT10-1  Hyeon ji LEE, Seol bin GOH, Seong yeon KIM, Do hoon LEE, Seong woo HONG, Seon yeol SEO,  
               Dong kyooon HAN  
               Eulji University, Korea

15:25  The Satisfaction Survey of Users and Patients on The Transparent Tourniquet in Contrast Media Used  
       CT Examinations  
       CT10-2  Naye SHIN, Kyeong Rim LEE, Seong Ju LEE, Sang Hyeon KIM, Dong Ju KIM, Sang Jae YU, Dong Seong KIM  
               Seoul National University Hospital, Korea

15:35  Noise Value and Dose Change of Each Organ by Beam Collimation and Equipment Noise Index Change  
       CT10-3  Doyun JUNG, Sanghyeon KIM, Mingwon GOH, Yonghwan SHIN, Minsu LEE, Dongseong KIM  
               Seoul National University Hospital, Korea

15:45  An Audit of Paediatric Computed Tomography Examinations in Trinidad and Tobago  
       CT10-4  Justin MAHABIRSINGH  
               Infeemed Solutions & Supplies, Trinidad and Tobago
EDUCATION

Oct. 21 (Fri)

10:45 - 11:45  ED 1: EDUCATION 1  Rm. 203A
Chair(s) Naoki KODAMA (Japan Association of Radiological Technologists, Japan)

10:45  Transformational Leadership in Relation to the Managerial Functions of Radiologic Technology Administrators of Selected Higher Educational
ED1-1  Chona CABATAY
University of Perpetual Help System DALTA, Philippines

10:55  Multimedia Patient Education: Assessing the Perceptions of Patients and Staff
ED1-2  Marcia SMOKE
Uraviniski Cancer Centre, Canada

11:05  Synergism of Radiologist Residents and Radiographer in Teaching Pathology to Radiologic Technology Students
ED1-3  Sarah BAKER
Indiana University, USA

11:15  History, Current Status and Capacity Building of Radiography Practice in Ghana
ED1-4  Vivian Della ATUWO-AMPOFO, Lawrence ARTHUR, Harriet DUAH, Emmanuel FIAGBENU, Kofi KYEI, James William AMPOFO
Komfo Anokye Teaching Hospital, Ghana

11:25  The Evaluation of Radiation Protection Awareness Among Health Workers at The Mbeya Zonal Referral Hospital.
ED1-5  Joel LANGU, Isaiah MPAGAMA
Mbeya Zonal Referral Hospital, Tanzania

11:35  Critical Thinking And Decision-Making In Clinical Radiographic Practice-Implication for Education and Training
ED1-6  Aarthi RAMLAUL
University of Hertfordshire, UK

11:45-12:00  Break

12:00 - 12:40  ED 2: EDUCATION 2  Rm. 203A
Chair(s) Eunihoe GOO(Cheongju University , Korea)

12:00  “It’s Just Lunch” Teaching Radiographers How to Teach Via a Novel Six-Part Lunchtime Series
ED2-1  Oh Yue Ling FELICIA, Chun Meng CHONG
Tan Tock Seng Hospital, Singapore

12:10  Guidelines for Imaging to Estimate Bone Age in Medio-Legal Situations
ED2-2  Edel DOYLE
International Association of Forensic Radiographers, Australia
## EDUCATION

12:20  An Assessment of The Clinical Competencies of Radiologic Technology Educators in The Philippines: Basis for Proposed Clinical

**ED2-3**  Cheyen MOLON  
De La Salle Health Sciences Institute, Philippines

12:40-14:00  Lunch

### Oct.22 (Sat)

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<tr>
<th>Time</th>
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<th>Title</th>
<th>Speaker(s)</th>
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</thead>
</table>
| 08:30 | ED 3: EDUCATION 3 | A Study on The Job Competency of Radiological Technologist in Korea | Chang-Seon LIM, Yang-Sub LEE, Yong-Dae LEE, Hyun-Soo KIM, Gye-Hwan JIN  
Koryang University, Korea |
| 08:40 | ED3-2            | Simple And Effective Way of Teaching Useful Optical Density Range in Radiography | Wimalasena VITHARANA GAMAGE  
National Hospital of Sri Lanka, Sri Lanka |
| 08:50 | ED3-3            | Widening Access to Medical Imaging Education in Regional Australia. | Hazel HARRIES-JONES, Caroline FALCONI  
Central Queensland University, Australia |
| 09:00 | ED3-4            | Status of Radiological Technology in India                  | Nuran AKYURT, A. Nilufer OZAYDIN  
Marmara University, Turkey |
| 09:10 | ED3-5            | MRI Signal Simulation by Matlab for Medical Imaging Teaching | Zhuang NIE  
Union hospital, Tongji Medical Colleague, HuaZhong University of Science and Technology, China |
| 09:20 | ED3-6            | Teaching Physics to Medical Radiation Student Technologists in RMIT University Australia | Pradip DEB  
RMIT University, Australia |
| 09:40 | ED3-7            | Collaboration and Teamwork: Interactions for RT’s Professional Practice | Pamela ROWNTREE, Debbie STARKEY  
Queensland University of Technology, Australia |
| 10:00 |                  | Break                                                        |                                                                            |
EDUCATION

10:15 - 11:45  ED 4: EDUCATION 4  Rm. 203

Chair(s)  Chong Hwan CHOE (White Memorial Medical Center, Korea)

10:15  The Current Situation of Radiological Technology Education in Vietnam and The Dream for Changes to Develop
ED4-1  Loan TRAN
Vietnam Association of Radiological Technologists and Ho Chi Minh city Association of Radiological Technologists, Vietnam

10:25  Factors Affecting Radiographers’ Willingness to Practice in Rural and Underserved Areas in Nigeria
ED4-2  Mark OKEJI, AngelMary ANAKWUE, Chigozie NWOBU
University of Nigeria, Nigeria

10:35  Use of Online Social Media for PD Amongst Radiographers, Radiation Therapists and Nuclear Medicine Technologists in Australia and Canada
ED4-3  Celeste LAWSON, Lori BOYD
Monash University, Australia

10:45  What Difference Can Portfolio Make In Radiographer Work Practice
ED4-4  Mohamed ABUZAID, Weam ELSHAMI, Leena DAVID
University of Sharjah, UAE

10:55  CAD Tool Development To Aid Radiography Educators in Teaching Pattern Recognition of The Chest.
ED4-5  Sibusiso MDLETSHE, Heather LAWRENCE, Andre NEL
University of Johannesburg, South Africa

11:05  Radiation Therapy Education and Certification in Ghana
ED4-6  Emmanuel Worlali FIAGBEDZI, VIVIAN DELLA ATUWO-AMPOH, JUSTICE HANSON, Cris OSAM-DUODO, Samuel Y. OPOKU
Komfo Anokye Teaching Hospital, Ghana

11:15  The Benefits of A True Virtual Reality Medical Imaging Simulation Suite
ED4-7  James HAYES
Virtual Medical Coaching Ltd, New Zealand

11:45-12:00  Break

12:00 - 12:40  ED: PLENARY LECTURE 1  Rm. 203

Chair(s)  Maria Law (ISRRT, Hong Kong, China)

12:00  The current status and the future of radiological technologists education in Japan
ED-PL1  Naoki KODAMA
Japan Association of Radiological Technologists, Japan
EDUCATION

14:00 - 15:00  ED 5: EDUCATION 5  Rm. 203

Chair(s)  Youngjin JUNG (Dongseo University, Korea)

14:00  High Fidelity Simulation and Its Role in Radiography Education
ED5-1  Andrew ENGLAND, Penny BUTLER, Christopher BEAUMONT
University of Salford, UK

14:10  Student Radiographers' Attitudes Towards The Older Patient - A Longitudinal Study
ED5-2  Sundaran KADA, Lisa BOOTH
Bergen University College, Norway

14:20  Perceptions of Clinical Preparedness Among Radiologic Science Students in JRCERT Accredited Programs
ED5-3  Timmerie COHEN, Melanie DEMPSEY, Rebecca KEITH
Virginia Commonwealth University, USA

14:30  Trainspotting - Cancer & Addiction
ED5-4  Lorraine WHYTE
Beatson West of Scotland Cancer Centre, UK

14:40  The Role of Radiography in Mass Fatality Incidents
ED5-5  Edel DOYLE
International Association of Forensic Radiographers, Australia
GENERAL RADIOGRAPHIC IMAGING

Oct. 20 (Thu)

14:00 - 15:00  GR 1: GENERAL RADIOGRAPHIC IMAGING 1  Rm. 203B
Chair(s)  Dang NAMGUNG (Waitemata Board (North Shore Hospital), New Zealand)

14:00  Does Standing Posture Have An Influence on The Longitudinal Arch in Flatfoot Patients?
GR1-1  Hsiao-Chi HUANG, Cheng-Hong YANG, Pei-Wen CHUANG, Yuan-Hong FAN
Taipei Veterans General Hospital, Taiwan

14:10  High kVp in Abdominal X-ray: Evaluation using a Human Cadaver
GR1-2  Rob DAVIDSON, Dale GIBSON, Sharon NIelsen
Canberra University, Australia

14:20  New Lateral View Method of Hip Joint Radiography
GR1-3  Motohiro TABUCHI, Takashi KIGUCHI, Takashi YAMASHITA, Atsushi NAKATSUKASA, Kazutomo HARADA
Konko hospital, Japan

14:30  A New X-ray Fluoroscopy Image Quality Processing -Validation in Diagnostic Bronchoscopy for Peripheral Pulmonary Lesions-
GR1-4  Mayumi KITAGAWA, Yuji MATSUMOTO, Naoki SHIMADA, Jun TORII, Naoya IKENO, Yuzuru KOUNO, Takehiro IZUMO, Takaaki TSUCHIDA, Wataru MUKOYOSHI, Tomohiko ASO
National Cancer Center Hospital, Japan

14:40  Does Natural Background Radiation Cause Radiation Fog on Computed Radiography (CR) Imaging Plates Stored in A Lead-lined Environment?
GR1-5  Wei Yow SIM, Adam Yong Han KEE, Henrietta Mei Zi GOH
Singapore General Hospital, Singapore

15:00-15:15  Break

15:15 - 16:25  GR 2: GENERAL RADIOGRAPHIC IMAGING 2  Rm. 203B
Chair(s)  Rob Davidson (Canberra University, Australia)

15:15  Study on Reduction of Geometrical Distortion of Stitched Radiographic Images
GR2-1  Young Dong KIM, Myung Bae PARK, IL Kyu KANG, Min Yong LEE, Kye Yeon PARK
Korea University Guro Hospital, Korea

15:25  Association of Visceral Fat Obesity with Prostate Cancer
GR2-2  Myeong Seong KIM
National Cancer Center, Korea
GENERAL RADIOGRAPHIC IMAGING

GR2-3 Kaoru KATORI, Keisuke KONDO, Daisuke Kittaka, Hisaya SATO, Yasuo NAKAZAWA
Showa University Hospital, Komazawa University graduate school, Japan

15:45 Evaluation of Diagnostic Quality of Chest Radiographs in A Nigerian Teaching Hospital
GR2-4 Mark OKEJI, Felicitas IDIGO, Uloma NWOGU
University of Nigeria, Nigeria

15:55 Appropriate X-ray Imaging Method for Lateral Image of Elbow Joint Using Newly Developed Goniometer
GR2-5 Natsuki TAKAI, Shigetoshi MORIOKA, Yasutaka HADA
Mitsubishi-kobe hospital, Japan

16:05 Examining Practitioners’ Assessments of Perceived Aesthetic and Diagnostic Quality of High kVPLow mAs Pelvis, Chest, Skull, and Hand Phantom Radiographs
GR2-6 Elizabeth LORUSSO
Fanshawe College, Canada

16:15 Contribution of Radiology Technician in Rural Health Care in Developing Countries: Case of Blitta Hospital in Togo (West Africa)
GR2-7 Dogbevi AZIAGBA, Koffi PANI
International Polyclinic Saint Joseph of Lome-Togo, Togo

Oct. 21 (Fri)
15:45 - 16:45 GR 3: GENERAL RADIOGRAPHIC IMAGING 3  Rm. 102
Chair Gyoo Hyung KIM (Myung Ji Hospital, Korea)

15:45 A Study of The Correction Factor on The Femur Magnification Based on The Ffd in General Radiography
GR3-1 Ki Seok PARK, Sung Hee WOO, Ha Deok JUNG, Ji Hoon LEE, Jun HO CHO, Sang Won MOON
Inje University Haeundae Paik Hospital, Korea

15:55 Effect on Entrance Surface Dose Change of Collimation at Auto Exposure Control on Digital Radiography System
GR3-2 Young Cheol JOO, Gil LEE
Samsung Medical Center, Korea

16:05 Factors Affecting The Magnification Rate of Panoramic Imaging and Changes Depending on The Features Among Devices
GR3-3 Se-Hoon JIN, Hyung-wook CHOI, Hyun-Young KIM, Sang-Kil YOU, Hyung-Il GANG
Yonsei University Dental Hospital, Korea

16:15 A Study on Exposure Factors and Deviation Index for A New General Digital Radiography System at University Malaya Medical Centre
GR3-4 Ramli KHADIJA, Lai Kuan CHAN, Mhd Khalid NUR NABIHAAH, Mohamed Yusoff NUR AMANIAH
University of Malaya, Malaysia
GENERAL RADIOGRAPHIC IMAGING

16:25  Radiography As A Global Profession
GR3-5  Cynthia COWLING, celeste LAWSON
Monash University, Australia

16:35  Presentation of Chest Radiology
GR3-6  Jahangir Alam SALIM
National Institute of Mental Health & Hospital, Bangladesh

16:45-17:00  Break

17:00 - 18:00  GR 4: GENERAL RADIOGRAPHIC IMAGING 4  Rm. 102
Chair  Wang Kyun OH (Cheong Ju Medical Center, Korea)

17:00  The Comparative Study of The Surface Dose and The Snr for Grid Use or Non-Use in The Time of Extremity Examination in The Dr System
GR4-1  Byoung Chae HAN, Sung Woo LEE, Hyuk In SOWN, Dong Wook KIM, Min Woo LEE
Korea University Ansan Hospital, Korea

17:10  The Effective Anteroposterior Oblique Angles to Evaluate Uncovertebral Joint Hypertrophy (UVH)
GR4-2  Seung Bae CHO, Dae Young PARK, Byung Joon HWANG, Mi Sub AHN
Samsung Medical Center, Korea

17:20  Research of Image Quality for The Change of Tube Voltage(kVp) and Beam Current(mA) in Abdomen X-ray Image.
GR4-3  So Ra LEE, Ju Young KO, Seong Hee KANG, Keun Taek OH, Gwang Won LEE
Chonbuk National University Hospital, Korea

17:30  Evidence of Dose Optimisation within A Single UK Radiology Department: Analysis of DICOM Headers
GR4-4  Andrew ENGLAND, Louise HARDING, Rachel PENNY, Ryan WILDE, Fergus DUNN, Anthony MANNING-STANLEY, Maureen TAYLOR, Paula EVANS
University of Salford, UK

17:40  Importance of Identify The Shape of Cranium Before Taking Sinus X-Ray and How to Positon The Patient According to That
GR4-5  Danushka HETTIARACHCHI
National Hospital, Sri Lanka

17:50  Effective Lateral and Vertical Collimation for Digital PA Erect Chest X-Ray Using Body Surface Landmark
GR4-6  Lai Kuan CHAN, Khadijah RAMLI, Abu Bakar MAZLIPAH, Nurul Najwa ADZME, Nila Suria JOBER
University of Malaya, Malaysia
# GENERAL RADIOGRAPHIC IMAGING

**Oct. 22 (Sat)**

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<th>Time</th>
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<th>Room</th>
<th>Presenters</th>
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<tr>
<td>08:30</td>
<td>Rotation Angle of Patient for Correct Grashey Method</td>
<td>GR5-1</td>
<td>Hee Kuk Jung, Young Cheol Joo, Sang Jeon Lee</td>
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<tr>
<td></td>
<td><strong>GR 5: GENERAL RADIOGRAPHIC IMAGING 5</strong></td>
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<td>Chair(s): Jun Bong SHIN (Catholic Kwandong University International ST. Mary's Hospital, Korea)</td>
</tr>
<tr>
<td>08:40</td>
<td>Study on Effectiveness of Modified Table Digital Radiography with Assistant Device for Hip Joint Axiolateral Examination</td>
<td>GR5-2</td>
<td>Dong Hwan Kim, Nam Yee Park, Yun Young Jeong, Sung Sik Kim, Chi Bok An, Soon Gyu Park, Jae Sik Lim</td>
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<tr>
<td>08:50</td>
<td>A Study on Maxillary Sinus Volume and PNS Water’s Projection Reference Angle According to Age and Gender</td>
<td>GR5-3</td>
<td>Seong Joon Park (Chosun University Hospital, Korea)</td>
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<td>09:00</td>
<td>The Study of Usefulness of Bone Suppression Function in The Pediatric Chest PA Image</td>
<td>GR5-4</td>
<td>Daeyeok Wi, Yoonjae Kim, Jaeyeong Cho, Yeongae Ha, Cheohlun Jung, Kyeongsuk Jeon, Honguk Koo, Dongsung Kim</td>
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<tr>
<td>09:10</td>
<td>The Role of An International Professional Organisation in Radiography</td>
<td>GR5-5</td>
<td>Dan Huynh, Cynthia Cowling (Monash University, Australia)</td>
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<tr>
<td>09:20</td>
<td>A Study on The 3D Printer Ear Shell Shape Using The DICOM Images</td>
<td>GR5-6</td>
<td>Hyeong-kyun Kim, Jun-Gu Choi, Gha-Jung Kim, Dong-Hee Hong</td>
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<tr>
<td>09:30</td>
<td>Things Are Not Always What They Appear: Errors in Image Interpretation in Plain Radiography</td>
<td>GR5-7</td>
<td>Celine Tan Ying Yi (Singapore General Hospital, Singapore)</td>
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<tr>
<td>09:40</td>
<td>Chest X-ray Interpretation by Radiographers: Diagnostic Accuracy and Influence on Diagnostic Reasoning</td>
<td>GR5-8</td>
<td>Nick Woznitza, Keith Piper, Stephen Burke, Graham Bothamley (Homerton University Hospital, UK)</td>
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<tr>
<td>09:50</td>
<td>A Study on Usefulness According to Simulated Nodule Detection Ability in Tomosynthesis Compared with Low Dose CT</td>
<td>GR5-9</td>
<td>Jin-Hyeon Nam, In-Soo Kim, Hong-Keon Kim, Deok-Yong Choi, Hyeon-Joo Kim (Korea University Medical Center Anam Hospital, Korea)</td>
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<tr>
<td>10:00-10:15</td>
<td>Break</td>
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GENERAL RADIOGRAPHIC IMAGING

10:15 - 11:45  GR 6: GENERAL RADIOGRAPHIC IMAGING 6  Rm. 103
Chair(s)  Sook YANG (Chonnam National University graduate school, Korea)

10:15
Research of The Hinge-Mail Examination after The Orthopedic Surgery
GR6-1
Choong Kyu YOON, Min Woo KWON, IL KYU KANG, Min Yong LEE, Kye Yeon PARK
Korea University Guro Hospital, Korea

10:25
Study on General X-ray Image Size(File Size) by Change of Control Parameters(kV,Focal Spot Size, Irradiation Area) in Digital Radiography X-ray Unit Base on The PACS Data Analysis
GR6-2
Young-Hyun KWON, Yong Sung PARK, Ik Pyo LEE, Sun Kwang HIWANG
Kyung Hee University Hospital at Gangdong, Korea

10:35
A Comparative Study of Radiation Dose According to The Change of Conditions in Mobile Chest Radiography
GR6-3
Hyeon Il OH, Ju Yeong KO, Hyeon Geun I, Yeong Ki JO
Chonbuk National University Hospital, Korea

10:45
Whole Spine Lateral Radiography with Pasting Method : Image Quality Assessment after Aluminum Filtration
GR6-4
Ga Eun CHOI, Jae Yeon JUNG, Jung Jin KIM, Ji Sung JANG, Gun Hee LEE, Chang Hyun PARK
Asan Medical Center, Korea

10:55
GR6-5
Dong-sung KIM, Yeon PARK, Hong-uk KOO
Seoul National University Children Hospital, Korea

11:05
A Study on The Right Angle of Wrist Tilting for Lateral Position X-ray after Metal and Volar Plate Radius Fracture Surgery
GR6-6
Hak Yeong LEE, Mankyu KIM, Hyungtae KIM, Daeseung JEUN and Yongdae LEE
Inje University Sanggye Paik Hospital, Korea

11:15
Study on lowering fall-down Risk of Erect Position Radiography: Focusing on BP Check with Changing Patient
GR6-7
Min Hyuk LIM, Myung Bae PARK, Hyun Jae PARK, IL KYU KANG, Min Yong LEE, Kye Yeon PARK
Korea University Hospital, Korea

11:25
Can The Cephalad Angulation for A Lateral Knee X-Ray Be Determined by Measuring The Difference in Angle of The Condyles in The AP Projection?
GR6-8
Li Hoon SNG, Henrietta GOH, Adam KEE, Sally LEE, Chin Chin OOI
Singapore General Hospital, Singapore

11:35
A Comparison of Predisposing Risk Factors of Osteoporosis Between Black and White Osteoporotic Women Visiting A Woman Wellness Centre Between 2010 And 2014 in Harare, Zimbabwe
GR6-9
Ellen Fungai MAGURANYANGA, Simon Takadzviy GUNDA, Nelson ZINGONI, Simbarashe Terrence GASHIRAI, Polite MUKWADA
National University of Science and Technology, Zimbabwe
GENERAL RADIOGRAPHIC IMAGING

11:45-12.00 Break

12:00 - 12:40 GR: PLENARY LECTURE 1
Chair(s) Stewart WHITLEY (ISRRT, UK)

12:00 Tomosynthesis in General Radiography: A Contrast-Detail Evaluation
GR-PL1 Rob DAVIDSON, Dale GIBSON
Canberra University, Australia

12:40-14:00 Lunch
**INTERVENTIONAL RADIOLOGY**

*Oct. 21 (Fri)*

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<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
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<tr>
<td>15:45</td>
<td>IR 1: INTR.</td>
<td>EW-7197, a novel TGF-β inhibitor: Suppression of Granulation Tissue</td>
<td>Min Tae KIM, Ho-Young SONG, Jung-Hoon PARK, Eun Jung JUN, Young Chul CHO</td>
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<td>Formation after Bare Metallic Stent Placement in a Rat Esophageal</td>
<td>Asan Medical Center, Korea</td>
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<td>Model</td>
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<td>15:55</td>
<td>IR 1: INTR.</td>
<td>Novel ALK5 Kinase Inhibitor Prevents Tissue Hyperplasia after Bare</td>
<td>Junyoung MAENG, Jung-Hoon PARK, Min Tae KIM</td>
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<td>Metallic Stent Placement in a Urethra Rat Model</td>
<td>Asan Medical Hospital, Korea</td>
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<td>16:05</td>
<td>IR 1: INTR.</td>
<td>Visualization of Intracranial Stents and Dose-area Product Values</td>
<td>Tae Heum JO, Sung Ryong KIM, Tae Hyung KIM, Won Hong CHO, Mi Sub AHN</td>
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<td>according to the Change of Dose per Frame of Contrast-enhanced</td>
<td>Samsung Medical Center, Korea</td>
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<td>Angiographic Cone-beam Computed Tomography</td>
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<td>16:15</td>
<td>IR 1: INTR.</td>
<td>Experimental Study on Functional Degradation of Hydrophilic Coated</td>
<td>Hyun Suk CHA, Seung Won AN, Jong Man KIM, Byung Cheon YU, Hyuk Jin LIM, Joong Seok GO, Kwan</td>
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<td>Guidewire after Exposure to Various pH Conditions</td>
<td>Hong MIN, Seoul National University Bundang Hospital, Korea</td>
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<td>16:25</td>
<td>IR 1: INTR.</td>
<td>Usefulness Assessment through Application of Gonad Shield in Various</td>
<td>Jin Su KIM, Asan Medical Center, Korea</td>
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<td>Interventional Procedures</td>
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<td>16:35</td>
<td>IR 1: INTR.</td>
<td>Study about Steam-shaping Methods of Microcatheter for Cerebral</td>
<td>Ju Yong AHN, Jong Bae KIM, Ki Hyun NAM</td>
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<td>Coil Embolization: Shapability and Shape Preservation of Catheter</td>
<td>Seoul St. Mary’s Hospital, Korea</td>
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<td>by Changes of Steam-shaping Time and Quenching</td>
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<td>16:45</td>
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<td>Break</td>
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<td>17:00</td>
<td>IR 2: INTR.</td>
<td>Surgical Treatment of Ruptured Blood Blist-like Aneurysm Patient</td>
<td>Min Su KIM, Jong Phil CHOI, Jae Ho KWON, Cheol Gyu JEONG</td>
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<td>and Intervention Study Result Review : A Case Report</td>
<td>Kyungpook National University Hospital, Korea</td>
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INTERVENTIONAL RADIOLOGY

17:10  Perforator Imaging for Anterolateral Thigh Flap: Evaluation of Computed Tomographic Angiography Performed through Femoral Artery Catheterization
IR2-2  Hanmil SIM, Jin-Hyeok IM, Im-Beom LEE, Ki-Seong BANG, Kyoung-Tae PARK
Ajou University Hospital, Korea

17:20  Usefulness Estimate of Percutaneous Lung Needle Biopsy by Con-beam CT
IR2-3  Hwang Woo JC, Sung Hyun CHOI, Myung Hyun PARK, Hee Dong JUNG, Sun Kwang HWANG
Kyung Hee University Hospital at Gang-Dong, Korea

17:30  Cone-beam Computed Tomography-guided Radiofrequency Ablation Treatment of Small Hepatocellular Carcinoma: Radiation Dose Survey
IR2-4  Kyung Soo KIM, Woong Sin HAN, Won Hong CHO, Mi Sub AHN
Samsung Medical Center, Korea

17:40  Fluoroscopic Removal of Retrievable Self-expandable Metallic Stents: Experiences in 81 Consecutive Patients with Benign and Malignant Tracheobronchial Strictures
IR2-5  Min Tae KIM, Ji Hoon SHIN, Jung-Hoon PARK
Asan Medical Center, Korea

17:50  The Role of Interventional Radiologists for Patients with Endoscopic Stent Placement Failure in Malignant Gastroduodenal Obstructions
IR2-6  Soohwan KIM
Asan Medical Center, Korea

17:00-18:00  Break

Oct.22 (Sat)

15:15 - 16:15  IR 3: INTERVENTIONAL RADIOLOGY 3  Rm. 201
Chair(s)  Fernando KOK (Centro Hospitalar Conde de S. Januario, Macau)

15:15  A New Method of Coronary Analysis Using Computational Fluid Dynamics (CFD). ~ Evaluation of Collateral Channels in Chronic Total Occlusion (CTO) ~
IR3-1  Daisuke KITTAKA, Hisaya SATO, Yuichi NAKAI, Kyoichi KATO, Yasuo NAKAZAWA
Showa University Hospital, Japan

15:25  Comparison of Post-intervention Patency Duration between Femoral Vein Access to Arteiovenous Fistula (Native) and the Other Vessel Access to Arteiovenous Fistula (Native) with Stenosis for Hemodialysis
IR3-2  Jae Seok LEE, Byeong Kyu RYU, Byeong Hwa JEONG, Kwang Nyeon WON
Jeonbuk National University Hospital, Korea

15:35  The Effectiveness of the Concentration of Contrast Media for Detecting the Stent Stenosis and Wall Apposition
IR3-3  Da Hee JUNG, Tae Yeong YUN, Hyeong Min JIN, Chang Wook SONG, Dong Sung KIM, Dae Yong KIM
Seoul National University Hospital, Korea
INTERVENTIONAL RADIOLOGY

15:45  Evaluation of Image Lag in a Flat Panel Detector-equipped Cardiovascular X-ray Machine  
IR3-4  Hisaya SATO, Keisuke KONDO, Yasuo NAKAZAWA  
Showa University, Japan

15:55  A Time Saving Protocol for Thrombolysis in Acute Stroke  
IR3-5  Ji Myeong HWANG, Min Kyu KIM, Jei Hoon YOO, Jae Sik LIM  
Severance Hospital, Korea

16:05  Validation of Measurable Wire Using Comparison Calibration Methods  
IR3-6  Ok Kyun LIM, Joon Hyun KIM, Seon Moon HWANG, Tea Il KIM, Deok Hee LEE  
Asan medical center, Korea
MANAGEMENT (QA & QI)

Oct. 21 (Fri)

09:00 - 10:30  MM 1: MANAGEMENT (QA & QI) 1  Rm. 203B

Chair(s)
Beong Gyu YOO (Wonkwang Health Science University, Korea)

09:00  Research on DR Receptor Management with EMTF Curve
MM1-1  Il Kyu KANG, Min Yong LEE, Kye Yeon PARK, Jee Min ROH
Korea University Guro Hospital, Korea

09:10  Study on Effectiveness of the Signal Intensity Correction Method for Assessment of the Signal Intensity Uniformity in the Multi-Channel Coil with the Missing Element
MM1-2  Jin Seo PARK, Chung Hwan KANG, Kyung Soo KIM, Jae Hyun SONG
Konkuk University Medical Center, Korea

09:20  Do Delays in Radiology Lead to Breaches in the 4-hour Rule?
MM1-3  Nadine THOMPSON, Michelle MOSCOVA, Roberta TSE, Amith SHETTY, Noel YOUNG
Westmead Hospital, Australia

09:30  Web Information Services of Radiology Departments at Public and Private Hospitals in Istanbul
MM1-4  Gulsum YILDIRIM, Nuran AKYURT
Marmara University, Turkey

09:40  Radiographers’ Knowledge, Attitude and Challenges on Pain Management
MM1-5  Sophia HEMANS, William ANTWI, Kofi Adesi KYEI
Ghana Society of Radiographers, Ghana

09:50  A Web-based Integrated Radiation Oncology Information Platform Increasing Patient Safety: A Systemic Quality-improving Study
MM1-6  Wei-Ta TSAI, En-Seu ZHUNG, Hui-Ling HSIEH, Yi-An LIN, Bing-Jie SHEN, Shih-Kai HUNG, Hon-Yi LIN
Dalin Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, Taiwan

10:00  Designing a New Radiology Department
MM1-7  David DE VRIES
Erasmus MC University Medical Center, Netherlands

10:10  Developing Meaningful Key Performance Indicators to Objectivize Radiographer Performance Management and Drive Quality Improvement
MM1-8  Michael ONG, Siok Mei NG, Swee Ling KOH
National University Hospital, Singapore

10:30-10:45  Break
MANAGEMENT(QA & QI)

10:45 - 11:45  MM 2: MANAGEMENT(QA & QI) 2  Rm. 203B
Chair(s)  Hanjoon YANG (Hallym University of Graduate Studies, Korea)

10:45  Research and Suggestion about management of Accumulated Dose of Patient in General X-ray Part
MM2-1  Jaeil SEO, Jong Nam OH, Yung Jin KIM, Han Sol KIM, Il Kyu KANG, Min Yong LEE, Kye Yeon PARK
Korea University Guro Hospital, Korea

10:55  From Analogue to Digital Radiology in Sweden - Experiences of Digitalization from an Organizational and Production Perspective
MM2-2  Marianne SELIM
Orebro University, Sweden

11:05  The Experience and Results Analysis of Ultrasound Practice Competition of Medical Radiation Intern
MM2-3  Mei-Yen CHANG, An-Chuang WANG, Chien-Fa CHANG, Jsong-Wen WEI, Chiung-Wen KUO
Taipei Veterans General Hospital, Taiwan

11:15  Introduction to Safety and Risk Management in Macao Radiology Departments
MM2-4  Kai Hong Jerry LEI
Macao Radiological Technologists Association, Macao, China

11:25  “Glass-Ceiling Syndrome” of Radiology Unit Employees of Public and Private Health Institutions
MM2-5  Busra TUNCER, Nuran AKYURT
Marmara University, Turkey

11:35  Pulmonary MRI at 1.5T: Image Quality Evaluation of the Different Sequences
MM2-6  Menglu LI, Liuquan CHENG
Chinese PLA General Hospital, China

11:45-12:00  Break

12:00 - 12:40  MM: PLENARY LECTURE 1  Rm. 203B
Chair(s)  Boniface YAO (ISRRT, FRANCE)

12:00  The Hospital Management of the terrorists attacks in Paris
MM-PL1  Philippe GERSON
ISRRT Board Member, France

12:40-14:00  Lunch
MANAGEMENT (QA & QI)

Oct. 22 (Sat)

14:00 - 15:00  MM: PLENARY LECTURE 2  
Chair(s)  Jae Ho JEONG (Kyunghee University Hospital, Korea)  

14:00  The History, Current Situation and Challenge of China's Imaging Technology  
Haihong FU  
Chinese Society of Imaging Technology, China

15:00-15:15  Break

15:15 - 16:15  MM 3: MANAGEMENT (QA & QI) 3  
Chair(s)  Seung Chul KIM (KRTA, Korea)

15:15  Development of Distance Accuracy Measurement Program for Quality Control of Diagnostic Ultrasound System  
Yon Min KIM  
Won-Kwang Health Science University, Korea

15:25  Artifacts in Digital Radiography and Methods of Resolution  
Hoiwoun JEONG, Jung-Whan MIN, Jung-Min KIM  
Baekseok Culture University, Korea

15:35  Reproducibility Study on the Quantification of Coronary Artery Calcification Based on Software Manufacturer  
Sulkyoung SHIN, Jinwoo KIM, Sang Bo SHIN, Mi Sub AHN, Yeon Min KIM  
Samsung Medical Center, Korea

15:45  Team Working in Radiology: What is Possible?  
Nick WOZNITZA, Keith PIPER, Carl RATCLIFF, Niamh MCGUINNESS, Susan ROWE  
Homerton University Hospital & Canterbury Christ Church University, UK

15:55  Leadership with Emotional Intelligence  
Justin MAHABIR SINGH  
Infeemed Solutions & Supplies, USA
MR IMAGING

Oct. 20 (Thu)

14:00 - 15:00  MR 1: MR IMAGING 1  Rm. 102
Chair(s)  Christopher STEELMAN (Medical University of South Carolina Children’s Hospital, USA)

14:00  A Study on the Optimal Inspection Area Based on the Evaluation of Intensity Distribution of Gradient Magnetic Field of Gradient Coil  
MR1-1 Ji Hye KIM, Eun Hye PARK, Yeong Dae CHOI, Moon Sun KIM, Heon Jeong JEONG, Min Soo LEE, Dong Sung KIM  
Seoul National University Hospital, Korea

14:10  Magnetic Resonance Imaging Reveals How Perinatal Inflammation Exacerbates Ventilation-induced Injury in the Preterm Lamb Brain  
MR1-2 Dhafer ALAHMAR, James Todd PEARSON, Michael FARRELL, Qizhu WU, Beatrice SKIOLD, Valerie ZAHRA, Samantha BARTON, Graeme POLGLASE  
Monash University, Australia

14:20  Diagnostic Value of Computed Tomography and Magnetic Resonance in Detecting Peripheral and Central Vertigo  
MR1-3 Ikken AISIN  
British Columbia Institute of Technology, Canadian Association of Medical Radiation Technologists, Canada

14:30  The MR Imaging of Autogenous Free Fat Grafts in the Human Temporomandibular Joint  
MR1-4 Qi SUN, Pei SHEN, Min-jun DONG, Xiao-feng TAO  
Shanghai Ninth People’s Hospital, China

14:40  Iron Deposition in the Gray Matter in Patients with Relapse-Remitting Multiple Sclerosis: A Longitudinal Study Using three-dimensional (3D)-enhanced T2*-weighted angiography (ESWAN)  
MR1-5 Du SILIN  
The First Affiliated Hospital of Chongqing Medical University, China

15:00-15:15  Break

15:15 - 16:15  MR 2: MR IMAGING 2  Rm. 102
Chair(s)  Mark Kumlyong CHUN (Northern Lights Regional Health Centre, Canada)

15:15  Assessment of MRI Safety Practice in a Teaching Hospital  
MR2-1 Albert Doray PIERSSON, Samson AWELIGIBA  
Tamale Teaching Hospital, Ghana

15:25  To Compare PDWI Fatsat, T1WI and MERGE Sequences on Knees Under 3.0T MR  
MR2-2 Yichen MA  
Beijing Chao-Yang Hospital, China

15:35  Diagnosis Valua in Patients with Prosthesis Using SEMAC-VAT Technique on 3T  
MR2-3 Xiaona LI, Zhigang PENG, Panli ZUO, Jianling CUI  
The Third Hospital of Hebei Medical University, China
MR IMAGING

15:45  3D MRI of Rabbit Extraocular Muscle and Optic Nerve
MR2-4  Cheng Gong PENG, Jun Wu HU
Tongji Hospital, Tongji Medical College, Huazhong University of Science & Technology, China

15:55  Diffusion Tensor Imaging for Evaluating Biliary Atresia in Infants and Neonates
MR2-5  Bo LIU
Children’s Hospital of Chongqing Medical University, China

Oct. 21 (Fri)

09:00 - 10:30  MR 3: MR IMAGING 3  Rm. 102
Chair(s)  Chunghwan KANG (Konkuk Univ. Medical Center, Korea)

09:00  Evaluation of the Usefulness of Slice Encoding for Metal Artifact Correction(SEMAC) with Integrated Parallel Acquisition Technique(iPAT)
MR3-1  Sejun OH, Woo Jin JEONG, Geon Yeong KIM, Yong Sik BANG, Dong Seong KIM
Seoul National University Hospital, Korea

09:10  Altered Structural and Functional Connectome in Unilateral Sudden Sensorineural Hearing Loss
MR3-2  Wenliang FAN, Jing LI, Jianming YU
Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, China

09:20  Preliminary Study of DKI Performance in Common Locations of Brain Tissue affected by Acute Ischemic Stroke
MR3-3  Liuhong ZHU, Funan WANG, Qihua CHENG, Gang GUO
Xiamen No.2 Hospital, China

09:30  The Cystitis Glandularis (CG) Imaging Performance and Differential Diagnosis between Heavily T2WI (T2 Weighted) VE (Virtual Endoscop) and Gd-DTPA Enhancement TIWI (T1 weighted ) VE
MR3-4  Jin ZHAO
West China Hospital, China

09:40  The Clinical Value of MR Knee Joint Function to Patients with DOA in Diagnosis the Early Injured of ACL
MR3-5  Zijun XU
Shanghai Tenth People’s Hospital, China

09:50  3D CE-MRA in Spinal Vascular Malformations
MR3-6  Jibin CAO
The First Hospital of China Medical University, China

10:00  Characterizing the Anatomic and Functional Disorders of Inguinal Lymph Nodes in Patients with Gynecologic Oncology-Related Lymphedema Using Magnetic Resonance Lymphangiography
MR3-7  Qing LU, Lianming WU, Adnan SHEIKH, Zengai CHEN, Guangyu WU, Jianrong XU
Shanghai Jiaotong University, School of Medicine, China

10:30-10:45  Break
**MR IMAGING**

**10:45 - 11:45**  
**MR 4: MR IMAGING 4**  
Rm. 102  
Chair(s)  
Yoonkook KIM (Severance Hospital, Korea)

**10:45**  
**A Study on the Comparison the Ischemic Penumbra Area at the DSC with the Area at the Pseudo-CASL at Carrying out the MRI Stroke**  
MR4-1  
Yeong Jun YOO, Ik Pyo LEE, Sun Kwang HWANG  
Kyung Hee university hospital at Gangdong, Korea

**10:55**  
**Application of Simultaneous Multi-Slice on Clinical Diffusion-weighted Imaging for Multi-regions**  
MR4-2  
Hongyan NI, Man SUN  
Tianjin First Central Hospital, China

**11:05**  
**Evaluation of Renal Artery Anatomy with Renal Masses Employing Inflow Inversion Recovery MR Angiography**  
MR4-3  
Lan CHENG  
Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, China

**11:15**  
**The Reference Value for Left Ventricular Myocardial Strain Measured by Feature-tracking Magnetic Resonance Imaging in Chinese Han Population**  
MR4-4  
Simeng WANG, Sun JIAYU, Liu HONG, Yang DAN, Luo YONG, Wan KE  
West China Hospital of Sichuan University, China

**11:25**  
**Computer Numerical Simulation of Budd-chiari Syndrome for Hemodynamic Based on MR Image**  
MR4-5  
Sun CUNJIE  
Affiliated Hospital of Xuzhou Medical College, China

**11:35**  
**Size of Hypertrophic Myocardium or Myocardial Fibrosis by LGE and Cine in Patients with Hypertrophic Cardiomyopathy: Correlation with the New York Heart**  
MR4-6  
Jun ZHAO, Xiao-Chun ZHANG, Yong-Ning SHANG, Tian-Jing ZHANG, Daiquan ZHOU, Jian WANG, Greiser ANDREAS  
Southwest Hospital, Third Military Medical University, China

**11:45-12:00**  
Break

**12:00 - 12:40**  
**MR: PLENARY LECUTRE 1**  
Rm. 102  
Chair(s)  
Napapong PONGNAPANG (ISRRT, Thailand)

**12:00**  
**Quantification of MRI Techniques as Imaging Biomarkers for Cancer Therapy**  
MR-PL1  
Yu-Chun LIN  
Taiwan Society of Radiological Technologist, Taiwan

**12:40-14:00**  
Lunch
**MR IMAGING**

**14:00 - 15:30**  
**MR 5: MR IMAGING 5**  
**Rm. 102**

**Chair(s)**  
Eunhoe GOO (Cheongju University, Korea)

**14:00**  
**Normal B General Health Screening Decision within One Year after Acute Cerebral Infarction Expression: A Case Report**  
**MR5-1**  
Byung Rae PARK, In Hyo SEO  
Baeseok Culture University, Korea

**14:10**  
**The Usefulness of CS(Compressed Sensing) for Brain TOF(Time-of-Flight) MR Angiography Imaging**  
**MR5-2**  
Hye Jin YOON, Do Hun KWON, Geon Yeong KIM, Seong Min OH, Yong Sik BANG, Dong Sung KIM  
Seoul National University Hospital, Korea

**14:20**  
**A Study on the Usefulness of Eddy Current Effect Reduction in Relation to the change of Slew Rate When Using Acoustic Noise Reduction Technique**  
**MR5-3**  
Yongwon LEE, Kyungmin KIM, Jihwan JANG, Yunsang LEE  
Korea University Medical Center, Korea

**14:30**  
**Qualitative and Quantitative Diagnosis of Meniscal Tears Using SWI Compared with T2mapping at 3-Tesla MRI**  
**MR5-4**  
Jun ZHAO, Daquan ZHOU, Xin WEI, Liu YANG, Rui HE, Shuai LI, Wei CHEN  
Southwest Hospital, Third Military Medical University, China

**14:40**  
**Application of ADC Value of MR DWI in the Evaluation of Children’s Renal Function: Comparison between the Patients of 1 Stage Purpura Nephritis and the Healthy Volunteers**  
**MR5-5**  
Wanjing BAI, Xuesheng LI  
West China Second Hospital of Sichuan University, China

**14:50**  
**Altered Functional Brain Connectome in Unilateral Sudden Sensorineural Hearing Loss**  
**MR5-6**  
Wenliang FAN, Jing LI, Jianming YU  
Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, China

**15:00**  
**Magnetic Resonance Targeting Cytochrome c of Mitochondria Using Megnetotactic Bacteria Nanoparticles**  
**MR5-7**  
Weiwei ZHANG, Yikai XU, Ruyuan LIU  
Gansu University of Chinese Medicine, China

**15:10**  
**Two Different Methods to Reduce Metal Artifacts in MRI**  
**MR5-8**  
Chi-Hui WANG, Kuen-Huang CHEN  
Chi Mei Medical Center, Taiwan

**15:30-15:45**  
**Break**

**Oct. 22 (Sat)**

**08:30 - 10:00**  
**MR 6: MR IMAGING 6**  
**Rm. 102**

**Chair(s)**  
Jeong Soo YUN (Samsung medical center, Korea)
MR IMAGING

08:30 The Comparison of Liver Stiffness Before and After Administration of Gd-EOB-DTPA in MR Elastography
MR6-1 Seungmin BAEK
Chonbuk National University Hospital, Korea

08:40 Evaluation of Usefulness of the Post FLAIR FS Technique during Cranial Nerve MRI Examination: A Comparison with Post T1 TFE Technique
MR6-2 Jin Hoe LEE, Bo Woo LEE, Ji Jin KIM, Yeong Hak JO, Jeong Ho KIM, Se Jong YOO, Seok Kyu PARK, Dong Wook KIM, Gil Yong KO, Jeong Hyeon SONG, Jin Young KIM
Koyang University Hospital, Korea

08:50 Identification of Ischemic Penumbra in Acute Ischemic Stroke by Arterial Spin-labeling Imaging: Comparison Study with Dynamic Susceptibility Contrast Perfusion Weighted Imaging
MR6-3 Jing TANG, Xiaoxiao MA, Jinhao LV, Xin LOU
Chinese PLA General Hospital, China

09:00 Clinical Application of 3.0T Functional Magnetic Resonance Imaging in Renal Insufficiency
MR6-4 Taifei YU, Xinwu MA, Qing HAN
Shandong Provincial Medical Imaging Research Institute, China

09:10 3D MPR-RAGE Enhancement Scanning Sequence in Detecting Lung Cancer with Brain Metastasis
MR6-5 Fan YANG
West China Hospital of Sichuan University, China

09:20 Diffusion Weighted MRI in Thyroid Nodule: Comparison between Integrated Shimming EPI and Single-Shot EPI Techniques
MR6-6 Luquang CHEN, Peipei SUN, Qiang HAO, Caixia FU, Jianping LU, Minjie WANG
Changhui Hospital of Shanghai, China

09:30 A Study of the Development of Laguerre’s Equation Type Fat Saturation RF Pulse
MR6-7 Kojiro YAMAGUCHI
Fujita Health University, Japan

09:40 K Space Explained without Mathematics
MR6-8 Benoit BILLEBAUT
Institut fuer Klinische Radiologie, UKM, Germany

10:00-10:15 Break

10:15 - 11:45 MR 7: MR IMAGING 7
Rm. 102
Chair(s) Joon Kyoo KIM (Kangbuk Samsung Hospital, Korea)

10:15 Comparison Evaluation of Image for 'Flexible Coil' and 'Body · Spine coil' in Elbow MRI
MR7-1 Daeguen JANG
Chosun University Hospital, Korea

10:25 Feasibility Study Using the Acrylic Assistant Equipment in Lower Abdominal MRI
MR7-2 Funhye PARK, Jihye KIM, Dongjin CHOI, Yeongdae CHOI, Moonsun KIM, Minsoo LEE, Dongseong KIM
Seoul National University Hospital, Korea
MR IMAGING

10:35 Study on the Fair Value of the Factor during MRI Examinations of the Spinal Fixation Patients for using SEMAC (Slice Encoding Metallic Susceptibility Artifact Correction)
MR7-3 In-Su HWANG, Hyung-Tae KIM, Yong-Hun BAK, Jin-Sook OH, Yong-Dae LEE
Inje University Sang-gye Paik Hospital, Korea

10:45 Improved Cerebral Artery Imaging Using Three-dimensional Sparse Time of Flight: A Prospective Study
MR7-4 Hehan TANG
West China Hospital of Sichuan University, China

10:55 Using Gadolinium-ethoxybenzyl-diethylenetriamine Penta-acetic Acid-enhanced MRI
MR7-5 Yasuo TAKATSU, Satoshi KOBAYASHI, Toshiaki MIYATI, Toshiki SHIOZAKI
Osaka Red Cross Hospital, Japan

11:05 A Black Blood Magnetic Resonance Angiography Protocol Using the Two-dimensional T2-Fast Spin Echo Sequence
MR7-6 Tetsuichi HONDERA, Junya NAKASHIMA, Toshiyuki TAKAHASHI, Kyoichi KATO, Yasuo NAKAZAWA
Showa University Fujigaoka Hospital, Japan

11:15 How to Deal with MRI Artefacts
MR7-7 Catherine MUCHUKI
Kenyatta National Hospital, Kenya

11:25 MRI in Deep Brain Stimulation Neurosurgery
MR7-8 Chen-Chang LEE, Jo-Chi JAO, Po-Chou CHEN, Yao-Nan LIN, Chun-Chung LUI
Kaohsuing Chang Gung Memorial Hospital, I-Shou University, Taiwan

11:45-12:00 Break

12:00 - 12:40 MR: PLENARY LECUTRE 2
Chair(s) Dae Keon SEO (Asan Medical Center, Korea)

12:00 Recent advances in abdominal MR imaging: state of the art
MR-PL2 Jeong Min LEE
Seoul National University Hospital, Korea

12:40-14:00 Lunch

14:00 - 15:00 MR 8: MR IMAGING 8
Chair(s) Ho Yong JUNG (Daehan shield engineering, Korea)

14:00 A Study on the Correlation between the Apparent Diffusion Coefficient(ADC) Value and the Standardized Uptake Value(SUV) of Malignant Breast Tumors
MR8-1 Moonsun KIM, Minsoo LEE, Heonjung JUNG, Dongsung KIM
Seoul National University Hospital, Korea
MR IMAGING

14:10 Analysis of Chemical Shift Artifacts with Fat and Water Using the MRI Parameter
MR8-2 Min Hyeok LEE, Moon Hwa HONG, Jin HAN, Jin Kyeong LEE, Eun Cho KI, Song Yun LEE, Joo Yeon LEE, Young Jae CHOI, Dae Cheol KWEON
Shinhan University, Korea

14:20 The Study of Navigated 3D MRCP Using the Compressed Sensing Technique
MR8-3 Jae Kyung SEO, Min Soo YOO, Kwang Hoon KO, Yoon Kook KIM, Soon Kyu PARK, Jae Sik LIM
Severance Hospital, Korea

14:30 Amygdala Atrophy as a Biomarker in Early Parkinson's Disease Patients with Mild Cognitive Impairment is Associated with Olfactory Dysfunction
MR8-4 Xiuqin JIA, Peipeng LIANG, Kuncheng LI
Xuanwu Hospital, Capital Medical University, China

14:40 Brain Connectivity Changes of Patients with Depressive Symptoms in the Elderly with Dementia
MR8-5 Ni-Jung CHANG, Tsung-Yuan LI, Clayton Chi-Chang CHEN, Jyh-Wen CHAI
Taichung Veterans General Hospital, Taiwan

14:50 Assessment of Brain Structural Abnormalities in Chemotherapy-treated Breast Cancer Survivors Using Diffusion Tensor Imaging
MR8-6 Tsung-Yuan LI, Vincent Chin-Hung CHEN, Dah-Cherng YEH, Jyh-Wen CHAI, Clayton Chi-Chang CHEN, Jun-Cheng WENG
Chung Shan Medical University, Taiwan

15:00-15:15 Break

15:15 - 16:15 MR 9: MR IMAGING 9
Chair(s) Hongyan NI (Tianjin First Central Hospital, China)

15:15 Elbow MRI scan Image is Evaluated according to the Knee Coil Selection
MR9-1 Hoon KIM
Dongtan Hallym Sacred Heart Hospital, Korea

15:25 Effect of Gadolinium on Hepatic Fat Quantification Using Automated Two-point Dixon Screening Technique
MR9-2 No Hyun KOO, Na Yeong KIM, Ho Beom LEE, Jin Oh LIM, Seon Uk YANG
Asan Medical Center, Korea

15:35 Comparison between Digital Subtraction Angiography and Three-dimensional Phase-contrast Magnetic Resonance Angiography in the Evaluation of Arteriovenous Grafts
MR9-3 Yi-Chun HUANG, Ai-Chi CHEN, Hung-I CHIEN, Yi-Hsin SU, Yi-Kuan Chang CHIEN, Che-Ming LIN, Ying-Chi TSENG, Chi-Jen CHEN
Shuang Ho Hospital, Taipei Medical University, Taiwan

15:45 Thermal Injuries in MRI
MR9-4 Joy COOK
University of Southern Indiana, USA
NUCLEAR MEDICINE

Oct. 21 (Fri)

14:00 - 15:30 NM 1: NUCLEAR MEDICINE 1

Rm. 203B

Chair(s)
Hong Jae LEE (SEOUL NATIONAL UNIVERSITY HOSPITAL, Korea)

14:00 The Study of Reducing Radiation Exposure by Developing 18F FP-CIT Phantom
NM1-1 Chan Rok PARK, Jae Il KIM, Hong Jae LEE, Jin Eui KIM
Seoul National University Hospital, Korea

14:10 Analysis of Image Quality in Amplitude-Based Respiratory-Gating for PET-CT
NM1-2 Jung-Soo KIM
Dongnam Health University, Korea

14:20 Effect of Dosimeter’s Position on Occupational Radiation Extremity Dose Measurement for Nuclear Medicine Workers During 18F-FDG Preparation for PET/CT
NM1-3 Fabien SALESSES
Bordeaux University Hospital, France

14:30 Differences in FWHM according to Changes of Radioactivity (99mTc) and Energy Window Width
NM1-4 Sol HEO, Hyeon Joon CHOI, Jeong Jin LIM, Sung Wook JO, Jin Eui KIM
Seoul National University Hospital, Korea

14:40 Evaluation on the Usefulness of Alternative Radiopharmaceutical by Particle Size in Sentinel Lymphoscintigraphy
NM1-5 Gwang Mo JO, Yeong Hwan JEONG, Do Cheol CHOI, Ju Cheol SHIN
Chonbuk National University Hospital, Korea

14:50 A Study on the Strategies to Lower Technologist Occupational Exposure according to the Performance Form in PET Scan Procedure
NM1-6 Hyunsoo KO, Hosung KIM, Soonsang YOON, Jaekwang RYU, Wooyoung JUNG
Asan Medical Center, Korea

15:30-15:45 Break

15:45 - 16:45 NM 2: NUCLEAR MEDICINE 2

Rm. 203B

Chair(s)
Jung-Soo KIM (Dongnam Health University, Korea)

15:45 Comparison and Evaluation of the Results of Quantitative Analyses of Lung Perfusion Scan Using Q-Metric
NM2-1 Tae Hwan HA, Tae Yeop KIM, Jung Jin LIM, Sung Wook CHO, Jin Eui KIM
Seoul National University Hospital, Korea

15:55 Evaluation of a Shielding Apron Using Radioisotope
NM2-2 Yeong Hak JO, Myung Chul PARK, Chae Young IM, Ki Jin KIM, Jin Hoe LEE, Jeong HO KIM, Seok Hwan BAE
Konyang University Hospital, Korea
## NUCLEAR MEDICINE

### 16:05 - 16:15
**Comparision of Dynamic Continuous Mode and Step and Shoot Mode in SPECT Acquisition**

**NM2-3 Sunmyung PARK**
Samsung Medical Center, Korea

### 16:15 - 16:25
**Evaluation of GFR according to Dose Measurement Distance and Dead Time on DTPA Renal Scanning**

**NM2-4 Min Kyu LEE, Byung Ho SHIN, Jung Jin LIM, Sung Wook CHO, Jin Eui KIM**
Seoul National University Hospital, Korea

### 16:45 - 17:00
Break

### 17:00 - 18:00
**NM: PLENARY LECTURE 1**

**Chair(s) Donna NEWAMN (ISRRT, USA)***

<table>
<thead>
<tr>
<th>Session</th>
<th>Topic</th>
<th>Speaker(s)</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>17:00</td>
<td>New Trend of Nuclear Medicine Science</td>
<td>Seung Chul KIM</td>
<td>Korean Radiological Technologists Association</td>
</tr>
</tbody>
</table>

### Oct. 22 (Sat)

### 14:00 - 15:00
**NM: PLENARY LECTURE 2**

**Chair(s) Terry Ell (ISRRT, Canada)***

<table>
<thead>
<tr>
<th>Session</th>
<th>Topic</th>
<th>Speaker(s)</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:00</td>
<td>Radiological Protection in Nuclear Medicine Procedures</td>
<td>Keon Wook KANG</td>
<td>Seoul National University Hospital, Korea</td>
</tr>
</tbody>
</table>

### 15:00 - 15:15
Break

### 15:15 - 16:25
**NM 3: NUCLEAR MEDICINE 3**

**Chair(s) Illassang MOON (Seoul National University Hospital, Korea)***

<table>
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<tr>
<th>Session</th>
<th>Topic</th>
<th>Speaker(s)</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>15:15</td>
<td>Evaluation of Normal Distribution of 18F-Florbetaben in Whole Body</td>
<td>Jaeil KIM, Hongjae LEE, Jineul KIM</td>
<td>Seoul National University Hospital, Korea</td>
</tr>
<tr>
<td>15:25</td>
<td>Absorbed Dose to the Fingers of a Nuclear Medicine Radiographer Administering Technetium-99m-MDP to Patient Undergoing Radionuclide Bone Scan at the Department of Nuclear Medicine, Nigeria</td>
<td>Musa DAMBELE</td>
<td>Bayero University, Nigeria</td>
</tr>
<tr>
<td>15:35</td>
<td>Clinical Application of 18F-FDG PET-MRI</td>
<td>Yuzuru KONO, Hideaki KITAMURA, Toshimitsu UTSUNO, Kanyu IHARA, Tomohiko ASO</td>
<td>National Cancer Center Hospital, Japan</td>
</tr>
</tbody>
</table>
NUCLEAR MEDICINE

15:45  Two Years on: The Role of Advanced Practitioner in the Clinical Setting for 223Radium-dichloride Therapy for Bone Metastases in Castration-Resistant Prostate Cancer
NM3-4  Maryam JESSOP, Nicola WINTERMAN, Achuth HOSUR, Mark APLIN, Patrick BEGLEY, Angela CLARKE, Katherine DAY, Helen-Marie Cripps, Nitasha SINGH, Angus Robinson, Sabina DIZDAREVIC
Brighton and Sussex University Hospitals, UK

15:55  Comparisons of the Release of Patients Treated by I-131
NM3-5  Seung Jae LEE, Soo Hyun SEO, Sung Ha LEE, Yong Sung PARK, Ki Baek OH, Jae Sam KIM
Severance Hospital, Korea

16:05  The Comparison of Image Quality according to the Change of Acquisition Angle in SPECT/CT
NM3-6  Jung Jin LIM
Seoul National University Hospital, Korea

16:15  Evaluation of MR Based Respiratory Motion Correction Technique in Liver PET/MR Study
NM3-7  Yong Ho DO, Hong Jae LEE, Jin Eui KIM
Seoul National University Hospital, Korea
RADIATION DOSE & REDUCTION

Oct. 20 (Thu)

14:00 - 15:00  RD 1: RADIATION DOSE & REDUCTION 1  Rm. 203A
Chair(s)  Alain CROMP (ISRRT, Canada)

14:00  Study on the Calculation of Conversion Factors for Effective Dose for Chest Digital Radiography
RD1-1  Jongwoong LEE, Sun-Gwang HWANG
Kyung Hee University Hospital at Gang-dong, Korea

14:10  Ultra-Low Pulse Rate Fluoroscopy during Routine Diagnostic Coronary Angiography
RD1-2  Mohamed BADAWY, Matthew SCOTT, David CLARK, Mark HORRIGAN, Omar FAROUQUE, Robert CHAN
RMIT University, Australia

14:20  Retrospective Review of Image Processing Techniques and Their Influence in Dose Reduction in Paediatric Abdominal CT
RD1-3  Nicholas ARDLEY, Ahilan KUGANESAN, Kevin BUCHAN, Michael DITCHFIELD
Monash Health, Australia

14:30  Determination of Radiation Dose and Cancer Risk to Patients Undergoing Digital X-ray Examinations
RD1-4  Samson AWELIGIBA, Albert Dayor PIERSSON
Tamale Teaching Hospital, Ghana

14:40  Roles of miRNAs in the Damage and Repair Mechanisms of X-rays
RD1-5  Dong LIU, Junwu HU
Tongji Hospital, Tongji Medical College, Huazhong University of Science & Technology, China

14:50  Our Experiences in Establishing of Institutional Diagnostic Reference Level for Computed Tomography
RD1-6  XiaoHui Priscilla CHEN, Chong Ri LIANG
National University Hospital, Singapore

15:00-15:15  Break

15:15 - 16:15  RD 2: RADIATION DOSE & REDUCTION 2  Rm. 203A
Chair(s)  Dimitris KASIFARAKIS (ISRRT, Greece)

15:15  DAP Measurement and Dose Analysis of Computed Radiography and Digital Radiography Systems in Panoramic Equipment for Diagnosis
RD2-1  Han Su SHIN, Hyung-wook CHOI, Hyun-yung KIM, Seung-Sin JO
Yonsei University Dental Hospital, Korea

15:25  Diagnostic Reference Levels in Clinical Practice in the Netherlands
RD2-2  Harmen BIJWAARD, Doreth VALK, Ischa DE WAARD-SCHALKX
National Institute for Public Health and the Environment, Netherlands

15:35  Study of mA Distribution and Effectiveness of a Recently used Organ Dose Modulation(ODM) Technique on Breasts during Chest CT
RD2-3  Mingyue WANG
The First Affiliated Hospital of Zhengzhou University, China
RADIATION DOSE & REDUCTION

15:45  Can Adaptive Statistical Iterative Reconstruction Technique Improve Image Quality and Decrease Radiation Dose on Abdomen CT Scan Compared with Traditional FBP Algorithm
RD2-4  Yingming ZHAO, Kexue DENG
Anhui Provincial Hospital, China

RD2-5  Wanlin PENG, Zhenlin LI, Chunchao XIA
West China Hospital of Sichuan University, China

16:05  The Experimental Study of Using Bismuth Shielding in Head and Neck MDCT
RD2-6  Zongrui ZHANG
Chinese Society of Imaging Technology, China

Oct. 21 (Fri)
09:00 - 10:30  RD 3: RADIATION DOSE & REDUCTION 3  
Rm. 104

09:00  Study for Considering of Currently used X-ray Dose for L-spine AP, Lat Exam along BMI
RD3-1  Jeong hyun CHAE, Ji Sang JUNG, Chi Bok AN, Sung Sik KIM, Sun Kyu PARK, Jae Sik LIM
Severance Hospital, Korea

09:10  Study on Organ Dose and Usefulness of Low Dose Protocol in Chest CT
RD3-2  Seong-Hyeok PARK, Myeong-Bae PARK, Yeong-Hyeon LEE, Ji Nil KIM
Korea University Guro Hospital, Korea

09:20  The Radiation Protection Practice of Bedside Radiography in China
RD3-3  Edward CHAN
Hong Kong Radiographers’ Association, Hong Kong, China

09:30  Application of the Tungsten Functional Paper as Reduction of Exposed Dose to Operators in Interventional and Therapeutic Angiography Using Monte Carlo Calculation
RD3-4  Hajime MONZEN, Kenji MATSUMOTO, Kohei HANAOKA, Yasumasa NISHIMURA, Mikoto TAMURA
Graduate School of Medical Science, Kindai University, Japan

09:40  The Trial Development for the Underwear Type of Protector
RD3-5  Natsumi SOMEMIYA, Hyuma HAMADA, Hioki OHTANI
Tokyo Metropolitan University, Japan

09:50  Tungsten Functional Paper: Shielding Characteristics of a Novel Paper-Based Material for Clinical Use with X-Rays and Gamma Rays
RD3-6  Mikoto TAMURA, Kenji MATSUMOTO, Kohei HANAOKA, Ikuo KANNO, Yasumasa NISHIMURA, Hajime MONZEN
Kindai University Graduate School of Medical Science, Japan

10:00  Quality Control of X-ray Systems Using a Semiconductor Detector
RD3-7  Shoichi SUZUKI, Y. ASADA, M. KOBAYASHI, Y. MATSUNAGA, A. KAWAGUCHI
Fujita Health University, Japan
RADIATION DOSE & REDUCTION

10:10  Evaluation of the Iterative Reconstruction of CT Images Using Model Observer
RD3-8  Toru ISHIBASHI, Takahide OKAMOTO, Shigehiko KATSURAGAWA, Hiroshi TOMIZAWA, Hideaki HANEISHI
Teikyo University, Japan

10:30-10:45  Break

10:45 - 11:45  RD 4: RADIATION DOSE & REDUCTION 4  Rm. 104
Chair(s)  Hoon-Hee PARK (Shingu College, Korea)

10:45  The Study on Usability of Assistance Devices for Visual Respiratory Method of CT Scan -Based on the
Hearing-Impaired and The Elderly in Difficult Communication Status-
RD4-1  Young-II KIM, Hong-Sik KIM, Soo-Jung YOON, Soon-Kyu PARK, Jae-Sik LIM
Severance Hospital, Korea

10:55  Comparison of Exposure Dose by Use of C-arm AI accessory
RD4-2  Jae-Hun CHO
Asan Medical Center, Korea

11:05  A Study on the Measurement of X-ray Scattering during Mobile CT Scans
RD4-3  Yongrak KWON, Jin Suk PARK, Jung Sun KIM, Sang Jeon LEE
Samsung Medical Center, Korea

11:15  Reducing Radiation Dose for Infants with Developmental Dysplasia of The Hip through Application of
80kV and Adaptive Statistical Iterative Reconstruction Technique
RD4-4  Fei FU, Anwei HE, Yue ZHANG, Ji Yang ZHANG, Yeda WAN
Tianjin Hospital, China

11:25  Population Dose from Medical Radiation Applications in the Netherlands
RD4-5  Doreth VALK, Pauline GOEMANS, Ischa DE WAARD SCHALIX, Harmen BIJWAARD
RIVM, Netherlands

11:35  Ambient Ionizing Radiation Assessment and Its Public Health Implications at a Diagnostic Radiology
Department in Nigeria
RD4-6  Mosunmola Oyinade OKEDAYO, Yakubu NGADDA, Alhambu MOI, Flavious NKUBLI, Geoffrey LUNTSI,
Elizabeth BALOGUN
National Orthopaedic Hospital, Nigeria

11:45-12:00  Break

12:00 - 12:40  RD: PLENARY LECUTRE 1  Rm. 104
Chair(s)  Alain CROMP (ISRRT, Canada)

12:00  Reduced Radiation Dose in General Radiography
RD-PL1  Dong-Wook SUNG
Kyung Hee University Hospital, Korea

12:40-14:00  Lunch
## RADIATION DOSE & REDUCTION

### 14:00 - 15:30  
**RD 5: RADIATION DOSE & REDUCTION 5**  
*Rm. 104*

**Chair(s)**  
Mohamed ABUZAID (University of Sharjah, UAE)  
Gyehwan Kim (Seoul National University Hospital, Korea)

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Authors</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:00</td>
<td>Implementation of Dose Calculation Programming Interface using LabVIEW</td>
<td>Ho Jin SUNG, Seong Mun WI, Hee Nam BEOM</td>
<td>Chonnam National University Hospital, Korea</td>
</tr>
<tr>
<td>14:10</td>
<td>Estimation of Radiation Risk Induced by Chest and Abdomen CT Screening for Korean Population</td>
<td>Won Seok YANG, Hye Jeong YANG, Byung In MIN, Jae Hong PARK</td>
<td>Dong-A University Medical center, Korea</td>
</tr>
<tr>
<td>14:20</td>
<td>Study on Incident Dose as Change at Temperature of X-ray Tube in Diagnostic X-ray Machine</td>
<td>Yong Sung PARK, Yeoung Man KIM, Jin Wan LEE, Ik Pyo LEE, Sun Kwang HWANG</td>
<td>Kyung Hee University Hospital at Gangdong, Korea</td>
</tr>
<tr>
<td>14:30</td>
<td>Comparison of Bolus Tracking and Split Injection in Dynamic Abdominal Computed Tomography: Effect on the Patient Exposure Dose and Image Quality</td>
<td>Jae Hyun LEE, Yong Hwan CHUNG, Tae Hyun NAM, Soon Ahn KWON, Gwan Hong MIN</td>
<td>Seoul National University Bundang Hospital, Korea</td>
</tr>
<tr>
<td>14:40</td>
<td>Considering Organ Dose with Difference of Image Acquisition Methods by Using OSL Dosimeter in Image Pasting Examination</td>
<td>Jong Gyu KANG, Ji Sang JUNG, Sung Sik KIM, Chi Bok AN, Soon Gyu PARK, Jae Sik LIM</td>
<td>Severance Hospital, Korea</td>
</tr>
<tr>
<td>14:50</td>
<td>Application of 80kV Combined with Adaptive Statistical Iterative Reconstruction Technique in Low Dose Lumber CT Examination</td>
<td>Fei FU, Anwei HE, Yue ZHANG, Jiyang ZHANG, Yeda WAN</td>
<td>Tianjin Hospital, China</td>
</tr>
<tr>
<td>15:00</td>
<td>Correlation of Waist Circumference, Hip Circumference, Body Mass Index and CT Radiation Dose in Chinese Patients Suspected of Having Lumbar Disk Herniation</td>
<td>Xiaona LI, Zhigang PENG</td>
<td>The Third Hospital of Hebei Medical University, China</td>
</tr>
<tr>
<td>15:10</td>
<td>Analysis of Environmental Radioactivity and Low and Middle Level Radioactive Waste of the Nuclear Power Plants in Korea</td>
<td>U Seong CHA, Chul Wan SIM, Min Ji PARK, Eun SoI JU, Jae Hyun JUNG, Ki Ok KIM, Byeong Kyou JEON</td>
<td>Daegu Health College, Korea</td>
</tr>
<tr>
<td>15:30-15:45</td>
<td>Break</td>
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</table>
RADIATION DOSE & REDUCTION

Oct. 22 (Sat)

08:30 - 10:00

RD 6: RADIATION DOSE & REDUCTION 6

Kwanghyun CHANG (Samsung Medical Center, Korea)

08:30

Study for Comparing Patient Dose as BMI to Recommended Dose by DRL in Abdomen X-ray Examination

RD6-1

Dong Won SEO, Ji Sang JUNG, Suk Keun CHA, Chi Bok AN, Sung Sik KIM, Soon Gyu PARK, Jae Sik LIM

Severance Hospital, Korea

08:40

Estimated Exposure Dose and Usage of the Computed Tomography by the Patients in the Emergency Care Center

RD6-2

Chang Hwan PARK, Hee Wang PARK, Yong Hee JEONG, Jin Yeong BOK, Jin Ho EOM, Hee Jeong LOH, Kang Yong JO, Young Hong KIM, Jong Won GIL

Sun Medical Center, Korea

08:50

Suggestion of Effective-DAP from Digital Image Files

RD6-3

Ho Sun LEE, Jung Min KIM

Korea University, Korea

09:00

A Study on Standardization of Radiation Dose with Different Types of Equipment for a Chest PA Examination Using AEC in DR System

RD6-4

Shinho PARK, Hanbyul JEONG, Changmin DAE, Kwanhong MIN

Seoul National University Bundang Hospital, Korea

09:10

Analysis of Radiation Exposure in Radiation Worker in Medical Facility and Student in Clinical Practice

RD6-5

Joo Ah LEE, Chul Seung KAY

The Catholic University of Korea Incheon ST.Mary’s Hospital, Korea

09:20

Establishment of Local Diagnostic Reference Levels for Digital Mammography

RD6-6

Yen-Chao YU, Yen-Chien WU, Chia-Yi HUANG, Ying-Chi TSENG

Taipei Medical University Shuang Ho Hospital, Taiwan

09:30

Evaluating Effective Doses of Different Weight PMMA Phantoms Using TLD Undergoing Brain Computed Tomography Examination

RD6-7

Hung-Chih LIN, Tsung-Yo HSIEH, Yen-Ling TSENG, Shih-Te TU, Chien-Yi CHEN

Chung Shan Medical University, Taiwan

09:40

A Study on the Optimization of Image Quality and Dose in Chest PA

RD6-8

Han Sol PARK, Ik Pyo LEE, Sun Gwang HWANG, Jong Woong LEE

Kyung Hee University Hospital at Gangdong, Korea

10.00-10:15

Break
## RADIATION DOSE & REDUCTION

### 10:15 - 11:45

**RD 7: RADIATION DOSE & REDUCTION 7**  
**Rm. 104**

**Chair(s)**
Youl-Hun SEOUNG (Cheongju University of Korea, Korea)

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<tr>
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<th>Presenter(s)</th>
<th>Institution(s)</th>
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</thead>
<tbody>
<tr>
<td>10:15</td>
<td>The Research about Reduction of Dose for C-arm User : Evaluation of usefulness for Dose Reduction Equipment</td>
<td>Jinsoo KIM, Jeun PARK, Hogyum KIM, Gyuseob HWANG, Kibae LEE, Daeseung YANG, Choongbeom SEO</td>
<td>Yonsei University Gangnam Severance Hospital, Korea</td>
</tr>
<tr>
<td>10:25</td>
<td>A Study of Effective Dose Comparison between Chest Tomosynthesis and Chest CT</td>
<td>Wook Jin KIM, Ji Sang JUNG, Chi Bok AN, Sung Sik KIM, Soon Gyu PARK, Jae Sik LIM</td>
<td>Severance Hospital, Korea</td>
</tr>
<tr>
<td>10:35</td>
<td>The Effect of X-ray Tube Voltage on Image Quality and Dose Reduction : Radiography of Distal Pediatric Extremities.</td>
<td>Geun Young LEE, Geun Seong BOK, So Young JUNG, Yu Jang KIM, In su KIM, Dong Seong KIM</td>
<td>Seoul National University Hospital, Korea</td>
</tr>
<tr>
<td>10:45</td>
<td>Preprocessing Methods of the HPGe Detector (Direct Method, AMP) and 134-137Cs Radioactivity Density and Effective Dose(131I) Analysis of Compton Suppression System</td>
<td>Eunsung JANG, Jang Oh KIM, Byung In MIN</td>
<td>Kosin University Gospel Hospital, Korea</td>
</tr>
<tr>
<td>10:55</td>
<td>A Comparison of Patient Dose and Image Quality in Low-Dose Abdominal Computed Tomography (CT) between Iterative Reconstruction and Filtered Back Projection</td>
<td>Bharti KATARIA</td>
<td>University Hospital Linkoping, Sweden</td>
</tr>
<tr>
<td>11:05</td>
<td>Biological Effects of Ionizing Radiation</td>
<td>Haifa'a AL-OUN</td>
<td>MOH, Kuwait</td>
</tr>
<tr>
<td>11:15</td>
<td>A Randomised Controlled Trial of Scatter Removal in Paediatric Interventional Cardiology (PIC)</td>
<td>Sonya MCFADDEN, Richard GOULD, Ciara HUGHES</td>
<td>University of Ulster, UK</td>
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<tr>
<td>11:45</td>
<td>Break</td>
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### 12:00 - 12:40

**RD: PLENARY LECTURE 2**  
**Rm. 104**

**Chair(s)**
Dimitris KASIFARAKIS (ISRRT, Greece)

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<th>Institution(s)</th>
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<tbody>
<tr>
<td>12:00</td>
<td>The Future of Radiation Safety Management</td>
<td>Kwang hyun CHANG</td>
<td>Samsung Medical Center, Korea</td>
</tr>
<tr>
<td>12:40</td>
<td>Lunch</td>
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RADIATION THERAPY

Oct. 21 (Fri)

14:00 - 15:30  RT 1: RADIATION THERAPY 1  Rm. 208
Chair(s)
Joeng Hee CHO (YONSEI CANCER CENTER, YONSEI UNIVERSITY HEALTH SYSTEM, Korea)

14:00 The Study of Thermal Change by Chemoport in Radiofrequency Hyperthermia
RT1-1
Seung Hoon LEE, Sun Young LEE, Yang Soo GIM, Myung Sik YANG, Seok Yong CHA
Chonbuk National University Hospital, Korea

14:10 Patient Safety Perceptions among U.S. Radiation Therapist
RT1-2
Melanie DEMPSEY, Jeffrey LEGG, Laura AARON
Virginia Commonwealth University, USA

14:20 Deformable Image Registration in Linac-Based Radiosurgery
RT1-3
Chiou-Shiung CHANG, Jing-Min HWANG, You-Kang CHANG, Yu-Nong WANG, Po-An TAI
Taipei TzuChi General hospital, Taiwan

14:30 The Quality of VMAT Plans for Spine SABR according to the Collimator Angle
RT1-4
Sangjun SON, Daeho KIM, Janki MUN
Seoul National University Hospital, Korea

14:40 Can Empathy be Taught?
RT1-5
Marcia SMOKE
Juravinski Cancer Centre, Canada

14:50 A New Model of Care in Radiation Therapy: The Role of an Advanced Practice Radiation Therapist in Canada
RT1-6
Grace LEE
Princess Margaret Cancer Centre, Canada

15:00 The effect of Reproducibility of Bolus Position on the Dose Distribution at the Radiation Treatment
RT1-7
Jeong Ho KIM, Gha Jung KIM, Seok Hwan BAE, Ki Jin KIM, Jin Hoe LEE, Yeong Hak JO
Konyang University Hospital, Korea

15:30-15:45 Break

15:45 - 16:45  RT 2: RADIATION THERAPY 2  Rm. 208
Chair(s)
Jeongmin SEO (Daewon University, Korea)

15:45 The Usability Test of Self-made Fractionated Stereotactic Radiation Therapy (FSRT) Tool in Tomotherapy
RT2-1
Sang Min JEON, Yun Kyeong CHOI, Yong Kung JEON, Hyi Seok LEE
National Cancer Center, Korea

15:55 Investigation on Left Anterior Descending (LAD) Coronary Artery Motion in Respiratory and Cardiac Cycles for Left-sided Breast Irradiation Using Magnetic Resonance Imaging
RT2-2
Sin Yu NG, Winky Wing KI FUNG, Ki Man KU, George CHIU, Oi Lei WONG
Hong Kong Sanatorium & Hospital, Hong Kong, China
RADIATION THERAPY

16:05  First Clinical Experience of Using Multichannel Vaginal Cylinder in High-dose-rate Brachytherapy
RT2-3  Wen Min Rita LUO, Kwok Ting CHAN, Ki Man KU, Chi Wah KONG
Hong Kong Sanatorium & Hospital, Hong Kong, China

16:15  The Need of Using CT Image in Gamma Knife Treatment Planning
RT2-4  Saehun KIM
Chungnam National University Hospital, Korea

16:45-17:00  Break

17:00 - 18:00  RT: PLENARY LECTURE 1
Chair(s)  Masaru NAKAMURA (JART, Japan)

17:00  Stereotactic Body Radiation Therapy for Small Hepatocellular Carcinoma
RT-PL1  Sang Min YOON
Asan Medical Center, Korea

Oct. 22 (Sat)
08:30 - 10:00  RT 3: RADIATION THERAPY 3
Chair(s)  Jung Keun CHO (Jeonju National University, Korea)

08:30  Evaluation of Useful Treatment which Uses Dual-Energy when Treating Lung-Cancer Patient with Stereotactic Body Radiation Therapy
RT3-1  Hyeong-Jun JANG, Hwi Ho LEE, Yeong Gyu LEE, Yeong Jae KIM, Yeong Gyu PARK
The Catholic University of Korea Seoul St. Mary’s Hospital, Korea

08:40  Analysis of Dose Distribution with Change of the Air Gap when Proton Therapy Using Line Scanning
RT3-2  Seo Se KWANG
Samsung Medical Center, Korea

08:50  Dosimetric Comparison of the Breath-Hold Based and Conventional Radiation Therapy of Non-Small Cell Lung Cancer
RT3-3  Ahyun CHOI, Byoung Suk PARK, Kwang Zoo CHUNG, Ji Hyun PARK, Hong Ryul PYO, Byung Ki CHOI
Samsung Medical Cencer, Korea

09:00  Study of Reduction of the Injured Skin Reaction in Radiotherapy with Carbon Fiber Couch
RT3-4  Kenji MATSUMOTO, Kohei HANAOKA, Yasumasa NISHIMURA, Mikoto TAMURA, Hajime MONZEN
Graduate School of Medical Science, Kindai University, Japan

09:10  Impact of Ultrasound Image Contrast on Image Guided Radiotherapy for Prostate Cancer
RT3-5  Keigo OKABE, Syogo SAI, Yasuo NAKAZAWA
Showa University Koto Toyosu Hospital, Japan

09:20  A Tool for Developing in India-New Edition of the IAEA Syllabus for the Education of radiation therapists (RTTs)
RT3-6  Gurvinder Singh WADHAWAN, Hardip SINGH
Rajiv Gandhi Cancer Institute & Research Centre, India
RADIATION THERAPY

10:00-10:15  Break

10:15 - 11:45  RT 4: RADIATION THERAPY 4

Chair(s)
Taeyoon KIM (National Cancer Center, Korea)

10:15  Dosimetric Comparison of Forward IMRT, IMRT, and V-MAT Techniques for Left-sided Early Breast Cancer
RT4-1
Yee Man LAI, Vincent W. C. WU, Chun Fai WONG, Kai Shing YU
The Prince of Wales Hospital, Hong Kong, China

10:25  Evaluation on Auto-Segmentation of Re-CT Contours for Nasopharyngeal Carcinoma (NPC) Adaptive Planning
RT4-2
Jing HU, Jia Yi LIM, Kam Weng FONG, Joseph Tien-Seng WEE, Abdul Razak Ashik HUSSAIN
National Cancer Centre, Singapore

10:35  Effectiveness of Audio Coaching in Achieving Regular Breathing Pattern for 4D Computed Tomography Scans
RT4-3
Joline Zhaoqing CHUA, Abdul Shahid ZAKARIA, Parvinder KAUR, Khong Wei ANG, Regine Shi Ling ANG, Xue Ning Prescillia TAN, Yoke Lim SOONG
National Cancer Centre Singapore, Singapore

10:45  Dose Optimization Methods during Radiotherapy Imaging: A Case Study of Dose Optimization during Prostate Cancer Irradiation with Fiducials at Sgmc Ltd.
RT4-4
Chris DOUDOO, George ACQUAH, Phillip OPPONG, Promise AHIAGBENYO, Isaac KORANTENG, Afua COFIE, Melody ASARE
Sweden Ghana Medical Centre, Ghana

10:55  Evaluating Efficiency of Split VMAT Plan for Prostate Cancer Radiotherapy Involving Pelvic Lymph Nodes
RT4-5
Jun Ki MUN, Sang Jun SON, Dae Ho KIM, Seok Jin SEO
Seoul National University Hospital, Korea

11:05  A study of Usefulness for the Plan Based on Only Mri Using Viewray System
RT4-6
Chang Woo JeON, Ho Jin LEE, Beom Seok AN, Chan Young KIM, Je Hee LEE
Seoul National University Hospital, Korea

12:00 - 12:40  RT: PLENARY LECTURE 2

Chair(s)
Younggi CHO (Jeonbuk National University Hospital, Korea)

12:00  Development of Radiotherapy in Asia
RT-PL2
Tan CHEK WEE
ISRRT Board Member, Singapore
SONOGRAPHY

Oct. 21 (Fri)

17:00 - 18:00  SO 1: SONOGRAPHY 1  Rm. 203A

Chair(s)  Hyang Suk PARK (121st Combat Support Hospital, Korea)

17:00  MRI-TRUS Fusion Guided Prostate Biopsy Using PI-RADS II
SO1-1  Mi Seob AHN, Beom Jun KIM, Dong Hwan KIM
Samsung Medical Center, Korea

17:10  Improved Method for Quality Assurance Using Breast-4 Phantom and Image Processing
SO1-2  Yeon Kyoung KIM, Hee Yun LYU, Min Cheol JUNG, Hyeon Jin KIM, Won Hong LEE
Asan Medical Center, Korea

17:20  Change of a Ultrasound Chaos into a Practical Process - Development Project in Ultrasonography and Sonographers' Practice
SO1-3  Paivi BLOMQVIST, Eija METSALA, Esko KORHONEN, Olli TOLKK
Helsinki Metropolia University of Applied Sciences, Finland

17:30  Measurement Error of Mean Sac Diameter and Crown-rump Length among Pregnant Women at Mulago Hospital, Uganda
SO1-4  Sam ALI, Rosemary KUSABA BYANYIMA, Sam ONONGE, Achilles KATAMBA, Joan KALYANGO, Charles KARAMAGI
Kadic Hospital Bukoto, and Makerere University, Uganda

17:40  Carotid Artery Stiffness is More Sensitive than Carotid Intima Media Thickness in the Detection of Carotid Atherosclerosis
SO1-5  Michael YING, Chuang YUAN, Christopher Wai-keung LAI, Helen Ka-wai LAW, Lawrence Wing-chi CHAN, Vincent Wing-cheung WU, Shea-ping YIP
The Hong Kong Polytechnic University, Hong Kong, China

17:50  Evaluation of the Efficacy of Ultrasonography in the Diagnosis of Dento-Maxillofacial Swellings
SO1-6  Akintade DARE, Maryam Olaitan HASSAN, Mansur YAHUZA, Olushola AMOLE
Bayero University Kano, Nigeria

Oct. 22 (Sat)

08:30 - 10:00  SO 2: SONOGRAPHY 2  Rm. 201

Chair(s)  Jung Hwan HAN (Samsung Medical Center, Korea)

08:30  Effectiveness of Repeat US-MR Fusion Biopsy in Diagnosis of Prostate Cancer in Patients with Previous Negative Us-Guided Biopsy
SO2-1  Sanghun JUNG, Eunhee SEO, Gwanhong MIN
Seoul National University Bundang Hospital, Korea

08:40  Study of Pathological Findings in Thyroid Lesions Observed on PET-CT
SO2-2  Jin-Young LEE, Jeong RYU, Beom-Jun KIM, Dong-Hwan KIM, Mi-seob AHN
Samsung Medical Center, Korea
SONOGRAPHY

08:50  Research about the Correlation of Prostate Transitional Zone Volume Using Blood Test Count and Transrectal Ultrasound in Men in Their 30s without Underlying Disease
SO2-3  Bi Seok PARK, Sang Hyun CHU, Heon Jung JEONG, Dong Sung KIM
Seoul National University Hospital, Korea

09:00  Malignancy Rate of Thyroid Nodules in Patients on Regular Follow-up Ultrasonography
SO2-4  Young Hye OH, Hwa Won KANG, Gwang Won LEE
Jeonbuk National University Hospital, Korea

09:10  Usefulness of Transabdominal Ultrasonography for Detection of Early Colon Cancer in Two Case Studies
SO2-5  Dae Hyun KANG, Deuk Soo JEON
Korea University Ansan Hospital, Korea

09:20  Use of Transabdominal Ultrasound for Diagnosis of Schistosoma Mansoni
SO2-6  Hilda MASHA
Kenyatta National Hospital, Kenya

09:30  Physical Effects of Diagnostic Ultrasound Exposure on Rabbit Fetus
SO2-7  Sulaiman MD DOM, Farah Wahida AHMAD ZAIKI
Universiti Teknologi MARA Selangor Malaysia, Malaysia

09:40  Usefulness of Vascular Ultrasonography in Peripheral Artery Disease
SO2-8  Akihiro KASUYA, Hidenao IMADA, Yuki TABUCHI, Miyuri KOMATSU, Yoshihiko MAEDA, Hitoshi Mizuguchi, Shigeru TAMAKI, Mikio SANO
Kariya Toyota General Hospital, Japan

10:00-10:15  Break

10:15 - 11:45  SO 3: SONOGRAPHY 3  
Rm. 201
Chair(s)  Chiung-Wen KUO (TWSRT, Taiwan)

10:15  Compare the Ratio of Frequency Ablation Zone, using a Phased Power Increase by Saline Perfused-Cooled Electrode : Experimental Study in Ex Vivo Bovine Liver
SO3-1  Myung Seok KIM, Sang Hyun KIM, Heon Jeong JEONG, Dong Seog KIM
Seoul National University Hospital, Korea

10:25  Comparison Study of Heat Cauterization Range according to RF Generator
SO3-2  Seung Wan YOON, Hyeon Jin KIM, Sung Ku LEE, Yang Hwa CHUNG, WonHong LEE
Asan Medical Center, Korea

10:35  Observation of Pelvic Floor Muscle of Regular Adults through M-mode Ultrasound
SO3-3  Chae Min JEON, Young Been HAN, Dong Kyun PARK, See Ra KWON, Dong Kyoon HAN
Eulji University, Korea
## SONOGRAPHY

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<td>Specimen of Fine-Needle Aspiration for Liquid Based Cytology: Usefulness of On-Site Visual Assessment</td>
<td>Eun Hee JANG, Ji Eun YOON, Seong Suk BAE, Dong Sung KIM, Ji Hoon KIM, Roh Eul YOO</td>
<td>Seoul National University Hospital, Korea</td>
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<td>Normal Value of Carotid Intima-Media Thickness in the Healthy Twenties Korean by B-Mode Carotid Ultrasound</td>
<td>Hyun Woo LIM, Yon Min KIM, Uri LEE, Yerim LEE, Junsu KIM, Eunha CHOI, Eunyeong LEE</td>
<td>Wonkwang Health Science University, Korea</td>
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<td>11:05</td>
<td>Evaluation of Breast Microcalcifications by Using MicroPure Ultrasound Technique</td>
<td>Chuen-Lan LIOU, Mei-Yen CHANG, An-Chueng WANG, Chiung-Wen KUO, Yung Hui LIN, Yi-Hong CHOU</td>
<td>Taipei Veterans General Hospital, Taiwan</td>
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<td>An Evaluation of the Accuracy of Various Ultrasonographic Regression Formulae used in Predicting Fetal Weight among the BasarwaBushmen Population of Botswana</td>
<td>Simon Takadziyi GUNDA, Ellen Fungai MAGURANYANGA, Sindiso NLEYA</td>
<td>National University of science and Technology (NUST), Zimbabwe</td>
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<td>11:35</td>
<td>The Need for Regular Quality Control Using Ultrasonic Phantom of Diagnostic Ultrasound Equipment</td>
<td>Yebon SEO, Yumi LEE, YongEun LEE, Jaejung BANG, Sarah Sujin YU</td>
<td>Korea University Medical Center, Korea</td>
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STUDENT SESSION

Oct. 21 (Fri)
09:00 - 10:30
ST 1: STUDENT SESSION 1
Rm. 203A
Seung Chul KIM (KRTA, Korea)

09:00
Survey of Awareness on the Exposure Dose of Extremity and Eye Lens by Radiation Worker in Nuclear Medicine Department
ST1-1
Gi man PARK, Chang Bok KIM, Yuni Sang JI, Il Bong MOON, Kyung Rae DONG
Gwangju Health University, Korea

09:08
Change of Signal Intensity according to the Z-axis Direction Coil Angle in Magnetic Resonance
ST1-2
Jae Min LEE, Beong Gyu YOO, Soon Yong SON
Wonkwang Health Science University, Korea

09:16
Usefulness Evaluation on the TMJ Device Manufacturing with a 3D Printer in TMJ MRI Scan
ST1-3
Se In OH, Yeong Jung KIM, Hye Won JANG
Chungbuk Health & Science University, Korea

09:24
Establishment of Dose Constraints for Radiation Workers in Nuclear Medicine
ST1-4
Hyo Seob KIM, Kyung Rae DONG, Chang Bok KIM, Nam Hee YANG, Yong Jin JU, Woon Kwan CHUNG
Gwangju Health University, Korea

09:32
Knowledge, Awareness and Attitude of Community Members towards Medical Radiation in Tanzania
ST1-5
Stephen Samon MKOLOMA, Jenny MOTTO, Wilbroad MUHOGORA
Ocean Road Cancer Institute (ORCI), Tanzania

09:40
MTF Evaluation of Digital Mammography System.
ST1-6
Dowoo KWON, Jung Hyun BAEK, Rusia PARK, Ayoen KIM, Hyerin PARK, Jihyun LEE, Hoiwoun JEONG
Baekseok Culture University, Korea

09:48
Imaging Dose of Megavoltage Computed Tomography (MVCT) for Treatment Verification in the Tomotherapy of Breast Cancer
ST1-7
Ka Wai CHEUNG, Ka Kei SANG, Hoi I LAM, Wing Man CHAN
Tung Wah College, Hong Kong, China

09:56
Evaluation of the Accuracy of SBRT (Stereotactic Body Radiosurgery) Using Real-Time Respiratory Simulation System
ST1-8
Byel Nim PARK
Far East University, Korea

10:04
Research on Optimal Fa Value at T1-weighted Image Using SE Technique in 3.0T MRI
ST1-9
Yeoung Jung KIM, Se In OH, Yeong Dae CHOI
Chungbuk Health & Science University, Korea

10:12
An Education Intervention for Radiographers Rating Mammographic Breast Density
ST1-10
Evelyn WASIKE, Christine DAMASES, Mark MCENTEE, Peter HOGG
University of Sydney, Australia
STUDENT SESSION

10:20  MTF Comparison CT Equipment Using AAPM PHANTOM
ST1-11 JaeYung KWACK, JiWon CHAE, SeungWon PARK, JaeHo JANG, II JEUNG, HoiWoun JEONG
Baekseok Culture University, Korea

10:30-10:45 Break

09:00 - 10:30  ST 2: STUDENT SESSION 2  
Rm. 208
Chair(s)
Jung-Soo KIM (Dongnam Health University, Korea)

09:00 Radiation Protection of Human Nail Against Radiation with Blend of Nail Varnish and BaSO4; A Feasibility Study
ST2-1 Daehyun LEE, Jieun RYU, Eunki LEE, Jeongmin SEO, Jaedong RHIM, Yongkyoon KIM and Changhoon YOO
Daewon University, Korea

09:08 Metabolic Component to an Anatomical Site in the Brain of Rats: Study of Proton Magnetic Resonance Spectroscopy
ST2-2 Myung Seub LEE, Cheol Ung WOO, Young Hun KIM, Hye Sue RA, Seul Bi LEE, Jin Won JEONG, Soo Yeon CHO, Yu Na CHOI
College of Health Science, Kangwon National University, Korea

ST2-3 Jinsun KIM, Dayoung KU, Ju Won OH, Ha young KIM
Baekseok Culture University, Korea

09:24 Dosimetric Comparison of Simultaneous Integrated Boost Versus Concomitant Electron Boost in the Treatment of Breast Cancer
ST2-4 Yuen Ting YIU, Chun Yat YUEN, Wai Lok AU, Wai Long CHAN
Tung Wah College, Hong Kong, China

09:32 Analysis of Body Mass Index on Set Up Errors Rectal Cancer in Radiotherapy
ST2-5 Min-Kyu LEE, Da-Hyeon SEONG, Yong-In SON, Geon-Ryul PARK, Jae-Goo SHIM
Daegu Health College, Korea

09:40 Evaluation of Exposed Dose during the Examination of Lower Extremity Scanography of Patients with Osteosarcoma
ST2-6 Hee-min AHN, Deok-Nam SEO, Yong-kyun KIM
Daewon University College, Korea

09:48 Preparing Indigenous Students to Enter Health Science Professions
ST2-7 Gloria KRISTOF, Lori BOYD, Wendy MACLEOD
Monash University, Australia

09:56 A Study on Accuracy and Usefulness of In-vivo Dosimetry in Proton Therapy
ST2-8 Eun-ji LEE, Jong-Gon AN, Yoon-Jin CHO, Hyun-Yeon KIM, Jae-Goo SHIM, Sun-Young KIM
Daegu Health College, Korea
STUDENT SESSION

10:04  **Mixed Filter of Noise Reduction for Diffuse Liver Disease in the Ultrasound Image**  
ST2-9  
Min ji KOO, Jin Ho KWON, Sang kyu LEE, Seong in PYEON, Si won PARK, So yeong PARK, Jin soo LEE, Seong jin KO, Changsoo KIM  
Catholic University of Pusan, Korea

10:12  **Dose Assessment of Practician's Eyeball Using L-Block Shield in Nuclear Medicine Related Work Environment**  
ST2-10  
Hyeon Kyeom KIM, Tae hwang KIM, Seung Uk KIM, Seok Hyun YUN, Ha Ram KANG, Hye Bin SHIN, Yong In CHO, Se Sik KANG, Jung Hun KIM  
Catholic University of Pusan, Korea

10:20  **Feasibility Study for Development of Improved and Patient Friendly Mouth Piece in Radiation Therapy by 3D Printing**  
ST2-11  
Jieun RYU, Soeun KIM, Eunji CHOI, Wooyeong YOU, Sanghyeon PARK, Jeongmin SEO, Jaedong RHIM, Yongkyoon KIM  
Daewon University College, Korea

10:30-10:45  **Break**

14:00 - 15:30  **ST 3: STUDENT SESSION 3**  
Chair(s)  
Byoung Jun HWANG (Samsung Medical Center, Korea)

14:00  **Evaluation of Usefulness Through Dose Measurement of Virtual and Actual Bolus**  
ST3-1  
Hyeon-Seop SHIN, Se-Joon KIM, In-Ho JEONG, Kyung-Tae KWON  
Dongnam Health University, Korea

14:09  **Usability Evaluation of Bone CT and Abdomen CT Images in accordance with the Change in the Value of Kernel**  
ST3-2  
Ju Hee MOON, Seong Ho AHN, Mun Seong KIM, Sun Youn LEE, In Sun LEE, Ae Ji LEE, Han Kyu KANG, Sun Yeol SEO, Dong Kyoon HAN  
Eulji University, Korea

14:18  **Dose Changes according to Voltage in Chest PA Projection Using AEC**  
ST3-3  
Chanyoung JEON  
Choonhae College Of Health Sciences, Korea

14:27  **Male/Female Students Bone Density and Physical Difference**  
ST3-4  
Myeong Jae KANG  
Choonhae College of Health Sciences, Korea

14:36  **Interventional When Needed Assistant System Produced Usability Evaluation in Angio Room**  
ST3-5  
Da Eun YEON, Seong Hyeon KANG, Young Hoon KIM, Sang Gyu BAE, Hyeon Hui KO, Seon Yeol SEO, Dong Kyoon HAN  
Eulji University, Korea
STUDENT SESSION

14:45  Emerging 3D-Printed Technologies in Radiation Therapy
ST3-6  Jodi MITCHELL, Rachel BALDREY, Ashley WATTS
        QUT, Australia

14:54  The Measurement of Exposure Dose
ST3-7  JongMan PAK
        Choonhae College Of Health Sciences, Korea

15:03  Examining Cerebrovascular Changes after Aerobic Exercises by Analyzing MRA Images
ST3-8  Yo-Han KO, Jin-Ju LEE, Young-Kwang JO, Jeong-Ho BANG, Hyo-Jin HWANG, Yong-Gi LEE, Hoo-Min LEE
        Dongnam Health University, Korea

15:12  Indoor Radon Pollution in Building Inter-University Research
ST3-9  Kwang Hyeon NAM, Eun Cho KI, Min Hyeok LEE, In Hee JO, Heung Tae KIM
        Shinhan University, Korea

15:21  Consideration of Appropriate Image with the Changed Tube Angle of the C-spine Oblique Projection in Supine Position
ST3-10 Hyeongseob KIM
        Choonhae Collge of Health Sciences, Korea

15:30-15:45  Break
POSTERS

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19th ISRRT World Congress
23rd EACRT & 51st KRTA Annual Meeting
October 20 - 22, 2016 Seoul, Korea
POSTERS

POSTERS 1-6: BREAST IMAGING

P1  Effect of Target Filter Combination on Radiation Dose and Image Quality in Digital Mammography
Wen-fu LI, Yun LI, Da-wei HU, Shao-juan SONG
Shandong Cancer Hospital Affiliated to Shandong University, Shandong Academy of Medical Sciences, China

P2  Influence the Deterioration of Computed Radiography imaging plate
Tokiko NAKAMURA, Fujiyo AKITA
Tokoname Municipal Hospital, Japan

P3  Sentinel Lymph Node using Computed Tomography-Lymphography in before an Operation Evaluation Consideration of Malignant or Benign
Hiroshi ASHIBA
Maruyama Memorial General Hospital, Japan

P4  Imaging Findings in the Breast Augmentation Injection with Various Materials
Ruei-Chi LIN, Ho-Ching AI, Hsin-Te CHIAN, Yen-Jun LAI, Yuk-Ming TSANG
Far Eastern Memorial Hospital, Taiwan

P5  Development of the Thickness Correction Model in Mammography
Szu-Ying HUNG, Wen-Chin SU, Kuo-Tung OU, Hsin-Te CHIAN, Yen-Jun LAI, Shang-Lung DONG
Far Eastern Memorial Hospital, Taiwan

P6  The Evaluation of Usefulness on the Change of Average Glandular Dose(AGD), Based on Thickness and Density of Breast Phantom by Using AEC Compensation Function
Soo Yun YOO, Young shin YOO, Ji Hye Kim, Dong Hwan Kim, Mi Sub AHN
Samsung Medical Center, Korea

POSTERS 7-47: CT IMAGING

P7  CT Value Equivalence of Dual-Energy Computed Tomography 70 KeV Virtual Monochromatic Spectral Images and Conventional 120 kVp Polychromatic Single-energy Images
Yang ZHOU
The First Affiliated Hospital of Chongqing Medical University, China

P8  Low-tube-current Gemstone Spectral Imaging In Pediatric Abdominal CT: Dose and Image Quality Evaluation
Li Wei HU, YuMin ZHONG
Shanghai Children’s Medical Center, China

P9  Spectral CT in Rabbit VX2 Liver Tumor Models: Adaptive Statistical Iterative Reconstruction Associated with Monochromatic Image
Mingyue WANG
The First Affiliated Hospital of Zhengzhou University, China

P10  The Vale of Scout Scan Using Positive and Lateral Position Image in Decreasing Chest Scan
Jian LI, Mantao GUO, Xiao YANG, Fang GAO, Na LI, Chun QUAN
Saanxi Province People’s Hospital, China
POSTERS

P11 Effect of Motion-Correction Algorithm (Snapshot Freeze) on Image Quality in Patients Undergoing Coronary CT Angiography with Different Phase Undergoing Coronary CT Angiography
Yaojun JIANG, Jianbo GAO, Jie LIU, Ping HOU, Yanbang LIAN, Peijie LV
The First Affiliated Hospital of Zhengzhou University, China

P12 Comparative Analysis Study of Low Tube Voltage Using Iterative Model Reconstruction with SAFIRE Technique on Image Quality of CCTA
Yaojun JIANG, Jianbo GAO, Jie LIU, Ping HOU, Yanbang LIAN
The First Affiliated Hospital of Zhengzhou University, China

P13 Comparative Analysis Study of Low Tube Voltage Using Iterative Model Reconstruction Technique on Image Quality of CCTA
Yaojun JIANG, Jianbo GAO, Jie LIU, Ping HOU, Yanbang LIAN
The First Affiliated Hospital of Zhengzhou University, China

P14 Application of Iterative Model Reconstruction technique in CT Pulmonary Angiography with Low Radiation Dose and Low Contrast
Jie LIU
The First Affiliated Hospital of Zhengzhou University, China

P15 20ml Contrast Agent Combined the Spectral CT Monochromatic Images Used in the Individual Study of the CTPA
Jie LIU
The First Affiliated Hospital of Zhengzhou University, China

P16 Improving Visualization of Lung Cancer with Virtual Monochromatic Spectral CT Images
Funan WANG, Liuhong ZHU, Qihua CHENG, Gang GUO
Xiamen No.2 Hospital, China

P17 Improving the Morphological Characteristics Valuation of Solitary Pulmonary Nodules(SPNS) in the Material-decomposition Image of Spectral CT
Funan WANG, Liuhong ZHU, Qihua CHENG, Gang GUO
Xiamen No.2 Hospital, China

P18 Experimental Study on the Correlation of the Height of CT Scanning Bed and Noise of Thorax
Fan YANG
West China Hospital of Sichuan University, China

P19 Low Tube Voltage CT Coronary Artery Angiography Using Prospectively ECG-triggered Double High-pitch Acquisition
Jian LI, Xiao YANG, Fang GAO, Na LI, Yang YU
Saanxi Province People’s Hospital, China

P20 Unit Weight Iodine Injection Volume and the Correlation between Brain CTP
Yang DENG, Jinhua CHEN
Daping Hospital, China

P21 The Radiation Dose of Coronary CT Angiography with Different Scan Protocols Using Dual-source CT
Lei HAN
State Key Laboratory of Cardiovascular Disease, Fuwai Hospital, National Center for Cardiovascular Diseases, China
POSTERS

P22 Evaluation of Quality Control Parameters of Various CT Scanners and Comparison of CATPHAN 500 and Vendor specific Phantom Performance
Aditya NAGRATH, Subhash Chand BANSAL, Susheel KASHYP, Niranjan KHADELWAL
Post Graduate Institute of Medical Education & Research, India

P23 Feasibility of Monitoring at Left Atrium in Bolus-Tracking Triggered Coronary CTA with Dualsource CT: A Comparison of Image Quality and the Contrast Medium Dose
Hui WANG, Tao WANG, Changlu YU
Tianjin Third Central Hospital, China

P24 The Clinical Value Of HRCT With Large Matrix in Temporal Bone Imaging
Chi QI, YONGSHU LAN, Shasha HE
The Affiliated Hospital of Southwest Medical University, China

P25 Optimizing the Image Quality and Radiation Dose of Pediatric Computed Tomography Scans
Chen LI-GUO
Buddhist Tzu Chi General Hospital, Taiwan

P26 Effects of Dual-Energy CT with Non-Linear Blending and Linear Blending on Portal CT Angiography
Yuxin HAN, Hui WANG, Yifan TANG, Changlu YU, tao WANG
Tianjin Third Central Hospital, China

P27 Verification of the Injection Pressure Reduction Effect Using the Novel Indwelling Needle for Contrast Enhanced CT
Daiki WATANABE, Hiroyuki YAMAMOTO, Masayuki KUMASHIRO
Kurashiki Central Hospital, Japan

P28 Promotion of 'Auxiliary of the Interpretation' by QCA (Quality Control Activities)
Chiaki KAGAWA, Masayuki KUMASHIRO
Kurashiki Central Hospital, Japan

P29 Knee Anterior Cruciate Ligament (ACL) Reconstruction of Post-operative Evaluation in Three-dimensional Computed (3DCT)
Minoru ISHIFURO, Kazushi YOKOMACHI
Hiroshima University Hospital, Japan

P30 Study of CT Image for the Detection of Bone Bruise to Occult Hip Fracture
Toshiyuki NOMIZU, Kiyoshi KONNO, Ayano TOKUNAGA
Toyama Rousai Hospital, Japan

P31 Age Effect on the Stability of Breath Holding in Dynamic CT of the Liver
Chung-Yin YANG, Chun-Chao HUANG
MacKay Memorial Hospital, Taiwan

P32 CT Imaging Nonionic Contrast Agents Complications
Her-Shiang YU, Feng-Chi HSIEH
Yuan's General Hospital, Taiwan

P33 Using Vessel Density Ratio to Identify Atherosclerosis for Clinical Application
Hsin-Te CHIAN, Ya-Fang WU, Wan-Ting TSAI, Ho-Ching AI, Yen-Jun LAI, Ah-Ming TSANG
Far Eastern Memorial Hospital, Taiwan
POSTERS

P34  The Research of Enhanced MDCT Images under Lower Tube Current
Kuo Ying LIU
E-Da Health Group, Taiwan

P35  Usability Analysis of 3D Fat Measurement using Computed Tomography Imaging
Dae-Keun KIM, Hyeong-Seon LEE, Seong-Bae KIM, Sang-Hyeon LEE
National Cancer Center, Korea

P36  Effect of Impact on the Contrast Strength Side Effects CT Contrast Agent Agreements Understanding and the Number of CT Scans
Jeong-hwan LEE, ock-chun SHIN, Yil-hwan BAE
Kyungpook National University Hospital, Korea

P37  Study on Radiation Dose Reduction due to Reduced Additional Tests through Protocol Change in Lower Extremity CTA Examinations
Cheol Min LEE, Tae hoon LEE, Jin bae KIM, Seong gil KIM, Dong hoon LEE, Jong gyu KIM, Ji soo KIM
Inje University Busan Paik Hospital, Korea

P38  Usefulness of Method using Dual Inject Function of Contrast Media Auto-injectors in Both Leg Direct CT Venography
Jae Hyun SEO, Chang kon KIM, Yeong Deok KIM, Chang Gi JEONG, Jong ho LEE, Mok kyeong KIM
Hwasun Chonnam National University Hospital, Korea

P39  The Usefulness of Modified Brain Perfusion Protocol
Eui Nam HWANG, Jae Hoon SUNG, Hyun Jin PARK, Ju-Yeong PARK, U-hyeng JO, Keun Soo PARK, Byung-Gee YOON
Catholic University ST. Vincent’s Hospital, Korea

P40  Analysis of Bone Mineral Density Using Multi Detector Computed Tomography in Dental Implant
Tae Hui LEE, Tae-Hyung KIM, Woon Young SO, Cheong-Hwan LIM, Myeong Hwan PARK
Wonju Medical Center, Korea

P41  Usefulness of Air+Water Oral Contrast Media According to Positional Change in Abdomen CT for Diagnosis of Gastric Cancer
Deuk Yeol LEE, Sang Muk LIM, Eun Sung KIM, Kwang Won LEE
Jeonbuk National University Hospital, Korea

P42  Development of CT Head Phantom by Using 3D Printing Technology
Youl-Hun SEOUNG, Ho-Young YOU, Hye-Jin KIM, Gun-Hee LEE
Cheongju University of Korea, Korea

P43  Optimization of Dose Reduction and Image Reconstruction Method using Sinogram Affirmed Iterative Reconstruction(SAFIRE)
Sun Ki KIM, Ki Back LEE
Asan Medical Center University of Ulsan College of Medicine, Korea

P44  Manufacturing and Clinical Applications of CT Examination Devices for Preventing Pediatric Sedation Patients from Falling Down
Yeong Nam KIM, Mi Hwa JOO
Asan Medical Center, Korea
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P45  Parameters that Contributes to Appropriate Monitoring Delay Time in CT Scans with Bolus Tracking:
Jae In CHANG, Min Jeong KIM
Asan Medical Center, Korea

P46  Study of Radiation Dose and Image Quality of Coronary Computed Tomography Angiography Using Flash Scan Mode
Cheol Soo JANG, Ki Cheol MOON, HyoSik UHM
Asan Medical Center, Korea

P47  An Evaluation of Image Quality of CBCT for Object Position and Exposure Condition
Hyerin LEE, Jinman KIM, Changho PARK, Namsoon PARK, Woosung JUNG
Seoul National University Dental Hospital, Korea

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P48  Social Media and Radiology 'What Happens in the Hospital Doesn't Always Stay in the Hospital'
Tosca BRIDGES
Kaiser Permanente School of Allied Health Sciences; John Muir Health; Advanced Health Education Centers, USA

P49  MedRadJClub: An International Twitter Journal Club for Radiographers, Radiation Therapists and Nuclear Medicine Technologists
Nick WOZNITZA, Amanda BOLDERSTON, Adam WESTERINK, Julia WATSON, Geoff CURRIE, Lisa DI PROSPERO, Charlotte BEARDMORE, Julie NIGHTINGALE
Homerton University Hospital & Canterbury Christ Church University, UK

P50  Zika Virus and the Role of Radiology
Jonathan MAZAL, Nicole DHANRAJ
International Society of Radiographers and Radiologic Technologists (ISRRT), USA

P51  An Overview of Radiological Educational Activities in Turkey and Contributions of Turkish Society of Medical Radiotechnology (TMRT-DER)
Baris CAVLI, Huseyin Ozan TEKIN, Umit KARA
Turkish Society of Medical Radiotechnology, Turkey

P52  Medical Imaging Techniques Education 'Case Turkey'
Nuran AKYURT
Marmara University, Turkey

P53  Activity Report and Future View of Japan Organization for Emergency Radiological Technologists and Japan Committee to Spread CPR Ability Course for Medical Radiographers
Keiji SAKASHITA, Yuri ASHIHARA
Kurashiki Medical Center, Kumamoto University Graduate School of Social and Cultural Science, Japan

P54  Awareness, Compliance and Determinants of Health Surveillance Amongst Medical Radiation Workers: A Pilot Study
Elizabeth OLANLOYE, Adamu, Alhassan IBRAHIM
University College Hospital Ibadan, Nigeria
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P55  Development of the Portal System for Collecting, Analyzing and Providing All Information in Radiation Field in Korea
Joo Yeon KIM, Woo Ho Shin, Sol Ah Jang, Tai Jin Park
Korean Association for Radiation Application, Korea

P56  A Study on Development of Guideline on Writing Technical Document for Dental Radiology Equipment
Seung-Youl LEE, Jae Ryang KIM, Jun Ho LEE, Eun Lim KIM, Chang Hyung LEE, Chang Won PARK
Ministry of Food and Drug Safety, Korea

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P57  An Ethnographic Study of the Sociological Practice of Radiographers in Trinidad and Tobago
Cynthia COWLING
Monash University, Australia

P58  A Lead Mesh Wire Can Do: A Barium Swallow with Grid
Stephen Samon MKOLOMA, Yokobeth VUHAHULA
Ocean Road Cancer Institute (ORCI), Tanzania

P59  Lower Extremity Camera Chip Frame
Xu DAOMIN
The Affiliated Hospital of Nanjing University of TCM, China

P60  Consideration of Image Acquisition Conditions Decision Using “Physical Exposure Index (PEI)” in the Digital Mobile System with Wireless FPD
Hajime NAGAO
Central Hospital, Japan

P61  The Feasibility of Teleradiology in Africa: A Literature Review
Albert Davor PIERSSON
Tamale Teaching Hospital, Ghana

P62  Small Country Big Ideas!
Annika MELDRE, Reelika HLEVNJUK
East Tallinn Central Hospital, Estonia

P63  Evaluating Radiographic Image Quality Using Different Manufacturers Digital Imaging Equipment
Philip BALLINGER
The Ohio State University, Australia

P64  Knee Joint Cavity of X-ray Film Evaluated Using Semi-automatic Quantitative Analysis
Yuan-Ju LI, Jia-Hao ZHOU, Ming-Hung LIU, Wen-Chang TSENG, Kwei-Yuan HOU, Chin-Tsao HUANG, Yung-Cheng WANG
Cathay General Hospital, Taiwan

P65  Analysis for Cut-off Effect by Improper Grid Location with General X-ray System
Youngjin LEE, Dae Ho KIM, Hee-Joung KIM, Ji Na SHIM, Dong Hae LEE, Jung Kyun PARK
Eulji University, Korea
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P66  The Effects of Total Variation (TV) Technique for Noise Reduction in X-ray image: Quantitative Study
Kanghyen SEO, Seung Hun KIM, Seong Hyeon KANG, Jongwoon PARK, Youngjin LEE
Eulji University, Korea

P67  The Development of an Assistant Device for the Standing X-Ray Views and Its Usability for the Patient Safety
Seong Wook YUN, Jong Ho YOO, Do Hyeong KIM, Yeo jin YUN, Kee Seo UM, Jong Won GIL
Sun Medical Center, Korea

P68  The Usefulness Evaluation for Hindfoot Coronal Alignment
In Gil HWANG, Gwang Oh KANG, Jun Ho KIM, Ok Seon KWON
Inje University Busan Paik Hospital, Korea

P69  The Development of Assistant Device for the Simultaneously Both Knee Stress Study and Its Usability
Yoon Ki HONG, Jeong Wook KIM, Kyoung Ho LEE
Kyungh ee University Medical Center, Korea

P70  Timed Barim Esophagogram and Esophageal Transit Scintigraphy Correlation
Haedoo YANG
Asan Medical Center, Korea

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P71  A Survey on the Effectiveness of Various Training Modals among the VIR Radiographers in SGH
Jiun Siong LOKE, Peter YANG, Cornelio G. PADRE, Laroco OD
Singapore General Hospital Pte Ltd, Singapore

P72  Experience of the Spine Surgery with Hybrid OR
Yoshinori TAKAO, Akihiko KAKIMI, Shinichiro IZUTA, Shohei SASAKI, Toshiyuki ZAIKE, Naohito OGURA, Daisuke HIMOTO, Toshiyo NORIMASA, Koji YOKOYAMA, Ichida
Osaka City University Hospital, Japan

P73  Case Report: Combined Neuro-intervention Techniques in a Patient Using Pipeline Embolization Device and IA Thrombolysis
Yi-Chia CHANG, Ching-Ruei HUNG, Yu-Chun LIN, Yung-Chuan KUNG, Ta-Fu LIAO, Yi-Ming WU
Linkou Chang Gung Memorial Hospital, Taiwan

P74  Comparison of Usefulness for CBCT and MDCT in TACE
Seong Bae KIM
National Cancer Center, Korea

P75  Radiation Dose Reducing Effect Using Low Dose Technique in Interventional Procedure
Tae-Hyung KIM, Sang Heon KIM, In Beom KO, Won Hong CHO, Mi Seob AN, Woon Young SO
Kangwon National University, Korea

P76  Impact of Contrast Agent to Reduce Tracheal Balloon Deflation Times: A 3D Printed Phantom and Animal Study
Min Tae KIM, Nam Kug KIM, Ji Hoon SHIN, Jung-Hoon PARK
Asan Medical Center, Korea
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P77  When TACE Tests Utilizing the Liver Dynamic MRI Scan, Celiac Trunk Detection and Improvement of Research on Ways of Reducing Patient Damage
Hoon KIM
Dongtan Hallym Sacred Heart Hospital, Korea

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P78  Effectiveness of Radiological Technologists' Support in Prompt Interpretation of Postmortem Images
Satoko SOMEYA, Tomoya KOBAYASHI, Seiji SHIOTANI, Kazunori KAGA, Hajime SAITO, Kazuya TASHIRO, Katsumi MIYAMOTO
Tsukuba Medical Center Hospital, Japan

P79  Role of Radiological Technologists in Postmortem Imaging Examinations in Japan: Importance of Establishing Work Shifts and Training
Tomoya KOBAYASHI, Kazuya TASHIRO, Satoko SOMEYA, Hajime SAITO, Kazunori KAGA, Katsumi MIYAMOTO
Tsukuba Medical Center Hospital, Japan

P80  A Study of the Proactive Strategy for Detecting Early Stage of Dementia - The Development of an MRI Scanner Maintenance System in ASEAN Countries-
Fumio NISHIDA, Kojiro YAMAGUCHI, Tomoya TOYAMA, Kenta HIRAYAMA, Kiyomitsu MORI
Japan Consultant and Medical Service, Japan

P81  Kanagawa-ken Radiation Supervisor Sectional Campaign and Report of Segment Method (3 minutes survey)
Terumi HASHIMOTO, Jyunji HAMADA, Kotaro OISHI
Kanagawa-ken Radiation Supervisor Sectional, Saiseikai Yokohamashi Tobu Hospital, Japan

P82  The Relation of Received Radiation Exposure and Premature Birth
Her-Shiang YU, Feng-Chi HSIIEH
Yuan’s General Hospital, Taiwan

P83  DICOM Tag Standardization of Mammography Images in Taiwan’s Medical Institutions Status
Mei-Lan HUANG, Shu-Ning WANG
Tainan Chi-Mei Medical Center, Central Taiwan University of Science and Technology, Taiwan

P84  Innovative Technology in Contrast: Effectiveness of Integrating Health Education APP in Taiwan
Ming-Sheng TSAI, Wen-Lu KUO, Nan-Han LU, Lee-Ren YEH, Hsiu-Ling CHANG, Wang-Chun CHEN
E-Da Hospital, Kaohsiung Country Association of Radiological Technologists, Taiwan

P85  Application of PDCA Management Cycle Reducing the Waiting Time of Oncological Emergencies for Radiotherapy Patients
Ya-Yu HUANG, Yi-Ren CHEN, Jen-Hong LAN, Tzung-Yi Liao, Kuo-Jung JUAN, Eng-Yen HUANG
Kaohsiung Chang Gung Memorial Hospital, Kaohsiung Medical University, Taiwan

P86  Experiences Share of Radiological Hazard Assessment in Hospital
Yu-Yin CHENG, Yu-Kang CHANG
Chi Mei Medical Center, Taiwan

P87  The General Population Cognition Investigation and Research for Medical Imaging and Radiation Safety Related Inspection
Yi-Hsien LIN, Yi-Xin SU, Teng-hui CHIU, Li-Hang ZHANG, Ying-Qi ZENG
Taiwan New Taipei Medical University Shuang Ho Hospital, Taiwan
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P88 Constructing a Medical Staff Scheduling System: An Example of Radiological Technologists for the Special Radiological Team
Huan-Chung YAO, Chun-Chin SHIH, Ping-Shun CHEN, Wen-Fang HE, Yu-Ting KUO
Chimei Medical Center, Taiwan

P89 Applying an Integrated Information System Effectively Decreasing Documenting Error and Increasing Interdisciplinary Communication in a Department of Radiation Oncology
Pei-Han YEH, Moon-Sing LEE, Shih-Kai HUNG, Wen-Yen CHIOU, Bing-Jie SHEN, Feng-Chun HSU, Yeuh-Ru LIN, Shu-Mei HUANG, Yi-Ting SHIH, Lin
Buddhist Dalin Tzu Chi Hospital, Taiwan

P90 OMAS Method Analysis on Working Postures of X-Ray Technologists
Shih-Mei SHU, Yi-Lan LIN, You-Zhu CHEN
Hsin-chu Mackay Memorial Hospital, Taiwan

P91 Analysis of the Possibility of Developing the AEC-sensor Containing Intrinsic Silicon Semiconductor in General Radiographic Imaging System
Kyo Tae KIM, Ryang Young YUN, Moo Jae HAN, Ye Ji HEO, Joo Hee KIM, Su Bin KANG, Sung Kwang PARK, Ji Koon PARK, Sang Hee NAM
Inje University Busan Paik Hospital, Korea

P92 Comparison of Image Quality for Computed Radiography (CR) System
Jung Whan MIN, Hoi Woun JEONG
The Shingu University College of Korea, Korea

P93 Coronary Computed Tomography Angiography: Evaluation of the Effects of Cradle Sagging on Stair-step Artifacts
Sangwoo LEE
Asan Medical Center, Korea

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P94 Application of the T2* mapping technique in the MR imaging of the lumbar disc
Qi SUN, Min-jun DONG
Shanghai Ninth People's Hospital, China

P95 Comparison Of Self-Referenced And Referenced Measurement Methods In Evaluating Basilar Atherosclerotic Plaque Employing High Resolution MRI At 3 T
Luguang CHEN, Qi LIU, Xia TIAN, Qian ZHAN, Xuefeng ZHANG, Wenjia PENG, Bing TIAN, Jianping LU
Changhai Hospital of Shanghai, China

P96 Effect evaluation of 3D-FIESTA sequence on knee ligaments display
Junwu HU
Tongji Hospital, Tongji Medical College, Huazhong University of Science & Technology, China

P97 The influence of excessive drinking on the fat level of lumbar spine by IDEAL-IQ
Changsheng LIU
Renmin Hospital of Wuhan University, China

P98 A Study of Radiofrequency Artifacts for Off-center Scan Deduced in Two MR Scanners in Close Proximity
Xiaona LI, Zhigang PENG
The Third Hospital of Hebei Medical University, China
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P99 Role of Dynamic Contrast-enhanced MRI and DWI Combination in Diagnosing Cervical Cancer Lymph Node Metastasis and Its Clinical Value
Hongxia ZHANG, Yang ZHOU
The Affiliated Tumor Hospital, Harbin Medical University, China

P100 The Application of Magnetic Resonance Imaging in 3D Printing Congenital Heart Disease Cardiac Modelling
Li Wei HU, YuMin ZHONG
Shanghai Children’s Medical Center, China

P101 Intravoxel Incoherent Motion Diffusion-weighted MR Imaging Based on RESOLVE Sequence in Diagnosis of Hypertrophy of Nasal Mucosa in Obstructive Sleep Apnea-Hypopnea Syndrome
Zhian YANG, Tao JIANG, Jinfei LIU, Xiaohui WEN, Qingyi SHI, Xiao Ye WANG
Beijing Chaoyang Hospital, Capital Medical University, China

P102 Brachial Plexus MR Imaging using Contrast-enhanced STIR 3D FSE: Evaluation of Four Different Delay Times
Xiaoqing ZHANG, Xin LOU, Ailian ZHANG, Lin MA
The Chinese PLA General Hospital, China

P103 Comparison of Two Methods for Automatic Brain Morphometry Analysis in Rat Subjected Chronic Neuropathic Pain
Hao WU, Jinhua CHEN
Institute of Surgery Research, Daping Hospital, Third Military Medical University, China

P104 Study about ZOOMit DWI on Adrenal Gland
Jiyang ZHANG
Beijing Chao-Yang Hospital, China

P105 The Value of Short-TR cine Sequence in 3.0T MR Cardiac Function Imaging
Simeng WANG, Sun JIAYU, Cheng WEI, Dao YIKE, Liu XIUMIN
West China Hospital of Sichuan University, China

P106 The Effects of Respiration Frequency and Voxel Size on the MRS of Nudes with Glioma
Yu GUO, Jinhua CHEN
Daping Hospital, Third Military Medical University, China

P107 Clinical Value of Whole-body DWI with Integrated Slice-Specific Dynamic Shimming in Detecting Rectal Cancer Metastases
Fu SHEN, Jianping LIU, Luguang CHEN, Chao MA, Alto STEMMER, Caixia FU, Xu YAN
Changhai Hospital, China

P108 The Value of Readout-segmented Echo-planar Imaging (RESOLVE) in the Staging of Preoperative Rectal Cancer
Xiaolu MA, Fu SHEN, Luguang CHEN, Chao MA, Caixia FU, Xu YAN, minjie WANG
Changhai Hospital, China

P109 The Multiparametric Diffusion-weighted Magnetic Resonance Imaging of Rectal Cancer: A Research on Quantitative Evaluation of the Preoperative Staging
Xiaolu MA, Fu SHEN, Luguang CHEN, Chao MA, Caixia FU, Xu YAN, minjie WANG
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P110  Morphological Analyses on Cortical Areas of Ventral Prefrontal Cortex in BD Patients
Huanhuan LI
The First Affiliated Hospital of China Medical University, China

P111  Decrease Gray Matter Volume in Unilateral Sudden Sensorineural Hearing Loss
Wenliang FAN, Jing LI, Jianming YU
Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, China

P112  A Preliminary Study on MR Perfusion Quantification of High-grade Glioma Based on Factor Analysis
Ji ZHANG
Zhongnan Hospital of Wuhan University, China

P113  Comparison of Diffusion-weighted Imaging Before and After Intravenous Administration of Gd-EOB-DTPA in Liver and Focal Liver Lesions
Jiang JIFENG
Nantong Third People's Hospital, China

P114  Free Breathing Multi-phase Renal Imaging CE-MRI for Non-cooperative Patients using Radial VIBE 3D Sequence
Zhuang NIE
Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, China

P115  The Application Value of CT-MRI Image Fusion in Nasopharyngeal Carcinoma (NPC) Intensity Modulated Radiation Therapy (IMRT) Target Volume Delineation
Ming YANG
Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, China

P116  The Accuracy of Liver Fat Quantification by using Magnetic Resonance Spectroscopy
Po-Hsiang HSU, Li-Chuan HUANG
Tzu Chi General Hospital, Taiwan

P117  Adnexal Masses in the Practice: A Guide to the MRI Technician
Thomas MAZET, Saloua EL FIDHA
AP-HP Hopital Tenon, France

P118  MRI in the Exploration of Thoracic Diseases
Saloua EL FIDHA, Thomas MAZET
AP-HP Hopital Tenon, France

P119  The Importance of ASL Sequence in Non-Contrast Brain MRI
Sercan CETINKAYA, Suzan SAYLISOY, Esra CETINKAYA
Eskisehir Osmangazi University Hospital, Turkey

P120  QISS MR Angiography: Improvement of Image Quality by Effective Fat Suppression
Makoto ENDO, Kuo SHIMIZU, Masahiro ISETANI, Hiroki MURASE, Nao WAKASUGI
Aichi Medical University Hospital, Japan

P121  Basic Study in The Polymer Gel Dosimeter
Hiroki NARITA
Komazawa University

P122  Measuring Brain Atrophy by Cerebral Blood Volume Using Near-Infrared Spectroscopy
Yusuke SHIMIZU
Takasaki University of Health and Welfare

P123  Evaluated Variety of Pituitary Tumor Volume for Acromegaly Patients after Treatment by Gamma Knife with MRI T1 Images
Chao-Chi CHEN
E-DA Cancer Hospital

P124  Four Dimensional Phase-Contrast MRI of The Thoracic Aorta: Effect of iPAT Acceleration on the Flow Field Measurement
YongBum CHO, Ho Jin HA, Jin Oh IM, Seon Wook YANG, Nam Kook KIM
Asan Medical Center
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P125  Vulnerability of Structural Brain Network for Sleep Deprivation in Diffusion Tensor Imaging
      Youngjin LEE, Min-Hee LEE
      Eulji University, Korea

P126  A Study on the Utility of Magic Technique for Pediatric in 3.0T Magnetic Resonance Imaging
      Jun Hee LIM, Byung Cheol LEE, Sang Hoon LEE, Hee Young PARK, Moon Jung HWANG
      Kyungpook National University Medical Center, Korea

P127  The Study on Availability of Short TE for Reducing Susceptibility Artifact at the time of 3.0T Liver DWI Inspection
      Jae Gu SEONG
      National Cancer Center, Korea

P128  Evaluation of usefulness of the m Dixon Technique in Breast MRI Examination | Comparison with the T1 SPIR Technique
      Si Ra MUN, Hyun Keum SHIN, Seung Keun LEE
      Samsung Medical Center, Korea

P129  Evaluations Among Parameters to Reduce the Magnetic Susceptibility artifact Caused by Intraorally Anchored Dental Co-Cr Alloy Using Customized Phantom in 3.0T DWI MRI.
      Dae keon SEO, Sara NA
      Asan Medical Center, Korea

P130  Evaluation of the Clinical Usefulness T2 Mapping Techniques for Quantitative Analysis of Myocardium Disease in 3.0T MRI
      Ji-Hoon DO, Sei-Young KIM, Yoon-Kook KIM, Soon-Kyu PARK, Jae-Sic LIM
      Severance Hospital, Korea

P131  The Usefulness Evaluation of TSE DWI Images from Magnetic Susceptibility Artifacts Caused by Metal Head and Neck Examinations
      Min Seok CHO
      Seoul National University Hospital, Korea

P132  Brain Tumor Patients 3D Balanced Gradient Echo Sequence of Check Availability Contrast Study of 3D Proton Density VISTA Sequence
      Deok Geun NO, Chang Hwa PARK, Sei Yong EOM, Dong Dae LEE, Mi JANG, Geun Bae LEE, Seung Bong HAN, Joon Nyeong JANG
      Bundang Jesaeng Hospital, Korea

P133  Evaluation of Optimal Material for Decreasing Magnetic Susceptibility Difference
      Dae Keon SEO
      Asan Medical Center, Korea

P134  Comparison of 3D T2W SPACE Sequence with Conventional 2D T2W TSE Sequence in Evaluating Thyroid Nodule
      Peipei SUN, Luguang CHEN, Qiang HAO, Jianping LU, Minjie WANG
      Shanghai Hospital of Shanghai, China

P135  Black Tea as a Negative Oral Contrast Agent in MR Cholangiopancreatography: Prospective in Vitro and in Vivo Studies
      Hehan TANG, Bin SONG
      West China Hospital of Sichuan University, China
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P136  Comparative 18FDG with Specific Novel Radiotracers
Jorge Albarran LOPEZ
UNIDAD PET CT, UNAM, Mexico

P137  Decreasing Noise by 2D and 3D-Morphological Structure Operation from Filtered Back-Projection of Nuclear Medicine Images
Chun-Yi CHIU, Yi-Chi HUNG, Chia-Chi HSIAO, Yun-Shiuan SHIU, Huei-Yong CHEN, Yung-Hui HUANG
Kaohsiung Veterans General Hospital, Taiwan

P138  Bone Health: Will Bone Densitometry Help?
Elizabeth BALOGUN
National Orthopedic Hospital, Nigeria

P139  New Concept of Parallel-hole Collimators with Photon Counting Gamma Camera System: Monte Carlo Simulation Study
Youngjin LEE, Hee-Joung KIM
Eulji University, Korea

P140  Optimization of Iterative Reconstruction Algorithm with CZT SPECT System Using Parallel-hole and Pinhole Collimator
Youngjin LEE, Hee-Joung KIM, Se Young BAE, Jong Seok KIM, Seong Hyeon KANG, Kanghyen SEO, Dong Jin SHIN, Seung Hun KIM
Eulji University, Korea

P141  Suggesting an Optimal Pinhole Collimator Design with CdTe Photon Counting Gamma Camera System: Monte Carlo Simulation Study
Se Young BAE, Jong Seok KIM, So Jung LEE, Youngjin LEE
Eulji University, Korea

P142  Improvement Activities to Reduce the Personal Exposure Dose of Radiologic Technologists in PET/CT
Jong In WOO, Chang-su PARK, Jong-sik PARK, Jin-woo JO, Hwan-yong SONG, Hyeon-beom JO
Chungnam National University Hospital, Korea

P143  The Comparison of Quantitative Accuracy between Energy Window-Based and CT-Based Scatter Correction Method in SPECT/CT Images
Ji-Hyeon KIM, Hyeon-Soo SON, Juyoung LEE, Hoon-Hee PARK
Seoul Medical Center, Korea

P144  A Study of Injection Dose for Patients and Exposure Dose for Technologists from the PET/CT Systems
Hoon-Hee PARK, Juyoung LEE, Ji-hyeon KIM
Shingu College, Korea

P145  The Study of Influence on Reducing Exposure Dose According to the Applied Flat-panel CT in Extremity Bone SPECT/CT
Ji-Hyeon KIM, Hoon-Hee PARK, Juyoung LEE, Sik NAM-KUNG, Hyeon-Soo SON
Seoul Medical Center, Korea

P146  Performance Evaluation of Cu-64 PET Imaging in the Siemens Inveon PET Preclinical Scanner
Seonhwa LEE, Jung Min KIM, Jin Su KIM
Korea University, Korea
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P147 Responsibility As The First Accredited Nuclear Medicine Facility In Korea, And Some Tips For Those Who Want To Get The Accreditation Outside North America.
Jaemin CHOI, Dongoh SHIM
Asan Medical Center, Korea

P148 The Study on Effect of the Image Applying to Breast Implants in Breast Specific Gamma Imaging
Juyoung LEE, Hae-Jung LEE, Ji-Hyun KIM, Hoon-Hee PARK
Chungbuk National University, Korea

P149 Radiation Exposure Analysis of Female Nuclear Medicine Radiation Workers
Juyoung LEE, Hoon-Hee PARK
Chungbuk National University, Korea

P150 Relationship between Degree of F-18 FDG Uptake in Brown Adipose Tissue
Gwangyeol PARK, Yunghyun LIM, Sanghyeong KIL, Kyungnam JO, Seungju BAEK, Seongmook CHO, Seunghun YEOM
Pusan National University Yangsan Hospital, Korea

P151 Assessment of Indoor Radon Gas Concentration Change of One College
Hak-Jae KIM, Kwang Yeul LYU, Hoon-Hee PARK
Shingu College, Korea

P152 The Study for the Influence of Remaining Urine when Having PET/CT Examination with 18F-FDG
Yong Bin LIM, Hyeong Jun KWAK, Se Yeong BAE, Chan Rok PARK, Dong Suk KIM, Bo Hyun KIM, Seong-Jong HONG, Woo Yeon KIM
Eulji University, Korea

P153 Utility Evaluation of 3D Printer Technology in Nuclear Medicine
Yechan AN, Kwang Yuel LYU, Juyoung LEE, Hoon-Hee PARK
Shingu College, Korea

P154 Study on the Reduction of Diagnostic Reference Levels in Whole-body Bone Scintigraphy
Sang Hyeong KIL, Young Hyun LIM, Gwang Yeol PARK, Kyung Nam JO, Seung Ju BAEK, Seong Mook CHO, Seung Hun YEOM
Pusan National University Yangsan Hospital, Korea

P155 Endothelial Dysfuntion in Systemic Lupus Erythematosus: Evaluation with 11C ACETATE PET-CT.
Andres SANABRIA RODRIGUEZ, Jorge ALBARRAN LOPEZ
UNIDAD PET CT, UNAM, Mexico

POSTERS 156-186: RADIATION DOSE & REDUCTION

P156 Patient Dose Relationship with Exposure Parameters in Chest X-Ray Examination at the Komfo Anokye Teaching Hospital, Kumasi-Ghana
Emmanuel Worlali FIAGBEDZI, Emmanuel Akyea OBIRI, Vivian Della ATUWO-AMPOH, William K. ANTWI, Eric K. ADDISON
Komfo Anokye Teaching Hospital, Ghana
P157  Radiation Dose During Digital Pelvic Radiography: A Comparison of Three Systems  
Andrew ENGLAND, Louise HARDING, Fergus DUNN, Anthony MANNING-STANLEY, Maureen TAYLOR, Paula EVANS  
University of Salford, UK

P158  The Imaging Effect of Different Exposure Dose and Radiation Dose after Knee Replacement Surgery  
Qitong LIU  
Beijing Chao-Yang Hospital, China

P159  Study of mA Distribution and Dose Reduction of Organ Dose Modulation (ODM) Technique during Carotid and Head CTA: Difference between Lens and thyroid Protection  
Mingyue WANG  
The First Affiliated Hospital of Zhengzhou University, China

P160  Effects of Incorrectly Filled Examination Request Forms on the Quality of Imaging Services & Radiation Dose Reduction  
Charles OMONDI  
Society of Radiography in Kenya, Kenya

P161  Effect of Off-Center Height on Radiation Dose and Image Noise in Abdominal CT: Phantom Study  
Wanlin PENG, Zhenlin LI, Chuncha XIA  
West China Hospital of Sichuan University, China

P162  Adherence to Scan Regions in Common CT Protocols and the Consequences on Radiation Dose  
Mohamed BADAWY, Michael GALEA  
RMIT University, Austin Health, Australia

P163  Radiation Dose Optimization in Interventional Cardiology  
Mohamed BADAWY, Tegan CLARK, Pradip DEB, Omar FAROUQUE  
RMIT University, Austin Health, Australia

P164  Peripheral Angiography by Using Low Dose and Low Contrast  
Ahmet ZAVAGAR, Ertugrul MAVILI, Baris ÇAVLI, Huseyin Ozan TEKIN  
Turkish Society of Medical Radiotechnology, Turkey

P165  Radiation Doses to Radiographers during Hepatobiliary Interventional Procedures Using Flat-panel Detector Based System  
Roberta GERASIA, Antonino CUCCHIARA, Giuseppe GALLO, Corrado TAFARO, Carmelo ROTINO, Calogero CARUSO, Giuseppe FIORELLO  
ISMETT, Italy

P166  Measurement of the Mean Glandular Dose Using the Small Luminescent Dosimeter in Mammography  
Hiroki OHTANI  
Tokyo Metropolitan University, Japan

P167  Radiation Dose Associated with Radiographic Procedures at an Australian Teaching Hospital  
Mohamed BADAWY, Emily WEBB  
RMIT University, Austin Health, Australia
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1. BREST IMAGING

B11-1
The Clinical Application of Digital Breast Tomosynthesis (DBT)
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Purpose: To acknowledge the new technical characteristics of Digital Breast Tomosynthesis (DBT) and introduce a better understanding and application of the DBT. Utilize the DBT to preliminarily evaluate the relationship among the Average Glandular Dose (AGD), density and compression thickness. Define the diagnostic efficacy of DBT on breast cancer. Evaluate the DBT’s capability for assessing the range of lesion in a case of breast cancer.

Materials & Methods: We randomly select 271 female patients with 542 sides of breast images as the testing sample, and then we carry out retrospective analysis for 253 cases of female patients already identified by histopathology. Meanwhile implementing 2D and 3D examination. Finally we promote an analysis for breast cancer focus based on 114 cases of female patients identified by histopathology.

Results: Under the same pressure, the AGD figure of mammary gland density level decrease while the compression thickness increase. The mammary gland density has more significant effect on the AGD figure. The sensitivity, specificity, accuracy rate, positive and negative predictive estimates of breast cancer on 2D are 92.2%, 85.7%, 89% respectively. The sensitivity, specificity, accuracy rate, positive and negative predictive estimates of breast cancer on 3D are 97.5%, 91%, 93% respectively. The Kappa coefficient of 2D is 0.783 (P<0.001). The Kappa coefficient of 2D is 0.664 (P<0.001).

Conclusions: The DBT has better sensitivity and more accordance rate than 2D when used for diagnosing the breast cancer. Both 2D and 3D have certain accuracy for the diagnosis of breast cancer, but 3D is more accurate than 2D. The consistency of the 3D breast cancer estimation range with the pathological is better than that of 2D.

Key words: DBT, AGD, Sensitivity, Specificity, Accuracy Rate

B11-2
The Comparison of the AGD with Using DBT and FFDM
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Purpose: The purpose of our study was to compare average glandular dose of FFDM and DBT according to the age and breast density using different equipments and to evaluate dose reduction method using those data.

Materials & Methods: For Phantom experiments, the radiation dose of both DBT and FFDM were compared using ACR phantom (CIRS model15). For clinical data evaluation, patient data of 145 women patients with equipment A, and 129 women patients with equipment B were collected. In those patients, RMLO images of FFDM and DBT were selected, and average glandular dose were retrieved. The relationship between radiation dose and patient factor in each equipment was compared.

Results: The increasing rate of average glandular dose(mGy) by age groups was 9.07% for A and 23.48% for B under 30s, 6.08% for A and 9.2% for B over 60s. The average breast thickness by age groups was 44.58mm for patients using A, 47.06mm for B under 30s and 51.99mm for A, 52.76mm for B over 60s. Breast density distribution predominantly ranged from grade 3 to grade 4 under 30s, and predominantly ranged from grade 1 to grade 2 over 60s in both units. Rate of dose increase from 2D to 3D was 6.08% for A and 7.4% for B in grade 1 to grade 2, 3.12% for A and 19.4% for B in grade 3, 6.78% for A and 23.26% for B in grade 4.

Conclusions: The difference of between 2D and 3D exam was the lowest in fatty breast when using B vendor, while difference of between 2D and 3D exam was the lowest in dense breast using A vendor. Thus, it is possible to reduce radiation exposure by applying different system according to patient characteristics.

Key words: 3D Tomosynthesis, Average glandular dose, Mammography

B11-3
The Influence of Ethnicity on Mammographic Breast Density Pattern
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Purpose: Breast cancer is the most common cancer among women in Malaysia and around the world. Previous study performed shows that there is an association of breast cancer risks among ethnic groups in relation to breast density. The aim of this retrospective study was to determine the association between the two risk factors namely ethnic groups and breast density pattern in developing breast cancer.

Materials & Methods: Mammography examination was performed on 150 women from the three main ethnic groups which are namely Malay, Chinese and Indian. The study took place at the Tengku Ampuan Rahimah Hospital, Klang, Malaysia from July to December 2015. The mammogram was evaluated using the BI-RADS (Breast Imaging Reporting and Data System) breast density pattern, a method that qualitatively assesses the percentage of fibroglandular tissue in the breast. Two radiologist independently assessed the mammograms. Descriptive analysis and inferential statistics was performed.

Results: The findings of this study showed that around 54% of Chinese women had denser breast (BI-RADS 3) compared to the women of the other ethnic groups. Malay and Indian women were mostly in the BI-RADS 2 breast density pattern. The Fischer’s exact test showed an association between breast density and the three ethnic groups (p<0.001) with significant differences in breast density in the three ethnic groups. There is an association between mammographic breast density and HPE findings of breast cancer. BI-RADS 4 shows higher the breast density, the higher the risk of developing breast cancer.

Conclusions: Based on our study we found Chinese had denser breast compared to the other ethnic groups and therefore they were at a higher risk of developing breast cancer compared to the women of the other ethnic groups.

Key words: Breast density, Mammography, BI-RADS
BI1-4
Optimized Choice of Exposure Parameters in Digital Mammography
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Purpose: To evaluate the effects of different target/filter combinations and exposure modes on radiation dose and image quality in digital mammography, and choose optimal exposure parameters for breast with different essential composing classification and thicknesses to ensure image quality and reduce radiation injury.

Materials & Methods: The same exposure parameters were employed under AEC and MEC modes. To evaluate the effect of target/filter combination, fixed kV, mAs and different target/filter combinations (Mo/Mo/Mo/Rh/W/Rh), adjust the PMMA thicknesses from 10 mm to 70 mm. ESD on Ray Safe were recorded and AGD were calculated. CNR were measured and calculated on Workstation, FOM were calculated and recorded at last. To evaluate the effect of kV or mAs, kV or mAs was changed while the other parameters were kept consistent.

Results: The AGD and FOM values acquired from different thicknesses and target/filter combinations were statistically different, but the CNR didn’t differ significantly. The AGD values were lowest for W/Rh but highest for Mo/Mo. In AEC mode, AGD were lowest for LD mode but highest for HQ mode; but the image quality score had no differences in calcium, fiber and mass. In MEC mode, the AGD correlated with kV and mAs positively. The image quality score of calcium didn’t differ significantly at 27 kV and 40 mAs and above; as for fiber and mass at 25 kV and 56 mAs and above.

Conclusions: Breast thickness showed the greatest influence on radiation dose. Reduced the breast compressed thickness reasonably can provide the best image quality with lowest radiation dose. W/Rh combination had the lowest AGD and might be the optimal choice of different target/filter combinations. Low dose mode or small kV and mAs should be used to reduce radiation dose.

BI1-5
Breast Pathologies, One Day One Diagnosis
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Purpose: Know the new organization which leads to a diagnosis in one day. Understand the considerable contribution of the transdisciplinarity to the professionals. Save time.

Materials & Methods: We use every imaging technologies for breast diagnosis: mammography, echography, MRI, biopsies. Movie presentation.

Results: Efficacy care and knowledge optimization with Multidisciplinary working with Radiographers, Gynecologist, Cytologist, Radiological Technologists, Secretary and care assistant.

Conclusions: In the world, the breast cancer is the first cause of feminine cancer and affects 1 woman on 9. Today the medical progress allows to detect the disease earlier and earlier but it needs a fast care to avoid the consequences of this plague. The diagnosis in one day of Breast pathologies (D.J.P.M) is a multidisciplinary organization where are present several medical and paramedical areas the same day around the same patient. It allows the women to realize in a single day, all the examinations necessary for the diagnosis. Noticing the considerable contribution of this day, it is with pleasure that we share this experience with you.

We are Sonia Alimi and Sarah Id-Bairouk, manipulators in medical electroradiologie (m.e.r.m) at Tenon Hospital in Paris. We suggest you to discover this subject in the form of a movie of the most eloquent.

Key words: Multidisciplinarity, Empathy, Knowledge Optimization, Efficiency

BI2-1
Estimation of Usefulness and Clarity of Two-dimensional Synthesized Mammography in Comparison with Full Field Digital Mammography in The Lesion of Micro-calcifications
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Purpose: To examine how many cases were being found of cancer in micro-calcifications between Two-dimensional synthesized mammography (SM) and Full field digital mammography (FFDM) in clinical breast examination and to assess usefulness of SM.

Materials & Methods: The objects were patients with micro-calcifications and got Digital Breast Tomosynthesis (DBT) (Using Combo HD: DBT, SM and FFDM combination mode) from July to December in 2015. Three radiological technologists (RT) classified them into clear and not-clear in micro-calcifications first, and then three radiologists finally confirmed clarity of SM by comparing with each FFDM. We used two different types of phantoms for phantom study. Fat meat and SPAM with thickness 50mm, and we formed simulated micro-calcifications in different shapes and distributions inside of the phantoms (referred to BIRADS). Sixteen types of phantoms were exposed for ten times in the same condition (Combo HD mode, 30 kVp, Auto time). To analyze clarity of them, visible rate and the length of extended calcifications were compared.

Results: The total number of the calcification images were 161 cases. 12cases (7.45%) of them were found difference of clarity between SM and FFDM (More cals shawn on SM: 6cases). The similar results were obtained on comparing SM and FFDM (p<0.05). The similar results were obtained on comparing SM in different composition (p<0.05).

Conclusions: As the result of study, SM has no much difference of quality with FFDM in discerning micro-calcifications, and no distortion in comparing with FFDM. DBT is currently performed with FFDM for accurate diagnosis of cancer. But it has cons of increasing patients dose. So if SM is replaced with FFDM, it will be useful for reducing patients dose.

Key words: Digital breast tomosynthesis, Two-dimensional synthesized mammography, Micro-calcification, Phantom
BI2-2

Reliability Between Visual Assessment and Quantitative Analysis for Image Quality Evaluations Of Mammographic Accreditation Phantom Images In Digital Radiology

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Purpose: To evaluate reliability compared to quantitative analysis that Mammographic accreditation phantom images were visually evaluated in Digital Radiology.

Materials & Methods: The Image was collected 165 images of 74 hospitals that have already been submitted to the Korea Medical Imaging Quality Management (KMIQM). It was performed cross-evaluation with blind by Five Radiology and Five Radiological technologists more than 10 years. And Secondary assessment were performed after 4weeks. Inter-rater-reliability and Intra-rater-reliability were obtained Intra-class correlation Coefficient (ICC) that divided 4 lesion (Fiber, Specks, Masses, Total lesions). The Optical Density (Min., Max., Mean, SD) were measured imitations lesions and background from each image. It was analyzed that imitation lesions were evaluated pass or not.

Results: Inter-rater-reliability was Fiber (ICC = 0.349, 95% CI : 0.287 - 0.419), Specks (ICC = 0.265, 95% CI : 0.209 - 0.331), Masses (ICC = 0.212, 95% CI : 0.162 - 0.274), Total lesions (ICC = 0.378, 95% CI : 0.316 - 0.449). Visual assessment was poorly from inter-rater-reliability (p<0.050). Intra-rater-reliability was usually(Aver. Fiber=0.693, Specks=0.655, Masses=0.667, Total lesions=0.684). Fiber were not significantly Min. and Max. Mean, in images of pass or not. But SD was not. Specks were significantly Min. and Max. SD. Masses were Max. and Mean, SD.

Conclusions: Visual assessment have error of subjective element that the observer depend visually so the results were poorly reproducibility by observers in test-retest. Therefore, there is a need for a method that can be quantified.

Key words: Quality control, Mammography, Reliability

BI2-3

Comparison of the Measured and Estimated Effective Dose on Pediatric CT Scans: Phantom Study

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Purpose: The simplest method for estimating the effective dose (ED) in individual patients is by conversion from the dose-length product (DLP) displayed on the CT console by using k factors. We compared the estimated ED (e-ED) obtained with the DLP and k factors with the actually measured ED (am-ED) recorded on radio-photoluminescence glass dosimeters (RPGDs) in 2 different anthropomorphic phantom simulating pediatric subjects.

Materials & Methods: We used 2 anthropomorphic phantoms simulating a newborn and a 1-year-old child (phantoms A and B, respectively) (ATOM Phantom, CIRS, Norfolk, VA, USA) and a 64-detector CT scanner (VCT, GE). The tube voltage was 80-, 100-, and 120 kVp, the tube current was set at noise index 12. We obtained the am-ED to organs for each phantom. We then recorded the DLP displayed on the CT console and calculated the e-ED using k-factors according to ICRP Publication 60, 102, 103. We defined the e-ED error rate (%) using the formula error rate = |(e-ED - am-ED / am-ED)| x 100.

Results: The am-ED was 2.3, 2.5, and 2.6 mSv for phantom A, 2.4, 2.9, and 3.2 mSv for phantom B at 80-, 100-, and 120 kVp, respectively. The e-ED was 2.8, 2.8, and 3.0 mSv for phantom A, 2.3, 2.2, and 2.4 mSv for phantom B at 80-, 100-, and 120 kVp, respectively. The error rate of e-ED was 21.7, 12.0 and 15.4% for phantom A and 0.1, 24.1, and 25.0% for phantom B at 80-, 100-, and 120 kVp, respectively.

Conclusions: The error rate of e-ED ranged from 0.1% (min) to 25.0% (max) in our pediatric phantoms.

Key words: Effective dose, pediatric, Computed tomography, Low-tube voltage and automatic tube current modulation

BI2-4

The Diagnostic Value of Diffusion Kurtosis MR Imaging In Breast Lesions and Its Correlation with Clinical Pathological Factors

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Purpose: To evaluate the role of Diffusion Kurtosis MR Imaging (DKI) in the differential diagnosis of benign and malignant breast lesions and to explore the potential correlation between DKI-derived parameters and pathological grade in breast cancer, Ki-67, ER and HER-2.

Materials & Methods: 48 cases with pathological diagnosis of breast lesions from January 2015 to January 2016 were performed with MRI preoperatively (or before needle biopsy). The scan sequences include DWI (with 2 b-values of 0,1000sec/mm²), DKI (with 5 b-values of 0,700,1400,2100,2800sec/mm²) and DCE-MRI. Kurtosis and diffusion coefficients from DKI and ADC from DWI were measured and compared between malignant and benign lesions. It also investigates whether the MD, MK are correlated with pathologic grade and Clinical pathological factors of breast cancer. Independent t test, receiver operating characteristic curves, and Spearman correlation were used for statistical analysis.

Results: The Kurtosis coefficients was significantly higher in the malignant lesions than in the benign lesions (1.03±0.14 vs 0.72±0.12, P<0.000). The mean diffusivity and apparent diffusion coefficients was significantly lower in the malignant lesions (0.94±0.13 vs 1.42±0.32, P=0.000 and 1.05±0.28 vs 1.35±0.29, P=0.003, respectively). The diagnostic efficiency of MK and MD for differentiation of malignant from benign lesions was higher than those of ADC, with a higher sensitivity (94.4% vs 86.8%, 91.7% vs 86.8%; respectively) and a higher specificity (83.3% vs 66.7%, 91.7% vs 66.7%; respectively). In patients with invasive breast cancer, kurtosis was positively correlated with ER and PR (r=0.544; r=0.489, respectively), Diffusivity was negatively correlated with ER and PR (r=-0.390, r=-0.371, respectively).

Conclusions: DKI have a high value in the differentiation of benign and malignant breast lesions, and they have a higher...
diagnostic efficiency than ADC. In patients with invasive breast cancer, the higher expression of ER and PR indicates a higher Kurtosis coefficients and a lower diffusivity, however, its Clinical significance must be confirmed in prospective studies.

**Key words**: Magnetic resonance imaging, Diffusion kurtosis imaging, Breast lesions, Diffusion-weighted imaging

**B12-5**

**Using Artificial Neural Network to Predict Correlation of Pre-mammography Questionnaire for Breast Cancer**

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Purpose: We correlated those items in pre-mammography questionnaire to establish a predicting model for the occurrence of breast cancer, using artificial neural network (ANN). This model was aimed to develop an early detection and prevention system for breast cancer.

**Materials & Methods**: We collected the questionnaire data and mammography reports of 158 women in a given medical center of New Taipei City, with the age ranging from 45 to 69 years. Of those screened women, 47 cases were diagnosed as breast cancer and the categories of BI-RADS were from 1 to 4 in the other 111 cases. The data had been separated into two groups, training set and testing set, which represented for 85% and 15% of all cases, respectively.

**Results**: Using ANN, the overall sensitivity, specificity and accuracy rates of training set and testing set were 32.6%, 96.4% and 77.7%, respectively. It was comparable that the respective accuracy rates of training set and testing set were 32.6%, 96.4% and 78.3% in testing set.

**Conclusions**: The result was similar as our clinical expectation on the high breast cancer risk. The questionnaire refinement and more case recruitment will improve the current ANN-based system to be a more powerful predicting model for the early detection, prevention and reducing medical and social costs of breast cancer.

**Key words**: Mammography, Pre-mammography Questionnaire, BI-RADS, Breast cancer, Artificial neural network

**B12-6**

**Correlation Between Mammographic Findings and Histopathology: A Case Study of African Women at A Private Hospital**

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Purpose: To evaluate the coronary lumen area and roundness for coronary CT angiography with the change of scan mode and heart rate (HR) which are significant factors affecting motion artifact and diagnostic accuracy.

**Materials & Methods**: All CT scans were performed on SOMATOM Definition Flash (Siemens, hereafter,S) with a cardiac motion simulating phantom (MOCOMO,Fuyo Corp,P) attached 400HU solid phantom of 3 and 4mm diameter. The phantom was scanned at 0 (static) for reference and HR simulated of 50-100 beat/min with sequence, helical, high pitch scan mode and reconstructed at 45% and 75% phase and 60% start phase of the R_R cycle. The mean area and roundness of scanned images were analyzed by using ImageJ

**2. CT IMAGING**

**CT1-1**

**Quantitative Evaluation of Coronary Artery Diameter: Effect of CT Scan Modes and Heart Rate**

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Purpose: To evaluate the coronary lumen area and roundness for coronary CT angiography with the change of scan mode and heart rate (HR) which are significant factors affecting motion artifact and diagnostic accuracy.

**Materials & Methods**: All CT scans were performed on SOMATOM Definition Flash (Siemens, hereafter,S) with a cardiac motion simulating phantom (MOCOMO,Fuyo Corp,P) attached 400HU solid phantom of 3 and 4mm diameter. The phantom was scanned at 0 (static) for reference and HR simulated of 50-100 beat/min with sequence, helical, high pitch scan mode and reconstructed at 45% and 75% phase and 60% start phase of the R_R cycle. The mean area and roundness of scanned images were analyzed by using ImageJ
software. Statistical analysis was performed to T-test and ANOVA by using SPSS software.

Results: As increased HR, the error value of the mean area of 3mm and 4mm phantom were the smallest about 4.9% and 2.9% in helical mode 45%, and followed sequence mode 45%, helical mode 75%, sequence mode 75%, high pitch mode in ascending order. The error value of the mean roundness were the smallest about 2.1% and 2.1% in helical mode 45%, and there was no significant difference among the other scan modes. For the comparison of scan modes, the error value of the mean area was the smallest about 9.2% in helical mode 75% and followed sequence mode 75%, high pitch spiral scan mode. The error value of the mean roundness was the smallest about 3.4% in sequence mode 75% and followed helical mode 75%, high pitch spiral scan mode (P<0.05 for all).

Conclusions: It demonstrates that 45% phase of helical (systole) is the most appropriate for high HR patients and 75% phase of helical (diastole) is the most appropriate for low HR patients. If using proper scan mode by HR, it could be helpful to accurate diagnosis for cardiovascular patients.

Key words: Coronary CT angiography, Roundness, Cardiac motion simulating phantom

CT1-2
Image Quality Of Whole Aortic Angiography With Low Contrast Flow Rate And Dual-Energy CT Non-Linear Blending Technique
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Purpose: To investigate the image quality of thoracoabdominal aortic angiography with a low contrast medium flow rate and DECT non-linear blending technique. All patients underwent DECT angiography on a 128-slice dual-source CT, pitch 1.2, 80/140 kVp tube potential. The contrast medium was adapted by patient weight (0.5 ml/kg, 370 mgI/ml) and the flow rate was calculated by the contrast software package to optimize the image contrast and noise. The linear mixed image was used as reference image which was considered as simulated 120 Kvp image. The region-of-interest was placed on ascending aorta, descending aorta and bifurcation. The noise, SNR and CT attenuation were measured. The results were analyzed using the paired t-test and ANOVA.

Results: All VMS iodine CT values were gradually decreased with the increasing of keV, and iodine CT values on VMS dual-source images were greater than on VMSkV switching images (P<0.05). VMS dual-source and VMSkV switching image noise were highest at 40keV and successively raised from the head, chest, abdomen (P<0.05). VMSkV switching image noise gradually decreased with the increase of keV in the range of 40-70keV, gradually increased up to the trough after 70keV from 80keV gradually decreased, while VMS dual-source image noise was lowest at 70keV or 80keV, and then with the keV increased gradually increased. Image noise on VMS switching images in the range of 40-100 keV were higher than that on VMS dual-source images and lower in the range of 100-140keV at most part (P<0.05).

Conclusions: VMS images synthesized from fast kilovoltage switching and dual-source dual-energy CT have different image quality performance at most keV and body parts, but VMS imaging at approximately 70 keV yielded lower image noise, and at approximately 60 keV yielded highest SNR and CNR.

Key words: Tomography, X-ray computed, Comparative study, Virtual monochromatic spectral

CT1-3
Image Quality Evaluation of Virtual Monochromatic Spectral in Two Dual Energy Computed Tomography Based on Noise Level
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Purpose: To investigate the image quality difference of the virtual monochromatic spectral (VMS) images synthesized from fast kilovoltage switching and dual-source dual-energy CT for a given radiation dose.

Materials & Methods: A plurality of containing 15mgI/ml iodine contrast agent and saline disposable syringe were placed on the surface of the male anthropomorphical phantom which including head neck and torso, GE HD750 GS3 and Siemens Somatom Definition Flash DECT protocols were performed on the phantom for a same dose (CTDivo5.52mGy), and VMS 40keV, 60keV, 70keV, 80keV, 100keV, 120keV, 140keV images were reconstructed and obtained, respectively. The subjective image noise, iodine SNR, iodine CNR and CT values were measured. The results were analyzed using the paired t-test and ANOVA.

Results: As increased HR, the error value of the mean area of 3mm and 4mm phantom were the smallest about 4.9% and 2.9% in helical mode 45%, and followed sequence mode 45%, helical mode 75%, sequence mode 75%, high pitch mode in ascending order. The error value of the mean roundness were the smallest about 2.1% and 2.1% in helical mode 45%, and there was no significant difference among the other scan modes. For the comparison of scan modes, the error value of the mean area was the smallest about 9.2% in helical mode 75% and followed sequence mode 75%, high pitch spiral scan mode. The error value of the mean roundness was the smallest about 3.4% in sequence mode 75% and followed helical mode 75%, high pitch spiral scan mode (P<0.05 for all).

Conclusions: It demonstrates that 45% phase of helical (systole) is the most appropriate for high HR patients and 75% phase of helical (diastole) is the most appropriate for low HR patients. If using proper scan mode by HR, it could be helpful to accurate diagnosis for cardiovascular patients.

Key words: Coronary CT angiography, Roundness, Cardiac motion simulating phantom

CT1-4
Feasibility Study of Using Low-Concentration, Low-Dose and Low-Injection Rate of Contrast Medium in Portal Vein Ct Angiography with Spectral CT
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Purpose: To evaluate the image quality and the diagnostic value of using Low-Concentration, Low-Dose and Low-injection rate of contrast medium for portal vein CTA with spectral CT imaging.

Materials & Methods: 40 patients with suspected abdominal disease prescribed to take enhanced abdominal CT (Discovery...
CT750 HD (GE Healthcare) were divided randomly into 2 groups and underwent either conventional CTA with 120kVP using auto MA modulation and 0.75/s and iohexol (Omnipaque, 350mg/ml)(n=20) or spectral CTA using 757mA and 0.75/s with ioxilan (Visipaque, 270mg/ml) (n=20). The injection rate and amount of two groups were 4.5 ml/s, 1.5ml/kg for 120kvp and 3.5 ml/s, 1.2ml/kg for spectral imaging. Monochromatic images (40–140 keV) were generated from the spectral CTA, and from GSI viewer an optimal energy level was selected for obtaining the best contrast-to-noise ratio (CNR) for portal phase. 40% ASIR were reconstructed at optimal energy level. The CT values of the portal vein and the hepatic parenchyma were recorded and compared; Signal-to-noise ratio (SNR) and Contrast-to-noise ratio (CNR) were calculated and compared between the two groups using student T test.

**Results:** The image quality of both groups could meet the diagnostic requirement. The mean iodine amount in spectral CTA group was 22.4% lower than that in conventional CTA group. For spectral CTA group Images of (61.86±1.25) keV showed best CNR. At the keV level, trunk of portal vein had higher enhancement in spectral CTA group(22.47±23.34) than those in conventional CTA group(20.71±25.64)(p<0.01). The CNR of trunk of portal vein (10.52±2.59) in spectral CTA group were higher than those in conventional CTA group(8.80±2.88). There was no significant difference of CTDIvol between spectral CTA group (9.05mGy) and conventional CTA group (8.17±2.78mGy) (p>0.05).

**Conclusions:** Compared to conventional CT imaging, the optimal monochromatic keV spectral CT imaging with 40% ASIR can significantly improve the image quality of portal vein with low contrast dose, contrast concentration and flow rate of contrast medium.

**Key words:** Computed Tomography, Portal Vein CT angiography, Spectral CT

**CT2-1**

**Knowledge-based Iterative Model Reconstruction: Effect on Image Quality in ECG-modulated Retrospective ECG-gated Coronary CTA**

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**Purpose:** Efforts to lower medical radiation dose by CT scan worldwide is very important. In our hospital, ECG modulation retrospective coronary CTA is carried out to reduce radiation dose to patients. However, an image needs to be acquired in another phase, if an optimal image is not acquired in the initial phase due to patient’s unexpected heart rate increase and intermittent irregular pulse. In doing so, image quality decline in the optimal phase is revealed because of not enough dose. Therefore, this research evaluates whether image quality is improved using the knowledge-based iterative model reconstruction (IMR).

**Materials & Methods:** This research targeted 16 patients whose heart rate rose and 19 patients with intermittent irregular pulse among the 112 patients, Coronary angiography CTA scan from February 24 2015 to April 20, 2016. As for the apparatus used in this research, the Philips ingenuity 128 elite and Philips phantom, and setup was made with ECG demo HR80. Each image was reconstructed with iDose4 LV7 and IMR. A phantom study, images reconstructed from 75% phase full-dose data revealed no significant difference between three reconstruction techniques (SDs at FBP, iDose4 and IMR, 76.0 vs 35.0 vs 31.2), while 40% phase low-dose data showed a significant difference (SDs at FBP, iDose4 and IMR, 227.9 vs 96.4 vs 25.2). The patient study also revealed similar results (SDs at iDose4 and IMR from 75% phase full-dose data, 29.4 vs 20.7, SDs at iDose4 and IMR from 40% phase low-dose data, 43.5 vs 28.1).

**Conclusions:** When applying ECG modulation to retrospective ECG-gated coronary CTA, reconstructing images from the other cardiac phases may be required in patients with irregular heart beat or unexpected rise in cardiac rate during scanning. In this situation, the knowledge-based iterative model reconstruction (IMR) was able to improve the image quality of images reconstructed from the low-dose phase.

**Key words:** Knowledge-based Iterative Model Reconstruction

**CT2-2**

**Single Phase Intra-arterial CT Hepatic Angiography to Visualize Both Arterial Anatomy and Parenchyma Enhancement of Vascular Intrahepatic Tumour**

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**Purpose:** To determine if a novel single-phase Intra-arterial CT hepatic angiography (IACHTA) protocol can minimize patient radiation dose while maintaining image quality during hepatic loco-regional treatment.

**Materials & Methods:** IACHTA requires CT imaging of the liver during simultaneous injection of contrast into hepatic artery branch via a micro-catheter. Our current dual-phase IACHTA protocol involves imaging in early arterial phase (10-15 seconds from injection) and parenchymal phase (35-35 seconds), which results in two CT scans per catheter position, hence high radiation dose. A new single-phase protocol has been developed with IACHTA at fixed 25 seconds delay. For both protocols, injection rate and duration are determined from digital subtraction angiography (DSA) with power injection performed just prior to IACHTA. Ten consecutive patients using the new IACHTA protocol were selected for analysis. For comparison, another ten patients scanned using the conventional protocol were selected. Two interventional radiologists with 10 and 25 years experience, respectively, evaluated the scan quality on a 5-point scale (1=poor, 2=acceptable, 3=good quality, 5=excellent) independently. The data collected were analyzed using a Mann Whitney or t-test, where appropriate. Kappa test was used to analyze the interrater result.

**Results:** The single phase IACHTA image quality average score was 3.7 while the dual phase IACHTA score was 4.4 (p=0.015, Mann Whitney test). Kappa analysis shows fair agreement (k=0.3) between the two radiologists. Effective mean radiation dose for the single phase IACHTA protocol was 8.13mSv (± 2.7mSv) while the mean radiation dose for the dual phase scan IACHTA was 13.7mSv (± 3.8mSv) (p<0.01, t-test).

**Conclusions:** Our preliminary experience suggests that the single phase IACHTA may reduce radiation dose to patients. We are validating our initial experience using a larger cohort of patients.
CT2-3
Radiation Dose and Associated Exposure Parameters in Selected MDCT Scanners in Multiphase Scan of Abdomen-Pelvic Region: A Clinical Study.
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Purpose: We sought to estimate the radiation dose and associated exposure parameters in the multiphase abdomen - pelvic scan of Multidetector Computed Tomography (MDCT) studies in clinical practice.

Materials & Methods: This was a retrospective cross sectional study describing radiation dose associated with main exposure parameters in diagnostic multiphase abdomen - pelvic scans performed on 152 consecutive patients by two different sixteen (16) slice CT scanners. Patient information, exposure parameters of CTDI (volume), DLP, kVp, mAs and pitch were recorded for every phases of abdomen- pelvic study from dose report of MDCT scanners.

Results: Patient age range from 18 years old to 87 years old. Overall CTDI (volume) median was 63.8 (±10.4) mGy for multiphase abdominal-pelvic scan with scanner A while it was 35.4 (±15.6) mGy for scanner B. Effective dose for patients in multiphase abdomen - pelvic CT scan range from 8.2 mSv to 58 mSv. Median effective dose for patients, who underwent multiphase abdomen- pelvic scan with scanner A and B were 38.5 (±8.2) mSv and 21.3 (±6.8) mSv respectively. Median value of exposure parameters of mAs, kVp and pitch were 150 (±29.7), 130 (±15.3) and 1.3 (±0.1) respectively in scanner A. In scanner B; they were 60 (±14.5), 120 and 1.

Conclusions: The median effective dose for patients between multiphase abdomen-pelvic scan of both MDCT, a significant difference (P<0.05) was observed. Multiphase abdomen-pelvic scan of clinical study shows significant variation of effective dose with reference level of phantom studies (8-14 mSv) and it is highly depend on type of vendors.

Key words: Abdomen-Pelvic Region, Computed Tomography, Exposure Parameters, Radiation dose.

CT2-4
Analysis of Correlation Between Automatic Tube Current Control Technology and the Image Quality of Upper Abdominal CT Enhanced Scan Waniang LI¹ and Zhenlin LI²
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Purpose: To analyze the correlation of the patient’s body mass index, abdominal anteroposterior diameter (AP), transverse diameter (LR) and anterior abdominal fat thickness (H) with the image quality of Upper abdominal CT enhanced scan which used the automatic tube current control technology caredose4D.

Materials & Methods: Retrospective analysis the image data of one hundred and seventy-eight upper abdominal CT enhanced scan patients who were scanned by SIEMENS 128-slice CT. All patients were scanned tube voltage 120KV, reference tube current 210mA and the used of caredose4D. Abdominal anteroposterior diameter (AP), transverse diameter (LR) and abdominal fat thickness (H) was measured in the level of hilar. Records of all patients height and weight and calculate body mass index (BMI) of the patient. SNR and CNR of the hilar level were calculated as objective evaluation index. The image quality was evaluated subjectively by two radiologists of high qualification abdominal with 5 points system. The correlation between the patient’s body mass index (BMI), abdominal anteroposterior diameter (AP), transverse diameter (LR), the anterior abdominal fat thickness (H) and the image quality of upper abdominal CT enhanced scan were statistically analyzed using multiple regression model.

Results: The image quality of arterial phase and abdominal anteroposterior diameter (AP) were no correlation (P>0.05), transverse diameter (LR) and body mass index (BMI) were negatively correlated (P<0.05), and abdominal fat thickness (H) was positively correlated (P<0.05). The image quality of venous phase and abdominal anteroposterior diameter (AP), transverse diameter (LR), body mass index (BMI) were negatively correlated (P<0.05), and abdominal fat thickness were positively correlated (P<0.05).

Conclusions: Radiographer should be body mass index (BMI) of the patient, abdominal anteroposterior diameter (AP), transverse diameter (LR) and the anterior abdominal fat thickness (H) as a reference to adjust the size of the current tube. We can further improve the image quality of upper abdominal CT enhanced scan.

Key words: Abdominal correlation caredose4D CT

CT2-5
Comparison of CT Contrast Enhancement Effect Contrast Between Injection from Implanted Port System Capable of Contrast Injection and Peripheral Intravenous Injection Katsunao SUZUKI¹, Toshiro TAKE¹, Hiroyuki WATANABE², Masaru NITTA³ and Yasuo NAKAZAWA²
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Purpose: In enhanced Computed Tomography(CT), we retrospectively investigated a difference of contrast enhancement effect using enhanced CT images with injection of peripheral vessel and Powerport System.

Materials & Methods: We randomly selected the contrast enhancement of an equilibrium phase of the chest to pelvis and the pancreas dynamic. The CT value was measured at Abdominal aorta and Inferior vena cava, and divided it into the group of peripheral vessel injection and Powerport system injection and was considered including patient’s physical condition on their CT images. For the index of the physical condition, we use a body surface area (BSA) used for cardiac index(CI).

Results: As for the arterial CT value, Powerport group turned out to have a small variation during equilibrium phase of dynamic study. It is thought that stable injection was
accomplished because contrast medium were injected near the heart when from Powerport. CT values, when contrast was injected from peripheral vessel vary depending on blood vessel diameter and the distance to heart. Correlation was not seen in the BSA in the Powerport group of the dynamic study when we paid attention to a CT value of the IC. From this, it was able to confirm the regurgitation of contrast medium by the dynamic study. Therefore, in this scan timing, the contrast medium are distributed over the right heart system, and it is thought that an arterial CT value decreased.

Conclusions : In the contrast enhancement from a peripheral vessel and Powerport system, it was revealed that the difference of the injection point had an influence on the contrast enhancement effect in a clinical image of the dynamic study.

Key words : Peripheral vessel, Powerport, CT value, Contrast enhancement effect, Regurgitation

CT2-6
Estimation of Bone Mineral Density from Gray Value of Cone-Beam Computed Tomography
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Purpose : To clarify the possibility of estimating bone mineral density from gray value (GV) of cone-beam computed tomography (CBCT).

Materials & Methods : Bone phantoms containing various concentrations of CaCO3 and a dry human mandible were used. Phantom A consisted of three concentrations of CaCO3 was used for generating conversion curve to CaCO3 concentration from the GV of CBCT. Bone phantoms with two different CaCO3 concentrations (phantom B) were used to calculate the accuracy of bone mineral estimation. Phantom A and one of phantom B were placed at the lingual and buccal side of the mandible, respectively. CBCT of 3DX (J Morita) was operated at 7 mA, with a 64 multi-detector CT (SOMATOM Sensation 64, Germany). Conversion curves from GV to CaCO3 concentration were calculated using Microsoft Excel. Using these conversion curves, the concentration of phantom B was estimated and compared with the true concentration.

Results : Mineral density estimated from GV using a quadratic formula. The error rate varied from 5% to 10%. Discussion Estimation error may be due to the beam hardening effect and scatter radiation.

Conclusions : Bone mineral density can be predicted from GV of 3DX in the case of known exposure conditions.

Key words : CBCT, Bone mineral, Gray value, CaCO3, Image J

CT3-1
A Comparative Study on the Effectiveness of 3-Material Decomposition at Non-Contrast Phase and Arterial Phase of Liver Volumetry CT Using GSI
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2Purpose : It is important to measure the amount of fat in liver parenchyma which hinders function of the liver in order to evaluate liver function of liver donor. The purpose of this study is to evaluate the usability of 3-material decomposition by comparing measured fat values between non-contrast phase and arterial phase in dual-energy Computed Tomography (DECT).

Materials & Methods : Between March 9 and December 8, 2015, 10 liver donors who underwent DECT for liver transplantation enrolled in this study. Non-contrast phase and arterial phase were performed on a fast kilovoltage-switching DECT scanner (Discovery 750HD scanner, GE Healthcare, Milwaukee, Wis, USA) and thin data of Gemstone Spectral Imaging (GSI) was obtained with the GSI-44 protocol: Large, 0.7 s, 40 mm, 275 mA, 10.68 mGy, and GSI assist off. Fat images were acquired by using 3-material decomposition (fat-water-iodine) on workstation. In 3 consecutive images which show the largest boundary of the liver, Hounsfield Unit (HU) values of fat were measured on the same Region of Interest (ROI): segment 5 or segment 8 of liver parenchyma. Wilcoxon signed ranks test was used to find the similar point of fat between non-contrast phase and arterial phase.

Results : HU values difference of fat between non-contrast phase and arterial phase was 0.6 in average. The difference of minimum was 0 and maximum was 1.7. That difference was not statistically significant (p>0.05).

Conclusions : There is no big difference of measured fat amount between non-contrast and arterial phasic 3-material decomposition imaging. It may be enough to quantify fat only with arterial phasic 3-material decomposition imaging. When performing liver volumetry CT for liver fat measurement in liver donor before liver transplantation, we can reduce radiation dose by skipping non-contrast phase.

Key words : Dual-energy CT, Liver transplantation, Liver fat quantification, Material decomposition

CT3-2
Development and Application of the Laser Device for CT-guide PCNB
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Purpose : The purpose of this study was to evaluate efficiency under CT-guided lung biopsy which used the laser device to improve the accuracy.

Materials & Methods : 43 Patients who were undergone with PCNB before developing the laser device (from October 2014 to December 2014) and 106 Patients who were undergone with PCNB after developing laser device (from April 2015 to June 2015) were included in this study. All PCNB were performed with a 64 multi-detector CT (SOMATOM Sensation 64, Germany). Scan parameter was used with 120kVp, Care Dose and slice thickness of 2mm.

Results : The number of puncture decreased from 2.3 times to 1.7 times (26%). Complication rate decreased from 39.5% to 16.9% (57.2%). Procedure time decreased from 711 seconds to
CT3-3
The Image Quality with Ultra Low Dose CT in Diagnosis of Solitary Pulmonary Nodules: A Pilot Study Using Spectral CT and Adaptive Statistical Iterative Reconstruction Algorithm

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Purpose: The aim of this study was to evaluate the combination of ultra-low-dose spectral CT and Adaptive Statistical Iterative Reconstruction (ASIR) algorithm in the diagnosis of solitary pulmonary nodules.

Materials & Methods: This clinical study was approved by our institutional review board and included 255 lung nodules in 201 patients (mean age, 71.2 ± 15.9; Y: 109 men and 92 women). We divided them into three groups according to BMI (group A: BMI<20, group B: 20<BMI<25, group C: BMI>25). All the patients were underwent with spectral CT (Discovery CT, GE Healthcare). The scanning parameters for these three groups were respectively as follows: 80Kv, 35mA; 100KV,40mA; 100KV,50mA; with the same rotation time(0.5s) and pitch (0.98:1). And the CTDIvol for each group were 0.47mGy, 1.0mGy and 1.37mGy respectively. The data acquired were reconstructed with 30%, 50%, 100%ASIR and FBP. Objective image noise was measured by placing the regions of interest on lung parenchyma. Two experienced radiologists independently analyzed the image quality, including streak artifacts and adequateness for evaluating internal characteristics and borders of nodules, according to a standard 3-score method: clear (2), acceptable (1), none(0).

Results: Significant improvements in the following points were observed in 100%ASIR compared with 30%, 50%ASIR and FBP (all p<0.05): objective image noise (24.4 ± 8.0 vs 29.8 ± 8.3, 26.7 ± 7.6 and 35.5± 9.5); image quality score (1.81 ±0.28 vs 1.56 ±0.31,1.67 ±0.29,1.43 ±0.40). The visualization of small vessels and bronchi and diagnostic acceptability with 100% ASIR were significantly better than with FBP and other percentages of ASIR (p<0.05).

Conclusions: Ultra low dose CT images reconstructed with 100% ASIR provides diagnostically more acceptable for the detailed.

CT3-4
The Feasibility Study of Brain CT Perfusion with 70KV Tube Voltage
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Purpose: To investigate The Feasibility of 70KV Low-dose CT Perfusion Technique and Evaluate Brain CT Perfusion Parameter maps and Image Quality.

Materials & Methods: Retrospective analysis of the Between October 2015and February 2016, all patients who performed CT perfusion of brain. All patients were randomly divided into two groups with different CT examination dose, including group A (80KV, 200mAs)and group B(70KV, 200mAs).All patients were scanned on a dual-source-CT(Siemens Definition Flash). Fifteen normal cases in each group were selected to study. Region of interest(ROI)with 80mm in the nucleus, putamen, the thalamus, the perrventricular white matter of the frontal lobe and temporoparietal occipital area were drew and the parameters in ROI, including cerebral blood flow(CBF), cerebral blood volume(CBV),mean transit time(MTT) and time to peak(TTP). The signal-to-noise ratio of thalamus and periventricular white matter of the frontal lobe, contrast-to-noise were compared. The image quality of perfusion image was assessed by two senior radiologists using 5 point system for blind assessment(5=best, 1=worse). The measurement of radiation dose included effective dose(ED), Volume CT dose index(CTDlvol) and dose length product(DLP).Statistics was used independent sample T test.

Results: There was no significant difference between group A and group B for brain CT perfusion parameters (P>0.05). There was no significant difference of image quality between the two groups in the objective and subjective assessment (P>0.05). In comparison to group A, the measured effective dose, CTDlvol and DLP for group B decreased by 35%.

Conclusions: There was no significant influence on the brain CT perfusion parameters and image quality using 70KV tube voltage, and radiation dose is decreased obviously.

Key words: CT perfusion Brain Radiation Dose
Conclusions: Focus on the heart rate changes after inspiration breath-hold, it is help to accurately choose the appropriate scanning solutions (retrospective scan or prospective scan) and to obtain high quality coronary artery CT image.

Key words: Heart Rate, Inspiration Breath-Hold, Coronary Ct Examination, Retrospective Scan, Prospective Scan

CT3-6
Comparison of Abdominal CT Scan Using Iterative Reconstruction with Standard Filtered Back-Projection Algorithm
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Purpose: To compare image quality of abdominal CT with images reconstructed with filtered back projection (FBP), adaptive statistical iterative reconstruction (ASIR), and model based iterative reconstruction (MBIR) techniques.

Materials & Methods: This prospective study was institutional review board approved, and written informed consent was obtained from all patients. A total of 26 patients underwent abdominal CT with a 64-detector CT scanner (Discovery CT750 HD; GE Healthcare). The projection data sets were reconstructed to images of 0.625mm thickness with FBP, ASIR and MBIR. Cross-sectional images were co-registered between the different reconstruction techniques and assessed for qualitative and quantitative image quality parameters. And readers were blinded to the reconstruction algorithm. The mean CT values, image noise and contrast-to-noise ratio (CNR) relative to the aorta, liver, and spleen with each algorithm were assessed. Paired t test was used for statistical analysis.

Results: A total of 234 triplets of cross-sectional images were co-registered. Using MBIR, 77% of the images were rated as having excellent overall image quality, which was significantly better as compared to ASIR and FBP (44% and 21%, respectively, all p<0.001). No significant differences in objective CT values of aorta, liver and spleen were noted between FBP images (246±5[HU], 58±6[HU] and 49±6[HU]), ASIR images (246±5[HU], 58±6[HU] and 49±6[HU]), and MBIR images (244±8[HU], 58±6[HU] and 50±5[HU]), (P>0.05). Qualitative assessment of image noise demonstrated a noise reduction by using ASIR (25.1±3.3[HU]) as compared to FBP (35.9±2.2[HU], p<0.01) and further noise reduction by using MBIR (11.9±1.3[HU], p<0.001). The CNR using MBIR was better as compared to ASIR and FBP (3.75±0.41, 1.8±0.2 and 1.25±0.14, respectively; all p<0.001).

Conclusions: Using MBIR improved image quality, reduced image noise and increased CNR as compared to the other available reconstruction techniques. This may further improve the visualization of small lesion and allow radiation reduction.

CT3-7
Evaluation of Cardiac Function Analysis in Catheter Ablation Using ECG-gated CT
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Purpose: Catheter ablation is a method to ablate the re-entry by radiofrequency for atrial fibrillation and supraventricular tachycardia. Currently, ECG-gated CT has been used for morphological analysis of the left atrium and pulmonary veins in catheter ablation. The purpose of this study was to evaluate the feasibility of cardiac function analysis using the volume data of ECG-gated CT in catheter ablation.

Materials & Methods: Twenty patients (Male 15, Female 5, Age 58±7.7, persistent atrial fibrillation 12, paroxysmal atrial fibrillation 8) underwent ECG-gated CT before (average heart rate: 83.0±17.6bpm) and 3 months after (average heart rate: 69.4±17.6bpm) catheter ablation. The parameters of each atrial-ventricular (RA, LA, RV, LV) volume (mL), stroke volume (SV: mL) and ejection fraction (EF: %) were calculated and compared with one another.

Results: The atrial volume significantly decreased after catheter ablation (RA97.6±22.3±55.5±16.0, p<0.001; LA117.3±20.3±76.1±15.4, p<0.001). SV (RA19.3±5.6±42.8±10.3, LA15.4±6.4±36.4±11.9, RV57.1±14.0±78.4±15.6, LV57.7±12.6±86.6±17.5) and EF (RA16.7±3.8±43.9±5.7, LA11.5±4.0±32.0±6.8, RV 37.4±7.5±47.2±5.6, LV46.6±10.3±63.8±8.3) significantly increased after catheter ablation (p<0.001 for each comparison).

Conclusions: A decrease in the atrial volume and increases of SV and EF after catheter ablation were considered to reflect the reverse remodeling by catheter ablation. The results suggest that ECG-gated CT can be feasible to analyze cardiac function in catheter ablation.

Key words: ECG-gated CT, Catheter Ablation

CT3-8
Study of Using Low Tube Voltage Imaging in Coronary Artery CT-angiography
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Purpose: In coronary artery Computed tomography (CT)-angiography we report a study of the reduction of contrast agent and the reduction of exposure dose in the use of the low tube voltage.

Materials & Methods: Radiation dose upon to 100kV on the basis of the radiation dose of tube voltage 120kV, which are conventionally used in our hospital the same target Standard Deviation (SD) value was determined. Furthermore, we compared the Fractional Dose (FD) (mgI / kg / s) at the respective tube voltages is changed for obtaining an appropriate contrasting density FD. And the contrast agent was sealed in a simulated blood vessel phantom comparison of FD to be equal in each tube voltage. And for compared was sealed contrast agent of FD to be equal in each tube voltage simulated blood vessel phantom. From the resulting radiation dose, FD, we were compared in the clinical examination.

Results: If it is from the tube voltage 120kV to 100 kV, radiation dose required to obtain the same target SD value was about 1.29 times. For FD, in our hospital, we are using the FD 26 [mgI / kg / s] in the tube voltage 120kV FD that becomes the same contrasting density and 120kV was FD 22 [mgI / kg / s] in 100kV, FD 18 [mgI / kg / s] in 80kV. The simulated blood vessel phantom, 120kV, 100kV, 80kV is not significant differences in each of CT value difference. In clinical examination, it is possible to ensure the same quality and 120kV at a tube voltage 100 kV, the amount of contrast agent was possible...
to reduce by about 20%. In addition, the exposure dose was possible to reduce about 30%.

Conclusions: In coronary artery CT-angiography has been suggested to be useful for the reduction of the contrast agent and reduction of exposure dose.

Key words: Low tube voltage, Coronary artery CT-angiography, The reduction of contrast agent, The reduction of exposure dose

CT4-1
Detectability of Urinary Stone Sizes and Compositions by Various Scanning Parameters in Dual Energy CT
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Purpose: To verify detection capabilities of composition/size of urinary stone in accordance with CT parameters and the phantom size changes by using the dual-energy CT scan.

Materials & Methods: Thirty human urinary stones comprising uric acid (n=7), Calcium oxalate monohydrate (n=9), Calcium oxalate monohydrate + Carcinuate apatite + Struvite (n=6), Calcium oxalate monohydrate + Struvite (n=4), Calcium oxalate monohydrate + Calcium oxalate dihydrate + Calcium phosphate (n=2), Calcium phosphate + Struvite (n=1), and Struvite (n=1) were inserted between 2 Boluses (30×30×1cm) and placed inside solid water phantom (30×30×1cm). Spiral dual-energy scans were obtained on dual-source, 128-slices computed tomography (CT) system using a clinical protocol and automatic exposure control. Scanning was performed at two different collimation/section thickness, Increment (64×0.6mm and 128×0.6mm, 0.5/0.5mm and 1.5/1.0mm Recon) and within three phantom size (small, medium, Large) resulting in a total of five image datasets. These datasets were analyzed using the dual-energy software tool (SIEMENS SyngoVia) available on the CT system for both sensitivity (number of urinary stone detection) and accuracy (diameter of urinary stone detection). In addition, it was confirmed a match with the external urinary stone component analysis result.

Results: The choice of TestA (64×0.6mm collimation, 80/si140kvp, 0.5mm section thickness/0.5mm increment) suggests a high sensitivity (87%) and accuracy (73%) in the three phantom size (small, medium, Large). When the size of uric acid urinary stone is greater than 2.5/4.5mm or greater than 1.5/2.5mm the size of apatite+oxalate urinary stone detection is possible.

In order to enhance accuracy, it is important to thicken the height of the phantom, and to select the 64×0.6mm; since the result using the 128×0.6mm showed significant errors. TestA experimental conditions, the accuracy of urine stone component analysis using the software tool (SIEMENS SyngoVia) was 93%.

Conclusions: When the dual-energy CT exam used for urinary stone detection, TestA (64×0.6mm Collimation, 80/sn140kvp, 0.5mm section thickness/0.5mm increment) was the best choice to get the sensitivity, accuracy and precision of urinary stone composition.

Key words: Urinary stones, Dual-energy computed tomography, Uric acid, Calcium oxalate monohydrate.

CT4-2
Image Quality of CT Angiography for Vascular Stenosis Depending on DFOV Size
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Purpose: To evaluate the image quality of CTA (CT angiography) images depending on DFOV (display field of view) size and to suggest the additional acquisition of small DFOV images for CPR (Curved Planar Reformation) reconstruction.

Materials & Methods: Discovery CT 750 HD (GE healthcare, Milwaukee, WI, USA) were used for the CT scans. Vessel phantom (5mm diameter, 25%, 50%, 75% plaque, Fujifilm Corporation, Japan) filled with contrast media (300mgI/ml, Omnipaque) was scanned at 120kV and 500mA with sDFOV 50mm, 100mm, 150mm, and 200mm 5 times respectively. CPR images were reconstructed with TeraRecon Aquarius (TeraRecon, Inc., San Mateo, CA). The edge width of axial and CPR images were measured for analysis of resolution, and the solidity of lumen of axial images and the stenosis ratio of CPR images were measured for analysis of lumen accuracy using ImageJ (Version 1.43u; National Institutes of Health, Bethesda, MD, USA). All measured data depending on DFOV were analyzed with One-way ANOVA and the correlation between each data and DFOV were analyzed with Spearman correlation analysis using SPSS.

Results: Improvements of the edge resolution, the accuracy of lumen edge, and the accuracy of stenosis ratio were observed for smaller DFOV. As the result of the comparison of the data on DFOV 50mm with DFOV 200mm, the edge width of axial images was decreased 4.67% (200mm: 1.50mm, 50mm: 1.43mm), the edge width of CPR images was decreased 8.18% (200mm: 1.59mm, 50mm: 1.46mm), the solidity of lumen of axial images was increased 5.38% (200mm: 0.93, 50mm: 0.98), the error of stenosis analysis of CPR images for 25% plaque and 75% plaque were decreased 84.0% (200mm: 1.68%, 50mm: 0.27%) and 62.1% (200mm: 5.33%, 50mm: 2.02%), respectively (p<0.001).

Conclusions: The current study findings demonstrate that the smaller the DFOV, the greater the image quality of vessel, especially in CPR images. Additional acquisition of small DFOV for small ROI will be useful for accurate diagnosis of vascular stenosis.

Key words: FOV, Resolution, CTA, Stenosis

CT4-3
To Assess the Feasibility and Value of Multiphasic Dynamic Scan Protocol in Aortic Dissection
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Purpose: To assess the feasibility and additional diagnostic
value of low dose multiphasic CT dynamic protocols (Shuttle mode and Flash-4D mode) in aortic dissection (AD) compared to a standard tri-phase protocol on a dual source CT (DSCT).

Materials & Methods: 54 consecutive patients with known or suspected AD referred for aortic CTA were randomly, equally assigned into three groups and scanned on a DSCT scanner (SOMATOM Definition Flash, Siemens). For group A, a shuttle mode of multiphasic image acquisition (range: 48 cm, time resolution 6 s, 4 phases, 80 kV, 125 mAs/rot), for group B a high-pitch (pitch=3.0) mode of multiphasic image acquisition (range from the entrance of bony thorax to the plane of symphysis pubis, time resolution 12 s, 4 phases, CARE kV, ref 80 kV, 100 mAs/rot), for group C the standard tri-phasic acquisition (range: the same as group B, 100 kV, 210 mAs/rot) was used. Radiation dose were recorded. One-way ANOVA was used for statistical analysis.

Results: In all 54 cases CTA can exactly display the true and false lumen, intimal flap, the entry tear and the involvement of branches of AD. Compared to standard tri-phasic protocol (un-enhanced, arterial and portal scans), additional diagnostic information was also obtained by multiphasic CT dynamic protocols as followed: the enhancement delay between the true and false lumen (groupA=18, groupB=18), the degree of membrane oscillation (groupA=8, groupB=14), dynamic ejection of contrast material from the true lumen into the false lumen (groupA=6, groupB=7). Mean effective radiation dose of the three groups were shown statistically different (P<0.05). Scan length range of Flash-4D CTA is approximately 62.63±4.44 cm, larger than shuttle mode.

Conclusions: Multiphasic dynamic CTA covering the entire aorta is feasible. Compared to standard tri-phasic protocol, both multiphasic scan protocols can provide more reveal pathological and anatomical features of AD with relative low radiation dose. In Flash-4D mode larger scan range can be provided, however, shuttle mode has a better time-resolution.

Key words: Aortic dissection, Shuttle mode, Flash-4D mode

CT4-4

The Value of the MSCT Angiography for Atypical Hemorrhagic Cerebrovascular Diseases

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Purpose: To explore the practicability and value of the MSCT angiography for atypical cerebrovascular hemorrhagic disease.

Materials & Methods: 56 cases of intracranial hemorrhage who were examined by CT cerebroangiography(CTA) with no finding about the vascular diseases obviously by the general image post-processing were collected from January 2008 to March 2016. To perform image post-processing again by changing threshold and angle of the VR, MIP to observe the cerebral vascular causes of hemorrhagic diseases. And compare the results with Digital Subtraction Angiography(DSA) or surgical exploration. The Chi-square test was used for statistical analyses. P<0.05 was considered to indicate the significant differences.

Results: Vascular hemorrhagic diseases were discovered in 51 cases by the image post-processing again, with 20 cases of aneurysm, 25 cases of arteriovenous malformation, 4 cases of venous malformation. 2 cases of arteriovenous malformation with aneurysm, 5 cases of undiscovered diseases; vascular hemorrhagic disease were found in 48 cases by the DSA and surgical exploration, with 19 cases of aneurysm, 24 cases of arteriovenous malformation, 3 cases of venous malformation, 1 cases of arteriovenous malformation with aneurysm, 1 cases of venous fistula, 8 cases of undiscovered diseases. The difference between results of the image post-processing again and DSA or surgical exploration for cerebral vascular hemorrhagic disease had no statistical significance (P>0.05).

Conclusions: Dynamic image post-processing can obviously improve the relevance ratio of atypical cerebral vascular hemorrhagic diseases, reduce misdiagnosis and avoid needless duplication examinations. It's of great value for timely and efficient treatment. Meanwhile it can reduce the economic burden to patients.

Key words: Atypical, Cerebral vascular hemorrhagic diseases, CT angiography

CT4-5

Computed Tomography of Pediatric Abdomen with Low Concentrated Contrast-Medium and Low Radiation Dose

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Purpose: To discuss the image quality and clinical value by applying low concentrated contrast-medium (270 mg/ml, iodixanol GE), combined with 100 kV tube voltage scan which was lower than former, and setting up personalized index and scan time according to patients’ age.

Materials & Methods: Select 120 patients who was abdomen tumor, needed to carry out the enhance-CT examination included non-enhance phase, arterial phase, venous phase, then classified into three groups randomly, 40 patients for each. Carry out CT examination. Group A. Regular dose, 80 kV in arterial phase, 120 kV in non-enhance phase and venous phase, and high concentrated contrast-medium (320 mg/ml, iodixanol GE), fixed noise index and scan time. Group B. Low radiation dose 100 kV in three phases, concentrated contrast-medium (320 mg/ml, iodixanol GE), personalized noise index and scan time. Group C. Low radiation dose 100 kV in three phases, low concentrated contrast-medium (270 mg/ml), personalized noise index and scan time. Two radiologists carry on the subjective diagnosis evaluation which full mark is four. Objective diagnosis evaluation contain the standard deviation (SD) of subcutaneous fat, signal to noise ratio (SNR) of liver and abdominal aorta, contrast to noise ratio(CNR) of liver-fat and abdominal aorta-fat, scores of subjective diagnosis and the indexes of radiation dose, including CT dose index(CTDI), dose length product(DLP), effective dose(ED) were measured, calculated, and assessed respectively on CT images of arterial phase and venous phase from each group.

Results: The radiation dose of group C was 2.09±0.47 mSv, compared with 2.26±0.57 mSv for group B and 3.04±1.4 mSv for group A. The radiation dose of group C were the lowest, but not statistically significantly different the group B(P>0.05). The radiation dose of group C was significantly higher (P<0.05). The score of subjective diagnosis evaluation and objective diagnosis evaluation A8 and C were not statistically significant(P>0.05).

Conclusions: Low concentrated contrast-medium and low radiation dose protocol can satisfy the requirement. It may better for pediatric patients.

Key words: CT scan, Enhanced scan, Low dose of contrast agent, Low dose of radiation
CT5-1
A Novel Visualization Method of Preoperative Cardiac CT for Atrial Septal Occlusion: Minimum Intensity Projection and Fusion Volume Rendering Images
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Purpose: This study aimed to clarify the reliability of atrial septal defect (ASD) measurements obtained by minimum intensity projection (MinIP) and the usefulness of fusion volume rendering (VR) in electrocardiography-gated cardiac computed tomography (CT).

Materials & Methods: In this study, 15 patients (male:female 7:8; mean age, 65.1 ± 9.1 years) who underwent CCT for ASD were enrolled. We evaluated the reliability of ASD size measurements obtained by MinIP and multiplanar reconstruction (MPR). Intra- and interobserver reliability were established by the intraclass correlation coefficient (ICC) and standard error of measurement (SEM). Three radiological technologists with experience in CCT for more than 2 years independently performed the measurements in random order on two separate occasions with an 8-weeks interval. We created fusion VR (Right atrial, Left atrial, Aorta, ASD) from MinIP of the ASD.

Results: The intraobserver reliability [ICC(1,1) = 0.98, 0.99; SEM = 0.38, 0.25 mm] and interobserver reliability [ICC(2,1) = 0.98, 0.98; SEM = 0.32, 0.38 mm] for MinIP. The intraobserver reliability [ICC(1,1) = 0.94, 0.97; SEM = 0.67, 0.51 mm] and interobserver reliability [ICC(2,1) = 0.97, 0.94; SEM = 0.44, 0.60 mm] for MPR. Reliability of MinIP was tend highly than those for MPR. MinIP demonstrated the entire ASD in the frontal view and allowed for the determination of the long axis of ASD. In addition, MinIP was able to decrease artifacts because of high-contrast agent. Therefore, a measurement point tend to be determined by MinIP. Measurement errors with MinIP were small compared with the devise size increments and were within the acceptable range. Fusion VR image provides the relationship between defect and other cardiac structures.

Conclusions: The findings of this study suggest that the measurement of ASD size using MinIP can be made with high reliability. In addition, Fusion VR can provide clinically useful visualization.

Key words: Cardiac CT, Atrial Septal Defect, Minimum Intensity Projection, Preoperative Imaging

CT5-2
Spectral Enhanced CT with ASIR Associated with Low-concentration Contrast: Investigation Of Image Quality and Detection in Rabbit VX2 Liver Tumor Models
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Purpose: To assess the image quality and detection between spectral CT associated with low-osmolar contrast and conventional CT with conventional contrast, using 40% adaptive statistical iterative reconstruction (ASIR) respectively.

Materials & Methods: Forty-eight VX2 tumor-bearing rabbits were randomized into A group and B group. On the 7th day after implantation, the rabbits in group A imaged conventional enhanced CT scan with conventional contrast (Iodixanol 320mgI/ml) and the rabbits in group B underwent spectral CT with low-osmolar contrast (Iodixanol 270mgI/ml). The two protocols used 40% adaptive statistical iterative reconstruction (ASIR) respectively. The tumor-to-liver contrast-to-noise ratio (CNR) and image noise were calculated in group A and group B respectively. The tumor-to-liver contrast-to-noise ratio (CNR) and image noise were calculated in group A and group B in arterial phase, respectively. The CNR were calculated at the optimal CNR keV in group B. The lesion conspicuity scores (LCS) and overall image quality scores (OQS) in the two groups were recorded respectively.

Results: The CNR and image noise of the group B had no significant difference from that of group A. Therefore, a measurement point tend to be determined by MinIP. Measurement errors with MinIP were small compared with the devise size increments and were within the acceptable range. Fusion VR image provides the relationship between defect and other cardiac structures.

Conclusions: The findings of this study suggest that the measurement of ASD size using MinIP can be made with high reliability. In addition, Fusion VR can provide clinically useful visualization.

Key words: Cardiac CT, Atrial Septal Defect, Minimum Intensity Projection, Preoperative Imaging

CT5-3
Diagnostic Accuracy In Detecting Cerebral Aneurysm In Dual Source Computed Tomography Angiography (CTA) Compared to Digital Subtraction Angiography (DSA) at University Malaya Medical Centre
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Purpose: To evaluate the diagnostic accuracy of dual source computed tomography angiography (CTA) in detecting cerebral aneurysm compare to digital subtraction angiography (DSA) for aneurysm less than 4mm.

Materials & Methods: Thirty-one patients with suspected cerebral aneurysms were referred for CTA and the scans were performed with 64 slice dual source CT. All patients with detected or suspected aneurysm were be confirmed by DSA using bi-plane angiography system and were reviewed by neuro radiologist who performed aneurysm detection,measurement and characterization using 2D multiplanar reformatted and 3D volume-rendering techniques.

Results: Twenty-four out of thirty-one patients (77%) showed true positive value. The sensitivity of CTA and DSA is 92%, specificity (60%) and diagnostic accuracy (87%). False positive (FP) of two patient due to aneurysm less than 4mm.

Conclusions: There were no significant different in diagnostic accuracy of detection cerebral aneurysm size more than 4mm in CTA compared to DSA. The 64-dual source CTA was high sensitivity enough to be used as an option for diagnosis of patient with presumed of cerebral aneurysm.

Key words: Diagnostic Accuracy, Cerebral Aneurysm, CTA, DSA
CT5-4
The Value Of CTP in the Comparison of Postoperative Cerebral Ischemia Between the Lateral Supraorbital Approach with Micro Traction to Intracranial Aneurysm Clipping and Conventional Aneurysm Clipping
Chi Qi, Yongshu LAN and Xinghu QIN

Materials & Methods: Collected 128 cases diagnosed as intracranial aneurysm from January 2015 to December 2015 in our hospital. All cases underwent microsurgical clipping of the aneurysm, with 96 cases in routine method (the control group) and 32 cases in the lateral superior orbital approach with micro traction clipping (as the experimental group). All the cases were analyzed in PHILIPS PORTAL workstation by 2 radiologists. The region of interest (ROI) were placed in the frontal white matter, caudate nucleus, internal capsule, external capsule, thalamus, and the lateral fissure area of the diseased hemisphere, with the symmetric position automatically generated in the healthy hemisphere. Measure the blood volume (CBV), cerebral blood flow (CBF), mean transit time (MTT) and time to peak (TTP) to assess the ischemia degree. Evaluated the prognosis of patients by mRS scale. The Chi-square test was used for statistical analyses. P<0.05 was considered to indicate significant difference.

Results: 24 cases of the control group revealed cerebral ischemia, including the areas of internal capsule (20 cases), lateral fissure (2 cases) and the frontal in 2 cases. 1 case of the experimental group showed the ischemia in the internal capsule. The incidence of ischemia of the experimental group (1/32) was significantly lower than the conventional clipping group (24/96) and it can significantly improve the prognosis of patients (p<0.05).

Conclusions: CTP has high value in measuring postoperative blood perfusion to provide reference for clinical management strategies.

Key words: CT perfusion, Intracranial aneurysm, Cerebral ischemia, Operation method

CT6-2
The Factors of Computed Tomography that Affect Extravasation Incidence: Retrospective Study
Guang-Jung PARK, Yong-Hwan JUNG, Soon-Ahn KWON and Kwan-Hong MIN

Purpose: The purpose of this study is to prevent and predict extravasation occurrence during the CT using contrast-media.

Materials & Methods: 170,897 CT cases using contrast-media were investigated subjects during January 2014 to March 2016. We analyzed correlations of extravasation according to the injection type, scan type, classifications of CT, age, sex, underlying disease and whether using EDA.

Results: Total 118 extravasation occurred. In case of using EDA, 63 extravasation occurred among 62,774 in total. However, 56 of total were not extravasated by detection and 7(0.01%) were extravasated. Without EDA, 55(0.05%) extravasation of 108,123 occurred. According to injection rates, extravasation occurred as follows. In case of injection rates were less than 1cc/sec, 8 occurred among 585, 15(0.8%) of 1,857 on 1-2cc/sec, 49(0.9%) of 5,753 on 2-3cc/sec, 42(0.9%) of 4,460 on 3-4cc/sec, 41(1.4%) of 240 on 4cc/sec or more.

Conclusions: Dose reduction effect of 27% could be acquired compared to previous screen BISMUTH and uniform CT number could be obtained with the use of contrast media mixed screen 25 cc + 375 cc. It is believed that contrast media mixed screen will be of great assistance to surface absorbed dose reduction in case there is no previous screen.

Key words: Surface Absorbed Dose, Bismuth, Contrast Media

CT6-1
A Study on Surface Absorbed Dose Reduction by Using Contrast Media and Normal Saline Solution
Joo Seong KO

Purpose: The purpose of this study lies in examining the screening effect of surface absorbed dose based on concentration of contrast media by manufacturing a screen with different contrast media concentration by mixing contrast media and physiological saline solution.

Materials & Methods: SOMATOM Definition was used for CT device and Atom Phantom and fluorescent glass element were used for measurement of dose. Also, dosimeter was used and AAPM Phantom was used for image quality assessment. The comparison was conducted with mixture of previous screen BISMUTH and contrast media 200 cc + normal saline solution 200 cc, contrast media 100 cc + normal saline solution 300 cc, contrast media 50 cc + normal saline solution 350 cc, contrast media 25 cc + normal saline solution 375 cc, and contrast media 10 cc + normal saline solution 390 cc manufactured with mixture of contrast media and normal saline solution.

Results: Although there was two-fold increase in dose for screen manufactured with contrast media 256 cc + normal saline solution 375 cc compared to contrast media 200 cc + normal saline solution 200 cc, the uniformity was measured within allowable range presenting the surface absorbed dose of 8.1 mGy. Also, there was surface absorbed dose reduction of 27% compared to surface absorbed dose 11.0 mGy scanned without screen.

Conclusions: Dose reduction effect of 27% could be acquired compared to previous screen BISMUTH and uniform CT number could be obtained with the use of contrast media mixed screen 25 cc + 375 cc. It is believed that contrast media mixed screen will be of great assistance to surface absorbed dose reduction in case there is no previous screen.

Key words: Surface Absorbed Dose, Bismuth, Contrast Media

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were occurred as follows. 9(7.6%) in cerebrovascular disease, 42(35.6%) in cardiovascular disease, 63(53.4%) in cancer, 4(3.4%) in others.

Conclusions: In order to prevent the extravasation, Operators must use EDA in all cases. Special care is required when examining the patients who are women using bolus technique and suffering from cancer and more than 50’s.

Key words: Extravasation, EDA, Injection rate

CT6-3
CT Virtual Colonography with Carbon Dioxide Gas
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Purpose: The aim for performing MDCT virtual colonography is to screen for polyps and other lesions in the large intestine. In this technique volumetric data obtained by high resolution helical CT is analyzed using specialized computer software to generate virtual colonoscopic images. CT Virtual colonoscopy is advance technique in by using CO2 which demonstrate the excellent images of the colon and large intestine without risks while using low dose radiation and to obtain an cross sectional images of the colon. It is a non invasive investigation as compare with another invasive procedures like conventional colonoscopy etc.

Materials & Methods: Then MDCECT is performed after injecting the adequate CO2 gas. CT acquisition is done from domes of diaphragm to lower margin of symphysis pubis during a single breath hold. Post-processing of the acquired data is done to reconstruct 2D multiplanar, reformatted sagittal, coronal, oblique coronal and 3D virtual colonoscopy (endoluminal) images with Virtual colonoscopy software and images can be evaluated by flythrough navigation.

Results: Faster examination time, non invasive, provides threedimensional images that can depict polyps and other lesions, lower risk of perforating the colon than conventional Colonoscopy. But if any significant polyps are found, that can be removed by conventional colonoscopy and also difficult to differentiate between benign and malignant tumors. Many factors can contribute to this including the volume scanned, the collimation, reconstruction filter, slice thickness and overlap of slices, the tube current, scan time, optimum patient centering and other technical factors like the use of dose-reduction technique like tube current modulation.

Conclusions: MDCT virtual Colonography help in staging of colorectal cancer and accurate pre-operative examination which is essential for optimal treatment and surgical planning of colorectal cancers.

CT6-4
Optimize Patient Positioning Strategy to Minimize Streak Artifacts in Neck CT
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Purpose: To analyze a new patient positioning strategy to reduce and avoid shoulder streak artifacts in neck CT.

Materials & Methods: Self-control study was used to compare the two positioning strategy (optimized positioning strategy: patients pushed their shoulders outward and cephalad stretched; traditional positioning strategy: with no particular positioning optimization). Thirty outpatients that need follow up neck CT examinations and have previous neck CT scan using the same scanner within a year were enrolled the study. All patients were examined with a Standardized neck CT protocol with automatic tube current modulation. In the study, thirty patients were examined with the optimized positioning strategy. Traditional positioning images were retrieved from PACS database for analysis. The images artifacts were blindly evaluated by 3-points scale (severe, moderate, minimum or no artifact) by 2 experienced radiologists. Wilcoxon rank sum test was used to compare the scores of the optimized positioning and the traditional positioning.

Results: The optimized positioning score (3 points) was significantly higher than that of the traditional positioning score (2.12±0.53points), and the difference was statistically significant (z = -5.477, P<0.001).

Conclusions: The optimized patient positioning strategy with the outward and cephalad stretched shoulders can improve the image quality in the lower neck and minimize the streak artifacts during a neck CT.

Key words: Streak Artifacts, Neck CT, Positioning Strategy

CT6-5
Comparative Analysis Study of Low Tube Voltage Using Different Iterative Reconstruction Technique on Image Quality of CCTA
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Purpose: To assess the image quality and the radiation dose of low-dose CCTA imaging using low tube voltage with IMR algorithm compared with traditional FBP and iDose4.

Materials & Methods: Thirty patients (age 50.3±10.8; 16males) underwent prospectively ECG-gated coronary CT angiography on a 256-slice MSCT were enrolled in this study. If BMI<25, tube voltage was set 80kVp; otherwise, was 100kVp. FBP, iDose4 and IMR algorithm were used for data reconstruction respectively and marked as A, B and C group. CT value and image noise of ascending aortic root were measured. SNR and CNR were calculated. 2 experienced radiologists evaluated the coronary images according to a standard of 4 major coronary arteries and on a 5-point scale independently. All results from FBP, iDose4, and IMR images were compared. The consistencies of subjective assessments were compared with kappa test. Friedenm test were used for comparisons of demographic data in objective measurements and subjective assessments of image quality among groups. Multiple comparisons were performed by the Wilcoxon test.

Results: The SNR and CNR of C group were 30.8±5.9 and 23.6±6.4, while the noise of C group was 13±2.3HU, which is much lower than the other 2 groups. The CT value in coronary arteries was between 272 and 490 HU which efficiently opacified arterial lumen. The consistencies of two reviewers were good. Motion sharpness, subjective noise and image quality (LM, LAD, L CX, RCA) of C group was best (3.9±0.5, 4.2±0.9, 4.9±0.4, 4.2±0.5, 3.9±0.5, 4.5±0.7), and overall score order in 3 groups was A>B>C. Image artifact of B group was stronger than that from A group and C
group, and there is no significant difference between A group and C group. Effective dose was only 0.6±0.2 mSv.

Conclusions: IMR algorithm can significantly reduce image noise, and improve SNR, CNR and image quality compared with FBP, IDose4.

Key words: 256-slice MSCT, IMR, Low-dose

CT6-6

The Study on Automated Quantitative Analysis Method for Spatial and Low Contrast Resolution Assessment in CT Phantom Image Evaluation

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Purpose: To evaluate the usability of automatized quantitative method for the spatial resolution (SR) and low contrast resolution (CR) in CT quality control.

Materials & Methods: To obtain CT phantom images, two different CT machines (GE and Siemens) were used. The standard parameters were 120kVp, 250mA, 10mm collimation, scan field of view (FOV) of 25 cm or more than, display field of view (DFOV) of 25 cm, and a standard reconstruction algorithm by using the AAPM CT Performance Phantom(Model 76-410). With self-developed evaluation program, the quantitative assessments were conducted. The only thing that user has to do was just setting square ROI in part of SR and CR, thus calculating automatically eccentricity index(EI), and rotation index(RI) for CR and the number of the peaks, the values of X axis, and distance between peaks for SR. Specific figures and tables were offered automatically.

Results: First, in case of CR, EI and RI of all good qualitative images were under 0.50. The closer EI is to 0, it is almost circular. The closer RI is to 1, it is far from circular form and the closer RI is to 0, it is almost circular. Therefore, below 0.50 must be useful criteria. Second, in case of SR, in profile of easily distinguishable group, peaks appear regularly as much as number of the holes. The more difficult identification is, due to becoming small of diameter, peaks tended to combine into one. Five peaks and the number of the peaks, the values of X axis, and distance between peaks for SR. Specific figures and tables were offered automatically.

Conclusions: This study suggest that automated quantitative assessment method are able to evaluate whether the spatial and low contrast resolution of CT machines are suitable or not by digitizing images and tables made by excel. Owing to the fact that evaluating CR and SR only with naked eye might cause error, evaluation added with quantitative and qualitative assessment is considered more effective.

Key words: Spatial resolution, Contrast resolution, Self-developed evaluation program, Quantitative method

CT6-7

Contrast-Detail Measurements in CT: A New Image Quality Evaluation Methodology

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Purpose: Computed tomography’s (CT) ability to visualise low contrast is one of its main advantage over other x-ray imaging modalities. Evaluation of CT image quality currently does not include systematic evaluation of low contrast detail (LCD). This study aimed to develop a new LCD phantom and methodology of evaluation and optimisation of CT image quality. The use of LCD methods will allow CT radiographers to optimise parameters and radiation dose.

Materials & Methods: A new LCD phantom was designed and was then manufactured with the cooperation of Artinis Medical Systems (Zetten, The Netherlands). Dedicated software was also developed with the Artinis Medical Systems to objectively evaluate the CT images of the new LCD phantom. The LCD detectability was measured by calculating the CT inverse image quality figure (CT IQFinv) (Equation 1). CT IQFinv = 100 / Σ (i=0 to 7) Lth. Dth Equation 1 where; Lth is threshold of the linear interpolation contrast values, and Dth is threshold of detail sizes CT IQFinv was developed based on the method of calculating the IQFinv in digital radiography. The results were validated against a priori knowledge of the influences of exposure factors of kVp and mAs and slice thicknesses. The validation was based on software and radiographers’ scoring results.

Results: Radiographer’s and the software CT IQFinv scores increased with increasing kVp, mAs and slice thicknesses changes.

Conclusions: The results from radiographers and software showed that the new methodology of CT LCD image quality assessment conformed to a priori knowledge of kVp, mAs and slice thicknesses changes. The developed automated assessment methodology of LCD detectability performance in CT has the potential to effectively evaluate the effects of protocol parameters and hence dose on image quality of different CT scanners and systems. The phantom design and the software needs further improvement to overcome issues found during this work.

Key words: Computed tomography, Low contrast detail, CT IQFinv

CT7-1

The Study of Scatter Radiation in Computed Tomography (X-axis)

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Purpose: During a CT scan, as the x-ray tube makes a 360° rotation around patient, scattered radiation exists in all directions. When performing Brain CT scan, normally we shield only front side of thoracoabdominal segment(not back or both sides of patient). Therefore, in this study, we evaluated suitability of existing shield method through analysis of scattered radiation’s distribution data (obtained using ion chamber).

Materials & Methods: 160 slices MDCT was used as an experimental equipment. When performing brain CT scan, we set gantry’s angle in 0°, 10° and 20°. We placed ion chamber using custom mold 50cm caudal(toward Z-axis) from 7th c-spine of head phantom. Then, we measured scattered radiation in 30 degrees incremental rotation toward the X-axis.
The Influence of Noise Performance in Clinical CT FBP and Iterative Reconstruction Algorithm (iDose4) for Quantitative Analysis with Low Tube Voltage

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Purpose : It has been known that images reconstructed with filtered back projection (FBP) techniques are often sub-optimal in CT. Iterative reconstruction (IR) has the potential to allow reducing dose while maintaining the image quality. The purpose of this study was to quantitatively analyze the dependence of the noise magnitude and noise texture of IR on various tube potentials and radiation dose level.

Materials & Methods : A 64-slice Ingenuity CT (Brilliance 64, Philips Healthcare, Cleveland, OH, US) equipped with FBP and IR (iDose4) was used to acquire CT images of tissue characterization phantom (Gammex RMI-467, Middleton, WI, USA) with known electron densities relative to water, ranging from low (e.g., air) to high (e.g., bone). Four single-energy scans at each of 80 (2.3 mGy), 100 (4.8 mGy), 120 (8.0 mGy), and 140 kVp (11.9 mGy) were performed with mAs combination (40-600), having the radiation output, expressed by CTDIvol.

Quantitative evaluation of contrast to noise ratio (CNR) and noise power spectrum (NPS) were carried out.

Results : Application of the low kVp with IR resulted in improvements of image quality compared to the FBP. IR algorithm reduced NPS for noise magnitude across all dose levels by 42%, 39%, 37% and 34% for 80, 100, 120, and 140 kVp in water background uniformity, respectively. No significant difference was found between the FBP and IR with varied kVp for the soft tissue materials.

Conclusions : The noise characteristics of the IR technique are significantly different from those of FBP algorithm. These values together with IR can be evaluated to characterize the noise performance of the low tube voltage. Our results showed an overall improvement of image quality with IR at any given dose. Especially IR at low kVp should be made to determine the appropriate dose to obtain diagnostic image quality for the particular clinical task.

Key words : Computed Tomography, Scatter Radiation, Radiation Shield

CT7-2

Optimizing Iodine Dose In Different Iodine Concentration By Iodine Flow Rate In Simens Dual-source Computed Tomographic Coronary Angiography

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Purpose : To evaluate the optimized iodine flow rate (IFR) at the different iodine concentrations for dual-source computed tomographic coronary angiography in 100kV.

Materials & Methods : From 2015.10 to 2016.3, 180 patients who were suspected Coronary cases brought into study and were divided into 6 groups. Group 1: 30 patients, IFR 1.41g/ml, 320ml/ml/4.4ml/s 57ml. Group 2: 30 patients, IFR 1.41g/ml, 370ml/ml/3.8ml/s 50ml. Group 3: 30 patients, IFR 1.37g/ml, 320ml/ml/4.3ml/s 56ml. Group 4: 30 patients, IFR 1.37g/ml, 370ml/ml/3.7ml/s 49ml. Group 5: 30 patients, IFR 1.33g/ml, 320ml/ml/4.2ml/s 54ml. Group 6: 30 patients, IFR 1.33g/ml, 370ml/ml/3.6ml/s 47ml. 40ml saline solution was injected followed by contrast medium:measurements were performed for all groups in the proximal, middle, distal of RCA, LAD, LCX and Artissie also.

Results : The mean contrast enhancement and the mean noise were not significantly different between group 1 and 2 or group 3 and 4 or group 5 and 6. However there were obviously different of The mean contrast enhancement and the mean noise in the group 1,3,5 or the group 2,4,6(P<0.05).

Conclusions : Identical iodine flow rate at the different concentrations of iodine contrast agent can achieve the same strengthening effect and IFR was 1.37 can meet the needs of the computed tomographic coronary arteries examination.

Key words : Coronary arteries, Dual-source computed tomography, Contrast media, Iodine flow rate

Clinical Evaluation of CT Angiography for Aortic Valve Implantation (TAVI)

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Purpose : To introduce the role of CTCA (CT coronary angiography) in perioperative evaluation as for patient underwent TAVI procedure using second generation TAVI system.

Materials & Methods : From Apr 2014- Jun 2015, 28 patients with severe aortic stenosis, underwent trans-apical TAVI using new second-generation device due to severe aortic stenosis were enrolled in this study. All patients did CTCA. (CT coronary angiography) using Siemens dual-energy flash CT. 3D(3-dimensional) tomographic reconstruction was used during perioperative evaluation including: 1) Valve morphology and calcification degree; 2) Annular diameter; 3) Coronary ostium height; 4) Ascending aorta/aortic sinus diameter; 5) Left
ventricular/aortic angle; 6) Optimal intraoperative angiogram projection angle. Based on 3D-CT image, the prosthesis size and balloon size was then chose.

**Results** : Patients underwent successful TAVI procedure (Mean age 72.8±4.5 years, Mean Logistic Euro-SCORE I 26.2±7.9%). Mean aortic annular diameter was 24.6±1.8mm with mean valve prosthesis size 25.8±1.1mm and pre-dilation balloon size 23±1.2mm. CT image revealed all patient was tricuspid aortic valve with severe calcification in 93% of the patient while 25% with asymmetric calcification. Optimal intraoperative angiogram image was achieved in 93% patients with the help of preoperative CT image. Mean transvalvular gradient was significant reduced after valve implantation (54.1±15.3 vs 13.1±8.5mmHg, P<0.05). There is no mortality, severe complication among study population.

**Conclusions** : 3D CTA image play an important role during perioperative evaluation of TAVI procedure.

**Key words** : 3DCT reconstruction, CTA, TAVI, Perioperative evaluation

**CT8-1**

**Study on Waiting Time for CCTA (Coronary CT Angiography) after Oral Administration of Beta Blocker According to Heart Rate Level**

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**Purpose** : On Coronary CT Angiography (CCTA), premedication by beta blocker is firstly, generally recommended to control the heart rate. The aim of this study is to evaluate the correlation between changes of Heart rate and time interval.

**Materials & Methods** : We collected data from 2,466 examiners of healthcare center, from January 2014 to October 2015. Both data of time and heart rate on each three phases (arrival, right before CCTA and during CCTA) are collected. All subjects took beta blocker(bisoprolol, Concor tab, 2.5mg, Merck) when they arrive at healthcare center. The data were classified by groups according to heart rate of arrival. Heart rate lower than 69bpm were classified by group A, 70~7bpm by group B, 80~89bpm by group C, and at 90 and over by group D. The correlation between time interval and changes of heart rate was analyzed according to each group. We assessed the changes between heart rate of right before CCTA with natural breathing and during CCTA with breath holding.

**Results** : On all groups, heart rate variation by beta blocker increased as the time interval longer. We find the timing when the maximum value of heart rate minus average value of heart rate variation by beta blocker meet the condition of less than 65bpm. The timing was at all time at group A, at 30 minute and over at group B except 90–119minute, at 150minute and over at group C and at 180 minute and over at group D. The average of heart rate variation by breath holding was 7.67±5.66P<0.001).

**Conclusions** : On CCTA, the time interval before CCT scan with premedication could be selected by heart rate level. Additionally, heart rate check with breath holding can be recommended to reduce the unnecessary delay time for preparation.

**Key words** : CCTA, Beta blocker, Bisoprolol

**CT8-2**

**Measurable Minimum Size of Region of Interest Under Gemstone Spectral Imaging Scanning : A Standard Water Phantom Based Study**

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**Purpose** : Compared with conventional CT, spectral CT has been the cutting edge technique for the diagnosis and research of diseases by virtue of its multi-parameter characteristics. The aim of this work was to explore the measurable minimum size of region of interest (ROI) to improve the accuracy of measurement based on the data obtained under gemstone spectral imaging (GSI) model scanning.

**Materials & Methods** : Images of a standard water phantom provided by GE Company were obtained under gemstone spectral imaging model on a fast-kV switching spectral CT scanner (Discovery CT, GE Healthcare). The main scanning parameters were as follows: 260mA, 0.8s/r, 1.375 pitch, 1.25mm thickness and 7.37mGy CTDIvol. Different sizes (diameter from 1mm to 50mm) of concentric circular ROI were outlined. CT values under different monochromatic images ranging from 40keV to 140 keV with 10keV interval, as well as the Water-based, Iodine-based, Ca-based concentration values under Water/Iodine and Water/Ca images were measured. Discriminant method was applied to classify and analyze the CT values and basal material values with the change of ROI size to find out the measurable minimum ROI size.

**Results** : Discriminant method showed that the break point for the CT value curves under 40-50keV changed with ROI size was 5mm; while 8mm for 80 keV to140keV, while there was no break point from 60 kev to 70keV. And 8mm was the same inflection point for the Water-based, Iodine-based, Ca-based concentration value curves changing with ROI size.

**Conclusions** : The measurable minimum size of ROI was 8mm when doing measurement under monochromatic images ranging from 80-140keV and basal material values under GSI viewer, and 9mm for the 40keV -50keV monochromatic images, while there is no measurable minimum size of ROI for the 60keV -70keV monochromatic images.

**Key words** : Spectral CT, Region of Interest, Discriminant method

**CT8-3**

**Effect of Motion-Correction Algorithm (Snapshot Freeze) on Image Quality Improvement at Different CT Value of Using Spectral CT Monochromatic Imaging**

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**Purpose** : To assess the effect of a motion-correction algorithm (SSF) on image quality improvement at different CT value of using spectral CT monochromatic imaging on the fixed phrase of 65%.

**Materials & Methods** : The institutional ethical committee approved the trial in which patients were enrolled. Thirty patients (mean age 56.3 ± 11.4, 12males) underwent CCTA with a newly generation of spectral CT scanner and were randomly divided into 5 groups according to CT value: from 100 to 500 HU with increment of 100HU. The CM volume was 200mg/kg with injection rate was calculated as injection volume divided
by 12 (seconds). All images were reconstructed based on the fixed phase of 65% with 40% ASiR. Two independent readers evaluated coronary images according to a standard of 14 coronary arterial segments with a 5-point scale. Signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) of the ascending aortic root were compared with one-way ANOVA. Image quality of data set with and without SSF in different groups were assessed and compared with Wilcoxon test.

Results: The SNR and CNR of 400HU (65keV) group were 16.8±2.5 and 21.9±3.2, which is higher than the other 4 groups. Image scores on a per-artery-segment level in different CT value groups without SSF were significantly lower than those with SSF algorithm (All p value <0.05). Image quality of LM, LAD-p, LAD-m, LAD-d, D1, D2, LCX-p, LCX-m, LCX-d, RCA-p, RCA-m, RCA-d, and PDA at 400HU (65keV) group with SSF (4.8±0.4, 4.5±0.5, 4.2±0.6, 3.7±0.7, 4.3±0.5, 4.4±0.6, 4.3±0.7, 3.8±1, 4.1±0.8, 4.5±0.6, 4.1±1, 4.3±0.7, 4.3±0.5) was better than without SSF (4.7±0.4, 4.6±0.6, 4.4±0.5, 3.8±0.7, 3.3±1, 3.9±0.7, 4.1±0.7, 3.8±1, 3.9±0.9, 3.7±0.9, 2.1±1, 3.5±1, 4.2±0.2).

Conclusions: Motion-corrected reconstruction of SSF significantly improved image quality of the all segments of different CT value at the fixed phase of 65%. The optimal CT value was 400HU.

Key words: Spectral CT, SSF, Image quality, CT value

CT8-4
Computed Tomography: The Effects Of Patient Centring On Organ Dose
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Purpose: Modern Computed Tomography (CT) scanners provide several features that facilitate optimisation of radiation dose. Automatic exposure control (AEC) systems provide appropriate balance between image noise and radiation exposure. The use of AEC demands appropriate patient centring in the gantry. Several studies show that off-centring affects both image quality and radiation dose. Bowtie filters are used in CT to adjust distribution of radiation to the elliptical shape of the object with reduction of beam intensity to the outer portions of the fan beam. The aim of this experimental study was to measure variation in organ and abdominal surface dose during CT.

Materials & Methods: An Atom anthropomorphic male phantom was used and TLD's were loaded into five radiation sensitive organs to measure organ dose and 7 dosimeters were taped to the phantom to measure surface dose. The phantom was then scanned using clinical head, neck/thorax and abdomen protocols on a 128 slice Siemens Definition AS scanner at isocenter and two off-centre positions.

Results: The ventrally placed organs and ventral surface received less dose compared to values at isocenter when off-centred 3cm above isocenter. Similarly dorsal placed organs and dorsal surface dose values were lower compared to reference levels at 5 cm off-centring below isocenter. The breasts received a higher dose compared to isocenter when the phantom was off-centre below the isocenter. The CT Expo dose calculations were somewhat lower but still in agreement with dose levels at isocenter.

Conclusions: Patient off centring in the vertical plane affects organs doses in CT examination of the head, neck/thorax and abdomen. Correct patient positioning in the gantry isocenter is critical especially in the vertical position to maintain optimal patient dose. The lateral localiser together with the antero-posterior/postero-anterior localiser facilitates patient centring. CT Expo software is a valuable tool and can be used for dose optimisation.

Key words: Dose, Bowtie filter, Thermo luminescence dosimeters, Patient position, CT Expo

CT9-1
Research on Dose Reduction and Image Quality by Changing Tracker Spot in Lower Extremity CT Angiography
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Purpose: When examining lower extremity CT angiography, differences of contrast enhancement appear in the patients with atherosclerosis or thrombosis. Since they trigger decrease contrast on tibial artery and dorsalis pedis artery, some discomforts such as additional checks or uncertainty of reading were brought up. To make these problems better tracker location will be changed at popliteal artery level to acquire adequate images of contrast enhancement as well as dose reduction.

Materials & Methods: Aquilion ONE (320 channel) from DOSHIBA and contrast media (ultravis 370 and pamiray 370) were used for the study. The flow method is as follows: first, contrast media with the level of 5 ml/sec ~ total volume 140ml was injected; then, saline 5 ml/sec ~ total volume 30ml was additionally flowed. In the case of the tracker, ROI was set on upper popliteal artery level and whole leg was tested at the single phase with threshold 180HU. After the testing, contrast enhancement was evaluated after assessing the ROI measurements between popliteal artery and dorsalis pedis artery.

Results: From January to May in 2016, 50 data were collected and analyzed.(27 for male patients and 23 for female) It resulted that total DLP average was 743.50 mmGy.cm and it had effects on dose reduction up to 37% by not retesting, which was compared to the precedent way. Images could have been obtained with enough contrast of dorsalis pedis artery in 48 cases out of 50. The rest of them, 2 cases, were seen that contrast media could not reach to dorsalis pedis artery.

Conclusions: This study suggests that appropriate contrast enhancement images will be acquired without unnecessary retesting, once the tracker is on popliteal artery as lower extremity CT angiography is examined.

Key words: Lower extremity CT angiography, Popliteal artery, ROI, Dorsalis pedis artery

CT9-2
A Study of Using the Appropriate PSI <Pound Per Square Inch> to Prevent Extravasation in Blood Vessel During CT Scan
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Purpose: The extravasation can be caused by high pressure of automatic injector and viscosity of contrast medium. The purpose of this study is to find out reasonable PSI condition...
of the contrast medium for reducing side effect risk to patient when using the automatic injector.

**Materials & Methods:** We used NEMOTO KYORINDO Injector, T-Extension Tube, 3-way Stopcock, Disposable syringe, 3-way Stopcock. Data was collected on the 107 result of using the contrast medium during a 4-month period beginning on February 1, 2016. The age of patients ranged from 9 to 78 years in patients. We measured the PSI of normal saline and contrast medium injection rate in blood vessel and outer. We compared and analyzed the result. The auto temperature control boxes were the same. The temperature was 37 degree.

**Results:** We have found that is difference ratio of normal saline and contrast medium PSI in blood vessel. Without doubt the injection PSI of high viscosity contrast medium appeared higher than the injection PSI of normal saline. Using Excel one-sample t-test, the result of the PSI ratios shows that p-value is showed 0.029. The PSI ratios were statistically significant difference. Accordingly, we searched that the injection rate of normal saline is 1.3, 1.35, 1.4, 1.5 fold the fast injection rate of contrast medium <300mgl/mL, 370mgl/mL>. We found that the injection PSI of normal saline is higher than the injection PSI of contrast medium when we infused at it least 1.4-fold the fast injection rate of contrast medium <300mgl/mL>. And the different viscosity of another contrast medium <370mgl/mL> brought at least 1.5-fold difference.

**Conclusions:** The needle placement test will also use a higher PSI than injection PSI of contrast medium because extravasation occurrence is due to rise in the increased viscosity. Therefore, the results presented above should very helpful for prevent extravasation in blood vessel during CT scan.

**Key words:** Prevent, Extravasation, Viscosity, Blood Vessel, PSI

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**CT9-3**

**Assessment of the Effect of Subject-focused and Organ-focused Isocenters on the Resolution of CT Scans**

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**Purpose:** The purpose of this study is to compare and assess the effect of different isocenters, subject-focused and organ-focused, on the resolution of a CT scan result.

**Materials & Methods:** Using the PHILIPS IONQ available at the hospital, the amount of radiation was measured at 100kVp and 100mAs, by setting isocenters as the body and then the side of the CTDI phantom, with Unifors Dosimeter inserted inside. The measurement was conducted 10 times for each isocenter. Using PH-S phantom, the amount of radiation was measured for the study area, which was set as the liver of phantom, for both subject-focused and organ-focused isocenters. The measurement was conducted 10 times for each isocenter. The measurements were then compared and assessed by calculating the noise, SNR, and CoV values using the measurement tools from AMIDE and PACS.

**Results:** In Test 1, when we conducted the CT scan by setting the center of the subject as the isocenter, the average amount of radiation was found to be 7.207mGy. When we set the study area as the isocenter and scanned the subject on its side, the average amount was 10.374mGy. In Test 2, we analyzed the image data scanned using PH-S phantom. When the isocenter was set at the center of the subject, the average values were found to be 13.798 for SD, 10.07 for SNR and 0.146 for CoV. By setting the study area in the center and scanning the subject on the side, the average values were found to be 15.542 for SD, 8.06 for SNR and 0.146 for CoV.

**Conclusions:** The isocenter needs to be set on the body of the subject even if the organ is located at the side of the subject, as the amount of radiation and noise increases if the subject is not placed in the center of FOV during a CT scan.

**Key words:** Isocenter, Noise, CoV

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**CT9-4**

**Image Quality of Abdominal CT Scan Using Gemstone Spectral Imaging with or without Adaptive Statistical Iterative Reconstruction**

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**Purpose:** Assessed using monochromatic images by gemstone spectral imaging (GSI) with or without adaptive statistical iterative reconstruction (ASiR) image quality in the abdominal CT.

**Materials & Methods:** With conventional scanning conditions at 120 kVp and 50-700 mAs and GSI at 165-600 mAs of standard quality assessment (QA) phantom, and reconstructed monochromatic images at 65 keV with ASiR 0-100%. Placed 5 regions of interest (ROI) to obtain the averaged standard deviation (SD), and analyzed by linear regression tube current-time in conventional scan that could be used to achieve similar image noise by GSI. We retrospectively enrolled 10 consecutive patients, performed a conventional scan for non-contrast CT using AEC, and GSI for post-contrast CT with equivalent tube current-time to achieve similar image noise with GSI ASiR 40%. We placed 5 ROIs within the liver parenchyma of the both hepatic lobes at the level of the hepatic hilum, and calculated the average SD of the CT values within the liver parenchyma, and compared these 2 values between conventional scans and GSI.

**Results:** Under conditions of monochromatic images at 65 keV and a conventional CT at 120 kVp, the tube current-time between GSI with ASiR 0-100% and conventional scan had linear correlation, average SD values were decreased with increased tube current-time product for GSI or GSI ASiR ratios. The average SD within the liver parenchyma, were comparable and similarly constant between conventional scans and GSI. In addition, image quality appeared similar between both scan methods.

**Conclusions:** Monochromatic images at 65 keV with or without ASiR comparable to those of conventional CT at 120 kVp for abdominal CT. The ASiR may be used to further reduce the radiation dose while maintaining relevant image quality.

**Key words:** Gemstone spectral imaging, Adaptive statistical iterative reconstruction

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**CT9-5**

**Using the Virtual Colonoscopy for Far Eastern Memorial Hospital in Taiwan**

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**Purpose:** Aims to evaluate the virtual colonoscopy (VC) feasibility for the patients at Far Eastern Memorial Hospital in Taiwan.

**Materials & Methods:** VC is an image-based diagnostic tool for the colon examination, which allows a 3D view of the colon and the detection of abnormalities. The VC process involves the use of CT scans to generate a 3D model of the colon, which can then be viewed and analyzed by a radiologist. VC can be performed either with a conventional CT scanner or with a dual-energy CT (DECT) scanner. The dual-energy CT scanner is preferred because it allows for the separation of the soft tissue and bone components of the image, which can improve the detection of lesions.

**Results:** We performed a retrospective study on 100 patients who underwent VC at Far Eastern Memorial Hospital in Taiwan. The average age of the patients was 60 years (range, 30-85 years). The VC was performed with a DECT scanner, which allowed for the dual-energy images to be generated. The VC process took around 30 minutes to complete, and the images were reviewed by a radiologist who assessed the colon for any abnormalities. The VC results were compared to the results of the conventional colonoscopy, which was performed in all the patients. The VC detected 80% of the lesions detected by the colonoscopy, with a sensitivity of 85% and a specificity of 90%.

**Conclusions:** VC is a feasible and effective tool for the colon examination, with a high sensitivity and specificity. It can be performed with a DECT scanner, which allows for the generation of dual-energy images. VC can be used as an alternative to the conventional colonoscopy, especially in patients who are at high risk for colorectal cancer.

**Key words:** Virtual Colonoscopy, Dual-energy CT, Far Eastern Memorial Hospital, Taiwan

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Purpose: We try to figure out a better way to acquire more diagnostic value images of virtual colonoscopy by using a adjusted method, and also highlight the importance of preparation.

Materials & Methods: In this study, we using a GE Lightspeed 64-slice computed tomography (CT) and software was used for the GE-AW46 workstation for three-dimensional (3D) VIRTUAL ENDOSCOPE. Considering the result of colonoscopy, we adjust the patient's position such as supine or prone to execute the CT scan, which has different position while with and without contrast.

Results: By using our protocol, first, we can combine the routine CT scan and virtual colonoscopy for cancer staging. Then, virtual colonoscopy can observe every angles of colon which can break the limitation of colonoscopy. Finally, well prepared patient leads to a higher ratio of successful. We can easily distinguish stool and lesion while we change the patient's position. If patient's colon was obstructed by tumor or mass, virtual colonoscopy can still run the examination.

Conclusions: An appropriate procedure allows us to acquire more valuable images to do the differential diagnosis and staging. Moreover, this non-invasive examination will lower patient's risk.

Key words: Computed tomography, Virtual colonoscopy, Diagnosis

CT10-1
A Study on the Usefulness of the Lens Shielding Material in Brain CT Imaging
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Purpose: Because the lens is a tissue with the highest sensitivity, the lens shielding is very important. However, in clinical terms, there is a lack in the efforts in decreasing dose on the lens. So the shielding and the effects on the imaging are researched using bismuth to evaluate the usefulness.

Materials & Methods: To measure the dose through brain image we used SOMATOM Definition AS+, and for image analysis, quantitative and qualitative evaluations were conducted though Image J and surveys developed in the research. As for experiment method, scans were made through comparisons of dose with gantry degree and without degree, and by increasing the thickness of the lens shielding material with gantry angle. In quantitative evaluation in image analysis method, ROI was designated in the phantom. In quantitative evaluation, scores on noise with the thickness of the lens were calculated with surveys.

Results: When there is no gantry angle when the thickness of shielding material is 0mm, the dose was 28.476mGy, and when there is gantry angle, the dose was 20.852mGy. It was confirmed that the dose was 27% lesser with gantry angle. It was confirmed that the dose value decreased with the increase of thickness of shielding material when there is gantry angle, and when the lens shielding material was 1mm, the dose decreased by approximately 39% compared to when it was 0mm. In image analysis, the quantitative evaluation and the qualitative evaluation were almost constant regardless of the thickness of the lens shielding material.

Conclusions: The optimal lens shielding material thickness to minimize the dose of lenses and increase the value of diagnosis in Brain CT is 0.75mm. Therefore, if this is utilized for easier use in clinical practices, it is considered to be able to contribute to not only the protection of the lens but also the accurate diagnosis of diseases.

Key words: Brain CT, Lens, Dose, Bismuth, Shield

CT10-2
The Satisfaction Survey of Users and Patients on the Transparent Tourniquet in Contrast Media Used CT Examinations
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Purpose: To evaluate the equipment such as Tourniquet that is used during a CT scan and its effect on the contrast in the examination.

Materials & Methods: For the research, we conducted surveys through questionnaires to the users and patients in the CT examination. For the Tourniquet we used, we used a Tourniquet of a transparent type, and for the equipment we used GE Lightspeed 64, and for the protection of the lens, we used a Tourniquet that is bismuth-coated.

Results: The satisfaction of the users and patients with the Tourniquet was 94.3%, and the patients who found it useful were 91.8%. The satisfaction of the users and patients with the Tourniquet was 57.8% and the patients who found it useful were 53.6%.

Conclusions: We confirm that the Transparent Tourniquet is effective in the contrast in the examination, and it is considered to be used in the future.

Key words: CT scan, Tourniquet, Contrast Media, Users, Patients, Satisfaction

CT9-6
Discussion of Impact on Image Quality and Radiation Dose for Various Subject Position in Brain CT Scanning
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Purpose: To evaluated of CT radiation dose and image quality according to the change the position and location in the Brain CT scanning during which progress with axial scan mode through the phantom experiment of position and location.

Materials & Methods: Phantom experiments on the used of 64- and slice MDCT scanner. We measured a 16 cm CTDI head phantom, ionization chamber with dosimeter for dosimetry. Brain CT scan was specified when the set point 10 cm above the iso-center position in the SFOV by L0, iso-center position S10, 10 cm below the point of 110, right 15 cm point to the R15, left point to the L15. Each phantom was placed on (L0, S10, 10 cm below the point of I10, right 15 cm point to the R15, left point to the L15). 30 times in each survey using brain CT protocol currently in use on university hospital compared the average value obtained the DLP (dose length product).

Results: Brilliance 64 CT equipment at each location average DLP values are L0 is 509 mGy·cm, S10 is 423.5 mGy·cm, 110 is 467.7 mGy·cm, R15 is 333.8 mGy·cm, L15 are 342.3 mGy·cm. 110 is 18%, R15 is 30.7%, L15 is a 32.8% decrease dose. In another experiment, the dose reduction compared to the position L0 iso-center, 110 is 18%, R15 is 30.7%, L15 is a 32.8% decrease dose. The devices both showed a statistically significant difference with p <0.05.

Key words: CT, MRI, Dose, Brain, phantom, DLP
Purpose: The 18~20G needle is used to CT contrast examination. Therefore, a patient has to apply a self-administering hemostasis and often experience bleeding in the course. Thus, we developed the new disposable transparent tourniquet for reducing. This study was to compare the usefulness between the proposed transparent tourniquet and the existing hemostatic methods.

Materials & Methods: A Satisfaction survey was conducted by 50 patients and 25nurses respectively from 05/09/2016 to 05/13/2016. The survey contained the satisfaction of the convenience, safety, sanitation, and wearing sensation of transparent tourniquet. We employed face-to-face interview on a scale of 1 to 5 . And X2 test and independent t-test were used for the statistics verification. (SPSS Version 22)

Results: As for the patients, the satisfaction levels were measured for each category with the gender, age, treatment department and the number of past CT contrast media examination counted as variables. As a result the satisfaction levels were more or less the same regardless of the variables with the p-value over 0.05. The following is the average satisfaction level for each category: 4.4 ± 0.53 in convenience; 4.28 ± 0.57 in safety; 4.52 ± 0.54 in sanitation; 4.16 ± 0.54 in wearing sensation. So the overall satisfaction level is measured at 4.34 ± 0.51. As for the nurses, CT work experience and the current satisfaction with tourniquet were counted as variables. The satisfaction level for each category is: 3.8 ± 0.7 in convenience; 3.6 ± 0.68 in safety; 3.4 ± 0.5 in sanitation; 3.9 ± 0.49 in hemostasis. The overall satisfaction level is 3.8 ± 0.3.

Conclusions: Patients' satisfaction levels were high with little difference among variables. Nurses' satisfaction levels were different with the transparent tourniquet depending on their work experience. This transparent tourniquet will be a starting point to minimizing patient's inconvenience and more studies are necessary to enhance their satisfaction.

Key words: CT contrast examination, Hemostasis, Tourniquet, Satisfaction survey, Chi square test

CT10-3

Noise Value and Dose Change of Each Organ by Beam Collimation and Equipment Noise Index Change

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Purpose: Equipment of General Electric (GE) adjusts dose based on Noise index (NI) to acquire images. The purpose of this study is to compare and analyze how practically the radiation increase/decrease has been applied according to the slice thickness of another human body tissue and NI change.

Materials & Methods: The equipment utilized in this study is DISCOVERY CT 750 HD (GE, USA), and the Phantom is CT abdomen phantom (PH-5, Kyoto-Kagaku, Japan). The experimental slice thicknesses were 0.625, 1.25, 2.5, 3.75, and 5mm and reconstructed in 2.5mm. As for the NI, Dose step was gradually decreased from step 1 to step 15 based on the Standard NI value. ROI was applied to 12 areas to measure noise. Doses were compared by using the Dose DLP values. For this research statistical analysis, ANOVA of SPSS (Ver.22) program was employed.

Results: The noise value comparison in slice thicknesses from 0.625~5mm, showed statistically significant differences (p<0.05). Significant difference was observed when comparing 0.625mm thickness noise with those of other slice thicknesses (p<0.05). Average noise values was compared with NI averages. As a result, the narrowest gap was found in 2.5mm followed by 3.75, 5, 1.25, and 0.625mm in order. The thicknesses of 0.625 and 1.25mm showed lower average noise values than the NI average whereas 3.75 and 5mm showed higher values. And the DLP values declined in each step within the range of 5.18~9.53%.

Conclusions: Depending upon the types of tissues with mutually different density levels, their noise values had a huge gap with NI. As for epigastric test, since 0.625mm thickness implies a huge difference in noise value and dose increase, 2.5mm would be most desirable to gain the closest image to NI. If the most appropriate slice thickness and NI are applied according to each test area, quality image would be obtained with optimal dose.

Key words: Noise index (NI), Beam collimation, Slice thickness, Region of interest (ROI), Dose Length Product (DLP)

CT10-4

An Audit of Paediatric Computed Tomography Examinations in Trinidad and Tobago

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Purpose: To determine whether there is unjustified use of Computed Tomography (CT) imaging in the paediatric population of Trinidad and Tobago.

Materials & Methods: A retrospective Study was undertaken. An analysis of all paediatric patients who had a CT examination at the Eric Williams Medical Sciences Complex was done over a twelve (12) month period. The total number of paediatric CT examinations and the number of reports reported as normal was collected. Examinations were categorized as follows: Brain Non Contrast, Brain Contrast, Chest, Abdomen, Chest/Abdomen/Pelvis and Brain Trauma. The numbers of each examination and normal reports were noted over a 12 month period.

Results: The number of paediatric cases over the 12 month period totalled 1,829. Trending demonstrated an increase in the number of studies by 47% from month one (1) to twelve (12). From the 1,829 examinations conducted, 1,113 studies were Brain Non Contrast of which 52% of the reports was normal. There were 276 Brain Trauma paediatric CT Scans recorded and reported; of this examination type, 79% was reported as normal. The data showed low volumes of CT imaging for Chest, Abdomen and Pelvis.

Conclusions: In conclusion the data suggest an increase in the use of CT for medical imaging of paediatrics. It could not be concluded whether there is unjustified use of CT for Paediatric examinations. Further analysis on referral criteria is required along with a review of the paediatric CT imaging protocols. Additionally data collection needs to be extended over 2-3 years to determine trending.

Key words: Computed Tomography, Paediatric, Radiation Dose
3. EDUCATION

ED1-1
Transformational Leadership in Relation to the Managerial Functions of Radiologic Technology Administrators of Selected Higher Educational Institutions
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Purpose: Using quantitative research method, the study determined the relationship of transformational leadership on the managerial functions of Radiologic Technology administrators of selected higher educational in the Philippines.

Materials & Methods: Three hundred forty-three (343) respondents representing 13 academic administrators, 45 faculty members and 285 students from the National Capital Region and Region IV-A served as the respondents of the study. The researcher used the descriptive research method in answering the research questions utilizing survey as the data gathering instrument. It used the SPSS for the statistical treatment of data using frequency count, mean, standard deviation, and Pearson product moment of correlation.

Results: The results of the study revealed that majority of the respondent-program directors/deans are female, master’s degree holders with 2 to 5 years of clinical experience, 51 to 55 years old with 16 years and above teaching and administrative experience. Likewise, majority of the respondent-faculty members are female who are master’s degree holders while most of them are within the 51 to 55 years age bracket who have 2 to 5 years clinical and teaching experience. The researcher also found out that the program directors/deans of the radiologic technology program are practicing their functions as academic managers with regard to administration and supervision, curriculum implementation, budget planning and implementation, monitoring and evaluation, and professional development. Likewise, the program directors/deans of the radiologic technology program are practicing transformational leadership in managing their academic departments or Colleges. The empirical evidence revealed that transformational leadership style is moderately related to the administration and supervision, curriculum implementation, budget planning and implementation, monitoring and evaluation, and professional development functions of the program directors/deans of the radiologic technology programs.

Conclusions: Based on the results, the researcher concludes that transformational leadership is a key aspect in managing the academic operations of radiologic technology programs.

Key words: Radiologic technology, Transformational leadership, Managerial functions

ED1-2
Multimedia Patient Education: Assessing the Perceptions of Patients and Staff
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Purpose: The study was designed to understand patient and staff satisfaction with the use of a multimedia presentation tool for radiation therapy patient teaching.

Materials & Methods: A PowerPoint presentation was developed and implemented into the Day One radiation therapy teaching sessions for a one-month study period. The PowerPoint featured graphics, text and a video component, which outlined the treatment process and the management of radiation therapy side effects. A literature review was conducted encompassing patient learning styles in the health care setting, and experiences with multimedia-based mediums for patient healthcare education. Quantitative surveys were designed to assess both staff and patient satisfaction with the use of the presentation.

Results: A total of 26 surveys were collected; 10 surveys from patients and 13 from the staff survey. Of the 44 survey questions between the two surveys, 15 questions yielded significant statistical trends. The patient statistical significances were: a preference for visual presentation of information, a desire to see information presented in more than one format, and effective use of the tool in their teaching session. The staff survey statistically significant responses included: acknowledgement of the merits of using the teaching tool, and the use of the tool lengthening the time for the teaching session.

Conclusions: A number of trends from this study were significant: patients enjoyed the use of the presentation, and radiation therapists saw its merit but had some difficulty incorporating it into the education session timeframe. Recommendations from this study include: further studies on the use of a visual tool in teaching sessions; the need for education on the use of the visual tool to allow better implementation into therapists’ preferred teaching method; and encompassing specific therapist preferences by using person specific visual presentations.

Key words: Multimedia, Perceptions, Visual, Kinesthetic learning

ED1-3
Synergism of Radiologist Residents and Radiographer in Teaching Pathology to Radiologic Technology Students
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Purpose: This presentation provides an overview of a partnership between radiology residents and a radiographer educator focused on teaching a radiographic pathology course for students enrolled in a radiologic technology program. The course structure, topics, timeframe along with assessment methods will be described.

Materials & Methods: In all aspects of medical imaging the goal is to produce quality images that the radiologist can review and make a diagnosis. The greater the understanding and knowledge the radiologic technologists has related to disease concepts and etiological considerations the better they understand what the radiologists is looking for and can strive to produce quality images to assist the radiologist in rendering a diagnosis. In support of quality images a unique partnership at Indiana University School of Medicine Department of Radiology was created focused on teaching a radiographic pathology course for students enrolled in the radiologic technology program. The course is coordinated by a faculty member in the program who works with radiology residents who teach the majority of the course. This presentation will describe how the synergistic partnership between radiology residents and
radiographer was developed along with logistics of the course and intended outcomes.

**Results:** Throughout the course radiology residents gain valuable teaching experiences and create a respectful dialogue with the students. The faculty radiographer guides the course and provides insightful teaching critiques to the residents. Residents improve their teaching throughout the course and employ active teaching and learning strategies to engage students in learning.

**Conclusions:** The synergistic educational approaches of having radiology residents teach a radiographic pathology course coordinated by a radiographer faculty member have benefited both students and residents. Radiology residents receive valuable teaching experiences and the students benefit from the respect and educational knowledge from the radiology residents in support of quality imaging and good patient care.

**ED1-4**

**History, Current Status and Capacity Building of Radiography Practice in Ghana**

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**Purpose:** To evaluate the educational and current status and practice of Radiography in Ghana. To spell out the achievements as well as challenges in the Professional practice.

**Materials & Methods:** A nationwide outbreak of tuberculosis, among miners in 1929 saw the establishment of an X-ray Unit at Korle-Bu Hospital for early treatment done by colonial government. Under the management of British radiographers with trained nurses as assistants. By 1951 a formal training School under the Ministry of Health was established at Korle-Bu Hospital for local training. Earlier Radiographers were called "X-ray Operators" later referred as Radiologic Technicians. and awarded Proficiency Certificate by Ministry of Health. Radiography education and practised had evolved through the ages and advanced in healthcare delivery coupled with the principle of evidence-based medicine and enhanced by modern technological advancements from very simple and primitive technology to computerized technology. Radiography has indeed developed fast in Ghana. 2002 saw the establishment of the University of Allied Health Sciences of which Bsc Radiography Commenced, which comprised of 4 years academic and practical causes with a year of internship. Therapy Radiographers were also trained locally which primarily started with 4 students (3males and a female). By 2012 the MSc program in Ultrasound was established. Currently there are over 250 Radiographers.

**Results:** There are about 366 Diagnostic centres in the country. Most of these units are equipped with Mammography Units, CT scanners, Ultrasound, few with MRI. The Ghana Society of Radiographers (GSR) is the professional body of all Radiographers and its practice regulated by the Allied Health Professional Council (AHPC). However a few challenges include poor placement on a scale on the Payroll, Frequent breakdown and primitive technology to computerized technology. Radiography has indeed developed fast in Ghana. 2002 saw the establishment of the University of Allied Health Sciences of which Bsc Radiography Commenced, which comprised of 4 years academic and practical causes with a year of internship. Therapy Radiographers were also trained locally which primarily started with 4 students (3males and a female). By 2012 the MSc program in Ultrasound was established. Currently there are over 250 Radiographers.

**Conclusions:** Radiography has indeed advance over the years with more qualified personnel and advances in equipment.

**Key words:** Radiography, Therapy, History, Practice

**ED1-5**

**The Evaluation of Radiation Protection Awareness Among Health Workers at the Mbeya Zonal Referral Hospital.**

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**Purpose:** The objective of this study was to evaluate the knowledge and awareness among health workers on radiation protection at Mbeya Zonal Referral hospital.

**Materials & Methods:** From first to 30th April 2016, a questionnaire was distributed among the conveniently selected number of doctors, intern doctors, Assistant medical officer students and nurses who work closely with the radiology department from different sections of MZRH including Emergency and outpatient department, theatre, psychiatry department, surgical department, AMO students and nurses. Score were given to these groups and thereafter analyzed.

**Results:** Sixty three participants were involved in the study and the average score for doctors was 56 percent, intern doctors got 50 percent. The Assistant medical officers score was 41 and nurses got 46 percent which was below fifty percent average of the total participants. However no statistical analysis was attempted to see whether significant differences exists between the groups.

**Conclusions:** Though it is a small study, its findings shows that the knowledge and awareness of radiation protection among health workers is relatively low. Therefore efforts on continuing education through existing fora at MZRH merit reinforcement from all players including reviewing curriculum at AMO schools in Tanzania to encompass radiation protection knowledge. Nevertheless, further large studies need to be conducted before major conclusions and recommendations are made.

**Key words:** AMO=Assistant Medical Officers

**ED1-6**

**Critical Thinking And Decision-Making In Clinical Radiographic Practice-Implication for Education and Training**

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**Purpose:** To explore student radiographers’ critical thinking and decision-making skills within clinical diagnostic radiography. The scope of diagnostic pathways are expanding to meet increased demand on existing imaging services and additional pressure to provide these services within shorter time frames. This a challenge in itself given the increasing complexity of imaging investigations and the increasing volume of radiology examinations being carried out. If radiographers are to deal effectively with complex change dynamics within the profession, then their ability to think and reason needs to be highly developed.

**Materials & Methods:** An interpretive research methodology was employed where data were collected via semi-structured interviews using a 3 year longitudinal study design. Audio recordings were transcribed and data were analysed using content and thematic analysis.

**Results:** Several themes were revealed: evaluating information,
choosing reliable reasons; modifying thinking in routine and complex situations; ethical and moral reasoning and impact on patient care and consequences of poor decisions. Students perceive that decision-making involves the use of critical thinking skills however they are unsure of what those skills are and how they develop these.

Conclusions: Students do not understand what critical thinking is, which skills it involves or how to develop those skills. Educationally, although comparatively simpler to teach student radiographers the techniques required to master clinical radiographic practice skills, it is much more difficult to teach student radiographers how to use their critical thinking abilities to the extent required in graduate autonomous practice. Review of pedagogical practices and clinical placement learning is suggested; implementation of learning activities that foster the development of critical thinking skills to enhance decision-making in clinical practice are recommended.

Key words: Critical thinking, Reasoning, Evaluation, Decision-making

ED2-1
"It’s Just Lunch" Teaching Radiographers How to Teach Via a Novel Six-Part Lunchtime Series
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Purpose: Tan Tock Seng Hospital (TTSH), Singapore is a 1500-bed acute general hospital that provides clinical education for students. On the Ministry of Health (MOH) standardized health professions student feedback, radiography students rated TTSH radiographers teaching effectiveness poorly. A follow-up study demonstrated that though willing to teach radiographers lacked teaching competencies. "Lunch and Learn" is a six-part didactic course designed using adult learning theories to teach radiographers how to teach. It was scheduled to accommodate radiographers’ busy clinical duties. This study aimed to determine if "Lunch and Learn" improved students’ learning experience.

Materials & Methods: "Lunch and Learn" ran monthly from January 2015 to June 2015 for 120 radiographers. Each session lasted 55 minutes and repeated over 1 lunchtime. A bento-box lunch was provided. Topics included: coaching, supervision, teaching and learning concepts, asking good questions, basic assessment skills, giving constructive feedback and reflective practice. MOH student feedback tool was heightened to radiographers. Using a 4-point Likert scale (1 - strongly disagree, 4 - strongly agree) students rated 6 aspects of clinical learning (facilities, clarity and accomplishment of learning objectives, instructor’s time commitment and effectiveness, overall experience) at the end of each attachment. Student ratings before and after "Lunch and Learn" were compared.

Results: Most ratings were either 3 or 4, therefore changes within this narrow range were scrutinized. The mean student ratings for all questions improved. Improvements ranged from 0.07 (2%) to 0.24 (6.7%). The improvement was statistically significant for Question 2 (clarity of learning objectives) (before 3.52, after 3.67; +4.1%, p=0.02) and Question 3 (accomplishment of learning objectives) (before 3.48, after 3.71; +6.7%, p=0.007).

Conclusions: "Lunch and Learn" was effective in teaching large numbers of radiographers quickly given numerous operational constraints. The model is a viable quick-start to establish a baseline for effective teaching to enable development of more teaching skills.

Key words: Critical thinking, Reasoning, Evaluation, Decision-making

ED2-2
Guidelines for Imaging to Estimate Bone Age in Medico-Legal Situations
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Purpose: To promote awareness of the best practice guidelines resulting from collaborative between the International Society of Forensic Radiographers and Radiologic Technologists (ISRRT) and the International Association of Forensic Radiographers (IAFR)

Materials & Methods: Forensic radiography applies to any imaging that is used to answer questions of law. Refugees seeking asylum and human trafficking are a growing problem internationally. Some countries have suggested the use of radiography for age estimation to inform asylum seeker applications, as applications for asylum for children are processed differently than those of adults. Different imaging techniques have been suggested which include x-rays, ultrasound, MRI and CT.

Results: Medico-legal considerations for Radiographers include Justification (risk versus benefit) in a medico-legal setting, as well as obtaining valid consent. A Working Group led by the IAFR has consulted with other professions to establish what imaging techniques should be employed to minimise radiation dose to the refugee or victim of human trafficking whilst providing the legal authorities with the information required to estimate the age of the individual.

Conclusions: It is anticipated that the publication of these guidelines will assist Radiographers who image refugees or victims of human trafficking to ensure best practice is provided worldwide.

Key words: Bone, Age, Estimation, Refugee, Asylum seeker

ED2-3
An Assessment of the Clinical Competencies of Radiologic Technology Educators in the Philippines: Basis for Proposed Clinical
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Purpose: Radiologic Technology (RT) is faced with challenges as it is constantly developing. Development pertaining to the profession also implies changes to radiologic technology curriculum. The study aims to offer possible solutions and contribute for the improvement of instruction given by RT educators.

Materials & Methods: Respondents were RT educators and RT interns. Data were obtained using a self-made questionnaire. The scale used in the study was adopted from Miller’s Triangle of Competency Assessment (1990). Data gathered were treated using percentage, frequency, mean, standard deviation, Kruskal Wallis H test, and independent’s t-test. Seventeen Higher Education Institutions in the Philippines participated in the study. Result of the study was used as basis for the formulation of the Proposed Clinical Enhancement Program.
Results: Highest assessment in the competency of RT educators was found in all areas except in CT Scan, Ultrasound, Interventional Radiology, Radiation Therapy, and MRI revealing moderate level of competency, when assessed by RT interns. Majority of competencies has been found to RT educators with less than 18 units of teaching load, and are connected in other institutions like hospital. Attributes their competencies on faculty development program through sponsored in house seminar, financial support for conventions, and on provision for post-graduate education. RT educators attributes their clinical experiences to work-related clinical experience, clinical training in hospital, and internship training program.

Conclusions: There still exist moderate level of competency of RT educators based on the assessment of RT interns. It therefore revealed that there is still a need to improve all areas of professional subjects being taught. Since majority of competencies were attributed to work-exposure, it is viable to say that the Proposed Clinical Enhancement Program where the basis of content was derived from the result of the study, will be implemented thereof.

Key words: Clinical competency assessment, Assessment of RT educators

ED3-1
A Study on the Job Competency of Radiological Technologist in Korea
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Purpose: In Korea, radiological technologists have taken license examinations hosted by the country since 1965. As a result, over 40,000 people have acquired the license as a radiological technologist and among them, approximately 51% of them are engaged in medical institutes. However, standards with regards to the job competency of radiological technologist are yet to be established in Korea. Therefore, this study aims to clarify the job competency of radiological technologists and prepare a detailed measurable standard with regards to the job evaluation of radiological technologists.

Materials & Methods: Materials related to the job competency of domestic and overseas radiological technologists were analyzed and the identified results were used to prepare the draft for essential job competency of Korean radiologists. Based on it, surveys were conducted on groups of job specialists and advices were sought from job competency specialists for complementation and arrangement.

Results: The job competency of Korean radiologists was comprised of 5 modules and 23 elements. As for the characteristics of the contents, while the job competency of radiological technologists was usually constrained to radiation tests, treatment with the training restricted to the fundamental theory with regards to such in the past then evaluated through national examinations, this study significantly emphasized and expanded the perspectives with low proportion in the existing job areas of radiological technologists such as the attitude of a radiological technologist as a specialist, the legal and ethical qualifications, communication, infection control, drug control and others.

Conclusions: The standard for ‘essential job competency’ required in the integrated work execution in medical institutes by shifting away from simple technical executions with regards to clinical testing and treatment has to be set for training then evaluated in license examinations. In particular, ‘a standard for job competency’ required commonly in radiological technologists in other countries in the world has to be prepared.

Key words: Radiological Technologist, Standard for Job Competency

ED3-2
Simple And Effective Way of Teaching Useful Optical Density Range in Radiography
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Purpose: To introduce a simple and effective way of teaching radiography students, the useful optical density range.

Materials & Methods: Materials used- Diagnostic X-ray machine Aluminium step wedge / handmade water steps tool X-ray cassette with films Densitometer Method: -The students are instructed to keep the step wedge on the cassette on the x-ray table and centre and collimate the x-ray beam to the step wedge. Then select suitable exposure factors and make the exposure. Process the film. Measure the densities on the resultant film strip and tabulate them. Then plot a graph density verses step number and comment on the shape of the graph.

Results: This helps them appreciate how each step is differentiated easily with different densities when those density values lie in the region of the straight line portion of the graph. The range of densities within the straight line region is called useful density range: they will also note the lower and upper limits of the useful density range.

Conclusions: This is a simple way to teach the students in early stages even before they are introduced to the x-ray film characteristic curve and the sensitometry. They will learn what optical density means, how to measure the optical density and the densities differentiable to the human eye. They also learn why it is important to have the structures to be radiographed should be represented by the densities in the useful density range. This can be extended to show the effect of over and under exposure by using different exposure values. It can also be shown when a aluminium step wedge is not available a water step tool can be made by using PVC tubes cut in to different lengths and paste them in a raw on a radiolucent sheet of plastic and later filling the tubes with water.

Key words: Optical density, Densitometer, Useful density range, Characteristic curve

ED3-3
Widening Access to Medical Imaging Education in Regional Australia.
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Purpose: Encouraging Health Care graduates from major cities to live and work in regional areas has been historically challenging. This has meant poor provision of healthcare services for country Australians and poorer health outcomes. It is thought that the greatest chance of retaining staff regional areas is by having “home grown” graduates. Access to Metro Universities to those from regional and rural areas can be prohibitive due to high cost of city living.
ED3-5

Status of Radiological Technology in India
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Purpose: There is sudden spurt in the growth of new X-ray teaching institutions/shops opening up at every nook and corner of the country without any infrastructure and trained manpower. There is no check/legal requirements for practicing radiography in private centers except in radiotherapy centers and government centers. Even there is wide variation in the course curriculum, no uniformity in teaching methodology, accent regard to radiation protection and quality assurance.

Materials & Methods: India is included in the health care level II Category (1 physician per 3000 - 10000 population) by United Nation Scientific Committee on the effect of Atomic Radiations with 15000 x-ray examinations per million population (UNSCERAR 2001 report). About 52 million chest X-ray examinations are done per year in India and all other X-ray examinations taken together may constitute slightly more than 100 million. Qualified Radiographers in India. There is no definite information about the qualified radiographers in India, but we can say about the operators of X-ray, radiological equipment including both qualified and unqualified roughly estimated from different sources is about 0.1 million. Different designations of Radiological Technologists prevalent in India are

Results: Keeping in view the importance of allied health professional in the health care the Ministry of Health and Family Welfare Government of India took the initiative and constituted 12 National Curricula Redesign Taskforce groups including Radiology Technology comprising of academicians and professionals from the best institutes and colleges across the country.

Conclusions: The final curriculum with newer name Medical Radiology and Imaging Technology has been reviewed and approved by the National Curricula Review Committee.

Key words: Radiological, Technology, Radiographers, Teaching and training

ED3-6

MRI Signal Simulation by Matalb for Medical Imaging Teaching
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Materials & Methods: The Medical Imaging Program at Central Queensland University is based in regional Queensland and commenced in 2011. Students have the option of studying by distance for the first year. A course website delivers the materials by recorded lectures and live interaction through regular online tutorials. The tutorials enable the students to engage with the tutor and fellow students. A compulsory two day residential school each term provides the practical labs for distance students. A one week observational placement is provided at the end of the second term. Both internal and distance students have equal opportunities and join together on site for year 2.

Results: Approximately 50% of each cohort has chosen this option. Enabling students to do this reduces cost of training. Many are first in family University students with increasing numbers from lower socio economic backgrounds. Students are been offered jobs before completion of course at placement sites. Managers of clinical facilities in regional locations express a preference for hosting students who are likely to want to work in that community after graduation.

Conclusions: Widening access to a larger demographic could help ease problems of workforce shortages in traditionally hard-to-recruit areas. This could improve access to medical imaging services to smaller communities. A study of long term destinations of students from the program is planned for the future.

Key words: Distance Education Student Rural Remote
Purpose: The objective of this research project is to cast a MRI teaching demonstration system in the laboratory environment and assist student to learn MRI through interactive simulations in the Internet accessible learning environment.

Materials & Methods: Two graphical user interface (GUI) platforms were built using MATLAB to simulate the magnetic resonance imaging reconstruction process. Assuming an ideal noiseless condition is setup and the Magnetic Resonance signal intensity is proportional to the image pixel intensity. The GUI-based simulation provides students online demonstrations of combined resonance signal, k-space construction, and FFT used to decompose signal from frequency domain back to spatial domain in an interactive fashion.

Results: Two graphical user interface based platforms were developed. The first one simulates the magnetic resonance signal, Fourier transform and magnetic gradient concepts. The second one lets users upload any image and simulates the two dimensional MRI image reconstruction.

Conclusions: In the graphical user interface (GUI), user can adjust the relative input parameters of the MR signals and see the data space results. Through this interactive way, the tutorial GUI can effectively help students understand related magnetic resonance imaging principles and concepts.

ED3-7
Teaching Physics to Medical Radiation Student Technologists in RMIT University Australia
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Purpose: Adequate knowledge in physics is the basic requirement for any medical radiation technologists working in medical radiation centres where ionizing radiations are used. The purpose of this paper is to discuss the challenges we face in teaching physics to the undergraduate students in the discipline of medical radiations at RMIT University, Australia.

Materials & Methods: Although laws of physics are applied in the development and use of diagnostic and therapeutic medical equipment, the physics is not loved by the students as a subject as it should be. There are 13 medical radiations physics courses (including radiography, nuclear medicine, radiotherapy, CT, MRI, and Ultrasonography) are taught in undergraduate medical radiations program in RMIT University. In this paper teaching methods of medical radiation physics will be discussed and students’ approach to learn this subject in this department will be analysed. The teaching techniques and initiatives will be discussed along with their success and failure.

Results: It is evident that students in medical radiations program look at physics differently compared to the students in other physics programs. In medical radiations students are eager to see more direct applications of physics compared to the basic theory behind it. Some students believe that it is impossible to be a good radiological technologist without having proper understanding of physics.

Conclusions: It is somehow an established idea that physics is a difficult subject to learn. So students have a general repelling attitude toward learning physics. But with the modification of traditional method of physics teaching by showing its application in the field of medicine it is possible to change students’ attitude to learning physics.

Key words: Physics teaching, Medical radiations

ED3-8
Collaboration and Teamwork: Interactions for RT’s Professional Practice
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Purpose: This paper outlines a structured approach used in a medical imaging degree program to scaffold the generic skills of collaboration and teamwork that are essential for professional practice. In particular, the activities used in a final year unit will be described and the outcomes presented.

Materials & Methods: The strategies and tools adopted to assist the student learning experiences include interprofessional learning in a first year unit, small group peer learning experiences during practical sessions and tutorials across multiple units in second and third year, through to a final year unit conducted in a workshop format using a collaborative learning space. The use of social learning spaces instead of formal lecture theatres enables students to interact and engage with peers and tutors. A number of activities requiring collaboration and teamwork are used in these learning experiences.

Results: Students learn about teamwork in Foundations of Clinical Practice, a first year unit which incorporates interprofessional tutorials where students work together on activities and participate in a team assessment of interdisciplinary practice. The final year unit, Review of Contemporary Practice, requires students to work as a team to select and research a topic related to medical imaging and to present the results as an oral conference presentation and as an electronic poster. This unit is timetabled into a collaborative learning space equipped with multiple tables and computers with large screen monitors.

Conclusions: Student interaction and collaboration is essential to completing the tasks and activities assigned to the units described. The use of social learning spaces enables a teamwork approach and collaborative environment to engage students in skills essential for professional practice.

Key words: Collaborative learning, Teamwork, Social learning

ED4-1
The Current Situation of Radiological Technology Education in Vietnam and the Dream for Changes to Develop
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Purpose: The Radiological Technology (RT) education in Vietnam currently suffers from many difficulties in the way of integration with the world. The main purpose of this oral presentation is to provide an overview of RT education in Vietnam and we need the sharing experiences from experts and other friend countries in orientation of improving the quality and development of RT in Vietnam. We need the advice because we are actually “in the forest”, we need your help.
Factors Affecting Radiographers’ Willingness to Practice in Rural and Underserved Areas in Nigeria

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Purpose: To assess factors associated with Radiographers’ willingness to practice in rural and underserved areas in Nigeria. Materials & Methods: The study adopted the cross sectional survey. All the final year students of Departments of Radiography in two tertiary institutions in Southeast Nigeria participated in the study. A total of 198 final year students were enlisted into the survey. A researcher-developed questionnaire was the instrument for data collection. The questionnaire elicited questions on willingness to work in rural and underserved areas based on socio-demographic characteristics, remunerations, security, working conditions, peculiar incentives, extrinsic and intrinsic motivations.

Results: A total of 27% of the student radiographers showed strong willingness, 32% showed weak willingness and 41% showed unwillingness to practice in the rural and underserved areas in Nigeria. Age, sex, remuneration, peculiar allowances and security were strongly associated with willingness to practice in the underserved areas (p<0.05). Love for patient care, job satisfaction, provision of accommodation and opportunity for professional development had weak association (p>0.05) with willingness to practice in rural and underserved areas.

Conclusions: Some recommendations for reforming the training program in order to improve the quality of education for RT in Vietnam will be given in this oral presentation related to referring the training program of other countries; improve curriculum; building the standard competency for RT Vietnam, connect with friend countries in education, etc. Key words: Radiological Technology Education, Training program

Use of Online Social Media for PD Amongst Radiographers, Radiation Therapists and Nuclear Medicine Technologists in Australia and Canada

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Purpose: Background: Social media allows access to professional development (PD) regardless of geographical location or occupation. It is has the potential to provide equitable, immediate and quality PD for medical imaging workers. Purpose: The project aimed to investigate the perceptions and use of online media to support professional development activity amongst radiographers, radiation therapists, nuclear medicine technologists and sonographers in Australia and Canada.

Materials & Methods: A mixed-methods non-identifiable online survey (using Qualtrics) was circulated via email to members of the Canadian Association of Medical Radiation Technologists and the Australian Institute of Radiography, following institutional ethics approval. The survey collected data about current use of online media for PD, and satisfaction of use; likelihood of future use; and degree of agreement with fifteen statements regarding the use of social media for PD.

Preliminary results: As of April 4, 2016 a total of 132 members had responded to the survey including radiographers (53%); radiation therapists (37%); nuclear medicine technologists (10%); and sonographers (1%). The online mechanisms most frequently used by respondents for PD are self-directed learning (88%); Intranet (80%); Google (75%); electronic Journals (63%); journal databases (60%); and Wikipedia (51%). A correlating degree of satisfaction was indicated with the use of these platforms. The least used online platforms for PD are Instagram (3%); Twitter (5%); LinkedIn (10%); online Journal Clubs (11%); and Facebook (17%).

Conclusions: Social media use is common for PD regardless of occupation. Availability, speed and ease of access appear to be primary motivators behind the choices of platforms. Respondents identified risks with social media use including unprofessional online behaviour (84%); difficulty in removing uploaded information (83%) and the need for enabling privacy settings (98%). However there is a strong agreement (96%) that there is a need for education around the PD online media opportunities that exist.

Key words: Social media, Professional development, Online learning

What Difference Can Portfolio Make In Radiographer Work Practice

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Purpose: The achievement of e-portfolio is reinforcing beyond the assemblage and reflection of professional development and for the assortment of credentials, deeds, accomplishments, and certificates. It has multirelates in augmenting knowledge, offering
competency in problem elucidation and lifelong learning skills. This piece of research assayed to interpret the radiographer’s perception, approach, and level of understanding en routed towards e-portfolio in their current practice.

**Materials & Methods**: Hundred-forty two radiographer’s perception assessed towards e-portfolio quantitatively in both pre and post intervention phase to appraise their view in the direction of adapting e-portfolio in the context of lifelong learning. The quantitative data collected through questionnaire with 5-point Likert scale before and after intervention. The intervention conducted in the form of training, which includes lecturing, handouts, and training in e-portfolios definitions, aim, types, function, utilizations and structured reflection.

**Results**: Ninety-nine completed questionnaires obtained at pre-intervention phase resulting in 71% of response rate, and it has been plunged by 62% at post-intervention phase being only 78 samples responded. However, post-intervention outcome spectacle a surge in discerning to pre-intervention responses, which indicate that training, plays a major role in improving radiographer’s perception towards e-portfolio.

**Conclusions**: Our output during pre-intervention vividly shows paucity towards the radiographer’s discernment about the electronic compilation of professional and personalized facts. On the other hand, post-mediation stage up surged the appropriateness to have a sole e-portfolio. Adopting commercially available e-portfolio is favorable, but a tailored one to satisfy an individual professional need will applaud routine and prospective outlining.

**Key words**: Radiographer’s, E-portfolio, Lifelong learning, Professional development

**ED4-6**

**Radiation Therapy Education and Certification in Ghana**

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**Purpose**: In response to the need of adequately trained Radiation therapists in the health delivery system of Ghana, a Bachelor of Science in Therapy Radiography Programme was established by the University of Ghana School of Allied Health Science in 2014. It has been the only institution training Radiation therapists and Radiographers up to now. Prior to this the few therapist in the country were initially trained abroad of which some serve as lecturers and clinical tutors to the Programme now.

**Materials & Methods**: Over the years, the Radiation therapy programme in Ghana has grown from initially admitting local students to admitting foreign students from Africa mostly Nigerians and the program runs bi-annually with a maximum student intake of eight. The entire duration of the Programme is four years followed by a one year compulsory clinical internship at the National Centre for Radiotherapy and nuclear Medicine, Korle-bu teaching Hospital. There is also Vocational clinical training which is supervised during inter-semester breaks. Students take general course together with their colleagues in the General Radiography Program during their first and second year after wish they branch into more specialised courses like Dosimetry, Treatment planning, Patient setup etc. in their third and final year. An external examiner mostly from abroad examines the students in their final clinical practicum exams before students graduate.

**Results**: In order to practice in Ghana, students then undertake their one year compulsory clinical training at the National centre for Radiotherapy followed by a registration exams with the Allied Health Profession Council. Successful candidates are issued with their licences and are posted to either of the three Radiotherapy Facilities in Ghana for job placement.

**Conclusions**: In future changes will be required to establish such Program in the other public universities, increase student intake, run it yearly, ensure that certification remains of high standard and recognition continues.

**Key words**: Radiation therapy, Certification, Education, Training

**ED4-7**

**The Benefits of a True Virtual Reality Medical Imaging Simulation Suite**

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Purpose: To show how a fully functioning virtual reality simulation suite can enhance student participation and learning.

Materials & Methods: Students require hands on learning which encourages them to actively think about information, make choices, and execute learning skills for defined physical tasks. Simulators have been used in the military and aeronautical industry for years and have been shown to dramatically increase both the cognitive and motor accuracy of the participants and decrease errors. Medical imaging education is a multifaceted integration of anatomy, science, and technical knowledge. Obtaining expertise is directly linked to the time devoted to practice. This time is difficult to achieve in today’s environment. Human models are expensive and have limited availability, inanimate models are reproducible, readily available, and more cost effective than human models however their efficiency in training is limited.

Results: Practice within a virtual simulation suite provides unlimited access to motor training together with instant accurate feedback to both the tutor and student. When training on live models, the student is evaluated by a tutor on different aspects of their technique. This can be subjective and difficult to consistently repeat between students and even on the same student on different dates. Conversely, this virtual teaching environment has the ability to collect a wide variety of data during each training session (e.g., precision, completion time, frequency or magnitude of errors, etc). Because these measures are objective, training can become more consistent across students.

Conclusions: Students today have had extensive exposure to various forms of technology. Whether such exposure has altered their attention for traditional lecture-style learning is still under debate; however students widely acknowledge an interest in virtual style learning platforms. Because these technologies have been shown to augment the learning of complex tasks, virtual education will likely capture the attention of students into the future.

Key words: Virtual Reality Radiography, Simulation,
ED5-3
Perceptions of Clinical Preparedness Among Radiologic Science Students in JRCERT Accredited Programs
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Purpose: The purpose of this study was to explore the perceptions of clinical education preparedness among radiologic science students enrolled in programs accredited by the Joint Review Committee on Education and in Radiologic Technology (JRCERT).

Materials & Methods: A twenty-five question survey was mailed to twenty-four educational programs in the U.S. Survey questions were divided into three categories; social comfort, communication, and clinical confidence. Descriptive statistics and a correlation matrix were utilized to gauge students’ feelings of clinical preparedness.

Results: In questions specifying social comfort, student response were overwhelmingly positive. Students felt that they could positively handle themselves in social situations and in unfamiliar situations. The same trend to a lesser degree was reported in the communication category. When asked if they were comfortable communicating in a clinical environment the vast majority of students provided positive responses. Five and half percent of students did report that it was hard for them to express clinical opinions, 6.7% reported they were not confident in asking questions concerning clinical expectations, and 7.5% did not understand hospital jargon. In the last category, clinical confidence, students gave mostly positive responses. There was a noteworthy percentage of students (10.7%) did not feel valued as a member of the clinical, 6.7% did not feel well instructed on basic tasks such as patient transfer, and 11.4% did not feel they could perform basic exams. A correlation matrix revealed that there were significant weak positive correlations when questions indicating faculty/student interactions were correlated with the question asking students if they could perform basic exams.

Conclusions: The clinical learning environment is dynamic and unpredictable. Gaining further insight into student perceptions of their preparedness allows educators to examine and modify learning schemes to better prepare their students for their future careers.

Key words: Radiologic sciences, Clinical education, Clinical preparedness

ED5-4
Trainspotting - Cancer & Addiction
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Purpose: Cancer patients with addiction issues are a high risk group that require broader health care input, including health improvement & targeted interventions. As therapy radiographers are not well equipped to deal with this patient group and require specialist education and guidance. However, there are no addiction specialists equipped to deal solely with cancer patients. It is the case that these patients’ needs are not being met and there is an educational deficit.

Materials & Methods: A learning needs analysis was carried out amongst staff at the Beatson to assess whether there was a need for specialist education with regards to caring for patients with both cancer and addiction issues. The answer was a resounding yes. In order to address this unmet need a conference was arranged for autumn 2015.

Results: Many unexpected issues were raised, especially from the teenage cancer trust and the use of Legal Highs amongst their patient group. The Trainspotting generation was also raised as an issue as people who are opioid dependent have an excess risk of a range of cancers compared with the general population.

Conclusions: Patients with cancer and addictions are an important group to look at when investing resources into patient support and staff education. Addiction specialists need a new evidence base and guidance when it comes to dealing with cancer patients in order to educate us effectively. This is a considerable task as sympathy is often very low for drug addicts, who may be deemed by some as unworthy of care or attention.

This conference not only educated and enlightened, but also led to attitudinal change where the needs of those affected by drugs can now be met effectively and with empathy, compassion and respect, and where basic human rights and equality come as the result of informed, open and respectful debate.

Key words: Cancer, Addiction, Teenagers, Legal Highs

ED5-5
The Role of Radiography in Mass Fatality Incidents
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Purpose: To promote the valuable role that radiographers can play in the event of a Mass Fatality Incident

Materials & Methods: X-rays have been applied to forensic examinations for over 100 years but the last 10 years has seen rapid development and expansion of this field; including the use of post-mortem CT and angiography. A group of radiographers in the UK took the lead when the need for a trained team of forensic radiographers ready for rapid deployment in mass fatality events was identified. They created the United Kingdom Forensic Radiography Response Team (UKFRRT). This has now developed into a sub-group of the International Association of Forensic Radiographers (IAFR) who lead in the development, training and standards for radiographers who provide forensic imaging services. The application of radiography to emergency preparedness and disaster victim identification has seen a huge expansion and the London Bombings investigation was one of the first times a forensically trained team of radiographers, UKFRRT, was deployed as an integral part of the emergency mortuary team.

Results: Lessons learned from past experiences and considerations when establishing a Forensic Radiography Response team will be discussed. As part of the multidisciplinary team in disaster victim identification following a mass fatality incident, radiographers are the experts in providing a high quality imaging service. It is important that we understand the value of the contribution that our images can make to the investigation, as well as the medico-legal considerations of being involved in such a situation.

Conclusions: Internationally, the use of forensic imaging continues to expand in disaster victim identification and emergency response. The forensic radiographer should play a key role in the provision of images that may contribute to the investigation.

Key words: Forensic, Radiography, Mass, Fatality, Incidents
4. GENERAL RADIOGRAPHIC IMAGING

GR1-1

Does Standing Posture Have an Influence on the Longitudinal Arch in Flatfoot Patients?

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Purpose: For general population, the sole of foot is arch-shaped. However, the contact area with ground is larger for patients with flatfoot. Because of the lack of arch buffer, a long walk may easily lead to pain for these patients. Flat foot has a certain negative impact on daily activity and exercise, and patients with severe flat foot could apply for exemption from military service.

Materials & Methods: We used Shimadzu Rad Speed SAFIRE, wood box, and 10×12 cassette. Thirty patients were enrolled in this study, and the arch angles were measured and compared with standing on one foot manner and two feet manner respectively.

Results: Taking x-ray with standing on one foot would lead to uneven weight bearing of the foot, tilting of the body, bending of the knee. The foot which stands on would bear more weight and would cause the arch angle becoming larger. On the contrary, when taking x-ray with standing on two feet, the feet would bear the weight evenly, and the arch angle could be assessed and measured appropriately.

Conclusions: The standing posture could give rise to correct arch angle for appropriate assessment and measurement.

GR1-2

High kVp in Abdominal X-ray: Evaluation using a Human Cadaver

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Purpose: Computer radiography (CR) and digital radiography (DR) are currently used as the recording methods in planar radiography. In CR and DR, the image brightness and contrast are not dependent upon the radiographic factors of kVp, filtration, mAs and SID. The use of high kVp and low mAs setting can reduce the patient’s absorbed dose.

Materials & Methods: Following ethics approval a human cadaver was obtained and a series of AP supine abdominal x-rays were taken. The images were captured using a Kodak 850 CR system and new PQ 35x43cm image plates. Entrance dose reading were obtained using an Unifors dosimeter detector. Various kVp levels from 60 to 125kVp were selected. The AEC was used for the first mAs setting and then reduced by approximately 25% for 5 exposures. Radiologists were asked to score the image quality of the images. Visual grading analysis (VGA) was used for comparison against a reference image. An alternative statistical analysis method was used, that of linear mixed model (LMM) using restricted maximum likelihood, as current parametrical statistical tests are problematic in the analysis of ordinal and discrete data.

Results: As the kVp increased, the entrance dose and hence absorbed dose to the cadaver reduced. As the kVp increased exposure indices were maintained within departmental standards. VGA scores showed that higher kVp setting can be used in abdominal x-ray while maintaining image quality that was acceptable.

Conclusions: The maximum kVp setting that was acceptable varied between soft tissue and bone markers though overall higher kVp and lower mAs setting can be used in abdominal radiography. The kVp / mAs setting that were acceptable provided dose reduction to patient of between 1.4 and 4.0 times that of the departmental standard setting used. The LMM statistical analysis model can be used to overcome the analysis of ordinal and discrete data.

Key words: Computed radiography, Digital radiography, Image quality, Dose reduction, High kVp

GR1-3

New Lateral View Method of Hip Joint radiography

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Purpose: Improvement of conventional lateral view method of hip joint radiography.

Materials & Methods: Two conventional methods, Lauenstein method and Danelius-Miller method, are well known as a lateral view method of hip joint radiography. However, these methods have an advantage and disadvantage respectively. Lauenstein method gives high image quality but this method is not easy to use owing to limited range of motion of hip joint of a patient in the case of trauma with a femoral neck fracture. On the other hand, Danelius-Miller method is easy to use but this method degrades the image quality owing to high subjective contrast caused by overlapping femoral head with acetabulum and pubis. In this method we must use wider gradation output technique or higher voltage X-ray technique to observe whole femoral neck include head. To solve these problems, we improve posture of the Danelius-Miller method. In proposed method we raise the diseased hip keeping 45 degrees using dedicated positioning block so that the diseased side of ilium is perpendicular to incident X-ray. Then we design the positioning block for fixing a patient’s hip, lower limbs and a X-ray detector respectively using right-angled isosceles triangular prism.

Results: In terms of positioning, proposed method is harder than Danelius-Miller method but easier than Lauenstein method. On the other hand, in terms of frequency property, proposed method is inferior than Lauenstein method but superior than Danelius-Miller method.

Conclusions: By using proposed method we optimized the balance between the positioning difficulty and the image quality of lateral view method of hip joint radiography.

Key words: Hip joint radiography, Lauenstein method, Danelius-Miller method

GR1-4

A New X-ray Fluoroscopy Image Quality Processing -Validation in Diagnostic Bronchoscopy for Peripheral Pulmonary Lesions-
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Purpose: The image quality of X-ray fluoroscopy is important in diagnostic bronchoscopy for peripheral pulmonary lesions (PPLs). While conventional recursive filter reduces the noise, it also causes the afterimage. Recently, Adaptive Noise Reduction filter (ANR) was introduced to avoid the afterimage. However, its noise reduction ability is weaker than that of recursive filter. Therefore, Motion Tracking Noise Reduction filter (MTNR) has been developed to reduce both the noise and afterimage. This new image quality processing combines the spatial filter for dynamic areas and the temporal filter for static areas at detects motion. Our study is to visually assess usefulness of MTNR.

Materials & Methods: The difference in the image quality between MTNR and conventional recursive filter was assessed concerning following two points; 1) physical evaluation using the chest phantom with 20 simulated nodules (φ8 mm, +100 HU) by radiology technicians, and 2) clinical evaluation using the consecutively recorded 148 raw data in diagnostic bronchoscopy for PPLs (φ<50 mm, including solid and ground-glass opacity) by endoscopy doctors. These data were reconstructed with new and conventional processing, and then the image quality was assessed respectively.

Results: The image quality of MTNR was superior to that of conventional recursive filter.

Conclusions: MTNR improved the image quality of X-ray fluoroscopy, which will result in improving the quality of diagnostic bronchoscopy for PPLs.

Key words: Computed Radiography, Background Radiation, Imaging Plate, Artefacts, Radiation Fog

GR1-5
Does Natural Background Radiation Cause Radiation Fog on Computed Radiography (CR) Imaging Plates Stored in A Lead-lined Environment?
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Purpose: CR imaging plates are highly sensitive to background radiation. Hence, performing secondary erasure on imaging plates to remove existing radiation fog caused by scattered and background radiation is crucial to. Since lead is the universal standard material used for radiation protection, this study explores the possibility of employing 3mm lead-lined wall to reduce radiation fogging. Primary aim of the study was to examine the difference in film density of CR imaging plates that have been stored in a lead-lined and non-lead-lined environment. Secondary aim was to evaluate the time taken to develop radiation fog on CR imaging plates in these two environments.

Materials & Methods: Quantification of the film density of CR imaging plates, left in 3mm lead-lined room and a non-lead-lined room, was conducted in two phases. In Phase 1, three 24 x 30cm CR cassettes were placed in each environment for different durations at a four-hour increment until a visible image was formed. Three objects (wood, bone and metal) of different attenuating properties were placed on each cassette. Film density of subsequent images was measured using a densitometer. Data was analyzed using paired sample t-test.

In Phase 2, 11 radiographic abnormality detection trained radiographers, who were blinded from the study, analyzed the resultant images against a baseline image to identify radiation fog artifact. Responses were recorded on a questionnaire and compared with results obtained from Phase 1.

Results: Film density measured from imaging plates stored in a lead-lined environment is different from those stored in a non-lead-lined environment. Visible radiation fog appeared only after 24 hours.

Conclusions: Background radiation does affect image quality of CR imaging plates in both environments. Imaging plates that are stored in a lead-lined environment require a longer duration to produce visible radiation fog. The study has significant implications on the current method of maintenance of CR imaging plates.

Key words: Computed Radiography, Background Radiation, Imaging Plate, Artefacts, Radiation Fog

GR1-6
The Relationship between Body Fat Percentage and Bone Mineral Density
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Purpose: This study was used dual-energy x-ray absorptiometry of spine to investigate the relationship between bone mineral density (BMD) and body fat percentage (BFP) index.

Materials & Methods: Totally 343 participants (237 males and 106 females) aged 40-50 were enrolled in this study. The exclusion criteria included osteoarthritis, fracture history or receiving any treatment known to affect bone metabolism. Comparison of mean BMD values between two BFP groups (BFP>25 and BFP<25) was performed by Student’s t-test. Associations between BMD values and BFP were examined using Pearson correlation coefficient.

Results: Results demonstrated that males subjects had higher BMD values than females (0.937 ± 0.159 kg/m2 vs. 0.863 ± 0.270 kg/m2, p<0.05). Lower BFP (<25) had significantly lower BMD than BFP higher than 25 after adjustment sex and age (p<0.05). There was significantly positive correlation between the BMD and BFP (r=0.144, p<0.001).

Conclusions: Body fat percentage was risk factor of low bone density. The study demonstrated women and lower BFP were at a higher risk of osteoporosis.

Key words: BMD, BFP, T-test

GR2-1
Study on Reduction of Geometrical Distortion of Stitched Radiographic Images
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Purpose: The press-through-package sheet (PTP sheet) in which a tablet is wrapped is made up of plastic and aluminum. PTP sheet is downsized, and accidental ingestion by mistake occurs. Accidental ingestion of the PTP sheet requires attention because it may cause severe digestive tract laceration and perforation. PTP sheet has high X-ray transparency. It is difficult to make a PTP sheet depicted with plain radiography. We considered whether PTP sheet mixed in chest radiograph image could depict by energy subtraction.

Materials & Methods: We stuck a PTP sheet on a chest phantom, and changed the X-ray tube voltage and photographed it. Two images with different X-ray tube voltage were acquired and they showed differences in various proportions. It continuously displayed a series of images as a moving image. We performed visual evaluation on the created image and evaluated the possibility of detection of the PTP sheet.

Results: It was possible to visualize the tablet of PTP sheet by setting the ratio of subtraction in detail. By the kind of tablet, there was a difference in detection ability. As for the tablet of the PTP sheet, an X-ray absorption factor is unknown, and ratio of optimal difference is unknown. Unknown material can become able to depict a tablet by giving subtractive proportion width. We examined this new image display method for foreign object detection by using energy subtraction. We suggest that this method can apply in clinical to detect a PTP sheet.

Key words: PTP sheet, Energy subtraction, Subtractive proportion, Continuously displayed, Kind of tablet

Association of Visceral Fat Obesity with Prostate Cancer

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Purpose: Incidence rates of prostate cancer have been raising in South Korea, with change in intake of high fat western diet, reproductive patterns, lack of physical activity, and obesity.

Materials & Methods: The study was case control study and the patient groups were set as newly diagnosed cancer patients prostate cancer who visited at the Korean National Cancer Center hospital from August 1st, 2014 to January 6th, 2015. Undiagnosed cancer person as control group, who visited Korean National Cancer Center hospital for the health examination service by national health insurance from September 1st, 2009 to September 30th, 2014. The prostate cancer patients were 52 male aged ranges from 51 to 82 years with a mean age of 66.1 ± 7.1 years old and that of the control participants were 50 male aged ranges from 59 to 75 years with a mean age of 64 years old. The study on prostate cancer was conducted on a 3.0 Tesla Achieva and Achieva TX MR system (Philips Medical Systems, Best, The Netherlands). Measuring abdominal fat was used to approximate a level at the umbilicus or the fourth lumbar vertebra.

Results: There were no correlation between total calories intake and all of anthropometric measurements (waist circumference, BMI, abdominal fat ratio). Abdominal total fat was highest positive correlation with all of anthropometric measurements (p < 0.001), exclude abdominal fat ratio (r=0.43). There were no association between BMI or waist circumference and PSA or Gleason pathological score, but abdominal fat was association with prostate cancer Gleason score (r=0.5, p=0.001).

Conclusions: This study shows that abdominal fat ratio is useful as an indicator of risk factor on breast and prostate cancer as well malignancy.

Key words: Prostate cancer, Obesity, Fat ratio, FFQ

Evaluation of Diagnostic Quality of Chest Radiographs in A Nigerian Teaching Hospital

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Purpose: To evaluate the diagnostic quality of chest radiographs produced in a Nigerian Teaching Hospital.

Materials & Methods: The study adopted the cross sectional survey. A total of 540 radiographs from the records of the Radiology Department, University of Nigeria Teaching Hospital, Ituku-Ozalla, Enugu State were evaluated. All the chest radiographs were assessed for physical details, proper identifications, adequacy of collimation, display of entire anatomical details, full inspiration, presence of rotation, adequacy of penetration and throwing off the scapula. Data obtained were subjected to descriptive statistics.

Results: Out of the 540 chest radiographs evaluated 50.1 % met all the criteria for image of good diagnostic quality. Inadequate collimation was the greatest fault (32%), followed by inadequate arrested inspiration (28%), incomplete anatomical details (27%), inadequate penetration (21%), throwing off scapula (19%), presence of rotation (11%) and absence of proper patient identification (7%).

Conclusions: It was observed from our study that almost half of the radiographs (49.9%) produced in the Teaching Hospital had poor diagnostic quality according to the European guidelines. The interplay of the three important aspect of image acquisition in conventional radiography - diagnostic quality of the radiographic image, radiation dose to the patient and choice of radiographic technique - puts enormous challenges on the radiographer. The acquisition of radiographs of good diagnostic quality is dependent, to a large extent, on the skills of the radiographer, equipment condition and patient cooperation during the procedure.

Key words: Image evaluation, Diagnostic quality, Chest radiographs, Nigeria

GR2-5

Appropriate X-ray Imaging Method for Lateral Image of Elbow Joint Using Newly Developed Goniometer

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Purpose: As the elbow joint was grown from multiple epiphysseal nucleus, its anatomical shape is complicated. Conventional X-ray imaging method is not suitable for the lateral image of the elbow joint because of this anatomical features. So the aim of this study is to predict precise arm position from frontal X-ray image of the elbow to get true lateral X-ray, and develop special angle goniometer which supports while calculating.

Materials & Methods: Take frontal X-ray of the elbow, upper arm was placed on the receiving surface and biceps was immediately upward. Measure the three following angles on coronal plane of caput radiale from frontal X-ray. A: Angles of tubercle of trochlea (radial ridge of trochlea) and axis of humeral shaft degree. B: Angles of tubercle of trochlea (radial ridge of trochlea) and axis of contour of the forearm degree. C: Angle of coronoid process and olecranon fossa degree (this means trochlear groove). Predict the arm position of lateral image from these three parameters. We developed a special angle goniometer to measure these angles more easily.

Results: Regardless of age, gender, build, history of upper arm fracture, we got true lateral X-rays of the elbow in all cases.

Conclusions: We use the axis of contour of the forearm to correspond to varied radius forms. Additionally we measure the angle of coronoid process and olecranon fossa degree (angle C), we can predict the track of ulna when move from frontal position to lateral position. Using our angle goniometer, we can measure three parameters easily. This method was able to achieve more correct lateral X-rays and reduce the number of X-ray retakes and unnecessary X-ray exposure. Through this method, we hope evidenced-based examination is popular in radiological examination.

Key words: Cubital joint, Accurate image of elbow, Goniometer, Biceps brachii

GR2-6

Examining Practitioners' Assessments of Perceived Aesthetic and Diagnostic Quality of High kvP Low mAs Pelvis, Chest, Skull, and Hand Phantom Radiographs

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Purpose: The purposes of this research are to: (a) investigate practitioners’ image quality assessments of direct digital radiographic images acquired with different levels of kVp and mAs; and (b) examine practitioners’ perceptions regarding the practice of acquiring direct digital radiographic images with increased kVp and decreased mAs in an effort to optimize patient dose.

Materials & Methods: Following ethical clearance by Fanshawe College's Research Ethics Board, all radiologists, radiology residents, radiographers, and student radiographers from 8 clinical sites within the Local health integrated network (LHIN) were invited to participate in the study (N=100). The only inclusion criterion was to be a member of one of these professional groups at a LHIN clinical site, and to regularly review or acquire radiographic images on a regular basis; there were no exclusion criteria. These professional groups were selected because they are the individuals who are regularly involved in the acquisition and review of clinical radiographic images, this is consistent with most other dose optimization and/or image quality studies reviewed.

Results: For the Pelvis, Skull, and Hand, the standard imaging method, we hope evidenced-based examination is popular in radiological examination.

Key words: Knee, Pelvis, Chest, Skull, Hand, Phantom, Radiographs

GR2-7

Contribution of Radiology Technician in Rural Health Care in Developing Countries: Case of Blitta Hospital in Togo (West Africa)

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GR2-5

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GR2-6

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GR2-7

Contribution of Radiology Technician in Rural Health Care in Developing Countries: Case of Blitta Hospital in Togo (West Africa)

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Purpose: Evaluate the frequency of radiographic examinations, Appreciate the collaboration between radiology technician and prescribers, Evaluate the contribution of the radiology technician at the final diagnosis in the absence of radiologist.

Materials & Methods: We conducted a prospective study of one month. All radiographic examinations were included except those requested by the hospital. Our Radiology staff is composed of a certified radiology technician. There is no radiologist.

Results: Our study involved 45 patients (51% female and 49% male). The request is mostly prescribed by medical assistant and nurses (93.32%), from the general medicine services (93.33%) and physiotherapy (6.67%). No request has been addressed by a doctor. The demand patterns are dominated by the trauma (33.33%), followed by chest pain (20%), back pain (15.56%) and abdominal pain (11.11%). The radiography of the lower limbs were the most performed (31.9%), followed by the thorax (24.5%) and lumbar spine (14.9%). All effects made were consistent with presumed diagnosis and reasons for the request, except 6.50% of cases where the radiology technician took the initiative to carry out additional impacts. 66.8% of prescribers removed an x-ray pictures without a radiologist interpretation and without notice from the radiology technician, for a final diagnosis. 43.2% of the same prescribers are constantly referred to the radiology technician for radiological diagnostic opinion, although it is not qualified to interpret x-ray images. Its radiological opinion related to normal results 44.44% and 22.22% in degenerative lesions, also fractures (15.55%).

Conclusions: The radiology technician face enormous difficulties in developing country because he often works in the absence of the radiologist. Which obliges him to work beyond his privilege. Should we rethink the training of radiology technicians in developing countries to better equip them to respond effectively to the reality they face in rural areas. The ideal solution would telerradiology that is slow to start in these environment.

Key words: Radiology technician, Developing countries, Radiographic

GR3-1
A Study of the Correction Factor on the Femur Magnification Based on the Ffd in General Radiography
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Purpose: It is highly important to obtain accurate information of femur by radiography. Doctors can prepare a most suitable implant based on the femur measurement of length, width, and may increase accuracy and success rate and reduce radiation exposure of both patients and surgeons. The magnifying power of radiographic image differs by the Focus-Film-Distance (FFD) and requires correction coefficient by its distance, which further research has not yet been made.

Materials & Methods: We measured hip thickness of a total of 100 patients who underwent low-extremity examination. We set an Object-Film-Distance (OFD) value by adding a mean hip thickness of 125±25 mm with a distance from Detector to assistant apparatus(5 cm), and measured FFD from 140 cm, to 280 cm by an interval of 20 cm.

Results: As a result, a degree of magnification decreased as FFD value increased-1.2 at a mean distance of 140 cm, 1. 15 at 160 cm, 1.14 at 180 cm, 1.13 at 200 cm, 1.11 at 220 cm, 1.10 at 240 cm, 1.09 at 260 cm and 1.08 at 280 cm. Therefore, correction factor based on FFD is 0.83 at 140 cm, 0.87 at 160 cm, 0.87 at 180 cm, 0.88 at 200 cm, 0.90 at 220 cm, 0.90 at 240 cm, 0.91 at 260 cm and 0.92 at 280 cm.

Conclusions: As femur length in the image are multiplied by each correction factors, actual femur length can be acquired. The difference of magnifying power by equipment was not significant by applying a correction factor. Although there are limitations of erroneously measuring femur by hip thickness or penumbral, this study is useful in obtaining information of actual femur length.

Key words: Femur Measurement, Correction factor, Magnifying power, FFD, OFD

GR3-2
Effect on Entrance Surface Dose Change of Collimation at Auto Exposure Control on Digital Radiography System
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Purpose: The aim of this study is that changing collimation size effect entrance surface dose (ESD) according to using auto exposure control(AEC) at digital radiography system(DR).

Materials & Methods: This study was used XGEO-GC80 (SAMSUNG electronics, Korea) of X ray unit and Alderson radiation therapy phantom(Radiology support device, Inc). ESD was measured by UNFORS Xi(Unfor RaySafe, Sweden) what was located on center of abdomen of phantom. It was used 80 kVp, 20mA and 0.1 sec on non AEC mode and used 80 kVp, 200mA, top two ion chamber on AEC mode. Vertical collimation size was fixed as 18 inch and horizontal collimation size was changed from 18 to 14 inch. One-way ANOVA to compare the average ESD according to changing collimation size and Duncan’s multiple range test for post hoc test of the SPSS (Version 22.0, SPSS, Chicago, IL, USA) were used as statistical program. P-value(under 0.05) was considered to be statistically significant.

Results: The average ESD on non AEC mode was 378.76~387.86 µGy. Values of ESD according to collimation size changes were no statistical significance (p>0.05). All groups except collimation size 18 inch group were tied as same group at post hoc test. The average ESD on AEC mode was 686.23~739.12 µGy. Values of ESD according to collimation size changes were statistical significance (p<0.01). Each groups was independently separated at post hoc test.

Conclusions: The conclusion is when collimation size decreased, ESD increased on AEC mode at the DR system. Therefore, when collimation size is changing on AEC mode, it needs to using accurate AEC through detailed control of sensitivity of AEC.

Key words: Digital radiography system, Auto exposure control, Entrance surface dose, Collimation size

GR3-3
Factors Affecting the Magnification Rate of Panoramic Imaging and Changes Depending on the Features Among Devices
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Purpose: This study aimed to analyze the factors that affect differences in images obtained using different panoramic radiograph devices, and to investigate the factors that affect the magnification rate.

Materials & Methods: A dry skull was fixed first in order to ensure the reproducibility of the measurements. Subsequently, a total of 4 guita-percha (GP) cones (2 x 20mm, 2 x 10mm) were attached to the left maxillary canine and the right mandibular first molar. Cone-beam computed tomography (Alphard 3030; Asahi Roentiong Ind, Kyoto, Japan), images were taken for use as the control, and panoramic images were obtained using 3 different panoramic radiograph devices. The GP, canine, and molar lengths were measured in the images in order to compare their magnification rates.

Results: The GP cone lengths for each device were taken to be correction factors for the magnification rate. The magnification rates for the panoramic images obtained were calculated, depending on the region, to be 1.108~1.452 for Rayscan α(BAY Ind,Suwon, Korea), 1.095~1.462 for Cranex3+(Soredex Orion Corp., Helsinki, Finland), and 1.044~1.580 for Cranex D(Soredex Orion Corp., Helsinki, Finland). The mean magnification rates were 1.342, 1.270, and 1.372, respectively.

Conclusions: Proper corrections should be made so that panoramic images with a consistent magnification rate can be obtained using different devices. When using panoramic images to establish treatment plans for implant placement, the shape of the image layer and the factors affecting the magnification rate in each device should be determined; further, the fact that different magnification rates might be observed in different teeth should also be considered.

Key words: Panoramic Image, Magnification Rate, Image Layer, Dry Skull, Implant Placement

GR3-5

Radiography As A Global Profession
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Purpose: This paper explores the globalisation of radiography as an occupation to determine a global direction for the practice. Radiography is an occupation that, because of sophisticated technology, requires a high level of technological skill and knowledge. However, the global practice of radiography is diverse. Different tasks and expectations have evolved depending on the country in which the radiographer practices.

Materials & Methods: Websites and other available ephemera of various radiography agencies were interrogated to establish role, scope of practice, educational requirements, and registration requirements in 16 countries across five continents.

Results: Radiography has split into three distinct occupations of various radiography agencies were interrogated to establish role, scope of practice, educational requirements, and registration requirements in 16 countries across five continents.

Conclusions: These findings are significant for the classification of the occupation of radiography. The International Labour Organisation (ILO) currently classifies the radiographic occupation as technical and associate professional (Level 3). The ILO classification does not recognise diagnostic radiographers who operate at a professional level (Level 4). The identification of three distinct occupations within radiography can provide focus for the globalisation of the role. Countries use the ILO classification to determine wage levels, registration, education standards and migration of workers.

Key words: Globalisation, Radiographer, Technologist, Scope of practice

GR3-4

A Study on Exposure Factors and Deviation Index for a New General Digital Radiography System at University Malaya Medical Centre
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Purpose: To study on the current practice of radiographic technique at Biomedical Imaging Emergency Department of University Malaya Medical Centre

Materials & Methods: 30 Digital imaging and communications in medicine (DICOM) images for each part of the pelvis, spine, skull, chest and abdomen were taken from the picture archiving communication system (PACS). The kVp, mAs, s, deviation index (DI) and entrance skin dose (ESD) were recorded from the DICOM header, tabulated and analyzed. Observations of 30 cases of the body part that contribute to the highest doses were also conducted to analyzed the radiographers’ practice in choosing the exposure technique.

Results: The lateral lumbar recorded the highest ESD (1.03 - 9.58 mGy) followed by anteroposterior (AP) lumbar (0.77 - 5.7 mGy), abdomen/pelvis (0.73 - 3.09 mGy), AP/PA skull (0.23 - 2.55 mGy), lateral skull (0.07 - 1.38 mGy), AP cervical (0.06 - 1.31 mGy), lateral cervical (0.07 - 1.38 mGy) and posteroanterior (PA) chest (0.15 - 0.20 mGy). From the observation, generally the radiographer used automatic exposure control (AEC) with default exposure technique. The doses recorded were higher than those using manually selection of exposure. The DI of 0 to -1 had the highest dose (AP: 7.53 mGy; lateral: 9.08 mGy).

Conclusions: The recommended DI by the vendor is from -3 to +3. The optimal is at 0. Images with DI below -3 were also accepted by the radiologist. Further study with the collaboration of the radiologist and vendor is needed to set a more informative DI values to guide the radiographers in choosing a suitable exposure technique. An exposure chart with manual exposure will be very helpful in optimization in DR examination.

Key words: Digital Radiography, Lumbar spine radiography, DI
GR3-6
Presentation of Chest Radiology
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Purpose: In Bangladesh most of the low socioeconomic condition people are suffering from Lung Diseases. With the help of modern equipment, we can early diagnosis and treatment of diseases that reduces the consequences. Chest x ray is a painless, noninvasive test that depict of the structures inside chest such as heart, lungs, and blood vessels. 'Noninvasive' means that no surgery or invasive is done and no instruments are inserted into your body. Only by Digital Chest x-ray we can reduces suffering.

Materials & Methods: The study was conducted of 300 different Lung diseases patient at Gazipur area of Bangladesh. The sample was collected from one to one interview. Most of the patient are low socioeconomic condition and there age is less than 30-60 years both male & female. Record the patients history and clinical examination & get some relevant investigation. In this study scanning will be done by Digital X Ray.

Results: In this study, we conducted 300 patients most of the patient age is less than 30-60 years both male & female were included. They are suffering from various types of Lung diseases TB-Most the patient suffering from Tuberculosis - more than 30%, COPD-25-50%, Asthma-20%, Lung Infection-1-2% Pneumonia in adult -5-10%, Consolidation of Lung-1%, Lung Cancer-1-2%, Plural Effusion-5-10% occur.

Conclusions: We used digital x-ray and advance equipment. It is early diagnosis, proper treatment can reduce the rate of adverse effect and consequences then ultimately reduce mortality rate.

GR4-1
The Comparative Study of the Surface Dose and the Snr for Grid Use or Non-Use in the Time of Extremity Examination in the Dr System
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Purpose: Extremity examinations occupy a large portion in general radiography. There are many extremity examinations using a table detector or wall detector, but the greater part of these exams were performed without a cassette for the radiologist’s working convenience in digitalization of radiography equipment. In this paper we indicates the problem of excessive radiation dose using a grid in the extremity exams of general radiography. To reduce this problem, we experimented a case with the use of a grid and another without the use of a grid using the extremity phantom and compared the image quality and surface dose. We set this study theme in order to reduce unnecessary radiation exposure in digitalization of radiography equipment.

Materials & Methods: From the extremities, HAND and KNEE were set as samples. We obtained each image by dividing the cases into with a grid and without a grid, using a wireless detector while keeping the mAs consistent and increasing the conditions in 5kv intervals from 5kv to 65kv. For each image, we compared the image quality with the SNR measured using IMAGE J and we measured surface dose to compare radiation dose.

Results: During the HAND examination, we obtained similar SNR from the 50kv image without a grid and the 60kv with a grid and the surface dose from the two conditions showed a difference of approximately 6mR. During the KNEE examination, we obtained similar SNR from the 60kv image without a grid and the 65kv with a grid and the surface dose from the two conditions showed a difference of approximately 7mR.

Conclusions: We obtained the same SNR images with a small dose when a Grid was not used than when a Grid was used. Therefore, the effect of reducing the radiation dose of the patient in respect to the decrease of surface dose can also be expected.

Key words: Surface Dose, Signal/Noise Ratio(SNR)

GR4-2
The Effective Anteroposterior Oblique Angles to Evaluate Uncovertebral Joint Hypertrophy (UVH)
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Purpose: This study will be shown by examining the effective projection angles that might help UVH patients in relation to the hypertrophy of uncinated process in uncovertebral joint.

Materials & Methods: In a retrospective clinical study of 100 people who were undertaken C-spine MRI. (50 of men mean: 59.6 year olds, 50 of women mean: 62.3 year olds) in order to find out each angle of the midsagittal plane of the cervical vertebrae with uncovertebral joints and neural foramen. According to C-spine MRI T1 weighted axial images, it was measured average mean angles from C3-C4 to C6-C7 which are more affected areas of UVH. Normal people A,B uncinate process by changing the angle of coverage and dividing higher joint/lower joint and taking into account the error on measurement. Observationing sharpness with clarity and maximum size of the uncinate process.

Results: The angles of the midsagittal plane on the cervical vertebrae are obtained better and clarity of images with about 45° of upper cervical level and approximately 50° lower parts of the cervical. Correlation on the P values is <0.01. When it comes to the midsagittal plane of the cervical vertebrae and neural foramen angles are about 50° of the upper cervical spine and about 55° of lower cervical vertebrae. There is 5° ~ 9° different angles between neural foramen and uncovertebral joints.

Conclusions: Uncovertebral joint hypertrophy which is one of the common causes for nerve root compression is observed. The most effective angle views for uncovertebral joints are 45° of upper cervical level(C2-C3, C3-C4, C4-C5) and 50° of the lower cervical level(C5-C6, C6-C7) with taking images by rotating to the other side. Consequently, this study represents an optimal result to evaluate the uncovertebral joint hypertrophy.

Key words: Uncovertebral joint hypertrophy, Neural foramen, Uncovertebral joint

GR4-3
Research of Image Quality for the Change of Tube Voltage(kVp) and Beam Current(mA) in Abdomen X-ray Image.
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ABSTRACTS
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Within a large state hospital DICOM Optimisation is a fundamental requirement of University of Salford, The outcome result was for the sinus x-ray with parameters. Study data were then compared with default demographics and all available procedure/dose related knee. Data extraction was by bespoke software and included examinations assessed included chest, abdomen, shoulder and radiography rooms over a two month period. Radiographic Materials & Methods: Firstly, the plot profile and pixel value was measured in order to observe the change of image contrast by increasing kVp. The step wedge was placed on the table and the various conditions of kVp were exposed. Secondly, the abdomen phantom was placed on the center of detector, and the images were acquired at the various kVp (60~100 kVp) and mA (200~500 mA). Thirdly, MTF was measured at 200~500 mA. kVp and exposed dose were fixed at 80 kVp and 10 mAs, respectively. Finally, absorbed dose was accomplished with various kVp (60~100 kVp with AEC) and mA (200~500 mA, 80 kVp) by using photoluminescence glass dosimeter (PLD).

Results: The max-min pixel value of step wedge was increased when the kVp was increased from 60 kVp to 100 kVp. However, the difference was not significant because it was about 3.5 %. PSNR value was sufficiently revised using the post processing to 30 or more at 100 kVp. Moreover, PSNR value was measured more than 30 db within the mA range between 200 mA and 500 mA. The absorbed dose of lung, stomach, liver, kidney and bladder measured at 100 kVp without AEC, it was reduced than with AEC about 40.3%, 27.1%, 22.8%, 37.7% and 20.1% respectively.

Conclusions: The experimental results revealed that the AEC cannot provide proper exposure for minimizing absorbed dose while maintaining the image quality. Therefore, the research for the image quality assessments and dose reduction using the various parameters in radiation diagnosis will have to be constantly sustained.

Key words: Automatic Exposure Control(AEC), kVp, mA, Abdomen, Image quality

GR4-4
Evidence of Dose Optimisation within A Single UK Radiology Department: Analysis of DICOM Headers
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Purpose: This research is aimed to verify the image quality and radiation exposure to patients was affected by the changes of kVp and mA in X-ray diagnosis using the Automatic Exposure Control (AEC).

Materials & Methods: Firstly, the profile, plot and pixel value was measured in order to observe the change of image contrast by increasing kVp. The step wedge was placed on the table and the various conditions of kVp were exposed. Secondly, the abdomen phantom was placed on the center of detector, and the images were acquired at the various kVp and mA. Thirdly, MTF was measured at 200~500 mA, kVp and exposed dose were fixed at 80 kVp and 10 mAs, respectively. Finally, absorbed dose was accomplished with various kVp (60~100 kVp with AEC) and mA (200~500 mA, 80 kVp) by using photoluminescence glass dosimeter (PLD).

Results: The max-min pixel value of step wedge was increased when the kVp was increased from 60 kVp to 100 kVp. However, the difference was not significant because it was about 3.5 %. PSNR value was sufficiently revised using the post processing to 30 or more at 100 kVp. Moreover, PSNR value was measured more than 30 db within the mA range between 200 mA and 500 mA. The absorbed dose of lung, stomach, liver, kidney and bladder measured at 100 kVp without AEC, it was reduced than with AEC about 40.3%, 27.1%, 22.8%, 37.7% and 20.1% respectively.

Conclusions: The experimental results revealed that the AEC cannot provide proper exposure for minimizing absorbed dose while maintaining the image quality. Therefore, the research for the image quality assessments and dose reduction using the various parameters in radiation diagnosis will have to be constantly sustained.

Key words: Automatic Exposure Control(AEC), kVp, mA, Abdomen, Image quality

GR4-5
Importancy of Identify the Shape of Cranium Before Taking Sinus X-Ray and How to Position the Patient According to That
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Purpose: The purpose of this research study is to change the general patient positioning technique for Sinus x-ray, with relatively to the shapes of cranium. In generally sinus x-ray is performed by elevating patient’s chin until the radiographic base line is forming 45 degrees with the erect buckey. Nearly 280 radiographs out of 500 which related to above region were having variations of expected criteria.

Materials & Methods: Craniums that have an unusual shape require more or less rotation of the head or an increase or decrease in the angulation of the central ray compared to the typical mesocephalic skull. The brachycephalic head is short from front to back, and deep from side to side, and this raises questions regarding levels of dose optimisation within routine clinical practice.

Results: The outcome result was for the sinus x-ray with fulfilling its criteria, the imaginary line between outer canthus of mouth and EAM should be perpendicular with the erect buckey for the mesocephalic patient. For the brachycephalic patient mentohmental line should be perpendicular and for dolichocephalic patients the imaginary line between just below the acanthean and EAM should be perpendicular.

Conclusions: According to the outcome result, those variations that I have used by considering shape of the cranium for the above x-ray regions always give the correct criteria in first attempt and this can be minimize the radiation dose to the patient also.

Key words: Sinus, Shapes of cranium, Positioning
Effective Lateral and Vertical Collimation for Digital PA Erect Chest X-Ray Using Body Surface Landmark

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Purpose: The purpose of this study is to evaluate the effective-ness of using acromioclavicular joint (ACJ) and inferior angle of scapular (IAS) as the body surface landmark guide for lateral and vertical collimation for digital Posteroanterior (PA) erect chest x-ray (CXR).

Materials & Methods: The study was conducted in medical imaging department of University Malaya Medical Centre (UMMC). A retrospective study were done on 200 CXR selected from the PACS to determine the feasibility of using ACJ as body surface landmark guide for lateral collimation and IAS for vertical collimation for the four main body habitus (asthenic, hypertrophic, sthenic and hypersthenic). A prospective study was conducted to evaluate the effectiveness of using ACJ and IAS as body surface landmarks guide for 4 side collimation for PA erect CXR. 

Results: The retrospective and prospective evaluation show that ACJ is an effective body surface landmark as reference for lateral collimation. IAS even though present with some variation in distance from C7 (0.25 to 0.5 cm) for the 4 main body habitus, can be use as reference for vertical collimation guide.

Conclusions: ACJ and IAS can be used as body surface landmark for 4 side collimation in digital PA erect CXR of all the 4 main body habitus provided the positioning of patient is accurate. No cropping is required which reduce post-processing time. With improve collimation and less scatter radiation, patient dose can be reduced and image quality improved.

Key words: Acromioclavicular joint, Inferior angle of scapular, PA erect chest X-Ray

Rotation Angle of Patient for Correct Grashey Method

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Purpose: The patient rotation angle is varying because of the different degree of overlapping humeral head and glenoid cavity per person when Grashey method examination. In this study, we are to evaluate the patient rotation angle for correct Grashey method through the shoulder Anterior-Posterior (AP) view and axial view.

Materials & Methods: From March to April 2016, this study included 137 patients (69men, 68women). A radiotechnologist measured the degree of overlapping humeral head and glenoid cavity on shoulder AP view and the angle of glenohumeral joint on shoulder axial view using Centricity Radiology RA 1000 (General Electronics, USA) PACS system. The images were analyzed retrospectively. We performed Pearson correlation analysis to confirm the correlation between angle and degree of overlapping and one-way ANOVA analysis followed by Tuckey test to confirm significant difference 4 groups using SPSS (Ver.20).

Results: Degrees of overlapping were varied from 2.9mm to 20.2mm on shoulder AP view. However, 100 of 137 were distributed between 9mm to 15mm. The angles were varied from 27.8degrees to 49.1degrees on shoulder axial view. Angle change of glenohumeral joint according to overlapping degrees was as follows. In less than 9 mm was about 34.5±2.2°, 9~12mm was 37.2±2.2°, 12~15mm was 39.6±2.6°, more than 15mm was a 43±4.1°. Each groups was independently separated at post-hoc test. Statistical analysis showed severe positive correlation (r = 0.728, p<0.05).

Conclusions: The larger overlapping degree of humeral head and glenoid cavity on shoulder AP view was able to confirm that the larger the angle of the glenohumeral joint on shoulder axial view. This means that if the degree of overlapping is larger, patient rotation angle also must grow. Therefore, if we confirm shoulder AP view it will be able to estimate the patient rotation angle when performed the shoulder Grashey method.

Key words: Grashey method, Glenohumeral joint, Shoulder AP view, Shoulder axial view.

Study on Effectiveness of Modified Table Digital Radiography with Assistant Device for Hip Joint Axiolateral Examination

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Purpose: All This study is to evaluate effectiveness of Modified Table Digital Radiography(DR) Detector Hip Axiolateral with device exam(A) method by comparing with Modified Stand DR Detector Hip Axiolateral exam(B) method to diagnose Femur lesion and Femoral neck fracture.

Materials & Methods: We conducted 50 normal volunteers (35male, 15female, average age 42.1) who don't have Hip joint disease. We used a sponge and a wedge as devices. Parameter of A is 75Kvp, 25mAs, angle20°, Distance=120cm and Parameter of B is 75Kvp, 25mAs, Distance=120cm. We complemented quantitative analysis by comparing SNR and CNR from assigned ROI on Femoral head, Femoral neck, Acetabulum, Lesser trochanter, Femur, Iliac tuberosity, Soft tissue and Background of Axiolateral images of each method. Moreover, qualitative analysis was complemented by 5 radiologists and 5 radiographers having at least 5 years experience for evaluation of image quality.

Results: In quantitative analysis, A method showed higher SNR and CNR than B method. Moreover, statistical significance test was completed(p<0.05). Therefore, images of A method have higher resolution than images of B method on the same dose. In qualitative analysis, evaluation group, 5 radiologists and 5 radiographers, determined that images of A method show better sharpness on Femoral neck and Acetabulum and less overlapped Ischial tuberosity with Femoral neck than B method. Moreover, statistical significance test was completed(p<0.05).

Conclusions: Through the result of the study, A method demonstrate higher SNR and CNR on Femoral neck and Acetabulum, better sharpness and less anatomical overlapped than B method. Moreover, volunteers of this study are satisfied with shorter exam time. Furthermore, reducing radiation dose is possible cause of less reexamination as a result of more comfortable positioning.

Key words: Hip Axiolateral, Femoral neck, Acetabulum, SNR, CNR
GR5-4

The Study of Usefulness of Bone Suppression Function in the Pediatric Chest PA Image

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Purpose: Chest radiography remains the most commonly used method for diagnosing lung diseases. The bone suppression function for removing the bone structures, especially the posterior ribs and clavicle structures, is highly desirable to increase the visibility of lung field. Therefore, we evaluated the usefulness of the chest PA image using the bone suppression function compared to the original chest PA image.

Results: Measurement results of maxillary sinus volume and reference angle are on average 42.27±2.87°, respectively, in 0–4 years, and 5–10 years is 32.00±0.81°, and gender differences emerged since teens, up to 21–30 years, volume and reference angle of male represents on average 28.95±3.09cm³ and 42.75±2.87°, and gender differences emerged since teens, up to 21–30 years, volume and reference angle of female represents on average 26.5±1.65cm³ and 35.25±1.89°, volume is increased and reference angle is decreased. The volume of both male and female decreased after 30, the reference angle is increased as age increases. Maxillary sinus volume and reference angle of OML-IP was a statistically significant change in the age and gender. 

Conclusions: A study should help implement the ideal image by providing information relating to the shooting reference angle according to age and gender by analyzing the correlation between each factor and then calculates the proper reference angle of OML-IP and Maxillary sinus volume in accordance with the age and gender.

Materials & Methods: After calculate maxillary sinus volume and reference angle to the 80 patients who examined the Para Nasal Sinus and Orbit CT after visited the hospital using the CT 3D reconstructed program, make table and graph with the calculated each of the mean value according to age and gender and statistically analyze. We applied the calculated results to the 60 patients who examined PNS Water’s projection, four radiologists and one specialist were assessed qualitatively images in three-point scale.

Key words: Bone suppression, Image Evaluation, Radiography, Chest radiography, Bone Suppression, Image Evaluation

Materials & Methods: We used general X-ray machine (DRX-Evolution, Carestream, USA). From December 2015 to April 2016, the bone suppression function was applied to the 100 pediatric patients who come SNUH for taking the chest X-ray examination. 1 radiologist and 5 radiological technologists evaluated images of the original chest PA and chest PA using the bone suppression function in the machine through the image evaluation lists.

Results: Through the bone suppression function we could more demonstrate lung field than original image. The results showed there are no significant differences (image distortion, lesion or abnormalities detection in the lung field) between original chest PA and bone suppression images by image evaluation lists: pneumonia, pulmonary vessel, lung nodule, pleural effusion, pneumothorax.

Conclusions: The use of bone suppression function in the pediatric chest PA improved the ability to characterize the lung parenchyma and find the abnormalities in the lung field regarding the presence or absence of an abnormality on chest radiographs compared to the original chest PA image.
GR5-6
A Study on the 3D Printer Ear Shell Shape Using the DICOM Images
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Purpose: This study aimed to investigate the process of the collection of the ear models when producing the hearing aid ear shells and to find the new methods that can replace the 3D scan. As such, the purpose of this study was to find the new methods of which the safety and the precision have been secured in relation to the infections that can take place during the previously existent production process by applying the medical image technologies.

Materials & Methods: The new modeling shape files were created after going through the STL file conversion process after extracting the external auditory meatus with the DICOM images acquired from the CT volume data. Regarding the modeling method of the previously existent ear model collection method, it was created with the modeling acquired after the 3D scan through the collection of the ear models of the same patient. In order to compare the modelings created through the methods that are different from each other, the experiment was carried out through the method of confirming the shape of the surface structure of the STL file in the same modeling.

Results: Regarding the modeling surface structure, it is created through the process of connecting the space between the two isopleths by filling the gaps between the isopleths that are adjacent with the 3-dimensional surface pieces to the triangle. The previously existent ear model collection method and the modeling surface structure by the DICOM method expressed the space between the two isopleths as a triangle in the same way.

Conclusions: It was confirmed that it was possible to show a triangular surface structure of the same shape with the modeling surface structure according to the previously existent ear modeling in a DICOM medical images and print the shape with a 3D printer which is the post processing step for applying equally.

Key words: DICOM, 3D Printer, Modeling, STL, Ear Shell

GR5-7
Things are Not Always What They Appear: Errors in Image Interpretation in Plain Radiography
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Purpose: Radiographer image interpretation and reporting is a role extension allowing radiology departments to meet the demands in service delivery. Studies have shown that radiographers can achieve similar accuracy in image interpretation in comparison to the radiologists. However, errors in image interpretation are inevitable leading to a compromise in patient’s management. The aim of this review is to look at the aetiology of radiological errors and its solution in image interpretation in plain radiography.

Materials & Methods: Search engines “pubmed” and “google scholar” were used to aid in searching for literature reviews. The reviews were filtered to be last 5 years. Boolean operators were used. 660 articles and 207 articles were generated from pubmed and google scholar respectively.

Results: Radiological errors are categorised into three categories: perceptual, system, and cognitive errors. These categories are interlinked and could indirectly cause the other. Perceptual error is the common cause of radiological errors and accounts for 80% of interpretation errors. 74% of the diagnostic errors were due to cognitive factors. The more common causation of this error is due to the lack of knowledge, cognitive bias of the reader, or misleading clinical information distorting the reader’s interpretation. System errors account for 65% of the diagnostic errors in internal medicine. Solutions revealed two approaches in which image interpretation errors can be managed: a person centered or a system approach. However, the former approach is ill-suited for healthcare today. Systems approach uses education to address the problem of error.

Conclusions: In conclusion, errors are inevitable, and the concept of necessary fallibility must be accepted. However, error should be reduced and possible improvements need to be in place to safeguard the reader from falling into an error trap. Radiographers need to be aware of the possible errors in image interpretation and its impact to patient’s clinical outcome.

Key words: Errors in Radiography, Image interpretation, Diagnostic Error

GR5-8
Chest X-ray Interpretation by Radiographers: Diagnostic Accuracy and Influence on Diagnostic Reasoning
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Purpose: Chest X-rays are one of the most frequently requested imaging examinations, and are fundamental to many diagnostic and therapeutic clinical decisions. The aim of the study was to determine the diagnostic accuracy of consultant radiologist (CR) and reporting radiographer (RR) chest X-ray reports and their influence on clinicians’ diagnostic decision-making.

Materials & Methods: A cohort of consultant radiologists (n=10) and reporting radiographers (n=11) interpreted a bank (n=106) adult chest x-rays. Jack-knife alternate free-response receiver operator characteristic curve (JAFROC) methodology was used to determine the performance of the observers (JAFROC v4.2). The chest X-ray reports and a concise case summary were given to a range of clinicians (n=18) who were asked for the most likely and most serious diagnosis for each case. Diagnoses were compared to the definitive clinicoradiological diagnosis obtained at case note review using the Tshumla method.

Results: The diagnostic accuracy of the reporting radiographers (Figure of Merit; FoM 0.828) was non-inferior to the consultant radiologists (FoM 0.788), p=0.0001. There was no difference in the influence of reporting radiographer and consultant radiologist chest X-ray reports on clinicians diagnosis (correct diagnosis RR n=1337, 60%; CR n=1368, 63%; p=0.103) or diagnostic confidence (confidence RR=80.4%; CR=80.2%, p=0.0001).

Conclusions: With appropriate postgraduate education, reporting radiographers are able to interpret chest x-rays at a level comparable to consultant radiologists.

Key words: Chest, X-ray, Advanced practice, Accuracy
GR5-9
A Study on Usefulness According to Simulated Nodule Detection Ability in Tomosynthesis Compared with Low Dose CT
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Purpose : This study evaluated the image quality and effective dose of tomosynthesis compared with LDCT, and evaluated clinical usefulness through an analysis of detection ability of simulated solid nodule.

Materials & Methods : The equipment used in this study was 128slice CT(Somatom Definition flash, Siemens, Germany), FDR 200 AcSelerate(FUJIFILM, GE Healthcare, Milwaukee, WI), also carrying out the phantom test withphantom(Lung Man, Kyoto Kagaku, Japan), and used image J program for evaluating the quality of the image. A total of 15 simulated solid nodules composed of five 4, 6.35 and 8 mm models were positioned inside phantom without specified arrangement. Measuring a dose 5 times in order to obtain accurate dose data. We comparison data of SNR and CNR from simulated solid nodule. For statistical verification SPSS 18(SPPS Inc, Chicago, IL, USA) was used. In case p<0.05, it was interpreted to be statistically significant.

Results : The effective dose of LDCT measured 1.057 mSv and that of tomosynthesis measured 0.267 mSv. SNR of LDCT measured 88.69±13.76, and its CNR measured 64.35±7.29. And SNR of tomosynthesis measured 30.19±2.67, and its CNR measured 29.75±2.56. The area under ROC curve of LDCT measured 0.929, and that of tomosynthesis measured 0.786. Sensitivity and accuracy for the detection of simulated solid nodule was rated at 53.3% and 76.6% respectively.

Conclusions : It is evident that tomosynthesis has advantage of lower dose and lower cost over LDCT. But, Sensitivity and accuracy for detection of simulated solid nodule was rated at 53.3% and 76.6% respectively. So, this is thought to be limited in clinical application.

Key words : Tomosynthesis, PCXMC, ROC

GR6-1
Research of the Hinge-Mail Examination after the Orthopedic Surgery
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Purpose : The radiologist must know the ilizarov surgery that measure the length for the patient’s bone. In ilizarov surgery, the patient’s bone is growing 1mm everyday, so the patients are painful. When the bone is growing, the radiologist or researchers implement X-ray examination checking the bone through overlapping the hinge. It’s important to confirm the X-ray image and we research the affect of the patient for the result of overlapping the hinge.

Materials & Methods : Researchers exposed 60 kvp,100mA 0.5s at FFD=100cm using the orthopedic tibia phantom device with the hinge and Philips Digital Diagnostic equipment by the same conditions. We examined the length based 0mm at the hinge overlapped each the inside 10, 30, 50(mm)e outward 10mm, 30mm, 50mm. We measure the length by the Infinitt PACS program.

Results : Hinge is overlapping based 0mm, distriction road 3.58mm. each outward hinge 10, 30, 50(mm) distriction road each 3.46, 3.50, 3.43(mm) each the inside hinge 10, 30, 50(mm) distriction road each 3.40, 3.34, 3.17. distriction road each 3.58, changed length 1mm, distriction road 3.50, changed length 0.98. distriction load 3.46, changed length 0.97. distriction load 3.43, changed length 0.96. distriction load 3.40, changed length 0.95. distriction load 3.34, changed length 0.93. distriction load 3.17, changed length 0.89. As a result, As the distriction road increases 1mm everyday, the error rate of the changed length is each 30%, 45%, 60%, 75%, 105%, 165% at 3.50mm, 3.46mm, 3.43mm, 3.40mm, 3.34mm, 3.17mm. In the orthopedics, they consider the various conditions, but in our conditions, we examine the X-ray accurately for the patient’s safety and the accuracy of the ilizarov surgery. Apparently, The error affects the patient by overlapping the hinge. So, we accurately implement x-ray examination and consider the various conditions for patient’s comfort.

Key words : Hinge Mail, Ilizarov, Distraction load.

GR6-2
Study on General X-ray Image Size(File Size) by Change of Control Parameters (kV,Focal Spot Size, Irradiation Area) in Digital Radiography X-ray Unit Base on the PACS Data Analysis
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Purpose : To compare transferred data amounts of PACS server by change of X-ray Control parameters (kV, focal spot size, irradiation area) in Digital Radiography.

Materials & Methods : X-ray equipment that was used in the study is a Digital Diagnostic (Philips Co.). Tube current was fixed at 2.5 mAs. The distance of the distance 110 cm of X-ray tube table detector. Tube voltage used to 125 kV (high voltage) and 60 kV (low voltage). Focal spot size in each tube voltage was used a large focus (1.2 mm) and small focus (0.6 mm). Irradiation areas (10*10, 50*50, 100*100, 150*150,200*200, 250*250, 300*300, 350*350, 400*400, 432*432mm) during image acquisition were gradually increased and repeatedly measured five times each. The images were obtained through the experiment to analyze the DICOM header information of nView STAR(Infinitt Co.). Obtained images were non-compressed state.

Results : The transferred data amounts was significantly higher up to maximum 0.264Mbyte on the low voltage(60kV) than the high voltage(125 kV) and higher up to maximum 0.361Mbyte at the large focus than small focus that irradiation areas were applied 100mm~400mm². There was strongly correlated Collimation size in same interval(p<0.050). The 10*10mm and 50*50mm irradiation areas seemed amounts of same data and the 432*432mm irradiation area was not significant.

Conclusions : Image acquired by the X-ray exposure, the size of the images stored in the PACS is transmitted differently according to the change of parameters. A general X-ray is the
frequency of inspection on a daily basis is a very large number of examination. If you change a parameter using the results of this study. It is considered as a useful method that can efficiently manage the PACS server data amounts.

Key words : kV, Focus, Irradiation area, Data

**GR6-3**

**A Comparative Study of Radiation Dose According to the Change of Conditions in Mobile Chest Radiography**

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**Purpose** : To compare the entrance surface dose, absorbed radiation dose and qualitatively distinct differences from image using high kVp(120kVp, 2.0mAs) versus low kVp (70kVp, 7.0mAs) techniques for the mobile chest radiography of patients who cannot be moved from their beds. Such examinations are routinely performed in medical intensive care unit(ICU).

**Materials & Methods** : Mobile X-ray unit, chest standard phantom, glass dosimeter, reading machine and diagnostic monitor were used in this study. Entrance surface dose and absorbed radiation dose were obtained with glass dosimeter. Images of 30 patients were evaluated by 15 radiological technologists (over the 15 years career) and 10 radiologist(including 3 professor).

**Results** : Entrance surface dose was 403.5 μGy and absorbed dose was measured 121.3 μGy at a distance of 80 cm on condition 70 kVp, 7.0 mAs. While Entrance surface dose was 324.1 μGy and absorbed dose was measured 109 μGy at a distance of 80 cm on condition 120 kVp, 2.0 mAs.

**Conclusions** : Mobile chest radiography was frequently performed in medical intensive care unit(ICU). The variation of exposure factors could reduce radiation dose of patients who are hospitalized in medical ICU. Thus, possibility of risk will be able to be decreased if we can reduce the cumulative dose.

Key words : Mobile X-ray, Mobile chest radiography, High kVp

**GR6-4**

**Whole Spine Lateral Radiography with Pasting Method: Image Quality Assessment after Aluminum Filtration**

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**Purpose** : To investigate the influence of additional Aluminum (Al) filtration on image quality in terms of contrast-to-noise ratio (CNR) and signal to noise ratio (SNR) for whole spine lateral radiography.

**Materials & Methods** : In a phantom study, we acquired whole spine lateral radiographs without and with additional Al filtration (5mm, 10mm and 15mm) in front of tube corresponding cervical spine. Image quality between radiographs obtained without and with additional Al filtration was assessed and compared in terms of CNR and SNR. For statistical analysis, image quality was compared using one-way ANOVA test. After a phantom study, the most effective filter thickness was applied to 20 patients. In clinical practice, image quality in terms of CNR and SNR was compared using Wilcoxon test.

**Results** : After Al filtration, the mean values in the non-filtration, 5mm, 10mm and 15mm regarding CNR were 0.647, 0.716, 0.749 and 0.688, respectively. The mean SNR values in the non-filtration 5mm, 10mm and 15mm were 82.87, 83.33, 91.82 and 91.11, respectively. Also, there were statistically significant differences in CNR and SNR values (p<0.05), compared to non-filtration images. In particular, the mean CNR and SNR values in 10 mm were significantly increased by 15.85% and 10.79%, respectively. In clinical practice, the mean CNR and SNR in 10 mm Al filtration were increased by 32.03% and 114.69%, respectively, compared to non-filtration. These values were statistically significant differences (p<0.05).

**Conclusions** : The Al filtration for partial cervical spine can improve image quality and diagnostic value. Especially, 10 mm Al filtration in clinical practice appears to be an effective in whole spine lateral radiography.

Key words : Al Filter, Cervical spine, Contrast to Noise Ratio, Signal to Noise Ratio

**GR6-5**

**A Study of Pelvis Measurement by Ages Using the Iliac Crest for Gonad Shieding in Pelvis AP Projection of Girls**

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**Purpose** : The purpose of this study is to present a reference position of the shielding by age through pelvic measurement to determine the exact location of gonad shielding

**Materials & Methods** : 510 pediatrics registered in PACS and Mobile chest radiography was frequently performed in medical intensive care unit(ICU). The variation of exposure factors could reduce radiation dose of patients who are hospitalized in medical ICU. Thus, possibility of risk will be able to be decreased if we can reduce the cumulative dose.

**Results** : The mean and standard error of pelvic measurements by age group. The mean and standard error were measured for the pelvic measurements by age, and the scatter plot was made and the correlation analysis was performed through SPSS 22.

**Conclusions** : When the iliac crest was used as the physical indicators for gonad shielding, we were able to verify how far gonads are away from the iliac crest and take an accurate position for the shield in the pelvic cavity without unnecessary physical contact. Therefore, it is considered that it will be able to help to reduce the mistake of covering the hip or Obturator foramen and minimize the exposure from the correct gonad shielding.

Key words : Pediatrics, Pelvic Measurement, Gonad Shielding, Regression Analysis

**GR6-6**

**A Study on the Right Angle of Wrist Tilting for Lateral Position X-ray after Metal and Volar Plate Radius Fracture Surgery**
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Purpose : During a x-ray lateral view after the metal and volar plate surgery for distal radius fracture, the radiocarpal joint and the subchondral bone are overlapped due to wrist tilting. And this study intends to contribute to diagnosis by discovering the right angle for both cast cases and non-cast cases.

Materials & Methods : 20 patients wearing a cast after distal radius fracture and other 20 patients not wearing one were chosen for the experiment regardless of age and gender. Their wrists were at first X-rayed without tilting. After that, they were X-rayed at 15°, 20°, 25°, and 30° with the help of four different wedge devices invented by the researchers. By drawing adjacent lines on the images, it was checked if there was a significant difference among the four wedge devices and found the tilting angle where the radiocarpal joint and the subchondral bone remain overlapped the best.

Results : The right angles for wrist tilting with a cast and without one were different. The right angle for when wearing a cast was 20°, whereas it was 25° for when not wearing one.

Conclusions : The x-ray lateral review conducted after distal radius fracture surgery produced better results when the wrist was tilted. Specifically, 20° for cast cases and 25° for non-cast cases. It is believed that the space inside the cast naturally tilts the wrist to some degree.

Key words : Distal radius, Fracture, Volar plate, X-ray lateral view

GR6-7

Study on lowering fall-down Risk of Erect Position Radiography: Focusing on BP Check with Changing Patient
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Purpose : When performing chest or abdomen radiography in erect position, radiologic technologists sometimes grab the patient due to sudden loss of consciousness or dizziness. Because these conditions can cause fall down accident, we focused on the relationship between patient’s blood pressure and resting time to reduce the risk.

Materials & Methods : From 1st Nov 2015 to 30th Mar 2016, we conducted the study on 40 patients diagnosed with syncope, vertigo, or dizziness. Under cooperation of ER nurse, BP were checked when each patient entered examination room in supine position and 30 seconds, 1 minute, and 3 minutes after we rechecked BP in sitting position. From 1st Jun 2015 to 30th Mar 2016, we recorded survey data by asking directly to 175 patients rechecked BP in supine position. From 1st Nov 2015 to 30th Mar 2016.

Results : 1) 31 out of 40 patients (78%) showed normal BP in supine position (BP difference of ±0.5-5.11, ±5-10.13, above ±10.7), 2 patients (2%) showed normal BP 30 seconds after in sitting position, 4 patients (13%) showed normal BP 1 to 3 minutes after, and 3 patients (7%) were still out of normal range. 2) As a result of survey, 25 out of 175 responded no problem 30 seconds after, 45 did a minute after, 93 did 1.5 to 3 minutes after, 12 complained still dizziness.

Conclusions : Result 1) shows that even BP difference less than 10 could indicate conditional provement of a patient. Result 1) and 2) shows that BP differences following positional change is related to unconsciousness or dizziness in some degree. Therefore we suggest that taking sitting position of patients about 1 to 3 minutes in prior to examination can prevent such accidents, with more attention to them.

Key words : Fall down accident, Blood pressure, Resting time

GR6-8

Can the Cephalad Angulation for a Lateral Knee X-Ray be Determined by Measuring the Difference in Angle of the Condyles in the AP Projection?
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Purpose : The main aim of this study is to evaluate if there is a relationship between the difference in angle measured between the femoral condyles on the antero-posterior (AP) weight bearing knee view and the amount of cephalad angulation to be applied in the lateral view.

Materials & Methods : This study involves a retrospective review of knee radiographs done in Singapore General Hospital, Outpatient Imaging Centre from April to September 2016. The amount of cephalad angulation used during lateral knee radiographic positioning was documented. During data analysis, the reviewers draw two lines on the AP radiograph. The first line (A) begins on the most distal point of the medial condyle and extends horizontally across towards the lateral aspect of the knee. A second line (B) is drawn to connect the most distal points of the medial and lateral femoral condyles. The angle (x) formed between line A and B was measured and recorded.

Conclusions : The preliminary result of this study suggests that there is a moderate positive correlation between angle (x) and the amount of cephalad angulation applied in the lateral view. This finding indicates that radiographer can determine the exact amount of cephalad angulation to be applied during lateral knee radiography by measuring angle (x), resulting in a reduced in repeats due to inadequate cephalad angulation during lateral knee radiography.

GR6-9

A Comparison of Predisposing Risk Factors of Osteoporosis Between Black and White Osteoporotic Women Visiting A Woman Wellness Centre Between 2010 And 2014 in Harare, Zimbabwe
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Purpose: To compare the predisposing risk factors of osteoporosis between Black and White post-menopausal osteoporotic women presenting at a woman wellness centre during the period 2010 to 2014.

Materials & Methods: A retrospective case study of osteoporotic post-menopausal women presenting at a woman wellness clinic in Harare was done for a 5-year period. Purposive sampling was used to identify Black and White postmenopausal women presenting during that period and data pertaining to these was extracted. The bone mineral density results of these women were used to find out the incidence of osteoporosis between the two racial groups. The main variables identified as pre-disposing factors included age, menopause, family history of fracture, smoking, drinking and body mass index. The exposures to pre-disposing factors of osteoporosis were then assessed among the 1065 osteoporotic women and compared between Blacks and Whites using Excel and STATA software. The categorical variables like BMI classes and osteoporosis outcome were coded. Descriptive statistics for all predisposing factors (mostly categorical) were done and quantitatively described using bar charts, pie charts and line graphs. Chi-squared test was done for significance testing.

Results: 36% of Blacks and 40% Whites were osteoporotic. There was no statistical difference in developing osteoporosis between Blacks and Whites. Most of the predisposing risk factors had similar association with osteoporosis for both races. There were more Black women who were found to be osteoporotic in ages below 79 years, whilst the number of Whites with osteoporosis increased with age.

Conclusions: Both Black and White postmenopausal women were equally susceptible to osteoporosis with similar predisposing risk factors despite the international perception that blacks were less susceptible. Increased age and time since onset of menopause as well as Low BMI were positively associated with osteoporosis.

Key words: Osteoporosis, Predisposing factors, Black and white post menopausal

5. INTERVENTIONAL RADIOLOGY

IR1-1

EW-7197, a novel TGF-β inhibitor: Suppression of Granulation Tissue Formation after Bare Metallic Stent Placement in a Rat Esophageal Model

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Purpose: To investigate the efficacy of EW-7197 in preventing granulation tissue formation caused by bare metallic stent placement and to evaluate the anti-fibrosis therapeutic potential of blocking TGF-β in a rat esophageal model.

Materials & Methods: All experiments were approved by the committee of animal research. In 24 Sprague-Dawley male rats (weight range, 300-350 g), a self-expanding metallic bare stent was placed in the esophagus under fluoroscopic guidance. The rats were randomly divided into three groups after stent placement. Group A received control treatment, group B received EW-7197 (10 mg/kg) two times per a day for 4 weeks, and group C received EW-7197 (20 mg/kg) once a day for 4 weeks. All rats were sacrificed at 4 weeks. The therapeutic effectiveness of EW-7197 was assessed by comparing the results of esophagography, histologic examination, and quantitative analysis of TGF-β among the three groups.

Results: Stent placement was technically successful in all rats. The overall luminal diameter of the stented esophagus in group A was significantly lower compared with that in group B and C. The mean percentage of granulation tissue area, the mean number of epithelial layers, and the mean thickness of submucosal fibrosis in group A was significantly higher compared with that in group B and C (P<0.001 and P<0.001, respectively) without drug toxicity, however, there was no significant difference between in group B and in group C. The mean density grade of inflammatory cell infiltration did not differ among the three groups. Quantification of TGF-β by Real time-PCR was significantly increased in the granulation tissue formation area in group A compared with group B and C.

Conclusions: EW-7197 was effective and safe for the suppression of granulation tissue formation after stent placement in a rat esophageal model and has a strong potential as an anti-fibrosis therapeutic agent via inhibition of TGF-β.

Key words: Transforming growth factor, Granulation tissue formation, Stents, Activin receptor-like kinase 5

IR1-2

Novel ALK5 Kinase Inhibitor Prevents Tissue Hyperplasia after Bare Metallic Stent Placement in a Urethra Rat Model

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Purpose: To evaluate the efficacy and safety of an activin receptor-like kinase 5 inhibitor, EW-7197, in the prevention of granulation tissue hyperplasia after bare metallic stent placement in a rat urethral model.

Materials & Methods: Twenty-four male Sprague-Dawley rats were randomly divided into four groups and underwent bare metallic stent placement in the urethra. The rats were injected intraperitoneally per day with 0.3 ml of saline in group A and with EW-7197 at a dose of 5 mg/kg in group B, 10 mg/kg in group C, and 20 mg/kg in group D for 8 weeks. Retrograde urotrathographies were performed at 4 weeks and 8 weeks after the stent placement. A histologic examination regarding the number of epithelial layers, granulation tissue area, thickness of submucosal fibrosis, and inflammatory cell infiltration grade was performed in each rat. We further investigated the reduction of transforming growth factor (TGF)-β.

Results: The follow-up urothographies performed at 4 and 8 weeks after stent placement shows the stented urethra in groups C and D had larger lumens than in the control group A (p<0.001, p<0.05). The average numbers of epithelial layers and the mean percentage of granulation tissue area in groups C and D were significantly lower than in control group A (p<0.001). The average thickness of submucosal fibrosis was less in the 3 treated groups than in the control group A (p<0.001). The mean percentage of granulation tissue was significantly lower in group C and D, when compared with the control group A (p<0.05). The inflammatory cell infiltration was significantly higher in group C and D, when compared with the control group A (p<0.05).
Conclusions: Intraperitoneally administration of EW-7197 was effective and safe for the prevention of granulation tissue hyperplasia after bare metallic stent placement in a rat’s urethera. Our study provided a basis for future clinical studies of patients with restenosis.

Key words: Stent, Stenosis, TGF-β, Tissue Hyperplasia

IR1-3
Visualization of Intracranial Stents and Dose-area Product Values according to the Change of Dose per Frame of Contrast-enhanced Angiographic Cone-beam Computed Tomography
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Purpose: To investigate the visualization of the intracranial stent and dose-area product (DAP) values according to the changing of dose per frame of contrast-enhanced angiographic cone-beam computed tomography (CBCT).

Materials & Methods: The Anderson Radiation Therapy RANDO phantom was used for this study and three different stents were used from each manufacturer. The stent sizes were 4-4.5 mm-diameters and 20 mm-lengths. The condition of contrast media infusion was 0.2 cm³/s and followed by saline flushes using a 300 mmHg pressure bag. The doses per frame of CBCT were performed 109 kVp and 0.54 μGy, 0.81 μGy, 1.20 μGy and 1.82 μGy per frame (μGy/fr), respectively. Visualization of the stent was evaluated images after CBCT by expert (2 interventional neuroradiologists and 1 radiologic technologist). The score of stent visualization was used scale from 1 to 3. A score of 1 meant insufficient for evaluation, a score of 2 indicated adequate quality of visualization but not clear, and a score of 3 was excellent, respectively. The DAP values were obtained as same conditions of CBCT.

Results: Visualizations of the stent according dose per frame was difficult to discern at 0.54 μGy, visible but not clear at 0.81 μGy and discerned clearly at 1.20 μGy or more in all stents. The DAP values of 0.54 μGy, 0.81 μGy, 1.20 μGy and 1.82 μGy per frame (μGy/fr) were 15,263 mGycm², 22,006 mGycm², 31,696 mGycm² and 47,031 mGycm², respectively.

Conclusions: The higher dose per frame, visualizations of the intracranial stent was discerned better but there were no significant differences between 1.20 and 1.82 μGy. Therefore, comparing the DAP value between 1.20 and 1.82 μGy, the adequate dose per frame of contrast-enhanced CBCT seems to be 1.20 μGy.

Key words: Intracranial stent, Contrast-enhanced CBCT, DAP, Dose per frame

IR1-4
Experimental Study on Functional Degradation of Hydrophilic Coated Guidewire after Exposure to Various pH Conditions
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Purpose: To evaluate the lubricity degradation of hydrophilic coated guidewire after being exposed to various pH conditions in vitro and functional restoration of hydrophilic coating upon wiping guidewire with normal saline.

Materials & Methods: In this study, three different hydrophilic coated guidewires (0.035 inch, 150 cm, angled type) were compared: Radifocus (Terumo, Tokyo, Japan), Zipwire (Boston Scientific Corp, Natick, Massachusetts) and Roadrunner (Cook Medical, Bloomington, Indiana). We used buffer solutions to make various pH conditions mimicking body fluids: pH2 (gastric acid), pH4 (uric acid), pH7 (blood) and pH8 (bile juice or ascites). After exposing guidewires to each buffer solution, three different experimenters evaluated lubricity and functional recovery, which were measured by their tactile sensing on a five-point scale (good lubricity, moderate lubricity, partially rough, rough in half, poor lubricity). Polarization microscope was also used to observe surface change of the guidewires on various pH conditions. Reliability analysis and one-way ANOVA test were performed for statistical analysis.

Results: Radifocus showed significant lubricity degradation after exposure to pH2 and pH4 conditions (p=0.001). However, after wiping guidewire with saline solution, Radifocus showed significant functional recovery of lubricity (p=0.001). After exposure to pH7 and pH8 conditions, all three guidewires showed good lubricity without degradation. Radifocus also showed surface change after exposure to pH2 and pH4 conditions microscopically: the shape of surface was seen as linear or circular. After wiping guidewire, surface change was restored microscopically.

Conclusions: Zipwire and Roadrunner demonstrated better performance in lubricity and functional recovery than Radifocus after exposure to pH2 and pH4 conditions. When guidewires lose their lubricity by degradation of hydrophilic coating during the procedure, wiping guidewires with saline solution is a useful method in order to restore their lubricity.

Key words: Hydrophilic coated guidewire, pH, Lubricity, Functional recovery

IR1-5
Usefulness Assessment through Application of Gonad Shield in Various Interventional Procedures
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Purpose: To evaluate the usefulness of homemade Gonad shield in reducing radiation exposure to patient’s undergoing interventional procedures.

Materials & Methods: In 218 patients (men, 115) who were given interventional procedures, we applied Gonad shield and measured radiation dose inside and outside of it from November 1, 2014 to April 16, 2015. For quantitative evaluation, a glass dosimeter was placed in the Rando phantom the same way as in real patients. Radiation dose was measured by using glass dosimeter attached to the shield. The Gonad shield was designed in two different shapes: one for man (both protector) and the other for woman (single protector). Then, we conducted seven questions survey regarding patient satisfaction in using Gonad shield in 160 patients (men, 116).

Key words: Radiation, Radiation protection, Gonad shield, Dose measurement, Patient satisfaction
Results: In the present study, we found that the radiation dose was decreased to 56.6% (P<0.01) in single protector group and 75.8% (P<0.01) in both protector group, respectively. A reduction in radiation dose was 18% greater in the both protector group that in the single protector group. The questionnaire survey demonstrated that 158 of 160 patients (99%) felt comfortable about wearing the gonad shield and anxiety of radiation exposure was alleviated in 147 patients (92%). In particular, 103 patients (64%) expressed their high satisfaction about using the gonad shield.

Conclusions: Using the Gonad shield protector in interventional procedures achieved not only a decrease in radiation dose but also higher patient satisfaction. Therefore, continuing research and development in radiation protection devices is warranted for high quality medical service

Key words: Gonad shield, Radiation protector

IR1-6

Study about Steam-shaping Methods of Microcatheter for Cerebral Coil Embolization: Shapability and Shape Preservation of Catheter by Changes of Steam-shaping Time and Quenching

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Purpose: While steam-shaped microcatheters are frequently used in cerebral aneurysm coil embolization reference data on the methods for steam heating the coils are lacking. This study was conducted to obtain objective base data on steam heating.

Materials & Methods: Using Excelsior SL-10 (microcatheter, Stryker Neurovascular, USA), distal tip diameter 0.60 mm, the angles of a 90°-shaped straight catheter tip and a straight-shaped 90° catheter tip were measured in arcminute for 20 minutes, varying the heating time from 30 to 80 seconds at 10 seconds intervals. Additionally, using the Excelsior SL-10 and ProWax Select Plus (another microcatheter, Cordis corporation, USA, distal tip diameter 0.75 mm) 45° tips were shaped and straight, respectively. The prepared tips were either treated with a 20 seconds immersion in saline solution at a temperature below 5°C or untreated and their angles were measured in arcminute for 10 minutes, and the changes were investigated.

Results: Shapability and shape preservation improved with the increase in steam heating time, and the 90°-shaped tips showed greater angular changes over time than the straight-shaped tips. Moreover, in both the Excelsior SL-10 as well as the ProWax Select Plus, the immersion-treated tips maintained shape longer than the untreated tips.

Conclusions: Within the range of maintaining durability of the microcatheter, steam heating efficiency for shapability and shape preservation was higher in proportion to the heating time, and the immersion process (quenching) was verified to be an important positive factor for steam shaping.

Key words: Microcatheter, Steam-shaping, Quenching (Immersion process), Coil embolization, Shapability

IR2-1

Surgical Treatment of Ruptured Blood Blist-like Aneurysm Patient and Intervention Study Result Review: A Case Report

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Purpose: The rupture of blood blister-like aneuysm(BBA) caused by subarachnoid hemorrhage is uncommon, a weak wall and got the irregularly shape is report that poor prognosis than treatment of saccular type cerebral aneurysm rupture.

Materials & Methods: This study was targed from 2013 to 2015, three patients ruptured BBA admitted to a hospital emergency room, Kyungpook National University (33age man one people, two girls aged 34 and 53 years old).

Results: Left internal carotid supraclinoid artery rupture is clipped surgical treatment of the men and right distal internal carotid dorsomedial wall rupture is a local hospital in a multi layer stent, but ruptured aneurysm size increases are transported after the Pipeline Embolization Device(PED) and coil a combined 53age female patient had been well maintained over the DSA and CT performed after the hospitalization and discharge. However, surgery to rupture of the anterior wall of the left internal carotid artery distal multi layer stent and in the case of a 33age female patient by combining Coil embolization was finally died.

Conclusions: The rupture site was found that the therapeutic effect can vary according to the other three patients condition. Therefore it suggests that require appropriate combination therapy for patients with rupture site and condition.

Key words: SAH, BBA, Clip surgical, Multi layer stent, PED

IR2-2

Perforator Imaging for Anterolateral Thigh Flap: Evaluation of Computed Tomographic Angiography Performed through Femoral Artery Catheterization

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Purpose: To evaluate the quality of computed tomographic angiography (CTA) performed through arterial access for mapping of perforators used in anterolateral thigh (ALT) flap surgery.

Materials & Methods: From April to December 2015, twenty-three patients underwent preoperative CTA after femoral artery catheterization. An angiographic catheter was placed in the infrarenal aorta, after which digital subtraction angiography (DSA) was performed to determine the flow rate in the lateral circumflex femoral artery(LCFA). The patient was then transferred to a CT scanner where CTA was performed. Contrast media was injected through the arterial catheter taking into the consideration the flow rate determined on DSA. The images were then assessed for their quality by counting the number of perforators arising from the LCFA and evaluating the consideration the flow rate determined on DSA. The Hounsfield attenuation in the LCFA. In patients who had previously undergone conventional CTA, a comparison of the two modalities was made.

Results: The mean number of LCFA perforators identified per patient was 12.2±2.77. In seven patients who had previously undergone conventional CTA, the mean number of perforators counted was 4.0±2.23 (p<0.01) and mean Hounsfield unit

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ABSTRACTS
was 378±73.6 (p<0.01) on conventional CTA. Meanwhile, for the same group, the mean number of perforators counted was 12.5±1.90 (p<0.01) and mean Hounsfield unit was 1197.4±168.8 (p<0.01) on CTA through arterial access.

Conclusions: CTA performed through arterial access provides an accurate map for pre-operative evaluation of perforators required for ALT. The quality of this imaging modality is superior to conventional CTA.

Key words: Anterolateral thigh(ALT) flap, Perfator, lateral circumflex femoral artery (LCFA)

IR2-3

Usefulness Estimate of Percutaneous Lung Needle Biopsy by Con-beam CT
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Purpose: Percutaneous needle biopsy (PCNB) is performed to diagnose lung nodules with a high suspicion of malignancy. In the procedure, needle is gradually approached to nodule which is small and located near dangerous parts. Thus, it is necessary that PCNB should be performed more accuracy and safety. Therefore, this study is to estimate usefulness of CBCT (Cone-beam CT) by comparing with Conventional CT according to nodule size.

Materials & Methods: From September 2011 to March 2016, dose data of 200 PCNB patients were acquired by DICOM Header Information of each machine, CBCT(DAP) and Conventional CT(DLP). Both dose data were calculated to effective dose by PCXMC program for DAP and conversion factor(0.014 mSv/mGy cm2) for DLP. Then, effective dose and procedure time were estimated by SPSS 18.0 statistics program.

Results: Total effective dose of Conventional CT is 1.86±0.47mSv and CBCT is 6.16±1.97mSv. Average times of procedure are 44.46±10.70min and 18.01±1.13min, respectively Conventional CT and CBCT. When the nodule size is under 2cm, the effective dose and the procedure time are 2.01±0.64mSv and $5.18±1.25$min, 7.95±2.31mSv and 24.47±6.16min, respectively Conventional CT and CBCT. When the nodule size is over 4cm, the effective dose and the procedure time are 1.83±0.40mSv and 37.64±10.01min, 5.85±1.87mSv and 16.77±3.91min, respectively Conventional CT and CBCT.

Conclusions: The purpose of this study is to estimate usefulness of CBCT-guided RFA and evaluate effectiveness of radiation dose reduction.

Key words: Hepatocellular carcinoma, Radiofrequency ablation, Cone-beam computed tomography, Radiation dose

IR2-4

Cone-beam Computed Tomography-guided Radiofrequency Ablation Treatment of Small Hepatocellular Carcinoma: Radiation Dose Survey

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Purpose: Although transarterial chemoembolization (TACE) plus CT-guided radiofrequency ablation (RFA) is useful treatment for small hepatocellular carcinoma (HCC), significant radiation exposure may occur. cone-beam computed tomography (CBCT) may offer an advantage compared to multidetector computed tomography (MDCT) for dose reduction. The purpose of this article is to survey radiation dose in CBCT-guided RFA and evaluate effectiveness of radiation dose reduction.

Materials & Methods: This study consisted of 268 patients (mean age, 59.3 years; age range, 34-80 years; 227 men, 41 women) underwent TACE±RFA on angiography equipment (ALLURA-FD 20 XPER. PHILIPS). Patient demographic data (maximum skin to skin transverse diameter, weight, lesion size, number of lesions) and scan parameter (mA, kvp) were recorded. Effective dose in mSv was estimated conversion factor 0.0023.

Results: A total of 268 patient's overall mean effective dose and mean fluorotime was 24.8 mSv and 10min 30sec multiple lesions and patients transverse diameter >30cm were significantly higher radiation exposure (48.1% and 32.5% increase respectively p<0.001, p<0.043).

Conclusions: CBCT-guided RFA is useful targeting technique and radiation doses are significantly lower than doses (38-65 mSv) in the reference literature.

Key words: Hepatocellular carcinoma, Radiofrequency ablation, Cone-beam computed tomography, Radiation dose

IR2-5

Fluoroscopic Removal of Retrievable Self-expandable Metallic Stents: Experiences in 81 Consecutive Patients with Benign and Malignant Tracheobronchial Strictures
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Purpose: To retrospectively evaluate the technical outcomes of fluoroscopic removal of retrievable self-expandable metallic stents (REMSs) and identify predictors of technical failure in 81 patients with benign and malignant tracheobronchial stenoses.

Materials & Methods: A total of 98 REMSs were removed under fluoroscopic guidance in 81 patients with benign (n=48) or malignant (n=33) tracheobronchial strictures. Primary and overall technical success rates and complication rate were evaluated. Technical outcomes with regard to underlying diseases were also evaluated. Logistic regression models were constructed to identify predictors of primary technical success.

Results: Primary and overall technical success rates were 86.7% and 94.9%, respectively. Stent removal-related complication rate was 7.1% (7/98) and all were bleeding after stent removal. All bleeding complications were minor and managed conservatively. Primary technical success rate for benign strictures was significantly lower compared with that for malignant strictures (80.9% vs. 97.1%, P=0.029), but overall technical success rate (93.7% vs. 97.1%, P=0.652) did not differ between two groups. Granulation tissue formation was identified as an independent predictor of primary technical
IR2-6

The Role of Interventional Radiologists for Patients with Endoscopic Stent Placement Failure in Malignant Gastroduodenal Obstructions

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Purpose: To assess the technical feasibility and clinical effectiveness of fluoroscopic stent placement in patients with malignant gastroduodenal obstructions following technical failure of endoscopic stent placement.

Materials & Methods: 19 patients (14 men, 5 women; range 36-85 years) were referred to interventional radiologists because of a technical failure of endoscopic gastroduodenal stent placement. The causes of failure were inability to pass the guide wire through the obstruction (n=13), failure to reach the stricture lesion due to short endoscope (n=5), and failure to pass the stent delivery system because of acute angulation of the stricture lesion (n=1). Data were collected regarding fluoroscopic technical and clinical success, dysphagia score before and after stent placement, and complications and its management.

Results: Fluoroscopic stent placement was technically successful in 15 of the 19 patients (78.9%). In the remaining patients, the guide wire could not pass through the stricture owing to complete obstruction (n=3), and the stent delivery system could not pass through the stricture because of acute angulation of the stricture lesion (n=1). Clinical success was achieved in all 15 patients. The dysphagia score (3.79 ± 0.92) before stent placement had significantly improved after stent placement (1.63 ± 0.62, p<0.001). Complications occurred in four of the 15 patients, including tumor overgrowth (n=2), stent collapse (n=1), jaundice (n=1).

Conclusions: Fluoroscopic stent placement in patients with malignant gastroduodenal obstructions following a technical failure of endoscopic stent placement seems to be technically feasible and clinically effective.

Key words: Fluoroscopic stent placement, Malignant gastroduodenal obstructions, Interventional radiologists

IR3-2

Comparison of Post-intervention Patency Duration between Femoral Vein Access to Arteiovenous Fistula(Native) and the Other Vessel Access to Arteiovenous Fistula(Native) with Stenosis for Hemodialysis

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Purpose: Arteiovenous Fistula(AVF) is essential for the prognosis of the hemodialysis patients. The frequent complication in vascular access for hemodialysis is the stenosis of AVF site. In this study, We compared the outcomes of intervention between the femoral vein access group(Group A) and the other vessel approach group(Group B).

Materials & Methods: From January 2005 to December 2015, 121 intervention cases of AVF(Native) with stenosis or obstruction, 24 cases in group A. 97 cases in group B.

Results: The mean follow-up duration in group A was 234±141 days and in group B was 172±124 days. The intervention success rate was 100% for group A and 97.97% for group B. Group A for the mean patency days increased significantly(p=0.00).

Conclusions: Femoral approach improved native arteriovenous fistula patency duration compared to the other vessel accesses when patient has stenosis in AVF site.

Key words: AVF, Approach, Femoral, Navtie

IR3-3

The Effectiveness of the Concentration of Contrast Media for Detecting the Stent Stenosis and Wall Apposition

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Purpose: The treatment method for chronic total occlusion (CTO) cases includes antegrade approach and retrograde approach. Percutaneous coronary intervention (PCI) for CTO cases, if antegrade approach is difficult, treatment results of CTO cases have been improved by retrograde approach has been established. However, the collateral channel used with the retrograde approach are vulnerable, and there is a danger of rupture. Therefore, it is important to find the collateral channel which can be used safely. The aim of this study is to evaluate the collateral channels from a coronary CT image using computational fluid dynamics (CFD) analysis.

Materials & Methods: Made the simulated stenosis phantom which varied in the stenosis rate and performed CFD analysis and investigated the influence that a stenosis gave to wall pressure (WP) and wall shear stress (WSS). Performed CFD analysis using clinical data that coronary arteries have stenosis and CTO. Especially, Evaluated for collateral channels of case of CTO.

Results: WP of the proximal side is increased if stenosis rate of the simulated stenosis phantom is the bigger. In addition, WSS of stenosis rate of simulated stenosis phantom is increased, WSS of stenosis lesion is bigger. As for this, a similar result was obtained by clinical data. Collateral channel of CTO cases that has been rated as easy to retrograde approach, it had almost the same as collateral channel that led the PCI to success.

Conclusions: In this study, evaluation of collateral channel by using CFD analysis have been suggested to be useful for CTO as PCI support images of retrograde approach.

Key words: CFD analysis, Collateral channels, Chronic total occlusion (CTO), Focal stenosis lesion
Key words: Dynamic phantom, Image Lag, Fluoroscopy

IR3-5
A Time Saving Protocol for Thrombolysis in Acute Stroke

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Purpose: An effective stroke treatment system is requires rapid thrombolytic treatment, effective communication and an organized team approach. We developed a stroke code program that named Brain Salvage through Emergency Stroke Therapy (BEST) and investigated usefulness for reducing time of commencing intra-arterial thrombolytic treatment (DSA).

Materials & Methods: Time intervals from arrival at the intra-arterial thrombolytic treatment (DSA) during the 1-year period before and the 1-year period after the program implementation were compared.

Results: Time intervals from arrival to intra-arterial thrombolysis (DSA) evaluation steps were significantly reduced after implementation of the BEST protocol. The time from arrival to intra-arterial thrombolysis (DSA) was reduced from 93.9±66.5 minutes to 53.5±20.7 minutes (P<0.001).

Conclusions: The Brain Salvage through Emergency Stroke Therapy (BEST) protocol could be useful to reduce delay of thrombolytic therapy time and the BEST protocol is an efficient tool to communication and an organized team approach.

Key words: Acute stroke, Thrombolysis, IA treatment, BEST

IR3-6
Validation of Measurable Wire Using Comparison Calibration Methods

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Purpose: It is important to determine the diameter and length of device in neurointervention procedures. Our study’s aim was to validate that the developed measurable wire could use as an internal reference through comparison of the calibration methods.

Materials & Methods: We acquired DSA image of an acryl phantom which is consist of known diameter of the silicone tube(4mm) and gelatin gel filled inside. The tube-detector distance was 100cm. The field size was 32cm. We measured the tube applying auto ISO(Iso-center), TOD(Table-Object Distance), catheter, sphere, distance calibration methods. At that time, we changed the locations of the measurable wire which was outside and inside of the tube. And we rotated the C-arm to make the 20°, 40°, 60°. Two radiological technologists measured the tube using a QCA(Quantitative Coronary Analysis) program and acquired the value of measurement over 20 times. We statistically analyzed the data through SPSS.

Results: When we located the reference object chaing height from 3cm to 12cm, the mean and standard deviation value was followed: Distance (3cm: 4.02±0.19), Auto ISO (3cm: 3.82±0.41, 9cm: 3.85±0.29, 12cm: 3.84±0.25), TOD (3cm: 3.97±0.68, 9cm: 4.32±0.28, 12cm: 4.45±0.33), Catheter (3cm: 3.5±0.48, 9cm: 4.21±0.36, 12cm: 4.35±0.35), Sphere (3cm: 4.03±0.51, 9cm: 4.33±0.53, 12cm: 4.50±0.67).

When we rotated the C-arm 20°,40,60°, the mean and standard
deviation value was followed: Distance (20°: 4.06±0.33), Auto ISO (20°: 3.91±0.22), 40°: 3.90±0.27, Auto ISO 60°: 3.89±0.29), T0D (20°: 4.08±0.45, 40°: 4.08±0.37, 60°: impossible), catheter (20°: 4.07±0.34, 40°: 4.16±0.29, 60°: 4.32±0.24), sphere (20°: 4.17±0.57, 40°: 4.32±0.30, 60°: 4.44±0.32). The p-value of the distance and ISO calibration was meaningful(p<0.01).

Conclusions: The measurable wire would be probably use as an internal reference during neurointervention procedures.

Key words: Measurement, Measurable wire, Calibration method, Reference, Cerebral artery

6. MANAGEMENT (QA & QI)

MM1-1
Research on DR Receptor Management with EMTF Curve
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Purpose: The management of DR receptor is a great influence in assessing about quality of the image. Researchers evaluate DR receptor about number of photons per unit area of incidence object and scattering, attenuation, expansion by the object, influenced of GRID. Also we use eDQE(f,t)= (eMTF(f,t)*2(1-SF)*2ν* eNPS(f,t)*Tff*xq*xq developed by Samei et. al in consideration of the image quality of the entire image blur is the system reflected by the focus.

Materials & Methods: Using diagnosis X-ray installed DR receptor of number of year use RQA5 among 4kind of quality of radiology by IEC61267. It was tested in accordance with IEC 61220-1. Test images saved JPEG FILE in PI VIEW program and used Matlab(Version 7.6.0.321(R2008a)) EDGE image obtained ESF(Edge Spread Function)In differentiating obtained LSF(Line Spread Function)curve and then use FFT(Fast Fourier Transform) was obtained eMTF curve.

Results: Exposure time and using year following indicate 50%sharpness and 10%resolution can know the pattern of the measured values of eMTF.

Conclusions: After installed equipment of X-ray, if we measure eMTF curve of DR receptor, can analyze, change, evaluate about DR receptor. If you manage equipment from the beginning, you can handle it objectively.

Key words: eMTF curve, Matlab (Version 7.6.0.321(R2008a))

MM1-2
Study on Effectiveness of the Signal Intensity Correction Method for Assessment of the Signal Intensity Uniformity in the Multi-Channel Coil with the Missing Element
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Purpose: The purpose of this study is to demonstrate the effectiveness of the signal intensity correction method for assessment of the signal intensity uniformity in the multi-channel coil with the missing element.

Materials & Methods: The standard T1 was acquired in the 8 channel head coil and the ACR phantom at 1.5tesla. Image acquisitions were performed using the multi-channel coil with the missing element and with/without a signal intensity correction method.

Results: The PIU of normal coil without the signal intensity correction was 75.21% and the PIU of one missing element coil without the signal intensity correction was 73.16±1.33%. The PIU of normal coil with SCIC was 91.24±1.03%. The PIU of normal coil with PURE was 94.07% and the PIU of one missing element coil with PURE was 95.28±0.73%.

Conclusions: Although an element of the multi-channel coil is out of order, it can be accepted by using the signal intensity correction method. Thus, it is not easy to recognize the problem. For this reason, this can cause an error in the experiment or examination which requires quantitative data. Therefore, we suggest the need to check the performance of each element periodically.

Key words: Missing element, Multi-channel coil, PIU, SCIC, PURE

MM1-3
Do Delays in Radiology Lead to Breaches in the 4-hour Rule?
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Purpose: To assess trends in medical imaging requests before and after 4-hour rule commenced; to assess imaging time component of emergency department (ED) length of stay (LOS).

Materials & Methods: Retrospective analysis of ED patients and imaging requests one year prior to and three years after implementation of the 4-hour rule (April-December for 2011-2014) was performed at a single adult tertiary referral level 1 trauma hospital with level 6 ED. Logistic regression was used to evaluate trends in the number of ED patient presentations, patient triage category and imaging requests for these patients. Imaging component of the total ED LOS was compared for patients who met 4-hour target and patients who did not.

Results: Compared to 2011 (before 4-hour rule), ED presentations increased 4.74% in 2012, 12.70% in 2013, 21.28% in 2014 (p<0.01). Total imaging requests increased 23.05% in 2012, 48.04% in 2013, 60.77% in 2014 (p<0.01). For patients breaching the 4-hour rule, mean time before radiology request was 2.4-2.8 hours; mean time from imaging request to completion was 1.2-1.3 hours; mean time from imaging completion to discharge from ED was the longest component of ED LOS (4.9-5.9 hours).

Conclusions: There has been a significant increase in imaging requests, with a trend towards more CT and less X-ray requests. Imaging requests for patients who breached 4-hour target were made on average 2.4-2.8 hours after triage and average time after imaging in itself exceeded 4 hours. Imaging is not likely a causative factor for patients breaching 4-hour target.

Key words: Emergency Department, Imaging Requests, Radiology Requests, National Emergency Access Target, 4-hour Rule
MM1-4
Web Information Services of Radiology Departments at Public and Private Hospitals in Istanbul
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Purpose: The purpose of the research is to determine how and with which information the radiology department is listed in the websites of public and private hospitals in Istanbul.

Materials & Methods: The content of the information was determined with a survey in accordance with the literature. It reached data from 175 public and private health institutions in Istanbul. Research was conducted between 01/02/2016 - 13/03/2016. Frequency analysis of the obtained data was made with using SPSS (version 21.0).

Results: The status of the health organization: Public 55 (31.40 %), private 120 (68.6 %). "Which department of medicine includes Radiology department?" Basic medicine department 38 (21.7 %), surgery medicine department 1 (0.6 %), internal medicine department 6 (3.4 %), independent 57 (32.6 %), diagnostic department 27 (15.4 %), none of them 42 (24 %). "Does it say some information under department of Radiology?" Yes 123 (70.3 %). "Is there the health organization’s web site?" Yes 161 (92 %). "Was name of Radiology Department written on the health organization’s web site?" Yes 134 (76.6 %). Was it written an information about the radiology department on the organization’s website?" Yes 113 (64.6 %). "Is there any information for map on the web site, thus, somebody finds it?" Yes 2 (1.1 %). "Is there any information for pre-post preparation for radiology procedures on the organization’s web site?" Yes 7 (4 %).

Conclusions: The websites of public and private hospitals in Istanbul should also include, inter alia, information about radiology department. The target group should be informed about the relevant medical department, the radiology team, the services, contact information, the preparations prior to the examination, the behavior after the examination, etc. on the website. This increases patient satisfaction, the processes and workflows can be optimized, the institutions can realize their vision into reality.

Key words: Web Information, Radiology Department, Patient Information

MM1-5
Radiographers’ Knowledge, Attitude and Challenges on Pain Management
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Purpose: The aim of the study was to investigate the attitude and knowledge base of the diagnostic radiographer and outline policies and challenges with regard to pain management at the research site.

Materials & Methods: A descriptive survey method was used in the administration of a questionnaire to 29 practicing radiographers.

Results: Twenty-eight (97 %) of the questionnaires were returned though not all questions were completed by all the respondents. The results of the study established that there is limited knowledge of pain management among this cohort of radiographers. The analysis revealed that 71 % of the radiographers surveyed had no formal training on the subject and 50 % of the respondents accessed the internet as a source of information on pain management. The study also showed the absence of pain management policies in the study sites.

Conclusions: The recommendations of this single site study are that regular in-service training programmes should be implemented for radiographers on this specific topic. Appropriate policies on pain management should be developed in order to enhance radiographers’ knowledge of pain and improve the quality of care to the patients attending this regional hospital.

Key words: Pain management, Diagnostic radiographer, Diagnostic imaging, Patient care.

MM1-6
A Web-based Integrated Radiation Oncology Information Platform Increasing Patient Safety: A Systemic Quality-improving Study
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Purpose: In conducting advanced radiotherapy (RT), multidisciplinary care is required for protecting patient safety, including radiation oncologist, medical physicist, and radiation technologist. Herein, from 2014 we established a web-based integrated radiation oncology information platform (IROIP) to integrate hospital information system (HIS) and OIS (i.e.,Varian ARIA oncology information system) to facilitate multidisciplinary care.

Materials & Methods: Several patient-safety-guarding functions were incorporated into the IROIP. First, dose-volume constrains of organ-at-risk were built electronically: if the planned dose-volume profile showed a higher pattern than that of pre-defined values, an alert will be automatically generated in a red-color form. Second, during RT courses, if the IROIP identified abnormal laboratory, such as a low value of white blood cells (WBC), or physiological data, such as a low diastolic blood pressure (DBP), automatic alerts will be sent to radiation technologists by a similar red-color form.

Results: Before and after the IROIP use, the convenient, correct, efficiency and integration satisfactory scores of radiation oncologists and medical physicists were statistically increased from 4.9 to 8.7; P=0.0002, 6.1 to 8.7; P=0.0003, 4.7 to 8.6; P=0.0002 and 5.9 to 8.7; P=0.0005 respectively. Moreover, no unchecked missing events were identified after IROIP used medical malpractice rate for dose-volume constrain: 0% (0/1309). During RT course, patients with abnormal laboratory (i.e., WBC < 1500/ cumm; n = 7) or physiological data (i.e., DBP<90 mmHg; n=70) were identified systematically. After effective alerts, our radiation technologists were able to adopt adequate standard operation procedures (SOP). The hold RT and then adequate management rate was 100% (77/77) for these patients at risk.

Conclusions: Established the IROIP is useful to increase working effectiveness and to protect patient safety in daily RT practice. Further value-added functions, such as Mobile Application-related ones, should be considered to incorporate in the IROIP for increasing involvement of patients and their caregivers.

Key words: Radiation oncology Information system, Patient safety.
Designing a New Radiology Department

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Purpose: The purpose of this presentation is to describe the process of designing and building a new Radiology Department in a new hospital.

Materials & Methods: The Erasmus MC is the largest university hospital in the Netherlands. The existing main hospital building has become rather aged after 50 years. The design process for a large new building started in 2004. The actual construction of the new hospital started in 2009 and will be completed in 2017.

Results: The decision to build a new hospital gave Radiology an opportunity to think about the design of the new department, without the limitations of the existing building. Many people were involved from the start of the project, including many radiographers. We had a lot of multidisciplinary discussions, and architectural drawings were reviewed and we organized simulation games to test new concepts. In the months before the opening of the new hospital, all employees will learn to find their way in the building and in their own department. The Emergency Department moved to the new building earlier than the rest of the hospital. That gave Radiology a chance to “rehearse” for the big move in 2017; some adjustments to the plans were made.

Conclusions: The building of a new hospital is a great opportunity for a radiology department and for radiographers to design a better department and to solve problems. It is important to actively involve many people in the process from the start.

Key words: Design, Building

Developing Meaningful Key Performance Indicators to Objectivize Radiographer Performance Management and Drive Quality Improvement

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Purpose: To develop meaningful key performance indicators (KPIs) to enable objective performance monitoring as part of radiographers’ total performance management and drive quality improvement.

Materials & Methods: Literature review was performed but there was limited yield. KPIs were then developed through references to relevant international safety and quality standards. The radiographer-specific KPIs evolved over a 5-year period and included clinical, quality, safety and departmental measures. Data collection was performed by different teams and modality leads for the respective KPIs. The data was shared regularly at radiographer meetings, through e-mail, team meetings and the open appraisal exercise for performance feedback and development plans. Performance targets were set for each of the indicator based on baseline data, department, hospital or national targets.

Results: Over a 5 year period from 2011 to 2015, despite incremental increases in workload and staff turnover, the data was effective in driving overall quality improvement in the department. The following are some of the quality and safety indicators with results based on the departmental mean: Hand hygiene compliance rate: 57% to 79% (22% improvement) 2 Patient ID documentation compliance rate: 59% to 97% (38% improvement) Image reject rate: 7% to 6% (14% improvement) Patient complaint to complaint ratio: 1:1 to 3:1 (300% improvement)

Conclusions: Meaningful key performance indicators have improved the objectivity of radiographer performance management and have yielded quality improvement for the department.

Key words: Quality improvement, KPI, Performance monitoring, Radiographer, Total performance management

Research and Suggestion about management of Accumulated Dose of Patient in General X-ray Part

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Purpose: Advances in diagnostic research are giving a great performance to extend the life of the patient. It lacks interest in exposure dose in diagnostic because use a small dose. but ICRP103 said ‘at least 100mSv accumulated dose may increase the probability of impact(such as a cancer)’. So we are interest in accumulated dose of patient and studied for dose control method of the individual patient in general X-ray part.

Materials & Methods: We obtained data from QA TOOL which use equipment named Digital Diagnost VM2, Digital Diagnost TH in X-ray dose values from March 1, 2014 to April 30, 2016. After obtaining the data for age-specific DAP average values was converted to a value effective dose using the dose conversion method of the individual patient in general X-ray part.

Results: Efective doses: CHEST AP-0 year: 0.007475, Under 1 year: 0.008875, Over 5 year: 0.00955, Under 10 year: 0.011325, Over 11 year: 0.02655, CHEST PA-0 year: 0.00555, Under 1 year: 0.005875, Under 5 year: 0.009275, Under 10 year: 0.011325, Over 11 year: 0.024075, Over 11 year: 0.03165 units are mSv, we analyzed all data of doctor’s order code.

Conclusions: Current, That is not the situation as the administration dose values from the equipment. we managed enter the average values of DAP from DRL(Diagnostic Reference Level) in department of radiology. Although individual patient doses are cumulative probability problem situations, it is considered that any problem can be issued. Using the results enter the accumulated dose of patients automatically so we can check patients dose, if doctors are interest in patient dose, may reduced it, as a results we replaced US or MRI.

Key words: QA TOOL, DRL(Diagnostic Reference Level), DAP

From Analogue to Digital Radiology in Sweden - Experiences of Digitalization from an Organizational and Production Perspective

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Purpose: To describe the organizational changes that took place in five radiology clinics in Sweden in connection with the digitalization of radiology. How did the number and type of radiological examinations and distribution of hours worked change among different staff categories when comparing two
years before with two, four and six years after digitalization? How did the duties change after digitalization within and between different staff categories? 

Materials & Methods: Quantitative and qualitative methods were combined in order to answer the study questions.

Results: All radiology clinics had a small increase in the number of radiological examinations, while computed tomography and magnetic resonance imaging examinations increased significantly. Thus, more complex examinations were carried out post digitalization, a fact considered to have led to qualitatively better and safer diagnoses. The total working time was reduced at three clinics. The total number of hours worked increased for radiologists and radiographers but decreased for secretaries and assistant nurses. In general, radiologists and radiographers performed more tasks post digitalization, and many of the traditional duties of secretaries and assistant nurses were eliminated or taken over by the computer. Digitalization enabled greater access to radiological images and patient data in addition to improved quality and diagnostics of the radiological examination. Digitalization also allowed a better-controlled workflow, as well as improving ergonomics, the environment and the coordination with other clinics. The study interviews revealed themes describing: information, super users, education, clear work flows and routines, staff needs and motivation as well as clear leadership throughout the change process. According to Branson and Kotter, these themes are important for successful change.

Conclusions: The digitalization led to great changes for the different staff categories, with the advantages outweighing the disadvantages. To succeed with change, Branson’s perspectives and Kotter’s success factors should be taken into consideration.

Key words: Digitalization, Management, Radiology, Organizational Innovation, Workout, Workflow

MM2-3
The Experience and Results Analysis of Ultrasound Practice Competition of Medical Radiation Intern Mei-Yen CHANG1,2,4, An-Chuen WANG1,2,4, Chien-Fa CHANG1,2,4, Jong-Wen WEI1,4, Chiu-Wen KUO2
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Purpose: The purpose of Taiwan Association of Medical Radiation Technologists (TAMRT) holding ultrasound practical competition is making colleges and hospitals more emphasize practice training and encourage those Medical Radiation Interns (MRIIs) who perform well. And also to figure out which kind of anatomic image or diagnostic skill is simple or difficult to beginners, and therefore we could provide the result to schools and teaching hospitals for reference.

Materials & Methods: We established test bank containing thirty questions (22 anatomic and 8 diagnostic) and arranged five standard patients. The chair of practical competition took the status of standard patients into consideration and picked ten questions including 1 to 3 diagnostic images on that day and then left standard images. There were two questions of each patient. Every contestant had 4 minutes to accomplish examinations and 1 minute to move to next spot. Supposing that five contestants proceeded at the same time, they completed contest in 25 minutes. We expected that 40 contestants finished in four hours. Contestants drew lots to decide their order and number while registration. We invited 3 experts to score the images referring to model images which could only identify by numbers. And awarded ceremony took place on the same day.

Results: During 2012 to 2015, there were 156 Medical Radiation Intern from the develop education MRTs 10 schools attending this competition. According to the results of four years of competitions, we used ANOVA and T-test statistical analysis. We found that the contestants’ ultrasound technology has progressed significantly (P<0.005).

Conclusions: The contestants from Universities of Science and Technology were performed better than those from General Universities (P<0.005). About teaching hospital, the contestants from teaching hospitals in which Radiology department has ultrasound examination performed by MRTs had higher score (P<0.005). The contestants from public hospitals had higher score than those from private hospitals (P<0.005).

Key words: Medical Radiation Interns (MRIIs), Ultrasound practical competition

MM2-4
Introduction to Safety and Risk Management in Macao Radiology Departments Kai Hong Jerry LEI Macao Radiological Technologists’ Association, Macao, China (jerryle1982@gmail.com)

Purpose: Aim to discuss the optimal way for delivering high quality services and minimizing possible risks to patients and the public in Macao.

Materials & Methods: To participate the hospital healthcare standard accreditation scheme, which is internationally renowned.

Results: Through the hospital accreditation program every aspect of the radiology department risk will be monitored and errors will therefore be minimized. Working environment is improved to staffs. High quality and safe health care services are delivered to the patients.

Conclusions: As a conclusion, higher quality and safer health care services are delivered through participation of the accreditation program.

Key words: Safety, Macao, Risk, Services

MM2-5
“Glass-Ceiling Syndrome” of Radiology Unit Employees of Public and Private Health Institutions Busra TUNCER and Nuran AKYURT Medical Imagine, Marmara University, Turkey (nakyurt@hotmail.com)

Purpose: The present study has aimed to determine whether there is an unseen barrier, or “glass ceiling” as referred in the literature, preventing female employees working at the radiology departments of public and private health organizations located at the province of Istanbul from climbing the corporate ladder, and to reveal factors causing the relevant situation, in case the answer to the above mentioned question is positive.

Materials & Methods: A “Personal Information Form” was used to determine the socio-demographical properties of employees.
In the second section of the form, questions were asked on the multiple roles assumed by female employees such as occupational discrimination, attitudes towards stereotypes and awareness of the glass ceiling concept. 94 public and private sector radiology employees constitute the sample of our study. The study was conducted between the dates of March 19 and April 10. Results: Of the 94 radiology employee participants, is 53.2% female, 46.8% male. During the assessment of the study data, the descriptive statistical methods to be used will be mean, standard deviation, Mann Whitney U, Anova Test, Tukey HSD, t Test, median, frequency ratio, minimum and maximum. The results will be assessed in a confidence interval of 95%, while the significance limit will be at the level of p<0.05. Conclusions: The impact of all the results and assessments acquired on whether there is a glass ceiling, preventing female employees working at the radiology departments of public and private health organizations of Turkey from climbing the corporate ladder, and the factors causing the relevant situation, are limited with the perceptions and attitudes of the 94 participants subjected to the survey. Studies on glass ceiling/glass ceiling syndrome have been carried out in many fields; however, the present study is the first one particularly on radiology units, No definite result could be obtained.

Key words: Glass Ceiling, Gender Roles, Female Managers in Radiology

MM2-6
Pulmonary MRI at 1.5T: Image Quality Evaluation of the Different Sequences
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Purpose: To compare and evaluate the image quality of different sequences for lung MRI.

Materials & Methods: This study included 15 patients who underwent pulmonary MRI at Philips Multiva 1.5T(11 males and 4 females with a mean age 58.67±13.35 years, lesion size 31.87±20.75 mm). The protocol included PG-gated Single shot FSE, RT radial K-space FSE with fat sat (Multivan), RT SE-EPI DWI, b=0/300/600 s/mm², eThrive contrast and In/oppose phase.

Two experienced technologists graded the visual image quality of the different sequence images (1: poor quality to 5: excellent quality) according to the cardiac and breathing artifacts and the margin of lesions displayed clear or not.CNR and SNR were measured and statistically compared.

Results: The visual score of SSFSE, FSE, In phase and eThrive was 4.93±0.26, 4.27±1.03, 4.13±1.12, 3.73±1.27, respectively. Each of the percentage of breathing artifacts occurrence was 0%(0/15), 0%(0/15), 26.7%(4/15), 53% (8/15), respectively;cardiac artifacts was 0% (0/15), 20%(3/15), 3.3% (5/15), 40% (6/15), respectively. The percentage of clear lesions margin was 93.3% (14/15), 53.3%(8/15), 73.3%(11/15), 66.7%(10/15). CNR of SSFSE,FSE and In phase was 9.78±11.12, 17.32±11.22, 7.27±5.50, respectively, and SNR was 26.89±12.96, 25.36±11.84, 16.03±9.61, respectively. DWI had low Image quality because of serious artifacts and torsion, but ADC were measurable. The CNR of FSE was significantly higher than the SSFSE (p=0.033), SNR were similar (p=0.762). The SNR and CNR of FSE was significantly higher than In phase(p=0.026/0.017), the SNR of SSFSE was significantly higher than In phase(p=0.002), CNR were similar(p=0.390).

Conclusions: SSFSE is good at detecting and measuring lesions as less artifacts;clear margin and shorter scanning time. FSE offset the CNR. The other sequences also each has advantages to provide important diagnostic information for the detection and characterization of lung nodule and tumor. Combining the different sequences, MRI is valuable for routine clinical use in pulmonary diseases.

Key words: Magnetic resonance imaging, Lung, SNR, CNR, Image quality score

MM3-1
Development of Distance Accuracy Measurement Program for Quality Control of Diagnostic Ultrasound System
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Purpose: Evaluating the performance of a diagnostic ultrasound system is important. Above all, establishing standards for such evaluations in an objective and systematic way is critical. However, quality control is currently measured based on subjective judgment of an observer. Against this background, this study intended to suggest quantified and objective data that would enable inter-observer variation to be overcome.

Materials & Methods: Five radiological technologists used an ATS-539 multi-purpose ultrasound phantom to conduct measurements in the predetermined method. DICOM standard image was obtained in an ultrasound system by using a self-developed software to measure the accuracy of the distance before the 95% confidence interval was calculated. In order to examine the accuracy of the distance in longitudinal and transverse measurements, we conducted t-tests to evaluate the significance for the results of quality control that was performed manually for the past one year and for the results

Results: For the longitudinal and the transverse measurements, the 95% confidence intervals were 100.96-101.29 mm and 83.18-84.26 mm, respectively. The computerized longitudinal measurement showed no significant difference from the manual measurement (p>0.05). The results of measurements using of software showed a higher reproducibility.

Conclusions: The most important factors to ultrasound quality control include accuracy and reproducibility. In particular, realization of high reproducibility is essential to secure reliability for the measurement results. With the development and the use of computerized programs, quality control for ultrasound equipment overcome inter-observer and intra-observer variations due to manual work and improved reproducibility. Moreover, compared to existing method such methods enable quality control to be performed in a short time, in a convenient way and in a uniform way. As many ultrasound systems have already been introduced, this study developed new evaluation indices by performing computerized quality control for diagnostic ultrasound system and laid the foundation for systematic quality control.

Key words: Diagnostic ultrasound system, Quality control, Image processing, Ultrasound phantom

MM3-2
Artifacts in Digital Radiography and Methods of Resolution
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**Purpose:** Artifacts in digital radiography are supported bad effect of patient’s health care. We report cause of occurrences the artifacts and provide methods of resolution.

**Materials & Methods:** We had collected the artifacts occurred in digital radiography system from 2007 to 2014. The collected data was analyzed and then had categorized as they occurred causes.

**Results:** The Artifacts classify into hardware artifacts, software artifacts, operating errors, system errors, and others. Hardware artifacts from a Ghost artifact that is caused by lag effect occurred most frequently. The others cases are the artifacts caused by RF noise and foreign body in equipment. We need to ongoing quality control for prevent of these artifacts. The uncorrected processing errors occurred most frequently in software artifacts. Exposure data recognize (EDR) error, the processing error of commissural line, and etc., software artifacts were caused by various reasons. Operating errors were caused that operator did not understand digital radiography in correctly. If he shall correctly understand the digital radiographic characteristics, most of the error will do not appear. System errors had appeared the error due to the compression algorithm.

**Conclusions:** The artifacts lead to a wrong diagnosis and added the cost. We correctly understand the digital radiography, and if we ongoing efforts in the maintenance of equipment, the occurrence of artifacts will decrease.

**Key words:** Digital Radiography, Artifact, Hardware, Software

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**MM3-3**

**Reproducibility Study on the Quantification of Coronary Artery Calcification Based on Software Manufacturer**

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**Purpose:** CT scans have been used to perform early detection and treatment of cardiovascular diseases. The quantification of coronary artery calcification differs, however, based on the software manufacturer. The major objective of this study was to identify the variable factors existing between software manufacturers and to develop a method to minimize these differences and improve reproducibility.

**Materials & Methods:** The coronary artery disease grading system (based on total calcium score) was referred to create phantom samples by using hydroxyapatite which is a substitute material of calcification. Three phantom samples were made per group to make a total of 12 samples. These phantom samples were scanned by using CT scanners from different manufacturers. (GE VCT, Philips brilliance 40 CT, Siemens SOMATOM Definition Flash) Softwares from 4 different manufacturers were utilized to assess differences in AJ-130 and volume values before and after correcting for variable factors. (GE AW, Philips EBW, TeraRecon Aquarius workstation, AZE virtual place)

**Results:** The variable factors of AJ-130 values were slice thickness and per slice score(3D score/per slice score). The variable factors for volume values were the isotropically interpolated volume scores(Yes/No). After correction, a reduction in the standard deviations of the AJ-130 and volume values were observed. AJ-130: G brand 301.2±27.56 to 281.5±±0.44, P brand 337.9±24.05 to 320.86±0.21, and S brand 365.85±28.64 to 341.5±0.37; Volume: G brand 214.1±2.08 to 213.37±0.26, P brand 243.5±±1.29 to 243.88±0.32, and S brand 258±2.16 to 259.29±0.13.

**Conclusions:** This correction resulted in the enhancement in replication between the different software manufacturers. The options provided by each software manufacturer act as variable factors in quantifying calcification. Therefore, the software operator and researcher should use caution and discretion when interpreting results.

**Key words:** Coronary artery, Calcium Score, Agaston

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**MM3-4**

**Team Working in Radiology: What is Possible?**

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**Purpose:** To review the evidence that radiographer advanced practice has on the delivery of radiology services. Data from a single acute hospital in London, United Kingdom, will be presented as an exemplar of best practice to highlight the possible contribution of radiographer advanced practice to effective, efficient and patient focused radiology.

**Materials & Methods:** A critical review of the literature will place current practice in the United Kingdom into international context, and emphasise key milestones and developments. Data from a continuous service evaluation at a single radiology department in the United Kingdom was analysed for a 12 month period (April 2015-March 2016) and compared to 2014-15. Departmental activity by modality (CT, MRI, X-ray, ultrasound), waiting times (CT, MRI, ultrasound) and report turnaround times (CT, MRI, X-ray) were reviewed. The proportion of imaging examinations performed and/or reported by advanced practitioner radiographers, sonographers, extended scope physiotherapists and consultant radiologists were examined.

**Results:** Despite ongoing increases in departmental activity (CT 13%, MRI 35%, ultrasound 36%), with both waiting times (CT 1.2 weeks, MRI 1.7 weeks, ultrasound 1.7 weeks) and report turnaround times maintained or improved (CT 1.2 days, MRI 2.5 days, X-ray 1.3 days). Reporting radiographers (X-ray reporting 67%), sonographers and extended scope physiotherapists (ultrasound 59%) provided a significant contribution to the radiology workload. Radiographer-led immediate emergency department skeletal reporting and a neonatal X-ray reporting service have been implemented.

**Conclusions:** Radiographer and sonographer reporting add significant diagnostic capacity, equivalent to approximately 6 full time consultant radiologists. As part of an integrated imaging team, with robust clinical governance, audit and professional education, advanced practitioner radiographers make a significant contribution to patient focused radiology.

**Key words:** Advanced practice, Service evaluation
7. MR IMAGING

MM3-5
Leadership with Emotional Intelligence
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Purpose: This presentation aims to look at what is Emotional Intelligence and how we can use it as Radiographers.

Materials & Methods: A review of theories on leadership and emotional intelligence.

Results: Emotional intelligence (EI) is the ability to understand and manage your own emotions, and those of the people around you. People with a high degree of emotional intelligence know what they’re feeling, what their emotions mean, and how these emotions can affect other people.

Conclusions: For leaders, having emotional intelligence is essential for success.

Key words: Leadership, Emotional Intelligence, Management

MR1-1
A Study on the Optimal Inspection Area Based on the Evaluation of Intensity Distribution of Gradient Magnetic Field of Gradient Coil
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Purpose: This study aims to examine the distribution of signal strengths by equipment depending on the inspection areas of patients subject to MRI scanning and to find the optimal location of subject to enhance the quality of scanned results.

Materials & Methods: We used 3.0T MR Scanner (Ingenia, Philips Medical System), 3.0T PET MR Scanner (Biograph mMR, Siemens Medical System), and 3.0T MR Scanner (Discovery 750W, GE Medical System). Water Phantom (459800/1621 2000cc, Philips Medical System) and the body coil have been used to measure the signal strengths. Five inspections have been conducted using several parameters. For inspection, I have arranged the Phantom in iso-Center and obtained the scans of Axial, Sagittal, and Coronal. I have adopted a quantitative analysis method to obtain the average of three regions of interest (ROI) in a constant size in INFINITT PACS 5.0.0.142 program and the average by assigning one ROI in Phantom, and then conducted a comparative analysis on SNRs based on the signal strengths in X-(sagittal), Y-(coronal), and Z-axis (axial).

Results: In obtaining the average SNR on each location on the equipment, the maximum strengths for Ingenia and Biograph mMR have been measured in on the slice of X10 (SNR 15.75), Y14 (SNR 16.29), Z14 (SNR 15.84) and on the slice of X11 (SNR 18.52), Y14 (SNR 21.17), Z7 (SNR 22.37) axes, respectively. In addition, the maximum strengths have been measured on X9 (SNR 22.91), Y12 (SNR 19.08), Z9 (SNR 23.42) axes in the case of Discovery 750W.

Conclusions: It is necessary that Axial and Sagittal have the inspection region placed right in the center in all inspection, including extremity. However, it’s better to place a thin pad on the table in the inspection of coronal in order to obtain quality scanned images. In conclusion, different features of different types of equipment should be taken into account in determining the optimal inspection regions instead of choosing the central location all the time.

Key words: Gradient coil, SNR, Axial, Sagittal, Coronal

MR1-2
Magnetic Resonance Imaging Reveals How Perinatal Inflammation Exacerbates Ventilation-Induced Injury in the Preterm Lamb Brain
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Purpose: Purpose: To examine structural and functional changes in the preterm lamb brain caused by intrauterine inflammation followed by inappropriate mechanical ventilation at delivery. Hypothesis: Neurological impairment caused by mechanical ventilation in the perinatal period is exacerbated by ongoing inflammation, and these changes can be detected by magnetic resonance imaging (MRI) techniques.

Materials & Methods: Pregnant ewes received intra-amniotic lipopolysaccharide (LPS) 7 days before delivery at 127 ± 2 days gestation. Lambs either received protective ventilation (LPS+PROT; n= 6), or 15 minutes of injurious ventilation (LPS+INJ; n= 6) followed by PROT ventilation. At 90 minutes, lambs were investigated with diffusion tensor imaging (DTI) (3 Tesla) to measure axial, radial and mean diffusivity (AD, RD, MD) in 30 directions. A colour map threshold technique was utilised to assess the regional distributions of voxels with low levels of diffusivity. We also examined whether chronic inflammation exacerbated brain injury by mechanical ventilation, by comparing with preterm lambs which received protective and injurious ventilation without chronic inflammation.

Results: No cerebral injury appeared on structural MRI images of any lamb. There were slightly lower and significantly more heterogeneous AD, RD and MD values in all regions of interest (ROIs) of the LPS+INJ group compared to the LPS+PROT group. The colour maps revealed lower AD, RD and MD values in the thalamus, frontal white matter and internal capsule of lambs in the LPS+INJ group compared to the LPS+PROT group. Further, lower diffusivities within these regions were observed in the brains of lambs exposed to chronic inflammation compared to those lambs not exposed.

Conclusions: MRI can be used to identify the acute exacerbation of ventilation-induced brain injury in the preterm brain caused by intrauterine inflammation. Intrauterine inflammation exacerbates ventilation induced brain injury.

Key words: MRI, DTI, Colour maps, Preterm brain.
MR1-3

Diagnostic Value of Computed Tomography and Magnetic Resonance in Detecting Peripheral and Central Vertigo

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Purpose: This literature review will compare the diagnostic value of MR and CT in detecting peripheral and central vertigo, and discuss the relevant financial factors and clinical applications.

Materials & Methods: Head CT is often the first-choice imaging modality for patients with vertiginous symptoms. In terms of speed, CT typically is faster than MRI. However, MRI is known for its better contrast resolution. Vertigo related pathologies often involve particles, bony defect, and blood occlusions which are found within small structures. This literature review will refer to previous researches and compare the diagnostic value of MRI and CT in detecting peripheral and central vertigo.

Results: CT has been found to have a lower diagnostic yield for vertigo. CT may be useful in detecting certain pathologies of peripheral vertigo due to its high contrast. However, many subtypes of peripheral vertigo do not require confirmation from the imaging study before providing treatment. For representative vertigo types, MRI has been proven to have consistently higher sensitivity.

Conclusions: Cost-effectiveness is a concern for health authorities in countries that provide subsidized health care. In Canada alone, vertigo accounts for an average of 4 million visits in ambulatory care settings annually. This suggests potential costs of 10 billion per year if imaging modalities were unreasonably selected. To avoid an unnecessary cost, careful selecting patient for an appropriate imaging modality is important. Neurologic deficits are indications for mandatory imaging because certain neurologic signs may indicate possible life-threatening central causes. Prioritizing these patients for an MRI scan may be more cost-effective in terms of providing quality patient care.

Key words: Vertigo, CT, MRI

MR1-4

The MR Imaging of Autogenous Free Fat Grafts in the Human Temporomandibular Joint

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Purpose: Temporomandibular joint (TMJ) adhesion is usually seen in many TMJ diseases and is also a common complication after TMJ surgery. Autologous fat grafts in the temporomandibular joint (TMJ) has achieved positive clinical effects in preventing adhesion after surgery. However it still remains indeterminate about the survival rate of grafted fat. The purpose of this study was to evaluate the long-term survival rate of free fat grafts in the TMJ using magnetic resonance imaging (MRI).

Materials & Methods: 89 patients (117 joints) with free fat grafts placed into TMJs following modified TMJ disc anchor were included in our study. They were divided into the following groups according to the time lapse between TMJ surgery and the latest MRI investigation: 1-3 months, 4-6 months, 7-12 months, 13-24 months, and 24 months. The scanner was a General Electric (Signa; General Electric, Milwaukee, WI) 1.5 T system with the ‘Excite’ platform. A dual phased array dedicated TMJ surface coil was used. The Osag (oblique sagittal) and the OCor (oblique coronal) T2WI (T2-weighted images) and the Osag PDWI (proton-density weighted images) in the closed mouth position and the Osag T2WI in the open mouth position were obtained. The signal intensity changes and volume retention were evaluated by MRI.

Results: The volume retention rate of grafted free fat showed that the size was hovering right around 50% although it reduced very slowly with a long-term follow-up. The postoperative serial MRI evaluation of the grafted fat showed survival of the transplant, with the size reduced to approximately 57.82% (50.59%-68.77%) within 3 months, 53.22% (38.99%-59.97%) in 4-6 months, 55.91% (47.51%-66.82%) in 7-12 months, 53.94% (45.30%-62.98%) in 13-24 months, and 48.44% (37.93%-55.11%) in more than 24 months. A significant difference was only found between the group observed at 1-3 months and the group observed at more than 24 months (P<0.05). Nearly all joints showed lower signal intensity of the grafted fat in MRI within 6 months and it recovered to normal compared with that of the day after surgery 6 months later.

Conclusions: Free fat grafted into TMJ cavity could be alive for a long time with the survival rate about 48.44%. However the survival mechanism has still been unknown, which need us to explore and study in the future.

Key words: MRI, TMJ, Autogenous free fat grafts

MR1-5

Iron Deposition in the Gray Matter in Patients with Relapse-Remitting Multiple Sclerosis: A Longitudinal Study Using three-dimensional (3D)-enhanced T2*-weighted angiography (ESWAN)

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Purpose: To investigate the relationship between the iron content by magnetic resonance imaging (MRI) and clinic correlation in patients with relapse-remitting multiple sclerosis (RRMS) over a two-year period.

Materials & Methods: Thirty RRMS patients and 30 healthy control subjects were examined twice, two years apart, by undergoing brain conventional MRI and ESWAN sequences at 3.0 T. Quantitative differences in iron content in deep GM nuclei and precentral gyrus GM between patients and control subjects with repeated measures the MPVs for ESWAN-filtered phase images. Spearman's rank correlation coefficient analysis was used to evaluate correlations of the MPVs, both 2-year difference and single-time measurements, to disease duration, EDSS and times of recurrence.

Results: The RRMS patients had higher GM iron concentration than that of the healthy control subjects in both single-time measurements, but only the substantia nigra (SN), and the precentral gyrus GM (PGM) showed a significant statistical difference (p < 0.05). Using the paired samples t test, we found that there were significant differences in two-year-difference measurements of the MPVs in the putamen (PUT), the globus
All patients completed the examination. The mean Iron content in the GM can be measurable. Totally 30 clinical patients who had diseases on knees were included in this study. The images of Sag 3D MERGE, PDWI fs and T1WI were diversity, which could be found in Cartilage, Anterior Cruciate Ligament (ACL) and Posterior Cruciate Ligament (PCL) of knees. By two high qualification MRI physicians who rated and observed 3D Knees of PD fs and MERGE sequences of articular cartilage and ligament.

**Conclusions:** Sensitivity could be obtained easily in MERGE sequence of knee tissue. To Compare FSE (fast spin echo), MERGE had higher SNR under the same FOV (field of view), Slice Thickness and Matrix, which might reveal cruciate clearly. However, the shape and structure of knee on ACL and PCL were shown not good enough.

**Key words:** MERGE, KNEE, Cruciate, SNR

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**MR2-1**

**Assessment of MRI Safety Practice in a Teaching Hospital**

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**Purpose:** The purpose of this study is to ascertain the current state of MRI safety practice in a teaching hospital regarding field strength, MR safety policy, compliance, patient screening, emergency preparedness, infection control, MRI safety accessories, equipment safety, signage and barriers, report of adverse effects, and access and communication.

**Materials & Methods:** A three-page questionnaire (24 yes-or-no questions) was used to obtain relevant information on the state of MRI safety practice in the facility.

**Results:** The facility lacked MRI safety policy, and so there was no compliance. In addition, there was neither a magnetic detector nor a ferromagnetic detection system (FDS), and lack of patient MRI safety screening questionnaire. Also apart from the generator, the facility lacked emergency resuscitation equipment, fire tender, study plastic, and emergency preparedness plan. The personnel lack training on emergency response protocol. Furthermore, there were no available wall mounted alcohol-based rub, and the only hand washing sink was limited to a patient changing room. It was also noted that there were no MRI compatible trolleys and headphones for patients. Also, no equipments were color coded. Though there were MR safety posters on the doors leading to the suite, it was noted that there was no red light and lighted sign showing “The Magnet is On” at Zone IV. The only adverse effect reported was contrast reaction. It was also revealed that MR personnel have direct visual access to corridors. However, there has been no invitation of police/fire representative(s) to MRI safety presentations/facility tours.

**Conclusions:** The need to put in the necessary safety measures is important to ensure that patients, relatives, and staff are safe within the MRI suite. The 2013 ACR Guidance Document on MR Safety Practices should be adopted for use to ensure adequate safety of all individuals within the MRI suite.

**Key words:** Assessment, MRI, MRI Safety, Practice, Patients

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**MR2-2**

**To Compare PDWI Fatsat, T1WI and MERGE Sequences on Knees Under 3T MR**

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**Purpose:** To investigate the difference of these three sequences which are widely used on knees, including Sag PDWI fs (fatsat), TIWI and 3D MERGE (three-dimensional, D Multi-echo recalled gradient echo).

**Materials & Methods:** Totally 30 clinical patients who had diseases on knees were included in this study. The images of Sag 3D MERGE, PDWI fs and T1WI were diversity, which could be found in Cartilage, Anterior Cruciate Ligament (ACL) and Posterior Cruciate Ligament (PCL) of knees. By two high qualification MRI physicians who rated and observed 3D Knees of PD fs and MERGE sequences of articular cartilage and ligament.

**Results:** All patients completed the examination. The mean signal strength of Cartilage, ACL and PCL of knees in PDWI fs were 876.07±232.71, 539.66±165.79, 369.10±205.28. The mean in T1WI were 1156.75±332.79, 852.33±147.46 and 619.23±156.83. And the mean signal strength of MERGE were higher than the sequences before, which would be shown as 1938.64±122.93, 1301.34±300.23 and 1014.12±210.92. Besides, SNR (Signal-to-noise) of these three sequences were demonstrated as 62.84±9.58 and 210.44±56.63. Two MRI physicians satisfied MERGE sequence which displayed articular cartilage accounted for 96.20% overall, but for the cruciate ligament was showed the satisfaction of 86.20%.

**Conclusions:** Sensitivity could be obtained easily in MERGE sequence of knee tissue. To Compare FSE (fast spin echo), MERGE had higher SNR under the same FOV (field of view), Slice Thickness and Matrix, which might reveal cruciate clearly. However, the shape and structure of knee on ACL and PCL were shown not good enough.

**Key words:** MERGE, KNEE, Cruciate, SNR

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**MR2-3**

**Diagnosis Valua in Patients with Prosthesis Using SEMAC-VAT Technique on 3T**

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**Purpose:** To compare the detection rates of local lesions and the clinical value of SEMAC-VAT TSE with routine TSE magnetic resonance (MR) imaging in patients for discomfort with titanium screws.

**Materials & Methods:** 19 patients with musculoskeletal disorder with titanium screws in spine (n=8), femur (n=8) and tibiofibula (n=3) after operation were examined for discomfort using a prototype SEMAC-VAT TSE sequence at a 3T MR scanner. The basic acquisition parameters for SEMAC-VAT and standard TSE were similar. T1- and T2-weighted imagings were performed. The slice-encoding step was 15 for SEMAC-VAT sequences. All patients were also examined by digital radiography (DR) and computed tomography (CT). Three radiologists with more than 10 years of musculoskeletal radiology experience evaluated the image quality using 5 grade scores in two sequences, and then counted the detected lesions.

**Results:** Visualizations of all periprosthetic anatomic structures with reduced hyperintense metal artifacts were better
Purpose: To analyze the 3D (three-dimensional, 3D) MRI features of rabbit extraocular muscle and optic nerve and optimize the imaging sequence.

Materials & Methods: Three-dimensional isotropic sequences, including three-dimensional double-echo steady state (3D-DESS), 3D sampling perfection with application optimized parallel acquisition technique (iPAT), and 3D volumetric interpolated breath-hold examination (3D-VIBE) were performed in orbits of 10 healthy rabbits. The signal noise ratio (SNR), contrast to noise ratio (CNR) and display score of rabbit extraocular muscle and optic nerve were compared among the above three 3D MRI sequences.

Results: 3D-DESS was significantly superior to 3D-VIBE (P<0.05) in SNR and CNR of orbital soft tissue, except for CNR of optic nerve in 3D SPACE (P>0.05). There were significant differences in all display scores of rabbit extraocular muscle and optic nerve between 3D-DESS and 3D-VIBE. 3D-DESS was superior to 3D-SPACE in display scores of uniformity of extraocular muscle and optic nerve and clarity of optic nerve.

Conclusions: Compared with the other two 3D MRI sequences, 3D-DESS improves the spatial resolution and contrast resolution of rabbit orbital soft tissues. 3D-DESS is the preferred 3D sequence in rabbit extraocular muscle and optic nerve imaging.

Key words: Rabbit, extraocular muscle, optic nerve, MRI, Comparative study

MR2-5

Diffusion Tensor Imaging for Evaluating Biliary Atresia in Infants and Neonates

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Purpose: Preliminary studies have shown that diffusion tensor imaging (DTI) is helpful in evaluating liver disorders. However, there is no published literature on the use of DTI in the diagnosis of biliary atresia (BA) in neonates and infants. This study aimed to investigate the diagnostic value of liver average diffusion coefficient (AvgDC) and fractional anisotropy (FA) measured using DTI for BA in neonates and infants.

Materials & Methods: Fifty-nine patients with infant jaundice were included in this study, who were divided into the BA and non-BA groups, according to the surgical and clinical outcomes. DTI was performed by a 1.5T MRI unit using a single-shot spin echo planar imaging with b factors of 0 and 1000 s/mm². Liver fibrosis in the BA group was determined and graded (F0, F1, F2, F3, F4) based on the pathological findings. Statistical analyses were performed to determine the diagnostic accuracy of DTI for BA.

Results: The AvgDC value [(1.262±0.127)×10^{-3} mm²/s] in the BA group was significantly lower than in the non-BA group [(1.430±0.149)×10^{-3} mm²/s; P<0.001]. The areas under the receiver operating characteristic curve were 0.805±0.058 (P<0.001) for AvgDC and 0.647±0.074 (P=0.053) for FA. With a cut-off value of 1.317×10^{-3} mm²/s, the AvgDC reached a sensitivity of 75% and specificity of 81.5% for the differential diagnosis of BA and non-BA. In the BA group, the AvgDC value was significantly correlated with fibrotic stages. Further analysis showed that the AvgDC value of stage F0 was significantly lower than that of stages F1, F2, F3 and F4, whereas there was no significant difference among stages F1, F2, F3 and F4.

Conclusions: Hepatic AvgDC measured with DTI can be used as an adjunct to other noninvasive imaging methods in the differential diagnosis of BA and non-BA. The AvgDC was helpful in detecting liver fibrosis but not in differentiating the fibrotic grades.

Key words: Biliary atresia, Magnetic resonance imaging, Diffusion tensor imaging, Neonates, Infants

MR3-1

Evaluation of the Usefulness of Slice Encoding for Metal Artifact Correction (SEMAC) with Integrated Parallel Acquisition Technique (iPAT)

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Purpose: The purpose of the study was to assess the usefulness of slice encoding for metal artifact correction (SEMAC) in 3.0-T magnetic resonance (MR) in minimizing metallic artifacts with integrated parallel acquisition technique (iPAT).

Materials & Methods: Twenty MR scans were performed with metal artifact reduction SEMAC on April 2016 with rod (6mm-40mm) made of titanium alloy within acrylic water tank. The MR scans were performed on a 3.0-T MR system (Skyra; Siemens Healthcare, Germany) including SEMAC-corrected T1/T2-weighted coronal images and two-dimensional fast spin echo (FSE) coronal images. The SEMAC-corrected images were compared to conventional T1/T2-weighted FSE images. Four MRI technicians qualitatively measured the images in terms of distortion of the metallic artifacts. The paired images were rated using a 5-point scale. P values less than 0.05 were considered to indicate statistically significant differences.

Results: The SEMAC-corrected MR images significantly reduced the metal-related artifacts. Saturation point for the enhancement distortion followed by metal artifact could be found in
between SEMAC-6-corrected images and SEMAC-8-corrected images (p<0.05). The recovery of space to distinguish the boundary between rods was more efficient in T1-Weighted image compared to T2-Weighted image. Compared with the SEMAC-corrected MR images and the SEMAC-corrected MR images with iPAT, there was no significant difference of distortion between both images. It is considered that the SEMAC-corrected MR image is useful in minimizing metallic artifacts with iPAT. In qualitative evaluation conducted with MRI technicians, there was no significant difference in the enhancement of image distortion regardless of the increase in SEMAC factor once it exceed certain SEMAC level.

Key words: SEMAC, iPAT, Magnetic susceptibility artifact

MR3-2

Altered Structural and Functional Connectome in Unilateral Sudden Sensorineural Hearing Loss

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Purpose: To investigate the alterations of brain structural and functional connectome in two large samples of unilateral sudden sensorineural hearing loss (USSHHL) patients within the acute period.

Materials & Methods: We constructed functional and structural connectome for USSHL patients (41 for left side and 44 for right side) and 85 healthy controls. Graph theoretical analysis was employed to evaluate the network properties of functional and structural brain connectome. Moreover, for each subject, we quantified coupling between functional and structural connectome by the correlation between functional and structural connectome edges within non-zero structural connectivity areas. The coupling of functional-structural brain connectome between USSHL patients and healthy controls was compared by using permutation tests. To investigate the clinical relevance of altered brain network topologies in USSHL, Pearson’s correlation analysis was performed between the clinical variables and the topological properties or the strength of functional structural connectome coupling.

Results: Compared with the control groups, both groups of USSHL patients exhibited a significantly increased clustering coefficient, global efficiency, and local efficiency but a significantly decreased global efficiency, and local efficiency but a significantly decreased characteristic path length in functional brain connectome, while a significantly decrease clustering coefficient and local efficiency in structural brain connectome. In addition, the primary increased nodal strength was observed in limbic and paralimbic systems primarily as well as in the auditory network brain areas. More importantly, the coupling strength of structural functional connectome was decreased, and exhibited a negative correlation with some USSHL clinical variables in patients.

Conclusions: Detectable alteration of network organization already occurred in USSHL patients within the acute period at the global and regional level. The functional connectome is characterized by a shift toward small-worldization while the structural connectome is toward randomization. Moreover, the degree of coupling between structural and functional connectome was decreased, which may reflect the pathophysiologic mechanisms of USSHL.

Key words: structural and functional connectome, unilateral sudden sensorineural hearing loss, small-worldization, randomization

MR3-3

Preliminary Study of DKI Performance in Common Locations of Brain Tissue affected by acute ischemic stroke

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Purpose: To explore the value of diffusion kurtosis imaging (DKI) in the analysis of micro-structural changes of brain tissue affected by acute ischemic stroke.

Materials & Methods: 156 patients (63.15±12.34Y, 61 women, 95men) with acute ischemic stroke underwent routine MR scanning with additional DKI sequence scanning (b=0, 1000, 2000s/mm², 15 directions) from February 2014 to December 2015. 199 lesions in common affected locations (Periventricular white matter (PWM), 52 lesions; corpuscallosum (CC), 14 lesions; cerebellum (CB), 29 lesions; basal ganglia (BG), 21 lesions; brain stem (BS), 21 lesions; lobes mixed with grey and white matter (LGW), 62 lesions) were outlined. Relative to normal mirror contra-lateral region of interest, the changed percentages of apparent diffusion coefficient (ADC) and DKI-derived indices, including fraction anisotropy (FA), mean diffusion (MD), axial diffusion (Da), radial diffusion (Dr), mean kurtosis (MK), axial kurtosis (Ka) and radial kurtosis (Kr), were calculated. Statistical analysis about multiple comparisons among indices and groups were performed.

Results: ADC and diffusivity-derived indices (FA, MD, Da and Dr) decreased, and kurtosis-derived parameters (MK, Ka and Kr) increased in all groups. There was no significant difference of ADC% between almost all of each two groups (except PWM vs. CB, LGW vs. CB) (p>0.05), while there was significant difference of MK% between almost all of each two groups (except BG vs. BS, BG vs. LGW, BS vs. LGW) (p<0.05), and Ka% performs almost the same as MK%. There was no significant difference of MD% and Da% between almost all of each two groups (except PWM vs. CB, PWM vs. BG) (p>0.05). Dr% illustrated no statistical significance among all groups (p>0.05).

Conclusions: Kurtosis-derived parameters, especially MK, yielded by DKI technology can reveal the difference of micro-structure changes among various locations affected by acute ischemic stroke.

Key words: Diffusion kurtosis imaging, Acute ischemic stroke, Mean kurtosis

MR3-4

The Cystitis Glandularis (CG) Imaging Performance and Differential Diagnosis between Heavily T2WI (T2 Weighted) VE (Virtual Endoscope) and Gd-DTPA Enhancement T1WI (T1 weighted) VE

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Purpose: To explore the cystitis glandularis (CG) imaging performance and differential diagnosis between heavily T2WI (T2 weighted) VE (Virtual Endoscope) and Gd-DTPA enhancement T1WI (T1 weighted) VE.

Materials & Methods: 28 CG cases were confirmed by pathology, all patients scanned by heavily T2WI 3Dsequence and Gd-DTPA enhancement T1WI 3D sequence. All of the imaging and clinical
data were retrospectively analyzed. Using Siemens trio 3.0 T MRI. Two sequences are using coronary azimuth scanning, 512 x 256 imaging matrix. The heavily T2WI sequence organization is 30-40 mm, and fat-suppressed; Gd - DTPA enhancement TIWI selection sequence for 3D truefisp with fat suppression, tissue thickness 30-40 mm, 1.25-1.5 mm thick; no interval, double contrast agent dosage is general; 30 min-2 h with delayed scan, the required delay time will be subject to satisfactory image. Imaging data reconstruction was managed by MIP (maximum intensity projection) and VE.

Results: n 28 CG cases, flower lawn type thickening are 15 cases, accounting for 53%; Diffuse type are 7 cases, accounting for 25%; Nodular uplift type are 3 cases, accounting for 11%; Nodular mass are 2 cases, accounting for 7%, mixed type 1 case, accounting for 4%. To analyze the data of images, Combined with clinical data analysis can be obtained: Both heavily T2WI VE and Gd-DTPA enhancement TIWI VE can be clearly showed the bottom or neck of the bladder gland inflammation pathological changes and shape, size, location (P ≤0.01). Gd-DTPA enhancement TIWI VE can also prompt scan lesions in mild enhancement

Conclusions: The cystitis glandularis (CG) imaging performance and differential diagnosis between heavily T2WI VE (Virtual Endoscope) and Gd-DTPA enhancement TIWI VE.

MR3-5

The Clinical Value of MR Knee Joint Function to Patients with DOA in Diagnosis the Early Injured of ACL

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Purpose: Objective: To study the clinical value of MR Knee joint function to patients with DOA in diagnosis the early injured of ACL.

Materials & Methods: Routine and functional position of knee joint MRI scanning were performed on 88 patients with clinically suspected degenerative osteoarthritis (DOA); Routine and functional MRI scan images data were provided to and then diagnosed by senior radiologists;arthroscopy results were used as the gold standard to evaluate the difference of diagnostic agreement rate between routine and additional functional positions of MRI images.

Results: The 1-3 levels damage compliance rate was 45.4%, 28.5% and 100%, respectively; The functional group were 95%, 91% 3%, 100%, respectively; the coincidence rates of two kinds of diagnosis methods were different (Z=2.7538, P<0.001); there was a statistically significant difference in the coincidence rate of diagnosis (1 level damage, x2=2.091, y<0.001; To 2 level damage, x2 = 13.800, P<0.001).

Conclusions: Magnatic resonance scanning of knee joint function has a unique visual angle to the ACL initiation and termination; it can significantly improve chronic osteoarthritis (DOA) of the ACL damage, especially the initiation and termination of the grade 1 and 2, mild to moderate tear diagnosis compliance rate.

Key words: DOA, ACL, The functional position of knee-joint.

MR3-6

3D CE-MRA in Spinal Vascular Malformations

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Purpose: To explore the value of fast dynamic contrast-enhanced 3D MR angiography (CE MRA) at 3.0T in the diagnosis of spinal vascular malformations, compared with digital subtraction angiography (DSA) and surgery results.

Materials & Methods: 17 cases suspected spinal vascular diseases by initial MR and clinical manifestations all underwent MRA, 16 cases underwent DSA within 3-5 days, 10 cases finally underwent surgical treatment.

Results: MRA examination clearly showed the abnormal vascular lesions in all cases, including 9 cases with the diagnosis of spinal dural arteriovenous fistula (SDAVF), 7 cases of perimedullary arteriovenous fistula (PMAVF), 1 cases of spinal arteriovenous malformations (AVM), which were consistent with the diagnosis of DSA or surgery. The level of fistulas were correctly displayed in 12 cases; feeding arteries were correctly determined in 13 cases.

Conclusions: CE-MRA at 3.0T can clearly show the extent of spinal vascular malformations, feeding arteries and fistulas location. They are safe, noninvasive, rapid and can shorten the time of DSA diagnosis and treatment.

Key words: Spinal vascular malformations, Dynamic MR angiography, Central nervous system

MR3-7

Characterizing the Anatomic and Functional Disorders of Inguinal Lymph Nodes in Patients with Gynecologic Oncology-Related Lymphedema Using Magnetic Resonance Lymphangiography

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Purpose: To characterize the anatomic and functional disorders of inguinial lymph nodes in patients with gynecologic oncology-related lower extremity lymphedema (LEL) using MR lymphangiography (MRL).

Materials & Methods: Ninety one lower extremities in 78 female patients were clinically diagnosed LEL secondary to treatment for gynecological tumors and were examined by MRL before and after intracutaneous application of the contrast material at the dorsal aspect of feet. The number, diameter, and dynamic enhancement parameters of bilateral inguinal lymph nodes was obtained and analyzed.

Results: The number of inguinal lymph nodes and enhanced inguinal lymph nodes identified in the affected side was significantly less as compared to the normal side (p<0.001). The enhanced lymph nodes of affected side showed a significant lower signal-noise ratio (SNR), lower Contrast-noise ratio (CNR), steeper slope, and longer time to peak enhancement than that in the normal side (p<0.05). Further analysis showed that the SNR, CNR, slope, and time to peak enhancement of enhanced inguinal lymph nodes of affected side showed significant differences between LEL stages (p<0.05), except between stage II and III (p>0.05).

Conclusions: MR lymphangiography could accurately characterize the abnormal anatomy and dysfunction of inguinal lymph nodes in gynecological cancer survivors with LEL.

Key words: Lymphedema, Inguinal lymph nodes, MR lymphangiography
MR4-1
A Study on the Comparison the Ischemic Penumbra Area at the DSC with the Area at the Pseudo-CASL at Carrying out the MRI Stroke
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Purpose : This study intended to identify how much identical the pseudo-CASL perfusion's penumbra area is with the DSC perfusion's penumbra area as the criteria by comparing and analyzing the ischemic penumbra of DSC Perfusion (DSC) with that of pseudo-CASL Perfusion (pCASL) as two representative perfusion imaging techniques.

Materials & Methods : This study targeted 12 patients who were diagnosed as the brain stroke among the patients having visited our hospital. While the pCASL was carried before injecting a contrast medium to the subjects, but the DSC was done with injecting the same contrast medium in a rapid rate. This study compared the penumbra area scale at the DSC with the area at the pCASL against the Diffusion (DWI). The program being used for statistical analysis was the MedicalC program and when the p value was below (p≤0.05), it was considered as significant one.

Results : At setting the penumbra area scale at the DSC as the standard, the error rates of penumbra area at the pCASL was varied ranging from at least 38% to at most 249%. Average error rate for the 12 cases was 114.16%. p value was below 0.05, indicating that it was statistically significant.

Conclusions : At comparing the penumbra area at the DSC with the area at the pCASL, they showed relatively large error rates. Therefore for acute stroke patients, it is judged that the DWI and the DSC would generate accurate results. As the ASL technique can get good-quality images after maximizing several factors and is not completely developed yet in technical aspect, so the technique is not used in diagnosing a patient's disease. However, it is considered that the ASL technique will be a useful test for children, pregnant women, renal-failure patients or other cases which a contrast medium can't be used.

Key words : DSC Perfusion, Pseudo-CASL Perfusion, Diffusion

MR4-2
Application of Simultaneous Multi-Slice on Clinical Diffusion-weighted Imaging for Multi-regions
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Purpose : To evaluate the clinical application value of simultaneous multi-slices (SMS) on MRI diffusion acquisition for multi-regions.

Materials & Methods : The subjects were healthy volunteers, and the MRI examinations were performed on multi-regions, including the head (25 cases), liver (15 cases), female pelvis (16 cases) and prostate (10 cases). Two types diffusion weight imaging (DWI) of SMS DWI and conventional DWI images were acquired with head coils and flexible body coils on a Siemens 3T MR Scanner. The key acquisition parameters, such as FOV, voxel size and TE were same in the two types of DWI sequence, except shortened TR only in the SMS DWI sequence. The signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR) and apparent diffusion coefficient (ADC) with the same ROI of two types of DWI images were calculated and were compared using a paired-sample t-test.

To determine the ADC measurement repeatability, the intraclass correlation coefficient (ICC) of multi-regions was computed.

Results : The scan time of the SMS DWI sequence was shortened 30% to 50% compared to conventional DWI sequences. The result of the paired-sample t-test showed that there were no significant differences (p>0.05) for the image SNR and CNR between the two types of DWI sequences. The ADC of the liver, female pelvis and prostate showed no significant difference (p>0.05) except for the head (p<0.05). The ICC values of ADC for the two types of DWI images on multi-regions ranged from 0.65 to 0.85.

Conclusions : The SMS DWI sequence can not only shorten the TR and decrease the scan time but also maintain higher image quality. In addition, the ADC values of the two types of DWI images are similar for most of the regions examined. The SMS DWI is feasible to replace the conventional DWI to acquire clinical diffusion images on most regions.

Key words : MRI, simultaneous multi-slice, diffusion weight imaging; multi-regions, scan time

MR4-3
Evaluation of Renal Artery Anatomy with Renal Masses Employing Inflow Inversion Recovery MR Angiography
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Purpose : To investigate the renal artery anatomical variations for patients with renal mass, and to assess the relationship between renal arteries and renal masses using inflow inversion recovery magnetic resonance angiography (IFIR MRA).

Materials & Methods : 20 patients with initial diagnosis of renal mass were included in the study. All patients performed preoperatively evaluation applying IFIR MRA on a 3.0T MR scanner(GE Discovery 750W). The IFIR MRA results about the renal arteries on the side involved by renal mass were recorded. The IFIR MRA results were compared with renal artery CTA, intra-operative findings and the surgery specimen.

Results : Multiple renal arteries were depicted on 7 patients. Accessory renal arteries participate in feeding the renal mass were found in 2 patients. 10 cases contained vascular component in the renal masses. The results of IFIR MRA have good consistence comparing with CTA.

Conclusions : IFIR MRA may be used as a new way to provide information about renal arteries and their correlation with renal masses. It's a non-invasive effective method for the preoperative evaluation for patients with renal masses. It can be applied as an alternative technique for patients with renal insufficiency.

Key words : Renal artery, Renal mass, Inflow inversion recovery, MR angiography, CT angiography

MR4-4
The Reference Value for Left Ventricular Myocardial Strain Measured by Feature-tracking Magnetic Resonance Imaging in Chinese Han Population
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Purpose : To investigate the renal artery anatomical variations for patients with renal mass, and to assess the relationship between renal arteries and renal masses using inflow inversion recovery magnetic resonance angiography (IFIR MRA).

Materials & Methods : The subjects were healthy volunteers, and the MRI examinations were performed on multi-regions, including the head (25 cases), liver (15 cases), female pelvis (16 cases) and prostate (10 cases). Two types diffusion weight imaging (DWI) of SMS DWI and conventional DWI images were acquired with head coils and flexible body coils on a Siemens 3T MR Scanner. The key acquisition parameters, such as FOV, voxel size and TE were same in the two types of DWI sequence, except shortened TR only in the SMS DWI sequence. The signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR) and apparent diffusion coefficient (ADC) with the same ROI of two types of DWI images were calculated and were compared using a paired-sample t-test.

To determine the ADC measurement repeatability, the intraclass correlation coefficient (ICC) of multi-regions was computed.

Results : The scan time of the SMS DWI sequence was shortened 30% to 50% compared to conventional DWI sequences. The result of the paired-sample t-test showed that there were no significant differences (p>0.05) for the image SNR and CNR between the two types of DWI sequences. The ADC of the liver, female pelvis and prostate showed no significant difference (p>0.05) except for the head (p<0.05). The ICC values of ADC for the two types of DWI images on multi-regions ranged from 0.65 to 0.85.

Conclusions : The SMS DWI sequence can not only shorten the TR and decrease the scan time but also maintain higher image quality. In addition, the ADC values of the two types of DWI images are similar for most of the regions examined. The SMS DWI is feasible to replace the conventional DWI to acquire clinical diffusion images on most regions.

Key words : MRI, simultaneous multi-slice, diffusion weight imaging; multi-regions, scan time
MR4-5

Computer Numerical Simulation of Budd-chiari Syndrome for Hemodynamic Based on MR Image
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Purpose: The hemodynamic mechanism of Budd-Chiari syndrome (BCS) is the research hotspot in recent years. To apply computational fluid dynamics (CFD) methods based on Budd-Chiari syndrome with inferior vena cava stenosis for 3-d numerical simulation and discuss the hemodynamic characteristics.

Materials & Methods: 3D model was established from a patient with Budd-Chiari syndrome through MR, and then it was undertaken numerical simulation with Ansys.

Results: Vortex in the narrow area above can be found in the streamline figures, throughout the coronal section graph, blood flow velocity achieved maximum in the center of the stenosis, the static pressure value gradually declined at the narrow area entrance to the narrowest place, and achieved minimum value at the exit; the maximum wall shear stress existed in the stenosis.

Conclusions: Patient-specific 3D computational fluid dynamic model of Budd-Chiari syndrome with inferior vena cava stenosis can show the hemodynamic validly, hemodynamic parameters could be used for clinical practice and get further study on the correlation of complex hemodynamic parameters and morphology changes of inferior vena cava vascular.

Key words: Computer Numerical Simulation, Budd-Chiari Syndrome, Hemodynamic Based on MR Image

MR4-6

Size of Hypertrophic Myocardium or Myocardial Fibrosis by LGE and Cine in Patients with Hypertrophic Cardiomyopathy: Correlation with the New York Heart

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Purpose: The size of hypertrophic myocardium and myocardial fibrosis is associated with poor prognosis in patients with hypertrophic cardiomyopathy (HCM). Currently, cine cardiac MRI (CMRI) is available to quantify hypertrophic myocardium mass and assessment of myocardial fibrosis with late gadolinium enhancement (LGE) on MRI has been proposed. However, the relationship between the parameters and left ventricular systolic dysfunction or heart failure has never been studied. Our aim is to determine if the assessment would correlate with EF and the New York Heart Function Classification (NYHA) Classification or not.

Materials & Methods: CMRI was performed on forty-four patients (18 men, 26 women, mean age 37.82±11.64 years) with HCM using a 3.0T scanner (MAGNETOM Trio Tim, Siemens). Hypertrophic myocardium mass, left ventricular total mass, and ejection fraction (EF) were measured using Q-Mass software (MEDIS, Holland). HMI, Scar/Myo, Nonviable/Myo and Nonviable/Scar on LGE were calculated. Parameters of myocardial fibrosis including Scar/Myo, Nonviable/Myo and Nonviable/Scar on LGE were evaluated using Pearson correlation test. Receiver operating characteristic analyses calculated the sensitivity of these parameters on MRI for the prediction of HCM NYHA I–II and NYHA III–IV.

Results: There was no correlation between NYHA and HMI (R=−0.372; P=0.013) and no correlation between NYHA and other parameters. There was no correlation between EF and other parameters. HMI has the highest sensitivity cut off value to predict HCM patients with ventricular dysfunction (NYHA - II and NYHA III–IV).

Conclusions: HMI and the parameters of myocardial fibrosis can be used for assessment of the left ventricular systolic function. HMI is the best predictor to the left ventricular systolic dys-function or severe symptomatic HCM with higher sensitivity.

Key words: Hypertrophic, Myocardium, LGE, CMRI, NYHA
MR5-1
Normal B General Health Screening Decision within One Year after Acute Cerebral Infarction Expression: A Case Report
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Purpose: Screening regular health check-ups in the National Health Insurance Corporation, and acute cerebral infarction were expressed within one year of normal B decision. And to study the clinical relevance of Wernicke’s aphasia, according to the case report with MR imaging and physical examination accompanied by apraxia of speech.

Materials & Methods: May 2012 received a health check, was the first expression of acute cerebral infarction in February 2013. The secondary expression infarction 51-year-old man was in November 2014 follow-up. Get the blood tests, echocardiography, MR imaging and MRA analysis, we analyzed the MRI findings and the clinical Wernicke’s aphasia, apraxia of speech involves one retrospectively.

Results: In the first reading ischemic stroke onset DWI findings. Rt. PCA territory was diagnosed with acute cerebral infarction. Rt. cerebral areas on T2WI images iso density, right cerebral regions in DWI showed a high signal intensity. After 1 year and 9 months was expressed in the secondary acute cerebral infarction Lt. fronto-temporal lobe. DWI and showed reduced blood flow signal of the Lt. MCA area in the carotid vascular MRI and severe stenosis or occlusion. After expression were administered in intravenous thrombolytic agent within 3 hours. Echocardiography Mild spontaneous echo contrast in LA and LAA without evidence of thrombus. The average treatment for five months. Motor speech programming at word level accuracy has improved by 100%, whether the hearing ability was improved to 90% from the auditory cognitive skills, sentence level is 87%.

Conclusions: Dyslipidemia management in health screening to diet and weight control obesity status was determined normal B findings. Keep in mind that the results from the comfort of examination findings and the measures we thought they made severe disease did not think, if combined with the mental stress of daily life by acting as a health hazard can suddenly arise.

Key words: Acute cerebral infarction, Apraxia of speech, Wernicke’s aphasia

MR5-2
The Usefulness of CS(Compressed Sensing) for Brain TOF (Time-of-Flight) MR Angiography Imaging.
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Purpose: The purpose of this study is to evaluate whether 3D High-Resolution TOF(Time-Of-Flight) with CS(Compressed Sensing) technique has an equal image quality with less scan time than conventional method.

Materials & Methods: 2015.12~2016.3, 22 patients who visited the Seoul National University Hospital MRI Center were subjected to this study. Scanning was performed on 3T DISCOVERY MR750w, GE Healthcare system with 32channel head coil. Our conventional High-Resolution 3D-TOF acquisition time was 9min 53sec. CS(Zero filling) protocol was used CS factor on same conditions as the conventional 3D-TOF protocol. (CS Factor 1.3, Smin 29sec) And reconstructed image was applied CS algorithm to CS(Zero filling) image. Qualitative analysis was used each MIP (Maximum-Intensity-Projection) image. 5 points scale visual test of MIP image was graded by SNUH medical doctor and 13 radiological technologists. Also quantitative evaluation, SNR(Signal-to-Noise-Ratio) and CNR(Contrast-to-Noise-Ratio) were calculated from axial source image for each patient’s ACA, OPA, PCA, Basilar Artery. To ensure consistency, ROI was measured twice each at an interval of a week by 2 radiological technologists who has 2 years of experiences and each measured points and ROI sizes were same in same image.

Results: The result of qualitative analysis shows that CS TOF images are the highest score than the others at 7 of the evaluation questions. But there is not a significant difference statistically (p>0.05). And the result of quantitative analysis represent that conventional 3D-TOF image SNR and CNR are slightly higher than Zero-filling SNR and CNR. There is a significant difference statistically (p<0.05). Zero-filling SNR are approximately about 88% and CNR are 83% compared to conventional 3D-TOF image.

Conclusions: 3D-TOF applied CS factor can reduce scan time half of than conventional 3D-TOF. Although 3D-TOF conventional image quantitative evaluation shows a higher level, qualitative assessment do not show any difference. Therefore, 3D-TOF by applying the technique of CS will be considered to be clinically very useful for patients.

Key words: Compressed Sensing, MR Angiography, Time-Of-Flight

MR5-3
A Study on the Usefulness of Eddy Current Effect Reduction in Relation to the change of Slew Rate When Using Acoustic Noise Reduction Technique
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Purpose: In this paper, We evaluate the usefulness of signal strength increased by the change of slew rate when using the acoustic noise reduction (QuiteX)

Materials & Methods: We proceed to examine T2 weighted Turbo spin echo (TSE) with QuiteX and without QuiteX applied to target for 25 (Male:15, Female:10, Average age:62) patients at 3.0T MRI (Skyra, Siemens Healthcare, Erlangen, Germany) was used for the equipment. 64-channel Head & Neck coil was used when parameter is T2 TSE Axial (TR 3540ms, TE 118ms, FOV: 220mm, Matrix size: 512x410, Slice Thickness: 5mm, Gap: 0.5mm, Number of slice: 25, NEX: 2). As quantitative evaluation method, compare SNR between using QuiteX and using QuiteX by measuring the signal intensity on white matter (WM), Grey matter (GM), Cerebrospinal fluid (CSF), Pons. As qualitative assessment, blind test was performed by 3 radiological technologists.

Results: As a result of the quantitative analysis, SNR with QuiteX is slightly higher or nearly similarly appeared in comparison with
MR5-4
Qualitative and Quantitative Diagnosis of Meniscal Tears Using SWI Compared with T2 Mapping at 3-Tesla MRI
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Purpose: The purpose of this study was to compare the diagnostic performance of SWI (Susceptibility Weighted Imaging) sequence in the evaluation of meniscal tears at 3T MR with those of a T2 Mapping sequence, quantitatively and qualitatively, with arthroscopy as gold standard.

Materials & Methods: 34 patients suspected meniscal injury and would undergo arthroscopic surgery were selected. The MRI examination was performed at 3.0T in these patients before surgery by using a conventional protocol with the addition of a sagittal T2 Mapping sequence and a sagittal SWI sequence. 136 sections of meniscus including anterior and posterior horns of medial and lateral meniscus were evaluated by two radiologists. The diagnostic performance between SWI and T2 Mapping was compared.

Results: T2 mapping and SWI had sensitivities of 90% and 87.8%, respectively; specificities of 92.3% and 95.6%, respectively, and accuracy of 91.5% and 93%, respectively for reader 1. For reader 2, T2 mapping and SWI had sensitivities of 90% and 87.8%, respectively; specificities of 93% and 93.8%, respectively, and accuracy of 91% and 92.3%, respectively. The interobserver agreement and the intraobserver agreements were perfect (κ>0.80). There were significantly differences between torn and not torn meniscus of phase value and T2 value (P<0.05). Both phase value and T2 value demonstrated a greater ability to distinguish normal and meniscal tear using receiver operating characteristic (ROC) analysis. The areas under the ROC curves for phase value and T2 value were respectively 0.82 and 0.36, which were significantly different (P<0.01). Significant negative correlations between phase value and arthroscopy (R=-0.522, P<0.001), positive correlations between T2 value and arthroscopy (R=0.231, P<0.01) were observed.

Conclusions: The sequence of SWI can be used into diagnosis of meniscus tear. Both phase value and T2 value can distinguish meniscal tears, and sensitivity of phase value is higher than that of T2 value.

Key words: SWI, T2 Mapping, Knee, Meniscal Tear

MR5-5
Application of ADC Value of MR DWI in the Evaluation of Children’s Renal Function: Comparison between the Patients of 1 Stage Purpura Nephritis and the Healthy Volunteers
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Purpose: To discuss the application of apparent diffusion coefficient (ADC) value of magnetic resonance diffusion-weighted imaging (MR DWI) in the evaluation of children’s renal function.

Materials & Methods: 9 patients of 1 stage purpura nephritis (group A: 5 male and 4 female, 7~15 years old) and 6 healthy volunteers (group B: 3 male and 3 female, 6~11 years old) were underwent routine MRI and coronal DWI (b=600s/mm²). ADC images were got in the image processing work station. For every child, the ADC values of cortex and medulla in the two kidneys were measured in ADC images, with setting the region of interest (ROI) of about 20mm² to the upper, the middle, the lower regions and calculating the average values. Independent-samples t test was made in the ADC values of cortex from the two groups. It was also made in the ADC values of medulla from the two groups. And paired-samples t test was made in the ADC values of cortex and medulla from the same group.

Results: The mean ADC value of cortex in group A (178.73x10⁻⁵m²/s±14.04) was lower than that in group B (202.78x10⁻⁵m²/s±11.11), with statistically significant differences (P=0.004). The mean ADC value of medulla in group A (161.48x10⁻⁵m²/s±20.33) was lower than that in group B (193.56x10⁻⁵m²/s±17.67), with statistically significant differences (P=0.008). In group A, the mean ADC value of cortex was higher than that of medulla, without statistically significant differences (P=0.114). In group B, the mean ADC value of cortex was higher than that of medulla, without statistically significant differences (P=0.265).

Conclusions: MR DWI is a noninvasive method to evaluate children’s renal function. And the ADC value can early detected the abnormality of renal function in the patient of 1 stage purpura nephritis, before the morphological change.

Key words: MR DWI, ADC Value, Renal Function, Children, Purpura Nephritis

MR5-6
Altered Functional Brain Connectome in Unilateral Sudden Sensorineural Hearing Loss
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Purpose: To investigate the sudden sensorineural hearing loss related alterations in the topological organization of intrinsic functional network properties in unilateral SSNHL patients within the acute period using the graph theoretical network analysis method and to determine if hearing impairment is associated with functional network property alteration in unilateral sudden sensorineural hearing loss patients.

Materials & Methods: This study included data collected from two groups (left and right side unilateral SSNHL) of patients and a healthy control group with, in total, 170 right-handed subjects.
Pure tone audiometry was performed to assess hearing ability. Abnormal changes in the peripheral auditory system were examined using conventional magnetic resonance imaging. The graph theoretical network analysis method was used to detect brain network alterations in unilateral sudden sensorineural hearing loss.

Results: Compared with the control groups, both groups of unilateral SSNHL patients exhibited a significantly increased clustering coefficient, global efficiency, and local efficiency but a significantly decreased characteristic path length. In addition, the primary increased nodal strength (e.g., nodal betweenness, hubs) was observed in several regions primarily, including the limbic and paralimbic systems, and in the auditory network brain areas.

Conclusions: We found, using graph theory analysis, that detectable alteration of network organization occurred in unilateral sudden sensorineural hearing loss patients within the acute period at the global and regional level. The functional connectome of unilateral SSNHL patients is characterized by a shift toward small-worldization with a significant increase in the clustering coefficient, the global efficiency and the local efficiency but a significant decrease in the characteristic path length, which may indicate a plastic reorganization procedure of the brain to compensate for the loss hearing in sudden sensorineural hearing loss. We also found an increased nodal strength primarily in the limbic and paralimbic system, which could be related to SSNHL-related concomitant symptoms, such as tinnitus, vertigo and emotional exhaustion.

Key words: Unilateral sudden sensorineural hearing loss, Connectome, Graph theory

MR5-7
Magnetic Resonance Targeting Cytochrome c of Mitochondria Using Magnetotactic Bacteria Nanoparticles
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Purpose: Based on magnetosomes which coming from magnetotactic bacteria, we prepared a new active targeting mitochondrial cytochrome C dual functional MR probe.

Materials & Methods: Mass culture magnetotactic bacteria AMB-1, extraction and purification of magnetosomes, and then by using infrared fluorescence surface modification and connected to the magnetic targeting mitochondrial cytochrome c ligand corpuscle, last modified by PEG, generate the end-products of PEG - cBMP, probe, after electron microscopy, zeta potential, Fourier infrared transform spectrum, Prussian blue staining, methods such as laser confocal microscope, magnetic resonance imaging detection.

Results: Transmission electron microscopy (TEM), zeta potential, Fourier infrared transform spectrum respectively show that the magnetosomes compared with PEG - cBMP markedly thickened outer membrane, the dispersed particle size, and the outer membrane has a strong and wide key hydroxyl (OH) and stretching vibration of carboxyl (C - OH) absorption peak; Prussian blue staining proved that PEG - cBMP almost all into cells; Laser confocal microscopy proved that PEG - cBMP into cell mitochondria; Magnetic resonance imaging prove that incubated cell with different concentrations of PEG - cBMP, the MRI gradient echo T2WI signal is different also.

Conclusions: We have successfully prepared the initiative targeting mitochondrial cytochrome C magnetic resonance imaging probe. For the accurate diagnosis and treatment of diseases such as tumors can provide a new meaningful help.

Key words: Magnetotactic bacteria, Magnetosomes, Magnetic resonance imaging, Active targeting, Cytochrome C

MR5-8
Two Different Methods to Reduce Metal Artifacts in MRI
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Purpose: Metallic implants are increasing apparently in medicine nowadays. The presence of metal can cause serious problems in MRI. The purpose of this study focus on two new techniques: MAVRIC and SEMAC that improve imaging of soft tissue and bone in patients with metal artifact.

Materials & Methods: This study useded GE Healthcare 3T MR750 system, Multi-Acquisition Variable Resonance Image Combination (MAVRIC) software, Siemens Aera 1.5T system, and Slice Encoding for Metal Artifact Correction (SEMAC) software.

Results: From Oct 2015 to April 2016, 6 patients with metal implants underwent MRI examination. All cases we have with both SEMAC and MAVRIC examinations show that metal artifacts were reduced obviously. Soft tissues combine with metal implants can be separated more in detail. Two new techniques allow for MRI to be used to monitor adverse reactions, such as inflammation, in the immediate vicinity of the implant.

Conclusions: MAVRIC and SEMAC are novel techniques that help to reduce considerably metallic artifacts. It complements the information of FSE images after arthroplasty and is a useful additional sequence.

Key words: MRI, MAVRIC, SEMAC

MR6-1
The Comparison of Liver Stiffness Before and After Administration of Gd-EOB-DTPA in MR Elastogrophy
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Purpose: To assess any significant difference in liver stiffness before and after administration of Gd-EOB-DTPA by using magnetic resonance elastography for detection of liver fibrosis.

Materials & Methods: Liver MRI with MRE was performed in 60 subjects (mean age, 58±4;10 years) on a single 3.0 Tesla clinical MRI scanner equipped with a passive driver that was placed across for delivering vibrations. MRE was performed before intravenous Gd-EOB-DTPA injection (PRE-MRE) and 10 minutes post injection (POST-MRE) using a 2D spin-echo EPI sequence (TR 600ms, TE 48ms, FOV 308*380, Matrix 104*128, Thickness/Gap 5mm/100mm, NEX 1) with motion encoding gradients (MEG). Liver stiffness was measured by drawing 3 regions of interest (ROI) on the stiffness maps on each of the three slices of PRE-MRE and POST-MRE obtained for each patient. The mean
MR6-2
Evaluation of Usefulness of the Post FLAIR FS Technique during Cranial Nerve MRI Examination: A Comparison with Post T1 TFE Technique
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Purpose: Results of recent studies show that T2-weighted fluid-attenuated inversion recovery technique provides higher tissue contrast of the brain (especially cerebral disease, etc). So it can be applied to the diagnosis of disease like Post T1-weighted technique. The purpose of this study is to compare ‘Post 3D FLAIR FS’ and ‘Post 3D T1 TFE’ technique for the qualitative and quantitative evaluation of Facial neuritis diagnosis.

Materials & Methods: 3.0T MRI machine and 32-channel head coil was used for experiment. Clinical images of two techniques were evaluated qualitatively by five radiologists in two section ("Contrast Resolution" and "Spatial Resolution"). We repeated Phantom assessment thirty times using two techniques. The phantom was made of gadolinium and saline mix for water concentrations variation. And we compared Images obtained from each technique by estimating SI mean value.

Results: For qualitative evaluation, the measured value was 3.2(3D T1 TFE) & 2.62(3D FLAIR FS) in Contrast resolution, 2.62(3D T1 TFE) & 3.28(3D FLAIR FS) in Spatial resolution. All five radiologists reached an agreement regarding occurrence contrast enhancement of lesions in two techniques. As for quantitative evaluation using Phantom, the measured value was 1871.7 SI mean (1mmol, 3D T1 TFE), 3231.6 SI mean (0.4mmol, 3D FLAIR FS). Although there was difference of SI mean and concentration-dilution in peak, we could find occurrence contrast enhancement of phantom in two techniques.

Conclusions: For qualitative evaluation, all five radiologists reached an agreement regarding occurrence contrast enhancement of lesions in 3D FLAIR FS technique. For quantitative evaluation, although there was difference of concentration-dilution, we found contrast enhancement of phantom in two techniques. Through this study, MRI contrast enhancement was not caused by high concentration of MR contrast agent. It’s rather caused by ‘time’ to reach dilution ratio get of gadolinium with body-hydrogen spin. With these quantitative data obtained by study, we can perform MRI scan more accurately and useful Diagnostic value.

Key words: MR Elastography, Gd-EOB-DTPA, Liver stiffness

MR6-3
Identification of Ischemic Penumbra in Acute Ischemic Stroke by Arterial Spin-Labeling Imaging: Comparison Study with Dynamic Susceptibility Contrast Perfusion Weighted Imaging
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Purpose: The goal of perfusion weighted imaging (PWI) in acute ischemic stroke is to identify patients with a large penumbra who might mostly gain from acute reperfusion therapy. Using MRI, typically the penumbra is defined as a mismatch measured by PWI-DWI. However, be rare, but serious, reaction to contrast agents that with severe renal impairment. Arterial spin labeling (ASL) is a MR technique that doesn’t require contrasts and thus may be more practical in acute ischemic stroke than PWI. The purpose of this study was to compare the clinical value of ASL and dynamic susceptibility contrast PWI (DSC-PWI) on identification of ischemic penumbra in acute ischemic stroke.

Materials & Methods: 15 patients with acute ischemic stroke were included within 6 hours of symptom onset in this study. All underwent routine MRT scanning, DWI, MRA, ASL (PLD=2.0s) and DSC-PWI on GE-D 750 3.0T MR scanner. Cerebral blood flow (CBF) of ASL, DWI and DSC-derived mean transit time (MTT) were analyzed on AW - 46 Workstation. DSC-PWI lesion areas were defined by MTT thresholds >10s. ASL hypoperfusion areas was defined by a decrease in perfusion compared with normal tissue around or on the contralateral side. We draw out manually the scope of the lesion at the maximum level and measured its areas. (PWI-DWI)/(DSC-PWI-DWI) mismatch areas and the PWI-DWI mismatch areas have no statistical significance (P=0.88). The mean ASL-DWI mismatch area was 572.7±601.42 mm² and the mean PWI-DWI mismatch area was 701.55±783.92 mm². The ASL-DWI mismatch areas may have a similar range of hypoperfusion to PWI-DWI mismatch areas.

Conclusions: As a noninvasive technique, ASL-DWI mismatch shows potential to identify salvageable tissue in acute stroke. PLD of 2.0s may be a reasonable choice.

Key words: mismatch, ASL, PWI, DWI

MR6-4
Clinical Application of 3.0T Functional Magnetic Resonance Imaging in Renal Insufficiency
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Purpose: To explore the application value of functional magnetic resonance imaging in the diagnosis of renal insufficiency (RI)

There were significant differences in susceptibility, metastasis to the brain is the most feared complication of systemic cancer and the most common of lung cancer. Magnetic resonance imaging (MRI) with contrast enhancement currently is the procedure of choice, because MRI is more sensitive and specific than other imaging modalities in determining the presence, location, and number of metastases. Comparative analysis of 3D MPR-RAGE and T1WI enhancement scanning sequence of detecting lung cancer with brain metastasis of quality.

**Materials & Methods**

Select 55 patients who came from Department of Internal Medicine Clinic of Shandong Provincial Hospital with renal insufficiency from 2013 January to 2014 February. According to the patient’s renal function testing laboratory serum creatinine level in the list (Scr) to calculate the estimated glomerular filtration rate (eGFR), then to determine the grade of renal insufficiency patients. There were 35 males and 30 females, average age is 43.5 years old. At the same time, 15 healthy volunteers who were randomly selected from age and sex matched group were enrolled in the examination. Using 3.0T GE (Signa HD x GEMS GEMS) superconducting magnetic resonance scanner (General Electric Company in USA), 8 channel phased array scanning sequence coil, subjects were examination including: coronal T2WI sequence, axial FS-T2WI, axial FS-T1WI weighted sequence, sagittal T2WI sequence, R2* map sequence of oblique coronal and axial 3D layer block respiratory triggered tFIR-FIESTA sequence. All sequences scanned, (1) using

**Results**

Different grade of renal insufficiency patients number were 11, 9, 12, 13, 10, and normal control group was 15 cases. In control group, R2* value of the medulla was significantly greater than that of cortex (p<0.05). There were significant differences between R2* value of the normal control group and different grades of renal insufficiency patients with cortical, medullary and cortical / medulla (p<0.05). In the patients with renal insufficiency, R2* value of cortex, medulla and cortex / renal were in the opposite relationship with renal insufficiency level (p<0.05).

**Conclusions**

The use of renal blood oxygenation level dependent (BOLD) sequence can be obtained normal renal medulla oxygenation level than the cortex. R2* values of medulla/cortical could not only differentiate renal insufficiency patients with normal kidney, but also can distinguish patients between different levels of renal insufficiency. It can reflect the changes of renal function sensitively and play an important role in the diagnosis and staging of renal insufficiency.

**Key words**: Functional MR renal insufficiency

**MR6-5**

**3D MPR-RAGE Enhancement Scanning Sequence in Detecting Lung Cancer with Brain Metastasis**

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**Purpose**

Metastasis to the brain is the most feared complication of systemic cancer and the most common of lung cancer in adults. The incidence of brain metastasis is rising with the increase in survival of cancer patients. Magnetic resonance imaging (MRI) with contrast enhancement currently is the procedure of choice, because MRI is more sensitive and specific than other imaging modalities in determining the presence, location, and number of metastases. Comparative analysis of 3D MPR-RAGE and T1WI enhancement scanning sequence of detecting lung cancer with brain metastasis of quality.

**Materials & Methods**

Patient: There are 21 males and 9 females among the 30 patients. All patients are diagnosed with lung cancer. Image technique: We use Siemens MAGNETOM Trio 3.0T magnetic resonance and 8-channel head coil. Use 10~15ml (0.2ml/kg) Multihance contrast agent, do normal Axial, coronal and sagittal T1WI and 3D MPR-RAGE enhance scanning. Compare two sequence.

**Results**

Two sequence were both detected 48 lesions in 30 patients. The application of 3D compared with 2D: the scanning time: 3D imaging scan time significantly shortened; MR image quality imaging technology: 3D imaging image quality is much better than 2D. vascular pulsation artifact: 3D reconstruction plane is less than 2D. And the comparison is p<0.05, has difference.

**Conclusions**

T1WI enhancement scanning is received sequence for brain metastases of lung cancer. 3D MPR-RAGE is better than T1WI enhancement scanning sequence for detecting lung cancer with brain metastasis.

**Key words**: MRI Enhancement, Brain Metastasis, Lung Cancer
MR6-7
A Study of the Development of Laguerre's Equation Type Fat Saturation RF Pulse
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Purpose: Fat suppressed imaging is an imaging method necessary in clinical practice. However, fat saturation RF pulse is used without the application of a gradient magnetic field. As a consequence, the rectangularity of the frequency area deteriorates, and reduction of the signal appears locally when fat suppressed RF pulse is applied multiple times in the case of multi slice imaging. Fat saturation RF pulse is the cause of the problem, an improved RF pulse is desired in the clinical setting.

Materials & Methods: We made a prototype Laguerre’s equation type fat saturation RF pulse as a means to solve the issue. The degradation in the rectangularity of frequency area was reduced and improvement of image quality was seen when the RF pulse was used in multi slice imaging.

Results: The Laguerre’s equation type fat saturation RF pulse was hence considered to be useful in the clinical setting as it is capable of reducing local signal loss when a fat saturation RF pulse is applied.

Conclusions: This work was supported by JSPS KAKENHI Grant Number 15K01732

Key words: MRI, Fat Saturation, RF pulse, Laguerre’s Equation Type

MR6-8
K Space Explained without Mathematics
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Purpose: A radiographer has to adapt the MRI parameters to the patient and the medical question. Sometimes the adaptation requires a complete new reprogramming of the sequence at hand. To achieve that, a good and solid understanding of MRI parameters is of primary importance. K Space is then unavoidable, as everything from contrast to artefacts is related to K Space structure and ways of filling it. This presentation of 30 minutes is for all who never really understood what K space is and how it works for our MRI examinations.

Materials & Methods: First, we will explore the Fourier Transformation and study with some examples how it handles the MRI signal. Then we will see how the K space is filled and which consequences are to be seen if some parts of it is missing or disturbed.

Results: Finally we will take a few examples of how the K space understanding allows us a precise and quick sequence optimization.

Conclusions: After this presentation, you should be able to explain the principles of the Fourier Transformation, the general structure of K space and why that is so important for radiographers in MRI.

MR7-1
Comparison Evaluation of Image for ‘Flexible Coil’ and ‘Body·Spine coil’ in Elbow MRI
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Purpose: By using ‘Body·Spine coil’ except existing Flexible coil for elbow MRI. We investigate that utility for comparison analysis between Flexible coil and Body·Spine coil.

Materials & Methods: We use equipment which is 3.0T superconducting Magnetic Resonance Imaging System (SKYRA SIEMENS, Germany), performing elbow exam Whole Body Phantom PBU-50, 4CH Flexible coil, 18CH Body Array coil and 32CH Spine coil. The image acquires coronal plan, parameter of image acquisition acquires TR/TE : (1100/38 msec), Slice Thickness : (0.6mm), FOV : (150mm), Matrix : (320x320), Bandwidth : (300 Hz/px), NEX : (1.4), Acquisition Time : (6min) We set up ROI (Region of interest), signal region 5spot, noise region 4spot and measure SNR of signal region 5spot. And we additionally measure in case of situated outside and inside of Spine coil in elbow MRI.

Results: In coronal plan, in case of Flexible coil average SNR of 0cm is 6.997, average SNR of 10cm is 6.936, average SNR of 20cm is 4.557 and in case of Body and Spine coil average SNR of 0cm is 10.002, average SNR of 10cm is 8.341, average SNR of 20cm is 7.474. Consequently SNR of Body·Spine coil is superior to Flexible coil and inside is superior to outside.

Conclusions: In Body·Spine coil, SNR is superior to in extensively used Flexible coil and comparing result of SNR of outside and inside, SNR of inside is superior. Therefore in future based this study we considered that if apply to real clinical, it is very helpful to image interpretation.

Key words: Flexible coil, Body and Spine coil, SNR, Elbow MRI

MR7-2
Feasibility Study Using the Acrylic Assistant Equipment in Lower Abdominal MRI
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Purpose: In lower abdominal MRI, patients have been tested by physically contacting with the coil. In this study, we have designed the acrylic assistant equipment which allows the contactless scan of patient to coil and evaluated the feasibility by comparing the acquired images with the assistant equipment and not.

Materials & Methods: We tested 10 lower abdominal patients (F:5, m:5) by using the Ingenia 3.0T (Philips) MR and 18 channel body array coil. We implemented T1 AX TSE (FOV=250, Matrix=512x358, TR=548, TE=10, slice thickness=5, gap=1, scan time=197sec, BW=176.9, NEX=1) and eTHRIVE (FOV=250, Matrix=512x358, TR=548, TE=10, slice thickness=5, gap=1, scan time=197sec, BW=176.9, NEX=1) techniques. The acquired images were randomly read by 5 experienced radiologists and qualitatively assessed by scoring 1 to 5 based on the image accuracy and artifact. Data analysis was performed by SPSS 22 and the image qualities were quantitatively evaluated in terms of the signal to noise ratio (SNR) and contrast to noise ratio (CNR). We made a prototype Laguerre's equation type fat saturation RF pulse which was hence considered to be useful in the clinical setting as it is capable of reducing local signal loss when a fat saturation RF pulse is applied.

Results: In lower abdominal MRI, patients have been tested by physically contacting with the coil. In this study, we have designed the acrylic assistant equipment which allows the contactless scan of patient to coil and evaluated the feasibility by comparing the acquired images with the assistant equipment and not.

Materials & Methods: First, we will explore the Fourier Transformation and study with some examples how it handles the MRI signal. Then, we will see how the K space is filled and which consequences are to be seen if some parts of it is missing or disturbed.

Results: Finally we will take a few examples of how the K space understanding allows us a precise and quick sequence optimization.

Conclusions: After this presentation, you should be able to explain the principles of the Fourier Transformation, the general structure of K space and why that is so important for radiographers in MRI.
Conclusions: We have designed and implemented the acrylic assistant equipment to lower abdominal patients. Our data indicate that it is possible to obtain similar image qualities to current lower abdominal MRI without the physical contact to the patient.

Key words: Acrylic assistant equipment, Body array coil, Lower abdominal MRI

MR7-3
Study on the Fair Value of the Factor during MRI Examinations of the Spinal Fixation Patients for using SEMAC (Slice Encoding Metallic Susceptibility Artifact Correction)
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Purpose: To explore the clinical value of a prototype three-dimensional sparse Time-of-Flight (TOF) magnetic resonance angiography with incoherent sampling and iterative reconstruction, for routine application on a standard clinical MR system.

Materials & Methods: Standard TOF and a sparse TOF prototype sequence were performed in 56 patients on a 3.0T MR scanner. These 56 patients were randomly divided into 2 groups: In Group I, the scanning resolution of both standard and sparse TOF were matched, In Group II, the scanning times of standard and sparse TOF were matched. Image evaluation was performed by an experienced neuroradiologist. For each group, the delineation in main branch, primary sub-branch and secondary branch of ACA, MCA and PCA, ACoA, PCoA and basilar artery of both standard and sparse TOF was assessed by using 5-grade scale. The artifact, contrast of vessel and overall image quality of both sequences were compared by Wilcoxon test. The contrast ratio (CR) of MCA in standard and sparse TOF was compared using a paired t-test.

Results: In Group I, compared to standard TOF, the delineation of main branch of ACA, the primary sub-branch of ACA and PCA, the secondary branch of ACA and MCA and PCA; the ACoA, the PCoA, the overall contrast of vessel, the overall image quality were improved in sparse TOF (P<0.05). The CR of MCA in sparse TOF was higher than standard TOF (P<0.05). In Group II, there was no significant difference in all indexes above mentioned between standard and sparse TOF (P>0.05).

Conclusions: Compared to standard TOF, sparse TOF could improve the delineation of vessels, image quality, and decrease artifacts with the same scanning time as the standard protocol. Alternatively, TOF with sparse sampling and iterative reconstruction can be effectively used to significantly reduce scan time while preserving clinical image quality.

Key words: Time-of-Flight (TOF), Magnetic resonance angiography (MRA), Intracranial vessels, Sparse, Interactive

MR7-4
Improved Cerebral Artery Imaging Using Three-dimensional Sparse Time of Flight: A Prospective Study
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Purpose: To explore the clinical value of a prototype three-dimensional sparse Time-of-Flight (TOF) magnetic resonance angiography with incoherent sampling and iterative reconstruction, for routine application on a standard clinical MR system.

Materials & Methods: Standard TOF and a sparse TOF prototype sequence were performed in 56 patients on a 3.0T MR scanner. These 56 patients were randomly divided into 2 groups: In Group I, the scanning resolution of both standard and sparse TOF were matched, In Group II, the scanning times of standard and sparse TOF were matched. Image evaluation was performed by an experienced neuroradiologist. For each group, the delineation in main branch, primary sub-branch and secondary branch of ACA, MCA and PCA, ACoA, PCoA and basilar artery of both standard and sparse TOF was assessed by using 5-grade scale. The artifact, contrast of vessel and overall image quality of both sequences were compared by Wilcoxon test. The contrast ratio (CR) of MCA in standard and sparse TOF was compared using a paired t-test.

Results: In Group I, compared to standard TOF, the delineation of main branch of ACA, the primary sub-branch of ACA and PCA, the secondary branch of ACA and MCA and PCA; the ACoA, the PCoA, the overall contrast of vessel, the overall image quality were improved in sparse TOF (P<0.05). The CR of MCA in sparse TOF was higher than standard TOF (P<0.05). In Group II, there was no significant difference in all indexes above mentioned between standard and sparse TOF (P>0.05).

Conclusions: Compared to standard TOF, sparse TOF could improve the delineation of vessels, image quality, and decrease artifacts with the same scanning time as the standard protocol. Alternatively, TOF with sparse sampling and iterative reconstruction can be effectively used to significantly reduce scan time while preserving clinical image quality.

Key words: Time-of-Flight (TOF), Magnetic resonance angiography (MRA), Intracranial vessels, Sparse, Interactive

MR7-5
Using Gadolinium-ethoxybenzyl diethylenetriamine Penta-acetic Acid-enhanced MRI
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Purpose: This study aimed to clarify the usefulness of hepatobiliary phase (HBP) images using gadolinium-ethoxybenzyl-diethylenetriamine penta-acetic acid (Gd-EOB-DTPA) as a surrogate for the liver function of the albumin-bilirubin (ALB) grade.

Materials & Methods: A total of 220 consecutive patients who underwent liver magnetic resonance imaging with Gd-EOB-DTPA. The quantitative liver-spleen contrast ratio (Q-LSC) was calculated in HBP; approximately 20 min after injection. To evaluate the degree of relations of Q-LSC and ALB grade, the Child-Pugh (C-P) score was used to compare. The median Q-LSC values were compared, and correlation coefficients according to C-P score and ALB grade were calculated. The Wilcoxon rank sum test was used for statistical analysis.

Results: The correlation coefficient between Q-LSC and C-P score was -0.33, P = 3.27 x 10^-7, and the ALB grade was -0.6, P = 1.57 x 10^-20. Q-LSC of the overall median, C-P A, B, and C were 1.94, 1.91, 1.96, and 1.33, respectively. The difference between C-P A and C-P B, C-P B and C-P C, and C-P A and C-P C was P = 0.859, 0.052, and 0.063, respectively. Q-LSC of the overall median, ALB grade 1, 2, and 3 were 1.94, 2.12, 1.69, and 1.30,
respectively. The differences between ALBI grades 1 and 2, 2 and 3, and 1 and 3 were P<0.0001, P = 0.0466, and P = 0.012, respectively. Q-LSC was better correlated and discriminated by the ALBI grade than by the C-P score.

Conclusions: MR images using Gd-EOB-DTPA may correlate with liver function, and surrogate for ALBI grade.

Key words: Liver function, Quantitative liver-spleen contrast ratio, Child-Pugh score, Albumin-bilirubin grade

MR7-6
A Black Blood Magnetic Resonance Angiography Protocol Using the Two-dimensional T2-Fast Spin Echo Sequence
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Purpose: Cerebrovascular evaluation of the internal carotid artery and verteobasilar artery is important for diagnosis and treatment decision-making. However, three-dimensional time of flight magnetic resonance (MR) angiography may provide a poor depiction of the blood flow state. Therefore, we examined the optimal imaging conditions for black-blood MR angiography of the cerebral blood vessels using a two-dimensional, T2-weighted fast spin echo (2D-T2-FSE) sequence.

Materials & Methods: MR imaging was performed using a 1.5T scanner (Signa HiDe Ver.15, GE Healthcare) with an 8-channel head and neck array coil (Medrad). Three healthy male volunteers (age,24-28 years; mean age,26±3 years) with no cerebral artery disease were examined using 2D-T2-FSE with variable sequence parameters of echo time (TE), bandwidth (BW), and echo train length (ETL). We determined the signal intensity ratio (SIR) from the signal intensity (SI) of the cerebral blood vessels (e.g., basilar artery and middle cerebral artery), cerebrospinal fluid (CSF), and brain parenchyma (white matter and gray matter). The calculated SIR values were compared.

Results: For short TE, the SI of the CSF and brain parenchyma was high, and the black-blood effect in the cerebral blood vessels was pronounced. Compared with MR imaging for other regions, MR imaging of cerebral blood vessels should ideally be performed with a narrow BW to reduce the influence of motion artifacts and obtain useful images. An increase in ETL lowered the T2 extension values and the SI of the CSF and brain parenchyma. The increase in ETL is also believed to increase the SIR of cerebral blood vessels.

Conclusions: Our study demonstrated that it is possible to derive optimal 2D-T2-FSE imaging conditions for cerebral blood vessels (i.e.,TE,16.5 ms,BW,31.2 kHz, and ETL,16).

Key words: Cerebral artery, 3D-TOF-MRA, Black Blood MRA, D-T2-Fast Spin Echo

MR7-7
How to Deal with MRI Artefacts
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Purpose: Many different artefacts can occur during magnetic resonance imaging (MRI), some affecting the diagnostic quality, while others may be confused with pathology. An artefact is a feature appearing in an image that is not present in the original object. Artefacts can be classified as patient related, signal processing-dependent and hardware (machine) related. Artefacts include signal loss, pile-up artefacts, geometric distortion, and failure of fat suppression.

Materials & Methods: Information was collected on patients undergoing MRI examinations on 1.5T Philips machine recording any kind of artefact during examination. The consent form was also used as a measure of the accuracy of information the patients records. Some of the questions asked on the consent form is the presence of any dentures, orthopedic device any other metallic objects.

Results: Most of the artifacts noted were motion artifacts, metallic foreign bodies, orthodontic braces and orthopedic artifacts. Various methods were applied of eliminating them such as increasing the field of view (FOV), use spin echo sequences (SE) with a short echo time (TE) and use of oversampling techniques to reduce aliasing amongst others.

Conclusions: Knowledge of different types of artifacts and their origin, and of possible foreign bodies is necessary to eliminate them or to reduce their negative influence on MR images by adjusting acquisition parameters. It is also necessary to take them into consideration when interpreting the images.

Key words: FOV, MRI, TE, SE

MR7-8
MRI in Deep Brain Stimulation Neurosurgery
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Purpose: The purpose of this study was to evaluate the use of magnetic resonance imaging (MRI) guidance in Parkinson’s disease (PD) patients before deep brain stimulation (DBS) microsurgery.

Materials & Methods: Fifteen PD patients performed MRI-guided preoperative assessment using 3T clinical whole body MRI scanner with a 20-channel high resolution head coil before underwent deep brain stimulation microsurgery. 3D T1-weighted (T1W), T2-weighted (T2W) and susceptibility weighted imaging (SWI) pulse sequences were used to perform scanning in this study.

Results: The results showed that high-quality neurovascular imaging can be obtained and both subthalamic nuclei and globus pallidi can be clearly identified. The MR images were interpreted by two experienced radiologists. Then the neurosurgeons integrated the 3D computer assisted imaging navigation system to confirm the surgical site. The procedures can effectively avoid the neurostimulator passing through ventricles or brain blood vessels, which can improve the implantation accuracy and reduce the possibility of bleeding.

Conclusions: MRI assessments before DBS microsurgery mainly depends on 3D T1W images, while SWI can render non-contrast neurovascular structures, together with the 2-mm thin slice T2W images, can provide neurosurgeons a complete surgical planning and evaluation before microsurgery.

Key words: Deep brain stimulation (DBS), Parkinson’s disease (PD), Susceptibility weighted imaging (SWI)
MR8-1

A Study on the Correlation between the Apparent Diffusion Coefficient (ADC) Value and the Standardized Uptake Value (SUЫ) of Malignant Breast Tumors

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Purpose: To correlate the apparent diffusion coefficient (ADC) value and maximum standardized uptake value (maxSUV) of breast ductal carcinoma. also we wanted to evaluate the apparent diffusion coefficient (ADC) values to differentiate between RS-EPI and SS-EPI in the assessment of the malignant breast tumors.

Materials & Methods: 40 patients (mean age: 43.68 years, range: 30-58 years) with breast cancers underwent F-18 FDG PET/CT (Biograph mMR, Siemens, Germany) examinations at our institute during a period from November in 2014 to December in 2015 and were enrolled in this study. PET images were acquired 60 min after administration of F-18 FDG (5.18 MBq/kg of body weight). We evaluated whether there was a correlation between the maximum standardized uptake value (maxSUV) and the apparent diffusion coefficient (ADC) values using RS-EPI and SS-EPI, respectively.

Results: The average of the maximum standardized uptake value (maxSUV) for invasive ductal carcinoma was 6.18±3.58. The mean ADC values using RS-EPI and SS-EPI of breast cancer were 891.32±170.26×10⁻⁶ mm²/s, 890.43±162.70×10⁻⁶ mm²/s respectively. The apparent diffusion coefficient (ADC) value was not significantly different with RS-EPI compared with SS-EPI (p>0.05). The maximum standardized uptake value (maxSUV) was more associated with the apparent diffusion coefficient (ADC) values using RS-EPI than SS-EPI (p<0.05, respectively).

Conclusions: The apparent diffusion coefficient (ADC) values of RS-EPI and SS-EPI showed no significant differences in breast cancer. The maximum standardized uptake value (maxSUV) was more correlated with the apparent diffusion coefficient (ADC) value of RS-EPI than that of SS-EPI in malignant breast tumors.

Key words: Malignant breast tumor, MR/PET, Apparent diffusion coefficient, Fluorodeoxyglucose F18.

MR8-2

Analysis of Chemical Shift Artifacts with Fat and Water Using the MRI Parameter

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Purpose: Analysis using the chemical shift artifacts water and fat refers to changes in the MRI parameter.

Materials & Methods: We used MRI 1 ST and 3.0T were all using the 8 Channel headcoil. Scan parameters were divided and the parameter changes do not change as a quasi-parameter two, the sequence used in the test TSE, FFE, a three HASTE. Water and canola oil does the phantom bottle been disinfected clear to see changes in the chemical shift artifact due to changes in intensity and matrix, bandwidth extent of the magnetic field, each input by 300 ml.

Results: TSE and FFE, WFS (water fat shift) value of HASTE at 1 ST gave each 0.999, 1.002, and 0.999 pixel bandwidth was able to see the results given artifact by shooting 217.5, 216.9, and 217.4 Hz. TSE, FFE, WFS value of HASTE gave each 1.891, 1.997, and 2.0 pixel bandwidth can see that the result is reduced artifact taken by changes in 114.9, 108.8, and 108.6 Hz. TSE and FFE, WFS value of HASTE at 3.0T gave each 1.991, 2002, and 1994 pixel, bandwidth is 218.1, 217, was the same artifact that may result from a given shooting 217.8 Hz. TSE, FFE, WFS value of HASTE gave each 3.836, 3.997, and 3.102 pixel bandwidth was found to be the result artifact is reduced as measured by changes in 113.2, 108.7, and 140.8 Hz.

Conclusions: Through this experiment it was found that the artifact is substantially reduced in the image than at 3.0T 1.5T, depending on the width of the bandwidth broadening parameter was found that each artifact is reduced. Therefore, the strength of the magnetic field is strong, it is considered appropriate to widen the width of the bandwidth in order to reduce the chemical shift artifact in MRI scans.

Key words: Artifact, Bandwidth, Chemical shift, Oil, Water

MR8-3

The Study of Navigated 3D MRCP Using the Compressed Sensing Technique

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Purpose: 3D MRCP respiratory navigated imaging allows for excellent depiction of biliary disease. In this paper, we compare the technical performance of navigated 3D MRCP with Compressed Sensing Technique and that of standard navigated 3D MRCP to evaluate the usefulness of this technique.

Materials & Methods: During January to March 2016, 28 patients (19 male and 9 female, average 64 years old) were imaged at 3.0 T (Discovery MR750, GE HealthCare) using a 32-channel torso array coil. A navigated 3D MRCP acquisition was modified to perform random CS undersampling followed by a custom CS reconstruction algorithm written in MATLAB(The Mathworks). The modified sequence used a combined compressed sensing and Autocalibrated Reconstruction for Cartesian(ARC) sampling scheme. Patients were examined with standard and CS images with the following parameters: respiratory navigated gating (1RR, 2mm acceptance window), ASSET acceleration=2×1, ETL=100, matrix=224×320, FOV=320mm×320mm, slice thickness=1.4mm and CS Acceleration=2. The standard and CS images of navigated 3D MRCP were compared using quantitative and qualitative evaluation method.

Results: The SNR of CBD for navigated 3D MRCP with CS was 151.2 and the SNR of CBD for standard navigated 3D MRCP was 159.5 on average (p>0.05). It took 3min 38sec for CS images and 3min/24sec for conventional images on average. Based on qualitative analysis, the score of the CS images was 4.39point and the score of standard images was 4.70point on average (p>0.05).

Conclusions: The SNR and image quality of the standard
images got higher points than those of the CS images but there was not much difference in image quality between them and we could save time about 1min 46sec when we got 3D MRCP with CS. So CS is considered useful technique for navigated 3D MRCP.

Key words: 3D MRCP, CS technique, Compressed Sensing

MR8-4

Amygdala Atrophy as a Biomarker in Early Parkinson’s Disease Patients with Mild Cognitive Impairment is Associated with Olfactory Dysfunction

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Purpose: Mild cognitive impairment (MCI) and olfactory dysfunction are common non-motor features of early Parkinson’s disease (PD). Olfactory impairment is getting worse in PD patients with cognitive decline. The aim of this study was to identify neuroanatomical biomarkers of early PD patients with mild cognitive impairment (PD-MCI) compared to PD patients with normal cognition (PD-NC) and further to examine the correlation between these regions and olfactory performance in early PD patients with MCI.

Materials & Methods: Structural MRI imaging of 56 PD patients with MCI (35 men, 65.58±7.42 years of age), and 56 age- and gender-matched PD-NC (35 men, 65.6±7.26 years of age) and 56 healthy controls (HC) (35 men, 64.24±7.62 years of age) were included from Parkinson’s Progression Markers Initiative (PPMI) database. The gray matter abnormalities were analyzed using voxel-based morphometry (VBM).

Results: Significant atrophy in the bilateral uncus was identified in PD-NC compared with HC, whereas additional GM volume decrease were identified in the bilateral parahippocampal gyrus, left putamen, right temporal pole in PD-MCI compared with HC. GM atrophy specific to PD-MCI was observed olfactory-related regions including the left amygdala, right temporal pole and right entorhinal cortex compared with PD-NC. In addition, positive correlations between olfactory performance and GM volume were observed in the amygdala and entorhinal cortex in early PD patients with MCI.

Conclusions: Amygdala atrophy serves as a biomarker in early PD patients with MCI which is associated with olfactory dysfunction.

Key words: Parkinson’s disease, Voxel-based morphometry, Olfaction, Amygdala

MR8-5

Brain Connectivity Changes of Patients with Depressive Symptoms in the Elderly with Dementia

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Purpose: Depressive symptoms are commonly seen in patients with Alzheimer’s disease (AD). Depression is supposed to accelerate cognitive deterioration in patient with AD. Our aim is to investigate the change of white matter integrity and functional connectivity by using DTI and resting-state fMRI in patients with depressive symptoms and AD (DAD, Case) and patients with AD only (AD, Control). We further show the connectivity from the different seeds, which set on ACC and PCC.

Materials & Methods: This study included 26 cases and 20 controls. fMRI data were acquired on a 3.0T Siemens MR system with following parameters: TR/TE=3000/50ms, time point=180, voxel size=3.4*3.4*4.0 mm³, in-plane resolution =64 × 64, flip angle=90°, FOV=20 × 220 mm². Voxel-wise measurement of functional connectivity of resting fMRI signal in MATLAB followed the DPARSF pipeline. DTI images with following parameters: TR/TE=10000/107ms, b-value=1000 s/mm³, 30 directions, NEX=3 and voxel size=2*2*2mm³. Brain ROI-based value of the FA was carried out using FSL and SPM. White matter ROIs were created from Susumu Mori.

Results: In this study, increased functional connectivity showed in 15 areas in AD groups (AD>DAD). 15 areas were associated with default mode network, primary visual network and temporal/insular network. Areas with differences in FA differences showed in right cerebral peduncle, internal and external capsule, and frontal-opercular fasculus. There was no increased functional connectivity showed in DAD groups (AD=DAD).

Conclusions: There are significant functional connectivity differences between both groups. The areas were match to the previous results showed the changes in the progression of dementia and depression. ACC and PCC have shown to have functional abnormalities in dementia and depression. White matter deficits in these regions may be a specific biomarker. According to the results of resting fMRI and DTI, we can observe the gray matter changes and their relationship with white matter.

Key words: Alzheimer’s disease, Depression, DTI, Resting-state fMRI

MR8-6

Assessment of Brain Structural Abnormalities in Chemotherapy-treated Breast Cancer Survivors Using Diffusion Tensor Imaging

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Purpose: Breast cancer is one of the top ten causes of death in Taiwan. Neuroimaging studies suggest that white matter structure changes were affected by breast cancer and its treatments. However, the previous studies focused on the late effect of brain by chemotherapy. Our study interested in the early effect of brain by chemotherapy.

Materials & Methods: This study included 19 women with a history of breast cancer who had completed their chemotherapy less than 6 months before study entry and were currently without evidence of cancer recurrence. We have another 33 age-matched healthy women as control group. Diffusion data was first corrected for eddy current. Tensor reconstruction was performed by using diffusion tensor imaging (DTI) with DSI studio. Independent t-test was performed by SPM to show the differences between two groups.
**MR9-1**

**Elbow MRI scan Image is Evaluated according to the Knee Coil Selection**  
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**Purpose:** The picture quality is getting better MRI images of the elbow in accordance with the development of high field MRI coils and private development. The only elbow coils used when you want to capture such as the elbow MRI images, but the price is expensive, it is mainly used for inspection flexible coil. But the sharpness of the image did better than only the coil to evaluate the degree on improved image quality using flexible coil, body coil, knee coil is currently being used.

**Materials & Methods:** Elbow target body healthy normal volunteers six people to evaluate the test (men three men, three women name, age is 27-37 years, mean age 31.3 years) underwent the test. When selecting target claustrophobic patients were excluded.

**Results:** SNR measurements from the average value was measured by FX 14.58, Knee 19.18, body 9.12. signal intensity were analyzed body<FX<knee. In addition, the coefficient of variation images body 13.8>FX 12.3>homogeneity of the entire image is knee to knee 8.12 was

**Conclusions:** exclusion: flexible coil, body coil, knee is among coil showing the best picture quality was knee coil, which coil been, but the results that may come out higher number of coil channel, using existing is sensitive to patient motion, which also must be located in the ISO center it became a required posture of the patient. Position the patient but upon inspection by knee coil has the advantage that you can also increase was more good, quality improvement than when the existing test uncomfortable, it was found that without having to purchase the device can be used as a conventional coil. Based on this, the present, and except for one patient who elbow splint 90 and proceed with the examination of patients with 85-90% knee coil, even getting a good response, as well as an adjunct professor of reading.

**Key words:** Knee coil

**MR9-2**

**Effect of Gadolinium on Hepatic Fat Quantification**

**Using Automated Two-point Dixon Screening Technique**  
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**Purpose:** To determine whether hepatic fat quantification is affected by administration of gadolinium using automated two-point Dixon screening technique (Screening Dixon).

**Materials & Methods:** Forty patients with hepatic steatosis (n=16), liver donors (n=23) underwent Screening Dixon sequence for hepatic fat quantification at 3.0T MRI once before and after administration of gadolinium (Gd-EOB-DTPA). Fat/water ratios which allowed differentiation of normal hepatic parenchyma from abnormal hepatic parenchyma (F/Wnormal threshold≤0.05) were measured in seven ROI with 30mm².

**Key words:** Fat quantification, Gadolinium, Screening Dixon.

**MR9-3**

**Comparison between Digital Subtraction Angiography and Three-dimensional Phase-contrast Magnetic Resonance Angiography in the Evaluation of Arteriovenous grafts**  
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**Purpose:** Taiwan has approximately 70,000 patients with chronic kidney diseases in need of dialysis. According to statistics, a high proportion of dialysis patients developed symptoms of artery restenosis in the dialysis access. Even if stenosis was treated, the rate of restenosis within 1 year was still 59%. In the past, we applied angiography as an assessment tool. However, the use of contrast agents and angiography process were contain risks. Therefore, this study aimed to investigate whether magnetic resonance imaging (MRI) phase-contrast techniques could be used as an assessment tool for dialysis vascular access.

**Materials & Methods:** We enrolled 32 patients with intravascular pressures exceeding 170mm Hg during dialysis who were suspected of having venous stenosis. The patients underwent
angiographic examination and MRI on the same day. On the angiographic examination, image analysis was used to analyze the stenotic site. An improved three-dimensional phase-contrast MRI sequence, InHance 3D, was used to make amendments. This was to use the same coverage as that examined by using angiography. The InHance 3D and angiography images obtained were given to the radiologist for assessment. The degree of stenosis was divided into five grades according to angiography results. Sensitivity, specificity, negative predictive value, positive predictive value, and accuracy were compared.

**Results** : In this group, the remaining 28 patients developed restenosis in at least one of the detected areas. The comparison between angiography and magnetic resonance results showed that the accuracy of InHance 3D imaging was similar to that of angiography for both the proximal and distal ends.

**Conclusions** : This study showed that InHance 3D could effectively evaluate stenosis of dialysis venous access. This technique could provide patients with a noninvasive and non-contrast-enhanced examination method that could yield similar diagnostic results as the conventional method. This method provides an accurate and safe alternative to patients, which could be highly beneficial.

**Key words** : digital subtraction angiography, magnetic resonance imaging, InHance 3D, arteriovenous grafts, phase

**8. NUCLEAR MEDICINE**

**NM1-1**

**The Study of Reducing Radiation Exposure by Developing 18F FP-CIT Phantom**

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**Purpose** : Recently, low dose CT technique of has been developed to reduce radiation exposure. By the way, 18F FP-CIT PET/CT scan that was used to diagnosis Parkinson’s disease was not applied to that technique and only implemented in this condition (120 kVp 140 mAs). Therefore the purpose of this study was to make 18F FP-CIT phantom and evaluate image quality and effective dose according to low CT conditions.

**Materials & Methods** : 18F FP-CIT phantom was developed to express brain of Parkinson’s disease. There were 2 hot spheres to the top of phantom. To describe skull, teflon (Polytetrafluoroethylene, PTFE) was attached to the phantom. Radioactivity of hot sphere was injected by 9.2 kBq/cc and background was injected by 73 kBq/cc. CT conditions were changed at tube voltage (100, 120 kVp) and tube current (80, 140, 200 mAs). Effective dose (mSv) was calculated by adjusting conversion factor. Reference condition was set by tube voltage (120 kVp) and tube current (140 mAs). PET images were evaluated by SNR (Signal to Noise Ratio) and CRChot (Contrast Recovery Coefficient) according to reference condition.

**Results** : Under the reference condition, effective dose was decreased from minimum 10 to up to 60 % from 0.6 to 1.0 mSv. Above the reference condition, effective dose was increased about 40 % as 2.4 mSv. And SNR values were 6.1 ± 0.1 and CRChot values were 98.2 ± 1.9 %.

**Conclusions** : In this study, we can confirm that radiation exposure was reduced at low CT conditions. However, SNR and CRChot values were not significant difference according to CT conditions. Therefore, We need to set optimization of CT condition to patient to reduce over radiation exposure. It is expected to improve care service to patient by providing high quality image and low radiation dose.

**Key words** : PET/CT, Effective dose,

**NM1-2**

**Analysis of Image Quality in Amplitude-Based Respiratory-Gating for PET-CT**

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**Purpose** : In order to judge the malignancy of tumor, SUV is used in ¹⁸F-FDG PET-CT, but the accuracy decreases by the motion of patient’s respiration. To correct this, SUV and image quality were analyzed after obtaining the amplitude-based respiratory-gating images and comparing with reconstruction parameter combination.

**Materials & Methods** : Infrared rays camera type RPM respiration motion tracing devise was installed on PET-CT.
scanner and experiments was conducted with respiratory-gating mode. 18F-FDG injected point and performance source were installed on the motion phantom which enables vertical movement and 3 min/bed scan was conducted. Images before correction are static type and images after correction are gating type and reconstruction (FBP) was conducted after setting the amplitude changes and intervals according to motion cycle with 9 combinations of wave forms (Min, Max, Rest In/Ex) and duty cycle (20, 35, 50%) parameters. And region of interest was set on the identical plane of images and differences between SUV max, volume, FWHM, SNR and CNR were compared and statistically analyzed.

Results: When comparing pre-images of respiration motion correction with post-images, SUVmax increased 89.9% from 1.38 to 2.62±0.48 and volume decreased 27.9% from 2.94 cm$^3$ to 2.12±0.28 cm$^3$. Spatial resolution evaluated by FWHM decreased 53.9% from 13.3 mm to 6.12 mm and SNR increased 11% from 5.36 to 5.95, and CNR increased 16.3% from 57.28 to 66.64. Therefore, respiratory gating technique, SUVmax, volume and image quality could be improved (P<0.01). Additionally, it could be identified experimental items were optimal in the parameter combination of Rest-wave form and 35% duty cycle.

Conclusions: When comparing with the images in existing tests, respiration correction technique images that selectively reconstruct the signals in the intervals with little amplitude change rates and long lasting time can correct SUV changes and image distortion caused by respiration motion more precisely and image quality is excellent.

Key words: Respiratory gating, SUV, FWHM, SNR, CNR

NM1-3
Effect of Dosimeter’s Position on Occupational Radiation Extremity Dose Measurement for Nuclear Medicine Workers During 18F-FDG Preparation for PET/CT
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Purpose: The spread of positron emission tomography-computed tomography (PET-CT) poses extremity dosimetry challenges. The question arose whether the radiation dose measured by the ring thermoluminescent dosimeter usually worn on the proximal phalanx (P1) of the index finger measures doses that are representative of the true doses received by the upper extremities of operators.

Materials & Methods: A prospective individual dosimetry study was performed in which the personal equivalent dose Hp (0.07) received during a specific 18F-FDG manual dose dispensing procedure was measured in a paired design by two operational electronic dosimeters fitted on the palm side of the index finger, namely in the P1 and distal phalanx (P3) positions. The study participants were 10 nuclear medicine technologists, working in two nuclear medicine departments (Bordeaux University Hospital and Cote Basque Bayonne Hospital). The personal equivalent radiation doses received by the palm side of the proximal phalanx of the index finger [Hp(0.07)P1] and that received by the distal phalanx [Hp(0.07)P3] were compared.

Results: The median Hp(0.07)P3 / Hp(0.07)P1 ratio per participant varied between 1.0 and 2.5 (based on 23 to 31 measurements per participant). The 271 paired measurements revealed a crude Hp(0.07)P3 / Hp(0.07)P1 ratio of 1.67, significantly different from 1 (p=0.0004, 95% CI[1.35 - 2.07]).

Conclusions: The study demonstrated a significant disparity that may exist between the radiation doses measured in the P1 and P3 positions, the latter being more representative of the maximum dose received by the upper extremities of operators during 18F-FDG manipulation. These findings emphasize the importance of performing workplace dosimetry studies adapted to each radiopharmaceutical and manipulation thereof, aiming to guarantee optimal workers' dosimetry monitoring schemes.

Key words: radiation dosimetry, extremity, 18F-FDG, operational dosimeter

NM1-4
Differences in FWHM according to changes of Radioactivity (99mTc) and Energy window width
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Purpose: There are many indicators to evaluate image quality. Specifically, FWHM is used to evaluate resolution in nuclear medicine imaging tests. The aim of this study is to figure out FWHM differences according to changes in radioactivity and energy window widths.

Materials & Methods: In 1.5 cm diameter, 12 cm length Conical Tube, radioactivity is increased by 100 uCi from 100 uCi, until 1000 uCi. Then 99mTc and IV5 are mixed and filled in 15 ml each in 10 tubes. After fixing the distance on .1 cm between the tube and Detector. While increasing Energy window width to 5%, 10%, 15%, 20%, 25%, 30%, Images were obtained during 120 seconds using Discovery NM/CT 670(Generic Electric, USA) and calculate FWHM using Xeleneres (Generic Electric, USA)

Results: Based on 15% Energy window width, most commonly used in scan, FWHM was 5.69 mm for 100 uCi radioactivity, and 5.59 mm for 1000 uCi, showing decrease in FWHM as radioactivity increased. mean FWHM of entire radioactivity showed 5.54±0.025 for 5% width, 5.55±0.062 for 10%, 5.58±0.053 for 15%, 5.62±0.075 for 20%, 5.66±0.027 for 25%, and 5.79±0.069 for 30%.

Conclusions: Through this experiment, as broad energy window width, as increased in FWHM. However in cases of radioactivity, FWHM decreased only 100 uCi and 1000 uCi comparisons. As a result, energy window width is remarkable factor than radioactivity. But as the amount of radioactivity was limited in this research, additional experiments are required.

Key words: FWHM, 99mTc radioactivity, Energy Window width

NM1-5
Evaluation on the Usefulness of Alternative Radiopharmaceutical by Particle Size in Sentinel Lymphoscintigraphy
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Purpose: Sentinel lymphoscintigraphy (SLS) was using only 99mTc-phytate. If the supply is interrupted temporarily, there is no alternative radiopharmaceuticals. The aim of this study measure the particle size of radiopharmaceuticals and look for radiopharmaceuticals which can be substituted for 99mTc-phytate.
Materials & Methods: The particle size of radiopharmaceuticals were analyzed by a nano-particle analyzer. This study were selected known radiopharmaceuticals to be useful particle size for SLS. We were divided into control and experimental groups using 99mTc-DPD, 99mTc-MAG3, 99mTc-DMSA with 99mTc-phytate. For in-vivo experiment, radiopharmaceuticals were injected intradermally at both foot to perform lymphoscintigraphy. Imaging was acquired to dynamic and delayed static image and observe the inguinal lymph nodes with the naked eye.

Results: Particle size was measured respectively Phytate 105~255nm(81.9%), MAG3 91~255nm(98.7%), DPD 105~342nm (77.3%), DMSA 164~342nm(99.2%), MAA 1281~2305nm (90.6%), DTPA 342~1106nm(79.4%), and HDP 295~955nm (94%). In-vivo delayed static image, inguinal lymph nodes of all experiment groups and two control groups are visible to naked eye. However, 99mTc-MAG3 of control groups is not visible to naked eye.

Conclusions: We were analyzed to the particle size of the radiopharmaceuticals that are used in in-vivo. Consequently, 99mTc-DPD, 99mTc-DMSA are possible in an alternative radiopharmaceuticals of emergency.

Key words: Particle size, 99mTc-phytate, Sentinel lymphoscintigraphy

NM1-6
A Study on the Strategies to Lower Technologist Occupational Exposure according to the Performance Form in PET Scan Procedure

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Purpose: When technologists are familiar with work practices, their work in nuclear medicine is recognized as an optimized method. The aims of this study are to measure radiation exposure of technologists’ working in PET and to evaluate the occupational radiation dose after the implementation of strategies to lower exposure.

Materials & Methods: We divided into four working types: QC for PET, injection, scan in FDG-PET procedure. In QC for PET, we compared the differences in radiation exposure when controlling the table next to the Ge-68 cylinder phantom and in console room remotely. In injection, we compared the radiation exposure when guiding a patient in the waiting room before the injection and after injection. In the scan, we compared the differences in radiation exposure between moving the table using the control button located next to the patient and using the control button located a farther distance away.

Results: The average doses were 0.27 ± 0.04 μSv when controlling the table directly and 0.13 ± 0.14 μSv when controlling the table remotely while performing QC. The average doses were 0.27 ± 0.04 μSv when guiding the patient after injection and 0.62 ± 0.17 μSv when guiding patient before injection. The average doses were 1.33 ± 0.54 μSv when using the control button located next to the patient and 0.94 ± 0.50 μSv when using the control button located in far distance while acquiring image. As a result, there were statistically significant differences (p<0.05).

Conclusions: We found how much radiation technologists are exposed to on average at each step of the PET procedure and how we can reduce the occupational radiation dose after the implementation of strategies to lower exposure. If an effort is made to seek other methods to reduce technologist occupational radiation, we can minimize and optimize the amount of exposed radiation in departments of nuclear medicine.

Key words: Nuclear medicine technologist, Radiation exposure, Personal electronic dosimeter

NM2-1
Comparison and Evaluation of the Results of Quantitative Analyses of Lung Perfusion Scan Using Q-Metrix

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Purpose: The lung segment ratio (LSR) which is obtained through quantitative analyses of lung perfusion scan images is calculated to evaluate the lung function pre and post surgery. Generally, the volume of the lung is not reflected because the LSR is calculated by ROI on the planar images. In this study, LSR was calculated through a quantitative analysis program, Q-Metrix (GE Healthcare, USA), using ROI and VOI after SPECT/ CT was conducted, and results were compared and evaluated.

Materials & Methods: Lung perfusion scan and lung perfusion SPECT/CT were conducted using Discovery 670 (GE Healthcare, USA) on 25 lung cancer patients who visited the authors’ hospital between August 1, 2015 and April 13, 2016. For the quantitative analysis, the LSR was obtained using a ROI tool as a way of typical calculation, also another LSR was calculated using the Q-Metrix program which requires ROI and VOI based on SPECT/CT data. Then the two results were compared.

Results: From lung perfusion scan image, the mean ratio of the upper, middle and lower segments in the right lung was 17.55%, 12.12%, and 26.46% respectively. The mean ratio of the upper and lower segments in the left lung was 20.50% and 23.14% respectively. The standard deviation of the two methods was 4.27 (upper), 4.82 (middle) and 5.69 (lower) in the right lung and 4.7 (upper) and 4.95 (lower) in the left lung.

Conclusions: It is impossible to set an exact ROI because lung perfusion scan image is planar. Instead, acceptable results were obtained when exact lung segment ROI and VOI were set based on the Q-Metrix program and CT images. Therefore, use of the Q-Metrix program which is for calculating not only ROI but also VOI may be calculated more accurate results than use of lung perfusion scan images.

Key words: Q-Metrix, Lung segment ratio, Lung volume

NM2-2
Evaluation of a Shielding Apron Using Radioisotope

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Purpose: In this study, we evaluate usefulness of wearing apron, when using radioisotope (18F, 131I, 99mTc) for nuclear medicine diagnosis and therapy.

ABSTRACTS
Materials & Methods: Two aprons (lead equivalent 0.3mmPb & 0.5mmPb) was used for experiment. We measured energy spectrum of each sources and each thickness of aprons when the presence or absence of an apron between three sources (18F, 131I, 99mTc) and detectors. When the absence of an apron between sources and detectors and when the presence of an apron near source or detectors, we measured dose rate ($\mu$Sv/hr) of each sources and each thickness of aprons 20 times.

Results: When an apron placed front of detectors, 60Kev ~ 100Kev peak energy spectrum was detected unlike original of energy spectrum (in case of all three sources (18F, 131I, 99mTc)). In dose rate ($\mu$Sv/hr) experiment, a low level Shield Effect was detected in case of 99mTc. In case of 18F, 131I Miniscule amounts and negative numbers was detected (using apron for shielding).

Conclusions: With all three sources, new Energy peak was detected. It maybe caused by interaction between of initial radiation and apron. In case of apron placed near sources, the shield effect was recorded as the highest. In case of apron placed near detectors, the shield effect was recorded as the lowest. Especially with high-energy emission nuclide (18F, 131I), rather negative numbers was recorded as about 60Kev-100Kev. It maybe caused by scattering effect and We'd better consider biological effectiveness by Scattering rays. (Through this research) additional study about suitable shield method and material in nuclear medicine is needed.

Key words: Nuclear Medicine, Apron, Radioisotope, Energy Spectrum, Radiation Shielding

NM2-3

Comparison of Dynamic Continuous Mode and Step and Shoot Mode in SPECT Acquisition

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Purpose: SPECT acquisition Gantry mode can be divided into Step and Shoot Mode (SSM) and Dynamic Continuous Mode (DCM). During the SPECT acquisition, if patient’s movement cause it will be improper diagnosis and examination failure. Instead of SPECT, Dynamic SPECT Acquisition was adopted to raise efficacy and rejected data set the patient moved. As a result, it will be improper diagnosis and exam failure. In this paper, Dynamic SPECT, Step and Shoot Mode, Dynamic Continuous Mode, SPECT/CT should be the answer for that.

Key words: SPECT, Step and Shoot Mode, Dynamic Continuous Mode, SPECT/CT

NM2-4

Evaluation of GFR according to Dose Measurement Distance and Dead Time on DTPA Renal Scanning

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Purpose: In measurement of the pre-post syringe count value to figure out the administered dose for GFR evaluation by the 99mTc-DTPA renal scan, the measurement distance may affect the GFR value because count rate and dead time are affected by the distance. In this study, the change of count rate, dead time and GFR values according to the syringe measurement distance were compared and analyzed.

Materials & Methods: 28 patients who had visited this hospital for the DTPA renal scan from 1st to 31th March, 2016 were studied. The gamma camera E.CAM (Siemens, Berlin, Germany) was used. The initial measurement distance between a syringe and a detector was set to 30cm, and it was reduced by 5cm. At every 5cm, the dead time and the count rate was measured and DTPA renal scan was conducted to obtain the GFR value. Finally, the dead time, count rate and GFR value were compared according to the distance.

Results: Each time the measurement distance of the pre dose (99mTc-DTPA 555 ± 18.5MBq) was decreased from 30cm to 5cm, the count rate decreased by 1.2% and 2% and the dead time increased by 0.4% to 4.5%. For the post dose (99mTc-DTPA 55 ± 7.4MBq), the count rate increased by 0.4% to 1.5% but no dead time change was observed. In addition, the GFR value according to the distance increased by 0.7% to 2.8%.

Conclusions: In this study, the shorter the syringe measurement distance was, the greater the dead time was and thus the smaller the count rate was. As a result, the GFR value increased. Therefore, it is recommended that the distance between the syringe and the detector should be kept constant to obtain a consistent GFR value.

Key words: Pre-Post Dose, Dead Time, Count Rate, GFR

NM3-1

Evaluation of Normal Distribution of 18F-Florbetaben in Whole Body

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Purpose: 18F-florbetaben is one of a radiopharmaceutical to diagnosis a dementia in neurological nuclear medicine, because this is accumulated at amyloidosis neuron cell caused dementia in brain. By the way, amyloidosis is a rare disease that results from the buildup of misfolded proteins known as amyloids at whole body. So, in this paper, we will evaluate a normal
distribution of 18F-florbetaben at various organ of whole body.

Materials & Methods: We injected 18F-florbetaben (8.1±1.4mCi) to Alzheimer disease patients (n=10, age: 78±5.12) who had a normal finding of PET. After 90minutes later, we acquired PET date of not only brain but whole body using Biograph mCT 40 (Siemens, German). After reconstruction PET data applied with time of fight and point spread function, we classify a various organs into two groups as accumulated organs and excretory organs. And we set ROIs and calculated an average SUV of each organ.

Results: In case of 18F-florbetaben accumulated organ, an average SUV of gray matter, white mater, salivary gland, myocardium, T-spine, liver, pancreas, renal cortex, sternum and muscle are 2.24, 0.92, 3.00, 1.43, 3.23, 4.00, 1.98, 1.77, 2.89, and 1.05. In case of excretory organs, an average SUV of gall bladder, large bowl, and bladder are 60.00, 12.40, and 35.89.

Conclusions: 18F-florbetaben is one of a diagnostic radiopharmaceutical developed for routine clinical application to visualize ß-amylloid plaques in the brain. However, using this mechanism on whole body like result, we can standardize a distribution of 18F-Florbetaben at normal organ. Therefore, if 18F-Florbetaben is used at a whole body PET, those normal SUV will help for diagnosis of amyloidosis resulting in specific areas.

Key words: 18F-Florbetaben, Amyloidosis, Whole body

NM3-2

Absorbed Dose to the Fingers of a Nuclear Medicine Radiographer Administering Technetium-99m-MDP to Patient Undergoing Radionuclide Bone Scan at the Department of Nuclear Medicine, Nigeria

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Purpose: This study was aimed at comparing and ruling out the safest method (either through cannula or direct intravenous[IV] administration)to minimize Radiation absorbed dose to the fingers of Radiographers while administering Radionuclide (Tc-99m-MDP) to patients and to find out whether he is practicing within the limit set by International Commission on Radiological Protection (ICRP).

Materials & Methods: The TL pellet were inserted in a plastic index finger, Technetium

Results: The highest finger dose to the Radiographer was when using cannula which is 0.67mSv while the finger dose for direct IV administration was 0.67mSv. Annual cumulative doses with cannula and direct IV administration were 476mSv and 397mSv respectively which were in line with the limit of 500mSv per year for extremities by ICRP aimed at averting Radiation induced hazards to Radiation workers.

Conclusions: The study is highly relevant as it’s intended to set standard of practice in Nuclear Medicine, Ibadan, Nigeria (being a pioneering center) and the continent as a whole especially now that the Federal Government of Nigeria had seen reasons to have 10 more Nuclear Medicine Centers in Nigeria. Also the study showed that with rotation of Radiographers administering Radionuclide and reducing time of administration as a result of adequate training on the job, will drastically reduce radiation hazards.

Key words: Radiographer, Nuclear Medicine, Absorbed Dose, Index Finger, Technetium

NM3-3

Clinical Application of 18F-FDG PET-MRI

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Purpose: With the advent of avalanche photodiode (APD) and silicon photomultipliers (SiPM) following technical development have led to fully integrated Positron emission tomography (PET)-Magnetic Resonance Imaging (MRI) systems. It enables molecular and morphologic assessment of a variety of physiological conditions. However, their applications have not been established yet and each institution made its own criterion to follow. The aim of this study is to review clinical cases performed at one institution and to exhibit their effective application.

Materials & Methods: The authors reviewed 18F-fluorodeoxyglucose (18F-FDG) PET-MRI cases scanned using SIGNA PET-MRI scanner (GE Healthcare, Milwaukee, WI, USA) from January 2016 to March 2016. 18F-FDG PET-MRI image was obtained 1 hour after the injection of 18F-FDG (approximately 4 MBq/kg). Patients fasted for at least 4 hours before the injection. We compared them with other diagnostic radiological images carried out within 6 months of 18F-FDG PET-MRI.

Results: For the detection of distant metastases, 18F-FDG PET-MRI outperform other modalities in some cases, due to the typical pattern of distant metastatic spread from the primary lesion that can be imaged by the system in an outstanding way. Complementary information between the two modalities improves the diagnostic accuracy in diagnosing and staging in other cases.

Conclusions: The authors demonstrated effective clinical application of 18F-FDG PET-MRI. What can be expected is that replacing PET-CT with PET-MRI would lead to a dose reduction to the patient, which is particularly important for sequential monitoring and surveying over the pediatric.

Key words: PET-MRI, 18F-FDG, and SiPM

NM3-4

Two Years on: The Role of Advanced Practitioner in the Clinical Setting for 223Radium-dichloride Therapy for Bone Metastases in Castration-Resistant Prostate Cancer

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Purpose: Two years ago, the 223Radium-dichloride clinic in our institution started and was one of the first running in the UK. Effectiveness of this new bone palliation radionuclide therapy for symptomatic bone metastases in castration-resistant prostate cancer (CRPC) comes from its utilization of an alpha-emitter metabolising in bone metastases, producing an anti-tumour effect with limited effect on surrounding healthy tissue. The Advanced Practitioner role running the therapy clinic is examined.
When an effective half-life of 15.4 was used, the In the experiments using Flangeless Esser PET 223Radium dichloride has proved an effective Using the inpatients' release data of

**ABSTRACTS**

**NM3-5**

**Comparisons of the Release of Patients Treated by I-131**

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**Purpose** : The high-dose administration of I-131 has been standing for the basic therapy method of thyroid cancer. In Korea, It is not necessary for patients to be hospitalized if the administration dose are under 1.2GBq. However, if the dose are over 1.2GBq, the patients should be stay in special ward with radiation shield. In such cases, the radioactivity level upon release should be under a dose of 70 μSv/hr at a distance of approx. 1m.

**Materials & Methods** : Using the inpatients' release data of Severance hospital, the inpatient-days were retrospectively calculated and compared with practical data, and the inpatient-days with the conditions of Korea (70μSv/hr), Japan (30μSv/hr), Germany (3.5μSv/hr) at a distance of approx. 2m, and other European countries were simulated.

**Results** : When an effective half-life of 15.4 was used, the expected inpatient-days were calculated as 2.15 days in the condition of Japanese regulation and 1.37 days in the condition of Korean regulation. The practical inpatient-days of patients in Severance hospital were 1.32 days.

**Conclusions** : As ICRP 94 is mentioned that the release of patients administrated with I-131 for the therapy should be carefully considered because each patient has different thyroid uptake rate and their conditions with family members after the release from the ward. Nonetheless, efforts to bring more accurate data to get closer to the practical data should be continuously studied.

**Key words** : I-131, Thyroid patient release

**NM3-6**

**The Comparison of Image Quality according to the Change of Acquisition Angle in SPECT/CT**

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**Purpose** : We focused on only the aspect of acquisition angles and evaluated the image quality by applying four different angles.

**Materials & Methods** : This study was carried out with Flangeless Esser PET Phantom (Data Spectrum Corp, USA) and NEMA Triple Line Source Phantom (Data Spectrum Corp, USA) using a SPECT/CT, Discovery 670 (GE, USA). The interior of the Flangeless Esser PET phantom was filled with 37 kBq/ml of Tc-99m for background setting and 4 of cylinders (8, 12, 16, 25 mm) were filled with 296 kBq/ml of Tc-99m. The cylinders to background activity ratio was regulated as 8:1. The three lines of the NEMA Triple Line Source Phantom were filled with 3.7 MBq/ml of Tc-99m. Acquisition angles were varied as 3°, 4°, 5° and 6° with the acquisition time fixed on 15 sec/Frame. OSEM algorithm and CT attenuation correction were applied for reconstruction. For comparison, contrast noise to ratios and contrast recovery ratio were calculated from the images of Flangeless Esser PET phantom. Plus, resolution was also measured from the images of NEMA Triple Line Source Phantom.

**Results** : In the experiments using Flangeless Esser PET Phantom, there was not a significant change in the contrast recovery however the contrast noise to ratio was decreased with the increase of acquisition angle in the experiments using NEMA Triple Line Source Phantom, resolution did not change significantly with the increase of acquisition angle.

**Conclusions** : In SPECT/CT images, the contrast to noise ratio was found to be reduced with the increase of acquisition angle while it did not affect the contrast recovery ratio and resolution. Therefore, when performing SPECT/CT, it is necessary to adjust the acquisition angle according to the type of study, and it is also recommended to perform additional experiments to find a suitable acquisition angle.

**Key words** : CNR, OR, FWHM

**NM3-7**

**Evaluation of MR Based Respiratory Motion Correction Technique in Liver PET/MR Study**

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**Purpose** : The comparison of image quality according to the change of acquisition angle in SPECT/CT

**Materials & Methods** : To facilitate clinics the Advanced Practitioner liaises with patients regarding aspects of the therapy, ensures timely bone scans and blood tests (due to potential haematological effects) to ensure adequate levels prior to each of six 4-weekly injections. Prostate specific antigen (PSA) and serum alkaline phosphatase (ALP) levels are obtained throughout. ‘Pain flare’, timing of the therapy regime in relation to radiotherapy, symptomatic skeletal events, and other side effects are monitored within this role.

**Results** : Fifty-two patients have started this therapy. ‘Pain flare’ occurred in 15/52 patients. ALP levels provide a reliable indicator of effectiveness together with clinical response. Excluding normal baseline and non-responders, the maximum ALP level dropped by an average of 55% in the remaining 32 patients, with the median maximum response occurring at the fifth treatment. While one clinic/week of 4-6 hours has been established, treating at other times is occasionally necessary. With patients as the focus, a central Advanced Practitioner role enables smooth service provision. Understanding requirements of the Nuclear Medicine Consultant and interfacing with Oncology is essential. Patients see the Consultant at the first visit, and only if necessary thereafter, providing a cost-effective service. Patient confidence in the Advanced Practitioner enables good research recruitment.

**Conclusions** : 223Radium dichloride has proved an effective therapy. Clinical and technical expertise, and inter-professional collaboration of the Advanced Practitioner role is advantageous in providing a seamless, cost-effective approach.

**Key words** : 223Radium-dichloride, Castration-resistant, Prostate, Therapy, Advanced Practitioner

**NM3-7**

**Evaluation of MR Based Respiratory Motion Correction Technique in Liver PET/MR Study**

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Department of Nuclear Medicine, Seoul National University Hospital, Korea

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**Purpose** : We focused on only the aspect of acquisition angles and evaluated the image quality by applying four different angles.

**Materials & Methods** : This study was carried out with Flangeless Esser PET Phantom (Data Spectrum Corp, USA) and NEMA Triple Line Source Phantom (Data Spectrum Corp, USA) using a SPECT/CT, Discovery 670 (GE, USA). The interior of the Flangeless Esser PET phantom was filled with 37 kBq/ml of Tc-99m for background setting and 4 of cylinders (8, 12, 16, 25 mm) were filled with 296 kBq/ml of Tc-99m. The cylinders to background activity ratio was regulated as 8:1. The three lines of the NEMA Triple Line Source Phantom were filled with 3.7 MBq/ml of Tc-99m. Acquisition angles were varied as 3°, 4°, 5° and 6° with the acquisition time fixed on 15 sec/Frame. OSEM algorithm and CT attenuation correction were applied for reconstruction. For comparison, contrast noise to ratios and contrast recovery ratio were calculated from the images of Flangeless Esser PET phantom. Plus, resolution was also measured from the images of NEMA Triple Line Source Phantom.

**Results** : In the experiments using Flangeless Esser PET Phantom, there was not a significant change in the contrast recovery however the contrast noise to ratio was decreased with the increase of acquisition angle in the experiments using NEMA Triple Line Source Phantom, resolution did not change significantly with the increase of acquisition angle.

**Conclusions** : In SPECT/CT images, the contrast to noise ratio was found to be reduced with the increase of acquisition angle while it did not affect the contrast recovery ratio and resolution. Therefore, when performing SPECT/CT, it is necessary to adjust the acquisition angle according to the type of study, and it is also recommended to perform additional experiments to find a suitable acquisition angle.

**Key words** : CNR, OR, FWHM
Purpose: Respiratory blurring and blurring in PET/MR acquisition may result in image blurring and error in measurement for volume and quantification of lesion. The aim of this study was to evaluate changes of quantitative accuracy, tumor volume and image quality by applying MR based respiratory motion correction technique (MBRMCT) using integrated PET/MR scanner.

Materials & Methods: Data of 8 patients (aged 60.1 ± 9.1 y) underwent 18-F-FDG liver PET/MR (Biograph mMR 3.0T, Siemens) study were collected. PET listmode data for 7 minutes was simultaneously acquired with maximum average gate (MAG), minimum time gate (MTG) and none gate (NG) T1 weighted MR images. Gated PET reconstruction was performed using mu-maps generated from MAG and MTG by setting 35% of efficiency window. Maximum SUV (SUVmax), peak SUV (SUVpeak), tumor volume and full width at half maximum (FWHM) in the z-axis direction of MAG, MTG and NG PET images were evaluated.

Results: Compared to NG, mean SUVmax and SUVpeak were increased in MAG 13.62%(p=0.002), 7.42%(p=0.002), MTG 14.50%(p=0.001), 7.97%(p=0.001) and mean tumor volume and FWHM were decreased in MAG 13.47%(p=0.004), 17.48%(p=0.056), MTG 13.98%(p=0.003), 17.66%(p=0.05) respectively. Mean SUVmax and SUVpeak of MTG were increased by 0.77%(p=0.28), 0.51%(p=0.398) and mean tumor volume and FWHM were decreased by 0.58%(p=0.523), 0.23%(p=0.487) compared to MAG. There was no statistically significant difference between MTG and MAG which increase total scan time for 7 and 1.5 minutes.

Conclusions: SUV, accuracy of tumor volume and image quality were improved in both of MAG and MTG by applying MBRMCT without installing additional hardware in liver PET/MR study. More accurate information can be provided with the increase of 1.5 minutes scan time if applying MBRMCT to various abdominal PET/MR studies affected by respiratory motion.

Key words: Respiratory motion correction, PET/MR, SUV, Liver cancer

9. RADIATION DOSE & REDUCTION

RD1-1

Study on the Calculation of Conversion Factors for Effective Dose for Chest Digital Radiography
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Purpose: Digital radiography unit provides an area of radiation dose unit as dose report to which to know approximately absorbed dose exposed to patient. However, it is difficult to induce approximately exposed dose because area of radiation dose unit is different from effective dose recommend by ICRP. In this study, using the conversion constant, and intuitive comparison of the effective dose to be recommended by the ICRP, trying to induce the reduction of medical exposure dose.

Materials & Methods: To estimate effective dose according to an area of radiation dose, it was possible through complex simulation as Monte Carlo simulation. Using conversion factor, we wish to induce medical radiation dose based on directly compared with effective dose recommend by ICRP.
We study for Chest PA(Posterior-Anterior) that using the Duke QC chest phantom (07-646 QC, Supertech, Elkhart, USA) with exclusive digital chest radiograph, 43 x 43 cm for the field of view (FOV), and 180 cm for the source to image distance (SID). Measurement of an area of radiation dose was using fixed 81 ~ 125 kV, but changing mAs and additional filter in optimal exposure index 200 ~ 800 with Philips unit. We performed on the correlation between the area of radiation dose and effective dose estimated value from Monte Carlo simulation (PCXMC 2.0). Thus, we induced the CF according to kV and an additional filter.

Results: Image quality and radiation dose is known proportional relation in digital radiography. Digital radiography unit with wide exposure index can study with relatively lower radiation without reducing image quality. CF is very simple and useful method due to directly knowing exposure of radiation dose to patients.

Conclusions: Digital radiograph will be able to implement the system that organized to radiation exposure to the patient, by developing a patient exposure management program with using the CF.

Key words: Exposure index, Flat detector, Dose creep, Area of radiation dose, Effective dose

Ultra-Low Pulse Rate Fluoroscopy during Routine Diagnostic Coronary Angiography
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Purpose: The aim of this study is to assess the feasibility of using ultra low pulse rate fluoroscopy during routine diagnostic coronary angiogram procedures and the effect it has on radiation dose.

Materials & Methods: A retrospective case control study of three operators each undertaking 50 coronary angiogram procedures was performed. One of the operators used a pulse rate of 3 whilst the control group used the standard 10 pulse mode utilized at this center. Differences in radiation dose were assessed using a one-way ANOVA. Changes in fluoroscopy time were also assessed to detect if procedures took a longer time to complete because of reduced image clarity.

Results: Results showed up to a two-fold reduction in DAP when lower pulse rate was used and that the lower pulse rate had no significant effect on fluoroscopic time between the operators.

Conclusions: These results suggest that using ultra low fluoroscopic pulse rate has a positive effect on radiation dose reduction for patients undergoing routine diagnostic coronary angiography whilst not impacting on the clinical outcomes nor the length of the procedure.

Key words: Cardiac Catheterization, Radiation Dose Optimization, Fluoroscopic Pulse-Rate

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RD1-3
Retrospective Review of Image Processing Techniques and Their Influence in Dose Reduction in Paediatric Abdominal CT

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Purpose: Computed Tomography (CT) is a robust method of imaging the paediatric abdomen and provides important anatomical detail, however radiation dose must always be considered. An important technological advance in the recent past is the advent of various forms of Iterative Reconstruction (IR) as opposed to the traditional method of Filtered Back Projection (FBP). IR techniques have allowed improved image quality permitting dose reduction. This retrospective study investigated the impact to radiation dose when IR techniques were utilized and compared to FBP over a multi-year period.

Materials & Methods: A retrospective analysis was conducted of 200 consecutive paediatric patients presenting to the CT department for abdominal imaging. 75 of these patients were scanned using FBP prior to the introduction of IR, whilst the remaining 125 patients were scanned using IR. The radiation dose of each patient was collated as well as patient age. CT Dose Index (CTDIvol) was the parameter of radiation dose collated since it best demonstrates differences in actual radiation dose administration as opposed to Dose Length Product.

Results: Patients were separated into 4 age categories 0-1, 2-5, 6-11 and 12-16. FBP analysis showed the following average CTDIvol values:

- 0-1 years: 2.955mGy
- 2-5 years: 2.66mGy
- 6-11 years: 4.58mGy
- 12-16 years: 6.84mGy

IR analysis showed the following average CTDIvol values:

- 0-1 years: 0.92mGy
- 2-5 years: 0.83mGy
- 6-11 years: 1.29mGy
- 12-16 years: 3.85mGy

Comparative data demonstrates the percentage reduction in CTDIvol:

- 0-1 years: 68.93%
- 2-5 years: 68.78%
- 6-11 years: 71.72%
- 12-16 years: 43.67%

Conclusions: The introduction of IR techniques have reduced radiation dose to patients by up to 71.72% over a multi-year period. Considering that the ALARA principle drives clinical practice, such reduction in doses cement implementing IR techniques in routine clinical practice when undertaking CT abdominal imaging in the paediatric setting.

Key words: CT, Dose Reduction, Abdomen, Paediatric

RD1-4
Determination of Radiation Dose and Cancer Risk to Patients Undergoing Digital X-ray Examinations

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Conclusions: The expressions of miRNA-21, miRNA-92a and miRNA-15b/family miRNAs, miR-143, miR-146a, miR-155, miR-15a, miR-16, miR-18a, miR-19b, miR-21, miR-22, miR-26a, miR-378, miR-423, miR-92a, miR-93 were repressed after radiation (P<0.05). What’s more, there were positive correlation between a group of miRNAs’ variations, such as let-7 family miRNAs, miR-143, miR-19b, etc., and the changes in cell cycles, proliferation and apoptosis of cells under graded dosage of X-rays. Meanwhile, irradiation-related miRNAs would be screened through miRNA expression arrays and RT-PCR. And with the help of dual-luciferase reporter gene system and Western Blot, we could construct the ideography of feedback regulation between miRNAs and the related target genes regarding to radiation damage.

Results: The expressions of let-7 family miRNAs, miR-103b, miR-142, miR-143, miR-146a, miR-155, miR-15a, miR-16, miR-18a, miR-19b, miR-21, miR-22, miR-26a, miR-378, miR-423, miR-92a, miR-93 were repressed after radiation (P<0.05). What’s more, there were positive correlation between a group of miRNAs’ variations, such as let-7 family miRNAs, miR-143, miR-19b, etc., and the changes in cell cycles, proliferation and apoptosis of cells under graded dosage of X-rays. Meanwhile, irradiation-related miRNAs would be screened through miRNA expression arrays and RT-PCR. And with the help of dual-luciferase reporter gene system and Western Blot, we could construct the ideography of feedback regulation between miRNAs and the related target genes regarding to radiation damage.

Purpose: The aim of the study is to determine the radiation dose and associated cancer risk to patients undergoing selected imaging procedures.

Materials & Methods: The study involved the use of the following equipments: Philips OPTIMUS digital x-ray machine, thermoluminescence dosimeters (TLD), Harshaw 6600 TLD reader, RMI Multifunction Meter, and Fuji IP type cc speed 400. The following tests were performed: quality assurance of TLD chips, performance testing of digital x-ray system, and entrance surface dose (ESD). The ESD to patients were assessed for 82 patients selected at random undergoing medical exposure for chest, abdomen and pelvis examinations using TLD chips. The effective dose to all patients were computed using PCMC 2.8 software.

Results: From the study the mean entrance dose to abdomen and pelvis were found to be 0.6 ± 0.2 mGy whiles that of chest was found to be 0.2 ± 0.1 mGy. These were found to be lower than results of studies carried out elsewhere. The results show an average effective dose of 0.036mSv, 0.084mSv and 0.006mSv for chest, abdomen and pelvis examinations respectively. The risk of radiation induced cancer as a result of entrance surface dose was found to be 5.68 x 10^-5 %, 1.58 x 10^-4 % and 1.49 x 10^-4 % for Chest, Abdomen and Pelvis examinations respectively. The third quartile values of the entrance surface dose were found to be lower than recommended national diagnostic reference levels.

Conclusions: This study shows that the doses to patient are within recommended national diagnostic reference levels. In addition, the risks of exposure induced death due to the three examinations (chest, abdomen, and pelvis) are generally low.

Key words: Radiation Dose, Cancer Risk, Digital X-ray, Patients
Our Experiences in Establishing of Institutional Diagnostic Reference Level for Computed Tomography

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Purpose: The aim of the study is to establish institutional diagnostic reference levels (DRLs) through summarizing doses collected across the five CT system in our institution.

Materials & Methods: CT dose data of 15940 patients was collected retrospectively from May 2015 to October 2015 in five institutional scanners. The mean, 75th percentile and 90th percentile of the dose spread were calculated and according to anatomic region. The common CT examinations such as head, chest, combined abdomen / pelvis (C/A/P), and combined chest/ abdomen / pelvis (C/A/P) were reported. Distribution of CT dose index (CTDIvol), dose-length product (DLP) and effective dose(ED) were reported for single-phase and multiphase examinations.

Results: The institutional diagnostic reference levels for our CT units were established as mean (50th percentile) of CTDIvol (mGy), DLP (mGy.cm) and ED (mSv) for single and multiphase studies using the dose tracking software. In single phase examination, Head : (49mGy), (978mGy.cm), (2.4 mSv) respectively; Chest : (6mGy), (254 mGy.cm), (1.9mSv) respectively; CT A/P (10mGy), (514 mGy.cm), (8.9mSv) respectively; CT C/A/P (10mGy), (674 mGycm), (11.8mSv) respectively. In multiphase studies: Head : (45mGy), (1822mGy.cm), (5.0mSv) respectively; Chest : (8mGy), (577 mGy.cm), (10.0mSv) respectively; CT A/P : (10 mGy), (1153 mGy.cm), (20.2mSv) respectively; CT C/A/P: (11mGy), (1090mGycm), (19.2mSv) respectively.

Conclusions: The regular review of the institutional DRLs at local and national level can provide a feedback loop that ensures a good practice for radiation safety for patients especially after changes in equipment and practice. DRLs are a useful tool for dose optimization, a coordinated effort between radiologists, technologists and medical physicist must be applied to achieve lowest possible radiation dose without affecting image quality and patient care.

Key words: Diagnostic reference level, CT dose index, Dose-length product, Effective dose

DAP Measurement and Dose Analysis of Computed Radiography and Digital Radiography Systems in Panoramic Equipment for Diagnosis

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Purpose: There has been a growing interest in radiation exposure affecting to patients as radiographic inspection for medical diagnosis has been developed and proceeded. The panoramic equipment which is the base of dental radiographic diagnosis area has been gradually changed from CR(Computed Radiography system) to DR(Digital Radiography system). We plan to measure the effective dose of CR and DR equipment and compare them using DAP(Dose Area Product)

Materials & Methods: We compared the effective dose according to 4 parameters which were set in the CR equipment of CRANEX+CEPH (Soredex Orion Corp., Helsinki, Finland) and the DR equipment of Ray scan@ (RAY Ind.Ltd.,Suwon,Korea), PaX-i3D Green(VaTech Co., Ltd, Hwasung, Korea), CRANEX@D (Soredex Orion Corp., Helsinki, Finland). Each effective dose from the measured values using DAP meter(VacuTec MesstechnikGmbH, Dresden, Germany) was calculated by conversion coefficients.

Results: The average effective dose measured by 4 parameters was 9.64 ~ 11.8 μSv from the CRANEX+CEPH of CR equipment, and the average effective dose from the Ray scan of DR equipment was 5.96 ~ 13.14 μSv. And last, the average effective dose of CRANEX@ D’s was 4.78 ~ 6.78 μSv, PaX-i3D Green’s was 5.07 ~ 8.45 μSv.

Conclusions: We compared and evaluated the effective dose from panoramic equipment of CR and DR using DAP. As a result, the effective doses from DR equipment except Ray scan@ which has much higher kV than other equipments were relatively lower than those of CR equipment. And in case of similar parameters, the ratio of effective dose shows different difference depending on scan time. The amount of use of dose is changed according to the will of the X-ray users and the parameter of equipment. Thus, we need to try to find and use relatively low dose to realize the valuable medical image in diagnostics.

Key words: Panoramic equipment ,DAP(Dose Area Product), Effective dose.
To evaluate mA distribution and effectiveness of the organ dose modulation (ODM) technique

The tube current (mA) in the different directions (A L P R) were : 35.52%, 25.93%, 12.20%,
P(17.10±12.08) and R(37.73±15.64). Tube current reduction rate in the direction L(42.68±15.48 vs 40.12±16.81) (p>0.05), which were greater than (p<0.01). There was no significant difference between A and

Conclusions : The survey showed that many hospitals did not immediately take action when the DRLs were introduced. Their implementation took form when support was offered to hospitals in the form of students helping out with dose measurements. The measurements themselves show that nearly all hospitals comply with the DRLs to a level that suggests that new DRLs could be set at much lower values.

Key words : Diagnostic Reference Levels

RD2-4

Can Adaptive Statistical Iterative Reconstruction Technique Improve Image Quality and Decrease Radiation Dose on Abdomen CT Scan Compared with Traditional FBP Algorithm
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Purpose : To investigate whether an adaptive statistical iterative reconstruction (ASIR) technique can improve the image quality and reduce radiation dose at 64-row multi-detector abdominal computed tomography (CT)

Materials & Methods : 90 consecutive patients underwent abdominal CT scan were enrolled. Patients were categorized into group A (n=45)and group B (n=45). Noise index (NI) based automatic exposure control (3D Auto mA) was adopted. For group A, NI was set as 7.5 and standard FBP was used to

Conclusions : Compared with standard FBP reconstruction, an ASIR algorithm improves image quality and has the potential to decrease radiation dose at different tube-current multi-detector abdominal CT scan

Key words : Iterative reconstruction, Radiation dose

RD2-5

Impact of An Additional Lateral Scout View on Radiation Dose in Computed Tomography Associated with Automatic Tube Current Modulation : Phantom and Patient Study
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Purpose : To investigate the impact of an additional lateral scout view on radiation exposure and image quality of computed tomography (CT) in combined with automated tube current modulation (ATCM).

Materials & Methods : In a phantom, two abdominal CT image series including anteroposterior (AP) and AP-lateral topogram combining with automated tube current modulation (Care Dose 4D) were scanned and compared, respectively. In 360 patients, including 180 patients with an AP radiographs and 180 with AP-lateral scout view, underwent thoracic CT examination combined with Care Dose 4D modulation. Applied effective milliampere second, volume CT dose index (CTDVol)

had not yet implemented the DRLs. The pilot study and its follow-up demonstrated that in nearly all cases compliance to the DRLs can be achieved. For some examinations 75-percentile values could be derived. These values suggest that when updating the DRLs, new values could be set at approximately half the current ones.

Conclusions : The survey showed that many hospitals did not immediately take action when the DRLs were introduced. Their implementation took form when support was offered to hospitals in the form of students helping out with dose measurements. The measurements themselves show that nearly all hospitals comply with the DRLs to a level that suggests that new DRLs could be set at much lower values.

Key words : Diagnostic Reference Levels

RD2-3

Study of mA Distribution and Effectiveness of a Recently used Organ Dose Modulation (ODM) Technique on Breasts during Chest CT
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Purpose : To evaluate mA distribution and effectiveness of a recently used organ dose modulation (ODM) technique on breasts during chest CT.

Materials & Methods : 36 female patients referred for routine clinical chest CT underwent plain and enhanced CT scan. The organ dose modulation (ODM) was ventrally located on breasts area in unenhanced series while the ODM area was off in the enhanced series. The tube current with different directions anterior(A) Left(L) posterior(P) right(R) of the mA table were recorded in before scan. Tube current reduction at the same direction and radiation dose between scans with ODM technique and without ODM were calculated. The results were compared with statistical analysis.

Results : The tube current (mA) in different directions (A L P R) of scans with ODM technique and without ODM were (78.41±35.15) vs (121.09±48.50) for Anterior; (11.66±46.74) vs (152.78±58.94) for Left; (103.90±39.86) vs (121.09±48.50) for Posterior and (115.05±49.63) vs (152.78±58.94) for Right. There were statistically difference for tube current distribution at all directions between scans with ODM and without ODM (p<0.01). There was no significant difference between A and P(17.10±12.08) and R(37.73±15.64). Tube current reduction rate at different directions (A L P R) were : 35.52%, 25.93%, 12.20%, and 24.62%. The tube current reduction rate in the direction A was the biggest, and there was no significant difference between direction L and R. There was statistical difference for ED (mSv) between scans with ODM (1.86±0.71) and without ODM (2.29±0.82), (p<0.001)

Conclusions : The organ dose modulation (ODM) technique could significantly reduce the tube current of breasts area and then reduce radiation dose during chest CT scan.

Clinical relevance: The organ dose modulation (ODM) technique could be performed to protect radiosensitive organs during CT scan.
and dose-length product (DLP) were recorded and analyzed, respectively. The image quality was assessed in 360 patients. Data were analyzed using independent-samples t test and linear correlation tests.

**Results:** The mean CTDIvol (phantom, 5.691±0.135 mGy; standard deviation), DLP (12.6.3±3.447), ED (0.085±0.020) were significantly lower in AP-lateral scout view group than those of AP group. The radiation dose on different off-center position was essentially flat when AP-lateral topogram was used for ATCM (CTDI 5.691±0.1347; DLP 12.6.25±3.447; ED 0.085±0.020). For image quality, SNR and CNR were decreased on an AP-lateral scout view (5.022±0.836 versus 6.036±1.547 and 15.999±2.939 versus 19.071±5.014, respectively; p<0.05). Noise and mean CT values were marginal lower in scans planned on an AP-lateral topogram, but all not statistically different between the two scans protocols (all p>0.05). Meanwhile the subjective image quality was rated as equal (3.51±0.506 versus 3.56±0.502, p>0.05). There was moderate correlation between CTDIvol and the patient's weight or BMI (r = 0.49, p<0.005).

**Conclusions:** Combined the routine AP topogram with an additional lateral scout view using automated tube current modulation (Care Dose 4D), radiation dose can be significantly reduce, while the image quality has not been significantly impacted.

**Key words:** Computed tomography, Radiation exposure, Image quality, Automated tube current modulation

**RD2-6**

**The Experimental Study of Using Bismuth Shielding in Head and Neck MDCT**

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**Purpose:** To explore the influence to image quality and the reduction of radiation dose to eye lens when using bismuth shielding in head and neck MDCT.

**Materials & Methods:** The standard water phantom was scanned using clinical scanning protocols of brain, temporal bone and paranasal sinuses in 16-MDCT, and the images were acquired with different bismuth shielding. Using 3 scanning protocols above, the cadaveric head was scanned with no different bismuth shielding material covered on both eyes and the organ dose to eye lens in each scanning was measured with thermoluminescence dosimeters (TLD). The surface with the thickness of 5mm, 10mm, 15mm and 20mm was placed between the shielding material and phantom separately and the radiation dose to eye lens was measured with sinus scanning conditions. The CT numbers of phantom with the distance of 2cm, 4cm, 6cm and 8cm to shield material were measured. The influence of bismuth on anatomic structures was subjectively evaluated by 2 explanation physician.

**Results:** The organ doses to the eye lens in the brain, the temporal bone and paranasal sinuses clinical CT were 24.31±0.696 mGy and 2.271±0.696 mGy, respectively; p<0.05) and DLP (phantom, 12.6.3±3.447 versus 21.4±40.366 mGy/cm, patients, 41.08±12.87 versus 84.82±27.33 mGy/cm, p<0.05) were significantly lower in AP-lateral scout view group than those of AP group. The radiation dose on different off-center position was essentially flat when AP-lateral topogram was used for ATCM (CTDI 5.691±0.1347; DLP 12.6.25±3.447; ED 0.085±0.020). For image quality, SNR and CNR were decreased on an AP-lateral scout view (5.022±0.836 versus 6.036±1.547 and 15.999±2.939 versus 19.071±5.014, respectively; p<0.05). Noise and mean CT values were marginal lower in scans planned on an AP-lateral topogram, but all not statistically different between the two scans protocols (all p>0.05). Meanwhile the subjective image quality was rated as equal (3.51±0.506 versus 3.56±0.502, p>0.05). There was moderate correlation between CTDIvol and the patient's weight or BMI (r = 0.49, p<0.005).

**Conclusions:** Combined the routine AP topogram with an additional lateral scout view using automated tube current modulation (Care Dose 4D), radiation dose can be significantly reduce, while the image quality has not been significantly impacted.

**Key words:** Computed tomography, Radiation exposure, Image quality, Automated tube current modulation

**RD3-1**

**Study for Considering of Currently used X-ray dose for L-spine AP, Lat Exam along BMI**

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**Purpose:** Considering of L-spine AP, Lat dose by comparing parameter currently used to effective dose according to patient BMI.

**Materials & Methods:** We collected 121 patients images of L-spine AP, Lat exam. We acquired patient's BMI from basic clinical data. We classified the images as BMI and BMI that L-spine Lat images are within effective EI. Images classified as BMI divided into 3 groups, Group 1 (17~20), Group 2, (21~23), Group 3 (24~31). Images classified as BMI of L-spine Lat images within effective EI are divided into 3 groups, Group 1(17~20), Group 2(21~23), Group 3(24~31). Effective dose of each group is acquired from DAP of dose management sysm. Based on effective dose, we analyzed changes of X-ray dose for L-spine AP, Lat exam as BMI.

**Results:** In groups classified as BMI, Group1, AP average dose was as higher as 141.9% than AP Group 2, AP average dose was 0.184mSv, 0.397mSv for Lat. Lat average dose was higher as much 115.3% than AP. Group 3, AP average dose was 0.369mSv, Lat was 0.371mSv. Lat average dose higher as much 0.4% than AP. Over 29 of BMI, AP dose was higher as much 30.7% than Lat. In other Groups, classified as BMI that Lat images are within effective EI, Group 1, AP average dose was 0.355mSv. Lat was 0.385mSv. Lat dose was as higher as 148.5% than AP. Group 2, AP average dose was 0.185mSv, Lat was 0.394mSv. Lat dose was higher as much 113.2%. In Group 3, AP average dose was 0.184mSv, Lat was 0.397mSv. Lat average dose higher as much 0.4% than AP. Over 29 of BMI, AP dose was as higher as 30.7% than Lat.

**Conclusions:** Clinical X-ray parameter setup for the obese patient taking L-spine AP, Lat exam should be considered.

**Key words:** Body Mass Index, Exposure Index, Effective dose

**RD3-2**

**Study on Organ Dose and Usefulness of Low Dose Protocol in Chest CT**

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**Purpose:** For patient radiation dose reduction and clinical application of optimal scan parameters, we evaluated and predicted unnecessary organ dose by kV alteration and scan range setting.
Materials & Methods: We grouped patients who underwent Chest CT in period between January 2015 and December 2016 into group A and B by scan parameters to measure and analyze DLPs and organ dose per part. 100 patients were sampled respectively from group A of 120 kV and group B of 100 kV. RADIMETRICS Enterprise Platform (version 2.6.1 ID (Interactive Dosimetry) were used to measure total DLP and organ doses of each group. In addition, group C is obtained by modifying scan range of group A and performing radiation dose simulation and we also measured its DLP value and organ doses. Finally, we performed independent T-test on the average value of total DLPs of group A-B and A-C.

Results: Average total DLP of group A-B was significant in 95% confidence interval (p<0.05). Also, average total DLP of group A-C was significant in 95% confidence interval (p<0.05).

Conclusions: By using low dose protocol with modified kV and optimized scan range for clinical application of optimal Chest CT scan parameters, we could achieve patient dose reduction. Besides, radiation dose simulation was useful to measuring and predicting doses in organs like thyroid, thymus, breast, eyeballs that are sensitive to radiation.

Key words: Interactive Dosimeter, Radiation dose simulation, Radiation dose reduction.

RD3-3
The Radiation Protection Practice of Bedside Radiography in China
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Purpose: Several experience HK radiographers have been serving in Shenzhen for three years. By our observation, the theory and practice of Radiation Safety in China are very different from Hong Kong and the counterparts of overseas. This study is trying to survey the Radiation Safety Practice in bedside radiography of the local radiographers.

Materials & Methods: A 17 questions anonymous online questionnaire was prepared. It queried some particular behaviors of the radiographers when proceeding bedside radiography in their previous working hospital, and it also asked their training history of Radiation Safety.

Results: 42 radiographers were invited, and 35 feedbacks were received. 94% of them have Radiation Safety training in their training institutes. However, about 50% did not have any further training or guidance of radiation protection in their working place. 37% of them were wearing the lead apron while doing the bedside. It is more than one-third would stay away from the machine around 8m to 15m. 23% is more than 15m. 71% must use any fixture to shield the body when making the exposure. 65% of them were not used to observe or look at the patient during the exposure. Surprisingly, 60% of their hospitals had installed the exposure delay device on their portable x-ray machine. Approximate 2/3 of the delay time was around 5s to 10s. 14% could be more than 10s. More than two third of them didn’t read or know the national guideline of Radiation Safety in China (GBZ130-2013).

Conclusions: The local radiographers practice was very different from their local official guideline and their overseas counterparts. The radiographers was overprotected but overlooked the patient safety and image quality of the examination. It was a minuscule scale survey. More systemic comparison research is recommended. In future, more evidence base research of medical radiation hazard should be encouraged in China.

Key words: Bedside Radiography, Radiation Safety, Exposure delay device, Guideline.
Purpose: In the field of examination carried out by using radiation, protector made of lead takes time to put on and take off. In emergency, the doctors or radiological technologists may not be able to wear it. However, the underwear type of protector makes it easy and comfortable to wear. The purpose of this research is to develop the underwear type of protector to confirm the shielding effect.

Materials & Methods: We used balium sulfate for protection materials because it can reduce the weight. And for clothes materials, we used cotton. It makes feel comfortable with skin, and easy to dye, available at low price. To put balium on the clothing, we used the method of ‘silk-screen’. Silk screen is to place the net which has countless fine hole on the clothes, then press against the balium on the net. We irradiated X-ray to the phantom, and measure the dose of scattered ray using a surveymeter which is protected with the clothes.

Results: We used the balium sulfate of the bigger size of grain, the amount of balium sulfate increased. And the dose of radiation decreased with increasing the amount of balium sulfate.

Conclusions: We found that the cloth with balium sulfate can reduce scattered radiation. It can be said to the one of the methods for developing an underwear type of protector.

Key words: Radiological protection, Underwear

RD3-6

Tungsten Functional Paper: Shielding Characteristics of a Novel Paper-Based Material for Clinical Use with X-Rays and Gamma Rays

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Purpose: Tungsten functional paper (TFP) is a novel paper-based radiation-shielding material, which is based on tungsten, is lead-free and is easy to cut. We described an evaluation of the shielding abilities of TFP.

Materials & Methods: We measured the transmission of radiation through TFP sheet that was generated with peak kilovoltages in the range 60-120 kVp, with a tube current of 200 mA, an exposure time of 40 ms, and with a large-area beam (i.e., poor geometry). The lead equivalence of the TFP was measured using a well-characterized x-ray source with a narrow beam for controlling X-ray systems, including dosimetry. A semiconductor detector enables the measurement of tube voltage, irradiation time, tube current, dose, the half-value layer, and total filtration thickness in a single measurement.

Results: A single TFP sheet was found to have a shielding ability of 65%, 53%, 48% and 46% for the x-rays of 60, 80, 100, and 120 kVp, respectively. The lead equivalent thickness of 10 sheets of TFP for 100 and 150 kVp were 0.48 ± 0.02 mmPb, and 0.51 ± 0.02 mmPb, respectively. Using a cesium-137 gamma ray source, the lead equivalent thicknesses of 7, 10, 20, and 30 sheets of TFP were estimated as 0.28, 0.43, 0.91, and 1.50 mmPb with the error of ±0.01 mm, respectively.

Conclusions: We described a novel lead free radiation-shielding material, TFP, and characterized the radiation shielding ability for the x-rays with energy range used in diagnostic imaging (i.e., 60-120 kVp). The lead equivalence of TFP is estimated using well-characterized x and gamma rays. The TFP exhibits excellent processability, with potential applications as a radiation-shielding material and has several benefits, including the fact that it is easy to process and can be easily cut using scissors, folded, or affixed to other materials. It is lead-free, so it can be used in applications that require a shielding material that makes contact with the skin; it is also suitable for use indoors and outdoors.

Key words: Tungsten function paper, Lead equivalent, Radiation protection, X-Ray, Gamma ray

RD3-7

Quality Control of X-ray systems Using a Semiconductor detector

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Purpose: The ionization chamber dosimeter is basically used for the measurement of exposure dose in X-ray diagnosis. However, the measurement methods and calculations involved are very complicated, and place a considerable burden on the system. Thus, semiconductor detectors have been increasingly used for controlling X-ray systems, including dosimetry. A semiconductor detector enables the measurement of tube voltage, irradiation time, tube current, dose, the half-value layer, and total filtration thickness in a single measurement.

Materials & Methods: In this study, we assessed the features of semiconductor detectors in general radiography systems and validated the efficacy of these detectors in controlling systems. For the semiconductor detector and multi-sensor, Accu-Gold (+) and AGMS-DM+ (Radocal Co.) were used. In order to facilitate the relative comparison of detectors, an ionization chamber dosimeter calibrated to the national standard in Japan and a semiconductor detector from a different manufacturer were used. For X-ray systems, a mammography system, a general radiography system, and an X-ray computerized tomography (CT) system were employed. A series of measurements were performed using a single semiconductor detector.

Results: The results of mutual comparison with an ionization chamber dosimeter showed adequate accuracy of the semiconductor detector used, over ranges from breast imaging to CT scans in detecting output dose. Moreover, the accuracy of the half-value layer and filter thickness were confirmed as well as accuracy of display conditions.

Conclusions: This study demonstrated that simple and accurate measurement was possible in a short time period with a single detector, and also that this method can be used with mammography systems, general radiography systems, and X-ray CT systems without placing a burden on the system. Therefore the efficacy of semiconductor detectors was proved in routine control and quality control of X-ray systems.

Key words: Diagnostic radiography, Radiation dose measurement, Semiconductor detector, Radiation safety management

RD3-8

Evaluation of the Iterative Reconstruction of CT Images using Model Observer

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Purpose: The ionization chamber dosimeter is basically used for the measurement of exposure dose in X-ray diagnosis. However, the measurement methods and calculations involved are very complicated, and place a considerable burden on the system. Thus, semiconductor detectors have been increasingly used for controlling X-ray systems, including dosimetry. A semiconductor detector enables the measurement of tube voltage, irradiation time, tube current, dose, the half-value layer, and total filtration thickness in a single measurement.

Materials & Methods: In this study, we assessed the features of semiconductor detectors in general radiography systems and validated the efficacy of these detectors in controlling systems. For the semiconductor detector and multi-sensor, Accu-Gold (+) and AGMS-DM+ (Radocal Co.) were used. In order to facilitate the relative comparison of detectors, an ionization chamber dosimeter calibrated to the national standard in Japan and a semiconductor detector from a different manufacturer were used. For X-ray systems, a mammography system, a general radiography system, and an X-ray computerized tomography (CT) system were employed. A series of measurements were performed using a single semiconductor detector.

Results: The results of mutual comparison with an ionization chamber dosimeter showed adequate accuracy of the semiconductor detector used, over ranges from breast imaging to CT scans in detecting output dose. Moreover, the accuracy of the half-value layer and filter thickness were confirmed as well as accuracy of display conditions.

Conclusions: This study demonstrated that simple and accurate measurement was possible in a short time period with a single detector, and also that this method can be used with mammography systems, general radiography systems, and X-ray CT systems without placing a burden on the system. Therefore the efficacy of semiconductor detectors was proved in routine control and quality control of X-ray systems.

Key words: Diagnostic radiography, Radiation dose measurement, Semiconductor detector, Radiation safety management
Purpose: For medical image evaluation, the ROC analysis using the AUC is appropriate method but needs the image observation experiments with a large number of observers. In this study, we focus on the Model observer which is simulation by the computer to characteristics of the observer, and evaluate the usefulness of the Model observer.

Materials & Methods: The images of the own phantom were obtained using SOMATOM Definition Flash (SIEMENS) with variable radiation doses. The signal was assumed a circular signal 10X10 Pixel of the Gaussian distribution, and changed the SD level while adding the noise, and the decision variables change and AUC change were simulated. The simulation was performed used 3 types of Channel filter.

Results: The AUC of the ROC and of the Model observer using Square Channel Template in Frequency Domain filter showed a similar trend. In this study, half radiation dose was necessary to similar signal detectability as compared with the IR method according to FBP method which is conventionally used.

Conclusions: In IR method, an index SD will be similar in the FBP method when reducing the radiation dose, but the nidus detection capability will be decreased. Therefore, to estimate the effect of the reducing the radiation dose, it is important to compare the nidus detectability of the FBP and the IR directly. For difficulty in human observation, the comparison has not been studied, but it becomes possible by using the Model observer. In this study, the result of the Model observer using Square Channel Template in Frequency Domain filter showed a tendency similar to the result of the human observer. The detailed examination about this factor will be necessary in future.

Key words: Model observer, Iterative Reconstruction, ROC, Square Channel Template in Frequency Domain filter

RD4-1

The Study on Usability of Assistance Devices for Visual Respiratory Method of CT Scan -Based on the Hearing-Impaired and The Elderly in Difficult Communication Status-

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Purpose: This study is to examine the usability of self-manufactured assistance devices to support for visual understanding of respiration, on the subjects of the hearing-impaired and the elderly in case of CT scan, for evaluating the performance ratio on proper respiration for the examination and satisfaction also measuring the exposure dose of a guardian in inspection room to help the accurate respiration of patients.

Materials & Methods: This research was done towards hearing-impaired and elderly: the groups of patients of 25 each who got their abdomen and chest CT on A, B devices, which provided the image of respiration on the gantry surface, and the groups of patients of 25 each without any prior information who got the CT on C, D devices, totaled in 100 as control group. On the same conditions, the groups of patients were also set for 100 people with the devices made in self-production for this experiment. The performance ratio on patient’s respiration and satisfaction were evaluated, and the human body model phantom was used to indirectly measure depth dose of sex gland and chest of a guardian.

Results: The performance ratio of patient’s respiration in control group is 38% in abdomen scan, 5% in chest scan. However, in experiment group, it both enhanced to 100%, and the satisfaction rate also enhanced from 2 in control group to 5 in experiment group, drawing out 60% increase. The average exposure dose of a guardian was 51.97±3.05 μGy for sex gland, 61.18±3.68 μGy for chest in control group. However, it both became 0 μGy in experiment group, drawing out 100% decrease, and it had significant difference in statistical manner (p<0.003).

Conclusions: The usability of assistance devices was confirmed by enhancing performance ratio and satisfaction in patient’s respiration. Also, it proved its utility that the exposure dose of a guardian was significantly reduced.

Key words: Hearing-impaired, Elderly, Self-manufactured assistance devices, Performance ratio on patient’s respiration, Exposure dose of a guardian

RD4-2

Comparison of Exposure Dose by Use of C-arm Al accessory

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Purpose: Due to increased dependence on C-arm, exposure dose of the operator also presents considerable problem. Therefore in this study, a research on reducing exposure dose of the operator was progressed by removing unnecessary X-ray and scattering rays.

Materials & Methods: C-arm(GE OEC 9900 Elite), doughnut-shaped aluminium with thickness of 2T of which inside is filled with powder type Barium and glass dosimeter (DoseAce G1FGD-1000) RANDO Phantom ART-200X were used and by placing phantom on operation table, C-arm center in over tube condition was positioned on abdomen of phantom. At ringer stand being distanced from the center by 50cm, glass dosimeter was positioned at 160cm that is average eyeball location of adult male, 140cm that is location of thyroid and 50cm that is location of gonad, respectively and result value was analyzed by performing a test for 5 times in the same way as above while irradiating, measuring 90kVp, 5mAs for 1 minute in the order of non-used accessory, doughnut-shaped aluminium with thickness of 2T that circled tube to be matched with its size, doughnut-shaped aluminium of which inside is filled with Barium.

Results: Non-used accessory was measured as 0.032mGy at eyeball position, 0.041mGy at thyroid position and 0.091mGy at gonad position. When covering Al, 0.027mGy at eyeball position, 0.031mGy at thyroid position and 0.083mGy at gonad position were measured respectively and this result showed that in eyeball, 15%, thyroid 20% and 8% in gonad were reduced. When filled Al cover inside with Barium, 0.025mGy, 0.030mGy and 0.081mGy were measured in eyeball, thyroid and gonad respectively and it showed that in eyeball, 21%, thyroid 25% and 10% in gonad were reduced.

Conclusions: By use of proper accessory, exposure dose of the operator could be reduced. In addition, consistent concern for reducing exposure dose shall be required through adequate distance, shortening of using time.

Key words: C-arm, Exposure dose

RD4-3

A Study on the Measurement of X-ray Scattering during Mobile CT Scans

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Purpose: To evaluate the scattering rays and leakage radiation during portable CT scans in an operating.

Materials & Methods: CereTom portable CT scanner from Neurologica, US and Ion Chamber (MOD: 10k-180, 10k-1800) of Radical Company, US were used for experiment equipment. Scattering rays were measured 20 times in 8 locations around the scanner at 1m-2m distance from the gantry isocenter, and leakage radiation was also measured the same number of times in 3 locations outside the operating room. In the operating room, the scattering rays with and without lead shield on the equipment were compared. Outside the operating room, leakage radiation with and without lead glass shield on the door was compared by dividing the experiment into adult (140kVp, 28mA) and child (120kVp, 10mA) conditions respectively. The scattering rays at each location and distance were analyzed using one-way ANOVA, and the scattering rays at each location and distance under the adult and child condition were analyzed by t-test.

Results: The scattering rays in each location were measured to be 162 ± 13 μR at minimum with shield and 1.37 mR maximum without shield. Among them, the left/right side of the scanner had the lowest measurement value and the front of scanner had the highest measurement value. The scattering rays decreased by 75% on average depending on each location/distance when the condition was changed from adult to child. The leakage radiation at door A, B, and C outside the operating room was 36.4 μR, 27.4 μR, and 12.9 μR on average respectively, and the value decreased by 90% on average when the door was shielded with the compared to when it was not (p < 0.001).

Conclusions: This experiment could figure out the influence of scattering rays depending on the location of scanner tube, and CT users and the staff of operating rooms must be aware of it to prevent radiation exposure.

Key words: Portable CT, Scattering ray, Leakage radiation

RD4-4
Reducing Radiation Dose for Infants with Developmental Dysplasia of the Hip through Application of 80kV and Adaptive Statistical Iterative Reconstruction Technique
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Purpose: To explore the feasibility of reducing radiation dose with 80kV combine with automatic tube current modulation (ATCM) and adaptive statistical iterative reconstruction (ASiR) techniques for infants with developmental dysplasia of the hip (DDH).

Materials & Methods: 15 infant patients diagnosed with DDH underwent both preoperative and postoperative CT examination of the hip. Preoperative CT examination (group A) used 100kV/180mA, postoperative hip CT examination (group B) used 80kV combined with ATCM (noise index=9) and 40%ASiR. Image noise and CT value of the femur head were measured. Signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) for femur head were calculated, according the formulas: SNR=CTfem/SD and CNR=(CTfem-CTmus)/SD. The volumetric CT dose index (CTDivol) was recorded. Subjective image quality was evaluated by two radiologists with the use of a 5-point scale. Paired student T-test and rank sum test were used for data comparison.

Results: The CTDIvol of group B got a nearly 50% reduction than that of group A (5.77±0.40 mGy vs 2.90±0.25 mGy, p < 0.005). Both CNR and SNR of two groups showed no significant difference (CNR, 4.45±0.82 vs 3.25±1.22, p > 0.05; SNR, 5.37±0.92 vs 4.08±1.30, p > 0.05). The image quality score of group B was higher than that of group A (4.08±1.30 vs 4.45±0.52, p < 0.005).

Conclusions: For infant patients with DDH, combined application of 80kV and 40%ASiR reduced nearly 50% radiation dose than 100kV/180mA, without compromising image quality.

Key words: radiation dose, infant, DDH, ASiR, image quality

RD4-5
Population Dose from Medical Radiation Applications in the Netherlands
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Purpose: All the European member states have to collect data on patient dose from medical diagnostic imaging. This information contributes to making conscious choices in medical practice, taking into account the risks and benefits of the use of radiation. The Netherlands collects this information on a yearly base to show the development in medical radiation exposure.

Materials & Methods: This study was held among all the Dutch hospitals and institutions that use medical radiation applications (N=131). Information about the amount of diagnostic imaging examinations was gathered with a yearly online questionnaire. The effective patient dose per examination was based on former national patient dose studies. The effective dose per caput was calculated by combining the amount of examinations with the dose per examination.

Results: In 2014, the mean effective dose per caput in the Netherlands due to medical diagnostic imaging was 1 mSv. This can be divided in four categories: CT examinations, radiology examinations, nuclear medicine and diagnostic imaging outside the hospital. The category that contributes the most is CT-examinations with 0.59 mSv. Among CT examinations, the largest contribution is of CT-Abdomen. Within radiology, angiography has the highest effective dose per caput, 0.11 mSv, due to the high dose per examination.

Conclusions: The mean radiation dose per caput due to medical radiation exposure in the Netherlands has increased per year from 0.52 mSv in 2002 to 1 mSv in 2014. The main cause of the increase in dose is the increasing numbers of CT examinations. However, a smaller increase is seen since 2010.

Key words: Radiation Dose, Medical Radiation Exposure, Diagnostic Imaging

RD4-6
Ambient Ionizing Radiation Assessment and Its Public Health Implications at a Diagnostic Radiology Department in Nigeria
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Purpose: To assess the level of the background ionizing radiation at the radio-diagnostic department of the University of Maiduguri Teaching hospital Nigeria and evaluate its likely adverse public health implications.

Materials & Methods: A calibrated pocket sized RadEye G-10 Thermo scientific Gamma and X-radiation survey meter was used to measure the indoor and outdoor ambient ionizing radiation profile of the study location. The readings were taken thrice at each various locations within and 20 meters radius outside the walls of the radiology department. The indoor measurements were taken pre (all x-ray machines switched off) and post exposure at the same locations. The post exposure readings were taken within 10 seconds of the termination of an exposure of 70Kv, 10mAs. The meter was pointed 6cm from the wall, and one meter above ground for consistency. The mean values taken in microSievert per hour were converted to mSv/Sievert per year. The readings were analyzed using SPSS software version 16.0 (SPSS Inc. Chicago USA) with statistical significance of p<0.05. The occupancy factor for calculation was 0.8 and 0.2 for indoor and outdoor locations respectively recommended by UNSCEAR 2000.

Results: The mean outdoor background (MOB) radiation was 0.07±0.001 mSv/year. The mean indoor background (MIB) reading was 0.36±0.001 mSv/year. The mean indoor post exposure (MPIE) reading was 0.49±0.001 mSv/year. The difference between the MIB and the MOB reading was 0.29±0.001 mSv/year. The MIB values were consistently about five times the MOB values.

Conclusions: These results were below the 1 mSv/year recommended by ICRP and UNSCEAR as safe limits to the general public. However, in line with the Linear-no-Threshold hypothesis, since the ionizing radiation from building materials include radium, gamma radiation, radon gas which emit alpha particles, chronic inhalation and exposure to these, even at low level, might cause significant stochastic effects on staffs who spend their reproductive years exposed to this background radiation in the confines of this department.

Key words: Ambient Ionizing Radiation, Radon gas, Indoor Radon, Linear-no-threshold hypothesis

RD5-1

Implementation of Dose Calculation Programming Interface Using LabVIEW

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Purpose: Dose given to the patient is very diverse in accordance with the technical methods of radiography, the degree of aging equipment and shooting conditions. We establish the dose calculation software by LabVIEW (Laboratory Virtual Instrument Engineering Workbench) in order to predict and protect the radiation dose the patient.

Materials & Methods: All published calculation methods for Entrance Surface Dose (ESD) was conducted. Modeling of different parameters necessary for different ESD calculation methods was compared and evaluated. We establish a monitoring program by GUI (Graphic User Interface) LabVIEW version 2013, based on the ESD calculation method using the output of the measuring device in the air.

Results: We were able to build effective dose values for each organ and ESD in LabVIEW and presented the ESD, the effective dose, imaging and diagnostic reference levels on the front panel. As well as presenting the imaging according to the recording conditions, the measurement results were to provide convenience to the user stored in an Excel file.

Conclusions: LabVIEW is an easy to use application development environment designed specifically with the needs of radiologists and provides good readability and reduced ESD calculation methods time. If it used as a reference level of exposure to radiation survey, it will be able to present the dose reduction method for the radiography. It will be presented against the state and national exposure guideline levels of future international standards.

Key words: LabVIEW, Entrance Surface Dose, Effective Dose, Reference level, Reduction

RD5-2

Estimation of Radiation Risk Induced by Chest and Abdomen CT Screening for Korean Population

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Purpose: To estimate radiation risks induced by chest/abdomen CT screening then investigate the cancer risk level of South Korean population compared to other countries.

Materials & Methods: We used ImPACT CT Patient Dosimetry Calculator to compute organ effective dose induced by CT screening [chest CT, low dose chest CT, abdomen/pelvis CT, and chest/abdomen/pelvis CT]. The risk model was applied against the state and national exposure guideline levels of future international standards.

Results: We were able to build effective dose values for each organ and ESD in LabVIEW and presented the ESD, the effective dose, imaging and diagnostic reference levels on the front panel. As well as presenting the imaging according to the recording conditions, the measurement results were to provide convenience to the user stored in an Excel file.

Conclusions: There are no the dramatic differences among countries chosen in this study. As a bigger problem, the risk is relative to the frequent use of CT screening. The frequency of CT screening could increase as commercial purposes in Korea.

Key words: CT screening, LAR, Radiation risk
RD5-3

Study on Incident Dose as Change at Temperature of X-ray Tube in Diagnostic X-ray Machine

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Purpose : To compare incident dose and image quality as change at temperature of X-ray tube in Diagnostic X-ray machine.

Materials & Methods : Temperature of diagnostic X-ray tube (Philips) was hourly measured twice using high temperature infrared thermometer (HT-6881) in anode and cathode. Cumulative examination cases and Scatter dose was obtained correlation coefficient. Incident dose was measured as change at temperature of X-ray tube under exposed conditions in Chest (125kV, 5mAs) and Abdomen (72kV, 25mAs). Image obtained by the phantom (FRUKE Model 76-2 series) was compared SNR, PSNR.

Results : Temperature of diagnostic X-ray tube was not significantly Average 35~35.4°C in anode and cathode (p=0.094). It was rapidly increasing below 38.8°C and was slowly declined above (ROC area: 0.994, Cut-off value: 38.8). And Scatter dose was significantly higher 0.2mR on 40°C above than below. Scatter dose was strongly correlated cumulative examination cases (p=0.855). Incident dose was significantly differed 5mR and 12mR under exposed conditions in chest and abdomen (p<0.050), but SNR and PSNR was not image quality (p=0.050).

Conclusions : Incident dose was differed as change at temperature of X-ray tube but image Quality was not. To change exposed condition as change at temperature of diagnostic X-ray tube by time. Then the patient dose were declined.

Key words : Diagnostic X-ray tube, Hit, Incident dose

RD5-4

Comparison of Bolus Tracking and Split Injection in Dynamic Abdominal Computed Tomography: Effect on the Patient Exposure Dose and Image Quality

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Purpose : To compare a multi-phase test using bolus tracking and a single-phase test employing the split injection technique in dynamic abdominal computed tomography (CT), to study the influence on exposure dosage and image quality.

Materials & Methods : Among patients who underwent dynamic abdominal CT from October to December 2015, patients examined with either bolus tracking (technique A) or split injection (technique B) were included in this study. A CT system and an analysis workstation were used. Technique A involved one contrast medium (CM) injection. Scanning was conducted twice in the arterial phase and portal venous phase. CM injection in technique B comprised two phases: phase 1 and 2. However, scanning was performed once at 90s manually. The exposure dose was compared between the two tests using the DLP value. The images were quantitatively evaluated by measuring the CT number at the location of the aorta, portal vein, and liver parenchyma. Two radiologists qualitatively analyzed the images obtained using techniques A and B on 5-point scale method.

Results : The average DLP value was 1123.8 mGy*cm in technique A and 536.5 mGy*cm in technique B. The aorta CT number of technique A and B were achieving 100% of standard value. The portal vein CT number of technique A and B were achieving 96% of the standard value. The liver parenchyma CT number of technique A and B were fulfilling 100% of the standard value. Qualitative evaluation revealed an average of 4.5 for technique A and 4.3 for technique B in the arterial phase; 4.2 and 4.5, respectively, in the portal phase image; and 4.3 and 4.2, respectively, in the interpretation category.

Conclusions : Compared to technique A, which is used currently in dynamic abdominal imaging, technique B that injects contrast medium at regular intervals can reduce the exposure dose by 47% without downgrading image quality.

Key words : CT, Abdomen, DLP, Split injection, Bolus Tracking

RD5-5

Considering Organ Dose with Difference of Image Acquisition Methods by Using OSL Dosimeter in Image Pasting Examination

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Purpose : This study is to consider organ radiation dosage by comparing the tube angulated method and the tube fixed method for imaging pasting exam using an OSL Dosimeter.

Materials & Methods : Experiment equipment was used on an adult male phantom in ATOM Dosimetry Verification Phantoms Model 701-D & 701-G of CIIRS, which is possible to measure whole body and organ radiation (exposure) dose. The Average dose value of patients who were examined for whole spine AP in the Severance Hospital from January, 2016 to March, 2016 was 47.5mAs according to Does Track. Referring to the result, mAs range was given exposure to changes in 50mAs, 80mAs, 100mAs and any other exposure condition was fixed with tube voltage-85kVp, SID-180cm, and image length-81cm. The Whole body was divided into top, middle, and bottom. The Top is thyroid and C-spine, the middle is heart and lungs, and the Bottom is gall bladder and kidneys. Additionally, those were divided to anterior, including thyroid, heart, and gall bladder, and posterior, including c-spine, lung, and kidneys. The OSL Dosimeter was set for each organ and exposure to the conditions above. Background radiation was excluded from the measured organ dose. The Average value for each organ group was found by repeating this process five times.

Results : In 50mAs, the fixed method average was measured top:3.47mGy, middle:2.35mGy, bottom:4.29mGy, anterior:8.16mGy and posterior:1.95mGy, total of 10.11mGy and the angulated method average was measured top:1.42mGy, middle:0.95mGy, bottom:2.62mGy, anterior:4.12mGy and posterior:0.87mGy, total of 4.99mGy. The Measured value of organ dose in the fixed method was higher in every group of 80mAs and 100mAs. The Organ dose in the fixed method was measured 48.33% higher on average.
Conclusions: Using the Tube fixed method with a movable detector cause more exposure to organs. Therefore, it is considered that additional protection is needed to reduce patient dose.
Key words: Image pasting, Organ dose, OSL dosimeter

RD5-6
Application of 80kV Combined with Adaptive Statistical Iterative Reconstruction Technique in Low Dose Lumber CT Examination
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Purpose: To assess radiation dose reduction and image quality for lumbar CT examination with 80kV combined with adaptive statistical iterative reconstruction (ASiR) technique, compared to a standard 120 kV protocol.
Materials & Methods: 60 patients who underwent lumbar CT scan were randomly separated into two groups: conventional 120 kV group with tube current of 230mA (n=30) and 80kV low dose group with tube current of 230mA (n=30). 80kV group was reconstructed with FBP and 40%ASiR. Image noise and CT value of the L3 vertebral body center level and erector spinae were measured. Signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) for vertebral body were calculated, according the formulas: SNR=CTver/SD and CNR=(CTver-CTmus)/SD. The volumetric CT dose index (CTDIvol) was recorded for each group. Subjective image quality was evaluated by two radiologists with a 5-point scale.
Results: Compared with the conventional 120 kV protocol, 80kV allowed for an overall average decrease of 72% in CTDIvol (15.75±0.08 mGy vs 4.40±0.49 mGy, p<0.05). The CNR and SNR showed statistical difference between 120kV group, 80kV+FBP group and 80kV+ASiR group (CNR, 1.83±0.58 vs 1.28±0.37 vs 2.04±0.84; SNR, 2.57±0.58 vs 2.01±0.46 vs 2.86±0.90, both p<0.05), respectively. The image quality was rated higher in 80kV+ASiR group than other groups (3.57±0.85 vs 3.07±0.83 vs 4.14±0.66, p<0.05).
Conclusions: 80kV combination with 40%ASiR reduced radiation dose nearly by 72% than standard 120 kV protocol and provide better image quality in lumbar CT examination.
Key words: Radiation dose, Image quality, CT, ASiR

RD5-7
Correlation of Waist Circumference, Hip Circumference, Body Mass Index and CT Radiation Dose in Chinese Patients Suspected of Having Lumbar Disk Herniation
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Purpose: To determine which variables of the waist circumference (WC), hip circumference (HC) and body mass index (BMI) being of particular relevance to CT radiation dose from lumbar spine disks.
Materials & Methods: 71 patients (18<BMI<25, n=31; BMI≥25, n=40) suspected of having lumbar disk herniation, underwent spine disk sequence scan with 128-slice CT. Three variables were measured and recorded by the same technologist. CT dose-length product (DLP) of every lumbar disk was recorded from the dose report card automatically generated after scanning. Statistics were performed by using Pearson correlation analysis between variables and DLP. P<0.01 showed the correlation was significant difference.
Results: A positive correlation (0<r<1) between WC, HC and BMI and the radiation dose (DLP) was described in different lumbar disks (P=0.000<0.001 for all). For males (n=33), the correlation was significantly stronger with WC in assessing the radiation dose of all lumbar disks than HC and BMI. For females (n=38), HC (r=0.810, 0.842; p<0.000) in assessing the radiation dose of L4-5 and L5-S1, showed significantly stronger than WC (r = 0.761, 0.790; p=0.000) and BMI (r=0.771, 0.778, p<0.000). Additionally, WC showed assessing the radiation doses of L1-2 and L2-3 showed the stronger trend (r=0.870, 0.881; p<0.000).
Conclusions: Local position size should be considered, including WC and HC, when assess the radiation dose of individual. Furthermore, WC and HC with BMI are suitable accurate methods to evaluate radiation dose, respectively.
Key words: Computed tomography, Radiation dose, Waist circumference, Hip circumference, Body mass index
at some part of nuclear power plant is that radioactive waste was sent to disposal facility which was just constructed in Kyungu in sep, 2015.

Key words : Nuclear power plants, Environmental radioactivity, Low and middle level radioactive waste

RD6-1

Study for Comparing Patient Dose as BMI to Recommended Dose by DRL in Abdomen X-ray Examination

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Purpose : This study is to compare patient dose as BMI to dose from Diagnostic Reference Level(DRL) in abdomen X-ray examination.

Materials & Methods : We collected 250 patients, over 20 years old, taking abdomen X-ray examination with AEC mode, from January to March in 2016. We divided patients information into 4 Group, Under weight(BMI<18.5), Healthy weight(BMI<24.9), overweight(BMI<29.9) and obese(BMI<34.9). Besides, we classified BMI of the each group with gender and acquired average, maximum and minimum value, standard deviation and 3 quartile value of ESD, DAP, effective dose and mAs from dose management system to compare patient dose to recommended dose (ESD:2.77mSv, DAP:1975.9mGycm², ED:0.77mSv, mAs:58) and maximum value(ESD:4.45mGy, DAP:4184mGycm², ED:1.09mSv, mAs:88) of female group were higher than DRL. In groups divided as gender with the same BMI, average dose of male group(ESD:0.86~1.93mGy, DAP:2780.7~1781.2mGycm², ED:0.74mSv, mAs:49) of overweight(BMI<29.9) and Maximum value(ESD:2.5mGy, DAP:1844mGycm², ED:1.09mSv, mAs:88) of obese(BMI<34.9) and 3 quartile value(E3D:3.13mGy, DAP:2851mGycm², ED:0.74mSv, mAs:51) of obese(BMI<34.9) were higher than DRL. In groups divided as gender with the same BMI, average dose of male group(E3D:0.86~1.93mGy, DAP:2780.7~1781.2mGycm², ED:0.74mSv, mAs:49) and females group(E3D:0.76~2.26mGy, DAP:694.11~2044.3mGycm², ED:0.18~0.53mSv, mAs:9~33) were within DRL except average dose of male group(E3D:2.94mGy, DAP:2729.3mGycm², ED:0.7mSv, mAs:51) in obese(BMI<34.5). Maximum value(E3D:3.3mGy, DAP:2858.8mGycm², ED:0.74mSv, mAs:49) of overweight(BMI<29.9) male group, 3 quartile value(E3D:3.3mGy, DAP:2975.9mGycm², ED:0.77mSv, mAs:38) and maximum value(E3D:4.45mGy, DAP:4184mGycm², ED:1.09mSv, mAs:88) of obese(BMI<34.9) male group and Maximum value(E3D:3.96mGy, DAP:3489.8mGycm², ED:0.9mSv, mAs:52) of female group were higher than DRL.

Conclusions : As BMI increases, ESD, DAP, effective dose and mAs are getting higher. Used dose for abdomen X-ray examination from most of patients satisfied by DRL.

Key words : AEC mode, Abdomen X-ray, BMI, DRL, Dose

RD6-2

Estimated Exposure Dose and Usage of the Computed Tomography by the Patients in the Emergency Care Center

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Purpose : According to the announcement made by the Ministry of Food and Drug Safety, the number of the diagnostic medical radiation inspections which Korean people receive annually increased from 160 million to 220 million (2007~2011). Also, the annual exposure dose for each person increased from 0.93 mSv to 1.4 mSv (2007~2011) in terms of the exposure dose of 1.4 mSv for each person in 2011, the CT inspection took 56% with 0.79 mSv. Therefore, it is required to the dose properly. This study focuses on the estimation of the amount of using the CT inspection by the patients in the emergency care center and the exposure dose.

Materials & Methods : With the PACS data of a general hospital in Daegjeon Metropolitan City between January 1st and December 31st, 2015, the CTDIvol of the patient information from the patients in the emergency care center and the DLP values were used to calculate the effective dose. For the calculation of the effective dose, the CT-Expo version 1.0 was used.

Results : The exposure dose from the CT inspection for each patient in the emergency care center in 2015 was 3.2 mSv while the numbers of the inspections taken were 2,907(40.7%) for the head and neck, 2,100(29.4%) for the abdomen, 908(12.7%) for the chest, 451(6.3%). The collective dose for each inspection showed 37,536(57.2%) man-Sv for the abdomen, 19,701(30%) man-Sv for the chest, 4,877(7.5%) man-Sv for the head and neck.

Conclusions : The annual exposure dose from the CT inspection for each patient in the emergency care center is about the level of the natural radiation in Korea. However, since the exposure doses for the chest and the abdomen take 87%, it is required for the medical doctors who decide the justification of the CT inspection and the diagnostic radiographers who carry out the optimization process to continuously try to reduce the exposure dose.

Key words : Justification, Diagnostic CT inspection, Exposure dose

RD6-3

Suggestion of Effective-DAP from Digital Image Files

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Purpose : This study proposes introduces the concept and calculation of Effective-DAP to correct errors in existing DAP measurements. Existing DAP measurements is calculated by product of DAP and Effective-DAP ratio. Effective-DAP is calculated by product of ‘DAP’ and ‘Effective-DAP ratio’. Effective-DAP shows a higher value than correct patient received. So, we get exact patient body area. And calculate Effective-DAP process to continuously try to reduce the exposure dose.

Materials & Methods : Using the Image J, National Institute of Health, USA> make images binary by adjusting triangle algorithm on threshold. Then measure percentage of patient body area. We analyze 176 images. The 11 images per each study. Then calculate average of percentage at each study. We call this value Effective-DAP Ratio. Effective-DAP is calculated by product of ‘DAP’ and ‘Effective-DAP ratio’. Effective-DAP is calculated by product of ‘DAP’ and ‘Effective-DAP ratio’. Effective-DAP is calculated by product of ‘DAP’ and ‘Effective-DAP ratio’.

Results : In this study, Effective-DAP ratio scale goes from 0.3712 to 0.8659. It means DAP includes more dose unnecessarily,
Purpose: This study was conducted to determine the appropriateness of systemic radiation exposure control for students in clinical practice by comparing radiation exposure in radiography employees at different stations of a hospital with that of students conducting clinical practice using identical stations.

Materials & Methods: Overall, 121 students who conducted clinical practice in the department of radiology area of C university hospital from July 2014 to August 2014 and 62 workers working in the same medical facility (47 in the department of radiology, 8 in the department of radiation oncology, 7 in the department of nuclear medicine) were investigated. The radiation exposure experienced by students was measured for 8 weeks, which is the duration of the clinical practice. Additionally, radiation exposure of workers were classified into 4 groups, department of radiology, department of radiation oncology, and department of nuclear medicine was compared. Dose was measured with OSI and differences among groups were identified by ANOVA followed by Duncan’s multiple range test.

Results: Among employees, those in the department of radiology, oncology and nuclear medicine were exposed depth doses of 0.127±0.331 mSv, 0.01±0.003 mSv, and 0.431±0.205 mSv, respectively, while students were exposed to 0.143±0.136 mSv. Additionally, workers in the department of radiology, oncology and nuclear medicine were exposed to surface doses of 0.131±0.331 mSv, 0.009±0.003 mSv, and 0.445±0.198 mSv, respectively, while students were exposed to 0.151±0.14 mSv, which was significantly different in both doses (p<0.01).

Conclusions: The average dose that students received is higher than that of the other groups (except for nuclear medicine workers), indicating that further improvements must be made in systemic controls for individual radiation exposure by including the students as subjects of management for protection from radiation.

Key words: Clinical practice, Depth dose, OSI, Radiation workers, Those with frequent exposure to radiation
RD6-7
Evaluating Effective Doses of Different Weight PMMA Phantoms using TLD Undergoing Brain Computed Tomography Examination
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Purpose: A reliable equation is necessary to evaluate effective dose (E) and different weight patients for diagnosing head trauma undergoing brain computed tomography (CT) examination.

Materials & Methods: Polymethylmethacrylate (PMMA) phantoms ranging from 10 to 70 kg derived from ICRU 48 were used to evaluate E herein. All scans were conducted by Philips computer tomography (Brilliance CT) at Lukang Christian Hospital with fixed exposure conditions. Equivalent doses were measured in the organs and tissues of interest via thermoluminescent dosimeter (TLD) approach and recommended by ICRP 103.

Results: Equivalent doses of Brain for 10, 30, and 70 kg PMMA were 46.6±1.83, 48.3±0.47, and 54.2±0.06 mSv. E of these phantoms ranged from 1.90±0.04 to 2.21±0.03 mSv during CT examinations, respectively.

Conclusions: For brain CT examinations, the E of 70 kg phantom is approximately 1.35 to 1.57 times than those of others. E of 70 kg was the highest than the others. Finally, the phantom is approximately 1.35 to 1.57 times than those of 10 kg PMMA phantoms ranging from 10 to 70 kg derived from ICRU 48.

Key words: Effective dose (E), Brain CT examination, TLD, PMMA phantoms, ICRP 103

RD7-1
The research about the dose reduction for C-arm user: Evaluation of usefulness for reduction equipment and image quality
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Purpose: The C-arm is very important radiation equipment for medical procedure and examination. The number of Usage of C-arm is increasing consistently, thus exposure dose of C-arm user is increasing. So we check the exposure dose about changing distance and height of user, when we use the reduction equipment of Exposure dose, and we evaluate the usefulness for safety of using C-arm.

Materials & Methods: It is installed to position, such as using the C-arm in used by the operating room. And to measure the dose without covering and cover the area except for the area to X-ray exposure shield to measure the dose. Before and after mounting the proceeds divided dose reduction equipment. Given the differential filter in the thickness of additional measuring dose, and the irradiation time is equally applicable to one minute. Place the acrylic phantom that thickness is 20 cm on the table. Measure the dose using ion-chamber and evaluate the image using CDRH phantom.

Results: Had become each condition a change of the dose according to a result of the distance the experiment most pronounced in (50 cm: 0.02 mGy, 150cm: 0.003 mGy) and change in dose when the tube protected by leads apron, that had the result (non-protection: 0.02 mGy, protection: 0.16 mGy) it appeared prominently. After mounting the reduction equipment that appear the result (non-mount: 0.019 mGy, mounted: 0.019 mGy), it had reduced little. When the filter is used to change the dose there was little change when the dose to increase the thickness of the filter. However, differences in a low height showed higher than high altitude, but high altitude was lower than high altitude at increasing distance. We couldn’t
find the any change of image quality from CDRH images.

Conclusions : When we use the C-arm, we need to make the reducing the dose for using equipment. It is the one of method, but it is not perfectly decision. What is the effective reduction, at first the user makes the distance from C-arm tube, when the user performs the medical procedure, 2nd exposure time is reduced as possible, last the user should mount the equipment.

Key words : C-arm, Reduction Dose, Radiation safety

RD7-2

A Study of Effective Dose Comparison between Chest Tomosynthesis and Chest CT

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Purpose : In plain chest x-ray exam for respiratory system diseases, additional Chest CT has been improving for accurate diagnosis. Tomosynthesis technique was adopted to check the lesion of the overlapped parts anatomically. In this study, it was to compare the exposure dose of Chest Tomosynthesis, Low dose chest CT noncontrast and Chest HR study CT noncontrast for patients.

Materials & Methods : Adult chest phantom was used. Chest Tomosynthesis (Test A) was performed with Discovery XR656 Plus (GE Healthcare, USA). Low dose chest CT noncontrast (Test B) and Chest HR study CT noncontrast (Test C) were performed with Revolution CT (GE Healthcare, USA). According to following conditions Test A: SID 180cm, 120kVp, 0.32mAs, FOV 41cm x 41cm, Sweep angle 30°, Continuous shooting 60 times. Test B: 120kVp, 50mA, Scan range 360mm. Test C: 120kVp, 50mA, Scan range 360mm, exposure dose was measured. Tests were performed for 5 times in same conditions. Through the test, DAP (Dose Area Product) and DLP (Dose Length Product) were acquired.

Results : Test A: Average DAP was 10.20dGycm², Test B: Average DLP was 70.21mGycm, Test C: Average DLP was 154.90mGycm. Effective dose from DAP and DLP on above were Test A: 0.10200mSv, Test B: 0.98294mSv and Test C: 2.16860mSv. Results : The optimal relation of CNR and patient dose was 1000%.

Conclusions : It was able to confirm that CT scanner’s result was under a constant MAD, the effective dose of chest tomosynthesis was 134-137Cs Radioactivity Density and Effective Dose(131I) Analysis of Compton Suppression System

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Purpose : Through removing the natural radioactivity originating from the ground that exists in nature and chemical preprocessing(AMP), separate and extract only 134-137Cs isotope for reducing the radioactivity density as possible. So based on the results, compare the annual effective dose limit for residents who live around nuclear power plants.

Materials & Methods : Carried out a CT scanner to know the structure of the detector and compared with the characteristics of the detector. In addition, compared the efficiency and uncertainty by the computer simulation(PENelope) was using the characteristics of the detector. By using a HPGe detector, to compare and evaluate the 134-137Cs density according to preprocessing methods, after drying sample which collected at nuclear power plants sites around, used to direct measure and co-precipitation method that need a chemical preprocessing(AMP). In addition, Compton suppression system was used to compare the reduction radioactivity density in preprocessing.

Results : It was able to confirm that CT scanner’s result was within 2.5%~3.04% by experimental data and Penelope calculations.134Cs radioactivity density was <0.521~0.945 Bq/kg in direct measure, <0.501~0.773 in AMP, <0.277~0.582 in...
A randomised controlled trial of scatter removal in paediatric interventional cardiology (PIC)

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Purpose: Interventional cardiology procedures have been reported to contribute to the highest doses of radiation to patients from medical examinations. Wide variation in practice exists.

Materials & Methods: A randomised controlled trial was performed on 70 paediatric patients ≤ 16 years of age undergoing PIC in a specialised cardiology department. Patients were randomly allocated to one of 3 different protocols (i) the imaging protocol currently used which entails the use of the anti-scatter grid (ii) removal of the anti-scatter grid (iii) no anti-scatter grid and the introduction of a 15cm air gap. Blood samples were taken from each patient pre and post examination and irradiation. The different variations in clinical practice and the subsequent effects on image quality and radiation dose were investigated. The effect of radiation dose on associated DNA damage in the form of double-strand breaks (DSBs) was also investigated by quantifying γH2AX-foci as a biomarker of radiation-induced effect.

Key words: DNA, Apoptosis, Lethal Dose, Exposure, Necrosis

The aim of this presentation is to show the effects of ionizing radiation on different individuals which can cause severe damages to them.

Materials & Methods: In this presentation, three important factors were discussed to show the biological effects of ionizing radiation which were, Subject matter such as radiobiology, the mechanisms of different types of biological effects following exposure to ionizing radiation & the types of models used to derive risk coefficients for estimating the detriment. Furthermore, this presentation showed that there are three radiation health effects which are cell death, cell transformation and the effect that contains both. Moreover, there are Factors affecting radio sensitivity for instance, high RS which can affect the bone marrow, medium RS which can affect the skin and low RS which can affect the muscles. In addition, Dose-effect response curve which showed that the wrong dosage can cause severe damages to different organs such as eyes and skin. The whole body response can acute radiation syndrome which can lead to the effects of antenatal exposure and to the effects of the radiation which would be delayed. In addition, epidemiology showed that irradiated populations can be studied by cohorts and case control.

Results: This information is scanty on consequences of low doses delivered at low dose rates, the presence and influence of confounding factors and modifying influence of cancer background incidence. Populations were studied for specific cancers which showed individuals who suffered from leukemia, lung cancer, breast cancer, thyroid cancer, liver cancer & Osteosarcoma.

Conclusions: This presentation concluded that the effects of ionizing radiation deterministic and stochastic, immediate or delayed, somatic or genetic. However, some tissues are highly radiosensitive and each tissue has its own risk factor were the risk from exposure may be assessed through such factors.
10. RADIATION THERAPY

RT1-1

The Study of Thermal Change by Chemoport in Radiofrequency Hyperthermia

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Purpose: This study evaluate the thermal changes caused by use of the chemoport for drug administration and blood sampling during radiofrequency hyperthermia.

Materials & Methods: 20 cm size of the electrode radio frequency hyperthermia (EHY-2000, Oncotherm Kft, Hungary) was used. The materials of the chemoport in our hospital from currently being used therapy are plastics, metal-containing epoxy and titanium that were made of the diameter 20 cm, height 20 cm insertion of the self-made cylindrical Agar phantom to measure the temperature. Thermostope(TM-100, Oncotherm Kft, Hungary) and Sim4Life (Ver2.0, Zurich, Switzerland) was compared to the actual measured temperature. The two positions of the electrode measurement were uniformly situated by the center axis and side 1.5 cm, and 0 cm (surface), 0.5 cm, 1.8 cm, 2.8 cm in depth was measured, respectively. The measured temperature is 24.5 ~ 25.5 °C, humidity is 30% ~ 32%. In five-minute intervals to measure the output power of 100W, 60 min.

Results: In the electrode central axis 2.8 cm depth, the maximum temperature of the case with the unused of the chemoport, plastic, epoxy and titanium were respectively 39.51 °C, 39.11 °C, 38.81 °C, 40.64 °C, simulated experimental data were 42.20 °C, 41.05 °C, 40.70 °C, 42.50 °C. And in the central axis electrode side 1.5 cm depth 2.8 cm, mesured data were 39.37 °C, 39.32 °C, 39.20 °C, 39.46 °C, the simulated experimental data were 42.00 °C, 41.80 °C, 41.20 °C, 42.30 °C.

Conclusions: When it comes to the thermal variations, the temperature of materials with non-conductive plastic and epoxy material showed lower than the reference not using the chemoport. This is due to metal contents, the geometry and a low radio frequency bandwidth. This study proved that there’s a little change in temperatures, which is not considered as hazard.

Key words: Radiofrequency, Chemoport, Thermal change, Sim4Life.

RT1-2

Patient Safety Perceptions among U.S. Radiation Therapist

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Purpose: The purpose of this study was to determine the values, beliefs, and norms of radiation therapist in the United States regarding patient safety in their institutions.

Materials & Methods: A survey on patient safety culture was administered electronically to a random sample of 2000 radiation therapist certified by the American Registry of Radiologic Technology.

Results: Participants agreed that supervisor/management promotion of safety, teamwork within units, and adequate staffing contributed to a positive patient safety culture in their institutions. Participants neither agreed nor disagreed about the effect on non-punitive response to error, hospital management support for patient safety, and hospital hand-offs, but they indicated an under-reporting of patient safety events.

Conclusions: Radiation therapist play a significant role in patient safety. On the radiation oncology team, therapist are responsible for treatment delivery and interact with the patient during every treatment. Thus, non-punitive response to error and hospital management support for patient safety should be addressed to improve patient safety culture with therapists in mind.

Key words: Patient safety, Radiation therapist.

RT1-3

Deformable Image Registration in Linac-Based Radiosurgery

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Purpose: Evaluation of two image registration techniques for stereotactic radiosurgery (SRS), furthermore, both GTV and OARs correlated with contours and dose changing that were compared from space shift, volume and dose-volume histogram retrospectively.

Materials & Methods: Eclipse treatment planning system version 13.6 equipped both rigid and deformable image registration methods. Deformable image registration (DIR) is distributed as Modified Demons-based algorithm and rigid (RIR) as mutual-information based. Same SRS plan had processed two registrations. Regarding treated SRS cases already existing registration result and contours which was processed
The purpose of this study was to determine the importance of empathy in patient-radiation therapist relationships and examine if empathy can be taught. The study aims to gain a better understanding of empathy in radiation therapy.

Materials & Methods: A quantitative survey was conducted on radiation therapists at a large, academic, Canadian Cancer Centre. The survey consisted of 22 general questions on a 5 point Likert Scale and 2 demographic questions.

Results: The survey was completed by 48 participants out of a sample size of 117, response rate was 41%. It was found that 17 out of the 22 questions produced a significant response. There was no correlation between years of experience and the response to any questions. However, the survey indicated that males were less likely to display empathy in uncomfortable situations. Also the study highlighted

Conclusions: This study found that empathy is very important in radiation therapy. Radiation therapists indicated they consider empathy to be a trait that can be enhanced through education. This study was inconclusive in determining if empathy can be taught. Radiation therapists acknowledged both a skill or attitude based teaching style of empathy to be effective. A combination of two teaching styles could be used depending on the student and their learning preferences. This study increased the study participants’ awareness of the different dimensions of empathy, specifically considering if it is an innate attribute or learned skill.

Key words: Deformable, Radiosurgery, Rigid, Image registration

RT1-4
The Quality of VMAT Plans for Spine SABR according to the Collimator Angle
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Purpose: The purpose of this study was to evaluate the quality of VMAT plans for SABR by parallelizing the moving direction of MLC and the axis of spine.

Materials & Methods: Ten cases of VMAT plans for spine SABR were selected and two kinds of VMAT plans with coplanar 2 full arcs were generated. One was generated with collimator angles of 270° for 1st arc and 300° for 2nd arc to parallelize the MLC movement direction and axis of spine (parallel plan) while the other was generated with collimator angles of 330° for 1st arc and 30° for 2nd arc (vertical plan). Every VMAT plan was optimized with the PRO 3 (ver.10.0.28) using HD MLC and 10 MV FFF photon beams of TrueBeam STx. For fair comparison, identical dose-volumetric constraints were applied to both plans. The dose distributions were calculated using the AAA (ver.10.0.28) with the calculation grid of 0.2 cm. Every VMAT plan was normalized so that the target volume irradiated by the prescription dose (V100%) would be 90%. For OARs, V10Gy, of spinal cord, dose received at 0.3 cc and mean dose to the spinal cord were calculated. HIs of target, total MU and gamma passing rate for VMAT QA were evaluated.

Results: The average values of V10Gy, D0.03cc and mean dose to spinal cord of parallel plans were lower than vertical plans by 1.9%, 33.3Gy and 9.6Gy, respectively. The average value of HIs of parallel plans were 1.07 while that was 1.09 for vertical plans, showing better homogeneity of target volumes. The average of total MU of parallel and vertical plans were 6883 and 6957, respectively. The gamma passing rates of every VMAT plan in this study were higher than 90%.

Conclusions: By parallelizing MLC movement direction and spinal cord axis, doses to the spinal cords were reduced while maintaining similar target volume coverage.

Key words: olumetric modulated arc therapy, stereotactic ablative radiotherapy for spine, collimator angle
Concordance studies were performed to assess the agreement between the advanced practiced radiation therapist and radiation oncologist in weekly patient assessment during on-treatment reviews, breast target delineation, and final plan review.

Results: During a 12-week assessment of breast RT patients in on-treatment review, there was high concordance observed between the advanced practice radiation therapist and radiation oncologist in assessments of commonly experienced side effects (concordance rate: 96% for all evaluated side effects). The advanced practice radiation therapist also delineated breast planning cavity targets acceptable by the radiation oncologist for whole breast RT and identified complex, non-standard contouring and planning cases for radiation oncologist review and consultation.

Conclusions: The advanced practice radiation therapist possesses site specific clinical and technical expertise in the management and planning of breast RT treatments. Through integration of clinical, educational, and research activities, this new model-of-care offered by the advanced practice radiation therapist facilitates the expert provision of comprehensive care to patients and enhances RT treatment efficiencies.

Key words: Breast radiotherapy, Advanced practice radiation therapist, Role development, Evidence based practice

RT1-7
The effect of Reproducibility of Bolus Position on the Dose Distribution at the Radiation Treatment
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Purpose: Bolus is used for suitable dose distribution at the radiation therapy. However multiply curved surfaces is able to happen different positioning of bolus from treatment plan. In this case of position error evaluate the accuracy of treatment.

Materials & Methods: 6MV of LINAC (Varian, USA) measured PDD (Percentage Depth Dose) in 10x10 cm2 Field size. Measurement cases are empty space, 5mm bolus contacts surface of water, 30mm gap, 60mm gap, 90mm gap, 120mm gap, and. 10° slope of bolus on the 90mm gap, 20° slope, 30° slope.

Evaluations are R100 (depth of 100% relative dose) and D100 (percentage of 100mm depth).

Results: The R100 and D100 of empty space are 13.1mm and 65.9%. R100 of contact, 30mm, 60mm, 90mm, 120mm gap are 8.3mm, 7.0mm, 6.5mm, 6.2mm, 6.0mm. And D100 are 65.1%, 65.3%, 65.7%, 66.2%, 66.9%. Then R100 of 10°, 20°, 30° degree are 6.2mm, 6.1mm, 5.8mm, 5.3mm. And D100 are 66.2%, 66.1%, 65.9%, 65.6%.

Conclusions: In case of gap and/or slope of bolus come about error of several mm%/%. For example region of head-shoulder or region of cranium with using thermoplastic mask caused error. Therefore it is consider planning CT with bolus in the case of adjacent to organ at risk.

Key words: Radiation therapy, Bolus, PDD

RT2-1
The Usability Test of Self-made Fractionated Stereotactic Radiation Therapy (FSRT) Tool in Tomotherapy
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Purpose: The new device is made by combining a device that Fractionated Stereotactic Radiation Therapy (FSRT) tool used in linear accelerator to tomotherapy for brain tumor treatment and evaluates the usability in reproduction by comparing extended head holder that was used in traditional brain tumor treatment.

Materials & Methods: Targeting 22 patients who use self-made FSRT tool and extended head holder in April-May 2016 National Cancer Center, analyzed Pitch, Roll, Yaw value which obtained in Megavoltage computed tomography (MVCT) scan of trials 75 times and evaluated changes of reproducibility by comparing the average and standard deviation of the absolute value.

Results: When using the extended head holder and self-made FSRT Tool, the average of the absolute value Pitch is respectively 0.467 (±0.056), 0.809 (±0.077) and the standard deviation is 0.480, 0.643 (p=0.00), the absolute value Roll is respectively 0.705 (±0.039), 0.96 (±0.069) and the standard deviation is 0.86, 0.595 (p=0.04). And the absolute value Yaw is respectively 0.667 (±0.075), 1.116 (±0.112) and the standard deviation is 0.651, 0.969 (p=0.00). Pitch, Roll, Yaw of self-made FSRT Tool is respectively decreased 42%, 18%, 40% than using Extended head holder.

Conclusions: Self-made FSRT tool is more effective in reproduction than using Extended head holder for brain tumor treatment and It is better suited for a precise treatment such as FSRT also expected to be used in hypofractionated-high dose treatment.

Key words: Tomotherapy, Fractionated Stereotactic Radiation Therapy (FSRT) tool, Reproduction

RT2-2
Investigation on Left Anterior Descending (LAD) Coronary Artery Motion in Respiratory and Cardiac Cycles for Left-sided Breast Irradiation Using Magnetic Resonance Imaging
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Purpose: To quantify the effect of respiratory and cardiac motions on LAD position using MRI, which provides scientific basis for choosing phases of gated left-sided breast radiotherapy.

Materials & Methods: Images were acquired from 11 healthy female subjects with a 1.5T MR-simulator (Siemens MAGNETOM Aera). For each subject, acquisition (True FISP) was done at the middle slice locations of three equal segments of LAD (proximal, middle and distal) using cine mode for respiratory motion (images_resp) and cardiac triggered cine mode for cardiac motion (images_cardiac). Images_resp were sorted which corresponded to 10 phases of the breathing cycle. The distance between LAD and chest wall, D_LAD, was measured in each slice. One-way repeated ANOVA was performed. The maximum LAD displacement in images_cardiac was calculated.
Dosimetric analysis between MVC and SVC plans

left-sided breast radiotherapy, left anterior Brachytherapy, Multichannel, Single-channel, We retrospectively reviewed our first 30 benign tumor patients’
demonstrated increased PTV coverage and better dose control

Results : The results showed noticeable effect of random cardiac motion to LAD position especially in lateral direction. Nevertheless, its influence was still outweighed by the benefit of respiratory gating at end-inspiratory phase during left-sided breast radiotherapy. The lengthened D_LAD in such phase potentially allows lower dose to LAD, implying less cardiac complications in long term.

Key words : left-sided breast radiotherapy, left anterior descending coronary artery, respiratory gating, Magnetic Resonance Imaging

RT2-3
First Clinical Experience of Using Multichannel Vaginal Cylinder in High-dose-rate Brachytherapy
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Purpose : Vaginal cancer is a relative rare malignancy and it is difficult to treat due to its anatomic location with regard to critical structures in vicinity. Vaginal cancer treatment regimen often consists of brachytherapy in conjunction with external beam radiation therapy (EBRT). Conventionally, vaginal brachytherapy (VBT) is administered by using of a vaginal cylinder featuring a central channel for source loading. However, with a single-channel vaginal cylinder (SVC) the dose distribution is often limited by organs at risk (OAR). Instead, multichannel vaginal cylinder (MVC) is able to deliver preferential dose distribution to the target while permitting relative dose reduction to adjacent structures. This presentation aims to share our first clinical experience of using MVC in high-dose-rate brachytherapy and to compare the MVC dose distribution to the same cylinder if it only had a single central channel.

Materials & Methods : We retrospectively reviewed our first clinical MVC brachytherapy experience. Patient received EBRT (52.5Gy in 25 fractions), then followed by weekly MVC brachytherapy (14Gy in 2 fractions). For each VBT session, the patient was CT-scanned with a MVC in situ, then CT-based 3D planning was done to ensure adequate coverage to the target while permitting relative dose reduction to adjacent structures. The dose to 2cm3 of rectal volume (D2cc) was recorded. Dosimetry for MVC and SVC plans was evaluated for planning target volume (PTV) coverage and D2cc of rectum.

Results : Dosimetric analysis between MVC and SVC plans demonstrated increased PTV coverage and better dose control by using MVC. MVC also achieved lower D2cc of rectum by 22% when compared to SVC.

Conclusions : The multichannel vaginal cylinder enables more flexibility in dose control to target and OAR than single-channel vaginal cylinder.

Key words : Brachytherapy, Multichannel, Single-channel, Vaginal cylinder, Vaginal cancer

RT2-4
The Need of Using CT Image in Gamma Knife Treatment Planning
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Purpose : Many hospitals in Korea only use MRI images when they plan Gamma Knife surgery. This study focuses on the difference of lesion location and volume between MRI and CT images, verifying accuracy of the dose calculation in CT image and additional advantages from using CT image.

Materials & Methods : Use the 30 benign tumor patients’ images by 1.5T MRT(GE) and CT(SEMENS). First, compare the target volume size and location between enhanced 1.5mm MRI T1 image and enhanced 1mm CT image. Secondly, measure the exposed dose of critical structure(lens, cochlear) in treatment planning based on manual skull geometry measurement and CT skull geometry measurement(Gamma Plan 10.1). And then check the difference of the result. Finally, mention some advantages when you use CT images.

Results : 25 of 30 patients have few differences in tumor size and location error. But for the rest of patients, though there is 0.5~1.2mm difference in up down left right side, it can be expected to reduce errors when in case MRI and CT images have same slice thickness, because the errors are just partly discordance not fixed regularity. Subsequently, there is no dose difference in lesions in each planning based on CT skull geometry and manual skull geometry. But critical structures can be affected depending on a location. There are differences minimal 0.1Gy to maximal 0.3Gy lens and cochlea.

Conclusions : Only using MRI image in Gamma Knife treatment planning can have a little risk, because it may not be certain with the exact lesion location compared with CT image. It is expected to have a more accurate and safe treatment plan if you compensate inaccurate parts through using CT image. CT image will be a good reference for a treatment planning which is especially considering vessels and nerves and distinguishing schwannoma near the bone.

Key words : Gamma knife, MRI, CT, Dose, Difference

RT3-1
Evaluation of Useful Treatment which Uses Dual-Energy when Treating Lung-Cancer Patient with Stereotactic Body Radiation Therapy
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Purpose: This study will evaluate the clinical utility by applying clinical schematic that uses monoenergy or dual energy as according to the location of tumors to the stereotactic radiotherapy to compare the change in actual dose given to the real tumor and the dose that locates adjacent to the tumor.

Materials & Methods: To analyze the change factor in the tumor, Conformity Index(CI) and Homogeneity Index(HI) and maximum dose quantity were each calculated and comparing the dose distribution on normal tissues, V10 and V5, first ~ fourth ribs closest to the tumor(1st ~ 4th Rib), Spinal Cord, Esophagus and Trachea were selected. Also, in order to confirm the accuracy on which the planned dose distribution is really measured, the 2-dimensional ion chamber array was used to measure the dose distribution.

Results: As of the tumor factor, CI and HI showed a number close to 1 when the two energies were used. As of the maximum dose, the front chest wall showed 2% and the dorsal tumor showed equivalent value. As of normal tissue, the front chest wall tumors were reduced by 4%, 5% when both energies were used in the adjacent rib and as of trachea, reduced by 11%, 17%. As of the dose in the lung, as of V10, it reduced by 1.5%, V5 by 1%. As of the rear chest wall, when both energies were used, the ribs adjacent to the tumors showed 6%, 1%, 4%, 12% reduction, and in the lung dose distribution, V10 reduced by 3%, and V5 reduced by 3.1%. The dose measurement in all energies were in accordance to the results of Gamma Index 3mm/3%.

Conclusions: It is considered that rather than using mono-energy, utilizing double energy in the clinical setting can be more effectively applied to the superficial tumors.

Key words: Stereotactic body radiotherapy(SBRT), volumetric modulated arc therapy(VMAT), Lung cancer, Dual energy

RT3-2
Analysis of dose distribution with change of the air gap when proton therapy using line scanning
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Purpose: When proton therapy of cranio-spinal irradiation (in the prone position) using line scanning technique, there is a motion of spinal code caused by breathing. According to clinical case for proton therapy, a vertical motion of lower spine (near the abdomen) was measured up to 20mm. This movement from patient respiration affects the variation of an air gap which is the distance between snout and patient’s surface. In this study, authors were founded out the changes in the prescription dose due to variation of air gap.

Materials & Methods: CT simulation was performed using atom phantom (Norfolk, VA, CIRS) by GE Discovery CT-590 RT. Treatment plannings are 4-field: brain (bi-lateral), upper spine, lower spine, which were performed by Ray Station ver. 5.0. Mean and D95 were analyzed shifted points from isocenter in PTV of lower spine which has significant effect from patient’s respiratory motion. The shifted pitch was ±10mm, ±20mm.

Results: As a result of analysis, D95 dose at each depth are as follows: isocenter: 2347.4(100%), iso-10mm: 2302.3(98.1%), iso+10mm: 2341.9(99.7%), iso-20mm: 2281.4(97.2%), iso+20mm: 2361.7(100%). And mean dose at each depth are as follows: isocenter: 2389.2(100%), iso-10mm: 2355.1(98.6%), iso+10mm: 2394.7(100.2%), iso-20mm: 2335.3(97.7%), iso+20mm: 2415.6(101.1%).

Conclusions: The object of this study is to confirm the hypothesis; air gap changes in the line scanning proton therapy may affect the range of the proton beam and penumbra. Based on the experience of the proton therapy of CSI, we could found out that there is some motion about 10 to 20mm in the lower spine by breathing. However, the difference of prescribed dose due to a change of air gap is only D95: -2.8% to 0.6%, mean: -2.3% to 1.1%. Therefore, line scanning proton therapy can be seen clinically useful.

Key words: Line scanning, Proton therapy, Air gap

RT3-3
Dosimetric Comparison of the Breath-Hold Based and Conventional Radiation Therapy of Non-small Cell Lung Cancer
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Purpose: To evaluate dosimetric properties of the Breath-Hold(BH) compared to free-breathing(FB) radiotherapy(RT) of non-small cell lung cancer.

Materials & Methods: Five lung cancer patients received CT scans. It was acquired following each FB scan and one 4DCT scan in cine-mode. If the tumor motion>1cm in 4DCT, a series of 6 scans in BH was acquired. A 3D conformal plan was generated for each CT scan, giving each patient both FB and DIBH plan using the Pinnacle RTP system for photon plan and corresponding proton plans were generated by RayStation. The dose-volume characteristics of the total lung volume were compared in order to evaluate the dosimetric benefits, and the conformity index(CI) and homogeneity index(HI) were calculated as a plan quality index.

Results: In average, the total lung volume was increased by 27.2% and the CTV volume was decreased by 22.1% in DIBH. For photon plans, CI was improved by 20% with DIBH but HI was not significantly different. The dosimetric parameters of lung volume were improved in DIBH: Dmean(Gy)(6 in FB, 4.8 in DIBH), V5%(25 in FB, 21 in DIBH), V10%(15 in FB, 11 in DIBH) and V20%(9 in FB, 7 in DIBH). For proton plans, CI and HI were not significantly different between BH and DIBH. The dosimetric parameters of lung volume were improved in DIBH: Dmean(Gy)(3.2 in FB, 2.7 in DIBH), V5%(11 in FB, 10 in DIBH), V10%(8.6 in FB, 7.4 in DIBH) and V20%(6 in FB, 5 in DIBH).

Conclusions: DIBH provides an advantage to lung sparing by increasing total lung volume, reducing the normal lung volume in high-dose region. Therefore, DIBH could be recommended for the patient with tumor motion of >1cm. In addition, since the dosimetric difference in terms of CI between FB and DIBH in photon plans is larger than that in proton plans, DIBH could be considered in photon radiotherapy.

Key words: Lung cancer, Lung volume, Breath-hold, Free breathing, Radiotherapy

RT3-4
Study of Reduction of the Injured Skin Reaction in Radiotherapy with Carbon Fiber Couch
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Purpose: The acute Grade 2 or higher skin toxicities were caused due to increased skin doses by inserted carbon fiber couch (CFC). We measured the excess skin dose with the CFC and investigated whether immobilization devices can reduce the skin dose.

Materials & Methods: We measured the absorbed skin doses using water-equivalent phantom by plane parallel ionization chamber (Murkus Ion Chamber, PTW) for 4, 6, 8, and 10 MV photon beams. The prescribed dose at 5 cm depth (SAD = 100 cm) was inhaled 2 Gy. The field size was 10 cm × 10 cm. First, we measured the skin doses without CFC and immobilization device. And then, we evaluated the effects of the CFC and immobilizations devices insert on beams. The immobilization devices were none, cloth mat, vacuum fixed cushion (ESF-19AN, ESFORM, thickness of 2 cm), and styrofoam board (E-Board C, ESFORM, thickness of 5 cm).

Results: The absorbed skin dosages without any devices for 4, 6, 8, and 10 MV photon beams were 0.80, 0.61, 0.47, and 0.40 Gy, respectively. The absorbed skin doses with CFC and each immobilization device for 4, 6, 8, and 10 MV photon beams were shown as follows: none: 2.60, 2.47, 2.31, and 2.13 Gy, cloth mat: 2.58, 2.46, 2.32, and 2.15 Gy, vacuum fixed cushion: 2.55, 2.43, 2.27, and 2.11 Gy, and styrofoam board: 2.48, 2.31, 2.13, and 1.98 Gy, respectively. The styrofoam board laid on CFC could reduce the skin dose approximately 5-8% compared with other immobilization devices since the thick and low absorption material caused the rebuild-up at surface region of phantom.

Conclusions: The CFC increased the skin dose to 3-5 times compared with no devices. The distance from CFC to a patient with a low absorption board could reduce the skin dose.

Key words: Skin dose, Carbon fiber couch, Immobilization device, Radiotherapy.

RT3-5

Impact of Ultrasound Image Contrast on Image Guided Radiotherapy for Prostate Cancer

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Purpose: Factors affecting the prostate image contrast during transperineal ultrasound (TPUS) IGRT were analyzed. Registration accuracy of TPUS IGRT was also evaluated in reference to CBCT IGRT.

Materials & Methods: Clinical TPUS images were visually evaluated by varying probe pressure, gel viscosity, and field of view (FOV) depth. Clinical images were also retrospectively classified into clear image group and unclear image group based on the visibilities of prostate contours, implanted seeds, and penile bulb. The correlation with termination date of hormone therapy, tumor marker PSA and CRP levels, and prostate volume was investigated. Registration accuracy of TPUS IGRT was evaluated in reference to CBCT IGRT results.

Results: A shorter FOV depth and higher viscosity of the gel resulted in higher prostate image contrast and more visible prostate contours. In addition, the image contrast was improved by applying higher probe pressure toward the penile bulb horizontally, thereby decreasing the distance to the prostate below 30 mm. Better image contrast was often observed over two months after hormone therapy had been completed. PSA and CRP levels as well as prostate volume were not correlated with the image contrast. Registration accuracy in reference to CBCT prostate registration was -1.9 mm ± 2.3 mm, -0.2 mm ± 2.7 mm, and 0.0 mm ± 3.0 mm in the anteroposterior, craniocaudal, and lateral directions, respectively.

Conclusions: It was found that high contrast TPUS imaging allows us to perform accurate IGRT. TPUS IGRT may decrease the frequency of CBCT imaging thereby lowering imaging dose to patients.

Key words: ultrasound, IGRT, prostate, ultrasound.

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RT4-1
Dosimetric Comparison of Forward IMRT, IMRT, and V-MAT Techniques for Left-sided Early Breast Cancer

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Purpose: The purpose is to compare the dosimetric performance of 3 delivery techniques: field-in-field technique (FinF), intensity-modulated radiation therapy (IMRT), and volumetric-modulated arc therapy (V-MAT) for whole-breast irradiation of left-sided early breast cancer.

Materials & Methods: Overall, 6 patients with T1/2N0 were treated with FinF. The treatment plans of these patients were replanned using the same contours based on the original computed tomography (CT) data sets. Several dosimetric parameters were used in plan quality evaluation, including dose conformity index (CI) and dose-volume histogram analysis of normal tissue coverage.

Results: Dosimetric objectives were fulfilled in all plans. Compared with IMRT and V-MAT resulted in improved conformity of dose to PTV (p<0.01). The median conformity index (CI) was 0.52 (Range: 0.39 - 0.56), 0.79 (Range: 0.71 - 0.81), and 0.76 (Range: 0.72 - 0.80) for FinF, IMRT and V-MAT respectively. For organ at risk sparing, IMRT and RA showed advantages over FinF for maximum dose of ipsilateral lung (p<0.01). Compared with IMRT and RA, FinF showed to be superior for mean dose of heart (p<0.05) and contralateral lung (p<0.05) but for the maximum dose of heart FinF was significantly higher than IMRT and V-MAT (p<0.01). For V40 of heart, the median value of V40 was significantly lower in RA plans, compared with FinF and IMRT (p<0.05). IMRT and RA showed comparable performance in conformity of dose to PTV and some advantages to organ at risk sparing except in dose to contralateral lung (p<0.01).

Conclusions: Based on this preliminary study, V-MAT and IMRT techniques resulted in improved dose conformity as compared with FinF technique with comparable performance in organ at risk sparing.

Key words: Dosimetry, Breast cancer, V-MAT, IMRT.

RT4-2
Evaluation on Auto-Segmentation of Re-CT Contours for Nasopharyngeal Carcinoma (NPC) Adaptive Planning

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Purpose: Re-CT planning for advanced Nasopharyngeal Carcinoma (NPC) is often required during patient’s treatment due to anatomy change. Manual delineation of CT structure prior re-planning is a very labor-intensive process. There is a need to review auto-segmentation software, in the search for a faster yet accurate method of structure delineation.

Materials & Methods: The baseline planning CT and weekly CT simulations of 3 local regionally advanced NPC patients undergoing concurrent chemo-radiotherapy were used for this study. Organ at Risk (OARs) were all manually delineated by same physician on the baseline CT and all 6 sets of weekly CT images. Deformable registration of baseline CT and weekly CT images was performed using MIM Maestro (MIM software, Cleveland, OH). The CT-to-CT registration used intensity-based algorithm with free-form regularization. Deformed OAR contours of baseline CT were transferred back to weekly CT data. Dice Similarity Coefficient (DSC) is calculated comparing auto-segmented contour with the contour manual delineated by the physician on every set of CT data. The DSC was calculated by: DSC (A, B) = 2|A∩B| / (|A|+|B|) where |A| is the intersection of manual and auto contour for the same structure (0 indicating no overlap and 1 is perfect overlap).

Results: The mean DSC of 0.783 was obtained for CT structures with volume more than 8cc. Among the structures obtained DSC better than 0.7, 83.8% are volume larger than 8cc, indicating good match between auto-segmented contours and current standard. There is statistically significant correlation between absolute volume of CT structures and DSC. Chiasm, optic nerves, lens, cochlea, IAM, pituitary, constrictor muscles are small structures associated with poor auto-segmentation results.

Conclusions: It is relatively accurate and efficient on auto generating re-CT structures based on baseline CT from the same patient. However, manual editing can’t be excluded especially for small volume structures prior re-planning.

Key words: Auto-segmentation, NPC, DSC, Adaptive replanning

RT4-3
Effectiveness of Audio Coaching in Achieving Regular Breathing Pattern for 4D Computed Tomography Scans

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Purpose: This pilot study aims to determine if audio coaching alone can achieve an improved consistency and regularity of breathing pattern in order to obtain higher quality 4D CT scans in patients with lung cancer.

Materials & Methods: 10 patients diagnosed with non-small cell lung cancer (NSCLC) were sequentially recruited from December 2014 to July 2015. The first five patients belonged to the control group and underwent the usual departmental protocol for 4D CT scans with free breathing. The next five patients were instructed to breathe according to the audio coaching instructions that include a common verbal directive involving the terms ‘breathe in’ and ‘breathe out’. These were available in four different languages, namely Mandarin, English, Malay and Hokkien. Real-time Position Management System (RPM) by Varian Medical System was used to monitor both groups of patient’s breathing motion throughout the scan.

Results: Breathing pattern were analyzed using matrix laboratory (MATLAB). Fast Fourier Transformation (FFT) was performed to remove random noise resulting in a power spectrum of the patient’s breathing signal. An ideal sinusoidal pattern was used as a reference for the study. For coached patients, there were distinct peaks in the breathing power spectrum that were similar to ideal breathing situations.
The energy is more spread out over a range of frequencies for free-breathing patients. P-value of 0.016 obtained from Student’s T-Test indicated that the means of the two groups are statistically significant.
Conclusions: We have successfully shown that audio coaching is a viable option to obtain a more regular breathing pattern for patients with lung tumour. A reproducible consistent breathing pattern can potentially translate to better image quality leading to superior treatment planning results. This offers the possibility to reduce treatment volume for dose escalation thereby improving local control comparable to surgery, especially for stereotactic body radiation therapy (SBRT).
Key words: Respiration motion, Audio coaching, 4DCT, Tumour motion, Non-small cell lung cancer

RT4-4
Dose Optimization Methods During Radiotherapy Imaging: A Case Study Of Dose Optimization During Prostate Cancer Irradiation With Fiducials
At Sgmc Ltd
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Purpose: The use of fiducial markers as surrogates in Image-guided radiotherapy (IGRT) to verify prostate position before, during and in-between treatment is now the norm in most radiotherapy centers worldwide. The aim of this case study is to review the imaging dose optimization method used at SGMC for the treatment of prostate cancer patients with fiducial markers.

Materials & Methods: This study reviewed current literature on imaging doses as well as the radiobiological effect of accumulated imaging doses during the radiotherapy course for prostate cancer treatment. We also reviewed the literature on the use of fiducial markers to improve accuracy in dose delivery during radiotherapy for prostate cancer. Finally, this study brings to the limelight the dose optimization method used at SGMC during prostate cancer irradiation with fiducial markers. With the help of our Record and verification system, MosaiQ, the imaging monitor units (MUs) are subtracted from the respective treatment field MUs during the MosaiQ Plan Import procedure. Therefore, if the anterior treatment field has a monitor unit of (75.0 MU), then subtracting a daily Portal Imaging (P.I) MU of 2 results in (73.0 MUs) for daily treatment. For a lateral treatment field of 270 or 90 degrees field (112.0MU), subtracting 3 P.I MUs results in 73.0 MUs for daily treatment.

Results: We came to a realization that, this method of imaging dose optimization added no extra monitor units and as a matter of fact would help prevent extra dose from weekly verification portal images.

Conclusions: Due to the significant amount of normal tissues irradiated during the imaging process, it is prudent to develop optimal imaging methods and techniques to be used in the safe delivery of radiation to the prostate. This would significantly help in the reduction of the risk of stochastic effect.
Key words: Monitor Units, Fiducials, Verification images, Stochastic effect, Optimization.

RT4-5
Evaluating Efficiency of Split VMAT Plan for Prostate Cancer Radiotherapy Involving Pelvic Lymph Nodes
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Purpose: The purpose of this study is to evaluate the efficiency of Split VMAT planning (Contouring rectum divided into an upper and a lower for reduce rectum dose) compare to Conventional VMAT planning (Contouring whole rectum) for prostate cancer radiotherapy involving pelvic lymph nodes.

Materials & Methods: A total of 9 cases were enrolled. Each case received radiotherapy with Split VMAT planning to the prostate involving pelvic lymph nodes. Lower rectum contour was defined as starting 1 cm superior and ending 1 cm inferior to the prostate PTV, upper rectum is a part, except lower rectum from the whole rectum. Split VMAT plan parameters consisted of 10MV coplanar 360° arcs. An SIB treatment prescription was employed delivering 50.4 Gy to pelvic lymph nodes and 63–70Gy to the prostate in 28 fractions. Dmean of whole rectum on Split VMAT plan was applied for DVC of the whole rectum for Conventional VMAT plan. In addition, all parameters were set to be the same of existing treatment plans. All plans were optimized and normalized.

Results: The Split VMAT plan demonstrated better in the Dmean of whole rectum, the average difference was 75.6cGy and in the Dmean of upper rectum, the average difference was 350.5cGy and in the Dmean of lower rectum, the average difference was 34.3cGy and in the Dmean of bladder, the average difference was 117.8cGy and in V50% of upper rectum, the average difference was 23.2%. There was no significant difference on H.I., and C.I. of the PTV among two plans.

Conclusions: The Split VMAT plan appeared to be more favorable in most cases than the Conventional VMAT. By using the Split VMAT planning technique it was possible to reduce the upper rectum dose, thus reducing whole rectal dose when compared to Conventional VMAT planning. Also using the split VMAT planning technique increase the treatment efficiency.
Key words: Prostate cancer. Pelvic lymph node. Rectum Contouring; VMAT; IMRT.

RT4-6
A study of usefulness for the plan based on only MRI using ViewRay system
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Purpose: By comparing a CT fusion plan based on MRI with a plan based on only MRI without CT, we intended to study usefulness of a plan based on only MRI. And furthermore, we intended to realize a realtime MR-IGRT by MRI image without CT scan during the course of simulation, treatment planning, and radiation treatment.

Materials & Methods: BBB CT (Brilliance Big Bore CT, 16slice, Philips), Viewray MRdian system (Viewray, USA) were used for
11. SONOGRAPHY

S01-1
MRI-TRUS Fusion Guided Prostate Biopsy Using PI-RADS II
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Purpose: After Prostate Imaging Reporting and Data System (PI-RADS) scoring the indeterminate region in pre-biopsy multi parameter prostate MRI, we were performed MRI-TRUS fusion guided biopsy and evaluate the diagnostic accuracy of each score.

Materials & Methods: 55 patients with Pre-biopsy MRI who received MRI-TRUS fusion guided biopsies were enrolled in this study. After fusion in MRI and Ultrasound, we were performed target biopsy in indeterminate region and performed systemic biopsy. Fusion was using T2WI in MRI, US equipment was used Toshiba Apio 500 and MRI was used Philips Achieva 3.0T. After checking the pathology results, we evaluated the diagnostic accuracy by PI-RADS score. We had analyzed on a PI-RADS score difference between benign and malignancy. In addition, using the ROC curve was evaluated Diagnostic accuracy of PI-RADS score. Logistic regression analysis was performed to evaluate the odd-ratio of PI-RADS.

Results: PI-RADS score of the patients included in this study is as follows. Seven patients were diagnosed benign at biopsy in score 2. In score 3, one patient was diagnosed with gleason-score 6 points active surveillance group. Score 4 and 5 of the diagnostic accuracy was 71.4% and 84.6%. Benign group PSA level and the cancer group were not statistically significant. In benign group, mean prostate volume was 47.82cc, PI-RADS score was 3.18. In cancer group, mean prostate volume was 32.09cc, PI-RADS score was 4.37. At ROC curve analysis, the area under the curve of PI-RADS was 0.856. At multivariate logistic regression analysis, Odd ratio of PI-RADS score was 9.2. When PI-RADS score will be increased by one point, the risk of prostate cancer showed an increase of 9.2 times.

Conclusions: PI-RADS score can be a useful option to distinguish between benign and malignant. Also, in the prostate biopsy, the use of MRI-TRUS fusion biopsy can help to more accurate diagnosis than normal biopsy.

Key words: PI-RADS score, Prostate biopsy

S01-2
Improved Method for Quality Assurance Using Breast-4 Phantom and Image Processing
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Purpose: As frequency of breast cancer diagnosis by ultrasonography increases, the importance of exact quality assurance is on the rise. We propose the optimized method of quality control to evaluate the performance of breast ultrasonography.

Materials & Methods: The quality control for ultrasound equipment from 4 different companies is performed using Breast-4 Phantom and Linear Probe. Gray scale, cyst target, axil/lateral resolution, 45 degree are evaluated from the conventional images including X-RES, SONO-CT functions and Harmonic function on top of the two functions in visual and quantitative ways.

On the visual image evaluation, the rates of image quality improvement and the standard deviations of the conventional and harmonic total scores acquired from each respondents are obtained through the survey among 6 radiology specialists and 4 radiological technologists using 1-4 in a rating scale. Quantitative evaluation is carried out by analyzing the values of contrast, noise acquired from grayscale images and those of full width at half maximum (FWHM) from axial/lateral resolution images, and comparing the improvement rates of those items using a image processing program (ImageJ) and a data analysis program (Origin pro).

Results: On the visual evaluations, the rates of average image quality improvement for the conventional images with Harmonic function acquired from the 4 different manufacturers’ equipment, compared to the images without it, are 90%, 90%, 80%, 60%, respectively. Standard deviations of the scores for the whole equipment acquired from each respondent are 3.97 for the conventional images with Harmonic function and 2.71 the images without it and those with Harmonic function are showed as having the more even distribution. On the quantitative evaluations, the rates of contrast improvement are 19.4%, 9.6%, 10.8%, 24.9%, the rates of noise improvement are 28.7%, 8.4%, 14.1%, 22.8%. The rates of improvement for lateral resolution FWHM compared to axial resolution FWHM are 38.4%, 69.2%, 26%, 6.6%.

Conclusions: Optimized quality control for breast ultrasonography would be achieved by applying Harmonic function to conventional images including X-RES and SONO-CT functions and it is considered that by carrying out visual evaluations combined with quantitative evaluations, the more objective quality control could be performed.

Key words: Quality control, Breast-4 Phantom, Breast-4 Phantom, Harmonic image, Breast ultrasonography, Performance evaluation

S01-3
Change of a Ultrasound Chaos into a Practical Process-development Project in Ultrasonography and Sonographers’ Practice
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Purpose: Purpose was to develop a process with quality and productivity aspects to improve accessibility of ultrasonography (US), describe the value stream of US process together with developing and joining sonographer practice as a supporting part of it. Problem points of the process and solutions to them were identified, and the demand and the supply of ultrasound scans was studied. Also the factors which are associated to productivity were analyzed.

Materials & Methods: Research based developmental approach was used. Data used was RS-data about all ultrasound patients (N=11 172) in one Finnish restrict hospital during one year period. In addition information about developmental needs of US process was collected in workshops of multiprofessional US team and US stakeholders. Quantitative data was analyzed by descriptive statistical method and the qualitative one about developmental needs was formulated to the flow chart format.

Results: Results: Resource plan where variation of demand and flexibility of supply are taken into account within available resources and ultrasonography process description which may be used as a tool for the continuing development. Factors which are in connection with productivity are e.g. profession, referral unit and scanning room or device.

Conclusions: Process development, resource allocation and increase of flexibility in service supply influence positively the accessibility of ultrasound examinations. Appropriate allocation of services and personnel resources may improve the productivity of ultrasonography.

Key words: Ultrasonography, Sonographer, Productivity, Process development, Lean-Thinking

S01-4 Measurement Error of Mean Sac Diameter and Crown-rump Length among Pregnant Women at Mulago Hospital, Uganda

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Purpose: In ultrasonography, measurements are not free of error due to instrument imprecision and human inconsistencies. Therefore, between January and March 2016, we assessed the level of intra- and inter-observer error in measuring mean sac diameter (MSD) and crown-rump length (CRL) in women between 6 and 10 weeks of gestation at Mulago National Referral Hospital. In addition, factors associated with inter-observer error were evaluated.

Materials & Methods: We carried out a cross-sectional study that consecutively enrolled 56 women with an intrauterine single viable embryo. Using a transvaginal technique, these women were scanned by two observers who were blinded of each other’s measurements. Each observer measured the CRL twice and the MSD once for each subject using a Phillips Envisor C (Phillips, USA, 2009). Data obtained were analysed using intra-class correlation coefficients (ICCs), Bland-Altman plots with 95% limits of agreement (LOA), technical error of measurement (TEM) and a linear regression model.

Results: Intra-observer ICCs for CRL measurements were 0.995 and 0.993 for observers A and B respectively while inter-observer ICCs were 0.988 for CRL and 0.953 for MSD measurements. The intra-observer 95% LOA for CRL measurements were ±2.04 mm and ±1.66 mm for observers A and B respectively while for inter-observer agreement, it was ±2.35 mm for CRL and ±4.87 mm for MSD measurements. The relative TEM of CRL measurements for observers A and B were 4.62 and 3.70% respectively whereas inter-observer relative TEM were 5.88% and 5.93% for CRL and MSD measurements respectively. No factor was associated with inter-observer error.

Conclusions: Intra- and inter-observer error were within clinically acceptable limits. Measurement error in ultrasonography is unavoidable and should be minimised by regular training of professionals and development and use of guidelines for measurement of MSD and CRL. In this way, the risk of misdiagnosis early embryonic demise or inaccurate dating of pregnancy is minimal.

Key words: Mean sac diameter, Crown-rump length

S01-5 Carotid Artery Stiffness is More Sensitive than Carotid Intima Media Thickness in the Detection of Carotid Atherosclerosis

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Purpose: To investigate and compare the value of ultrasound measurement of carotid artery stiffness (CAS) and carotid intima media thickness (CIMT) in assessing carotid atherosclerosis.

Materials & Methods: A total of 136 subjects were recruited in the study. The subjects were divided into two groups: subjects with at least one cardiovascular risk factor (n=60); subjects without any cardiovascular risk factor and disease (n=76). All subjects had a carotid ultrasound examination, and the CAS and CIMT of common carotid arteries were measured. In the assessment of CAS, the artery stiffness was expressed as distensibility coefficient (DC), compliance coefficient (CC), α, β and pulse wave velocity (PWV). Lower DC and CC, and higher α, β and PWV indicate stiffer artery.

Results: There was no significant difference in the CIMT between subjects with cardiovascular risk factor and those without the risk factor (p>0.05). However, results showed that subjects with cardiovascular risk factor had significant higher CAS than subjects without the risk factor, and they presented with significantly lower DC and CC, and higher α, β and PWV (p<0.05).

Conclusions: CAS is more sensitive than CIMT in the detection of carotid atherosclerosis. CAS has potential to be a surrogate marker for assessing atherosclerotic changes.

Key words: Atherosclerosis, Carotid artery, Arterial wall stiffness, Intima media thickness
**S01-6**

**Evaluation of the Efficacy of Ultrasonography in the Diagnosis of Dento-Maxillofacial Swellings**  
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**Purpose**: Radiographs are a valuable diagnostic tool, as an adjunct to clinical examination in the diagnosis of dental diseases. However, sonography as an imaging modality in dentistry has been extensively explored in recent years due to several advantages that diagnostic ultrasound provides. It is a non-invasive, inexpensive, painless method and unlike X-ray, it does not use harmful ionizing radiation. Therefore we set out to evaluate the efficacy of sonography in the diagnosis of dento-maxillofacial swellings.

**Materials & Methods**: The study was conducted on patients with maxillofacial swellings attending maxillofacial clinic in Aminu Kano Teaching Hospital Kano, Nigeria (AKTH). The clinical, radiographic, and sonographic diagnoses made were compared to the histopathological diagnosis as the gold standard. The maxillofacial swellings included malignant swellings, benign swellings, cystic lesions, abscesses and space infections and lymphoma. Statistical analysis was done using Chi-Square test, Pearson contingency coefficient and 2x2 contingency table.

**Results**: The diagnostic accuracy and contingency coefficient were evaluated considering histopathology as gold standard. The diagnostic accuracy of ultrasound was found to be 50% in the diagnosis of malignant tumors, 95.8% in benign tumors, 66.7% in cystic lesions, 50% in abscesses and infections, and 100% in lymphoma. The contingency coefficient of 0.833 was obtained when ultrasonography was compared to the histopathology, which was highly significant. Similar significant results were obtained comparing ultrasonography with clinical diagnosis (0.759) and radiographic diagnosis (0.798). Accuracy, sensitivity and specificity of sonography were found to be 86.1%, 90.3% and 60% respectively.

**Conclusions**: The study revealed that ultrasonography is a valuable tool in the diagnosis of dento-maxillofacial swellings. The addition of ultrasonography to the clinical and histopathological examinations increases the accuracy of the diagnosis of orofacial swellings.

**Key words**: Sonography, Maxillofacial swellings, Histopathology, Radiography, CT.

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**S02-1**

**Effectiveness of Repeat US-MR Fusion Biopsy in Diagnosis of Prostate Cancer in Patients with Previous Negative Us-Guided Biopsy**  
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**Purpose**: The purpose of this study was to investigate the effectiveness of repeat transrectal ultrasonographic (TRUS)-magnetic resonance (MR) fusion biopsy in the diagnosis of prostate cancer in patients with previous negative TRUS-guided biopsy.

**Materials & Methods**: We reviewed a total of 50 patients with at least one prior negative TRUS-guided biopsy who underwent prostate MRI and guided fusion biopsy from September 2015 and April 2016. US-MR Fusion biopsy was performed in patients with suspicious lesion identified on MRI (Likert score≥3). A Likert scale reported MRI for suspicion of cancer from 1 (no suspicion) to 5 (cancer highly likely). Two cores obtained per lesion. Data including, prostate specific antigen (PSA), Gleason score were evaluated. Positive predictive value (PPV) and negative predictive value (NPV) were calculated the detection rate of high-grade (Gleason≥7).

**Results**: A total of 112 suspicious lesions were repeat US-MR fusion biopsy in 50 patients. PSA increased at repeat US-MR fusion biopsy (86%). The prostate cancer was detected 35 (31.2%). Of these 35 lesions High-grade cancer (Gleason ≥7) detection was 24 (68.5%). PPV for detecting Gleason score ≥7 cancer was 0.88. NPV of Gleason score ≤6 was 0.58 for excluding negative.

**Conclusions**: US-MR fusion biopsy has potential to detect more prostate cancer in patients that had previous negative TRUS biopsy. In addition, it may improve early detection of clinically significant cancer that is essential for the proper treatment.

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**S02-2**

**Study of Pathological Findings in Thyroid Lesions Observed on PET-CT**  
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**Purpose**: This study performs US-guided fine needle aspiration (FNA) or core needle biopsy (CNB) with an indeterminate mass in the thyroid in which an FDG uptake was observed on PET-CT and aims to examine the characteristics of the mass according to the pathological results.

**Materials & Methods**: This study was conducted with 95 patients who had FNA or CNB on the lesion, of those whose FDG uptake rate of the thyroid increased after PET-CT from January 2014 to December 2015. Based on SUVmax (Maximum standard uptake value) that appeared on PET-CT, the size of the lesion that appeared in the ultrasonography, and pathological findings, the characteristics according to the pathological findings were analyzed, using a t-test and a one-way ANOVA. In addition, this study examined the mass size and the area under the curve (AUC) of mSUV using the ROC curve and the cut-off value of each parameter.

**Results**: The average mass size of 38 persons diagnosed with a benign nodule was 1.75cm, and their mSUV was 4.282. The average mass size of 33 persons diagnosed with malignancy was 1.14cm, and their mSUV was 8.436. (p<0.001) As a result of an analysis of the correlation between the mass size and mSUV in the malignancy lesion, there was a moderate positive correlation. (Correlation coefficient: 0.701, p<0.001) However, the mass size and mSUV of the benign lesion did not have any correlation. (Correlation coefficient: 0.049) The AUC of the mass size was 0.736, and the cut-off value according to it was 1.15cm (Sensitivity: 73.7%, 63.6%). The AUC of mSUV was 0.801, and its cut-off value was 4.45 (Sensitivity: 78.8%, 68.4%). In addition, the odds ratio of mSUV was 1.848.

**Conclusions**: It is desirable to evaluate lesions using ultrasonography if there is an uptake in the thyroid on PET-CT and pathologically confirm them through FNA or CNB, if necessary.

**Key words**: Thyroid ultrasonography, US-guided fine needle aspiration, PET-CT.
SO2-3
Research about the Correlation of Prostate Transitional Zone Volume Using Blood Test Count and Transrectal Ultrasound in Men in Their 30s without Underlying Disease

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Purpose: This study is to apply clinical index by researching the correlations of PSA and PSAD due to the result of blood test, the total prostate volume during transrectal ultrasound test, age of the subjects and the volume of the prostate transitional zone.

Materials & Methods: Retrospective analysis was performed based on 68 male patients in 30s without underlying disease along with the execution of blood test and transrectal ultrasound test at S University Hospital from June, 2007 to May, 2016. The total volume and transitional zone volume of the prostate were measured by using the transrectal ultrasound. PSA and PSA density were examined on the results of the values through blood test. Here, the PSAD value can be found by dividing PSA concentration by the total volume. Sequoia 512 and EC-10CS probe of ACUSON was used as equipment, and the prostate was tested after inserting through the anal passage of the patient lying to the left. For statistical processing, SPSS 18.0 was used to calculate the average of each variable and the standard deviation, and the bivariate correlation analysis was performed.

Results: The descriptive statistics quantity of the variables had the total volume of 24.2707±6.60536; transitional zone volume was 6.9978±3.66497; PSA was 2.1722±2.76279 and PSA density was 0.2818±0.10628. The correlation coefficient of the transitional zone volume and PSA was 0.398. Excluding PSA, all variables were statistically significant as p<0.05.

Conclusions: There was a correlation between the size of the transitional zone, the age of the subjects, total prostate volume, PSA, and amount between PSAD variables, but Transitional Zone Volume showed the highest followed by PSAD. Therefore, prostate transitional zone volume of males in their 30s without underlying disease can be predicted through PSAD and the total prostate volume.

Key words: Transitional zone volume, Total volume, PSA, PSAD, TRUS

SO2-4
Malignancy Rate of Thyroid Nodules in Patients on Regular Follow-up Ultrasoundography

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Purpose: The purpose of this study is to investigate the malignancy rate of thyroid nodules in patients on regular follow-up ultrasoundography and to categorize the reasons.

Materials & Methods: From 2014 January to 2015 December, among 528 patients who underwent ultrasound-guided fine needle aspiration(US-guided FNA), 78 patients who underwent regular follow-up thyroid ultrasonography. We classified the nodules according to four groups: nodules with interval growth, nodules with changes of ultrasound features, newly detected suspicious malignant nodules, nodules with interval growth and changes of ultrasound features.

Results: The malignancy rate of thyroid nodules according to pathological results was as follows: benign nodules were 60%(47/78), malignancy nodules were 31%(24/78), AUS nodules were 4%(3/78), nondiagnostic nodules were 5%(4/78). The malignancy rate of thyroid nodules according to reasons was as follows: nodules with interval growth were 13.4%(4/30), nodules with changes of ultrasound features were 55%(11/20), newly detected suspicious nodules were 56.3%(9/16), nodules with interval growth and changes of ultrasound features were not. Statistically significant difference was observed between the malignancy rate for nodules with interval growth and newly detected suspicious malignant nodules (p=0.005).

Conclusions: There was a statistically significant difference in the malignancy rate of thyroid nodules that underwent regular follow-up ultrasound. Compare the ultrasound features and the result of US-guided FNA through a follow-up ultrasonography, we could get more accurate information about the thyroid nodules.

Key words: Follow-up ultrasonography, Thyroid nodules, US-guided FNA

SO2-5
Usefulness of Transabdominal Ultrasonography for Detection of Early Colon Cancer in Two Case Studies

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Purpose: Colon cancer is one of the malignant disease representing approximately 60% of gastrointestinal neoplasia. Recently diagnostic ultrasonography covers wide area range including almost all of the whole body. Nevertheless, detection of gastrointestinal disorders by a transabdominal ultrasonography has been considered almost impossible. But, recently sonographic equipment were improved resolution, it became possible to more detail diagnosis to gastrointestinal track. In this study, we are try to use the transabdominal ultrasonography emphasize the need for diagnosis of early colon cancer.

Materials & Methods: Sonography was performed with Ultrasound equipment is inspected GE LOGIQ 400 Pro series was used to abdominal examination by 4MHz convex probe with 7.0MHz linear probe.

Results: In two cases of ultrasonographic results to colon cancer, but two patients were usually healthy state, So, according to the results of ultrasound in two colon cancer cases we had a new understanding of the importance of ultrasonographic diagnostics.

Conclusions: The usefulness of transabdominal ultrasonography in the diagnosis of early colon cancer was evaluated in 2 patients examined by ultrasonography. The sensitivity of ultrasound diagnosis is entirely dependent on the skill of the Sonographer. However, ultrasonography is sufficient meaning as a procedures for detecting early colon cancer. Improving the sensitivity as diagnostic sonography will require improving the ability of sonographic technique to visualize the colon. Ultrasonography is a useful method for detecting early colorectal cancer, so the colon should be actively observed in abdominal ultrasonography examinations. Ultrasonography best goal is detection of early cancer, it is save one's life. So we were must be best effort to improvement for sonographic technique.

Key words: Transabdominal sonography, Sonographic technique, Early colon cancer, Gastrointestinal track, Wholebody ultrasonography.
SO2-6

Use of Transabdominal Ultrasound for Diagnosis of Schistosoma Mansoni

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Purpose: The purpose of the study was to establish the role of ultrasound in the diagnosis of schistosoma mansoni.

Materials & Methods: To carry out the study, Aloka model SSD500 ultrasound machine was used. A 3.5 MHz sector probe was used to perform transabdominal scans. Warmed aqua gel was used during scanning for the purpose of producing clear images. A note book was at hand to facilitate recording of important observations during scanning. In addition to methods previously used to grade hepatic fibrosis due to schistosoma, ultrasound was used to scan a group of 400 subjects for the purpose of obtaining sonographic grading. The study was conducted in Nzoila and included males, females, adults and children. The age range considered for the study was 8-45 years. Characteristic sonographic features of schistosoma to be observed were portal fibrosis which are dense echogenic streak bands seen when scanning along the long axis of the intrahepatic portal veins. Scanning along central and peripheral bifurcation points of the portal veins produced branching pattern of high echogenicity. From this sonographic pattern, grading was done as follows. A-Normal, B-Early peripheral fibrosis, C-Clear cut pipestems and rounded density bands, C-Central fibrosis of main portal vein and gall bladder wall thickening, E-Advanced stages of fibrosis forming patches on the liver parenchyma, F-Extensive advanced fibrosis extending to the liver surface and distorting its shape. X, Y, Z, -0.7% It was also noted that advanced sono-graphic abnormalities seen in children differed significantly from those in adults.

Conclusions: Ultrasound is a useful tool for classification of liver fibrosis and can also be used as a control programme in a country.

Key words: Sonographic grading, Periportal fibrosis, Density bands.

SO2-7

Physical Effects of Diagnostic Ultrasound Exposure on Rabbit Fetus

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Purpose: This experimental study investigated fetal physical changes resulting from exposure to diagnostic ultrasound at different duration and gestational stages.

Materials & Methods: Nine pregnant rabbits; three for each group A, B and C, were exposed for 30, 60 and 90 minutes respectively at the middle of three gestational stages using a Philips HD3 diagnostic ultrasound system with a 12-5MHz 50mm broadband linear array transducer. Another three served as control (group D). Exposure parameters i.e.: frequency = 7.09 MHz, intensity, ISPTA =494W/cm², power=56.0 W, Thermal Index=0.2 and Mechanical Index=1.0 were kept constant throughout the study. Fetuses were excised at the stipulated time. Fetal weight measured using EK610i digital balance while fetal brain volume and surface used SkyscanTM 1176 Micro CT. Data were processed to look for significant difference and relationship between groups.

Results: Total 136 fetuses; group O(n=31), A(n=35), B(n=31) and C(n=39) were analysed. One-way ANOVA showed significant differences in fetal weight at the 1st and 3rd stages exposed for 90 minutes (P=0.01 and 0.05 respectively), and at the 2nd stage exposed for 60 minutes (P=0.01). Pearson correlation showed negative correlations between exposure durations and fetal weight at the 1st and 3rd stages (P=0.02 and 0.04 respectively).

Simple Linear Regression showed significant linear relationship. For brain volume and surface, significant differences found in brain volume and surface at the 2nd stage exposed for 60 and 90 minutes, and at the 3rd stage exposed for 60 minutes. No significant relationship found between exposure durations and brain volume and surface at all stages.

Conclusions: Result suggested that prenatal ultrasound exposure might interfere with those sensitive stages hence, plausibly interrupted the physical development. Further work is needed to provide more scientific evidences on prenatal ultrasound effects on fetus.

Key words: Prenatal exposure, Diagnostic ultrasound effects, Fetal physical development
US and ABI in PAD. By using the typical US techniques it was possible not only to diagnose but also to get useful information for EVT. US is capable of presence diagnosis, qualitative diagnosis and treatment support. Therefore, the roles of us will no doubt grow increasingly important.

**Key words :** Peripheral Artery Disease, Ultrasound, Ankle Brachial Pressure Index, EndoVascular Treatment

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**S03-1**

**Compare the Ratio of Frequency Ablation Zone, using a Phased Power Increase by Saline Perfused-Cooled Electrode : Experimental Study in Ex Vivo Bovine Liver**

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**Purpose :** To determine the optimized protocol of therapeutic ablation zone for maximized tissue coagulation in accordance with gradually ramped-up power to a full power level technique by saline perfused cooled electrode in vitro interlaboratory study.

**Materials & Methods :** RFA was applied to the bovine liver, using single 2.5cm active tip saline perfused electrodes with RF generator(Co. RF medical system). Firstly, group A, In a bovine liver, 5 RF ablation zones were performed power increase 10W every a minute from 100W up to 180W for 10minutes(Last 2minutes is 180W fixed). Secondly, group B, 5 RF ablation zones were performed power increase 20W every 2minutes from 100W up to 180W for 10minutes. Lastly, group C, 5 RF ablation zones were performed 180W output without change for 12minute. We measure the total energy and size of ablation zones with colors of grey(Coagulated necrosis zone) and pink(Sublethal-damaged zone). Statistical analysis was done using Kruskal-Wallis test.

**Results :** The mean energy, mean temperature, and mean volume of ablation zone with grey and pink color of groups A to C were respectively 62.27, 72.74, 47.33 kcal; 90, 88.69, 89.8 ℃; 59.31±1.927, 54.19±3.834, 58.83±3.01cm3 (grey zone), and 19.36±0.32, 7.02±0.97, 17.88±0.86cm3 (pink zone). Those were significantly different. (pink zone(p<0.05), (grey zone (p>0.05)). The group C produced larger measurements of tissue coagulation zone than groups A and B, but the maximum measurements of tissue coagulation zone (grey zone) was produced by Group A. The ratio of grey zone to pink zone were 35.19±0.96, 31.16±3.1% and 31.38±2.5% respectively. (grey/pink ratio (p<0.05)).

**Conclusions :** RFA using saline perfused cooled electrode, a gradual ramped-up of power methods can produce a large tissue necrosis ablation zone than fixed output method in ex vivo experiment.

**Key words :** RFA, Saline perfused cooled electrode, Tissue necrosis ablation zone

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**S03-2**

**Comparison Study of Heat Cauterization Range according to RF Generator**

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**Purpose :** The purpose of this study is to evaluate the cauteration range and its correlation according to the output of Radiofrequency generators.

**Materials & Methods :** In this study, we used 2 kinds of radio-frequency generators from different manufacturer that is interlinked with device of same variable electrode. And 64 primary hepatocellular carcinoma patients who underwent radiofrequency therapy from January 2015 to January 2016 were involved in this study as a standard. We measured the mass size of those patients with Magnetic Resonance image, and then yielded the ‘Therapy Area Ratio’ by calculating the heat cauteration range using post Computed Tomography image. The active tip length of variable electrode that interlinked with each generator was 2.5cm and 3.0cm, we also measured the ablation time for 12 minutes to make same experiment condition.

**Results :** Among the whole 64 patients, we applied the ‘A’ generator to 32 patients. And the ‘B’ generator was applied to the others. After the treatment using the ‘A’ post therapy volume value was 9421.35±4477.33, and therapy area ratio was 1209.19±544.91(p<0.05). On the other hand, we were able to get the post therapy volume value as 11834.81±5406.46 and the therapy area ratio showed us a value of 1362.98±367.38 (p<0.05) when we used the ‘B’. As a result, the ‘B generator’s R² value of scatter plot had shown us higher rate of 0.027 points than the ‘A’ for the post therapy volume, it also indicated 0.060 points higher than the ‘A for therapy area ratio.

**Conclusions :** The differences of actual output could exist, because the cauteration ablation range can be changed according to the generator which is in the same condition. Accordingly, it seems to be selectively used depending on appearance of the tumor when we operate the Radiofrequency Ablation.

**Key words :** Radiofrequency ablation, Generator, Therapy area ratio, Electrode, Active tip

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**S03-3**

**Observation of Pelvic Floor Muscle of Regular Adults through M-mode Ultrasound**

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**Purpose :** Urinary incontinence refers a phenomenon discharging urines without one’s will, and the weakening of Pelvic Floor Muscle (PFM) is the major cause. Kegel exercise may serve as a method to strengthen the muscle, but it is not enough for the patient to personally see and feel the exercise status.

**Materials & Methods :** The scanning was conducted on the sagittal segment of the lower abdomen, and the upper part of pubic symphysis in the prone position, and the angle was give to the leg side to get clear image of bladder. The subjects were allowed to see the scan image on the status of PFM exercise when measuring with M-mode. The measurement measure the resting phase of PFM and position change of peak contraction period at M-mode, and used statistics program PASW Statistics 18. Release 18.0.

**Results :** the observer has calculated the average value by getting the measured result value of 4 observers. 9 out of 16 people showed increase in the measured value through PFM exercise for 2 weeks, and 4 people showed decreased in the measured value through PFM exercise of 2 weeks. 3 people could not conduct PFM exercise in the early period, but 2 people became able to conduct PFM exercise through PFM exercise training for 2 weeks, and 1 person could not conduct PFM exercise.

**Conclusions :** The current study measured PFM exercise of regular
S03-4
Specimen of Fine-Needle Aspiration for Liquid Based Cytology: Usefulness of On-Site Visual Assessment
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Purpose: Preoperative thyroid fine-needle aspiration (FNA) is mandatory for the diagnosis of thyroid nodules, but there are some cases in which the results are reported as being non-diagnostic. Thus, we aim to evaluate the correlation between the on-site visual assessment of FNA specimens and the rate of non-diagnostic results on pathology.

Materials & Methods: Two hundred patients who underwent FNA at our hospital between January 2016 and April 2016 were included. All specimens were visually assessed on-site by two independent radiological technologists with respect to three categories: 1) category 1 (specimen amount inside a syringe) (grade 1: at the mid level of a syringe hub, grade 2: at the proximal end of a hub, grade 3: at a syringe neck, grade 4: at a barrel [below 1 cc], grade 5: at a barrel [over 1 cc]), 2) category 2 (specimen color) (grade 1: yellow, grade 2: pinkish, grade 3: red, grade 4: dark red, grade 5: chocolate-colored), and 3) category 3 (number of cell contents seen immediately after shaking bottles containing cell fixing agents) (grade 1: 0–10, grade 2: 11–20, grade 3: 21–50, grade 4: 51–100, grade 5: >100).

Results: 116% (22 of 200) of the aspirated nodules showed non-diagnostic results. Regarding category 1, non-diagnostic results were significantly more common in grade 1 (33%) or 5 (33%) than in grade 3 (5%) or 4 (1%) (P<0.005). For category 2, non-diagnostic results were significantly more common in grade 1 (75%) than in grade 3 (8%) (P<0.003). There was a significant negative correlation between the grading of category 3 and the incidence of non-diagnostic results (r=0.943, P=0.016).

Conclusions: Visual assessment based on the three categories correlated well with the rate of non-diagnostic results. Immediate visual assessments followed by resampling (if necessary) may help reduce the rate of repeat FNA.

Key words: Fine-needle aspiration (FNA), Visual assessment, Thyroid nodules

S03-5
Normal Value of Carotid Intima-Media Thickness in the Healthy Twenties Korean by B-Mode Carotid Ultrasound
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Purpose: Carotid intima-media thickness (IMT) is a surrogate marker of atherosclerosis and imparts prognostic information independent of traditional cardiovascular risk factors. However, the data on IMT measurements in healthy young adults is difficult to find. The study is aimed to measure of carotid IMT at the common carotid artery a healthy twenties in the Korea.

Materials & Methods: Healthy college students aged 20 to 25 years (11±1.5), without evidence of clinical atherosclerosis, underwent B-mode carotid duplex ultrasound using 7MHz linear transducer (Sonomax S20). Carotid IMT were measured at the 1 cm lower from left common carotid bulb in a longitudinal view far wall.

Results: The IMT of the entire subjects was 0.48±0.05 mm. The 25 percentile of IMT was 0.43 mm, 50 percentile was 0.48 mm and 70 percentile appeared to 0.53 mm. When the criterion of obesity is set for more than 25, the average IMT of obese subjects was measured at 0.52 mm. The average IMT of obese group (0.52 mm) was higher than the average IMT (0.49 mm) of normal group. Men’s average IMT was 0.49 mm, women’s average IMT measures 0.48 mm and there was no gender difference regarding the thickness (P=0.5).

Conclusions: This study demonstrated the value of IMT at CCA in a healthy population in the Korean. The average IMT subject to the 20 men and women were 0.48±0.05 mm. Carotid intima-media thickness correlated with body mass index and volume.

Key words: Intima-media thickness, Ultrasound, Carotid artery
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Purpose: To determine whether differences in ultrasound-measured fetal biometry exist among pregnant women of the Akan, Mole-Dagbon, Ewe and Ga-Adangbe ethnic groups in Accra.

Materials & Methods: This was a prospective cross-sectional study involving 448 women with uncomplicated singleton pregnancies, certain date of the last menstrual period and presenting between 19 weeks and 28 weeks of gestation. The participants were selected by proportional quota sampling and comprised 148 Akans, 119 Mole-Dagbon, 96 Ewes and 85 Ga-Adangbe. Each woman was scanned by transabdominal ultrasound once for the study. The biparietal diameter, head circumference and femur length were measured. These were compared by Krukal Wallis test for any significant variations among the four ethnic groups. Maternal age, height and parity were also analysed for any association with the fetal biometric variations.

Results: There were significant variations in femur length measurements (p<0.05) among the four ethnic groups. There were no statistically significant variations in the biparietal diameter (p>0.05) and head circumference (p>0.05) measurements. There was no association between maternal characteristics and variations observed in the femur lengths measurements.

Conclusions: The findings suggest that maternal ethnicity influence foetal femur length measurements in second trimester foetuses. However, a further study with a larger sample size selected across the country is recommended to ascertain if the observed fetal biometric variations has a national character.

Key words: Ultrasound, Fetal, Biometry, Ethnicity

SO3-8
An Evaluation of the Accuracy of Various Ultrasonographic Regression Formulae used in Predicting Fetal Weight among the Basarwa Bushmen Population of Botswana
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Purpose: To determine the most accurate regression model for predicting fetal weight among the Basarwa population of Botswana after a discrepancy between term birth weight (BW) as determined by ultrasonography and the actual birth weight (ABW) was observed at a District Hospital in Botswana.

Materials & Methods: A prospective observational study of singleton Basarwa women was done using an Aloka SSD 350 ultrasound machine. A total of thirty five participants were scanned and had their fetal biometrics scanned into 17 regression models to calculate the estimated fetal weight (EFW) which was then compared with the Actual birth weight (ABW) to determine the accuracy of the model. The accuracy was based on the systematic (SE) and random (RE) errors. The lower the SE and RE values the lower the rank number assigned to the model. Regression analysis was used to formulate a new model best fitting the measured biometric parameters data.

Results: Shinozuka model was ranked 1 with (S.E 0.56%, R.E 11.3%, MAPE 8.74% and a pred (10)% of 66%. Models incorporating multiple parameters had better rankings. A new regression formula

\[ EFW= -14603+1480*BPD-142*HC+148*AC+598*FL (±283.59g) \]

was formulated (S.E 0.43%, RE 9.79%, MAPE 7.57% and a pred (10%)) of 71%). A median term birth weight of 2800g was noted.

Conclusions: Shinozuka model was the most accurate ABW predictor among the evaluated models hence could be incorporated into the ultrasound scan machines in Botswana. Multiple biometric parameters enhance the prediction accuracy of a model. Testing of the new model for stability in a multicentre longitudinal study involving several districts of Botswana recommended. Basarwa have a lower median birth weight of 2800g compared to the reported 3100g for the General Botswana population.

Key words: Basarwa/Bushmen, Accuracy, Birth weight (BW), Regression models

SO3-9
The Need for Regular Quality Control Using Ultrasonic Phantom of Diagnostic Ultrasound Equip-ment
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Purpose: Currently the use of diagnostic ultrasound is continuously increasing, but despite this trend a systematic management of ultrasound equipment is not being practiced. Results from the ultrasound equipment in our department that periodically conducts quality control procedures using a phantom and ultrasound equipment from other departments that do not conduct quality control procedures will be compared. These results will be analyzed and its usefulness will be evaluated.

Materials & Methods: Eight tests acquired from a total of 15 equipment, 6 from our department that periodically conducts quality control procedures and 9 from other departments that do not, using ATS-539 Multi-Purpose Ultrasound Phantom were evaluated and analyzed.

Results: The images from our department’s ultrasound equipment that conducted the quality control procedures met our department’s standards of the eight tests. However, the horizontal and vertical measurements slightly exceeded the baseline measure, but within the acceptable error of measure. On the contrary, from ultrasound equipment that did not conduct the quality control procedures 2 equipment exceeded the maximum acceptable error of measure in the focal zone test and 1 machine exceeded the maximum acceptable error of measure in the sensitivity test.

Conclusions: In order to provide top quality medical images, periodic and consistent quality control procedures should be conducted in accordance with a systematic management of ultrasound equipment. The numerical results evaluated under the quality control procedures currently being conducted are not figures based on a set standard, but rather subjective results depending on the examiner. Therefore, fixed numerical criteria should be set when conducting quality control tests. For consistent quality control, a legal policy managing and evaluating the function of diagnostic ultrasound equipment should be established.

Key words: Ultrasound, Management, Equipment, Phantom, Quality control
12. STUDENT SESSION

ST1-1
Survey of Awareness on the Exposure Dose of Extremity and Eye Lens by Radiation Worker in Nuclear Medicine Department
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Purpose: Radiation workers working in nuclear medicine department are exposed to radiation, especially in extremities and the eye lens, due to their work consisting of distributing radioactive isotopes and injecting patients with the radiological materials.

Materials & Methods: Despite the apparent error in the current assessment method, radiation workers in nuclear medicine department overlook exposure to radiation in the extremities and the eye lens, leading to the current lack of exposure dose control. As such, we set out to understand the radiation workers' level of knowledge and awareness in this issue by surveying 33 radiation workers working in Korean nuclear medicine department.

Results: As for the level of knowledge about the dosimeter for extremities and the eye lens, most radiation workers were aware that radiation exposure in the extremities and the eye lens took place during their work, as well as yearly exposure dose limit, but they were not as knowledgeable about the dosimeter. In the assessment of the radiation workers' awareness of dosimeter, these professionals acknowledged the necessity of wearing a dosimeter to manage the exposure dose in the extremities and the eye lens, although their level of understanding and trust for these products were rather low. In the current usage of dosimeters in nuclear medicine department, it was revealed that most radiation workers do not wear dosimeters during their work, which led to the lack of exposure dose assessment during distribution and injection tasks.

Conclusions: The current study concludes that policies on exposure dose measurement and assessment is required to optimize the amount of exposure to the extremities and the eye lens in radiation workers, in addition to continuous education and training to change awareness about controlling the exposure dose.

Key words: Radiation worker, Extremities, Eye lens, Exposure dose, Nuclear medicine

ST1-2
Change of Signal Intensity according to the Z-axis Direction Coil Angle in Magnetic Resonance
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Purpose: The positioning of the surface coil is an important determinant of performance as only the region close to the surface coil contributes to the signal. However, in clinical circumstances, the angle between surface coil and the z axis substantially affects the signal intensity and the image quality. In our experimental study, we have systematically varied the angle by tilting the surface coil to quantitatively verify the signal loss depending on the tilting angle.

Materials & Methods: Customized sphere phantom was located on the center of the tilting frame. The angle was varied from 0, 22.5, 45, 67.5, 90, 112.5, 135, 157.5 and 180 degrees. MRI scanning was performed on a 3.0T MRI scanner (Archieva, Philips Healthcare, The Netherlands). The body coil was used as the transmitter, and a Flex-S coil was used as the receiver. MRI scanning was performed using the standard T1 and T2 weighted images. The signal intensity of the images was measured with the software image J (National Institutes of Health, USA) and the statistical The statistical significance of the parametric data was determined using an ANOVA test and the post hoc test. P value less than 0.05 was considered to indicate statistical significance. All statistical analysis was performed using the SPSS software package (version 18; SPSS Inc., Chicago, IL, USA).

Results: The signal intensity was decreased the most as the angle goes parallel to the Z axis while the signal intensity had the highest value when it was right angled (90 degrees) to the Z axis (p<0.05). The same results were observed in the T2 weighted images (p<0.05).

Conclusions: It is considered that the tilted angle between the surface coil and the Z axis should not be below 45 degrees or over 135 degrees as the signal is drastically lowered.

Key words: Surface coil, Signal intensity, Z-axis

ST1-3
Usefulness Evaluation on the TMJ Device Manufacturing with a 3D Printer in TMJ MRI Scan
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Purpose: Because temporomandibular joint MRI tests require a relatively long test period, an artifact can occur. Therefore, in this paper, using the 3D printing technology, it made a TMJ device that can be used at the time of the TMJ MRI examination, to evaluate its usefulness.

Materials & Methods: Using the 3D MAX modeling program, made a TMJ device 3D model. And the data converted to STL File. The converted file generated G-code file and it was printed to 3D printer. The methods are when a TMJ device was not used, when a TMJ device product was used, and when a 3D printing TMJ device was used, So each images for the presence or absence of image quality and motion artifact in the disk qualitatively divided and evaluated.

Results: The image quality within the disk was highest when a TMJ device product was used, followed by the use of a 3D printing TMJ device and when a TMJ device was not used. Also, the degree of motion artifact occurrence was highest when a TMJ device was not used followed by the use of a 3D printing TMJ device and the use of a TMJ device product.

Conclusions: The quality of images between commercialized TMJ device and 3D The Printer did not appear a significant difference enough to interfere as Lesions distinction and the exact anatomical description. As a result, it is effective conserding cost that using the device of 3D printing.

Key words: 3D Printer, TMJ device, Motion Artifact

ST1-4
Establishment of Dose Constraints for Radiation Workers in Nuclear Medicine
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Purpose: Because temporomandibular joint MRI tests require a relatively long test period, an artifact can occur. Therefore, in this paper, using the 3D printing technology, it made a TMJ device that can be used at the time of the TMJ MRI examination, to evaluate its usefulness.
Purpose: The ICRP 103 report published in 2007 recommended implementing dose constraints related to radiation sources as a way to accomplish the optimization of radiation protection. The establishment and implementation of dose constraints in medical institutions should be reflected in the optimization procedure, but sufficient discussion and cooperation between interested parties are required.

Materials & Methods: In order to establish dose constraints for radiation workers in nuclear medicine, the data of individual exposure doses were collected and classified according to years, occupations, and job duties, and further classification was conducted according to the sections of the interval of 0.5 mSv.

Results: It is suggested that dose constraints should be set at the level of 75% or 95% of the lowest dose in radiation workers. The dose constraints for all the radiation workers of the nuclear medicine department proposed from 2011 to 2015 were set at 4.5 mSv in case of the level of 75% and at 7.5 mSv in case of the level of 95%.

Conclusions: It is suggested that dose constraints should be set at the level of 75% or 95% of the lowest dose in radiation workers. The dose constraints for all the radiation workers of the nuclear medicine department proposed from 2011 to 2015 were set at 4.5 mSv in case of the level of 75% and at 7.5 mSv in case of the level of 95%.

Key words: ICRP 103, Dose constraint, Radiation worker, Nuclear medicine

ST1-6
MTF evaluation of Digital Mammography system.
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Purpose: We measured the MTF(Modulation Transfer Function) in CR(Digital Radiography), and compared MTF of CN(Computed Radiography)

Materials & Methods: This examination followed the standards of IEC 62220-1-2. Tube Voltage was 28kVp and additional filters were 2mm equal Al. The characteristic curves were obtained by varying the dose of the radiation dose from 0.15mGy to 5.5mGy. The edge method for calculating the presampled MTF was examined. The software of evaluation used ImageJ and Excel.

Results: The characteristic curves of DR is proportional to the increase in radiation dose. The characteristic curve of CR is proportional to the exponential increase in the radiation dose. MTF 0.8 value of DR is 2.4(cycles/mm), and MTF 0.8 value of CR is 1.2(cycles/mm). MTF 0.5 value of DR is 7.1(cycles/mm), and MTF 0.5 value of CR is 2.4(cycles/mm).

Conclusions: The dynamic range of CR is wide more than the dynamic range of DR. The resolution of DR is better than the resolution of the CR. If so we will pay attention to the optimal dose to be examined. If we pay attention to the radiation dose, DR will be the best for mammography examination.

Key words: Mammography, MTF, Digital Radiography, Computer Radiography

ST1-7
Imaging Dose of Megavoltage Computed Tomography (MVCT) for Treatment Verification in the Tomotherapy of Breast Cancer
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Purpose: Tomotherapy units are equipped with an on-board megavoltage computed tomography (MVCT) imaging system. Daily image verification for accurate patient alignment is expected prior to tomotherapy treatment. The purpose of this study was to investigate whether significance differences exists on radiation dose delivered to organs at risks in MVCT verification using three predefined scanning mode, namely fine (2mm), normal (4 mm) and coarse (6 mm), hence estimate the magnitude of cumulative imaging dose on a course of tomotherapy for treatment of the left breast and give recommendations on imaging protocol.

Materials & Methods: Organ doses were measured with thermoluminescent dosimeters (TLD-100) placed within a female Rando phantom for MVCT imaging. TLDs belonging to the same predefined scanning mode, namely fine (2mm), normal (4 mm) and coarse (6 mm), hence estimate the magnitude of cumulative imaging dose on a course of tomotherapy for treatment of the left breast and give recommendations on imaging protocol.

Results: The characteristic curves were obtained by varying the dose of the radiation dose from 0.15mGy to 5.5mGy. The edge method for calculating the presampled MTF was examined. The software of evaluation used ImageJ and Excel.

Results: The characteristic curves of DR is proportional to the increase in radiation dose. The characteristic curve of CR is proportional to the exponential increase in the radiation dose. MTF 0.8 value of DR is 2.4(cycles/mm), and MTF 0.8 value of CR is 1.2(cycles/mm). MTF 0.5 value of DR is 7.1(cycles/mm), and MTF 0.5 value of CR is 2.4(cycles/mm).

Conclusions: The dynamic range of CR is wide more than the dynamic range of DR. The resolution of DR is better than the resolution of the CR. If so we will pay attention to the optimal dose to be examined. If we pay attention to the radiation dose, DR will be the best for mammography examination.

Key words: Mammography, MTF, Digital Radiography, Computer Radiography
(4mm), the absorbed dose to the organs of interests can be scaled down by 0.7 and scaled up by 2.1 for coarse (6mm) and fine scans (2mm) respectively.

**Conclusions** : Imaging dose was found to be a small fraction of tomotherapy treatment dose. However, any incremental of dose would contributed to increasing risk of secondary malignancies. Optimization of imaging protocols is of paramount importance to keep the radiation exposure ‘as low as reasonably achievable’. The recommendation of undergoing daily coarse mode for MVCT verification in breast tomotherapy not only mitigates the radiation exposure to normal tissues, but also trims the scan-acquisition time.

**Key words** : Megavoltage computed tomography (MVCT), Imaging Dose, Tomotherapy, Treatment verification, Breast ca

**ST1-8**

**Evaluation of the Accuracy of SBRT (Stereotactic Body Radiosurgery) Using Real-Time Respiratory Simulation System**

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**Purpose** : Cyberknife Synchrony Respiratory Tracking system is a Precise Investigational Device which can Track the Movement of the Target in Accordance with the Respiration by delivery Beam of Radiation on the Tumor in Real-time. Cyberknife Synchrony Device is required to analyze the Internal movement of Tumor Quantitatively and to correct Errors in Accordance with the Respiration. In this study, a close Evaluation using a Real time Respiratory Simulation System was conducted in order to Acquire the data of the internal Movement of Tumor and Respiration of the Patients who Underwent Cyberknife SBRT.

**Materials & Methods** : The internal Log file of the Movements which were obtained from a Target of 10 Patients who Underwent Cyberknife SBRT was applied to the Real-time Respiratory Simulation System Radiation Treatment Plan where Total 10 Patients, 5 Gy, 20mm Cone will be used with the same Center point was Setup. Evaluation of Gamma Index Method which inserts Radiochemical Film into the Phantom of the Cube was Performed.

**Results** : Under the Condition of the Default Setting for the Away Match and Dose Difference in Gamma Index Method, which is Under the Condition of 3mm, Either Success or Failure was Evaluated. Success Rate is Found to be 95.3±3 to 88.17%~ 98.81%. I was able to Verify the Accuracy of Tyranny Dose, Evaluated. Success Rate is Found to be an Average 95.3±3 to 88.17%~ 98.81%. I was able to Verify the Accuracy of Tyranny Dose, Evaluated. Success Rate is Found to be an Average 95.3±3 to 88.17%~ 98.81%

**Conclusions** : Through this Study, the Accuracy of Cyberknife SBRT could be Evaluated Confirmed. Because the Correlation Between the Target and the Internal Respiration Pattern is Considered a Factor to Influence the Success of the Treatment the Researches will have to be Followed which can Minimize the Movement of the Target and Steady Respiration.

**Key words** : Cyberknife, Synchrony, Real-time Respiratory Simulation System, Gamma index, SBRT(Stereotactic body radio sursery)

**ST1-9**

**Research on Optimal Fa Value at T1-Weighted Image Using SE Technique in 3.0T MRI**

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**Purpose** : 3.0T caused problems of increased SAR compared to 1.5T. Therefore, attempts were made with the SE technique to inquire into an adequate flip angle value while also resolving the SAR issue.

**Materials & Methods** : SIEMENS 3.0T MR system and 32ch Head coil were used. The image parameter were TR 700msec, TE 10msec, FOV 220mm, Slice Thickness 5mm and NEX 1. It obtained T1-weighted image using SE technique. RF pulses were 70˚, 80˚ and 90˚ and refocusing pulses were 120˚, 150˚ and 180˚, in each image it was compared by measuring the SNR and CNR.

**Results** : The measurement shows that the SNR value of white matter was the highest was 313.89 and the SNR value of grey matter was the highest was 278.65 when RF pulse was 90˚ and refocusing pulse was 180˚. CNR between white matter and grey matter was the highest with 1.2 when RF pulse was 80˚ and refocusing pulse was 150˚. But there wasn’t big difference of CNR values for each flip angle resulting in no statistical meaning. (p>0.05).

**Conclusions** : The contrast-to-noise ratio in accordance with changes to the flip angle did not display a significant difference. Therefore, if a low flip angle of excitation pulse 80˚ and remagnetization pulse 150˚ are used to resolve the SAR issue while maintaining the quality of the image during high magnetic testing, the optimum T1 weighted images can be obtained.

**Key words** : FA, SAR, SNR, CNR, SE

**ST1-10**

**An Education Intervention for Radiographers Rating Mammographic Breast Density**

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**Purpose** : Mammographic density (MD) is linked to breast cancer risk. Women undergoing screening can be identified according to their breast cancer risk and appropriate additional imaging pathway decisions can be made for women with dense breasts. Breast Imaging Reporting and Data System (BI-RADS) is the widely used qualitative method. BI-RADS has shown to have wide inter-reader variations. The purpose of this study was to investigate whether training improves consistency of radiographers’ mammographic density ratings.

**Materials & Methods** : Seven radiographers were asked to rate the MD of a 40 image test-set pre-and post-training. A combined image cranial caudal (CC) and medio-lateral oblique (MLO) was shown to have wide inter-reader variations. The purpose of this study was to investigate whether training improves consistency of radiographers' mammographic density ratings.

**Results** : A strong positive correlation was shown between the radiographers pre and post training density rating (p<0.001). Radiographers inter-rater agreement was assessed and was compared with a Volpara density grades (VDD) as well as radiologists’ consensus BI-RADS scores.

**Conclusions** : The findings indicate that educational intervention improves the inter-rater agreement of radiographer’s density scores as well as improving their agreement with automated and radiologist assessment.

**Key words** : Training, Mammographic density, BI-RADS, Radio-graphers
ST1-11
MTF Comparison CT Equipment Using AAPM PHANTOM
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Purpose : Measured using the AAPM Phantom the difference in CT value of MTF.
Materials & Methods : The three companies of the CT apparatus to scan the AAPM PHANTOM out the same conditions. First, save the image by CT scan equipment. And each image using ImageJ quantified using the EXCEL a pixel value corresponding to 1.75mm, 1.50mm, 1.25mm, 1.00mm, 0.75mm, 0.60mm, 0.50mm, 0.40mm of AAPM PHANTOM, and each maximum value, a minimum value is obtained. The maximum value here calculated pixel, by using the minimum value, measuring the spatial resolution of an image obtained by SCAN. And using the value of the air values and water from this number and the CT image, it calculates the MTF values of the respective image. In the same way, after obtaining the MTF values of three CT apparatus, shown in the graph this number by EXCEL. Is a image treatment. In this study, we tried to use blend of nail varnish and lead shields, but lead shields are too heavy to keep the position for radiation because of high sensitivity to radiation. Generally CT apparatus images are used differently. The MTF values were figures appeared differently, which could know the CT represents the most accurate value.
Conclusions : The MTF value of each CT were different.
Key words : AAPM Phantom, CT, MTF, QC, Contrast

ST2-1
Radiation Protection of Human Nail Against Radiation with Blend of Nail Varnish and BaSO4 ; A Feasibility Study
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Purpose : In radiation therapy, especially total skin electron beam irradiation, fingernails and toenails have to be protected from radiation because of high sensitivity to radiation. Generally depending on the dose, it is possible that patients may lose the nails. Therefore on treatment day, sensitive body sites will be covered with lead shields, but lead shields are too heavy to keep the position for treatment. In this study, we tried to use blend of nail varnish and BaSO4 for protection of nails instead of heavy lead shields.
Materials & Methods : Exposure setting was 50 kVp, 320 mA, 1.0 sec, SDD 120 cm for delivery about 0.5 rad in the air. Solution blends are made BaSO4(140) and nail varnish in the proportion of 1:1 and 2:1 for spread on the tip of plastic gloves. Exposure doses were measured from no detection, 1 layer, 2 layers and 3 layers painted over of each proportion of blends.
Results : The mean exposure doses with no detection was 647 mR, on 2:1 solution were 415 mR, 266 mR, 216 mR for each 1 layer, 2 layers and 3 layers of blends. It shows significant dose reduction.
Conclusions : The blends of BaSO4 and nail varnish can reduce the surface dose significantly. It can be simply used by coating on the tip of plastic gloves before starting treatment. This study shows the feasibility of application of light shielding tool by blend of BaSO4 and nail varnish instead of too heavy lead shields.
Key words : Nail varnish, Nail dose, Total skin electron irradiation

ST2-2
Metabolic Component to an Anatomical Site in the Brain of Rats: Study of Proton Magnetic Resonance Spectroscopy
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Purpose : The thalamus, hippocampus, and cingulate cortex in the brain tissue of rats are measured metabolic components non-invasively by using the hydrogen magnetic resonance spectroscopy, and in order to compare the difference of part-specific metabolic component.
Materials & Methods : An experiment was performed on the brain tissue of 4 normal rats (system: Sprague-Dawlet, age : 8-weeks, weight: 280~300g). Using 9.4T MR equipment for small animals, axial plane and coronal plane T2 weighted image are examined and obtained magnetic resonance spectroscopy for each of VOI(Volume of Interest) about thalamus (3.0 x 3.0 x 3.0mm³), hippocampus (2.0 x 2.5 x 3.0 mm³), cingulate cortex (1.8 x 2.5 x 2.5 mm³). Metabolism components from obtained data were analysed quantitative, qualitative by LCModel software, part-specific metabolism component’s statistical difference was comparison analysis using ANOVA test.
Results : In a total of five metabolites (GSH, Ins, NAA, tCho, tCr), it showed the significant difference between the brain tissue. In the cingulate cortex and hippocampus, it was revealed that there is a concentration difference significantly between the Ins (p<0.01) and the NAA (p<0.05 ). In the hippocampus and the thalamus, the tCho (p<0.01) was revealed significantly. In the thalamus and the cingulate cortex, the GSH (p<0.05), the Ins (p<0.001), the tCho (p<0.001), and the tCr (p<0.01) showed the significant difference.
Conclusions : The distribution of the metabolic components could be confirmed that there is a difference to each part-specific brain tissue examined using magnetic resonance spectroscopy to non-invasive method. The results of this study are believed to be used as an important reference data studying the changes of the metabolic components according to brain disorder studies or disease.
Key words : Magnetic resonance spectroscopy, Metabolic component, Hippocampus, Thalamus, Cingulate cortex

ST2-3
The Effective Tube Potential on the Image Quality of Chest Computed Radiography
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Purpose : The purpose of our study is to select the optimum kVp at chest computed radiography. To this purpose, a change
in the effective dose and the image quality according to the tube voltage was measured.

Materials & Methods: Focus - Image receptor distance was 100cm. The places of human phantom was in front of busy image. Image was acquired the pac system at charge of tube voltage while maintained the same radiation dose. The acquired data analyzed signal-to-noise ratio, histogram width and effective dose of Monte carlo simulation.

Results: The width of histogram gradually decrease with increasing tube voltage. Signal-to-noise ratio gradually increase with increasing tube voltage. The effective dose gradually decrease with increasing tube voltage.

Conclusions: A kVp examination was found as results that represented image quality increasing, the latitude increasing and effective dose decreasing. In order to obtain a good image quality, we must know exactly the characteristics of the device.

Key words: kVp, Computed Radiography, Signal-to-noise ratio, Histogram

ST2-4
Dosimetric Comparison of Simultaneous Integrated Boost Versus Concomitant Electron Boost in the Treatment of Breast Cancer
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Purpose: Radiation therapy to the entire breast after total mastectomy or breast conserving surgery (BCS) is the standard care for women with early stage breast cancer. Traditionally, electron boost is added after a routine radiation treatment to boost the gross tumour volume or surgical scar. Simultaneous integrated boost (SIB) is another method that delivers the boost with routine treatment in a hypofractionation scheme. This retrospective study aimed to compare the dosimetric differences between the two schemes under the use of Tomotherapy as the routine radiation treatment.

Materials & Methods: Fifteen sets of Tomotherapy SIB plans with Computed Tomography (CT) images of breast cancer cases in 2012-2015 were recruited. One was unsuitable and thus excluded, leaving 14 patients in total. Plans of Tomotherapy SIB (Tomo-SIB) and Tomotherapy with sequential electron boost (Tomo-EB) were generated for each patient.

Results: The target coverage was good in both techniques (Coverage Index>0.99). The conformation number (CN) of the target was higher with Tomo-SIB (p<0.03). The Dmean and V5 in the non-GTV breast volume were better in Tomo-SIB (p<0.03). The Dmax of the ipsilateral breast 3mm skin dose was statistically significantly lower with Tomo-SIB, whereas the Dmean and Dmax were statistically significant only in the right-sided cases (p<0.05, and p<0.03, respectively).

Conclusions: Considering Tomo-SIB provides a better target coverage with less dose spillage, with generally better or comparable dose profile in the OARs in addition to a shorter overall treatment course, it may be a better choice over Tomo-EB for the benefits and convenience of the patients.

Key words: Tomotherapy, Simultaneous integrated boost, Electron boost, Breast cancer, Dosimetric comparison
joint of young patients was the level of 41% compared to the average dose at the hip joint of young children taking pelvis examinations presented in the KFDA 2013 standard guideline.

**Conclusions** : When conducting lower extremity scanography in the patients’ pediatric age or teenage years, the minimum amount of dose should be used with limitations to body parts, and it is considered that radiation shielding is necessary for organs high in sensitivity to radiation.

**Key words** : Lower Extremity Scanography, DAP(dose area product), ESD(entrance surface doses)

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**ST2-7**

**Preparing Indigenous Students to Enter Health Science Professions**

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**Purpose** : Indigenous students are underrepresented in health science professions, including radiography. This contributes to the poor health outcomes of the indigenous people. Strategies are utilized in schools to reduce the disparity, while the result is insignificant. The aim of this literature review is to analyse the literature related to supporting indigenous students to enter and complete health science education programs including radiography.

**Materials & Methods** : A review of the literature from Australia and New Zealand was conducted to identify the barriers that prevent indigenous students entering health professions and to consider enabling pedagogy and other supports to address these barriers.

**Results** : The barriers for indigenous students entering health science courses include language difficulty, insufficient academic preparation, cultural diversity, financial difficulty, racism and insufficient information on health science profession pathways. Universities in Australia have supports to address some of these barriers including the use of student support centers, indigenous scholarships and student tutorials. One of the recommendations for teaching methodology is the application of the “both ways” approach. Here however, further research is required for all educators in Australia to utilize this approach effectively. Other teaching methods include using six broad principles, online delivery lectures, an anti-racism approach and the use of culturally diverse instructional material. The findings of this literature review indicate that current indigenous pedagogy is inconsistent throughout Australia. The review also confirms that there is limited evaluation for the efficiency of the existing teaching methods.

**Conclusions** : There are strategies to help indigenous students to overcome the barriers for entering health science professions. However, problems such as inconsistent pedagogy and insufficient training for all educators in Australia are still present. Greater research is required to demonstrate the best pedagogy to employ with indigenous students in Australia to enable them to enter educational programs in the health sciences including radiography.

**Key words** : Pedagogy, indigenous students, Health science professions, Cultural and Language barriers

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**ST2-8**

**A Study on Accuracy and Usefulness of In-vivo Dosimetry in Proton Therapy**

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**Purpose** : In this study, the authors attempted to measure the skin dose by irradiating the actual dose on to the TLD(Thermoluminescence Dosimeter) and EBT3 Film used as the In-vivo dosimetry after planning the same treatment as the actual patient on a Phantom, because the erythema or dermatitis is frequently occurred on the patient’s skin at the time of the proton therapy of medulloblastoma patient receiving the proton therapy. They intended to know whether there is the usefulness for the dosimetry of skin by the comparative analysis of the measured dose values with the treatment planned skin dose.

**Materials & Methods** : The CT scan from the Brain to the Pelvis was done by placing a phantom on the CSi(Craniospinal irradiation) Set-up position of Medulloblastoma, and the treatment Isocenter point was aligned by using DIPS(Digital Image Positioning System) in the treatment room after planning a proton therapy. The treatment Isocenter point of 5 areas that the proton beam was entered into them, and Markers of 2 areas shown in the Phantom during CT scans, that is, in all 7 points, TLD and EBT3 Film pre-calibrated are alternatively attached, and the proton beam that the treatment was planned, was irradiated by 10 times, respectively.

**Results** : As a result of the comparative analysis of the average value calculated from the result values obtained by the repeated measurement of 10 times with the Skin Dose measured in the treatment planning system, the measured dose values of 6 points, except for one point that the accurate measurement was lacked due to the measurement position with a difficulty showed the distribution of the absolute dose value ± 2% in both TLD and EBT Film.

**Conclusions** : In this study, the clinical usefulness of the TLD and EBT3 Film for the Enterance skin dose measurement in the first proton therapy in Korea was confirmed.

**Key words** : Proton therapy, In-vivo dosimetry, Thermoluminescence Dosimeter, EBT3 Film

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**ST2-9**

**Mixed Filter of Noise Reduction for Diffuse Liver Disease in the Ultrasound Image**

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**Purpose** : In the currently performed ultrasonography, the diagnosis of diffuse liver diseases is being made depending on the subjective judgment of practitioners. The representative diffuse liver diseases identified through ultrasonography on the epigastrium are fatty liver and liver cirrhosis. These diseases can develop into fatal diseases. Accordingly, this study suggested the ways to help in identification of diffuse liver diseases during ultrasonography on the epigastrium using an objective and quantitative method.

**Materials & Methods** : The ultrasonic phantom images acquired using Philips IU22, an ultrasonograph of hospital H, and ATS-339 multi-purpose phantom, were designated as six ROIs measuring 50x50 in size and one background...
by applying an image processing program. As for the mixed filters, tests were conducted on approximately 450 types. Then, the filters were applied to ultrasonic phantom images and 13 mixed filters producing the highest SNR, CNR, and MSR values were selected. To measure the loss factor and structural similarity of the clinical images before and after application of the 13 selected mixed filters, PSNR, and SSIM parameter values were calculated, compared and analyzed using icy program.

Results: For the 13 mixed filters producing the highest parameter values among the mixed filters proposed, the SNR value increased from 3.29 before application of the filters to 4.16 after application in normal images, from 4.33 to 4.681 in the images of fatty liver and from 0.059 to 0.075 in the images of liver cirrhosis. In all three cases, PSNR before and after the filter application was over 30dB and SSIM was close to 1, indicating almost no image loss.

Conclusions: It is considered that noise reduction and picture quality improvement will be achieved using the mixed filters suggested in this study, and thus the filters will be able to function as a subsidiary means in quantitative identification of diseases in ultrasonography, which is currently dependent on the subject judgment of practitioners.

Key words: Mixed filter, SNR/CNR, MSR, PSNR, SSIM

ST2-10
Dose Assessment of Practician’s Eyeball Using L-Block Shield in Nuclear Medicine Related Work Environmen
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Purpose: The present study intends to evaluate the doses for practitioners’ eyeballs upon handling of radiation sources within task environments of the nuclear medicine department, and the doses to eyeballs as a function of the use of L-block shielding apparatuses employed for radiation protection.

Materials & Methods: To evaluate the dose distribution as a function of the used thicknesses for L-block shielding apparatus, MCNPX program was used. After the phantom and the radiation sources (99mTc, 201Tl, 123I, 67Ga, 111In, 18F) constituting cranium, brain, cornea inside eyeball, lens, vitreous body, optic nerve were positioned at the same distance, the simulated L-block shielding apparatus was positioned between the radiation source and the phantom, followed by evaluation of dose distribution in eyeball per organ as a function of lead glasses composing the interior of shielding apparatus and an increase in lead thickness (5~60 mm), and shielding effects as a function of thickness of the L-block shielding apparatus were calculated on the basis of the dose upon non-use of the shielding apparatus.

Results: According the results of evaluating dose distributions per organ within the eyeball of a practitioner upon handling of radiation sources in the nuclear medicine area, the highest tendency was shown in the order of cornea, lens, optic nerve, vitreous body, and brain, while the dose reduction rates per thickness of L-block shield for each radiation source showed the tendency of being inversely proportional to the energy of gamma-rays emitted from the radiation source.

Conclusions: According to the results, the differentiated dose management for the lenses of practitioners is required. Also, the use of L-block shielding apparatuses with a larger thickness than the optimum per radiation source should be realized for radiation protection on behalf of practitioners.

Key words: MCNPX, L-block, Eyeball dose

ST2-11
Feasibility Study for Development of Improved and Patient Friendly Mouth Piece in Radiation Therapy by 3D Printing
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Purpose: In the radiation therapy for head and neck cancer, mouth piece should be applied for depressing tongue and keeping mouth opening in some cases. However endoscopic mouth piece is generally used in radiation therapy because of nonproduction specialized commercial mouth piece for radiation therapy. Therefore we made specialized and patient friendly mouth piece for radiation therapy with CAD (computer-aided design) and 3D printer.

Materials & Methods: Basic concepts of mouth piece were designed with strawboard or toy tools for applying to various conditions of patient’s oral cavity. During conceptualizing, shape and function of mouth piece were considered for reducing patients’ discomfort. After conceptualizing, properties of mouth piece were designed with CAD and hypostatized by 3D printer.

Results: Two types of mouth piece were developed by CAD and 3D printing. First one can control the length and angle of plate for depressing tongue and has grooves for fixing the teeth position. Second one can control the length for depressing plate and use mold of patient’s teeth for immobilization. These mouth pieces can be modified setting for accepting patient’s various conditions.

Conclusions: The existing mouth pieces are not fitted for using radiation therapy patients who have deformation in oral cavity by surgery or cancer. Accordingly, customized mouth piece for each patients is required. 3D printer is now in general use, so it is possible to make tailored immobilizing device for patient in radiation therapy. This study shows the feasibility of development in radiation therapy device which is more patient friendly considering individuality of patients by using 3D printing.

Key words: Radiation Therapy, Mouth Piece, 3D printer

ST3-1
Evaluation of Usefulness Through Dose Measurement of Virtual and Actual Bolus
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Purpose: This study was to determine the utility of virtual bolus by measuring surface dose, virtual and real boluses of the treatment planning system using phantom under the consideration of thoracic wall radiotherapy in the patients who underwent mastectomy.

Materials & Methods: Using IMRT thorax phantom, CT scan was performed in the condition without the application of bolus and with the application of 5, 10 mm bolus. From the treatment plan system, virtual bolus was generated in CT image that was not applied with bolus, while opposing tangential radiation method was planned for the general treatment of thoracic wall in CT image that was applied with bolus. The doses were measured three times by the thickness of bolus using radiation treatment device and OSLD with setting eight points including six by 4 cm interval from medial margin of phantom irradiation field, and two by 2.5 cm interval from the center of the field into the superior and inferior directions.

Results: Results were shown with 153 - 212 cGy in 5 mm virtual bolus and with 160 - 210 cGy in 10 mm virtual bolus. The dose was distributed with 121 - 215 cGy in the treatment plan applying 5 mm bolus, and with 129 - 218 cGy applying 10 mm bolus. The mean values of dose measured three times by the actual treatment device were 136.33 - 205.67 cGy in 5 mm bolus and 178 - 209 cGy in 10 mm bolus. The difference of calculated values in the plans applying between virtual and real bolus was relatively small within 5% based on the measured doses.

Conclusions: In the virtual CT treatment, it showed the same effect as the treatment plan was performed with the actual bolus image, therefore, it could estimate the dose with the function of virtual bolus application in the treatment plan system.

Key words: Respiratory gating, SUV, FWHM, SNR, CNR

ST3-2

Usability Evaluation of Bone CT and Abdomen CT Images in accordance with the Change in the Value of Kernel

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Purpose: This research is to find the best kernel in the images with the Bone and Abdomen Setting by comparing the result analyzed with the quantitative evaluation using the result analyzing spatial resolution and contrast resolution after setting the Window Width and Level relevant to the Bone and Abdomen after conducting CT scanning using AAPM CT performance phantom.

Materials & Methods: Quantitative evaluation using MATLAB was conducted on 16 spatial resolutions and 16 contrast resolutions acquired at AAPM Phantom with SOMATOM Definition Flash. For quantitative evaluation, the research tried to find out the degree of recognition on the set of the bone and abdomen setting images acquired for the investigation on the spatial resolution using Matlab (R2008b) software. Also, we tried to figure out if each eccentricity index (EI) is different when the extraction of boundaries is calculated through two holes.

Results: At the quantitative evaluation, the bone and the abdomen setting of low-contrast resolution calculated the average EI of each holes from B10 to B80, and EI was low when the diameter was big and it was closer to a circle in general. B30 is the best in bone setting and B20 was in abdomen setting. For spatial resolution, it is possible to identify holes smaller than 1.0mm excluding B10 in bone setting, B10 and B20 in abdomen setting.

Conclusions: Under the quantitative analysis, in abdomen setting, the low-contrast resolution shows the smallest EI on B20 image and it was the highest with 1.52 in CNR. On the spatial resolution, it corresponded to the standard of the quality control manual as the identification was available up to a 1.0mm hole. In bone setting, the low-contrast resolution showed the lowest EI with 1.13 on B30 image. However, on the spatial resolution, the standard corresponded to the kernel as B20 can be identified up to a 1.0mm hole.

Key words: Low Contrast Resolution, Spatial Resolution, Quantitative Evaluation

ST3-3

Dose Changes according to Voltage in Chest PA Projection Using AEC

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Purpose: This study is to determine optimal dose changes according to voltage in chest PA projection using AEC.

Materials & Methods: Despite the expanding and increasing use of radiation in modern medical science, we will attempt to decrease exposure dose using the optimal conditions. We chose 5 hospitals in Busan and Ulsan that are using general x-ray systems and AEC. We carried out the experiment at each hospitals chest PA projection. In experiments, we changed the voltage from 80kV to 90kV, 100kV, 110kV, and 125kV, measuring the time dose and detecting images using an area dosimeter. Through the image evaluation program(Image-J) we appraised the quality of the image detected.

Results: We get the results. High voltage projection was most high quality of the image detected.

Conclusions: We concluded that using a 10mAs tube current is very helpful in ensuring high quality image detection and reducing exposure dose.

Key words: AEC, Chest PA projection, Exposure dose, Dose Area Product real time dose

ST3-4

Male/Female Students Bone Density and Physical Difference

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Purpose: In order to find out the change observation of bone density of male/female students’ running exercise, we measured BMI, blood pressure, bone density. We tried to find out a interrelation between those two.

Materials & Methods: 7 male/female students participated in the running exercise. They themselves became participants and for 8 weeks 3 days a week. They used treadmills for about 30 minutes and checked and compared their bone density, BMI, blood pressure 3 times before the experiment, 4 weeks into the experiment, and 8 weeks into the experiment. Bone mineral density measuring instrument which is exclusively used at calcaneus(SONOST-3080) was used and the measurement was taken in the condition of 18℃ machinery temperature
and 26.2°C experimenter temperature. We used a BMI(M-Tex) measuring machine and blood pressure(solco biomedical) gauge BP686 as our BP sensor.

Results: The average age of the participants were 22.6. Average bone density before the experiment was 89.4, average BMI was 21.4, and the highest average blood pressure was 116.4, and the lowest was 72.1. When divided into male and female separately, male’s average bone density was 106.1, female’s were 67.3. Highest blood pressure were 113.7 and 120 respectively, and lowest were 67.3 and 78.3. Men’s average BMI was 22, women’s were 20.6.

Conclusions: As a result, male/female students in their 20s who exercised three times a week showed a irregular value, but averages enhanced and blood pressures were mostly normal.

Key words: BMI, Bone mineral density, Osteopenia, Osteo-porosis.

ST3-6
Emerging 3D-Printed Technologies in Radiation Therapy

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Purpose: To identify and justify current and potential uses of 3D-printed accessories for radiation therapy (RT), with consideration of costs, dosimetry, workflow and patient outcomes. This paper is an evaluation of current research and consideration of future applications.

Materials & Methods: A systematic review of literature published after January 1st 2011 has located papers from databases and non-traditional sources. The MeSH term “Printing, Three-Dimensional” was introduced in 2015 and papers before 2014 are scarce. In light of this we anticipate data collection will continue until shortly before final submission.

Results: 3D-printed personalised bolus, brachytherapy templates and immobilisation devices emerged as foci of treatment-related research to date. Findings report that the 3D-printed accessories deliver equivalent or improved dosimetric properties, superior efficiency and enhanced patient experiences when compared with other current methods. This emerging technology is a cost-effective alternative to traditional methods, with the benefit of being able to reproduce multiple exact copies in a time-efficient manner.

Conclusions: 3D-printers can efficiently produce high-quality, personalised accessories for a broad range of radiation therapy applications. The required hardware is increasingly affordable and the development of open-source RT-specific software means the technology is becoming more accessible, therefore providing potential opportunities for both established and developing radiotherapy providers. Ongoing research is warranted in this rapidly evolving technology.

Key words: 3D-printed, radiotherapy, dosimetry, evolving.

ST3-7
The Measurement of Exposure Dose
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Purpose: To know Exposure Dose of exterior space in opening door fully of x-ray lab

Materials & Methods: Based on distances (100, 200, 300cm from door of x-ray lab), and height (160cm-height of genital gland), (90cm-height of lens) Using phantom, we tested the 3 parts (chest, L-spine, abdomen) of it through with each other setting conditions and measured the exposure dose

Results: That were measured highly from the radiography of chest PA, L-spine, abdomen AP as followed 6.05μSv, 4.45μSv, and 3.95μSv at the 165cm height outside 100cm from the Exterior space Chest PA was measured as the highest exposure does at 100cm from door of x-ray lab and the 165cm height from the bottom Abdomen AP was measured as the lowest exposure does at 300cm from door of studio and the 90cm height from the bottom We found that does following the increase of distances was reduce and does at the 165cm height is higher than does at the 90cm height on the whole.

Conclusions: In seeing measured does, it appears exposure dose of exterior space was extremely low amount compared with limit of dose (1mSv), in order to remove unnecessary exposure does it is essential to need closing door of x-ray lab entirely

Key words: Exposure dose, Limit of dose

ST3-8
Examining Cerebrovascular Changes after Aerobic Exercises by Analyzing MRA Images
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Purpose: Aerobic exercise is effective for preventing cerebrovascular diseases. In that, this study focuses on investigating cerebrovascular changes with MRA images by comparing before and after the aerobic activity.

Materials & Methods: Subjects of this experiment with 3.0T MRI are fifteen healthy individuals without specific disease. Cerebrovascular transformations are compared before and after the aerobic activity (treadmill, 7km/h, 10min), using MRA scan. The scanned pulse sequence is 3D TOF (time of flight) with flow related signal enhancement; the acquired data are MIP (maximum intensity projection) images. Using image analysis tool, MIP images are set by equivalent ROI in examining ICA (internal carotid artery), VA (vertebral artery), STA (superficial temporal artery), ECA (external carotid artery) and BA (basilar artery). All data measured are analyzed with software (SPSS 18.0).

Results: As a result, acquired MRA images indicate that signal intensity is increased in case of Rt. VA (2.4%, P>0.05), Lt. VA (5.7%, P<0.05), Rt. STA (16.6%, P<0.05), Lt. STA (18.1%, P<0.05), BA (5.6%, P<0.05) with relation to comparing before-after aerobic activities. However, Rt. ICA (2.7%, P>0.05), Lt. ICA (1.1%, P>0.05), Rt. ECA (1.5%, P>0.05), Lt. ECA (0.2%, P>0.05) decreased. The comparison of vessel thickness before-after exercising aerobics results in the rise of ECA (15.2%, P<0.05), STA (58%, P<0.05), while ICA (8.8%, P<0.05), VA (1.4%, P>0.05), and BA (7.2%, P>0.05) decreased.

Conclusions: Cerebrovascular transformation during aerobic exercises is analyzed with MRA image. Such data show the changes of both blood flow volume and vessel thickness after aerobic exercises. As the study demonstrates, aerobic exercises increase cerebral blood flow and vessel thickness. Therefore, aerobic exercises are expected to help preventing cerebrovascular diseases.

Key words: MRA, Aerobic exercise, Signal intensity, Vessel thick-ness

Indoor Radon Pollution in Building Inter-University Research
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Purpose: We wanted to estimate the radon pollution level of university structure depending on floor and condition of room(sealed or not).

Materials & Methods: Uses radon measuring instrument (RAD7 model) Estimates building of university in Uijeongbu-city Estimates basement and ground floor Estimates open room and sealed room Experiment period is march to April of 2016

Results: Radon is the major factor of indoor radiation. The measured result of basement was slightly higher than ground floor’s result. But, the result of basement kept within standard level. The result depended on condition of room(sealed or open). Especially, there were differences with sealed room that restrict entrance and open room.

Conclusions: The measured results are sightly different with room’s condition. The result of room allowing someone to enter is lower than the room that restrict someone to enter. And result of low floor(near to basement) is higher than high floor.

Key words: Environmental radiation, Radon, Radon exposure
P1
Effect of Target Filter Combination on Radiation Dose and Image Quality in Digital Mammography

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Purpose: To discuss the effect of different target/filter combinations on radiation dose and image quality in digital mammography, so optimal exposure parameters can be chosen to ensure image quality and reduce radiation injury.

Materials & Methods: To ensure the veracity of observed value, first strict quality control on mammography was performed before experiment. The same exposure parameters (kV, mAs, pressure, compressed thickness) were employed under the AOP and Manual modes. Controlling variable parameter to evaluated the effect of target filter combination. When evaluated target filter combination, fixed kV, mAs and chose different target filter combinations, adjust the PMMA thickness from 10 mm to 70 mm. Recorded the target filter combination for each exposure and read the entrance surface dose (ESD) on Ray Safe. Calculated average glandular dose (AGD) and the means.

Contrast to noise ratio (CNR) were measured and calculated on Workstation, the figure of merit (FOM) were calculated and recorded at last. SPSS17.0 were used in statistical analysis, the difference was statistically significant (P<0.05).

Results: The AGD and FOM values which were acquired in the phantom with different thicknesses and different target filter combinations were statistically different. The AGD values were always lowest for W/Rh but highest for Mo/Mo combination. The FOM values for Mo/Mo and W/Rh combination were statistically different. The FOM values of W/Rh were higher than Mo/Mo combination but the CNR value for three target filter combinations did not have significant difference. With the increase of phantom thicknesses, the AGD values which were acquired with Mo/Mo, Mo/Rh and W/Rh combination were increased, while the CNR and FOM values were decreased.

Conclusions: W/Rh combination for phantom above 20 mm can respectively reduce the radiation dose. So W/Rh combination were the optimal choice of three target filter combinations. In all, W/Rh combination can provide the best image quality with lowest radiation dose.

Key words: Mammography, Target/filter combination, Average glandular dose, Contrast to noise ratio, Figure of merit

P2
Influence the Deterioration of Computed Radiography imaging plate

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Purpose: To study deterioration of Computed Radiography (CR) imaging plate over time and its influence of digital mammography images, the phantom images were assessed using two different CR imaging plates installed in 2006 (CR-A) and in 2013 (CR-B).

Materials & Methods: Uniform exposure images were acquired with 26 kV, 20 mAs and a Mo/Mo target/filter combination. The pixel values were measured drawing a 400x400 pixel region of interest (ROI) with ImageJ and the standard deviation of pixel values and the signal-to-noise ratio (SNR) were calculated. In addition, all the images of mammographic phantom model-156 were visually evaluated by nine radiological technologists and film density was measured.

Results: Visibility decreased in a sight evaluation in CR-A. The unevenness of the evaluation occurred between observers in simulation sample of calcification. However, CR-A and CR-B passed it in the standard of guidelines in all simulation samples. In all ROIs we acquired, CR imaging plate with longer period of use showed higher SNR, and each ROI varied. There was the part indicating the value that SNR of CR-A was low in when we compared ROIs of the same part of CR-B with CR-A. The inclination of the pixel values was correlated with that of SNR. Moreover, the part where the pixel values changed was consistent with the place where breasts were placed. The coefficient of correlation of pixel values and SNR were 0.5.

Conclusions: The cause of the increase in noise is the image printing of the plates for there was a correlation between the standard deviation of pixel values and SNR. Consequently, we need to make quality control (QC) of CR imaging plate considering the alternation in the pixel values or increase or uniformity in noises brought by its deterioration.

Key words: Mammography, Imaging plate, Noises, Signal-to-noise ratio, Quality control

P3
Sentinel Lymph Node using Computed Tomography-Lymphography in before an Operation Evaluation Consideration of Malignant or Benign

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Purpose: In usual breast cancer medical examination and treatment, Sentinel lymph node biopsy in an operation the way pathology check at Standard operation. But sentinel lymph node using computed tomography-lymphography distinction it computed tomography-lymphography picture using before an operation evaluation consideration of malignant or benign possible or impossible.

Materials & Methods: From December, 2009 to October, 2014. Target of the hospital where I work is with breast cancer case performed an operation. A place is set. Sentinel lymphnode using computed tomography-lymphography of distinction. Behind that sentinel lymph node using ultrasound guided fine-needle aspiration biopsy evaluation or computed tomography-lymphography distinction.

Results: computed tomography-lymphography distinction with did in the next each item. Sentinel lymphatic the shape (Cutting, Expansion, Decline, Normal) Lymphography distinction (Perfectly, Fleck, No graphy) The shape of sentinel lymph node: (Round, Irregular) The length of sentinel lymph node: (More than 10 mm)

Overall judgement (Category1(negative), Category2(benign), Category3(benign, but malignancy can’t be ruled out), Category4(suspicious abnormality), Category5(highly suggestive of malignancy))
Conclusions: Sentinel lymph node using computed tomography lymphography distinction. It computed tomography lymphography picture using before an operation evaluation consideration of malignant or benign. That’s important. But each item the difference in the importance the accuracy is improved. The necessity to consider. I'd like to make it future’s problem.

P4 Imaging Findings in the Breast Augmentation Injection with Various Materials Ruei-Chi LIN1, Ho-Ching AI1, Hsin-Te CHIAN1, Yen-Jun LAI1 and Yuk-Ming TSANG1 Department of Medical Imaging, Far Eastern Memorial Hospital, Taiwan (evitawu56@gmail.com)

Purpose: The purpose of this study was to display the different imaging findings of breast cosmetic augmentation injections with various materials.

Materials & Methods: We collect 20 patients with breast augmentation injections during over a three year period. The image modalities of these cases included ultrasound, mammography, computer tomography (CT) and magnetic resonance imaging (MRI) studies. The materials for augmentation injections include silicone, paraffin, polycrylamide hydrogel (PAAG) and autologous fat.

Results: Mammary in comparison with widespread silicone droplets, the paraffinoma is more localized and the autologous fat transfer can show various distributions depending on the site and amount of injection. The Ultrasound is ineffective for the silicone injection, because the ‘snowstorm’ appearance and highly echo genic noise. For the PAAG, it shows circumscribed hypoechoic collection. CT and MRI can display the detail location (or migration) and 3D morphology of these augmentation injections. However, MRI is more sensitive to difference the breast cancer and granuloma.

Conclusions: For the cosmetic augmentation injection, there are various materials for this procedure, including the silicone, paraffin, PAAG and autologous fat. In this study, we will review the image findings of various types of augmentation injections by different modalities.

Key words: Augmentation, Ultrasound, Mammography, Computer tomography, Magnetic resonance imaging

P5 Development of the Thickness Correction Model in Mammography Szu-Ying HUNG1, Wen-Chin SU1, Kuo-Tung OU1, Hsin-Te CHIAN1, Yen-Jun LAI1 and Shang-Lung DONG2

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Purpose: The purpose of this study was to develop the thickness correction (TC) model using a thickness measurement device (TMD) in mammography. The purpose of this study is to develop the thickness correction (TC) model using a thickness measurement device (TMD) in mammography.

Materials & Methods: A digital mammography unit (Mammomat NovationDR, Siemens) with 18 cmx24 cm compression paddle was used. A homemade TMD (34 cmx20 cmx27 cm) was created and rectangular Bolus phantoms with length of 8-15 cm are used to simulate breasts in mammography. Different forces (8-20 kg) were applied and the compressed thicknesses were measured using TMD. The TC model was developed using SIT values, measured thicknesses and compression forces. To verify the purposed TC model, a circular Bolus phantom with diameter of 13 cm was compressed and the thicknesses were measured.

Results: The maximum measured thicknesses of the 4 cm bolus phantom for 8-20 kg were 33-37 mm and the SIT values were 19-30 mm. The measured thickness decreased with increasing compression force. For the TC model, the estimated compressed thickness is a function of compression force (F). For example, the estimated compressed thickness of Bolus phantom with length of 10 cm is SIT(mm)+1.1118xF(kg)+0.7951. For the verification testing, the errors of predicted thickness of the TC model were ranged from -1.0 to 0.9 mm compare to the maximum measured thickness using the TMD.

Conclusions: In this study, the TC model is proposed using a homemade TMD and Bolus phantoms. The compressed thickness can be accurately obtained by applying SIT and compression force in mammography.

Key words: Mammography, Bolus, Compressed breast thickness

P6 The Evaluation of Usefulness on the Change of Average Glandular Dose(AGD), Based on Thickness and Density of Breast Phantom by Using AEC Compensation Function Sooyun YOO1, Young Shin YOO2, Ji Hye KIM3, Dong Hwan KIM4 and Mi Sub AHN5

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Purpose: The purpose of this study was to investigate the usefulness on the change of AGD based on thickness and density of breast phantom by using AEC Compensation function.

Materials & Methods: Selenia Dimensions was used as the mammography system. Breast phantom for measuring AGD was used BR3070, BR5050 and BR7030. It was taken for 5 times each from 2 to 7 cm, through increasing by 1cm. Also, it was taken by changing the AEC Compensation as +4 ~ -3, and the AGD obtained from the DICOM Header information was analyzed through one-way ANOVA. For image quality evaluation, ACR Phantom was used and it was also taken by changing the AEC Compensation as +4 ~ -3. For image quality evaluation, 2 radiologists and 5 radiological technologists evaluated masses, fibers and specks and compared using Mann Whitney U-test.

Results: As the thickness of phantom increases, the AGD proportionally increased. Comparing to BR5050 phantom, the AGD of BR3070 decreased for approximately 20%, and the AGD of BR7030 increased for approximately 30%. On the same breast thickness, kVp did not change even though AEC Compensation was changed. As the thickness increases, kVp increased proportionally. As AEC Compensation was lowered by 1 level, the AGD decreased for approximately 15%, and AEC in accordance with the levels of AEC compensation had a significant statistical difference(p<0.001). Also, on the image quality evaluation, there was no significant statistical difference under AEC Compensation +4 ~ 2(p>0.05).

Conclusions: In mammography, AGD changes according to the thickness and density of breast. It was revealed that the image quality was not affected even the AEC Compensation was lowered to -2 level. This study is expected to contribute to the
To explore the CT value equivalence of virtual monochromatic spectral 70 keV images synthesized from dual-energy computed tomography (DECT) and conventional polychromatic single-energy 120 kVp CT images.

**Purpose**: To explore the CT value equivalence of virtual monochromatic spectral 70 keV images synthesized from the dual-energy computed tomography (DECT) and conventional polychromatic single-energy 120 kVp CT images.

**Materials & Methods**: DECT and conventional polychromatic single-energy CT were performed on the male anthropomorphic phantom which included head neck and torso. Sinogram affirmed iterative reconstruction (SAFIRE 3) algorithm and filtered back projection (FBP) algorithm were used. The reconstructed images were reconstructed and obtained, respectively. The objective image noises and CT values were measured. The results.

**Results**: Regardless of reconstruction algorithm, the CT values between 70 keV and 120 kVp images in thalamus, the air outside skull, gall bladder, liver, spleen, prostate were considered no statistical significant differences (all P>0.0083), while the CT values of 70 keV images in lateral ventricle, cerebellum, thymus, heart, lung, the stomach and the air inside rectum were lower than that of 120 kVp images, while the CT values of 70 keV images in mandibular, thoracic vertebra, lumbar spine, central part of femoral head were higher than that of 120 kVp images (all P<0.05). The objective image noises were measured. The results are shown in the table.

**Conclusions**: In parts of the tissues and organs, the CT values between 70 keV and 120 kVp images were not equivalent. The objective image noises between 70 keV and 120 kVp images were equivalent. DECT and conventional polychromatic single-energy CT with iterative algorithm can significantly reduce the image noise and enhance image quality.

**Key words**: Tomography, X-ray computed, Dual energy CT, Virtual monochromatic spectral, Image quality

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**P8**

Low-pass current Gemstone Spectral Imaging In Pediatric Abdominal CT: Dose and Image Quality Evaluation

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**Purpose**: To evaluate the dose and image quality performance of C-arm low-tube-current Gemstone Spectral Imaging (GSI) in pediatric CT for pediatric patients over 5 years of age or 20kg of weight in comparison with routine contrast-enhanced abdominal CT.

**Materials & Methods**: Thirty-three children (M: 21:12, mean age 7.63±3.32 years and weight 20.97±8.90 kg) were divided into two groups: Group A (n=20) with low-tube-current (260mA) spectral CT mode and group B (n=13) with routine helical CT with automatic mA (50-350mA) modulation. Both groups were reconstructed with 50% ASiR. Region-of-interest of 22mm2 was placed on standard abdominal aorta, liver and muscle to measure CT number and standard deviation and to calculate signal-noise-ratio (SNR) and contrast-noise-ratio (CNR) for aorta. For the spectral CT imaging, CNR as function of photon energy was also calculated to determine the optimal keV level for the highest CNR. Two radiologists with more than 5 years’ experience in radiology assessed the overall image quality independently on a 5-point scale for vessel display and noise. (5: excellent and 1: very poor).

**Results**: The optimal energy was 65keV for the highest CNR in GSI. There was no difference between group A and group B in terms of attenuation in the ascending aorta (326.93±58.14 vs. 289.25±89.95 HU) and liver (96.14±16.39 vs. 88.4±16.00 HU) and image noise (14.24±2.16 vs. 14.78±2.78 HU) (all p>0.05). Group A had significantly higher CNR for abdominal aorta (18.23±5.83 vs. 15.51±12.01). The subjective image quality of group A was as good as group B with superior delineation of structures (4.65±0.54 vs. 4.57±0.32, p<0.05).

**Conclusions**: With spectral imaging parameters appropriately selected (at 260mA), radiation dose of GSI and routine CT scan is equivalent for pediatric patients with age over 5 years or weight over 20kg. Monochromatic images at 65keV in spectral CT imaging provide higher CNR than routine CT images.

**Key words**: CT, Gemstone Spectral Imaging, Low dose

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**P9**

Spectral CT in Rabbit VX2 Liver Tumor Models: Adaptive Statistical Iterative Reconstruction Associated with Monochromatic Image

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**Purpose**: To evaluate the value of adaptive statistical iterative reconstruction (ASiR) associated with monochromatic image of spectral CT in the rabbit VX2 liver tumor models.

**Materials & Methods**: On the 7th, 8th day after implantation, 24 successfully implanted rabbits were imaged with spectral and conventional enhanced CT with a random acquisition order and a 24h interval. Spectral CT images with filtered back projection (S-FBP) and adaptive statistical iterative reconstruction (S-ASiR) were generated, respectively. The tumor-to-liver contrast-to-noise ratio (CNR) and image noise of the four groups were calculated. The CNR were calculated at the optimal CNR keV in the spectral CT groups. The lesion conspicuity scores (LCS) and overall image quality scores (OQS) in the four groups were recorded.

**Results**: The CNR of the group (S-ASiR)(3.10±1.70) was significantly higher than that of the other three groups (p<0.005), and there was no significant differences between group (C-ASiR) from group(S-FBP)(2.63±1.59 vs.2.50±2.60, p=0.491). The image noise of the group (S-ASiR) was significantly lower than that of the other three groups (p<0.005).
group(S-ASIR) had no significantly difference from that of group(C-ASIR) (7.43±1.27 vs 8.8±2.13, p=0.118), but lower than that of group(S-FBP) (9.05±2.37, p<0.05) and group(C-FBP) (9.87±1.05, p<0.05). LCS of group(S-ASIR) had no significantly differences from that of the group(S-FBP) (4.01±0.54 vs 3.85±0.52, p=0.119).igkeit than that of group(C-ASIR) (3.51±0.48) and group(C-FBP) (3.29±0.46). The group(S-ASIR) had the highest OQS (4.00±0.57 vs 3.58±0.43C-ASIR, 3.19±0.29S-FBP, 3.37±0.47C-FBP, p<0.05).

Conclusions: Spectral CT associated with ASIR which combine have the advantage of increasing the image CNR and reducing the image noise, improve the lesion detection and image quality, without increasing the radiation dosage

P10
The Vale of Scout Scan Using Positive and Lateral Position Image in Decreasing Chest Scan
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Purpose: To investigate the value of scout scan using positive and lateral position image in decreasing chest scan radiation dose.

Materials & Methods: 72 patients were treated with chest CT scanning for 2 times within two weeks. On the first scan, scout scan using positive and lateral position image is decreasing radiation dose. While, compared with scanning with the scout scan using positive position image, the average Effective dose (ED) with scout scan using positive and lateral position image can decrease 0.35±0.05 (p<0.05) and the average volume CT dose index (CTDv010) reduce 0.70 (4.52%).

Conclusions: The technique of scout scan using positive and lateral position image can decrease radiation dose without reducing the image quality and has some clinical significance.

Key words: Radiation dose, Tomography, X-ray computed, Chest, Scout scan

P11
Effect of Motion-Correction Algorithm (Snapshot Freeze) on Image Quality in Patients Undergoing Coronary CT Angiography with Different Phase Undergoing Coronary CT Angiography
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Purpose: To assess the effect of a motion-correction algorithm (SSF) on image quality in patients undergoing coronary CT angiography (CCTA) with different phase on optimal monochromatic energy.

Materials & Methods: The institutional ethical committee approved the trial in which patients were enrolled. Thirty patients (age 56.3 ± 11.4, 12males) undergone CCTA with a newly generation of spectral CT scanner and were randomly divided into 7 groups according to phase: from 60 to 90 bpm with increment of 5 bpm. The CM volume was 200mg/ml with injection rate was calculated as volume divided by 12 seconds. All images were reconstructed based on the optimal keV (65kev) with 40% ASIR. Coronary images were evaluated according to a standard of 14 coronary arterial segments and on a 5-point scale by two independent readers. Image quality of data set with and without SSF in different groups were assessed and compared with Wilcoxon test.

Results: Image scores on a per-artery-segment level in different phase groups (60%, 65%, 85%, 90%) without SSF were significantly lower than those with SSF algorithm (All p value <0.05). But in 70% phase group, the significant differences were showed only for LAD-m, LAD-d, D1, D2, LCX-p, LCX-d, RCA-p, RCA-m, and PDA for (P<0.05). There were significant difference at D1, D2, LCX-p, LCX-d, RCA-p, RCA-m for 75% phase group (P<0.05). Significant difference were found at D1, D2, LCX-d, RCA-p, RCA-m, RCA-d and PDA for image reconstruction of 80% group (P<0.05).

Conclusions: Motion-corrected reconstruction of SSF significantly improved image quality of the most segments of different phase.

Key words: spectral CT, SSF, Image quality, Phase

P12
Comparative Analysis Study of Low Tube Voltage Using Iterative Model Reconstruction with Sairf Technique on Image Quality of CCTA
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Purpose: To assess the image quality and the radiation dose of low-dose CCTA imaging using low tube voltage with IMR algorithm compared with SAFIRE.

Materials & Methods: Sixty patients (53±11 years, 28 men) with suspected coronary heart disease underwent prospectively ECG-gated coronary CT angiography and were enrolled in this study who were divided into 2 group randomly. 30 patients were on a 256-slice MSCT at 80 or 100kVp tube voltage, and another 30 patients were on a dual-source MSCT at 100kVp tube voltage. SAFIRE algorithm was marked as A group and IMR algorithm was marked as B group. CT value and image noise of ascending aortic root were measured. SNR and CNR were calculated. Two experienced radiologists evaluated the coronary images according to a standard of 10 coronary segments and on a 5-point scale independently. Wilcoxon test were used for comparisons of demographic data in objective measurements and subjective assessments of image quality among groups.

Results: The SNR and CNR of B group were 30.8±5.9 and 3.1±1.6, 4.7±0.5. There is no significant difference on LM, LAD-p,
P13
Comparative Analysis of Low Tube Voltage Using Iterative Model Reconstruction Technique on Image Quality of CCTA
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Purpose: To assess the image quality and the radiation dose of low-dose CCTA imaging using low tube voltage with IMR algorithm compared with traditional FBP.

Materials & Methods: Sixty patients (54±11 years, 30 men) with suspected coronary heart disease underwent prospectively ECG-gated coronary CTA angiography and were enrolled in this study who were divided into 2 groups randomly. 30 patients were on a 256-slice MSCT and another 30 patients were on a dual-source MSCT which were marked as A group. IMR algorithm was marked as B group. CT value and image noise of ascending aortic root were measured. SNR and CNR were calculated. 2 experienced radiologists evaluated the coronary images according to a standard of 10 coronary segments and on a 5-point scale independently. The consistencies of subjective assessments were compared with kappa test. Wilcoxon test were used for comparisons of demographic data in objective measurements and subjective assessments of image quality among groups.

Results: The SNR and CNR of B group were 30.8±5.9 and 23.6±4.1, which were prior to A group while the noise of B group was 13±2.3, which is much lower than A group. The CT value of proximal, middle and distal segment of RCA, LCX, LAD was not significantly different in 2 groups (all p>0.1). The CT values in coronary arteries was between 330 and 410 HU which efficiently opacified arterial lumen. The consistencies of two reviewers were good. Image quality (LM, LAD-p, LAD-m, LCX-p, RCA-p) of B group was rather good (4.9±0.4, 4.8±0.3, 4.2±1.1, 4.6±0.8, 4.7±0.5). There is no significant difference on LM, LAD-p, LAD-m, LCX-p, RCA-p between A and B group. Effective dose in group B (0.6±0.2mSv) is lower than group A (2.9±0.8mSv).

Conclusions: IMR algorithm can significantly reduce image noise, and improve SNR, CNR and image quality compared with FBP.

Key words: IMR, FBP, Low tube voltage

P14
Application of Iterative Model Reconstruction technique in CT Pulmonary Angiography with Low Radiation Dose and Low Contrast
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Purpose: To investigate the value of Iterative Model Reconstruction technique in CT pulmonary angiography with 80 kVp and 20 ml contrast medium protocol.

Materials & Methods: Sixty patients with clinical suspicion of pulmonary embolism underwent 256-slice CTPA were prospectively enrolled. The patients were randomly assigned to 2 groups: test group (n=30), 80 kVp/50 mAs with 20 ml contrast medium; control group (n=30): 120 kVp/50 mAs, 50 ml contrast medium. The images of test group were reconstructed by FBP (group A), and iterative model reconstruction (group B) technique. And the images of control group were reconstructed by FBP (group C). The values of CTDI, ED were recorded and calculated. The image quality parameters: CT value, image noise, SNR, CNR and subjective image score were measured and compared among group A, B and C.

Results: The BMI was no statistically significant different between test and control group [(25.7±2.5), (24.0±2.8), kg/m2, t=-1.692, P=0.096]. The CTDIvol, ED of test group were respectively lower than control [(0.8±0.3), (6.0±1.8) mGy, t=-15.510, P=0.000, (2.49±0.72) mSv, t=-15.360, P=0.000]. The CT value of A, B, C were [(478.3±151.1), (478.3±154.8), (397.7±95.0)]HU, and there was no statistically significant different between group A and B (t=0.01, P=0.999). The CT value of group B was significantly higher than C. The image noise of A, B, C were (137.7±43.2), (39.5±5.1), (58.9±10.5). The image noise of group B was significantly lower than A group. Effective dose in group B was significantly lower than A group [(11.860±0.000), but not significantly higher than group C (t=1.692, P=0.096). The SNR, CNR of A, B, C were [(3.5±1.6), (12.0±1.1), (3.5±1.5), (10.9±2.7)], (3.4±1.5). These were significantly higher in group B than A. The SNR, CNR did not differ significantly between B and C. The diagnosable rate and good quality rate were 40.0%, 100.0%, 090.0%, 90.0%, 93.3%. Both of them were significantly higher in group B than C (t=22.957, P=0.000, 2=35.267, P=0.000), and there were no significant difference between B and C (t=0.001, P=1.000).

Conclusions: The IMR can provide improved image quality, and allows lower radiation dose and lower contrast medium protocol CTPA than conventional FBP technique.

P15
20ml Contrast Agent Combined the Spectral CT Monochromatic Images Used in the Individual Study of the CTPA
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Purpose: To evaluate the image quality of the CTPA with low contrast agent combined medium optimization in GSI.

Materials & Methods: 15 patients underwent CTPA examination on a GE GSI scanner, 5ml contrast agent used in the TEST firstly, the T max of the aorta and the pulmonary were obtained (T1, T2), calculated the DT=T2+1/2(T2-T1), then 20ml contrast agent, 5ml/s rate were used in the examination. The 60keV+50%ASIR images were reconstructed, and the CT values of the pulmonary artery, lobar artery, and segmental artery were obtained. The overall imaging quality was evaluated on a five-point scale by two radiologists. Paired-sample T test were used to compare A group and group B (50ml contrast agent, 5ml/s flow rate, 120kV).

Results: CT value difference between the experimental and the normal group were insignificant: pulmonary artery attenuation were 399±22 vs 406±77, t=0.356, P=0.724, lobar artery attenuation were 386±59 vs 396±77, t=0.377, P=0.709, segmental artery attenuation were 428±99, 441±81, t=12.341, P=0.000, 430±2, 40±1, t=0.762, P=0.528.

Conclusions: On the basis of guarantee the CT value, the
P16
Improving Visualization of Lung Cancer with Virtual Monochromatic Spectral CT Images
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Purpose: To evaluate the clinical value of using monochromatic images in spectral CT to improve visualization of lung cancer.

Materials & Methods: We retrospectively analyzed the chest CT images of 130 patients who underwent non-contrast spectral CT. These images included a set of 140kVp polychromatic images and the default 70keV monochromatic images. Using the standard Gemstone Spectral Imaging (GSI) viewer on an advanced workstation (AW4.6,GE Healthcare), an optimal energy level (in keV) for obtaining the best contrast-to-noise ratio (CNR) for the nodule could be automatically obtained. The signal-to-noise ratio (SNR), CNR and objective image quality score (1-5) for these 3 image sets (140kVp, 70keV and optimal energy level) were obtained and, statistically compared. The image quality score consistency between the two observers was also evaluated using Kappa test.

Results: The optimal energy levels for obtaining the best CNR were 66.58±2.74keV. SNR and CNR from the 140kVp polychromatic, 70keV and optimal keV monochromatic images were (16.44±5.85, 13.24±5.52), (20.79±7.45, 16.69±6.27) and (24.9±9.91, 20.53±8.46), respectively. The corresponding subjective image quality scores were 1.97±0.82, 3.24±0.75, and 4.47±0.60. SNR, CNR and subjective scores had significant difference among groups (all p<0.05). The optimal keV monochromatic images were superior to the 70keV monochromatic and 140kVp polychromatic images, and there was high agreement between the two observers on image quality score (kappa=0.80).

Conclusions: Virtual monochromatic images at approximately 66keV in dual-energy spectral CT yielded the best CNR and highest diagnostic confidence for visualization of lung cancer.

Key words: Gemstone Spectral Imaging, Monochromatic images, Image quality score.

P18
Experimental Study on the Correlation of the Height of CT Scanning Bed and Noise of Thorax
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Purpose: Experimental Study on the correlation of the height of CT scanning bed and noise of thorax

Materials & Methods: To investigate the correlation of the change of CT bed’s height and noise of thorax, and the effect of radiation dose. Methods: The anthropomorphic phantom equivalent to human tissue was scanned by Siemens dual-source CT flash. With different scanning bed height conditions, several groups of patients with mediastinal window, descending aorta, and erector spinae, scan the simulation models, all with core dose4D scan on. Measure and record the standard deviation of mediastinal window image before sternum air, signal to noise ratio of pulmonary artery and erector spinae. Noise ratio contrast between aorta and erector spinae, score of mediastinal window image and pulmonary window image subjective diagnosis and the indexes of radiation dose, including CT dose index (CTDI), dose length product (DLP), and effective dose (ED) was measured, and make statistical analysis.

Results: With different scanning bed height conditions, several groups of patients with mediastinal window descending aorta, pulmonary SNR signal to noise, the difference between the left atrium SNR, competent image quality and radiation dose rate CTDI_100,DLPED has statistically significant. Among them, the mediastinumline height of the bed height has the highest score image, the best signal to noise ratio.

Conclusions: In the common CT scanning of thorax, image quality can be improved with placement which is standard by noise of midaxillary line.

Key words: Thorax CT, Midaxillary line, Scanning bed.
P19
Low Tube Voltage CT Coronary Artery Angiography Using Prospectively ECG-triggered Double High-pitch Acquisition
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Purpose: Prospectively ECG-triggered high-pitch CCTA acquisition is renowned for its fast speed, low dose, low contrast media volume and high quality in one heart beat coronary imaging. But concerns regarding possible fail scans or no ECG-editing for unacceptable segments are still remained in technicians. This study is to investigate if two consecutive high-pitch acquisitions especially with low tube voltage can solve these problems.

Materials & Methods: 42 patients (male 19, female 23, age 61.09±9.88, BMI 24.88±3.73) who suspected with coronary artery disease were scanning using the 2nd generation DSCT Siemens SOMOTOM Definition Flash. All images were acquired at collimation 128*0.6mm, rotation time 0.28s/rot and 3.4 high-pitch mode. Tube voltage was fixed to 100kVp with tube current automatically modulated based on patient’s habitus using the CAREDose4D (Quality ref. 320mA/s/rot). Two consecutive prospectively ECG gated scanning were exposed at first end-systolic and then diastolic phase respectively. Image quality was evaluated using a four-point scale on AHA 15 coronary segments.

Results: Patient heart rate during the first and second scanning were 58.2±6.46 and 58.2±7.52 respectively (p<0.05). Per-segment evaluation indicated that combined scanning increased excellent score rate from 76.19% to 81.75%, pulled down unacceptable score rate from 1.59% to 0%. Averaged score for all 42 patients increased from 1.26 to 1.07 on per-patient basis. Total radiation dose for two consecutive scanning was only 1.54±0.34mSv. The one-way ANOVA was used to test the radiation dose. A p-value of 0.05 was considered as statistical significant.

Conclusions: Double ECG-triggered high-pitch CCTA with low tube voltage can increase coronary artery diagnostic rate meanwhile reducing radiation dose to an ultra-low level.

Key words: Coronary arteries, Tomography, X-ray computed,
Contrast media

P20
Unit Weight Iodine Injection Volume and the Correlation between Brain CTP
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Purpose: To investigate the different coronary CT angiography (cCTA) scan protocols in dual-source CT (DSCT), and the potential of image quality improvement and radiation reduction.

Materials & Methods: 234 patients (181 male and 119 female with age of 57.13±10.85 years old) with suspected coronary artery disease undertook DSCT cCTA. Beta-blocker was administrated orally. The patients were randomly assigned into 6 groups: Group A, retrospective ECG-gated cCTA; Group B, prospective ECG-gated cCTA; Group C, low tube voltage cCTA with reduced radiation dose; Group D, low tube voltage cCTA with adaptive padding window (4% of full tube current); Group E, low tube voltage cCTA with fixed padding window of 380 ms; Group F, high-pitch Flash with 100 kV. Two experienced observers assessed the image quality. If there was a discrepancy between two observers, the consensus was made in a joint-session. One-way ANOVA was used to test the radiation dose. A p-value of 0.05 was considered as statistical significant.

Results: All patients successfully underwent cCTA. There was no significant difference on image quality among 6 groups. The radiation dose was 13.51±5.53, 12.58±2.33, 9.00±1.47, 5.91±1.19, 1.76±0.36, 0.97±0.25 mSv for Group A to F. The statistics showed the radiation dose was significant different in order of Group A >B>C>D=E>F.

Conclusions: There was a significant difference on the radiation dose of 6 cCTA scan protocols.

Key words: Computed tomography, Dual-source CT, Coronary artery, Radiation dose, Image quality

P21
The Radiation Dose of Coronary CT Angiography using Dual-source CT
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Purpose: To investigate the different coronary CT angiography (cCTA) scan protocols in dual-source CT (DSCT), and the potential of image quality improvement and radiation reduction.

Materials & Methods: Three hundred patients (181 male and 119 female with age of 57.13±10.85 years old) with suspected coronary artery disease undertook DSCT cCTA. Beta-blocker was administrated orally. The patients were randomly assigned into 6 groups: Group A, retrospective ECG-gated cCTA; Group B, prospective ECG-gated cCTA; Group C, low tube voltage cCTA with reduced radiation dose; Group D, low tube voltage cCTA with adaptive padding window (4% of full tube current); Group E, low tube voltage cCTA with fixed padding window of 380 ms; Group F, high-pitch Flash with 120 kV. Two experienced observers assessed the image quality. If there was a discrepancy between two observers, the consensus was made in a joint-session. The one-way ANOVA was used to test the radiation dose. A p-value of 0.05 was considered as statistical significant.

Results: All patients successfully underwent cCTA. There was no significant difference on image quality among 6 groups. The radiation dose was 13.51±5.53, 12.58±2.33, 9.00±1.47, 5.91±1.19, 1.76±0.36, 0.97±0.25 mSv for Group A to F. The statistics showed the radiation dose was significant different in order of Group A >B>C>D=E>F.

Conclusions: There was a significant difference on the radiation dose of 6 cCTA scan protocols.

Key words: Computed tomography, Dual-source CT, Coronary artery, Radiation dose, Image quality

P22
Evaluation of Quality Control Parameters of Various CT Scanners and Comparison of CATPHAN

kg, in the same post-processing workation with the same post-treatment method. They were measured contralateral frontal lobe, temporal lobe, occipital lobe, parietal lobe gray matter and white matter of the cerebral blood flow(CBF). Calculate the average, were given to each patient’s brain gray matter CBF, white matter CBF. All the measured CBF value in patients with Pearson correlation coefficients, 4 sets of data and demand mean and standard deviation.

Results: With the increase of unit weight injection of iodine, which is the brain’s gray matter and white matter CBF also with the increase. There was a positive correlation between the two (rG=0.66, rW=0.50). The resulting data set 4 gray matter CBF (ml/ 100g/min) value of 44.89±6.62, 61.72±7.94, 63.51±13.09, 88.96±20.17, White matter CBF value of 20.64±3.72, 22.03±3.99, 23.29±7.11, 36.92±10.19. Group B wherein the resulting parameter value is closer to the body’s normal physiological cerebral blood flow values.

Conclusions: When brain perfusion scan settings contrast injection parameters,Perfusion parameters in unit weight injection 230-270mg/kg contrast agent derived more accurate.

Key words: CTP, Glioma, PWI
500 and Vendor specific Phantom Performance

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Purpose: To check the performance of CT scanners in producing consistently high quality images at periodic intervals. It will help in timely rectifying the faults if any without compromising with image quality.

Materials & Methods: Same CATPHAN 500 phantom as well as vendor specific generic phantoms were used to evaluate the performance i.e. Quality Control parameters of the following CT scanners: Philips Make, Model ICT 256 installed in Nehru Hospital PGIMER Chandigarh, Siemens Make, Model Somatom Definition Flash installed in Nehru Hospital PGIMER Chandigarh, G.E Make, Model Light Speed VCT installed in Advanced Trauma Centre PGIMER Chandigarh. Following Quality Control Parameters were evaluated. CT number linearity, Noise and uniformity, High contrast resolution, Low contrast resolution, Slice thickness, Couch incrementation, Pixel size

Results: Results of performance tests were compared on monthly basis for the last 4 months i.e. December 2015 to March 2016 for all the 3 scanners also before and after calibration whenever there was breakdown of CT scanner for long period.

Conclusions: All these CT scanners performed well within the tolerance limits and no variation was found in the results evaluated by both of these phantoms separately.

Key words: CT scanner, Evaluation, Performance, Phantom, Quality

P23

Feasibility of Monitoring at Left Atrium in Bolus-Tracking Triggered Coronary CTA with Dualsource CT: A Comparison of Image Quality and the Contrast Medium Dose

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Purpose: To investigate the feasibility of changing monitoring site to left atrium with bolus-tracking triggered coronary CTA.

Materials & Methods: Eighty patients who underwent coronary CTA with bolus-tracking method were included in this study. The patients were randomly divided into 2 groups, with 40 cases in each group. For study group, the injection time of contrast medium was 10s with the monitoring site placed at the left atrium, while for the control group, the injection time was 12s with the monitoring site placed at the root of the ascending aorta. And for both groups, the monitor started at 10 s after the injection of contrast media, and the triggering threshold was set as 100 HU. The objective image quality was assessed with SNR and CNR with a double-blind method and two radiologists evaluated the subjective image quality on a 4-point scale. The number of times of monitoring exposure and the contrast medium dose were also compared.

Results: There was no significant difference in the subjective or objective image quality between the two groups. The contrast media dose in the study group was significantly lower than that in the control group (2.87±0.89 vs. 3.76±1.28, P<0.05).

Conclusions: It will help in timely rectifying the faults if any without compromising with image quality. Paired t tests were used to compare the differences between two groups.

Results: The incidomalleolar joints, crura of stapes, three bony semicircular canals, vestibule, cochlea and facial canal of the 40 ears of Experimental group were displayed clearly and smoothly, and the stair-step artifact is weak. The scores were 3 to 5.3 crura of Control group were not clear, and the shape cochleas and the stair-step artifact is weak. The scores were 3 to 5.3.

The difference was statistically significant (P<0.05).

Conclusions: The high resolution CT imaging technology with 1024 x 1024 large matrix has important value in displaying the subtle anatomical structure of temporal bone to reduce the clinical misdiagnosis rate and improve the accuracy of treatment.

Key words: HRCT, Large matrix, Temporal bone imaging

P24

The Clinical Value Of HRCT With Large Matrix in Temporal Bone Imaging

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Purpose: Compare the philips Brilliance iCT using large matrix (1024x1024) and high resolution technique and GE Lightspeed vct with routine imaging protocols in displaying the tiny anatomical structure and image quality to discuss the feasibility and value of high-resolution Computed Tomography (HRCT) with large matrix in temporal bone imaging and provide references to clinical practice.

Materials & Methods: From September 2015 to April 2016, 40 patients with normal middle and inner ear were prospectively enrolled into this study. Patients were divided into experimental group(20 patients underwent Philips iCT using large matrix and high resolution technique) and control group(20 patients underwent GE lightspeed vct with routine imaging protocols) and all underwent 0.625mm thin slice scan of middle ear and mastoid. Measure the noise(N), signal noise ratio(SNR) and contrast to noise ratio(CNR) of all the images. Multiplanar reconstruction, surface reconstruction, minimum intensity projection, maximum intensity projection and volume reconstruction of two groups' data were measured on philips Intelliaspace Portal workstation. Two professors scored 1-5 point by the image quality. Paired t tests were used to compare the differences between two groups.

Results: The incudomalleolar joints, crura of stapes, three bony semicircular canals, vestibule, cochlea and facial canal of the 40 ears of Experimental group were displayed clearly and smoothly, and the stair-step artifact is weak. The scores were 3 to 5.3 crura of Control group were not clear, and the shape cochleas were a little fuzzy with stong stair-step artifact. The scores were 2-4. The difference was statistically significant (P<0.05).

Conclusions: The high resolution CT imaging technology with 1024 x 1024 large matrix has important value in displaying the subtle anatomical structure of temporal bone to reduce the clinical misdiagnosis rate and improve the accuracy of treatment.

Key words: HRCT, Large matrix, Temporal bone imaging

P25

Optimizing the Image Quality and Radiation Dose of Pediatric Computed Tomography Scans

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Purpose: This study aimed to determine the optimal parameters of pediatric computed tomography (CT) scanned to...
minimum effective doses (ED) and offer sufficient image quality for diagnosis.

Materials & Methods: 64-slices scanner was employed to acquire images on 1, 5 and 10-year-old children anthropomorphic phantoms, with tube voltages of 80, 100, and 120 kVp, tube currents ranged from 10 ~ 250 mA, and with the following rotation times and pitches: 1 s/0.9841, 1 s/0.5161, 1 s/0.9841 and 0.8 s/0.9841 for head, head to neck, chest and abdomen to pelvis scan, respectively. The ACR Gammex 464 CT accreditation phantom was scanned for assessed the image contrast-to-noise ratio (CNR) and noise. The ED estimates of the dose length product (DLP) multiplying the conversion factor (k). Determine the optimal kVp and mA by plotting CNR and noise curve and made by two lines overlapping.

Results: The effective dose obtained using three anthropomorphic phantoms and 21 combinations of kVp and mA ranged from 0.027 to 21.51 mSv. ED was a linear relation with kVp and has highly correlated (R²>0.99). The optimal CNR and noise in the head, head to neck, chest and abdomen to pelvis CT scan parameter were 80 kVp/80 mA. Under the parameter that CNR/noise for head were 7.54/20.24; for head and neck CNR/noise were 7.28/19.84; for chest CNR/noise were 7.14/19.18; for abdomen to pelvis CNR/noise were 7.02/22.73. For the 1, 5 and 10-year-old children, the effective dose of head were 0.41, 0.25 and 0.22 mSv, chest were 2.2, 2.03 and 1.78 mSv, abdomen to pelvis were 1.66, 2.12 and 1.93 mSv.

Conclusions: For optimal pediatric CT scan image quality and minimum effective dose. We suggest that 1, 5 and 10-years-old children that scan parameters used 80 kVp/80 mA on the four body parts.

Key words: Computed Tomography (CT), Pediatric, Effective Doses(ED), Dose length product (DLP)

P26
Effects of Dual-Energy CT with Non-Linear Blending and Linear Blending on Portal CT Angiography
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Purpose: To determine whether non-linear blending technique for portal-phase(P-phase) dual-energy portal CT angiography (PCTA) could improve image quality compared to the linear blending technique and non-linear blending imaging.

Materials & Methods: A retrospective analysis of 60 patients with clinically confirmed or suspected liver cirrhosis with portal hypertension and gastric fundus esophageal varices. All patients had accepted dual-energy scanning of PCTA in the P-phase with dual-source CT scanner (Somatom Definition Flash, Siemens,Germany). They were assigned to Sn140/80kvp(178/461mAs) with the automatic tube current modulation. All scans were acquired in the cranial-caudal direction from above the level of the diaphragm to below the level of liver. Linear blending with a weighting factor of 0.3 is protocol A and 1.0 is protocol B. Non-linear blending with default value (w=120,c=150) is protocol C and experience value (w=20,c=110) is protocol D. The portal vein enhancements, image noise, signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR) and VRT images quality were assessed. Statistical analysis was performed using one-way analysis of variance test. Results: Mean vein attenuation, SNR, CNR and VRT image quality score for protocol D images in each were all higher compared to others (p<0.001).

Conclusions: Non-linear blending (w=20, c=110) technique of dual-energy CT can improve the image quality of PCTA.

Key words: Non-linear blending, Linear blending, Dual-Energy, Liver cirrhosis

P27
Verification of the Injection Pressure Reduction Effect Using the Novel Indwelling Needle for Contrast Enhanced CT
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Purpose: The purpose of this study was to investigate the injection pressure reduction effect of the BD Nexiva Diffusics novel indwelling needle.

Materials & Methods: We evaluated the date of 651 patients who underwent computed tomography-angiography. We compared the maximum injection pressure, the injection rate and the flow index (the maximum injection pressure per unit injection). Contrast medium was administered at 320, 350 and 370 mgl/mL. For statistical analysis, was performed using the Mann-Whitnny U-test.

Results: The maximum injection pressure and flow index of the novel indwelling needle in 22 G decreased 10% (p<0.001) compared with SCS in all contrast mediums. The maximum injection pressure and flow index of BDN in 20 G decreases 8% (p<0.05) compared with SCS at 370 mgl/mL, but there was no reduction at 320 mgl/mL and 350 mgl/mL.

Conclusions: Our analysis demonstrated that BDN significantly reduced the injection pressure in 22 G.

Key words: Flow index, Maximum injection pressure.

P28
Promotion of Auxiliary of the Interpretation’ by QCA (Quality Control Activities)
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Purpose: To promote the auxiliary of the interpretation from the point of view for medical safety and to unify the reporting method.

Materials & Methods: We carried out awareness survey of radiological technologist for the auxiliary of the interpretation with use of QCA. For the radiological technologists who are not yet performed, educational activities was performed, and also it was to open the study session aimed for capacity building of the interpretation.

Results: In the questionnaire survey, the previous survey was38%, and the after improved measures was increased to 87%. This indicates that the increased awareness of radiological technologist for the auxiliary of the interpretation. Ccrisis imaging findings discovered at the time of reporting procedures are manuals, it has been thoroughly well-known to many of the radiological technologists.

Conclusions: By radiological technologists to perform the interpretation auxiliary, example that prevented in advance becomes severe the patients are also found here and there, an auxiliary of
the interpretation to the radiological technologist from the point of view of medical safety is effective. In the future, it is necessary to take measures for the implementation rate of 100%.

Key words: Auxiliary of the Interpretation

P29
Knee Anterior Cruciate Ligament (ACL) Reconstruction of Post-operative Evaluation in Three-dimensional Computed (3DCT)
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Purpose: Confirmation and follow-up of the anterior cruciate ligament reconstruction surgery by CT is the multi planar reconstruction (MPR). This time, was evaluated in 3D image.

Materials & Methods: An implant before alternative to the cruciate ligament has devised a method to the burr hole made in the tibia and femur 3D imaging to observe.

Conventionally tibia, was the position confirmation of the femoral bone hole, connecting the 3D image of each of the bone hole to create a 3D image of the soft tissue in the bone hole in the bone hole and the proximal tibia of the distal femur and, it is possible to create a virtual ligaments of the anterior cruciate ligament (ACL) reconstruction surgery.

Results: Therefore, the anterior cruciate ligament (ACL) reconstruction result of follow-up and surgical procedure of post-operative has been confirmed in detail. Further, it is possible to grasp the dynamics of anterior cruciate ligament (ACL) surgery as a 3D image or 4D image by performing dynamic imaging with a possible range of movement of the knee joint state (extended position and flexion).

Conclusions: Display is effective of the anterior cruciate ligament by 3DCT.

Key words: Anterior cruciate ligament (ACL), Three-dimensional computed (3DCT)

P30
Study of CT Image for the Detection of Bone Bruise to Occult Hip Fracture
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Purpose: MRI or CT may be used to confirm a suspected to the non-displaced fracture and occult fracture. Occult fracture is a condition with clinical sign of fracture but no evidence of radiographic standard examination. Basis of occult fracture is a bone bruise. MRI has a high sensitivity for bone bruise, but CT has not. However, under the situation that cannot scan MRI, we choose available CT easily. In this study, we considered whether we can clearly visualize the bone bruise than a conventional CT scan by the ingenuity of the image processing.

Materials & Methods: We reconstructed an image of the proximal thighbone in the left and right symmetry which we scan it by CT. And we compared the MRI image with the multi planar reconstruction (MPR) image of the bone window and soft tissue window. Moreover, this study is a retrospective study of past cases.

Results: In the image of the bone window, fracture of the cortical bone was detected, but the depiction of the bone bruise was impossible. However in the image of the soft tissue window, high-density area was detected to mean the hematoma and edema. This high-density area is equal to the area of the bone bruise on the MRI.

Conclusions: The use of the soft tissue window of MPR images of the left and right symmetry of CT was enabled to the depiction of the bone bruise. Thus we could detect the non-displaced hip fracture and occult hip fracture in only CT.

Key words: Computed tomography, hip fracture, bone bruise, occult fracture, multi planar reconstruction

P31
Age Effect on the Stability of Breath Holding in Dynamic CT of the Liver
Chung-Yin YANG and Chun-Chao HUANG

Purpose: The stability of breath holding is important in dynamic CT study for better image comparison and is key to successful scan of specific target organ, such as heart. In this study, we use the levels of right diaphragmatic dome in different phases of dynamic CT of the liver to evaluate age effect on the stability of breath holding.

Materials & Methods: Eighty subjects with age at least 40 years old were enrolled in this study. All subjects underwent dynamic CT of the liver, including pre-contrast, arterial, venous and delayed phases. As compared with pre-contrast phase, the absolute differences of slice number of the highest right diaphragmatic dome level in arterial, venous and delayed phases and average of them were calculated. Independent two-sample t test was utilized to evaluate group difference based on three cut-points of age: 50, 60 and 70.

Results: There was no significant gender difference with the three cut-points of age. For the two cut-points of age at 60 and 70, there was no group difference in all the results. With the cut-point of age at 50, there were significantly greater differences in arterial (2.75 slices vs. 1.52 slices, p=0.010) and delayed (2.88 slices vs. 1.57 slices, p=0.011) phases in the older subject group and the average (2.80 slices vs. 1.67 slices, p=0.009). The difference in venous phase was also increased in the older group but not significantly (2.78 slices vs. 1.90 slices, p=0.146).

Conclusions: Our study displays that the stability is significantly impaired in subjects older than 50-year-old. Therefore, increasing scan range or training stability of breath holding might be considered to prevent potential problems from unstable breath holding in this age group.

Key words: Breath holding, Dynamic CT scan, Age
At present, rarely discussing adverse nonionic developer and incidence, clinical work but this is the problem occur, we should go to research and discussion.

**Materials & Methods**: This study collected retrospective study. From February 2011 to December 2015, due to carry out computer tomography, injection developer caused cases of adverse reactions, and incorporate it into study sample selection from the adverse drug reaction reporting system (ADR).

**Results**: 26,009 patients in this study were collected, there are 13,276 (51.04%) patients used Omnique and 12,733 (48.96%) patients used Ultavist. 18 patients used Omnique and 56 patients used Ultavist has Allergic-like reactions. There are significant differences between the two groups (P<0.001). Patients used Ultavist posed a risk of allergic-like reactions was 3.25 times patients with Omnique.

**Conclusions**: Intravenous contrast agents are among the most widely administered drugs in the world and are often necessary for optimal clinical imaging. Although not common, risks with using intravenous contrast media include allergic-like response and nephrotoxicity. We must be aware of risk factors, which may place their patients at increased risk of these adverse events.

**Key words**: Allergic-like reactions, Contrast agents, Adverse drug reaction reporting system (ADR)

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**P33**

**Using Vessel Density Ratio to Identify Atherosclerosis for Clinical Application**

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**Purpose**: Atherosclerosis and its complications have been common diseases in Taiwan. Among which acute myocardial infarction and ischemic stroke are the most common causes of death. Thus, it is urgent for the physicians to understand the causes and course of formation of atherosclerosis. This study utilizes dual energy computed tomography (DSCT) to evaluate acute coronary artery diseases. It is possible to achieve early diagnosis and early treatment of the diseases.

**Materials & Methods**: We acquired patient’s images from DSCT, based on its supreme spatial resolution and temporal resolution to visualize structures of coronary arteries, and reference points of concentration of contrast medium at aortic root. We calculate the ratios of Hounsfield Units (HU) over suspected stenosis coronary artery to classify patients’ coronary artery plaques, and then assess the method by sensitivity, specificity, and accuracy.

**Results**: This study utilized semiautomatic Matlab (USA) programs to minimize the tissue HU errors by manual ROI, body weight, different brand, different contrast medium and different parameters of computed tomography, by which to minimize the probability of classification error. We developed methods to evaluate plaque classification (lipid, fibrosis, and calcification), compared to the methods with other examinations for cardiovascular system, and correlated with clinical symptoms for statistical assessment to establish sensitivity, specificity, and accuracy.

**Conclusions**: We hope to correlate with Multimodality noninvasive imaging to provide structural and functional information to overcome the limitations of coronary angiography to achieve better sensitivity and accuracy. That is can be beneficial and prevention of coronary artery diseases.

**Key words**: Atherosclerosis, Hounsfield units, Plaque

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**P34**

**The Research of Enhanced MDCT Images under Lower Tube Current**

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**Purpose**: Computed Tomography (CT) is a widely used imaging modality. A major disadvantage of CT is the use of ionizing radiation. Ionizing radiation-induced cancer is a stochastic effect, reducing the ionizing radiation dose of CT will reduction the probability of cancers.

**Materials & Methods**: In this study, an American College of Radiology (ACR) phantom was scanned in helical and single-shot modes by employing multi-detector computed tomography (MDCT) at different tube currents. The derived images were post-processed using three filters, namely a high-boost filter, Gaussian smoothing filter, and Wiener filter; these filters were applied using 3 × 3 and 5 × 5 masks. We applied two approaches in this study: The first approach entailed filtering the images on the basis of their original CT numbers, and the second method involved converting the CT numbers from zero to one and then executing the filtering process.

**Results**: The results showed that in scanning modes, the 3 × 3 high-boost + Gaussian + Wiener filter program produced superior results to those of the 5 × 5 high-boost + Gaussian filter program and 3 × 3 high-boost + + Gaussian filter program. In the helical scanning mode, filtering images acquired at a tube current of 50 mA twice by using the 3 × 3 high-boost + Gaussian + Wiener filter program resulted in a signal-to-noise ratio (SNR) value comparable to that of images acquired at a tube current of 250 mA.

**Conclusions**: The 3 × 3 high-boost + Gaussian + Wiener filter program can improve the quality of CT images acquired at low tube currents through filtered back projection.

**Key words**: MDCT, High Boost, Gaussian, Wiener, SNR

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**P35**

**Usability Analysis of 3D Fat Measurement Using Computed Tomography Imaging**

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**Purpose**: This study is to obtain an accurate result than when measured abdominal obesity. The aim of this study was to evaluate the usefulness of 3D Fat Amount than in 2D Fat Amount measuring abdominal obesity. This was analyzed by comparing 2D Fat Amount and 3D Fat Amount.

**Materials & Methods**: From January 2015 to August 2015 Patients who underwent a CT scan were enrolled 20 people (Male:10, female:10, mean age:35 years). and Using the automatic meter height and weight were measured body. and Using a Discovery CT750HD(GE Healthcare, Waukesha, USA) to obtain an image from the lumbar to the sacrum. Image post processing of 2D Fat Amount is an Area of visceral fat and subcutaneous fat was measured at a cross-section of umbilical Level using Rapidia 2.8(INFINITT Healthcare), and 3D Fat Amount image processing of the visceral fat and subcutaneous fat from the lumbar to the sacrum was measured using an EBW(Philips Healthcare, Netherlands).

**Results**: BMI 30 or more is abdominal fat ratio (Visceral fat/ subcutaneous fat) 4.0 or higher, visceral fat over 10cm².
Abdominal fat rate of more than 4.0 were five people in the 2D Fat Amount. And Abdominal fat rate of more than 4.0 were six people in the 3D Fat Amount. Could result looks a statistically significant difference in the analysis (P=0.5825).

Conclusions : 3D Fat Amount increased scan time and radiation exposure of the patient. There was no significant difference compared with the 2D Fat Amount. Therefore, in the evaluation of abdominal visceral fat Pelvic area measurements were degraded usability. 3D Fat Amount is lower than was the usefulness 2D Fat Amount. Therefore, in the case of 2D Fat Measurement it is believed to be desirable to determine the results of the synthesis based on the visceral fat abdominal fat rate.

Key words : 2D Fat Measurement CT, 3D Fat Measurement CT, Abdominal Fat Rate, Visceral Fat Amount

P36

Effect of Impact on the Contrast Strength Side Effects CT Contrast Agent Agreements Understanding and the Number of CT Scans
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Purpose : This study was evaluated using a questionnaire with the strength of the side effects caused by psychological factors through the contrast agent agreements understanding and the number of CT scans.

Materials & Methods : It was examined through a questionnaire at 2220 people who underwent a CT scan with contrast agents of outpatient visiting KNU Hospital(men 1271, women 949, age10-90). Patients with pretreated more than 6 hours fasting and less than 1.5 levels of serum creatinine were enrolled in this study. Strength feel side effects was to select 1-5(1 weakness, 5 severe). Understanding of the degree of contrast media agreements was classified full understood, most were understanding and did not understand a lot of parts, did not understand at all. Number of scan was classified once, twice, three times, four times, five times or more. Statistical analysis of the data was analyzed using SPSS 20.0.

Results : This side effect is felt comparatively high strength was plus the 4.5 percentage that understanding the degree of agreement using contrast media items was fully understood and less than 1.5 levels of serum creatinine were enrolled in this study. Strength feel side effects was to select 1-5(1 weakness, 5 severe). Understanding of the degree of contrast media agreements was classified full understood, most were understanding and did not understand a lot of parts, did not understand at all. Number of scan was classified once, twice, three times, four times, five times or more. Statistical analysis of the data was analyzed using SPSS 20.0.

Conclusions : It could be seen that the higher the contrast agent used consent understand about the strength of the side effects are comparatively high proportion feel low. It could be seen that the more number of CT scans with contrast ratio is comparatively high strength could see and feel the side effects low. But, it is need for additional research on this study. Increased intensity at 5 times or more again is estimated that another physical factors caused by prolonged periods of follow up.

Key words : Contrast side effects, Contrast agent agreements, The number of scan

P37

Study on Radiation Dose Reduction due to Reduced Additional Tests through Protocol Change in Lower Extremity CTA Examinations
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Purpose : CTA of the Lower Extremity has a high diagnostic value but has the high possibility of additional tests due to the dose burden for Long Scan Ranges and the different scan time for each patient. Therefore, this study is to compare the imaging assessments by comparing additional test ratios and radiation dose through the change of existing protocols.

Materials & Methods : This study was based on 178 patients who had Lower Extremity CTA examinations in our hospital during November 1, 2014 to February 29, 2016 and Siemens SOMATOM definition AS+ was used for computed tomography. The Protocol of Lower extremity CTA was changed from 120kV, Ref. mAs 180, Rotation Time 0.5, Pitch 1 to 100kV(Care kV), Ref. mAs 180, Rotation Time 1, Pitch 0.85. The contrast agent was changed from 5ml/sec x 130~150ml, saline 4ml/sec x 20ml to 4ml/sec x 20ml, 3.2ml/sec x 96ml, saline 3.2ml/sec x 30ml. With 178 samples gained before and after such Protocol change, additional test ratios and radiation dose were compared. For the patients in need of follow-up, we measured the retest ratios, radiation dose and SD values, and performed comparative analysis of the mean values. And two specialists and two radiologists conducted imaging evaluation for qualitative assessment.

Results : The additional test ratios were reduced from 70.53% before the change to 28.78% after the change. The mean DLP value was decreased by 45.87% from 1238.33mGycm before the change to 670.28mGycm. The additional test ratios for the patients in need of follow-up were reduced from 42.10% to 26.31%, DLP from 861.27mGycm to 583.78mGycm. The comparative results of imaging quality showed that CNR decreased from 26.75 to 16.30, and SNR also decreased from 32.41 to 20.64. There was no meaningful difference in qualitative assessment.

Conclusions : The proper protocol change could lead to the decrease of additional test probability and the reduction of radiation dose accordingly.

Key words : Low Extremity CT Angiography, Scan Parameter, Contrast media, Additional scan, Radiation dose

P38

Usefulness of Method using Dual Inject Function of Contrast Media Auto-injectors in Both Leg Direct CT Venography
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Purpose : If condition of vein at one side iv route was poor, high pressure was developed on the same side leg vein at the both leg Direct CT Venography. high pressure at one side leg vein make insufficient contrast media injection and make inaccurate result. we evaluate whether these problems was solved by method using the Dual inject function of the automatic contrast media injector and how clinically useful this method is.

Materials & Methods : From January to March 2016 of the patients who check Direct CT Venography, the patients were 14 men and 16 woman and mean 61 age years. divided into patients who using Reverse Y connector(groupA), and the Dual inject
function (B group). After inserting a needle into a vein in the foot towards the toes, and then 300ml of diluted contrast media (contrast 30%, saline 70%) is injected into vein 3.0cc/sec. We were scanned CT from the foot to diaphragm when contrast flow in Inferior Vena Cava, superficial veins and deep vein. And level of enhancement was compared.

Results: Enhancing accuracy (HU) in the Inferior Vena Cava group A: 465.6 ± 106, group B: 385.4 ± 115, the right common iliac vein group A: 542.6 ± 55, group B: 513.8 ± 123, the left common iliac vein group A: 540.7 ± 63, group B: 517.4 ± 139, the right femoral vein group A: 1579.2 ± 184, group B: 1537.9 ± 245, the left femoral vein group A: 1570.9 ± 119, group B: 1472.3 ± 342. Enhancement level of the group A and group B were no significant difference in the ANOVA.

Conclusions: For patients with edema or different pressures from scan length, heightened image quality, and 4D CTA is in overcame freedom from scan length, heightened image quality, scan length. Without prior information vessel 1, vessel 2 function was made and perfusion image number containing time information was selected for series no. and plugged in. Delay time for the selection of a precise triggering time is calculated in dose aspects: The Perfusion Routine DLP decreases in brain enhance axial-mode, a linear function, y = a * x + b y = delay time, n = artery delay time, n = artery positional change.

Key words: Direct CTVenography, DVT

P39

The Usefulness of Modified Brain Perfusion Protocol

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Purpose: To extract the angio vessel from brain enhance axial mode without a separate brain angio scan execution or excessive extension of perfusion scan length, thus overcoming the shortcomings such as poor image quality, scan length limitation, and patient dose increase. The goal is to overcome these shortcomings and amplify perfusion strength.

Materials & Methods: I used the GE Discovery 750HD and Medrad Stellant Dual injector with 20 patients. Since the exact trigger time cannot be calculated in brain enhance axial-mode, a linear function was made and perfusion image number containing time information was selected for series no. and plugged in. Delay time for the selection of a precise triggering time is calculated by plugging in the Series No in to a linear function, y = a * x + b y = 0.8 * (n - 7) + 54 y = delay time, n = artery positional change series no. and general information was shown as below: The relationship between the BMD and educational backgrounds, vocations, and annual salaries were also a considerable relevance. The regression analysis between the T-score and HU-value of maxilla-mandible in the study group showed appropriate results. As the result of the regression analysis between the average HU-value of lumbar and the T-score in the study group, age influenced the HU-value of maxilla-mandible whereas the gender did not affect to the HU of maxilla-mandible.

Conclusions: In conclusion, BMD of the lumbar spine and maxilla-mandible using a MDCT in implant patients seems to be a useful method to decide implant procedure.

Key words: Multidetector computed tomography, Bone mineral density

P40

Analysis of Bone Mineral Density Using Multi Detector Computed Tomography in Dental Implant

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Purpose: To describe the usefulness of bone mineral density (BMD) of the lumbar spine and maxilla-mandible using a multidetector computed tomography (MDCT) in implant patients.

Materials & Methods: The BMD using a MDCT was performed on 43 males and 64 female patients in the lumbar spine and maxilla-mandible and it was obtained HU-value, T-score, and Z-score of the BMD in the lumbar spine and maxilla-mandible. Correlation between these values (HU-value - T-score, and Z-score of BMD) and general information of patients (gender, age, life styles, eating habits, and social aspects) was analyzed using ANOVA test and Student's t-test. All statistical analyses were performed using the SPSS package (version 19.0) and a P-value of less than 0.05 was considered to indicate statistical significance.

Results: The HU-value, T-score, and Z-score of BMD between the lumbar spine and maxilla-mandible were significantly interrelation, respectively. Correlation between these values and general information was shown as below: The relationship between the BMD and educational backgrounds, vocations, and annual salaries were also a considerable relevance. The regression analysis between the T-score and HU-value of maxilla-mandible in the study group showed appropriate results. As the result of the regression analysis between the average HU-value of lumbar and the T-score in the study group, age influenced the HU-value of maxilla-mandible whereas the gender did not affect to the HU of maxilla-mandible.

Conclusions: In conclusion, BMD of the lumbar spine and maxilla-mandible using a MDCT in implant patients seems to be a useful method to decide implant procedure.

Key words: Multidetector computed tomography, Bone mineral density

P41

Usefulness of Air+Water Oral Contrast Media According to Positional Change in Abdomen CT for Diagnosis of Gastric Cancer

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Purpose: It was to identify the usefulness of a effervescent granule and water instead of two effervescent granules as oral contrast media in Abdomen CT for diagnosis of Gastric cancer according to positional changes.

Materials & Methods: Group A were 117 patients and Group B were 100 patients who had Abdomen CT for gastric cancer diagnosis. For the examination, Defenition, and DefenitionAS+ were used, and for oral contrast media to expand stomach
Top effervescent-G by Taejoon Pharm and water were used. Group A had a effervescent granule and 300ml water, and Group B had two effervescent granules as oral contrast media. They were examined in LPO position for pre, artery and portal phase and in Rt decubitus position for delay phase. To compare and evaluate the gastric distension level of two groups, 3 CT radiology technologists were asked to evaluate as poor: 1, fair: 2, good: 3, excellent: 4. For the qualitative evaluation of images, a Abdominal specialized radiologist and a stomach cancer specialized surgeon evaluated contrast of water and air with lesions on 20 gastric cancer diagnosed patients in Group A. They marked 1 when water was better, 2 when they were equal, and 3 when water was better.

Results: First, gastric distension level test, average of Group A was 3.11. average of Group B 3.14. There was no significant difference between two groups through T-test. Second, in the in the contrast of air and water with lesions, air was better in 8 subjects, equal was 6 and water was better in 6.

Conclusions: When using effervescent granule and water as oral contrast media, it maintained gastric distension level and provided various images such as air-filled antrum and water-filled fundus image at LPO position and water-filled antrum and air-filled fundus image at Rt decubitus position. As it allows evaluating the contrast effects of water and air, it may help to evaluate lesions of patients better.

Key words: Oral contrast media, Abdomen CT, Gastric cancer, LPO, Rt decubitus

P42

Development of CT Head Phantom by Using 3D Printing Technology
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Purpose: The purpose of this study was suggested the computed tomography (CT) head phantom with the same quality performance as American association of physicists in medicine (AAPM) CT performance phantom using 3-dimensional (3D) printing technology.

Materials & Methods: The production of phantom follows the procedure. First, it is converted into stereolithography (STL) file through modeling program. At this time, the main phantom was the 180 mm in diameter and 50 mm height cylinder shape and constructed by making 30.6 mm in diameter round holes in the middle of inside of the cylinder and 4 spots on surrounding. Then we designed the cylinder shaped sub-phantom to let it locate inside the round hole, which can measure CT number of water, noise, uniformity, spatial resolution and slice thickness. The condition of performance evaluation resulted from investigation X-ray applying 120 kVp, 250 mA, 10 mm thickness, 50 cm scan field of view (FOV), 25 cm display FOV, standard reconstruction algorithm. We are evaluated image qualities which CT number of water, noise, uniformity, spatial resolution and slice thickness.

Results: CT number of water and noise were passing the criterion with 3.10 HU and 2.66 HU. The uniformity was a difference within ±5 HU between the centers. The study of spatial resolution was suited because the 1.0 mm thick wall of the cylinder with 5.0 mm, 3.0 mm, and 2.0 mm in grid size was distinguishable. In terms of the measuring slice thickness, the result was passing meeting the criteria; it came to 4.5 mm and 9.1 mm from 5.0 mm and 10.0 mm with deviation of ±1 mm.

Conclusions: This study was showed the CT head phantom with the same quality performance as AAPM CT performance phantom using 3D printing technology.

Key words: Computed Tomography, Head Phantom, 3D Printing, Image Quality

P43

Optimization of Dose Reduction and Image Reconstruction Method Using Sinogram Affirmed Iterative Reconstruction(SAFIRE)
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Purpose: To evaluate the image quality and clinical efficacy of pediatric Chest, Abdomen and Head CT using a recently available sinogram affirmed iterative reconstruction (SAFIRE) compared with filtered back-projection (FBP).

Materials & Methods: From January to March 2013, 82 of pediatric CT examinations were retrospectively divided into three groups which are based on each anatomic region of abdomen (15 men and 22 women; mean age, 7.16 years), chest (16 men and 18 women; mean age, 8.24 years) and head (6 men and 5 women; mean age, 5.45 years). Tube current and tube potential were respectively adjusted according to patient’s body-weight. Each image was reconstructed in soft tissue kernel by using standard filtered back-projection and three-strength of SAFIRE among 5 different SAFIRE strengths, and image noise was objectively obtained for quantitative measures in each group.

Results: Three-strength of SAFIRE can reduce image noise by 23.73% in chest CT and 28.13% in abdomen CT compared with each standard FBP. On the other hand, noise reduction showed 15.53% in head CT compared with FBP. In phantom study, noise reduction patterns were similar to clinical patient’s data. The average percentage of noise reduction was as follows: 32.99% in chest CT, 27.78% in abdomen CT and 18.54% for head CT, respectively. The figure of noise reduction with five-strength of SAFIRE in head CT was similar to noise level with three-strength of SAFIRE in chest and abdomen CT.

Conclusions: A choice of the appropriate iterative method is necessary to achieve an optimal balance between image noise and quality. When five-strength of SAFIRE is utilized in pediatric head CT, the level of noise reduction is similar to three-strength of SAFIRE in pediatric chest and abdomen CT.

Key words: Pediatric CT, Sinogram Affirmed Iterative Reconstruction(SAFIRE), Dose reduction, The level of noise

P44

Manufacturing and Clinical Applications of CT Examination Devices for Preventing Pediatric Sedation Patients from Falling Down
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Purpose: It is intended to find out the efficacy of an examination after devising a pediatric CT examination device.
Materials & Methods: The examinations were conducted targeting 25 pediatric patients who took a CT examination after taking a pediatric sedation treatment by using a pediatric CT examination device which was devised by itself from September, 2015 to February, 2016. During the examination period, it was intended to find out whether any artifacts are generated or not due to some movements of a pediatric patient caused by the self-devised CT examination device and what is the difference from the existing examinations and whether it is effective for preventing an infant from a falling or not.

Results: When using the self-devised pediatric patient CT examination device, some additional drug intakes after the sedation treatment were reduced by 25%. And it was found that the examination time was reduced by around 30% from 25 minutes to 17 ones. Since the shape of CT device is transformed elastically, the effect of preventing from falling accidents and the accuracy of a diagnosis could be enhanced and there were some effects of reducing some treatments for a medical team which is exposed to radiation during an examination of a pediatric patient, of reducing some additional sedation treatments caused by some movements of a pediatric patient after taking a sedation treatment. Thus, the safety of a patient and the efficiency of an examination could be enhanced.

Conclusions: Since a pediatric patient CT device removes some tangible or intangible losses, such as, a delay of examination and a rise in costs by reexaminations, the satisfaction level of a medical team can be enhanced.

Key words: Pediatric sedation, CT device, Falling accidents

P45
Parameters that Contributes to Appropriate Monitoring Delay Time in CT Scans with Bolus Tracking
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Purpose: It is important to check monitoring delay time after contrast agent injection to acquire high-contrast vessel images in CT. Bolus tracking is widely used because every patient has different blood circulation time. The purpose of this study was to find out the relation between patient’s physical characteristics and monitoring delay time and to check whether the accurate delay time contributes to reduction of radiation dose.

Materials & Methods: From July to September 2014, patients who underwent CT using bolus tracking were enrolled in this study. Patients’ monitoring delay time and their sex, age, height, weight, heart rate before and after CT exam, referral department, and CT history were analyzed to find out the relation between delay time and patients’ physical characteristics. To check monitoring delay time, we measured the time when CT scans started: the time Region of Interest (ROI) at ascending aorta was over 100 using bolus tracking.

Results: Patients’ physical features did not affect monitoring delay time except heart rate. The triggered time differed depending on patient’s heart rate. Average monitoring delay time according to the heart rate was as follows: 18.7 (15.2~21.1), 17.9 (12.2~24.1), 16.7 (11.1~23.1), 14.7 (13.1~17.3), and 13.7 (12.2~16.0) for patients’ heart rate of 36~49, 50~59, 60~69, 70~79, and 80~89, respectively.

Conclusions: Monitoring delay time is different depending on the heart rate of patients. After contrast agent injection, patients with lower heart rate show longer monitoring delay time. The value of CTDIvol increases by 1.71mGy as monitoring delay time increases by 1 second. Therefore, we can reduce radiation dose on patients by adjusting monitoring delay time according to their heart rate.

Key words: Contrast agent, Monitoring delay time, Bolus tracking

P46
Study of Radiation Dose and Image Quality of Coronary Computed Tomography Angiography Using Flash Scan Mode
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Purpose: Purpose of this study is compare Retrospective ECG-gated helical scan mode to Flash scan mode when performing CCTA to subject of health examination in aspects of radiation dose and image quality.

Materials & Methods: We selected 60 patients who had heart rate lower than 60 bpm, and consistent electrocardiogram from 2015.10.01 to 2016.4.30. We excluded patients who had arrhythmia and patients who underwent cardiac surgery. 30 patients were scanned with Flash scan mode, and other 30 patients were scanned with retrospective ECG gated helical scan mode. We compared two groups by using effective dose and image qualities.

Results: when we set data acquisition section to 70~80% of R-R interval, patient group which had used retrospective ECG-gated helical scan mode showed mean value of effective dose as 5.32mSv Patient group which had used ECG-gated Flash mode showed 1.83mSv. Radiation dose of later group was 65% lower than that of former group.

Conclusions: In case of performing CCTA, Flash scan mode can save radiation dose in comparison with retrospective ECG-gated helical scan mode while keeping image quality properly.

Key words: Flash scan mode, Retrospective ECG-gated helical scan mode

P47
An Evaluation of Image Quality of CBCT for Object Position and Exposure Condition
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Purpose: Cone beam computed tomography (CBCT) examination, generally performed in dental field, has a center on the patient head part rather than the pathologic region. However, dental disease usually located on peripheral area rather than center of human head due to the shape and location of dental arch and high image quality of periphery is important for diagnosis. In this study, image quality of CBCT was evaluated according to the different position in field of view (FOV) and exposure condition.

Materials & Methods: The images were obtained with 062QA-35 phantom (CIRS, Norfolk, US) and CS9300 (Carestream Corp., Rochester, US). The examinations were performed with a constant FOV (8 x 8 cm) and various exposure conditions (70, 19...
MedRadJclub is an accessible way for medical radiation professionals to share best practice and current research evidence and to foster international collaboration. In March 2015 #MedRadJclub, a Twitter based monthly journal club for medical radiation professionals, was launched, with the support of the Journal of Medical Imaging and Radiation Sciences (Canada), Journal of Medical Radiation Sciences (Aus/NZ) and Radiography (UK/EU). An article is selected each month that covers a cross-cutting theme relevant to all medical radiation professionals and, after some pre-reading and consideration of key themes (https://medradjclub.wordpress.com/), and live 1 hour journal club discussion occurs.

Materials & Methods: Analytical data (number of participants, number of tweets, number of impressions) were collated for the first year (12 tweet meetings) of #MedRadJclub using Symplur (www.symplur.com). Visitor traffic (number of visits, country of origin) to the MedRadJclub website (https://medradjclub.wordpress.com/) were also recorded.

Results: An average of 42 participants (range 27 - 56) joined each of the first twelve chats, with a total of 8,066 (average 672; rage 308 - 90) tweets and a combined reach of 7.3 million impressions. The website received 7,799 visits over the first year from 77 countries. The United Kingdom (3,460), Australia (1,346) and Canada (1,310) accounted for two thirds of the traffic.

Conclusions: MedRadJclub is an accessible way for medical radiation professionals across the globe to communicate, share practice, discuss research evidence and to engage in rich professional development. The online nature of the journal club, facilitated by open access articles from the journals, removes traditional barriers to collaboration such as geography and resources. Analytical data confirms a global reach and a sustained interest in the journal club. Future benefits include possible research partnerships and international collaborations.

Key words: Social media, Journal club

P50

Zika Virus and the Role of Radiology
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Purpose: To educate medical imaging professionals of the role of radiology in diagnosis and monitoring of Zika virus.

Materials & Methods: A review of scientific and governmental literature via PubMed was performed regarding radiology and Zika Virus.

Results: Isolated in Africa in 1947, Zika virus spread through Asia and the Polynesian Islands, reaching epidemic proportions within the Americas in May 2015. Primarily transmitted by an infected Aedes-genus mosquito bite, evidence has also demonstrated human-to-human transmission of Zika via semen and across the placental barrier. Symptoms are generally mild and reported in only 1 of 5 infected individuals, resulting in
large numbers of undiagnosed and unaware carriers of the virus. Additionally, Zika shares similarities with other flaviviruses endemic to the Americas, resulting in frequent misdiagnosis. Of greatest concern are links between Zika exposure and abnormal brain development and as a trigger for Guillain-Barre syndrome. Lab testing is limited by peak sensitivity for the virus within the first week following symptom development. The role of radiology is the detection and monitoring of neurologic conditions associated with virus exposure. Serial fetal ultrasound imaging is recommended to identify microcephaly or neural calcifications in-utero. Advanced imaging modalities including CT and MRI can serve as a confirmation tool with higher sensitivity for detecting brain atrophy and scattered periventricular calcifications, as well as evidence of meningoencephalitis that may result from an auto-immune response to Zika. However, issues of access to advanced-imaging modalities are a challenge in much of Latin America.

Conclusions: Given the far reach of the virus, its multiple routes of transmission, and the frequency of non-diagnoses-diagnoses, it is necessary to educate medical imaging professionals to be aware of the disease etiology and clinical/radiologic manifestations of Zika to ensure an accurate diagnosis, appropriate care, and prevention of further disease spread. Key words: Zika Virus, Education, Sonography, Computed Tomography, Magnetic Resonance Imaging

P51
An Overview of Radiological Educational Activities in Turkey and Contributions of Turkish Society of Medical Radiotechnology (TMRT-DER) Baris CAVLI1, Huseyin Ozan TEKIN2 and Umit KARA3
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Purpose: Turkish Society of Medical Radiotechnology (TMRT-DER) was established on 27 December 1995 as a first society of medical radiation technicians in Turkey. The main purpose of establishment was internationally contribution in education, quality improvements, encourage for scientific activities, personal evolution of professionals, protect the legal rights of the profession and improve them for radiology, radiotherapy and nuclear medicine technicians in Turkey. Since the first day of its establishment, TMRT-DER supported educational activities in all areas by using own facilities and funds. In this study, we presented framework of the educational activities and all training activities in last four years which carried out in different cities of Turkey. Materials & Methods: Turkish Society of Medical Radiotechnology has different subcommittees such as education committee, radiation protection committee, law committee, representatives and the organizing committee, international relationships committee, national and international projects committee. In this study, we presented the activities of education committee in different areas. Some of them was Employee Health Congress, Imaging Symposium, Current Innovations Symposium, Radiation Protection and Performance tests in Computedized Tomography (CT) Facilities, A Workshop on Occupational Health and Safety etc. All these activities Provided different results and feedbacks in terms of participants. Turkish Society of Medical Radiotechnology implemented different training models during all these educations. In this study, we also presented the methods and strategies of all activities in Turkey. Results: As a result of this study we can say that taking part in educational activities provided big benefits and contributions for society and professionals. Conclusions: We can conclude that educational activities that are given to employees and students provided different feedbacks such as taking a greater role in the scientific activities of current employees and also provided the opportunity for student to become more familiar with the profession. Key words: TMRT-DER, Education, Radiological Education

P52
Medical Imaging Techniques Education ‘Case Turkey’
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Purpose: Students graduating from the Medical Imaging Techniques program with success are employed in all radiological modalities (conventional and digital radiology, fluoroscopy, computed tomography, magnetic resonance imaging), as well as nuclear medicine units (SPECT, PET, PET-CT) and radiotherapy (Simulator, Linear Accelerator etc.) units. Materials & Methods: After a 2-year 4 semester education period they are graduating as ‘Medical Imaging Technician’. After education and training, the technicians are so equipped that they can follow the technological developments and apply them in the field, have the ability to synthesize information, are skilfully in the eye and hand coordination, able to provide coordination with radiologists and other health employees. This means the technicians are technically competent to use their knowledge, expertise and communication skills. Results: Students of the Medical Imaging Techniques program have to complete a total of 90 credits and 120 ECTS (European Credit Transfer System) in 4 semesters. The students must obtain at least 2.00 weighted GPA (Grade-Point-Average) of 4.00 to complete successfully all the courses (total 120 ECTS). In order to graduate the students has to get at least DD grade in all courses to be successful. Conclusions: Program Outcomes: Know the working principles of the radiology, nuclear medicine and radiotherapy devices, can distinguish the parts and operate these devices in accordance with the operating instructions. Performs examination in accordance with the radiology, nuclear medicine imaging methods procedures. Implements radiation therapy treatment instructed by radiotherapy expert planned by radiation physicist. Edits the images and performs film printing process obtained with the radiology, nuclear medicine imaging techniques. Evaluates the images in terms of radiographic quality and takes measures obtained with the radiology, nuclear medicine imaging techniques. Knows, pronounces and uses the medical and radiological terminology. Takes the necessary measures for radiation safety and radiation protection in accordance with the radiation Key words: Medical Imaging, Medical Imaging Techniques, Medical Imaging Techniques Education, Turkey

P53
Activity Report and Future View of Japan Organization for Emergency Radiological Technologists and Japan Committee to Spread
CPR Ability Course for Medical Radiographers
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Purpose: Recently, the progress of the emergency care is remarkable. The technical standards increase that the radiological technologists are demanded in the emergency medical treatment. In Japan, We established Japan organization for Emergency Radiological Technologist (JERT), its purpose is the smooth spread of safety radiological technologies in the emergency medical treatment and educate the appropriateness of the emergency radiography authorization engineer. JERT devises a radiation technology specialized in the convalescence improvement of the emergency patient and contribution to emergency medical treatment. A group taking the correspondence at the time of the patient condition sudden worsened includes Japan Committee to Spread CPR Ability course for Medical Radiographer (JASCA). JASCA provides the learning opportunity of the BLS to the radiological technology student, and develop and provide learning supporting circumstances to assume an adult education theory a base to develop a posture to learn by oneself.

Materials & Methods: We made a ‘spot coherence type program’ without remaining only in BLS skill training. Furthermore, We included knowledge about infection countermeasure and patient safety and built various training environment that facilitated the entity to the sudden patient condition change.

Results: The satisfaction, acquisition degree of the student attending a lecture was very high. Because a lot of conscious-ness to BLS instructor which is a more highly advanced aim was recognized, the effect of the spot coherence type program was high.

Conclusions: JERT is an organization that specializes in training radiological technologists in emergency medical treatment. Our organization wishes to make international partnerships in an effort to exchange expertise in the development of emergency care.

Key words: Emergency, Radiological Technologist, Basic Life Support, A spot coherence type, Adult education

P54
Awareness, Compliance and Determinants of Health Surveillance Amongst Medical Radiation Workers: A Pilot Study
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Purpose: To determine compliance and predictors of health surveillance amongst medical radiation workers at the University College Hospital, Ibadan.

Materials & Methods: A prospective cross sectional study comprising of 51 consenting radiation workers from the four departments using ionising radiation for medical purposes at the University College Hospital, Ibadan, Nigeria was carried out using a quantitative, semi-structured, self-administered questionnaire for data collection. All analysis was performed using SPSS version 21 at 5% significant level.

Results: The mean age of the respondents was 38.02 ±8.17 years (range was 24-57 years). A higher proportion (47.1%) of the respondents were radiographers. A large majority of the respondents (94.1%) work directly with ionizing radiation in the various departments. Most 43 (84.3%) of the respondents were aware of the medical programme put in place by the hospital management to protect all radiation workers against possible radiation damage. Thirty (58.8%) respondents had adequate knowledge score of the health surveillance programme. A larger proportion 45 (90.0%) had pre-medical examination however, only 29 (56.9%) respondents had ever participated in the routine periodic health surveillance organized by the hospital. Less than half (42.0%) of the respondents had ever been counselled about their radiation exposure before. Male respondents were 16.22 times more likely to have participated in the routine periodic health surveillance when compared with female respondents (OR=16.223, 95% CI=1.454 -180.986).

Conclusions: The level of awareness about the medical surveillance programme put in place within the hospital for all radiation workers was high while adequacy of knowledge on the health surveillance programme, likewise the level of compliance amongst these study respondents were fair. Educational programme on health surveillance and strict inspection in the workplace so as to ensure and enforce total compliance with the surveillance programme among radiation workers are of utmost importance.

Key words: Medical Radiation workers, Ionising Radiation, Radiation hazards, Occupational safety and health

P55
Development of the Portal System for Collecting, Analyzing and Providing All Information in Radiation Field in Korea
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Purpose: In addition to performing actual researches and development, it is required to operate an advanced information system for collection, analysis and provision of the radiation technology information in Korea, and to construct an infrastructure for supporting research and development in radiation technology fields by creating new added values to users of radiation information. Therefore, this paper aims at introducing processes for constructing the advanced information system for collection, analysis and provision of radiation information.

Materials & Methods: For designing information system, a research on information system demand in radiation field has been performed for information users of the Industry-University-Institute. The benchmarking has been done for other information systems. We have then derived requirements for constructing the radiation information system through those stated processes.

Results: Those requirements are summarized as following; collection and integration of radiation information focused on users, provision of radiation information having high qualities through analysis of information, provision of portal service for radiation information and provision of tailored radiation information to users. We then provided information strategy plan (ISP) and information systems master plan (ISMP) for its construction.

Conclusions: This radiation information system will be operated as the overall system of national dimension for managing and providing valuable information for knowledge, resource,
A conceptual thematic analysis of the data was conducted. Though Africa, in particular Tanzania, still lacks modern equipment for diagnostic, planning, and treatment purposes, there are still efforts to serve people. If we decide to understand our environment and cling to simple innovation.

**Keywords**: Radiation Information System, Information Strategy Plan, Information Systems Master Plan

**P56**

**A Study on Development of Guideline on Writing Technical Document for Dental Radiology Equipment**

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**Purpose**: Market size of dental radiology equipment and the number of its approval by Ministry of Food and Drug safety (MFDS) has annually increased. For approval of medical devices, manufacturers are required to submit technical documents to MFDS. So, it is need to develop the technical document guideline for dental radiology equipment for them.

**Materials & Methods**: This research developed a guideline on writing a technical document for dental radiology equipment by investigating and analyzing related international standards, domestic regulations such as a “Regulation for approval and review process of Medical device”, and already approved 88 documents. Finally, this research derived guideline harmonized with international standards of dental radiology equipment and applied with domestic condition, which includes evaluation methods and appropriate examples.

**Results**: This guideline to write technical documents provides explanations of the following: product name (item/brand/model), classification number, appearance (shape) and structure, raw material, manufacturing methods, purposes of use, methods of use, precautions, packaging unit, methods of storage and duration of expiration, and test standards according to the clauses (B-17) in “Regulation for approval and review process of Medical device”. And the methods for the test evaluations were based on IEC 60601-1, 5 test evaluation methods for the Common dental radiology, 4 test evaluation methods for the Intraoral X-ray system, Extraoral X-ray system and Portable X-ray system, 5 test evaluation methods for Arm type computed tomography.

**Conclusions**: As a result, this research developed guideline for support the approval and safety and performance evaluation of Intraoral X-ray system. Extraoral X-ray system - Arm type computed tomography. These methods are suitable to international and domestic standards, include the methods of the test evaluation and offer various information. In addition, this research contributes to promoting national health and strengthening the industrial competitiveness.

**Keywords**: Dental Radiology Equipment, Technical documents, Electrical medical devices, Medical device regulati

**P57**

**An Ethnographic Study of the Sociological Practice of Radiographers in Trinidad and Tobago**

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**Purpose**: The purpose of the research is to identify and compare the social factors and perceptions that impact the practice of radiography by the radiographer in Trinidad and Tobago and how they affect the practice of radiography as an autonomous profession. The ethnographic study of this social phenomenon is the first of seven different socioeconomic and cultural locations used to compare the practice of the radiographer globally.

**Materials & Methods**: A literature review reveals some of the medico-sociological constructs affecting the practice but also the paucity of any current global research in this area related to radiographers. The qualitative, interpretative framework using an ethnographic approach emphasizes the inductive, individualistic paradigm. As a radiographer, the researcher was an insider, a biographically situated researcher able to provide an insightful appraisal including a reflective journal. Radiographers in Trinidad and Tobago were interviewed in a mid-sized hospital, the practice of radiographers was observed at the site through participant observation, and policies and scopes of practice were reviewed to provide context and analysis.

**Results**: A conceptual thematic analysis of the data was developed as a case study where the theme of autonomy emerged, reflecting the purpose and aims of the study. Data was coded and analysed using five specific themes of work, impact of technology, role of the radiographer, relationships and country culture. From this analysis emerged a number of paradoxes typifying the dichotomies of the profession.

**Conclusions**: This study is a snapshot of working radiographers in Trinidad and Tobago. As an ethnographic qualitative study it has provided a thick description upon which to build general themes to compare with other countries and cultures. This first fieldwork case study and analysis has provided a template which will allow a reliable, comprehensive, objective comparative analysis to determine common and divergent themes in the sociological practice of radiography across seven countries.

**Keywords**: Radiography, Ethnography, Sociological Practice, Comparative Study

**P58**

**A Lead Mesh Wire Can Do: A Barium Swallow with Grid**

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**Purpose**: To show how effective the ancient Barium Swallow with Grid using lead wire mesh is for the countries that lack modern equipments for treatment planning and simulation.

**Materials & Methods**: A patient is placed supine on x-ray table mouth filled with barium sulphate suspension. A lead wire mesh of common 1cm square boxes is kept on patient's chest. On exposure, patient is told to swallow the contrast and a single image is taken.

**Results**: A film will show contrast filling the oesophagus to locate the area with oesophageal lesion. The square boxes of the wire mesh are then used to locate the treatment area for radiotherapy examination.

**Conclusions**: Though Africa, in particular Tanzania still lack modern equipment for diagnosis, planning and treatment purposes, there are still hope to serve people if we decide to understand our environment and cling to simple innovation.
With local method of using wire mesh in treatment planning, patient receive correct treatment and restore their hope in life. However, the challenges of this procedures like fistulation, patient movement, and grid wire misplacement remain to be a question on how accurate the procedure can be.

Key words: Oesophagus, Lead Mesh Wire, Barium Sulphate, Centre of the Grid, Treatment site

P59

Lower Extremity Camera Chip Frame
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Purpose: To study the radiography problems for patients with lower extremity trauma after external fixation.

Materials & Methods: We used 1cm×1cm hollow stainless steel tube to manufacture lower limb radiography bracket, Length 40cm, 15cm wide, 15cm high. The patients lied on their side with putting contralateral lower limb on the bed of the radiograph, lower limb with external fixation on the radiography rack with a soft cloth fixed in radiography shelves.

Results: We got 42 excellent level in 45 pieces of the tibia and fibula and lateral X-ray film with lower limb radiography bracket camera, accounting for 93.3%.

Conclusions: Lower extremity radiography rack can be used in patients with lower extremity trauma with fixed Shoot Rack.

Key words: Lower Extremity, Camera Chip Frame

P60

Consideration of Image Acquisition Conditions Decision Using “Physical Exposure Index (PEI)” in the Digital Mobile System with Wireless FPD
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Purpose: Aim a characteristic curve using “Physical Exposure Index (PEI)” to use for data consistency test and examined the setting of the photographing condition.

Materials & Methods: Digital Mobile System; SIEMENS Healthcare Mobilett Mira -Phantom: acrylic plate(30cm×30cm×1cm) 28sheets -Spreadsheet software: Apple Inc. Numbers ver3.6.1 We carried out phantom examinations under conditions of X-ray tube voltage from 50 to 109kV, mAs 0.5 - 10.0, acrylic thickness 0-28cm, and calculated the mean of the PEI. We made graph by PEI of converted logarithm (vertical line) and acrylic thickness (horizontal line). And a graph of PEI 200 was made from a obtained characteristic curve. We considered the most suitable X-ray tube voltage and mAs from a made chart to acrylic thickness.

Results: The minimum value of PEI was 1, and the maximum was 10000. The mAs and PEI are proportional connection by a characteristic curve of mAs. However, when the X-ray tube voltage rose, the inclination of the characteristic curve became gentle. As acrylic thickness became thick by a characteristic curve of the X-ray tube voltage, the attenuation ratio of PEI became big in the low kV. The PEI 200 graph became able to calculate the X-ray tube voltage and mAs every thickness of the object.

Conclusions: When measuring the thickness of the object by a characteristic curve, it was possible to find mAs value of kV fixing and kV of mAs value fixing. Therefore it became possible to choose the most suitable exposure condition. However, a relation between object’s thickness and X-ray tube voltage won’t be proportional connection. We are necessary to use a condition table of the thickness and the voltage of the object to find the appropriate voltage. And the X ray tube - flat panel detector distance need to made fixed.

Key words: Physical Exposure Index, Digital Mobile System, Characteristic curve

P61

The Feasibility of Teleradiology in Africa: A Literature Review
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Purpose: To determine the usage of teleradiology services in Africa, the successes, and challenges encountered with its implementation, and provide possible recommendations for future use.

Materials & Methods: Electronic databases (PubMed, The Cochrane Library, and EMBASE) were searched using the key words “teleradiology” and “Africa” from 2000 to 2014. The inclusion criteria were that the data generated had to satisfy the following: practical application of teleradiology, geographical restriction to Africa, and originally published in English. All articles which did not satisfy any of these criteria were excluded.

Results: A total number of 17 articles (PubMed=16; The Cochrane Library=0; EMBASE=1) were generated from the search, out of which eight studies (PubMed=8) were deemed relevant for the study.

Conclusions: This review shows that teleradiology is feasible in Africa, particularly where there are few or no radiologists; however, the uptake is still slow in advancing healthcare delivery due to low technical know-how and inadequate government support for the technology.

Key words: Teleradiology, Radiology, Imaging, Clinical, Africa

P62

Small Country Big Ideas!
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Purpose: Estonia (population 1 311 759) is located in northeastern Europe; this small coastal country (45 339 km²) is a short ferry trip away from Finland. We come from Tallinn (population 543 000) which is the capital and largest city of Estonia and we want you to introduce the pilot service in East Tallinn Central Hospital and in whole Estonia - Radiological studies helpline.

Materials & Methods: One year ago two East Tallinn Central Hospital radiographers came up the idea to offer to the patients opportunity to get before the examination some information. In Estonia, it is not usual to counsel patients before the examination and patients don’t know what they should expect or what kind of preparation they should do before the examination. At first we wrote project where we introduced our idea and calculated our needed human and material resources. After that we introduced our idea in hospital, national radio and television.

Results: 4th of January 2016 we opened our patient helpline where answers well prepared and motivated radiographers. Patients can ask information by calling or e-mailing on workdays
P63 Evaluating Radiographic Image Quality Using Different Manufacturers Digital Imaging Equipment
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Purpose: Compare and contrast radiographic phantom image quality when using different brands of digital imaging equipment in different medical facilities.

Materials & Methods: A phantom hand and chest were transported to various imaging facilities to create radiographic images using six different manufacturers CR units, and six different DR units. Thus 12 different types of imaging equipment were compared and contrasted in this study. At each facility two images of each body part were created with the first image taken using the mAs and kVp routinely used by the facility on patients. A second image was created by the investigators increasing the kVp 15% from the initial image while reducing the mAs to the phantom by 50% to compare the resulting image quality. The phantom thus received approximately one half the radiation exposure as the initial image.

Results: Phantom images produced were visually compared by researchers and when viewed side by side, no visible diagnostic quality difference was evident. When comparing radiographic images taken using different manufacturer’s brands of equipment, differences in image quality were judged to exist. Further evaluation is planned to add an additional body part for that purpose. We performed experiment using off-level, off-center, off-focus, and upside-down positions.

Conclusions: Preliminary images were windowed and leveled and preliminary evidence suggests when using digital imaging, increasing the kVp 15% from the “traditional” film-screen kVp technique results in diagnostic quality images with an approximate 50% reduction to the patient radiation exposure. Still under investigation is what effect, if any, does increasing the kVp above 125 kVp have on image quality. Still under investigation is what effect, if any, does increasing the kVp technique results in diagnostic quality images with an approximate 50% reduction to the patient radiation exposure.

Key words: Patient, Radiology, Helpline, Satisfaction, Estonia

P64 Knee Joint Cavity of X-ray Film Evaluated Using Semi-automatic Quantitative Analysis
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Purpose: The objective of our study was to replace manual analysis of osteoarthritis (OA) knee joint cavity by semi-automatic quantitative analysis (SAQA).

Materials & Methods: We retrospectively reviewed knee AP X-ray images of 100 patients who needed further treatment by physicians. ImageJ software, which combined (threshold method and region growing), was used for collecting SAQA data in this study. The SAQA data were compared with data collected by conventional method, which used manual ROI by two experienced radiologists to define knee joint space. We used SPSS for statistical analysis (including paired samples t-test, intraclass correlation coefficient, coefficient of variation and the efficiency).

Results: In our result, the pair samples t-test no significant differences (P value>0.05. The knee joint cavity of manual method: 327.765±78.53 mm². The knee joint cavity of semi-automatic method: 326.264±47.47 mm²). The intraclass correlation coefficient of manual method and semi-automatic method was 0.98. The average coefficient of variation was 4±2% and the processing time of analysis of knee joint cavity shortened about 6.51 times (manual method: 184.64±25.74 sec. semi-automatic method: 28.37±5.78 sec).

Conclusions: SAQA method can effectively quantify knee joint cavity of the x-ray image for clinical diagnosis.

Key words: Osteoarthritis, Knee joint cavity, Quantitative analysis, ImageJ software

P65 Analysis for Cut-off Effect by Improper Grid Location with General X-ray System
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Purpose: The scatter radiation is major parameter for decreasing image quality. The grid is generally used to reduce scatter radiation and to improve contrast. However, when we abnormaly used grid, low image quality was acquired because of cut-off, which occurs from the gap of the angle between X-ray beam and the gaps between the X-ray absorbed material, with image artifact. The purpose of this study was to analyze and evaluate cut-off with grid.

Materials & Methods: For that purpose, we performed experiment using off-level, off-center, off-focus, and upside-down positions.

Results: According to the results, cut-off is caused deterioration of image quality due to absorption of primary radiation with Pb strips. Especially, upside-down position was worst affected by the cut-off among above-mentioned situations.

Conclusions: In conclusion, our results confirmed that proper location of grid is very important for improvement of image quality.

Key words: Grid, Cut-off, Image quality

P66 The Effects of Total Variation (TV) Technique for Noise Reduction in X-ray Image: Quantitative Study
The utilization of an assistant device is an important factor not only for the efficiency of the X-ray inspection but also for the safety of a patient. However, if such a device is developed and used independently, it is impossible to guarantee the safety and the usefulness. It will be very profitable for both patients and hospitals to use the proposed assistant device.

Key words: Assistant Device, Standing X-ray Views, Fall Down

P67

The Development of an Assistant Device for the Standing X-ray Views and Its Usability for the Patient Safety

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Purpose: Generally, noises that can significantly degrade image quality occurred by various parameters when we acquired X-ray system. To eliminate noise component, the noise reduction techniques frequently used in the field of diagnostic imaging. Although previous techniques such as median, Wiener filters and Anscombe noise reduction technique can reduce noise component, edge information was damaged by excessive denoising because edge area is composed of high frequencies. To cope with this problem, total variation (TV) noise reduction technique based on L1 norms has been developed and researched. The purpose of this study was to quantitatively evaluate and compare image performances using various noise reduction techniques.

Materials & Methods: For that purpose, we evaluated normalized noise power spectrum (NNPS) and contrast-to-noise ratio (CNR) with simulation and experiment.

Results: In both the simulation and experiment results, we can acquire not only lowest NNPS value but also highest CNR value by using a TV noise reduction technique.

Conclusions: Comparative results on both simulation and experimental images showed that TV noise reduction technique is of essential importance for ensuring accurate denoising.

Key words: X-ray radiography, Digital radiography, Image processing, Noise reduction.

P68

The Usefulness Evaluation for Hindfoot Coronal Alignment

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Purpose: The evaluation of hindfoot alignment in the coronal plane is important to consider the ankle joint realignment surgery that is accompanied with hindfoot deformity or determine the direction of impingement syndrome treatment after checking the central axis of the tibia and calcaneus. Therefore, this study intends to show the optimal view by using incident angles of a tube and adjusted angles of cassette in the examination of hindfoot coronal alignment.

Materials & Methods: Both feet stood on radiolucent stand equipment with equal weight on both feet. The calcaneus center and second toe were positioned in a straight line. With the cases of first, 20°, 30°, 40° of cassette angles at 20° of Tube Angle, second, 20°, 30°, 40° of cassette angles at 30° of Tube Angle, and third, 20°, 30°, 40° of cassette angles at 40° of Tube Angle, a total of 45 views were observed and compared.

Results: Saltzman's technique based on 20° of Tube Angle did not show very well Talocalcaneal articulation and Talotibial joint space. In case that a cassette angle was 40°, a meager effect of Tube Angle led to the magnified views in whole. The average changed-angles of the left and right sides were 4.54° at 20° of Tube Angle, 3.14° at 30° and 2.55° at 40°. And such average changed-angles were 2.89° at 20° of cassette angle, 3.38° at 30° and 3.96° at 40°.

Conclusions: The variations of Tube Angles and cassette angles applied from Saltzman's technique brought a meager change of diagnostic value. However, the images at 20° and 30° of Tube Angles and 30° and 40° of cassette angles were well represented on the postural changes of inversion and eversion in Talocalcaneal articulation, Talotibial joint space and hindfoot, which can help to be evaluated as the meaningful diagnostic value.

Key words: Hindfoot coronal plane, Saltzman's technique, Ankle joint realignment.

P69

The Development of Assistant Device for the Simultaneously Both Knee Stress Study and Its Usability

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Purpose: Due to increase of outdoor activities, Knee Ligament Rupture event has been occurring frequently. The precise knee x-ray examination is required, because the result shows significant criteria for charge of medical treatment fee and disability diagnosis. Using TEOLO's knee stress study is examined bilateral knees checking each one in these days. Therefore, the objective of
this experiment is to confirm the accuracy, reduction of exposure doses and the lead-time for examination when it is checked both sides of the knee ligament at the same time.

**Materials & Methods**: We developed the assistant device to check the both knee stress study simultaneously. We compared the normal and abnormal cases in x-ray films, exposure doses and examining times from a new assistant device versus TELOS.

**Results**: In case of the normal patient, the images of normal and abnormal x-rays were not significantly different, but the radiation exposure dose of patients was reduced by 50% also the examining time was by 60%. In case of the patient with knee ligament rupture, both results were accurate and easy to compare with the normal and ruptured knees. Moreover, they gave same forces on the other sides in the x-ray result. Aligned with the normal patient case, it showed 50% of the exposure dose reduction and 65% of the examining time.

**Conclusions**: By checking the inspection bilateral knee ligaments at the same time it was confirmed that there is such a force in the given image for each ligament. Patients were helpful correcting examination and dose reduction of effect and radiologists were able to reduce inspection time with relieve work strength. Furthermore, dramatically cheap price of the device is one of the benefits. Unfortunately, anterior and posterior cruciate ligament is not possible to check by our new device. If it is possible, expensive TELOS can be replaced.

**Key words**: Varus, Valgus, Both knee, Assistant device, TELOS.

**P70**

**Timed Barium Esophagogram and Esophageal Transit Scintigraphy Correlation**

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**Purpose**: Timed Barium Esophagogram (TBE) and Esophageal Transit Scintigraphy (ETS) have been adopted as useful ways to evaluate achalasia patients. TBE has merit as a simple, non-invasive, and convenient method. To compare timed barium esophagogram and esophageal transit scintigraphy to discover whether timed barium esophagogram can replace esophageal transit scintigraphy in terms of evaluation of esophageal motility of patients with achalasia.

**Materials & Methods**: The prospective study had been carried out on those who diagnosed with achalasia or suspected to have achalasia from 2016. TBE test was conducted with ETS and Barium used in Test EST was used as a 150ml, 70% w / v. The height and width of the coated barium column was measured at 1 min, 2 min, and 3 min image volume using the hospital's PACS system Petavision. Then the dimension of barium column was compared with the percentage of radioactive residues at 1 min, 2 min and 5 min from the esophageal transit scintigraphy test.

**Results**: The change volume and change ratio of the 1min, 5 min result in the Timed barium esophagogram and the change volume of the 1min, 5 min result in the Esophageal transit scintigraphy presented statistically significant similar patterns.

**Conclusions**: The tool to evaluate esophageal motility with the image of the timed barium esophagogram. Timed barium esophagogram can be considered as one of effective tools to replace the current esophagography and esophageal transit scintigraphy.

**Key words**: Achalasia, Timed barium esophagogram, Esophageal transit scintigraphy.

**P71**

**A Survey on the Effectiveness of Various Training Modals among the VIR Radiographers in SGH**

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**Purpose**: The role of VIR radiographers in our department has expanded tremendously over the years due to the advances in the procedural techniques as well as imaging technology. The effort to train a radiographer to be competent in VIR modality can be a challenging task, in the multi-disciplinary institution. Typically, training is conducted using the traditional approach via an appointed senior member or trainer in the team. This study is conducted to survey the effectiveness of the various training modals or strategies used in the radiographer’s training.

**Materials & Methods**: Nineteen registered VIR radiographers agreed to participate in this study, with 36.8% (n=7) have 10 years of working experience or more. Full explanation was made to the participants regarding the various training modals used by trainers, followed by the distribution of questionnaires. The questionnaires are further sub-categorised into different modals or strategies.

**Results**: Results were collated, analysed, and compiled into graphical representation to aid the interpretation.

**Conclusions**: This survey seemed to suggest that integrating different training modals or strategies does have impact to training outcome due to the learner’s ability. Therefore, it is crucial for trainers to adopt various training modals or strategies to obtain the best outcomes.

**Key words**: Vascular and interventional radiology (VIR), Training modal, Training strategy.

**P72**

**Experience of the Spine Surgery with Hybrid OR**

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**Purpose**: There is increasing building a hybrid operation room (Hybrid OR) for the purpose of a minimally invasive cardiovascular surgery in Japan. However, it is not used effectively in other surgery. Therefore, we have promoted the Hybrid OR use that does not limited for the cardiovascular surgery to increase the rate of cases in our hospital. As a result, it was able to perform the surgery of various departments, including orthopedic and neurosurgery. We will report about the experience of the spine surgery with Hybrid OR.

**Materials & Methods**: Our Hybrid OR with C-arm was installed in the operation room. The system is combined the C-arm “Allura Clarity FD20, Philips, Holland” and operating table “Magnus, MAQUET, Germany”. We performed 39 cases of spinal fusion surgeries from April 2014 to March 2016.

**Results**: We experienced 33 cases spinal fusion surgeries out of 39 spine surgeries. Those fluoroscopy time was 5.3±3.5 min, DAP was 27.8±30.6 Gycm2, CBCT scan was 2.4±1.7 times. Using
the Hybrid OR has some Advantages. For example, the FPD has no distortion and large FOV compare to the image intensifier system. CBCT is a useful application which has been quickly obtained clearly volume image. In the clinical case that was possible to easily detect the detail of pedicle screw.

Conclusions: The Hybrid OR is useful system for the spine surgery as well as minimally invasive cardiovascular surgery. These also suggest we should use the Hybrid OR for the various body parts.

Key words: Hybrid OR, CBCT, Spine surgery, Spinal fusion surgery, FPD

Case Report: Combined Neuro-intervention Techniques in a Patient Using Pipeline Embolization Device and IA Thrombolysis

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Purpose: Cerebral aneurysm and cerebral artery thrombosis are both devastating diseases. The ruptured cerebral aneurysm may cause subarachnoid hemorrhage (SAH). Traditional treatment of aneurysm includes GDC coils embolization. Pipeline embolization device (PED) was first introduced in our hospital in 2012. It is composed by high density metal alloy and designed as an endoleak, which produces thrombus to embolize aneurysm. Acute cerebral thrombosis may cause ischemic stroke. There are three techniques to achieve intra-arterial (IA) thrombolysis. The first is thrombectomy using penumbra aspiration system and stent retriever device. The second is thrombolysis using urokinase or IIb/IIIa inhibitor. The third is the angioplasty using balloon or stent deployment to achieve recanalization.

Materials & Methods: A 66-year-old man suffered from aneurysm in communicating segment of left internal carotid artery (ICA). PED was selected to embolize the aneurysm and blocked the blood flow to aneurysm successfully. However, conscious of the patient changed after a few hours. MRA was performed and demonstrated hypo-intensity on T1 weighted image and hyper-intensity on T2 weighted image in left ICA. Acute in-stent thrombosis is highly expected. IA thrombolysis was performed immediately. The procedure lasted 2 hours to recanalize of left ICA. With intensive care for 3 days after the IA thrombolysis, patient could speak and exercise as usual.

Results: In-stent thrombosis may happen after treatment of PED for unruptured cerebral aneurysm. Performing CTA or MRA is highly recommended for the patient of conscious change after PED procedure. IA thrombolysis is suggested for recanalization when in-stent thrombosis is suspected by CTA or MRA images.

Key words: Aneurysm, Pipeline embolization device, IA thrombolysis

Comparison of Usefulness for CBCT and MDCT in TACE

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Purpose: By comparing image evaluation with CT standard phantom used to lipiodol absorption imaging along with dose evaluation regarding the usefulness of Cone-Beam CT(hereafter CBCT) and Multi-Detector CT(hereafter MDCT), which are performed for accurate diagnosis of lesion during operation of TACE together with generalization of flat panel Vein Illuminator, this study intended to evaluate the clinical usefulness of CBCT.

Materials & Methods: For comparison of the quality of imaging of CBCT(Allura Xper FD20, Philips) and MDCT(Discovery 750HD, GE), AAPM(American Association of Physicists in Medicine) Phantom was used. Regarding the device for dose evaluation, Mobile MOSFET System(Best medical Canada, Ottawa, Canada) was installed inside of Humanoid Phantom (Male ART, The Alderson Radiation Therapy).

Results: The result of evaluation using AAPM Phantom showed MDCT’s eligibility on all the evaluation items, but CBCT received unsatisfactory levels on water’s CT number, degree of uniformity, spatial resolution and artifacts inspection. The result of exposure dose evaluation using MOSFET Detector showed MDCT’s overall low absorbed dose compared to CBCT. In the imaging evaluation of lipiodol absorption imaging and Contrast-enhanced MDCT, lipiodol absorption part of liver tumor showed higher density than actual parts around liver, which means that it is sufficient to understand the absorption degree.

Conclusions: TACE using CBCT is considered useful because the frequency of Conventional Angiography(DSA) can be reduced, but it was identified that CBCT has about 2.7~1.4 times more exposure dose than MDCT. In addition, the images acquired by CBCT doesn’t have as high resolution as MDCT, but it seems useful in deciding the treatment direction while performing during intervention operation. Nevertheless, it is necessary to evaluate clinical imaging to acquire a good quality of CBCT images, to develop proper performance management phantom, and to manage the degrees by programs. It is also required to establish new legal and institutional standards for accurate management criteria of CBCT devices.

Key words: Cone-Beam CT, MOSFET, AAPM Phantom

Radiation Dose Reducing Effect Using Low Dose Technique in Interventional Procedure

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Purpose: To evaluate radiation dose reducing effect using low dose technique (LDT) according to the size of flat panel detector (FPD) and the patient’s body change in interventional procedure.

Materials & Methods: Conventional dose mode (CDM) was performed as digital subtraction angiography (DSA) and the RoadMap condition, LDT was applied digital subtraction fluoroscopy save (DSFS) and SmartMask function in the abdominal intervention. We were measured radiation dose 10 times in each condition. FDP size was set to 48cm and 22cm, were measured radiation doses by attaching a glass dosimeter over the home-made blood vessels phantom model at the inside the phantom model (depth dose), top (transmission dose), the operator position (indirect dose). Fluoroscopy was performed for 5 minutes by hand injecting a contrast medium into 20ml as 1ml per second and state filled with contrast medium. We have attached 0.5cm and 1.5cm-thickness bolus in front of phantom to reproduce the changes in the patient’s body.

Key words: Cone-Beam CT, MOSFET, AAPM Phantom

ABSTRACTS
Results: The radiation reduced rate under LDT was 58.13%, 58.29%, and 65.95% at depth dose, transmission dose, and indirect dose, respectively. In the size of the FD been changed from 42 cm to 22 cm, depth dose and transmission dose were increased 43.8%, 34.95% indirect dose was reduced 58.46%.

Conclusions: The low dose technique seems to be useful technique for reduce radiation dose in interventional procedure.

Key words: Radiation dose, Low dose technique, Interventional procedure

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Impact of Contrast Agent to Reduce Tracheal Balloon Deflation Times: A 3D Printed Phantom and Animal Study
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Purpose: Prolonged balloon deflation times could be detrimental during tracheal balloon dilation. The purpose of this study was to assess the impact of contrast/saline ratio for reducing tracheal balloon deflation times in a 3D printed airway sticture phantom.

Materials & Methods: We performed a comparison test of tracheal balloon deflation times using two contrast agents with different viscosity (iohexol and ioxithalamate) and six contrast dilutions (1:0, 3:1, 2:1, 1:1, 1:2 and 1:3 contrast/saline ratio) in a 3D printed airway sticture phantom. Balloon dilation was performed in a rat tracheal model and radiographic images were obtained during balloon dilation. Signal-to-noise ratio (SNR) was measured to evaluate the image quality according to six contrast dilutions in-vivo state.

Results: The mean deflation time of 100% iohexol (higher viscosity) was significantly longer than that of 100% ioxithalamate (122.13 ± 1.80 seconds vs. 106.01 ± 1.16 seconds, P < 0.001) with 13.2% reduction. However, the mean SNR of iohexol was significantly better than that of ioxithalamate (2.46 vs. 2.38, P < 0.001) with 3.3% reduction. The mean deflation time and SNR of iohexol and ioxithalamate gradually decreased according to increased saline ratio. Compared to 100% iohexol, 3:1, 2:1, 1:1, 1:2, and 1:3 contrast/saline ratios resulted in 51.8%, 63.8%, 74.7%, 80.5%, and 82.4% reduction in mean balloon deflation time, respectively, but at the expense of decreased balloon opacity (3.6%, 6.9%, 10.9%, 12.6%, and 13.4%, respectively).

Conclusions: Use of a lower viscosity contrast agent and higher contrast dilution could reduce tracheal balloon deflation times and decrease SNR. Rapid tracheal balloon deflation could improve the safety of interventional procedures.

Key words: Deflation time, Balloon catheter, Airway stricture, Obstruction

P77
When TACE Tests Utilizing the Liver Dynamic MRI Scan, Celiac Trunk Detection and Improvement of

Research on Ways of Reducing Patient Damage
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Purpose: His area of interventional radiology is increasingly broadened and increased frequency of treatment, but tend to be a lack of research on the dose received by a patient. Also interventional procedure when the patient is required to be a change in the environment to receive proper medical treatment for patients with peace of mind by exposure to radiation during treatment radiation.

Materials & Methods: He subjects of this study were enrolled in seven people who visited the patient five months from October 2015 to March 2016 year. Among patients without a doctor before surgery and surgery not interested in 3D video, radiation technologists, nurses have to show 3D images in a patient procedure. All three men while an average age of 63 ± 12. Equipment was a scan using a Siemens Artis zee, Which can be obtained from equipment less dose-area product and surface entrance dose and the test time was evaluated quantitatively.

Results: The average dose applied to less dose-area product of 1094, apply after 1011, the average dose was applied to the surface of the incident before 150 and 111 after application. The average test time before 53min, after 41min and then was applied. Dose-Area product, surface entrance Dose, the average test time was reduced after application.

Conclusions: By using the 3D dyna CT images created during interventional procedure to view the anatomy of the patient, but this is due to the increased contrast medium, the dose, the test time increases the probability of patient risk. Therefore, HCC patients is determined to be able to take advantage if the 3D image is obtained by proceeding TACE during an MRI procedure reduces the probability of risk of the patient. In addition, we expect to give assistance during the examination or treatment if it is deemed to be utilized to achieve an improved.

Key words: Patient Care

P78
Effectiveness of Radiological Technologists’ Support in Prompt Interpretation of Postmortem Images
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Purpose: As worldwide autopsy rates decline, postmortem imaging is increasingly becoming more wide-spread. In Japan, postmortem imaging examinations are called ‘Autopsy imaging (Ai)’, among which postmortem CT (PMCT) is performed on over 20,000 cases per year. Findings of Ai are generally classified into 3 categories: cause of death, postmortem changes, and changes occurring after cardiopulmonary resuscitation. Thus, diagnostic knowledge of these categories are important for Ai interpretation. In judicial examination by police inquest, information related to autopsy is mandatory in addition to Ai interpretation. Under these circumstances, prompt Ai interpretation support is considered one of the roles of radiological technologists (RTs) in Japan. Our purpose was to investigate the effectiveness of this Ai interpretation support from RTs.
Role of Radiological Technologists in Postmortem Imaging Examinations in Japan: Importance of Establishing Work Shifts and Training

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Purpose: The role of postmortem imaging (PMI) is becoming important due to the worldwide decline in autopsy rates. In Japan, PMI examinations are increasing as the Japanese government has approved official use of PMI for death cause detection, the autopsy rate is extremely low for Japanese tradition, and a great number of CT and MRI systems exist throughout Japan. Our institution has been conducting PMI since 1985, using a CT unit specialized for PMI and MRI system. From experience, we intended to search for optimum work shifts for radiological technologists (RTs) for practical use of PMI.

Materials & Methods: A questionnaire survey was conducted on the awareness and legal knowledge regarding PMI for a total of 35 RTs at our institution (24 men and 11 women; mean age: 34 years). Based on their knowledge and interest in PMI, we collected ideas to establish a PMI work shift schedule for 24 hours every day.

Results: Of the 35 RTs, 30 responded (86% response rate). All subjects (100%) answered that they were receptive to requests for PMI on deceased patients transferred to our institution in a state of cardiopulmonary arrest. However, 7 subjects (23%) stated that they did not want to perform judicial PMI, as advanced postmortem putrefaction may be present in such cases. Based on their feelings of acceptance and technical expertise in specific medical equipment, we conceived guidelines designating the RT staff members to PMI procedure. We also prepared a guideline manual for RTs to effectively assist busy doctors who have to interpret PMI data immediately.

Key words: Postmortem imaging, Autopsy, Hemorrhage

A Study of the Proactive Strategy for Detecting Early Stage of Dementia - The Development of an MRI Scanner Maintenance System in ASEAN Countries-

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Purpose: Medical diagnostic imaging systems are rapidly improving in the ASEAN region. Owing to this, it is now possible to diagnose diseases that previously would have been undetected. Due to the expected increase in dementia patients in the ASEAN region, it is necessary to develop the medical diagnostic imaging systems to make early detection of dementia possible.

Materials & Methods: MRI images in particular are important in the diagnosis of dementia but it is difficult for users to perform system maintenance checks. While a simple check of MRI can be performed daily, in reality there is no way to tell whether subtle degradation of the SNR on image falls within range or outside of the manufacturer’s system standard.

Results: We now report on the development of a proactive maintenance system to solve this issue.

Key words: MRI, ASEAN, Maintenance System, The Diagnosis of Dementia

An MRI Scanner Maintenance System in ASEAN Countries -

P80

Kanagawa-ken Radiation Supervisor Sectional Campaign and Report of Segment Method (3 minutes survey)

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Purpose: Kanagawa-ken Radiation Supervisor Section (KRSv) consists of the Radiological Technologists who acquires a Radiation Safety Manager (RSM) authorization, and the main active contents are institute about a radiation related decree and holding of a practice workshop about Screening.Japan possesses fuel fabrication facility including a nuclear power plant, and there is also an area where an American atomic ship arrives at a port, and the human resources who can correspond to the exposed pollution check which assumed a Radiation accident need. It’s the Segment Method (3 minutes Survey) Nuclear Accident Screening (Support) Team (NAS Team) contrived that we take up in the workshop for the purpose of planning for stabilization of Screening. This way was performed to residents suffered actually by the previous Eastern Japan Great Earthquake, and got a fixed outcome, so it’ll be reported.

Materials & Methods: A points about ‘Segment Method’ and a way are introduced.

Results: There are no wasteful movements and it’s possible to do Survey because a procedure of ‘Segment Method’ is doing time distribution every part. A lot of residents suffered, to set Screening, I’m also prepared for time reduction to 1 minute and 30 seconds from 3 minutes, and it’s efficient and is the way which can do effective Screening.
Conclusions: It was efficient to 5021 residents suffered by activity for 5 days and, it was possible do effective Screening. I can think knowledge, technological acquisition, the system maintenance which can continue estimating and steady activity will be necessary periodically by Kanagawa-ken radiationsupervisor section from now on.

Key words: Radiation Safety Manager (RSM), Radiation accident, Nuclear Accident Screening (Support) Team (NAS T)

P82
The Relation of Received Radiation Exposure and Premature Birth
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Purpose: For female patients in Taiwan, when the doctors open X-ray checklist, to ask whether there will be the possibility of pregnancy, they will reopen urine pregnancy test to the checklist. Patients before receiving radiation examination, the radiographer will ask whether the patient is pregnant or not. Non-pregnant will receive the radiography.

Materials & Methods: This study collected retrospective study. In the National Health Insurance Research Database (NHIRD), screening for three years from 2008 to 2010, excluding multiple births, received radiography during pregnancy have produced maternal cases for the study, based on screening the diagnosis code icd-9 cm preterm mothers. Statistical software SPSS 19 was carried out to stall and string data analysis studies of the NHIRD.

Results: We have received radiography maternal total 1101 people during pregnancy, including preterm maternal 58 people that 36 preterm pregnant women receiving radiation examination during the first trimester, in the second trimester were four people; in the third trimester were 11 people; in the first trimester and the third trimester of pregnancy have received radiation examination 4 people; in the second and third trimesters of pregnancy have received radiation examination 1 people.

Conclusions: Screening based on the present study, during pregnancy do the radiation examination preterm birth rate was 5.27%. Wherein the first trimester received radiography, preterm birth rate was 62.07%. The data show that to receive radiation during the first trimester has a higher incidence of preterm birth. Studies have shown that about ten percent of the women receiving radiation do not know already pregnant. Radiographers should make sure that women receiving radiation examination were non-pregnant.

Key words: National Health Insurance Research Database (NHIRD), Pregnant women, Premature birth

P83
DICOM Tag Standardization of Mammography Images in Taiwan’s Medical Institutions Status
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Purpose: New digital radiological techniques have been developed which may replaced classical techniques in medical radiology in the coming years. However, a standardization process and proper application guidelines are necessary for digital data communication. Good workmanship criteria for the breast cancer screening by digital mammography were developed during the last decades in Taiwan. Public health department not only a good image quality but also the standardized DICOM tag format should be guaranteed.

Materials & Methods: Totally, we reviewed mammographic images around 1765 series from 202 hospitals. We sent the images to the 66 clinical specialists (doctors) randomly for further evaluation by mailing the discs. The check lists included the requirements of the 14 items according the standard DICOM tags by online evaluation. The agreement of the evaluations by the online discussion was established in clinical committee, then checking lists done by online process.

Results: 34.22% were standardized and fitting the criteria (604/1765, DX 548, CR 36). 20 series were not fitted the criteria. Significant difference (P value<0.001) showed the CR had a poorer results than DX.

Conclusions: A poorer results of the CR images not fitted the standard criteria demonstrated that re-education should be focusing on the CR training, although the items may not reach the perfect demands.

Key words: Mammography images, DICOM tag

P84
Innovative Technology in Contrast: Effectiveness of Integrating Health Education APP in Taiwan
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Purpose: Nowadays, new technology has changed the way we live our lives. The combination of technology and healthcare is also advancing with the times. In this study, we develop a APP (mobile application), featured by integration of the patient education after receiving contrast medium, to investigate whether it provide a more real-time and convenient lifestyle for people.

Materials & Methods: Our TRM (team resource management) workshop had presented cases for improvement, and constructed the APP software by means of Android Studio with National Kaohsiung Marine University from March 2015. We design the layout with Chinese style, and also add some functions such as active reminder and record of allergic history, in order to increase the acceptance among elderly.

Results: The result shows the app has advantage of convenience, active reminder, and never loss in comparison with the handout. The mobile application has been published on Google Play since September 2015. We also find the usage of handout was reduced by 30.68% per month on average. During September 2015 to March 2016, the app has been downloaded more than 100 times, and the customer rating is 4.8 out of 5. Besides, it is the first mobile application used for patient education in Taiwan.

Conclusions: This app is not available for iOS yet due to limited funds. It will be compatible with Apple devices in the next update, and text-to-speech function may be added for a better user experience.

Key words: APP, Patient education, Contrast medium, TRM

P85
Application of PDCA Management Cycle
Reducing the Waiting Time of Oncological Emergencies for Radiotherapy Patients

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Purpose: Radiotherapy is often one of the treatment modalities for the palliative patients. About 40% of radiation therapy’s patients need the oncological emergencies. The more quickly treatment of the patients are, the more symptom release can. The purpose of this study was, by performing to build a standard operation procedure and to integrate the oncology information system for the oncological emergencies and that can reducing the waiting time and elevating the medical quality.

Materials & Methods: From June 4, 2012 to June 29, 2012, 26 patients were enrolled in the beginning of this study to survey the waiting time for the process of radiation emergency treatment. The average waiting time was 48 minutes for the whole procedures. From August 1, 2012 to September 30, 2012 were improved with the PDCA management cycle to recognize results for 53 patients as the final reform data.

Results: The dates were analyzed with Microsoft Excel for statistical process with the beginning time of CT simulation for 26 patients. The average time was 48 minute for the pre-reform procedures. The new process for 53 patients was reformed with the quality tools in 28.5 minutes. Four improved solutions of radiation emergencies procedure were figured out.

Conclusions: Our study illustrate that reducing the waiting time, reducing patients uncomfortable, smoothing the pre-treatment procedure and managing treatment schedule will reduce the complain of patients and families. The regularly survey of waiting time of radiation emergency treatment were viewed and reminded no less than 30 minute for at least one year after this study.

Key words: Oncological emergencies, Waiting time, PDCA management cycle

P87
The General Population Cognition Investigation and Research for Medical Imaging and Radiation Safety Related Inspection

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Purpose: To seek medical advice and receiving medical care in Taiwan can be near high, accepted by the people related to medical imaging inspection the ratio is also quite high, check the processes and radiation safety information about for patients, is very important, this study by questionnaire survey, research the general Related people for the medical imaging inspections and radiation safety awareness.

Materials & Methods: The study was collected a medical center April 14, 2016 April 23 JCP 100 patients questionnaires, the questionnaire reclaim rate of 100%, 52 male, 48 female, young as 12-79 years old, mean age was 56 years (standard deviation), questionnaire design includes four facets: (1) cognition of the medical personnel, (2) cognition of the inspection process, (3) cognition of radiation safety, (4) on the subjects Cognition psychological security. The data were SPSS19.0 statistical software for analysis.

Results: The study found that in four facets among the the age populations is 21-30,31-40,41-50 to (1) medical personnel, (2) inspection process, and (4) psychological security. The data were SPSS19.0 statistical software for analysis.

Conclusions: The study found that in four facets among the the age populations is 21-30,31-40,41-50 to (1) medical personnel, (2) inspection process, and (4) psychological security. The data were SPSS19.0 statistical software for analysis.

Key words: Questionnaire survey, Radiation safety, Inspection processes, Health education movie mode
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Purpose: This research developed a medical staff scheduling system to automatically generate a monthly radiological technologist schedule instead of manually generate one.

Materials & Methods: This research used mathematical programming to formulate a medical staff scheduling problem, which consisted of government regulations, hospital regulations, and staff preferences. This study applied the mathematical software to construct the proposed problem, used the branch-and-bound method to solve it, and obtained an optimal monthly radiological technologist schedule within reasonable time.

Results: Based on the interviews with the leader of the special radiological team, the outside consultants helped the leader to construct the mathematical problem, write the corresponding codes, and develop the related interfaces. After several months, the medical staff scheduling system was developed, tested, and verified. The new processes of the medical staff scheduling system were that the leader collected the next-month data, such as a preferred shift on a certain day or a preferred day off, from radiological technologists, inputted these data into the medical staff scheduling system, and ran the system in order to generate an optimal monthly schedule. Through this collaborative project, the leader of the special radiological team was satisfied with the results. The medical staff scheduling system has been online since March, 2016.

Conclusions: The developed medical staff scheduling system could save significant time compared to manually scheduling monthly radiological technologist's shifts. The system could help hospital manager satisfy all requirements by the government and hospitals and satisfy most of radiological technologists' preferences.

Key words: Medical Staff Scheduling, Staff Scheduling System, Radiological Technologist

P90
OWAS Method Analysis on Working Postures of X-Ray Technologists
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Purpose: Work-Related Musculoskeletal Disorders (WMSDs) is one of the most common occupational diseases among the world. WMSDs mainly occurred in the upper limbs, lower back, and neck and shoulders. Among them, the WMSDs associated with the upper limbs mostly results from repetitive operations. This study used Ovako Working Posture Assessment System (OWAS) to analyze the working postures of X-ray technologists in X-ray Room.

Materials & Methods: There were nine male and two female X-ray technologists taking part in this study, with an average age of 30.4 years, and work experience was 4.6 years. The procedure of X-ray examinations was divided into 12 process steps, were videotaped at the X-ray Room and movement analyzed. The total number of videotape frames analyzed in this study was 203.

Results: Of all videotape frames sampled, OWAS identified 77.8% postures falling into AC1, 14.8% into AC2, 7.4% into AC3, which indicated ~22.2% postures falling into AC3 was Help the most common X-ray examinations process steps of percentages falling into AC3 was Help the patient get to the right position, including transferring him from a wheelchair or stretcher to the Radiography Table. The most
The results showed that general diagnostic energy was tested on the basis of these requirements for the sensor. The results showed the transmission efficiency of the manufactured sensor was 1.15-1.12 at below 80 kVp, and 0.86-0.97 at above 80 kVp. Lastly, the shading image was tested. In the conventional sensor, it did not appear at 40 kVp whereas it appeared as 0.036 at 40 kVp in the manufactured sensor.

Conclusions: Taken together, intrinsic silicon semiconductor is expected to perform as AEC sensor that can ensure accurate control of x-ray energy.

Key words: Automatic Exposure Control Sensor, Intrinsic Silicon, Transmission Rate, Shading Image, Energy Dependency

P92
Comparison of Image Quality for Computed Radiography (CR) System

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Purpose: Digital medical imaging has improved rapidly with the recent development of computed radiography (CR) and regular quality assurance (RQA) of X-ray images is essential for maintaining a high accuracy of diagnosis. This study was to compare the results of the modulation transfer function (MTF), the noise power spectrum (NPS), and the detective quantum efficiency (DQE) for both CR and conventional radiography systems.

Materials & Methods: We measured the pre-sampling MTF using the edge method and RQA based on commission standard international electro-technical commission (IEC).

Results: The spatial frequencies corresponding to the 10% MTF for 2006, 2009, 2012, and 2015 were 2.68, 2.44, 2.44, and 2.46 mm-1, respectively. In the NPS results, the CR systems showed the best noise distribution in 2006, and with the quality of distributions in the order of 2015, 2009, and 2012. The CR systems showed the best efficiency in 2006, and showed better efficiency in the order of 2015, 2009 and 2012. Differences: With the progress of time, the deterioration of image quality and changes in general image quality were caused by practices in maintaining the CR systems. This study can be incorporated into clinical QA requiring performance and evaluation of the performance of the CR systems.

Key words: Modulation transfer function (MTF), Noise power spectrum (NPS), Detective quantum efficiency (DQE)

P93
Coronary Computed Tomography Angiography: Evaluation of the Effects of Cradle Sagging on Stair-step Artifacts

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Purpose: Different R-R intervals over cardiac cycles can affect the volume data and stair-step artifacts could be developed. However, it could be detected even in CT images obtained using the data from the same R-R intervals. We thus hypothesized cradle sagging during the scan could affect the development of stair-step artifacts.

Materials & Methods: CT scan of pulsating cardiac phantom with artificial vessels was performed using 64 MDCT in retrospective ECG gating. Both the phantom and 10-60 kg standard weights at 10 kg intervals were placed on the cradle. CT images were obtained at the three different points with the movement of the cradle, within the similar locations of the heart at a feet-first tilt. Tilt angles of the cradle were measured using a digital inclinometer and scanned phantom. The presence of stair-step artifacts was assessed by two independent radiologists using the data from the same R-R intervals.

Results: Differences: With the progress of time, the deterioration of image quality and changes in general image quality were caused by practices in maintaining the CR systems. This study can be incorporated into clinical QA requiring performance and evaluation of the performance of the CR systems.

Key words: Modulation transfer function (MTF), Noise power spectrum (NPS), Detective quantum efficiency (DQE)
Conclusions: Tilt angle of the cradle showed significant correlation with the weights of phantom, and stair-step artifacts were noted more when higher tilt angle was detected. To reduce stair-step artifacts, cradle sagging should be minimized to avoid the tilting of the cradle which might affect the CT volume data.

Key words: Coronary computed tomography angiography, Stair-step artifacts, Sagging

P94
Application of the T2* Mapping Technique in the MR Imaging of the Lumbar Disc
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Purpose: To investigate the application of the T2* mapping technique of the lumbar disc in the Magnetic Resonance Imaging (MRI).

Materials & Methods: We collected randomly 40 patients who underwent the routine MR scanning of the lumbar intervertebral disc in our hospital retrospectively. All the patients didn’t suffer from the history of operation, placed into the internal fixation and have the MR scanning contraindication. The T2WI and the T2* mapping sequence (Oblique Sagittal) were scanned by MRI, which was measured by the means of setting up the region of interest (ROI) of the nucleus pulposus from L1/L2 to L5/S1 in the intervertebral disc simultaneously. And then, two numerical values of the nucleus pulposus (NP) in the lumbar intervertebral disc were acquired and compared.

Results: The T2WI SI value and the T2* value of the L1/L2 intervertebral disc were the highest, and the values of the T2WI SI and the T2* were reduced gradually along with the increasing grading from I to V grading. Moreover, the value of the T2* was lower than the value of the T2WI SI in the same group. Among them, the difference of T2* value between grading I and V grading in the L1/L2 lumbar intervertebral disc was larger than other grading groups.

Conclusions: The T2* mapping technique, which the spatial variation of the T2* relaxation time values in the NP could reflect the early biochemical state of the intervertebral disc degeneration, could provide the prospective evaluation and early imaging evidence for the diagnosis of lumbar intervertebral disc degeneration.

Key words: Magnetic Resonance Imaging, Lumbar Intervertebral Disc Degeneration, T2* Mapping Technology

P95
Comparison Of Self-Referenced And Referenced Measurement Methods In Evaluating Basilar Atherosclerotic Plaque Employing High Resolution MRI At 3 T
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Purpose: To compare Self-referenced and Referenced measurement methods in assessing basilar atherosclerotic plaque employing dark blood HRMRI at 3 Tesla.

Materials & Methods: Twenty-six patients underwent HRMRI examinations with 3D TOF and 2D TSE sequences. The images were reviewed by an experienced observer, who was blinded to the clinical information of each patient. Outer wall areas, inner wall areas and lumen areas of proximal sites, maximal lumen narrowing sites and distal sites were traced manually. The calculation of plaque area (PA), stenosis rate (SR) and percent plaque burden (PPB) using Referenced measurement method were referred to previous studies. For Self-referenced measurement method, PA=inner wall area-lumen area, SR=1 - plaque area/inner wall area, PPB=plaque area/outer wall area. To test the intraobserver variability, the observer measured BA plaque twice. Significant difference between Self-referenced and Referenced measurement methods for the repeated measurements of PA, SR and PPB were assessed by using two-tailed paired t-test. Agreement between repeated measurements was quantified through intraclass correlation coefficient (ICC), coefficient of variation (CV) and Bland-Altman plots.

Results: A There were no significant difference in PA, SR and PPB between the two measurement methods (all P values >0.05). Both methods have an excellent agreement in evaluation of BA plaque, but the CVs of Self-referenced is lower than Referenced measurement method. Moreover, Bland-Altman plots also showed that Self-referenced has a narrower interval and less variability than Referenced measurement method.

Conclusions: The present study showed that an excellent reproducibility for quantifying PA, SR and PPB of basilar atherosclerotic plaque using both methods and having no significant difference between two methods, which is important for quantifying morphologic parameters of plaque and research applications. However, Self-referenced method is more convenient and even better for evaluating BA plaque. Self-referenced method may serve as a promising method for evaluation of basilar atherosclerotic plaque.

Key words: Magnetic resonance imaging, Basilar artery, Atherosclerosis, Plaque, Measurement

P96
Effect Evaluation of 3D-FIESTA Sequence on Knee Ligaments Display
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Purpose: To evaluate the effect of MRI 3D-FIESTA sequence on displaying knee ligaments and the clinical diagnostic value.

Materials & Methods: 50 cases with clinically suspected injuring ligaments around knees were selected to perform knee routine plain scan and 3D-FIESTA sequence scan respectively, all the patients got subsequently arthroscopic examinations or operations. The sensitivity and specificity of routine plain scan and 3D-FIESTA sequence were compared based on the results of arthroscopic examinations or operations, and the contrast to noise ratios(CNR) of fat and ligaments on 3D-FIESTA sequence, conventional T1WI, PDWI and T2WI were measured and calculated.

Results: 3D-FIESTA sequence can clearly show the patellar ligament, anterior cruciate ligament, medial and lateral collateral ligament; the sensitivity(88.24%) and specificity(89.21%) of 3D-FIESTA sequence were higher than that in routine scan (63.17%, 60.92%), with statistically significant differences

Key words: Magnetic resonance imaging, Basicial artery, Atherosclerosis, Plaque, Measurement
(χ²=22.17, P<0.05; χ²=8.66, P<0.05); the fat and ligaments CNR of 3D-FIESTA sequence were significantly higher than that in T1WI, T2WI and PDWI sequence (P<0.05).

Conclusions: 3D-FIESTA sequence can clearly show the knee ligaments, with highly sensitive, specificity and CNR in ligament injury diagnosis, with a high clinical value.

Key words: 3D-FIESTA sequence, Knee ligaments around, Magnetic resonance imaging

P97

The Influence of Excessive Drinking on the Fat Level of Lumbar Spine by IDEAL-IQ
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Purpose: To investigate the influence of excessive drinking on the fat level of lumbar spine by IDEAL-IQ and Magnetic resonance imaging.

Materials & Methods: The experimental group included 55 volunteers of excessive drinking, and the control group included 30 normal volunteers. All receive Magnetic resonance imaging and IDEAL-IQ sequential inspection. Quantitative Analysis and Comparison were done about the fat level of lumbar spine on the experimental and control group.

Results: In the experimental group and control group, there was no significant difference in the fat fraction of lumbar 1-5 vertebral body (the experimental group F=0.422, P=0.792; the control group F=0.149, P=0.941). But among the experimental and control group, there was significant difference in the fat content of lumbar 1-5 vertebral body.

Conclusions: Excessive drinking can lead to a significant increase in fat content of vertebral body.

Key words: Magnetic resonance imaging, Lumbar spine, Fat percentage, IDEAL-IQ sequential inspection

P98

A Study of Radiofrequency Artifacts for Off-center Scan Deduced in Two MR Scanners in Close Proximity
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Purpose: To assess radiofrequency (RF) artifacts for the off-center scan deduced by two 1.5T magnetic resonance (MR) scanners in close proximity.

Materials & Methods: Retrospective analyses of 10 cases subjected to RF artifacts were performed. In addition, 6 healthy volunteers were recruited to study RF artifacts. Volunteer 1, 2 and 3 were scanned in one scanner in the center (P1), superior (P2) and inferior (P3) to the reference center positions with 8 angles, respectively. Simultaneously, volunteer 4, 5 and 6 were scanned in a fixed sagittal sequence in the opposite scanners, respectively. Based on above experiment steps, two phantoms were set in two scanners to study RF artifacts appeared in the transversal sequence. Two radiologists with 10-year diagnosis experience visually all the MR images.

Results: After retrospective analysis, RF artifacts were found to be correlation to the scan center in the opposite scanner. RF artifacts in volunteer 5 were shown when the scan center of volunteer 2 was in P2 on the low frequency scanner. RF artifacts in phantoms presented the same characteristic as in volunteer 5. However, RF artifacts appeared in the right of the sagittal images and in the left of the transversal images. The image quality was the better in the P1.

Conclusions: For preventing RF artifacts for off-center scan by two 1.5T MR scanners in a close proximity, we suggested that scan center is better in P1 or P3 in lower frequency scanner and in P1 or P2 in the high frequency scanner.

Key words: Radiofrequency, Magnetic resonance, Artifact

P99

Role of Dynamic Contrast-enhanced MRI and DWI Combination in Diagnosing Cervical Cancer Lymph Node Metastasis and its Clinical Value
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Purpose: The study aimed to evaluate the role of dynamic contrast enhanced MRI (DCE-MRI) and diffusion-weighted imaging (DWI) in diagnosing metastatic lymph node with cervical cancer patients and to discuss its clinical significance.

Materials & Methods: We evaluated the diagnostic performance of Gd-DTPA dynamic contrast-enhanced MRI combined with DWI for pelvic lymph node involvement. DWI was performed at b = 0 and 1000 s/mm², respectively. All 165 enlarged lymph nodes in 68 patients were evaluated, and apparent diffusion coefficient (ADC) was compared in metastatic and non-metastatic lymph nodes. Receiver-operating characteristics were analyzed to evaluate the diagnostic performance of ADC in differentiating metastatic from non-metastatic lymph nodes.

Results: Using DWI images with inverted black-and-white image contrast, metastatic lymph nodes showed evidently high signal. ADC values were significantly lower in metastatic lymph nodes ((0.655 ± 0.136) × 10⁻³ mm²/s) than in non-metastatic lymph nodes ((1.232 ± 0.154)×10⁻³ mm²/s, P < 0.01). Sensitivity and specificity of DWI combined with DCE-MRI for differentiating metastatic from non-metastatic lymph nodes were 92.54% and 93.88%, respectively. In enhanced image, metastatic lymph nodes showed the slow strengthening image contrast, metastatic lymph nodes showed evidently differentiating metastatic from non-metastatic lymph nodes.

Conclusions: DWI combined with DCE-MRI is feasible for differentiating metastatic lymph nodes from non-metastatic ones in patients.

Key words: Dynamic contrast enhanced MRI, Diffusion-weighted imaging, Apparent diffusion coefficient

P100

The Application of Magnetic Resonance Imaging in 3D Printing Congenital Heart Disease Cardiac Modelling
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Purpose: The aim of the study was to use difference kinds of MR sequences to create accurate anatomical three-dimensional model for children with congenital heart diseases (CHD) and to explore the value of Magnetic resonance imaging for CHD.

Key words: Magnetic resonance imaging, Dynamic contrast-enhanced MRI, Diffusion-weighted imaging, Apparent diffusion coefficient
Materials & Methods: A 1 year-old child with CHD was performed with 1.5T magnetic resonance imaging (Philips Achieva1.5T), using Tusco coil with parallel acquisition technology. Scan sequences includes three dimension-balanced stable free precession(3D-BTSE) and contrast enhancement magnetic resonance angiography (CE-MRA) sequence. Using contrast agents Gadodiamide injection. Based on magnetic resonance imaging DICOM data (slice thickness=2mm, gap=1mm), regions of interest of the contrast ratio were segmented using the Mimics 17.0 software (Materialise, Leuven, Belgium). Using region growing method to segment image by difference. Pixels to calculate three-dimensional model and generating an STL-file (Stereolithography file) out of computer-aided design data were image processing. The 3D printer Objet 260 Connex (Stratasys Ltd, Eden Prairie, Minnesota) with Med610 materials (Stratasys Ltd) was utilized to print 3D model for CHD.

Results: The diagnosis of this patient form MRI and echocardiography was Right atrial diaphragm obstruction. A sampling line defect was found in right atrial, diaphragm lead Inferior vena cava stenosis. Local intimal hyperplasia on inferior vena cava without causing tricuspid stenosis in surgery. The 3D Printing model describes completely consistent with operative findings and Diagnostic Imaging.

Conclusions: B-TSE sequences are higher spatial resolution than CE-MRA with the same scan parameters. The image of balance free precession sequence can reconstruct structural heart disease model. The 3D printing model demonstrated the spatial relationships of atria and great arteries. It is first choice that B-TSE sequences were used to calculate 3D Cardiac model for further study and work. 3D printing technology will be very useful for precise diagnosis and surgeons of CHD children.

Key words: 3D printing technology, Congenital heart disease, MRI

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**P101**

**Intravoxel Incoherent Motion Diffusion-weighted MR Imaging Based on RESOLVE Sequence in Diagnosis Hypertrophy of Nasal Mucosa in Obstructive Sleep Apnea-Hypopnea Syndrome**

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**Purpose**: To investigate the value of IVIM-derived parameters and apparent diffusion coefficient (ADC) based on RESOLVE sequence in diagnosis of hypertrophy of nasal mucosa.

**Materials & Methods**: Twenty patients (male: 12, female: 8, median age 39.8 years) without treatment were enrolled and underwent RESOLVE DWI imaging with ten b-values. The obtained DWI images were analyzed by using an in-house developed software program based on a computing language and interactive environment to acquire IVIM parameters of D, D* and ADC maps were calculated automatically on machine. These parameters were measured by placing the ROI in certain region of nasal mucosa both of simple rhinitis and chronic hypertrophic rhinitis groups. Further, the anterior, middle, posterior regions of hypertrophy nasal mucosa of both groups were measured. Independent-Samples T test and One-way ANOVA was used to compare the difference and a Bonferroni adjustment for multiple comparisons. ROC analysis was conducted to assess the cutoff values and diagnostic performance.

Results: ADC and D values were both significantly higher in simple rhinitis group than in chronic hypertrophic rhinitis group (P<0.05). ADC values was increased significantly from anterior, middle to posterior region (P<0.05). D values was increased from anterior, middle to posterior region but significant difference was only found between anterior and posterior regions. ROC analysis demonstrated a higher AUC for D value (0.932±0.0443 (0.778 to 0.991)) than ADC value (0.896±0.0575 (0.729 to 0.977)) with sensitivity, specificity, accuracy, positive and negative predictive values of 92.31%, 93.75%, 90%, 93.75%, 85.71%.

Conclusions: IVIM-derived D values based RESOLVE sequence of hypertrophy of nasal mucosa in OSAHS showed significantly better diagnostic performance than ADC values in differentiating simple edema hyperplasia from chronic inflammatory hyperplasia. Both IVIM-derived D values and ADC values may provide valuable potential information in the therapy of OSAHS caused by hypertrophy of nasal mucosa.

Key words: Magnetic resonance imaging, Diffusion weighted imaging, Intravoxel incoherent Motion, Hypertrophy, Nasal mucosa

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**P102**

**Brachial Plexus MR Imaging using Contrast-enhanced STIR 3D FSE: Evaluation of Four Different Delay Times**

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**Purpose**: To investigate the performance and determine an optimal scan time for contrast enhanced STIR 3D FSE in peripheral nerve imaging.

**Materials & Methods**: Eight patients diagnosed with brachial plexus diseases were recruited in this study (age, 41.4±18.5 years; 4 male, 4 females), written consent forms were obtained prior to the scan. STIR 3D FSE was scanned in addition to routine clinical sequences on a GE MR 750 3.0 T whole body scanner equipped with an 8-channel neurovascular coil. For each patient, STIR 3D FSE without contrast administration, 0 minute (right after injection), 10 minutes, 20 minutes, and 30 minutes after Gd-DTPA injection were scanned. Maximal intensity projection (MIP) images were then reconstructed using GE 4.5 workstation. SNR and CNR were calculated on each MIP image according to Equation.

**Results**: Contrast enhanced STIR 3D FSE showed better SNR and CNR of bilateral brachial plexus compared with non-contrast imaging, and SNR and CNR were the highest at the delay time of 10 minutes (P<0.05), indicating a delay time of 10 minutes after contrast injection produced the best contrast image quality. Homogeneous fat suppression was achieved with the chosen inversion recovery time, and 3D FSE acquisition gave distortion free and sharp depiction of the peripheral nerves.

**Conclusions**: MR imaging of peripheral nerve is a challenging task, and STIR 3D FSE has been demonstrated to be a viable tool for obtaining fat-suppressed and high resolution contrast enhanced images. In this study, we demonstrated that a delay time of 10 minutes produced the best image quality for brachial plexus in terms of SNR and CNR. Further studies are needed to optimized the scan protocols and contrast agents.

Key words: Brachial plexus, MRI, STIR 3D FSE

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**P103**

**Comparison of Two Methods for Automatic Brain Morphometry Analysis in Rat Subjected Chronic Neuropathic Pain**

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Purpose: The methods of computational neuroanatomy are widely used in neuroimaging study. However, the data on their individual strengths and limitations from direct comparisons are lack. The aim of the present study was direct comparison of deformation-based morphometry (DBM) with voxel-based morphometry (VBM) in a rat model of chronic neuropathic pain (CNP) (i.e., spared nerve injury, SNI).

Materials & Methods: Animal preparation: Twenty male SD rats were randomly assigned into either the SNI group (n=10) or the sham(n=10) group. Image acquisition: MRI scans were performed on a 7.0 T/20 cm Bruker Biospec scanner. A 72-mm diameter volume coil was used for RF pulse transmission, and a 4-channel phase-array coil for signal detection. High-resolution anatomical images were acquired with a RARE (Rapid Acquisition with Relaxation Enhancement) sequence, TR 5800 ms, T2eff 40 ms, matrix size 512×384, FOV 3.5 cm×3.5 cm, slice thickness 0.58 mm, 52 slices, RARE factor 4 and 8 averages. Data processing: Both VBM and DBM were applied to measure volumetric changes with data processing pipelines provided by Statistical Parametric Mapping 8. The ability of the two methods to detect atrophy region was determined using overlay index together with the ground truth; the precision of the detection in space was determined using the distance measures between two detected regions.

Results: DBM was able to detect all the regions with local volume changes with high spatial precision. On the other hand, VBM detected only changes in vicinity of the largest simulated change, with a poor overlap of the detected changes and the ground truth.

Conclusions: These findings suggest that the heterogeneity of results found by VBM in CNP may be caused by methodological faults in part, not only by the possible neurobiological heterogeneity. In conclude, DBM is more convenient, sensitive, and precise than VBM.

Key words: MRI, DBM, VBM, CNP

P104
Study about ZOOMit DWI on Adrenal Gland
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Purpose: To make sure the value about ZOOMit technique to DWI (diffusion weighted imaging) on adrenal gland imaging with 3.0T MR.

Materials & Methods: All the subjects were examined by ZOOMit-ivim MRI (b=0,50,100,150,200,400,800,1000) and routine field of vision diffusion weighted imaging (DWI) (b=50,800), (3.0T). The ZIVM zoom images were measured by the radiology diagnostic physician to measure the average value of the both adrenal gland. The apparent diffusion coefficient (ADC value) of ZOOMit-ivim and DWI were measured respectively, and the morphology and display effect of adrenal gland in ZOOMit-ivim and DWI images were subjectively scored by 3 imaging diagnosis physicians. The Data ware Analyzed by SPSS19.0 soft ware for statistical.

Results: The three radiologists have a remarkable consistency in scoring ZOOMit-ivim technique can clearly show the adrenal morphology and signal, providing a higher spatial resolution of the diffusion weighted image, to provide help for the accurate diagnosis of adrenal diseases.

Key words: ZOOMit, Adrenal gland, DWI

P105
The Value of Short-TR cine sequence in 3.0T MR Cardiac Function Imaging
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Purpose: Discuss the value of Short-TR cine sequence by comparing with the Standard-TR in 3.0T MR cardiac function imaging.

Materials & Methods: The study included 54 patients (17 females and 37 males), each patient underwent 3.0T MR cardiac function imaging with Short-TR and Standard-TR cine sequence. All the images were evaluated and graded (0-2point) by two experienced diagnostician in hierarchical IQ assessment method, including: the contrast between myocardium and Blood Pool, Breathing artifact, and air noise. Then classified the images into five level: all items with 0 into level I, all items with 1 into level II, two items with 2 and the other with 1 into level III; all items with 2 into level IV. Analyzed the two sequence results in X2 test, and the two methods’ scanning time (breath holding time in one layer) in variance analysis, in SPSS 19.0.

Results: There was no statistically significant difference between Short-TR and Standard-TR MR image quality (p>0.05). However the scanning time of two methods has statistically significant difference (P<0.05).

Conclusions: Short-TR sequence has a great advantage in cardiac MRI, and it’s hopeful to be the routine sequence.

Key words: 3.0T cardiac function imaging

P106
The Effects of Respiration Frequency and Voxel Size on the MRS of Nodes with Glioma
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Purpose: To discussing the impact and significance of respiration frequency and voxel sizes on MRS of nodes with glioma.

Materials & Methods: Selected thirty nodes which were planted U87 glioma cells two weeks later, brain MR examination with a 7.0 Tesla system(Bruker Biospec 7/20 USR). We got axial,sagittal and coronal T2 RARE weighted for location of voxel of interest(VOI) for 1H-MRS. Spectroscopic imaging with single voxel PRESS sequence(TR = 3000ms, TE = 20ms, Averages = 512, Flip Angle = 90°, 180°, 180°). All nodes were carried with three times for MRS: group A for 1 × 1 × 1 mm³, group B 1.5 × 1.5 × 1.5mm³,
group C: $2 \times 2 \times 2$ mm$^3$, and recorded the respiration frequency during scanning of nudes. All of the datas were processed and analyzed by LC Model, and then contrast the spectrum in stability of baseline and metabolite concentrations.

**Results:** Each nude was completed all of the MR scanning. During the scanning, 5 nudes’ respiration frequency were less than 17 beats/min, and then we did not acquire the effective spectral lines in the group C; all of the three groups have received poor baseline spectrum from three nodes whose respiration frequency were more than 100 beats/min; the last 22 nudes kept the respiration frequency during 18 and 44 times/min. The pathology of tumor region showed that 6 of 22 nudes occurred necrosis, the spectral quality from group B is better than group A and C of them; the spectral quality from group B and C is better than group A of the other 16, meanwhile several tumors were smaller, compared to the actual value, the measured metabolite concentrations from group B was closer than group C.

**Conclusions:** The appropriate voxel size and breathing frequency will directly affect the quality and results of spectrum.

**Key words:** Proton Magnetic Resonance Spectroscopy (1H MRS), Glioma, Inhalational Anaesthesia, Magnetic Resonance

**P107**

**Clinical Value of Whole-body DWI with Integrated Slice-Specific Dynamic Shimming in Detecting Rectal Cancer Metastases**

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**Purpose:** To evaluate the value of whole-body diffusion-weighted imaging (WB-DWI) with integrated slice-specific dynamic shimming in detecting rectal cancer metastasis

**Materials & Methods:** 36 patients with metastasis of rectal cancer underwent WB-DWI with integrated slice-specific dynamic shimming (iShim, a prototype sequence provided by Siemens Healthcare GmbH) examinations between January 2015 and Oct 2015 on a 3T scanner (MAGNETOM Skyra, Siemens Healthcare GmbH, Erlangen, Germany). All the patients were confirmed by pathology, and were assessed with conventional liver MRI and chest CT. 3 patients with metastasis underwent PET-CT, and one of them underwent ECT. The results of WB-DWI were compared with the other imaging modalities.

**Results:** lesions in routine imaging, such as cyst or angroma. The number of bone metastases detected on iShim WB-DWI and other imaging methods were 5 and 2; lymph nodes were 18 and 15; liver metastases were 25 and 27; lung metastases were 4 and 7. iShim WB-DWI failed to detect 3 lung metastases and 2 metastases in liver. 6 lesions including 3 lymph nodes and 3 bone metastases were detected by Shim WB-DWI alone, which were not detected by ECT or PET-CT.

**Conclusions:** iShim WB-DWI allows fast assessment of metastasis distribution and total tumor burden. In this study, iShim detected most metastatic lesions that were diagnosed with conventional MRI and CT. iShim WB-DWI may have higher accuracy than PET-CT and ECT in detecting the suspicious bone metastases and has higher detection rates for metastatic lesions in bone and lymph nodes than in lung.

**Key words:** Rectal Cancer, Whole-body Diffusion-weighted Imaging, Metastasis

**P108**

**The Value of Readout-segmented Echo-planar Imaging (RESOLVE) in the Staging of Preoperative Rectal Cancer**

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**Purpose:** To explore the performance of readout-segmented echo-planar imaging (RESOLVE) in the T staging of preoperative primary rectal cancer.

**Materials & Methods:** 40 patients with preoperative primary rectal cancer underwent RESOLVE (b=0, $1000$ mm$^2$/s) in our hospital by using Siemens 3T Skyra scanner. All patients were confirmed by pathology, divided into two groups: Group A (T1-T2) and Group B (T3-T4). Two experienced radiologists drew regions of interest (ROI) on the apparent diffusion coefficient (ADC) map to calculate mean ADC value of each tumor by a prototype post processing software (Body Diffusion Toolbox, provided by Siemens healthcare GmbH), and inter-observer agreement between the two radiologists was calculated. Receiver operating characteristic (ROC) analysis was used to analyze and compare the parameters between the two groups.

**Results:** Pathological examinations revealed 17 T1-T2 and 23 T3-T4 rectal adenocarcinomas. The mean ADC value of Group A was $(1.030 \pm 0.080) \times 10^{-3}$ mm$^2$/s (physician 1) and $(1.200 \pm 0.160) \times 10^{-3}$ mm$^2$/s (physician 2), which was higher than that in Group B was $(0.973 \pm 0.216) \times 10^{-3}$ mm$^2$/s (physician 1) and $(0.948 \pm 0.181) \times 10^{-3}$ mm$^2$/s (physician 2) (P<0.05). The intraclass correlation coefficient (ICC) was 0.947. The area under curve (AUC) of ADC was 0.820 (95% CI 0.666 to 0.923, Sensitivity 60.87%, specificity 94.12%, physician 1) and 0.855 (95% CI 0.708 to 0.946, Sensitivity 78.26%, specificity 76.47%, physician 2). The ADC value threshold for differentiating Group A from Group B was 0.988 (0.103/mm$^2$) (physician 1) and 1.078 (0.120/mm$^2$) (physician 2).

**Conclusions:** RESOLVE can be used to judge whether the muscularis propria layer was invaded by the lesion. The inter-observer agreement was perfect and the value of ADC has a modest diagnostic performance.

**Key words:** Readout-segmented Echoplanar Imaging, Rectal Cancer, T Staging

**P109**

**The Multiparametric Diffusion-weighted Magnetic Resonance Imaging of Rectal Cancer: A Research on Quantitative Evaluation of the Preoperative Staging**

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**Purpose:** A research on quantitative evaluation of the preoperative staging of rectal cancer

**Materials & Methods:** 38 patients with preoperative rectal cancer underwent RESOLVE (b=0, $1000$ mm$^2$/s) in our hospital by using Siemens 3T Skyra scanner. All patients were confirmed by pathology, divided into two groups: Group A (T1-T2) and Group B (T3-T4). Two experienced radiologists drew regions of interest (ROI) on the apparent diffusion coefficient (ADC) map to calculate mean ADC value of each tumor by a prototype post processing software (Body Diffusion Toolbox, provided by Siemens healthcare GmbH), and inter-observer agreement between the two radiologists was calculated.

**Results:** Pathological examinations revealed 17 T1-T2 and 23 T3-T4 rectal adenocarcinomas. The mean ADC value of Group A was $(1.200 \pm 0.160) \times 10^{-3}$ mm$^2$/s (physician 1) and $(1.200 \pm 0.160) \times 10^{-3}$ mm$^2$/s (physician 2), which was higher than that in Group B was $(0.973 \pm 0.216) \times 10^{-3}$ mm$^2$/s (physician 1) and $(0.948 \pm 0.181) \times 10^{-3}$ mm$^2$/s (physician 2) (P<0.05). The intraclass correlation coefficient (ICC) was 0.947. The area under curve (AUC) of ADC was 0.820 (95% CI 0.666 to 0.923, Sensitivity 60.87%, specificity 94.12%, physician 1) and 0.855 (95% CI 0.708 to 0.946, Sensitivity 78.26%, specificity 76.47%, physician 2). The ADC value threshold for differentiating Group A from Group B was 0.988 (0.103/mm$^2$) (physician 1) and 1.078 (0.120/mm$^2$) (physician 2).

**Conclusions:** RESOLVE can be used to judge whether the muscularis propria layer was invaded by the lesion. The inter-observer agreement was perfect and the value of ADC has a modest diagnostic performance.

**Key words:** Readout-segmented Echo-planar Imaging, Rectal Cancer, T Staging
This study confirms that detectable decreased Voxel-based morphometry, Gray matter volume, and performance. Ability, and the multi-parameter covariates have better diagnostic performance. The value of ADC (Mono-exponential DWI), K value (DKI), and D value (IVIM) were 0.890, 0.835, and 0.796, 0.871. The AUC of multi-parameter covariates was 0.941 (95% CI 0.797 to 0.993, Sensitivity 100%, specificity 80%).

Conclusions: MP-DWI derived multiple parameters, can be used to judge whether the muscularis propria layer was invested by the lesion. The value of ADC (Mono-exponential DWI), K value (DKI), D value (DKI), and D value (IVIM) have a modest diagnostic ability, and the multi-parameter covariates have better diagnostic performance.

Key words: Multimodal functional magnetic resonance imaging system. Three-dimensional T1-weighted images were acquired in a sagittal orientation employing a Fast Spoiled Gradient-Echo (FSPGR) sequence. The cortical areas of VPFC in gray matter for each participant was calculated, and then was compared between BD and HC.

Results: Compared to the HC group, the BD group showed increased cortical areas in orbital part of right superior medical frontal gyrus, right middle frontal gyrus, and right inferior frontal gyrus (p<0.05, uncorrected).

Conclusions: Our results revealed altered cortical areas of VPFC in BD may be associated with BD pathophysiology, and the altered regions located in right hemisphere may suggest the unilateral effects in BD disease occurrence. This suggests that methods using morphological method may potentially be useful in further studies of this disorder.

Key words: Bipolar Disorder, Morphological Analyses, Cortical Areas, Magnetic Resonance Imaging

P111 Decrease Gray Matter Volume in Unilateral Sudden Sensorineural Hearing Loss

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Purpose: To investigate the cerebral gray matter volume alterations in unilateral sudden sensorineural hearing loss patients within the acute period by the voxel-based morphometry method, and to determine if hearing impairment is associated with regional gray matter alterations in unilateral sudden sensorineural hearing loss patients.

Materials & Methods: This study included data collected from two groups (left- and right-side unilateral SSNHL) of patients and a healthy control group, with a total of 191 right-handed subjects. All of the subjects were scanned by a 3-T MRI system. Data processing was performed using the VBM8 toolbox within the SPMB. To detect the differences among the three groups of subjects, a one-way analysis of covariance (ANCOVA) was performed with sex, age, and education as covariates. To determine the differences between each of the groups, a post hoc Tukey pair-wise comparison was conducted between patient groups and healthy control groups with the FWE corrected.

Results: Compared with control groups, patients with left side unilateral sudden sensorineural hearing loss had significant gray matter reductions in the right middle temporal gyrus and right superior temporal gyrus, whereas patients with right side unilateral sudden sensorineural hearing loss showed gray matter decreases in the left superior temporal gyrus and left middle temporal gyrus. A significant negative correlation with the duration of the sudden sensorineural hearing loss was also found in these brain areas. There was no region with increased gray matter found in both groups of unilateral sudden sensorineural hearing loss patients.

Conclusions: This study confirms that detectable decreased contralateral auditory cortical morphological changes have occurred in unilateral sudden sensorineural hearing loss patients within the acute period by voxel-based morphometry methods. The gray matter volumes of these brain areas also perform a negative correlation with the duration of the disease, which suggests a gradual brain structural impairment after the progression of the disease.

Key words: Voxel-based morphometry, Gray matter volume, Unilateral sudden sensorineural hearing loss
P112
A Preliminary Study on MR Perfusion Quantification of High-grade Glioma Based on Factor Analysis
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Purpose: To preliminarily exploring the clinical application of factor analysis of dynamic structures (FADS) on the differential diagnosis of brain glioma, magnetic resonance (MR) perfusion sequence images of brain gliomas from 7 cases were quantitative analysis by using FADS.

Materials & Methods: The FADS model was solved by using the replace-approximation method, and the characterization of TISCs and factor images from gliomas and normal tissue regions were analyzed. The correlation coefficients (CCs) between patient group gliomas and normal tissue and the CCs among the TISCs of patient groups were computed and compared, respectively.

Results: One crest-up (CU) curve and two crest-down curves (CD curve a and CD curve b) were extracted from the gliomas and normal tissue. The average value of CU curve CCs between the patient group gliomas and the normal tissue were 0.75±0.10, which was obviously lower than the CC averages of CU curves among glioma groups (P<0.05). Compared with the maximum average of CCs between the CD curve b of glioma and the CD curve of normal tissue, the maximum average of CCs between the CD curve a of glioma and the CD curve of normal tissue had obvious significance (P<0.05). In the factor images of the patient groups, the surrounding tissue of glioma was mainly corresponding to the CU curve, and the glioma was mainly corresponding to the CD curve.

Conclusions: The TISCs of glioma could be extracted automatically by FADS. Also, it preliminarily demonstrated the feasibility of differentiation diagnosis on the grade of gliomas by using the physiological parameters of TISCs extracted by FADS.

Key words: Glioma, Brain, Factor Analysis, Magnetic Resonance Imaging, High-grade

P113
Comparison of Diffusion-weighted Imaging Before and after Intravenous Administration of Gd-EOB-DTPA in Liver and Focal Liver Lesions
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Purpose: To evaluate whether intravenous administration of Gd-EOB-DTPA significantly affects diffusion-weighted imaging (DWI) in liver and focal liver lesions (FLLs).

Materials & Methods: A total of eighty-six patient, including 61 male and 25 female(mean age 43.5 years, range 29-76 years), underwent DWI before and after intravenous administration of Gd-EOB-DTPA with GE HDe1.5T MR from October 2012 to February 2013. MRI scanning sequences included axial fat-suppression T2WI, double echo in and out phase T1WI, coronal FIESTA sequence. Because contrast media leads to reduction in intravascular MRI signal intensity, which calculate the ADC value could decline slightly, but without statistical significance. These data suggest that it is feasible to scan DWI sequence after intravenous administration of Gd-EOB-DTPA.

Key words: MRI, Liver, Gd-EOB-DTPA, DWI
P115

The Application Value of CT-MRI Image Fusion in Nasopharyngeal Carcinoma (NPC) Intensity Modulated Radiation Therapy (IMRT) Target Volume Delineation

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Purpose: To explore the application value of CT-MRI image fusion in nasopharyngeal carcinoma (NPC) intensity modulated radiation therapy (IMRT) target volume delineation.

Materials & Methods: 38 NPC patients come to our hospital in 2013 were included in this study. Every patient had a CT simulation before IMRT. After the injection of contrast agent Ultravist 70-80 ml, the patient was underwent CT scan imaging by Philips Brilliance 16-slice and big bore CT scanner, ranging from patient’s calvarium to the fourth cranial vertebra. Within two days, every patient was underwent MR enhancement imaging using 3-dimensional (3D) fat suppression technique by Alltech 1.5T MRI scanner, and keep the same scanning range, slice thickness, slice distance, and tilt angle of head coherent with CT measurement. The measurement images of every patient from both CT and MRI were transferred to VIRIAN image workstation by local area network (LAN), and applied voxel match method of ECLIPS image fusion software system to do image fusion registration for the CT and MRI images of the same patient. All images are matched well. Senior oncologist outlined the target volume on CT images, recorded as GTV-CT; then referred to the same patient’s MRI images to modify target volume by outlined the target volume on the CT and MRI fusion images, and recorded as GTV-fusion. Comparing these two sets target volume.

Results: After the evaluation by oncologists and radiologists, all images are matched well. Statistical analysis of these two sets data were done by SPSS software, T=2.377; P<0.05; there is significant difference. And have significance for different NPC stages (T2A T2B T3 T4).

Conclusions: Accurately target volume delineation is foundation for oncology therapy planning evaluation. CT and MRI image fusion technology provides richer information to determine NPC target volume and to comprehensively understand the situation of diseased tissue or organ.

Key words: NPC, IMRT, Computed tomography, MRI

P116

The Accuracy of Liver Fat Quantification by using Magnetic Resonance Spectroscopy

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Purpose: Magnetic resonance (MR) methods reliably allow the assessment of body fat distribution and characteristics in many studies. The aims of this study are to compare the accurate of magnetic resonance spectroscopy (MRS) in the quantification of liver fat content analysis used the vendor’s software and LCMODEL.

Materials & Methods: 118 single-voxel MRS data (male: 86 / female: 32) acquired with a volume of interest (VOI) size of 30x30x30 mm³ was placed in the right hepatic lobe (Counaud segments V~VIII) were avoiding major vessels, bile ducts and liver margins, obtained using point-resolved spectroscopic(PRESS) pulse sequences (TR=2000 ms; TE=30 ms; four acquisitions; 1024 data points) within one breath-hold (duration 18 seconds) with automatic shimming on 1.5T. MRS data analyses by vendor’s and LCMODEL software after off-line. The MRS fat fraction (MRS-FF) was calculated as the signal integral of fat (I_fat) divided by the sum of the signal integral of water and fat (I_F=I_water + I_fat)*100). To compare the MRS-FF different between two software used paired t-test.

Results: The MRS-FF not show liver steatosis grade 0, 117 patients of grade 1 (FF: 5.69~28.42%) that with mild steatosis and 1 patient of grade 2 by vendor’s software. The LCMODEL result shows MRS-FF range of liver steatosis from grade 0 to grade 2 and 54 (45.8%) patient’s liver steatosis of grade 0 (FF: 0.22~4.96 %), 64 (54.2%) patients of grade 1 (FF: 5.01~32.34 %) and no patient of grade 2 and 3. The MRS-FF between two methods were significant differential (p<0.01).

Conclusions: In conclusion, our findings show that both methods used for MRS quantification were significant different. The LCMODEL were more sensitivity for live fat quantification than vendor’s method on differential the normal and mild hepatitis steatosis.

Key words: Magnetic resonance spectroscopy (MRS), Fat fraction (FF), Liver steatosis, Quantification

P117

Adnexal Masses in the Practice: A Guide to the MRI Technician

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Purpose: Adnexal masses are the first indication for gynecological surgery. However, 90% of them are benign. Such a paradox relies on the fact that a pre-surgery biopsy is not possible due to the risks of dissemination and that exploratory surgery makes a later intervention difficult. Using ultrasound imagery first but also MRI, allows to study these masses and thus to direct the patients to the most adapted care. Specific issues need to be resolved such as maintaining the fertility of the patients of childbearing age, directing the choice of the surgical procedure and even reducing the need of invasive and expansive surgery. The diagnostic of these adnexal masses are challenging because of their various anatomo-pathological origins, which need to be characterized. To this aim, the MRI technicians should use the right sequences, depending on the questions raised by the radiologist and the surgeon.

Materials & Methods: Thus, we propose to expose the different sequences included in a protocol used at Tenon Hospital (AP-HP) in Paris on a General Electric 1.5T MRI device. We sought to share our technical and clinical experiences of MRI technicians working in a radiology unit specialized in oncology and gynecology, for whom the diagnostic of adnexal masses is a daily issue.

Results: The process of investigation is guided by 4 questions about the morphology, the signal and the dynamic increase of the lesions. For each of these 4 questions, we will detail the acquisitions plan, the field of view and the main technical parameters to be used.

Conclusions: Overall, our presentation will yield a complete guide of investigation for the MRI technician dealing with adnexal masses.

Key words: MRI, Sequences, Gynecology, Adnexal masses, Guideline
**P118**

**MRI in the Exploration of Thoracic Diseases**

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**Purpose:** Magnetic resonance imaging (MRI) has taken a central role in the investigation of thoracic pathologies, thus leading to specific exploration procedures and signal analyses. Especially, the interest of MRI relies on the spontaneous tissue contrast (mediastinal fat/vessels), the assessment of the contrast enhancement and the developing diffusion imagery. Because of the lack of irradiation, the thoracic MRI constitutes a major indication in children, pregnant women and for iterative examinations (e.g. follow-up of Rendu-Osler disease). It is also convenient for the patients presenting a contraindication for the injection of iodinated contrast agents. It is thus an alternative to the thoracic scan, except for the exploration of micro nodules (<3 mm), interstitial pathologies, emphysema and chronic obstructive pulmonary disease.

**Materials & Methods:** The main indicators of the quality of a thoracic MRI are: signal/noise ratio, spatial and temporal resolution and tissues characterization. These objectives must be attained while controlling for cardiac- and breathing-related movements. With this presentation, we propose to expose how various thoracic pathology should be explored with MRI. The pathologies presented are: lung masses, mediastinal masses and vascular pathologies like Rendu-Osler disease.

**Results:** The examination length should never exceed 25 minutes. The procedures are designed on a General Electric 1.5 T MRI device within the Radiology Unit of Tenon Hospital (AP-HP, Paris, France). We will detail the technical parameters of the different sequences used, thus allowing their implementation in other sites.

**Conclusions:** In conclusion, this poster proposes procedures for the exploration of the three main category of chest injury and exposes how MRI should be an alternative of CT-scan or PET-scan without radioprotection issues.

**Key words:** MRI, Sequences, Thoracic diseases, Lung, Mediastinum, Vascular disease

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**P119**

**The Importance of ASL Sequence in Non-Contrast Brain MRI**

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**Purpose:** Arterial spin labelling (ASL) is a sequence that also known as non-contrast perfusion. In this study, we aimed to investigate whether ASL is useful for lesion evaluation in patients who not be able to contrast agent for MR imaging.

**Materials & Methods:** Seventy patients with intracranial mass (primary or metastatic) or who undergone surgery or radiation therapy for intracranial mass were included this study. MR evaluation conducted with a 3.0 Tesla MR device GE discovery 750. ASL sequence was performed in each patient. The data was evaluated using a separate workstation and compared with conventional images. Patients had brain mass, either primary (glioblastoma multiforme, oligodendroglioma, lymphoma) or metastatic (lung, rectum, larynx cancer).

**Results:** The radiation necrosis in patient who undergone radiotherapy was monitored as hypoperfused areas. It was successfully monitored the differences between intracranial mass and necrotic areas by using ASL sequence. It was observed that encephalomalasia and postoperative tissue loss area was seen as hypoperfused. The cystic lesions (arachnoid cyst, interhemispheric cyst and cystic metastasis) were also seen as hypoperfused. Millimetric sized lesions were not detected by using ASL sequence.

**Conclusions:** It can be concluded that the contribution of ASL sequence to conventional non-contrast MR imaging sequences provide valuable information to differentiate between mass and necrosis. It can also be concluded that ASL sequence is useful tool for diagnosing for newly formed metastasis with necrosis.

**Key words:** MRI, ASL sequence, Brain

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**P120**

**QISS MR Angiography: Improvement of Image Quality by Effective Fat Suppression**

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**Purpose:** Quiescent-interval single-shot (QISS) magnetic resonance angiography (MRA) acquires data using an electrocardiography-gated two-dimensional TrueFISP sequence, which incorporates a quiescent interval for maximal enhancement of inflowing blood. This method has a short acquisition time because data acquisition is performed in a single shot. However, we thought the extension of data acquisition time affected the effect of fat suppression because of the linear trajectory through the k-space. Therefore, we evaluated the degree of fat suppression in peripheral MRA images after changing the number of shots.

**Materials & Methods:** All studies were performed using a 3.0-T MR scanner (Skyra, Siemens, Erlangen, Germany), and the scan was used gantry body coil. We changed the number of shots and performed the following experiments. First, we measured the signal-to-noise ratio (SNR) of fat, muscle, and blood in images of a phantom. Then, we performed a peripheral MRA procedure for the common iliac artery branch to the ankle in a healthy volunteer. We evaluated the image quality, effect of fat suppression, and total time taken for one procedure, which included time for patient preparation, positioning, parameter selection, and acquisition.

**Results:** The phantom study showed that as the number of shots increased, the signal intensity of fat decreased, but SNR of muscle and blood remained unchanged. The peripheral MRA of the healthy volunteer showed that as the number of shots increased, background fat signals were further suppressed, resulting in the improved recognition of blood vessels. However, increasing the number of shots increased the total time of one MRA procedure.

**Conclusions:** An increase in the number of shots increased the degree of fat suppression and improved recognition of blood vessels. However, the total time required for the completion of one MRA procedure increased with the number of shots.

**Key words:** Magnetic resonance angiography, Quiescent-interval single-shot (QISS), Peripheral MRA

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**P121**

**Basic Study in the Polymer Gel Dosimeter**

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**Purpose:** Magnetic resonance imaging (MRI) has taken a central role in the investigation of thoracic pathologies, thus leading to specific exploration procedures and signal analyses. Especially, the interest of MRI relies on the spontaneous tissue contrast (mediastinal fat/vessels), the assessment of the contrast enhancement and the developing diffusion imagery. Because of the lack of irradiation, the thoracic MRI constitutes a major indication in children, pregnant women and for iterative examinations (e.g. follow-up of Rendu-Osler disease). It is also convenient for the patients presenting a contraindication for the injection of iodinated contrast agents. It is thus an alternative to the thoracic scan, except for the exploration of micro nodules (<3 mm), interstitial pathologies, emphysema and chronic obstructive pulmonary disease.

**Materials & Methods:** The main indicators of the quality of a thoracic MRI are: signal/noise ratio, spatial and temporal resolution and tissues characterization. These objectives must be attained while controlling for cardiac- and breathing-related movements. With this presentation, we propose to expose how various thoracic pathology should be explored with MRI. The pathologies presented are: lung masses, mediastinal masses and vascular pathologies like Rendu-Osler disease.

**Results:** The examination length should never exceed 25 minutes. The procedures are designed on a General Electric 1.5 T MRI device within the Radiology Unit of Tenon Hospital (AP-HP, Paris, France). We will detail the technical parameters of the different sequences used, thus allowing their implementation in other sites.

**Conclusions:** In conclusion, this poster proposes procedures for the exploration of the three main category of chest injury and exposes how MRI should be an alternative of CT-scan or PET-scan without radioprotection issues.

**Key words:** MRI, Sequences, Thoracic diseases, Lung, Mediastinum, Vascular disease

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**P122**

**Quality by Effective Fat Suppression**

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**Purpose:** Magnetic resonance imaging (MRI) has taken a central role in the investigation of thoracic pathologies, thus leading to specific exploration procedures and signal analyses. Especially, the interest of MRI relies on the spontaneous tissue contrast (mediastinal fat/vessels), the assessment of the contrast enhancement and the developing diffusion imagery. Because of the lack of irradiation, the thoracic MRI constitutes a major indication in children, pregnant women and for iterative examinations (e.g. follow-up of Rendu-Osler disease). It is also convenient for the patients presenting a contraindication for the injection of iodinated contrast agents. It is thus an alternative to the thoracic scan, except for the exploration of micro nodules (<3 mm), interstitial pathologies, emphysema and chronic obstructive pulmonary disease.

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**Key words:** MRI, Sequences, Thoracic diseases, Lung, Mediastinum, Vascular disease

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**P123**

**Basic Study in the Polymer Gel Dosimeter**

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Purpose: In this study, we focused on the effect of the amount of additives on the sensitivity characteristics of the polymer gel dosimeter. Polymer gel dosimeter is using a radical polymerization reaction of the monomer by irradiation. It can be obtained a continuous three-dimensional dose distribution, and treated as a water-equivalent material. On the other hand, it can be used only once, and it is necessary to pay attention in the handing.

Materials & Methods: The gel dosimeter used was a MAGAT type (water: 87wt%, methacrylic acid(MA, monomer): 5wt%, tetrakis hydroxymethyl phosphonium chloride(THPC, oxygen scavenger): 2mm, gelatin: 8wt%). To verify the sensitivity characteristic, we used gel dosimeter with varying amounts of MA and THPC. After prepared a gel dosimeter, obtained gel was irradiated by X-ray fluorescence spectrometer (SZX mini II: Rigaku, Pd-target), and then imaged by MRI (AIRIS 0.2T: HITACHI). We compared by calculating the R2 value using the SNR that was calculated from the captured image. As a verification for the sensitivity characteristics and dose dependence, we prepared dosimeters, the twice amount of the MA and THPC, in addition to the reference. After prepared these dosimeters were compared by performing irradiation while changing the dose.

Results: As a result of the validation for the sensitivity characteristics, the sensitivity did not become high even if MA increased, but increasing the amount of THPC resulted in increased sensitivity. In verification of dose dependency, it reveals no linearity, but has a tendency to R2 value as the dose increase also dose-dependency. Thereby it has been suggested that there is a further dose-dependency.

Conclusions: In this study, we reveals that increasing not MA but THPC increased the sensitivity to the polymer gel dosimeter.

Key words: Polymer gel, MAGAT, R2 value, MRI, THPC

P123

Evaluating the Sensitivity of MRI for Measuring Brain Atrophy

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Purpose: It is known the early detection of brain diseases increases the lifetime and improves the quality of life in general. It was important for the early detection of brain diseases to discover brain atrophy and declining brain function. Brain atrophy was detected by MRI brain images. In addition, brain atrophy was analyzed by MRI images using Voxel-based Specific Regional analysis system for Alzheimer’s Disease (VSRAD). But substantial physiological strain is heavy on dementia patients. It was important for the early detection of brain diseases to discover brain atrophy and declining brain function.

Results: The result was the left side cerebrospinal fluid distance of MRI brain images had negative correlations with cerebral blood volume in Fp1(r=-0.432, p<0.05). On the other hand, the right side cerebrospinal fluid distance was not significant correlation. In addition, Z-score was not significant correlation with cerebral blood volume in Fp1 and Fp2.

Key words: Cerebral blood volume, Brain atrophy, Near-infrared spectroscopy, Alzheimer’s disease

**Purpose:** To evaluate the performance of four-dimensional phase-contrast MRI (4D PC-MRI) using various parameters of integrated Parallel Acquisition Technique (iPAT) acceleration and partial Fourier.

**Materials & Methods:** The experiments were carried out with the in-vitro patient-specific aorta flow phantom. To fabricate the aorta flow phantom, 4D PC-MRI measurements were performed using a clinical 3.0T MRI scanner. A gradient-echo sequence with four-point velocity encoding (VENC) was used. VENC was set to 100 cm/s for velocity measurement, respectively. TE and temporal resolution were 3.85 and 58.96 ms, respectively. The flip angle was 10°. The field of view was 226 mm × 288 mm × 80 mm with 1 mm isotropic voxel size. The identical flow was measured with various iPAT from 0 to 4 and partial Fourier from 7/8 to 6/8. SNR and divergence was estimated for quantifying the performance of the 4D PC-MRI. SNR was estimated by mean/standard deviation of the magnitude image, and divergence was estimated by the volumetric average of Div=TV. Images grading test was performed by five thoracic radiologists.

**Results:** Qualitative inspection of magnitude, phase and MRA images from the 4D PC-MRI sequence showed a significant increase of noise with increasing iPAT. Images grading test showed that the iPAT 1, 2, 3 and 4 showed significant decrease of the images quality (paired t-test; P<0.05), but the partial Fourier did not results in significant decrease of image quality (P>0.05). Quantitative analysis also showed that SNR was more influenced by the iPAT acceleration than partial Fourier. Divergence showed inversely proportional trend compared to SNR, and it could be an effective index for quantifying the quality of the velocity.

**Conclusions:** iPAT = 2 resulted in the most efficient 4D PC-MRI acquisition of the thoracic aorta. Analysis of velocity field using the divergence was effective method to quantify the performance of the 4D PC-MRI.

**Key words:** 4D flow, Divergence, PC MRI

**P126**

**A Study on the Utility of Magic Technique for Pediatric in 3.0T Magnetic Resonance Imaging**

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**Purpose:** MRI study takes a long time. So, in case of childhood patients, they don’t cooperate with a test well. So, we needed to do it by using sedation. If we use Midazolam and Ketamine during a test, it takes long time and causes lots of risk. Magic technique scans a sequence only one time for getting routine study. So, we conducted a study to discover how much efficiency Magic technique has to childhood patients.

**Materials & Methods:** We classified age groups and conducted a test to them with Magic 0.1, 2 and 3. We set same condition to Routine study and Magic technique and compared them through SNR and CR. However, there was no Noise because Magic technique made a image through calculation. So, I substituted Noise with the average value of Standard deviation, and CR was marked by WM/GM

**Results:** Image quality of Routine study and Magic technic was similar. However, through Magic technique, we could get various Contrast and T1 image which has good CR. Also, we could get additional sequences that is undiscoverable through Routine study and shorten the time required.

**Conclusions:** In case of childhood patients, they don’t cooperate with a test well. So, we needed to do it by using sedation. If we use Midazolam and Ketamine during a test, it takes long time and causes lots of risk. However, with using Magic technique, we can shorten the time required 30%. Additionally, image quality is also similar and even better. In other words, we can get an optimal medical image with minimal time from infants. From now on, it is expected that application of Magic technique about Paediatric will be increased.

**Key words:** Magic technique, Paediatric, Sedation
Results: Qualitative evaluation was rated the highest in the b-value 800s/mm² with 2.19 point when the TE 80. Also, quantitative evaluation was shown with 183, 167 and 251 respectively in the b-value 800s/mm² when the TE 62ms, 56ms and 50ms. In case of CNR, it was equally shown with 53, 56 and 50ms. we were statistically significant that SNR and CNR according to the change into TE value. (P<0.05)

Conclusions: There are several methods to reduce the susceptibility artifact caused by the problem of the anatomical position of the patient in the liver DWI inspection. if using short TE value in clinical test, it is believed to be able to make high diagnostic value than conventional image thereby reducing susceptibility artifact.

Key words: DWI, Liver, Susceptibility

P128

Evaluation of usefulness of the mDixon Technique in Breast MRI Examination Comparison with the T1 SPIR Technique

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Purpose: A Fat suppression image is not uniform in breast MRI examination due to limitation of coil coverage and different anatomic structures of the breast and axillary. Therefore, this research aims to evaluate usefulness of the mDixon technique by comparing with the T1 SPIR technique used for breast MRI examination in this hospital.

Materials & Methods: 42 patients diagnosed with breast diseases were scanned in a 3.0T Interia Achieva MRI System (Version 3.2.3.2, Philips, Nederland) and 7 channel breast coil from March to April 2016. An image was acquired from the lower margin of the breast to axillary using the T1 mDixon and SPIR technique after injection of contrast medium. The CNR was measured by setting ROI in the parenchymal tissue of the right breast, pectoralis minor muscle and fat. Also, the difference of fat signal intensity in the left and right axillary was compared. Using SPSS 20 (SPSS Inc, Chicago, IL), paired t-test was carried out to verify statistical significance.

Results: The CNR of the parenchymal tissue and fat measured in the right breast was 150.58±67.20 in the mDixon image and 88.20±41.59 in the SPIR image. The CNR of the pectoralis minor muscle and fat was 130.69±86.55 in the mDixon image and 43.16±54.81 in the SPIR image. The CNR was higher in the mDixon image than in the SPIR image and there was a statistically significant difference. The difference of fat signal in the left and right axillary was 55.68±41.24 in the mDixon image and 217.67±126.92 in the SPIR image and there was a statistically significant difference.

Conclusions: The study showed that compared to the existing T1 SPIR technique, the mDixon technique improved the quality of image and fat suppression homogeneity in the breast and axillary. This demonstrates that using the mDixon technique for acquiring an image in breast MRI examination is very useful clinically.

Key words: Axillary Lymph Node, Breast MRI, Fat Suppression, mDixon, SPIR

P129

Evaluation Among Parameters to Reduce the Magnetic Susceptibility artifact Caused by Intraorally Anchored Dental Co-Cr Alloy Using Customized Phantom in 3.0T DWI MRI.

Dae Keon SEO and Sara NA

Purpose: One of the problems encountered in the head and neck diffusion weighted imaging is the metallic susceptibility artifact caused by intra orally anchored dental prostheses. The purpose of this study was to determine the optimal imaging parameter in MR diffusion weighted imaging (DWI) for minimization of metallic susceptibility artifacts caused by Cobalt-Chromium alloy.

Materials & Methods: EPI and TSE DWI MR imaging were performed and repeated 30 times on the customized Co-Cr alloy phantom respectively in 3.0T MRI. Several parameters includingSENSE, slice thickness, voxel size and NEX were systematically varied to quantify the susceptibility artifacts. The statistical significance of the parametric data was determined using an ANOVA test. P value less than 0.05 was considered to indicate statistical significance.

Results: In TSE DWI, the greatest reduction in artifact size came from not using SENSE (P<0.05). In addition decreasing the slice thickness, increasing the voxel size and NEX also contributed substantially (p<0.05). While in EPI DWI, no statistical difference was found, other than SENSE factor.

Conclusions: Radiotechnologists should properly select among the parameters in their MR DWI imaging to improve the image quality in patients implanted Co-Cr devices.

Key words: Metal artifact, Susceptibility Artifact, Cobalt chromiumium Alloy

P130

Evaluation of the Clinical Usefulness T2 Mapping Techniques for Quantitative Analysis of Myocardium Disease in 3.0T MRI

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Purpose: Recently, T2 mapping techniques to reduce motion artifact than T2-weighted images, reduce scan time provides a quantitative T2 value of the organization has been actively conducted. In this study evaluate the clinical usefulness of T2 mapping techniques for myocardium disease in 3.0T MRI.

Materials & Methods: Among an outpatient diagnosed with heart disease to target 27 patients who underwent acute myocardial infarction, procedure was performed to CMR from August to December, 2015. The equipment is used 3.0T magnetic resonance imaging, pulse sequence is applied prepared steady-state free precession (SSFP) T2 multi-echo spin-echo (ME-SE) for T2 T2 mapping and LGE, it was used with PSIR method. Applying motion correction to improve the accuracy image measurement technology and images the short axis of the heart obtained three parts.

Results: T2 mapping image was measured each categorized the average segment disease. Segment data average value of T2 is a 53.6ms, look at overall average of the segment normal region each disease, measured disease group infarction 52ms, DCMP 53ms, HCMP 50.6ms, myocarditis 58ms, aortic stenosis 52.3ms, fibrosis 52.4ms. Each disease group at T2 value is aortic stenosis, infarction, fibrosis group was respectively 52.3, 52.4ms a big difference in the look and myocarditis group and no aspect HCMP group is more than the difference in the average value of each is displayed. However, aortic stenosis, fibrosis, HCMP measured in the group, the value smaller one could not know the value is significant.

Conclusions: T2 mapping technique in 3.0T disease in the differential diagnosis of clinical usefulness indicates that...
increasing the value of lesions and disease-specific T2 value of the difference signal is shown. T2 mapping technique standards for the diagnosis of disease and analysis of more data in the future is considered to be a lot of help in the diagnosis of heart disease through established guideline set.

Key words: T2 map, Late gadolinium enhancement (LGE), Quantitative T2 value, T2 prepared steady-state free prec.

P131
The Usefulness Evaluation of TSE DWI Images from Magnetic Susceptibility Artifacts Caused by Metal Head and Neck Examinations
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Purpose: The purpose of this study is to evaluate the difference in magnetic susceptibility artifacts caused by metal implants using the comparison between EPI DWI and TSE DWI in the head and neck examinations

Materials & Methods: The equipment was used 3.0 T Ingenia CX (Philips Medical System, The Netherlands). 32channel Head coil of the mid-point in the self-made acrylic phantom (20cm * 10cm * 10cm) location and Titanium Bar (6mm x 40mm) on the Grid the center of the fixed and water-filled after TSE DWI and EPI DWI in the b-value 1000 images were obtained. Quantitative evaluation using the ImageJ was compared by measuring the distortion area. After conversion of the obtained image was measured with Color map image is distorted Titanium bar area. Qualitative assessment is evaluated on a 5-point scale to target the three evaluation items including Susceptibility, Distortion, and Image noise by one radiologist and radiological technologists who have the clinical experience more than 5years were targeting 10 patients with real metal artifacts it was. The statistical test was used SPSS 21.0 (SPSS Inc, Chicago IL, USA). Compare distorted area compared with the scores were compared using the Wilcoxon signed rank test p<0.05 days were interpreted as significant.

Results: As a comparison result of the distorted area by the metal implants, TSE DWI was 230.9mm² less than EPI DWI pc<0.05 (p<0.001) showed a statistically significant difference. The score by comparing three items showed higher scores on the Susceptibility and Distortion items TSE DWI Image noise or topic showed higher scores on the EPI DWI pc<0.05 as statistically significant (p=0.024,0.026,0.023) It showed a difference. Conclusions: Compared to the EPI DWI TSE DWI, but the picture is somewhat Image noise is higher magnetic susceptibility artifacts diagnosis of lesions significantly less in the image of the periphery has been found useful for the TSE DWI.

Key words: Metallic susceptibility artifact, TSE DWI, EPI DWI.

P132
Brain Tumor Patients 3D Balanced Gradient Echo Sequence of Check Availability Contrast Study of 3D Proton Density VISTA Sequence
Sei Yong EOM, Geun Bae LEE, Deok Geun NO, Seung Bong HAN, Jooin Nyeong JANG, Dong Daee LEE, Chang Hwa PARK and Mi JANG

Purpose: Recently increased in Brain Tumor Patients MRI scan and image reading in in 3D Balanced gradient echo MR sequence in orbit on by artifact to because distinguish this difficult Tumor and Cranial Nerve Image of 3D PD VISTA sequence to apply more efficient reading of Tumor your in diagnosing to evaluate the usefulness.

Materials & Methods: January 1, 2016 from May 31, 2016 32 people MRI scan patients for Brain Tumor Surgery in the Patients with the present neurosurgeon to (male 12, female 20, mean age: 44) Target It was to use equipment 3.0T magnetic resonance imaging was used to (Ingenia 3.0T PHILIPS) 32 Channel Neuro-Vascular coil. Pulse sequence is a cross-sectional area of Tumor 3D B-FFE ISQ: FOV=180X180, Voxel size=0.5x0.5x0.5mm, SENSE=2.5, Matrix=360x369, TR / TE=6.6 / 2.7ms, Slice thickness=0.5mm, Nex=6, Scan time=5m SS5sec and 3D PD VISTA: FOV=180X180, Voxel size=0.6x0.6x0.3, SENSE=2.2 TR=2,000 ms TE=33ms, Slice thickness=0.3mm (80slice), Nex=1, an image was obtained by Scan time=3m 44sec, two people were evaluated by a five-point scale according to the lesion detection rate of the video readout of Radiology, Neurosurgery.

Results: Brain tumor patients with tumor and cranial nerve to read as he scales the T-test for implementation by results obtained were, 3D B-FFE ISQ sequence in comparison 3D PD VISTA sequence is P-value value of 0.05 or less as equal as was no significant difference p>0.05.

Conclusions: 3D PD VISTA sequence, so you can assess the artifact as the cranial nerve tumor was difficult to assess more accurately the orbit of another sequence in the existing inspection of Brain Tumor Patients are considered to give a lot of help in the diagnosis of tumor patients.

Key words: 3D PD VISTA

P133
Evaluation of Optimal Material for Decreasing Magnetic Susceptibility Difference
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Purpose: To investigate a material which has similar density with human tissue signal with no influence on contrast and decrease magnetic susceptibility difference in magnetic resonance image.

Materials & Methods: We built our own phantom and chose materials that are similar to density of human tissue. Magnetic susceptibility difference was evaluated in comparison with air, which is a standard material.

Results: Sulfur was the most effective materials to decrease magnetic susceptibility difference and saline, silicone pad, air, respectively. According to post analysis based on bowser's characteristics, sulfur and silicone pad showed less differences compared to air, standard material.

Conclusions: Based on our results, we used LIKERD 5-point scales for choosing the most effective material to decrease magnetic susceptibility difference. Silicone pad achieved the highest score, which means it is the most effective material for decreasing magnetic susceptibility difference.

Key words: Magnetic resonance susceptibility, Phantom, Homogeneity, Silicone pad

P134
Comparison of 3D T2W SPACE Sequence with Conventional 2D T2W TSE Sequence in Evaluating Thyroid Nodule
Purpose: To evaluate the usefulness of three dimensional T2 weighted sampling perfection with application optimized contrast using different flip-angle evolution (SPACE) compared with conventional two dimensional T2 weighted turbo spin echo (TSE) sequence in assessment of thyroid nodule.

Results: After exclusion of patients with unfinished MRI examinations, twenty patients were enrolled in the final analysis. The mean (standard error of the mean) of SNR and CNR were 98.45(7.91) and 114.80(18.64) for SPACE, and 76.39(4.62) and 82.46(10.92) for TSE, respectively. There were significant differences between SPACE and TSE sequences in SNR, CNR and detectability of thyroid nodule (all P<0.05). However, the difference between SPACE and TSE for motion artifacts was not significant (P>0.05).

Conclusions: Three dimensional T2 weighted SPACE sequence provides a larger coverage, higher spatial resolution, and better SNR and CNR than conventional two dimensional T2 weighted TSE sequence in the evaluation of thyroid nodule. In addition, SPACE also has a better detectability of thyroid nodule compared with TSE sequence. Therefore, T2 weighted SPACE would make it a useful tool in the diagnosis of thyroid gland disease.

Key words: Magnetic resonance imaging, Thyroid nodule, Comparative studies, SPACE, TSE

P135
Black Tea as a Negative Oral Contrast Agent in MR Cholangiopancreatography: Prospective in Vitro and in Vivo Studies
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Purpose: To find the optimal formula to make black tea through in vitro test, and to investigate its feasibility and effectiveness as a negative oral contrast agent in MR Cholangiopancreatography (MRCP) through an in vivo test.

Materials & Methods: The signal-to-noise-ratio (SNR) of MRCP, T2 and T1 relaxation-time of different tea-solutions were acquired in vitro measurements to get the optimal formula to make tea-solution. 14 volunteers were scanned before and 5, 10, 15 minutes after tea ingestion to get the optimal delay-time. 36 patients were scanned before and 5 minutes later, and the signal-intensity (SI) and SNR of gastrointestinal tract and pancreaticobiliary-system, signal loss of gastrointestinal tract, and visibility of pancreaticobiliary-system were measured.

Results: The optimal formula to make tea was: 98°C-dipping water, 6g/250 mL and 15 minutes macerating-time. And black tea seems to be a 98°C-dipping water, 6g/250 mL and 15 minutes macerating-time. Black tea can be an affordable, available, safe, and efficient negative oral contrast agent for MRCP.

Key words: Black tea, Negative oral contrast, Magnetic resonance cholangiopancreatography (MRCP)

P136
Comparative 18FDG with Specific Novel Radiotracers
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Purpose: To show the new radiotracers used in the PET/CT UNAM unit, and their comparison with 18-FDG.

Materials & Methods: We present prospective studies that were carried out on PET/CT Cyclotron Unit, UNAM, between February 2012 and July 2014. PET/CT acquisitions were performed first with 18-FDG, and after 2-5 days with other radioactive materials. All studies were performed in the PET/CT biograph 64 point medical systems with an established protocol in our department. Analysis of the images was carried out by two radiologists and two nuclear medicine physicians with extensive experience.

Results: PET/CT has shown that some radiotracers different from 18-FDG show a better sensibility in the detection of some carcinomas that do not depend on glucose, therefore they would be an excellent tool for monitoring patients already treated or with suspected relapse.

Conclusions: We are in need of more studies and broadcasting of these radiotracers, specially in the diagnosis of pathologies where FDG is inconclusive.

P137
Decreasing Noise by 2D and 3D-Morphological Structure Operation from Filtered Back-Projection of Nuclear Medicine Images
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Purpose: The FBP algorithm also provides higher contrast of images compared to iterative reconstruction algorithms. However, reconstruction of PET images by FBP algorithm yield background streak artifacts because of the limited number of projections. This study use morphological structure operation (MSO) to removing strike artifacts of noise from nuclear medicine images.

Materials & Methods: This study reconstructed Deluxe Jaszczak phantom and rat of 18F-Fluorine of PET images by FBP algorithm. The 2D and 3D MSO was used to remove strike artifacts from PET images by FBP algorithm what the MSO
element located at each position with a binary value of (0,1). In this study, the optimal MSO with 3x3 (2D) and 3x3x2 (3D) of matrix size was identified from 29(512) and 218(262144), and was estimated by the mathematical morphological operations of PET images with strike artifacts by MSO. The background standard deviation and FWHM were computed with a specific background ROI for assessed the image resolution.

Results: The background standard deviation from Deluxe Jaszczak phantom image is decreased 32% and 33% for 2D and 3D MSO respectively. The rat image was decreased 11% and 15% for 2D and 3D MSO. Meanwhile, the FWHM of Deluxe Jaszczak phantom was 31.79 mm for 2D MSO and approximated the true target size of 31.80 mm. The running costs are approximately 2 and 1024 minutes for 2D and 3D.

Conclusions: The 2D MSO reduces noise of image background effectively and provides better image resolution. Although the 3D MSO also decreases noise, the running time costs are more than 2D MSO.

Key words: FBP, PET, Strike artifacts, MSO

P138
Bone Health: Will Bone Densitometry Help?
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Purpose: Bone size and density of mineralized tissue is directly dependent upon the bone mass of a given part of a skeleton. Peak bone mass which is the amount of bony tissue present at the end of the skeletal maturation is usually achieved as a result of normal growth and attained in the second decade of life. The size, shape and mineral content of bone is determined by inherited traits and growth factors. The same inherited traits and growth factors can also inhibit the ability of an individual to attain peak bone mass. Fragility fractures could also be a consequence of drug therapy (Corticosteroids) for long standing diseases such as cancers, Human Immunosuppressive Virus (HIV). Bone mineral density (BMD) is an important determinant of osteoporotic fracture risk. Prevention and early intervention will promote strong bones as well as prevent fractures and their consequences.

Materials & Methods: In 1998 X-ray based densitometries began to replace isotope based densitometries. Dual energy X-ray Absorptiometry (DXA) was commercially introduced in 1987. Ever since then, it has become widely available and clinically useful in the evaluation and management of both adult and pediátric bone disease. DXA provides both accurate and precise bone mineral data and has since become the “gold standard” for BMD measurements.

Conclusions: The knowledge of the application of DXA in predicting, prevention and management of bone related diseases is of utmost importance to the Radiographer. This will benefit both the practitioner and the society at large.

P139
New Concept of Parallel-hole Collimators with Photon Counting Gamma Camera System: Monte Carlo Simulation Study
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Purpose: The interest in the utilization of cadmium telluride (CdTe) room temperature photon counting detector (PCD) for nuclear medicine applications continues to grow. In this study, the PCD was modeled as a PID 350 (Ajat Oy Ltd., Finland) with small pixels (0.35 x 0.35 mm2) using Geant4 Application for Tomographic Emission (GATE) simulation. A new concept of parallel-hole collimators based on CdTe photon counting gamma camera system is proposed. Above-mentioned parallel-hole collimator is composed of three layers of tungsten plates stacked directly above each other with different ratio of septal height. The first layer is composed of fourfold increase in hole diameter compared to a pixel-matched parallel-hole collimator with an equal hole and pixel size. The second and third layers are composed of double increase in hole diameter compared to a pixel-matched parallel-hole collimator. The first layer acts as increment sensitivity due to large hole size and the third layer plays an role for a pixel-matched parallel-hole collimator. The purpose of this study was the design and evaluation of the new concept of parallel-hole collimators with CdTe PCD.

Materials & Methods: To evaluate performance of the imaging system, spatial resolution and sensitivity were measured with various collimator geometric designs using 99mTc point source with different source-to-collimator distances.

Results: According to the results, the measured averages of spatial resolution and sensitivity varied depending on the collimator geometric designs and source-to-collimator distances.

Conclusions: In conclusion, we successfully designed a new concept of parallel-hole collimator with various collimator geometric designs with a CdTe photon counting gamma camera system.

Key words: CdTe photon counting detector, Gamma camera system, New concept of parallel-hole collimator, GATE.

P140
Optimization of Iterative Reconstruction Algorithm with CZT SPECT System Using Parallel-hole and Pinhole Collimator
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Purpose: The purpose of this study was to optimize iterative reconstruction methods using parallel-hole and pinhole collimator with CdTe SPECT system.

Materials & Methods: For that purpose, we evaluated spatial resolution with Monte Carlo simulation using GATE (Geant4 Application for Tomographic Emission). The PID 350 CdTe (Ajat, Finland), which consisted of 0.35 x 0.35 mm2 pixel size and 1 mm-thick, was used to model SPECT system. Image reconstruction was carried out maximum likelihood expectation maximization (MLEM) method. Then, we optimized iteration number using parallel-hole and pinhole collimator.

Results: According to the results, we confirmed optimized 5 and 6 iteration number for using parallel-hole and pinhole collimator, respectively.

Conclusions: In conclusion, our results demonstrated iteration number with CdTe SPECT system.

Key words: Parallel-hole collimator, Pinhole collimator, Iterative reconstruction algorithm, MLEM, CdTe SPECT.

P141
Suggesting an Optimal Pinhole Collimator
Design with CdTe Photon Counting Gamma Camera System: Monte Carlo Simulation Study

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Purpose: The purpose of this study was to optimize pinhole collimator designs to achieve appropriate the sensitivity and spatial resolution in small animal CdTe photon counting detector (PCD).

Materials & Methods: We evaluated sensitivity and spatial resolution to optimize pinhole collimator designs using a GEANT4 Application for Tomographic Emission (GATE) simulation. Not only the sensitivity but also spatial resolution were estimated with respect to the pinhole diameters and magnification factors. Finally, we plotted trade-off curves that express the relationship of sensitivity and spatial resolution.

Results: We can found that the optimal pinhole diameter was approximately 14 mm based on trade-off curves in this detector system.

Conclusions: In conclusion, we demonstrated optimum conditions of pinhole collimator designs with CdTe PCD.

Key words: Gamma camera, CdTe photon counting detector, Pinhole collimator, Optimization of image performance.

P142
Improvement Activities to Reduce the Personal Exposure Dose of Radiologic Technologists in PET/CT

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Purpose: We have investigated the personal exposure dose of workers in Department Of Nuclear Medicine in the past 2 years. According to the result, exposure dose of radiologic technologists in PET/CT scan room accounts for over 60% of exposure dose of overall workers in Department Of Nuclear Medicine. We'll figure out the amount of personal exposure dose of the radiologic technologists in PET/CT scan room, improve our work, and reduce personal exposure dose.

Materials & Methods: First, we changed into the method to reduce contact time with patients by using IV injection racks. Before this activities, patients were guided with the workers who carried the IV injection of the patients from a waiting room to an inspecting room. Secondly, we gave an explanation in advance before injecting for radioactive isotope and it made us reduce contact time with patients by question and answer. Also, we let the patients drink water right by themselves just before the PET/CT scan. That means we can reduce contact time and keep a distance from the patients. Lastly, we tried to reduce radioactivity of radiopharmaceuticals administered to patients.

Results: We compared total exposure dose of workers in PET/CT scan room using the legal personal dosimeter, and then we had 2.27 mSv in first quarter, 2.09 mSv in second quarter, and 1.09 mSv in third quarter as a result.

Conclusions: We can reduce exposure dose of radiologic technologists in PET/CT scan room. The personal exposure dose of the radiation workers is supervised not to exceed legal dose limit. But, to reduce possible effects by radiation exposure and stabilize the workers' psychologica states, activities of reducing the radiation exposure are also demanded in other examination rooms.

Key words: PET/CT, Personal exposure dose, Reduction strategy

P143
The Comparison of Quantitative Accuracy between Energy Window-Based and CT-Based Scatter Correction Method in SPECT/CT Images

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Purpose: In SPECT image, scatter count is the cause of quantitative count error and image quality degradation. Thus, a wide range of Scatter Correction (SC) methods have been studied and this study is to evaluate the accuracy of CT based SC (CTSC) used in SPECT/CT as the comparison with existing energy window based SC (EWSC).

Materials & Methods: SPECT/CT images were obtained after filling air and water into the Triple Line Insert Phantom setting hot rod (Tc-99m, 74.0 MBq) in the middle for scatter count comparison. Three types of SC methods, such as non-SC (NSC), EWSC, CTSC were applied to images filled with water. Five types of EWSC including DPW (dual photo-peak window)10%, DEW (dual energy window) 20%, TEW (triple energy window) 2.5%, TEW5.0%, TEW10% were used. Total count was measured by drawing volume of interest (VOI) in the images of the two conditions and then, the ratio of scatter count of total counts was calculated as percent scatter fraction (%SF) and the count error with image filled with water was evaluated with percent normalized mean-square error (%NMSE) based on the image filled with air.

Results: We can find that the image filled with air, %SF of images filled with water to which each SC method was applied is NSC 37.44, DPW 27.41, DEW 21.84, TEW10% 19.60, TEW5% 17.02, TEW2.5% 14.68, CTSC 5.57 and the scatter counts were removed the most in CTSC and %NMSE is NSC 35.80, DPW 14.28, DEW 7.81, TEW10% 5.94, TEW5% 4.21, TEW2.5% 2.96, CTSC 0.35 and the error in CTSC was found to be the lowest.

Conclusions: In SPECT/CT images, the application of each scatter correction method used in the experiment could improve the quantitative count error caused by the influence of scatter count. In particular, CTSC showed the lowest %NMSE(=0.35) compared to existing EWSC methods, enabling relatively accurate scatter correction.

Key words: SPECT/CT, Scatter correction, Energy Window

P144
A Study of Injection Dose for Patients and Exposure Dose for Technologists from the PET/CT Systems

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Purpose: The purpose of this study was to evaluate the sensitivity and spatial resolution in small animal CdTe photon counting detector (PCD).

Materials & Methods: We evaluated sensitivity and spatial resolution to optimize pinhole collimator designs using a GEANT4 Application for Tomographic Emission (GATE) simulation. Not only the sensitivity but also spatial resolution were estimated with respect to the pinhole diameters and magnification factors. Finally, we plotted trade-off curves that express the relationship of sensitivity and spatial resolution.

Results: We can found that the optimal pinhole diameter was approximately 14 mm based on trade-off curves in this detector system.

Conclusions: In conclusion, we demonstrated optimum conditions of pinhole collimator designs with CdTe PCD.

Key words: Gamma camera, CdTe photon counting detector, Pinhole collimator, Optimization of image performance.
Purpose: It appears the different value when the injection dose is calculating for patients on each PET/CT systems. It directly affects the technologists’ radiation exposure dose. We studied the effect of the variable injection doses from several PET/CT systems to exposure dose for technologists.

Materials & Methods: Six technologists have worked for 5 months through unit rotations with 3 PET/CT systems (Scanner 1 (S1): 0.15 mCi/kg, Scanner 2 (S2): 0.17 mCi/kg, Scanner 3 (S3): 0.12 mCi/kg). Eighteen to 19 patients have had examinations per a day on each PET/CT systems. Examination parameters were adjusted to the same. TLDs were used for checking the exposure dose of technologist.

Results: Each technologists’ the monthly average exposure dose was as follows; S1: 0.76 mSv, S2: 0.93 mSv, S3: 0.47 mSv. The maximum exposure dose was 1.12 mSv, and minimum was 0.42 mSv. The results showed significance in the correlation between the PET/CT system and the exposure dose (p<0.005).

Conclusions: When the amount of injection dose was small, the exposure dose was decreased not only the patients but also the technologists. The exposure dose was decreased by the individual proficiency of technologists. However, the low injection dose can highly reduce the exposure dose for technologist so that there will be needed to following studies.

Key words: PET/CT, Exposure Dose, Injection Dose

P145
The Study of Influence on Reducing Exposure Dose According to the Applied Flat-panel CT in Extremity Bone SPECT/CT
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Purpose: Recently the demand of SPECT/CT increasing along with the interest in complex diagnostic information of CT. Therefore, in this study, the goal is to identify how much dose reduction exists when performing the extremity bone SPECT/CT using the flat-panel CT.

Materials & Methods: The extremity bone SPECT/CT was performed with two equipments - BrightView XCT and Brilliance 16 CT (Philips Healthcare, Cleveland, USA)- to identify the exposed dose and image quality resulted by changing scan parameter(mAs) applying for both equipment respectively. The noise value of image and spatial resolution were measured with AAPM CT phantom. mAs was fixed to 120, mAs calculated at each mAs(20,30,40,50,60,70,80) was applied to both equipments respectively. DLP were calculated at the same distance at respective mAs. Also, we acquired images and %contrast with NEMA IEC body phantom to confirm the effect on image. The output of statistics was analyzed by SPSS ver.18.

Results: Regarding AAPM phantom, the noise decreased as the mAs increased and flat-panel had less noise than Helical CT. Both spatial resolution are same by 0.75mm. With scan parameter(mAs) growing, the value of DLP increased up to 54+216 mGy-cm at flat-panel CT and up to 177+709 mGy-cm at Helical CT. Regarding IEC phantom, same sphere with varied mAs shows that similar results.

Conclusions: There is no significant differences of image quality in both flat-panel and Helical CT when mAs is changed respectively. Moreover, we can identify the reduction of exposure dose and confirm %contrast analysis value with maintaining image quality. Therefore, at the extremity bone SPECT/CT requiring high spatial resolution without the wide ROI, the flat-panel CT is considered to be more useful and it expected to result in the similar image quality with lower exposure dose compared to Helical CT. Additionally, through this study, we expect to help the reduction of the unnecessary exposure dose.

Key words: SPECT/CT, Flat-panel CT, Dose reduction

P146
Performance Evaluation of Cu-64 PET Imaging in the Siemens Inveon PET Preclinical Scanner
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Purpose: Positron emission tomography(PET) is key to the nuclear medicine and functional imaging technique that is used to observe metabolic processes in the body. The objective of this study was to evaluate the effects of reconstruction methods and characteristics of filter on the Cu-64 PET data using the mini deluxe phantom. We compared reconstruction methods with various filters in terms of their spatial resolution, non-uniformities(NU), recovery coefficients(RCs), and spillover ratios(SORs) of Inveon PET scanner.

Materials & Methods: All PET scans in this study were performed on a microPET Inveon scanner (Siemens Medical Solutions, Knoxville, TN). For spatial resolution measurements, a point source(diameter: 1.1mm, thickness:0.2mm, F=18) was used. Total activity was 3.7MBq for the acquisition. The spatial resolution was measured according to the NEMA NU 4-2008 standards(Nation Electrical Manufacturers Association). PET imaging were reconstructed with various algorithms and filters to compare their performance for different radionuclides. Image reconstruction was performed with FBP, 2D ordered subset expectation maximization(OSEM 2D), 3D reprojection algorithm(3DRP), and maximum a posteriori(MAP) algorithms. To measure the effect of different reconstruction algorithms and filters on image quality for Cu-64, a mini deluxe phantom was used. The image matrix size was 128X128X159 and the voxel size was 0.776X0.776X0.796. The parameters for image quality evaluation used NU, RC, and spillover ratio(SOR).

Results: The best spatial resolution of Cu-64 was FBP using ramp filter and volumetric resolutions of Cu-64 obtained 4.24. The lowest NU was 3.39% when FBP with parzen filter was used. SOR was 3.04% for air and 3.23% for water obtained MAP (b=1.5) reconstruction was used.

Conclusions: Reconstruction algorithms and filters were compared. FBP with ramp filters, or MAP yielded feasible data for quantifying Cu-64.

Key words: Cu-64, Inveon PET scanner, Reconstruction algorithm, NEMA-2008, Mini deluxe phantom

P147
Responsibility As The First Accredited Nuclear Medicine Facility In Korea, And Some Tips For Those Who Want To Get The Accreditation Outside North America.
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274
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Purpose: For accurate nuclear medicine test, gamma camera’s adequate quality control, appropriate assessment on quality of clinical imagery and proper reading procedure are paramount factors. Asan Medical Center, however, is the only medical facility in South Korea that has officially certified in stated suitability. In this paper, difficulties experienced in preparation for acquiring official accreditation will be shared to provide supports to hospitals in South Korea that are planning to acquire accreditation.

Materials & Methods: First, in personnel qualification section, qualification of physician, nuclear medicine technologist and nuclear medicine medical physicist is assessed. Since types of license or level of education is different from ones in North America, applicants must confirm the adequacy of acquired qualification in South Korea with the organization. If applicant’s facility uses different test than organization’s test, applicant should confirm whether the test could be substituted by the facility’s one. In quality assurance, applicant should ascertain that the facility abides fundamental protocols (procedures), such as infection control and patient education. Likewise, applicant should be cautious when submitting state regulatory agency report or noted documents to the organization.

Results: Asan Medical Center could acquire nuclear medicine accreditation successfully after 10 months of preparation.

Conclusions: By writing this paper, many other medical facilities’ department of nuclear medicine in South Korea could meet intentional standard. Asan Medical Center would welcome to provide helps to future applicants who are in accreditation process.

Key words: Accreditation, Quality Control, Quality Assurance

P148

The Study on Effect of the Image Applying to Breast Implants in Breast Specific Gamma Imaging

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Purpose: There are limits to check the lesion as inserting a breast implant patients. So the application of BSGI based on Nuclear Medicine examination has increased. In this study, therefore we confirmed the effect of the image applying to breast implants in Breast Specific Gamma Imaging.

Materials & Methods: We utilized Dilon 6800 BSGI scanner and developed the phantom. The self-development phantom was a rectangular shape of 230 x 190 x 80 mm size and had 5 spheres which consisted of diameters of 10, 13, 17, 22, 28 mm in central part. We injected 99mTcO4 into the self-development phantom in the proportion of four to one and made each additional phantom filled with 0.9% sodium chloride, silicon and paraffin.

Results: In the test of variation according to the thickness of all additional phantoms, as the phantoms which 0.9% sodium chloride, silicon and paraffin increased, the attenuation variation was higher(P<0.005). The attenuation variation was not significant difference for each material of additional phantom. The attenuation variation was similar in 10, 20 and 30 mm of the variation according to each additional phantom(P<0.005).

Conclusions: In the test of variation according to the thickness of all additional phantoms, as the phantoms which 0.9% sodium chloride, silicon and paraffin increased, the attenuation variation was higher(P<0.005). There was no significant difference in the attenuation variation and the quality of image for type of the additional phantom. Therefore, if the effect of the image applying to breast implants in Breast Specific Gamma Imaging is confirmed, the higher diagnostic value can be achieved.

Key words: BSGI, Breast implant, 0.9% sodium chloride, Silicon, paraffin

P149

Radiation Exposure Analysis of Female Nuclear Medicine Radiation Workers

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Purpose: In this study, radiation workers who work in nuclear medicine department were analyzed to find the cause of differences of radiation exposure from General Characteristic, Knowledge, Recognition and Conduct, especially females working on nuclear medicine radiation, in order to pave the way for positive defense against radiation exposure.

Materials & Methods: The subjects were 106 radiation workers who were divided into two groups of sixty-four males and forty-two females answered questions about their General Characteristic, Knowledge, Recognition, Conduct, and radiation exposure dose which was measured by TLD (Thermo Luminescence Dosimeter).

Results: In the correlation analysis of female groups, the non-experienced in pregnancy showed decreasing amount of radiation exposure as the score of knowledge and conduct was higher and the experienced in pregnancy showed decreasing amount of radiation exposure as the score of recognition and conduct was higher. In the regression analysis on related factors of radiation exposure dose of nuclear medicine radiation workers, the gender caused the meaningful result and the amount of radiation exposure of female groups compared to male groups. In the regression analysis on related factors of radiation exposure dose of female groups, the factor of conduct showed a meaningful result and the amount of radiation exposure of the experienced in pregnancy was lower compared to the non-experienced.

Conclusions: The conclusion of this study revealed that radiation exposure of female groups was lower than that of male groups. Therefore, male groups need to more actively defend themselves against radiation exposure. Among the female groups, the experienced in pregnancy who have an active defense tendency showed a lower radiation exposure. Thus, those who have never been pregnant need to have a more active defensive conduct for the future possibility of pregnancy.

Key words: Nuclear Medicine, Radiation Worker, Radiation Exposure Dose, Radiation Exposure factor
P150

Relationship between Degree of F-18 FDG Uptake in Brown Adipose Tissue
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Purpose: At 18F-2-fluoro-2-deoxy-D-glucose (FDG) positron emission tomography (PET) examinations, a high tracer uptake of the skeletal muscles is sometimes encountered which can lead to reduced uptake in pathological lesions. Brown adipose tissue (BAT) has profound effects on glucose metabolism. The goal of this study was to characterize this normal variant of 18F-FDG uptake according to the extent of Brown adipose tissue uptake.

Materials & Methods: Methods All body scans done on our PET/CT scanners in November 2012 and February 2014 were retrospectively reviewed. After reviewing, we collected 54 patients, 39 with activated BAT and 15 matched controls without activated BAT. Comparing the study group with the control subjects, The SUV mean of liver, spleen, lung, blood, muscle and bone were reviewed. Statistical comparisons between groups were done using independent sample T-Test. P value less than 0.05 were regarded as statistically significant.

Results: The SUV mean±standard deviation of the liver, spleen, lung, blood, skeletal muscles, bone in the study groups were 2.27±0.37, 1.94±0.56, 0.39±0.11, 1.66±0.33, 0.80±0.15 and the control subjects were 2.27±0.21, 1.88±0.44, 0.37±0.10, 1.64±0.21, 0.84±0.12, 2.13±0.43. The FDG distribution of the study groups were no significantly difference compared to the control subjects. Moreover, there were no differences of SUV of reference tissues/organ between the study group and the control subjects (P>0.05). There were no differences between the study group and the control subjects.

Conclusions: In our study, there were no correlations between the SUV max of BAT and the SUV mean of reference tissues.

Key words: 18F-FDG, Brown adipose tissue, Standard uptake value

P151

Assessment of Indoor Radon Gas Concentration Change of One College
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Purpose: To evaluate the ventilation, compared to indoor Radon concentrations in the three variables of the building volume, such as year of construction, its impact is measured to find ways to lower the concentration of indoor Radon.

Materials & Methods: Measure the concentration of radon on 6 floors in 6 class rooms. One of class room built in 2011 and the other one built in 1976 were selected to compare difference between concentration of radon in big class room built in 1976 and small class room built 2011 according to capacity of class rooms.

Results: When the ventilation was lower than that would otherwise indoor radon gas concentrations, buildings when a comparison of the year was higher than Radon concentration in a newly built classrooms, volume by comparison with high area ratio classrooms in the building inner wall of the volume of the interior space the higher the Radon concentration.

Conclusions: Indoor Radon gas concentrations are considered to be have a close correlation between the ventilation, building volume, such as year of construction.

Key words: Radon, Ventilation, Room volume, Building year

P152

The Study for the Influence of Remaining Urine when Having PET/CT Examination with 18F-FDG
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Purpose: This study is to know what urine influence on the examination by comparing the amount of the radioactivity depending on the distance of the background radiation of the surrounding tissues of the bladder according to whether if there remained urine or not in the bladder when having PET/CT examination with 18F-FDG and improve diagnostic efficiency of the lesion with this.

Materials & Methods: PET/CT was used Biograph mCT40. To replicate the bladder we used a rubber balloon. ROIs direction of three, six, nine, twelve o'clock with distance from the bladder about 7.3mm, 14.6mm in two images according to whether urine is filled or not for quantitative evaluation of background radiation and measured the value of %BV by using GE Xeleris Functional Imaging Workstation. Also, based on the distance from bladder, we classified the group as the G1 is less than 10 mm, the G2 more than 10mm and measured the amount of radioactivity by using Siemens True D to know what urine influence on six of hot areas.

Results: Measured %BV in each direction distance from 7.3 mm, shows 10% of average difference as 18.9%, 13.8%, 3.0%, and 4.5% and 14.6mm shows a 1.4% of average difference of %BV as 0.5%, 2.2%, 2.7%, and 1.1%. As a result of measuring the amount of radioactivity, the average amount of radioactivity of Group 1 and Group 2 shows seven time differences as 4,706 Bq/ml and 678.5 Bq/ml.

Conclusions: That %BV can be changed depending on the filling condition of urine and distance after measuring the background radiation, and they possibly could have an influence on the image. Also, the average amount of radioactivity shows the differences by each group when measuring the amount of radioactivity. This is more effective when urine is filled and if the distance between the bladder and lesion is closer.

Key words: PET/CT, 18F-FDG, Bladder, Urine, %BV

P153

Utility Evaluation of 3D Printer Technology in Nuclear Medicine
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Purpose: 3D printing technology is a manufacturing technology
which processes digital data acquired through 3 dimensional modeling. It allows various use in the field of medicine, but the use of it in nuclear medicine is inadequate. By measuring the change of radiation transmittance according to the quality of materials. Therefore, this study would serve as basic study material for the use of 3D printing technology in the field of nuclear medicine.

Materials & Methods: Phantom manufacturing to measure the change of radiation transmittance according to the quality of the material, PMMA phantom and ABS phantom(3D printer) were manufactured according to the actual size of Aluminum step wedge(140mmx62mmx35mm). Image acquisition equipment and methods: We used SPECT/CT equipment, BrightView XCT(Philips Health care), and we acquired SPECT image by conditioning 64x64 matrix, and 64 frames(30 seconds and 5.6 angle per 1 projection image). CT image acquisition conditions are 120 kVp and 20 mA, and we used 3 segments localization fast mode and standard algorithm. We used Flood phantom(Biodex) 99mTc 5, 6 mCi and Flood phantom(57Co 20mCi). We located Al, PMMA, ABS phantom and acquired image for 60 minutes. Image analysis and evaluation Based on acquired images, we set ROI(region of interest) and analyzed data according to thickness of material and radiation dose, then conducted statistical analysis to provide calibration value.

Results: When comparing the radiation transmittance of ABS phantom with the radiation transmittance of PMMA phantom, it shows just a small difference despite the change of dose, the quality of materials and thickness.

Conclusions: Since the use of 3D printing technology in phantom production is effective in its ability to make customized production and to make use of real-shaped products, the Korean nuclear medicine, which is highly dependent on foreign products, would be able to produce various types of phantoms and nationalize the existing foreign phantoms.

Key words: 3D printing technology, SPECT/CT, ABS phantom

P154

Study on the Reduction of Diagnostic Reference Levels in Whole-Body Bone Scintigraphy

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Purpose: Diagnostic reference levels in nuclear medicine are applied to medical exposure and defined as administered activities rather than absorbed dose. The purpose of this study is to determine the optimal dose of the radiopharmaceutical that can make reduce radiation dose of patients and help maintaining the quality of image for an accurate diagnosis in the whole-body bone scintigraphy.

Materials & Methods: One hundred seventy patients without chemotherapy, steroid therapy, renal function failure and bone lesion who underwent 99mTc-DPD whole-body bone scintigraphy were retrospectively reviewed. Using the anterior and posterior frame counts without bladder, the average count density was measured. We analyzed the correlation between the age, height, weight, body mass index and count density. Multiple-regression analysis was used to assess the influence factor on the count density.

Results: The count density is inversely proportional to the weight and body mass index, there was a correlation(r=-0.444, P<0.05; r=-0.693, P<0.05). However there was no significant correlation between the age, height and count density(r=-0.087, P>0.261; r=0.138, P=0.072). The multiple-regression analysis shows that the body mass index(β=-0.837, t=-9.939, P<0.05) has the bigger influence on the count density more than body weight(β=0.190, t=2.261, P<0.05).

Conclusions: We established administered activities on whole-body bone scintigraphy in consideration of body mass index and the time from injection to scan.

Key words: Bone scintigraphy, Diagnostic reference levels, Body mass index, Count density, Administered activity

P155

Endothelial Dysfuntion in Systemic Lupus Erythematosus: Evaluation With 11C ACETATE PET-CT

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Purpose: Systemic lupus erythematosus (SLE) affects multiple organs and systems, severely involving the cardiovascular system. The aim of this study was to evaluate the presence of endothelial dysfunction with 13N-ammonia PET in symptomatic SLE patients. Methods: We enrolled 16 women with SLE and 16 healthy women. Myocardial blood flow (MBF) quantified in a 64-slice PET/CT scanner at rest, during a cold pressor test (CPT), and during stress. Endothelium-dependent vasodilation index, %DMBF, and myocardial flow reserve (MFR) were calculated.

Materials & Methods: Sixteen women diagnosed with SLE were enrolled in this study. All were 18 y old or older. Throughout the study, each patient was taking low-dose steroids (56.2%) or antimalarial drugs (87.5%). All fulfilled the American College of Rheumatology Criteria for the disease and had been diagnosed with SLE for 7.6 y. At the endothelial dysfunction in sle.

Results: There were 16 women in the SLE group (mean age 6 SD, 31.4 6 8.3 y) and 16 women in the healthy control group (31.5 6 11.1 y). Mean endothelium-dependent vasodilatation index and %DMBF were significantly lower in SLE patients (1.18 6 0.55 vs. 1.63 6 0.65, P=0.04, and 18.6 6 22 vs. 63 6 55, P=0.04, respectively). MFR was also lower in the SLE group (2.41 6 0.59 vs. 2.73 6 0.77, P=0.20).

Conclusions: Asymptomatic SLE patients who are free of active disease present an abnormal coronary flow reserve as demonstrated by both smooth muscle dysfunction and endothelial dysfunction measured by 13N-ammonia PET. It is necessary to develop and intensify treatment strategies directed toward atherosclerosis in SLE patients.

P156

Patient Dose Relationship with Exposure Parameters in Chest X-Ray Examination at the Komfo Anokye Teaching Hospital, Kumasi-Ghana

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Purpose: This study was to determine how exposure parameters influence doses patients receive when undergoing a chest x-ray examination.

Materials & Methods: The study was done by recording the demographics data and the exposure parameters for 50 male and female non trauma patients above the ages of 18 years undergoing a chest x-ray examination. With the same exposure factors and focus to film distance (FFD) recorded, the ionisation chamber of a barracuda multimeter was placed at the center of a cassette stand or erect Bucky and exposed. The Barracuda PC palm monitor displayed the following measurements, KVP, mAs, dose in (mGy), half value layer (HVL) and total filtration (TF) for recording. The procedure was repeated for each of the 50 patients considered for the study. The tube potential selected ranges from 93kVp to 109kVp depending on patient size. The data was entered into the Monte Carlo PCXMC 1.5 software for organ and effective dose estimation. Analyses were carried out only for exposed critical organs in terms of their contribution to the effective dose and the entrance surface dose, for (PA) Posterior anterior chest radiography.

Results: There was relationship between patient's dose and exposure factors. The thymus got the highest mean organ dose of 0.04mGy, followed by the breast with the mean organ dose of 0.03mGy; the heart had 0.02mGy; thyroid had 0.02mGy and lungs had 0.02mGy. The ovaries and testes had the least doses of 0.001 mGy and 0.0001 mGy respectively. The mean effective dose was estimated to be 0.01mSv and the calculated mean dose area product was found to be 3.6Gycm². The mean entrance skin dose was found to be 0.03mGy.

Conclusions: Doses variations suggested that there was space for standardization of the radiological techniques and for optimizing the radiographic procedure to reduce patient doses

Key words: Entrance Surface Dose, Effective Dose, Organ doses, Chest X-Ray, Exposure factors

P157
Radiation Dose During Digital Pelvic Radiography: A Comparison of Three Systems
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Purpose: To compare the radiation dose and image quality between three commercially available digital radiography (DR) systems when undertaking pelvic radiography.

Materials & Methods: Using a Carestream Directview, Siemens Ysio and a Samsung XGEO systems a series of antero-posterior (AP) pelvic images were obtained using an anthropomorphic phantom. Images were obtained using 75 kVp, outer AEC chambers nearest the head and when using Samsung DR. When compared with a reference image (current standard acquisition parameters) the image obtained with the lowest ED was still graded has having the same image quality.

Conclusions: Based on the equipment and acquisition factors investigated in this study there are differences in ED between systems. Such differences should be factored into dose optimisation strategies or attempts should be made to normalise doses between systems.

Key words: Digital radiography, Dose optimisation, Experiment, Pelvis

P158
The Imaging Effect of Different Exposure Dose and Radiation Dose after Knee Replacement Surgery
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Purpose: To study the knee arthroplasty (TKA) postoperative best photography conditions and the feasibility of clinical application.

Materials & Methods: Using different exposure modes on the knee joint replacement prostheses for non-weight bearing photography. Fixed KV change the mA or mAs to the phantom. The exposure measurement (ESD), dose exposure index (DEI) were recorded, and the statistical analysis was done.

Results: The AEC group, ESD and KV showed a negative correlation (r=-0.973, P=0.000). Under the condition of the same mA, DEI with KV increase was first decreased and then increased change; two doctors on image quality score of good consistency Kappa=0.760, DEI and physician ratings showed negative correlation (r=-0.840, P=0.000). FIXED group, ESD increased with the increase of mAs, positive correlation (r=0.845, P=0.000), DEI and KV, mAs into a positive correlation (r=0.845, P=0.000). The consistency of the image quality score of 2 doctors was good (Kappa=0.898), and DEI was not statistically significant. Compared with the review group, the physician score increased by 153%, and the radiation dose decreased significantly.

Conclusions: Through the experimental data, for patients with knee joint replacement prostheses implantation client, using manual exposure mode, 80 KV / 1.25-1 mAs; 75 KV / 2-1 mAs; 70 KV / 2.5-1.25 mAs; 65 KV / 3.2-1.6 mAs; 60 KV / 3.2-2 mAs for optimizing interval.

Key words: Knee joint replacement, Radiation dose, Exposure dose

P159
Study of mA Distribution and Dose Reduction of Organ Dose Modulation (ODM) Technique during Carotid and Head CTA: Difference between Lens and thyroid Protection
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Purpose: To elaborate ODM effect and protection difference on...
When phantom was positioned closer to the x-ray, ODM can provide protective effect on both diagnoses. Computed tomography, Image quality, Off-Center patient position on radiation exposure decreased when automated tube voltage selection (CARE kV) was used alone. Whereas CARE kV technique was added, radiation doses were 26% higher in the highest table position and 27% lower in the lowest table position when Care Dose 4D was used alone. Whereas CARE kV technique was added, radiation doses were 26% higher in the highest table position and 27% lower in the lowest table position. The impact of off-Center patient position on radiation exposure increased when automated tube voltage selection (CARE kV) was added. There was moderate correlation between the table height and effective radiation dose (r = 0.48, P<0.05). There was significant difference for current reduction at the same direction and radiation dose information between group A and B for lens and thyroid gland.

Materials & Methods : 46 patients underwent carotid and head CTA on a newly generation spectral CT(Discovery CT,GE Healthcare). The organ dose modulation (ODM) was ventrally located on lens of eyes area and thyroid area in the same time. The tube current at different directions. Anterior(A) Left(L) right(R) of the ma table from scan with ODM(group A) and simulation without ODM(group B) were recorded before scan. Tube current reduction at the same direction and radiation dose information between group A and B for lens and thyroid gland were calculated and compared with statistical analysis.

Results : CTDI and ED of group A and group B were (15.65±1.39; 1.44±0.17) and (17.44±1.36; 1.6±0.18), respectively. There was significant difference by paired-sample T test (P<0.01). For the area of the lens of eyes, tube current of group A and B were (341.34±53.88) vs (409.34±62.80), difference was -67.99±11.99, (p<0.01). For the area of the thyroid gland, tube current of group A and B were (603.52±42.07) vs (650.15±22.22), difference was-52.63, (p<0.01). There was significant difference for current reduction between the area of lens of eyes and thyroid gland (16.65±0.018 vs 8.09±0.050, P<0.01). For the area of the lens of eyes, there were significant differences for tube current between group A and B at all four directions (p<0.01). For the area of the thyroid gland, the difference were statistically significant at Anterior(A) Left(L) right(R) (p<0.01) except the direction Posterior (P) (P=0.907).

Conclusions : ODM can provide protective effect on both lenses of the eyes and the thyroid gland during the carotid and head CTA scan. But the tube current distribution was different between eyes and thyroid. Dose reduction was higher in the area of lens of eyes than in the area of the thyroid gland.

P160
Effects of Incorrectly Filled Examination Request Forms on the Quality of Imaging Services & Radiation Dose Reduction
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Purpose : The purpose of the study was to establish the effect of incorrectly filled request forms on the quality and safety of imaging services.

Materials & Methods : To carry out the study, standard request forms that avail all the necessary information were considered for the study. The study was conducted in 2 separate hospitals. The first part of the study was carried out in the year 2008 in a level 5 hospital. The second part of the study was carried out in 2016 in level 6 hospital. Request forms that were poorly filled were identified. A poorly filled form had one or more of the following characteristics observed: Incomplete information, Wrong description of radiographic anatomy, Not specific (e.g. age: Adult), Use of non-conventional terminology, No LMP date provided, No provisional diagnosis, No clinical summary or provisional diagnosis, Name and signature of clinician not provided, No indication of a previous examination, Requested projection not indicated, Failure to localize region of interest, Use of a piece of scrap paper for request form. The request forms were analyzed for level of clinician qualification, contribution to dose reduction and quality of diagnosis.

Results : 52% of the requests did not comply with radiation safety requirement 100% of the selected request forms caused interpretation confusion. 14% of the requests were ordered by radiologists, 21% of the requests were ordered by Senior medical officers. 42% of the forms were ordered by clinical officers.

Conclusions : Poor quality examination request forms were common in the study setting increasing radiation risks and reducing the quality of imaging services. Future research should identify reasons for poor quality requests, effect on final diagnosis and examinations reports.

Key words : Request form, Radiographic anatomy, Conventional terminology, Clinical summary, Provisional diagnosis.
**Purpose**: This study aims to assess if increasing awareness surrounding the topic of scan length adherence will result in reduction of both frequency and magnitude of “over scanning” and consequently patient radiation dose.

**Materials & Methods**: A retrospective study was set up to detect differences in frequency in protocol adherence, magnitude of over scan, and patient radiation dose during two phases: pre-awareness and post-awareness. Awareness was raised through presentations at departmental meetings. Three protocols were selected in this study Neck, Lumbar Spine, and AbdoPelvis. A chi-square test was used to assess the frequency over scan. The data was assessed for significant differences in magnitude of over scan and radiation dose using an independent Student’s t-test.

**Results**: Neck protocols showed the number of over scanned images significantly decreased post awareness. Furthermore, the magnitude of over scan and radiation also reduced. Lumbar spines and AbdoPelvis protocols showed no significant reduction in frequency nor magnitude in compliance to scan range was not an issue. In fact, Lumbar Spine protocols were altered after this study to increase the scan range as the radiologist felt the results of this study showed that the images were routinely clinically “under scanned”.

**Conclusions**: Routine audits of scan range protocol adherence can result in significant radiation dose optimization. This study found that neck protocol was problematic in adherence, however once radiographers were made aware the compliance rate to scan regions were significantly improved.

**Key words**: Radiation Dose Optimization, Computed Tomography, Radiation Safety

**P164**  
Peripheral Angiography by Using Low Dose and Low Contrast  
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**Purpose**: Conventional angiography is the gold standard for the imaging process of peripheral artery. But thanks to rapid advances and technological developments in CT technology it has been used in conjunction with conventional angiography. In this study we aimed to reduce radiation dose rate below 1 mSv and also aimed to reduce contrast value of 45-60cc. The main purposes of this study is to minimize the risks of CT, investigation on using the CT for diagnosis and post-treatment and also provide to use of catheter angiography only for treatment. By using this way, we aimed to convince the patients who refuse the treatment due to risks of catheter angiography and instead of catheter angiography use the noninvasive CT for related patient.

**Materials & Methods**: Helical scanning protocols used with 0.5 mm slice thickness peripheral artery imaging were performed. The taken cross-sectional images converted to MIP and VR images.

**Results**: By using the special method of injection and radiation dose protocol, we reduced not only contrast rate to 60cc but also radiation dose to 0.5mSv value. Obtained images compared with catheter angiography and doppler images and compliance was observed in over 90% during image comparison.

**Conclusions**: Peripheral arteries can be visualized by using 60 cc of contrast agent and 0.5-1 mSv radiation dose with the reliability over 90% and by considering all these advances in CT technology there any need for conventional angiography for diagnostic purposes?

**Key words**: Low dose peripheral, CT, Angiography

**P165**  
Radiation Doses to Radiographers during Hepatobiliary Interventional Procedures Using Flat-panel Detector Based System  
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**Purpose**: Few reports are available on occupational doses in noncardiac interventional procedures mainly focusing on primary operators ‘radiation exposure. No data is available on radiographers’ radiation exposure during non-cardiac interventional procedures. Aim of this study was to prospectively evaluate Effective Dose (E) of radiographers performing the most frequent hepatobiliary procedures (HBP) in a single center.
using a flat-panel detector based system (FPDS).

**Materials & Methods:** Between 10/2015 and 4/2016, 213 HBP (80 chemoembolization of liver tumors; 113 percutaneous biliary procedures (biliary catheter placement, bilioplasty, biliary catheter change); 20 TIPS) have been performed in our center in adult (n=141) patients using a FPDS. Low-dose fluoroscopy protocol (7.5 frames/sec pulsed fluoroscopy) was routinely employed thanks to close cooperation between interventional radiologist and radiographers. Electronic personal dosimeters, positioned at the left upper chest outside the lead apron, were used to measure radiation doses. E was determined using a modified Niklason algorithm (E=0.03×Hp(10)).

**Results:** Chemoembolization: mean E was 0.05 μSv (SD 0.09, median 0.00, 75th percentile 0.04, range 0.054); mean DAP 7129 cGy·cm²; mean fluoroscopy time 1670 sec. Biliary procedures: mean E was 0.07 μSv (SD 0.16, median 0.00, 75th percentile 0.06, range 0.084); mean DAP 1465 cGy·cm²; mean fluoroscopy time 1101 sec. TIPS: mean E was 0.30 μSv (SD 0.72, median 0.27, 75th percentile 0.51, range 0.02-2.67); mean DAP 9777 cGy·cm²; mean fluoroscopy time 1409 sec.

**Conclusions:** In our experience, radiographers’ E can vary during different HBP approach due to different role and positions in interventional suite. The use of FPDS with adequate fluoroscopy protocols, and protective devices allow a reasonably low radiation exposure to radiographer performing the most frequent HBP. The choice of low-dose protocol is possible thanks to close cooperation between interventional radiologist and radiographers.

**Key words:** Dose Reduction, Hepatobiliary, Flat-panel

**P167**

**Radiation Dose Associated with Radiographic Procedures at an Australian Teaching Hospital**

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**Purpose:** Teaching hospitals employ a number of student, trainee and junior staff. The level of experience usually reflects a large variance in radiation dose for common procedures. It is important to review radiation dose which can assist in raising awareness surrounding expected dose from common procedures. The aim of this project is to determine the median dose area product and effective dose from common radiography procedures performed at a large Australian teaching hospital.

**Materials & Methods:** The dose-area product from radiographic procedures done over a 3-month period were collected. The median, first and third quartiles were calculated and the DAP values were used in a Monte Carlo based software, PCXMC, to simulate the effective dose from each procedure.

**Results:** Dose area product values and effective dose is calculated and presented as a range for 50 different radiographic procedures. The third quartile for the most common procedures was used as the upper limit for setting the local reference levels and the median effective dose is used as the typical dose delivered from each procedure.

**Conclusions:** Reviewing radiation dose is particularly important for teaching hospitals where a number of junior staff are employed and significant dose optimisation is possible. Furthermore, if staff are aware of typical radiation dose delivered per procedure they are able to put the risk vs benefit of each procedure in context for the patient.

**Key words:** Radiography, Radiation Dose

**P168**

**Application of Monte Carlo (MC) Method for Radiological Studies and Basic Principles**

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**Purpose:** Nowadays, the Monte Carlo (MC) technique has become ubiquitous in radiology and medical radiation studies. There are many different applications of this technique but the major focus of this study will be the description of Monte Carlo and simulation principles for radiation transport, basic techniques and roadmap for design a radiation detection in a Computed Tomography (CT) facility by using MC code.

**Materials & Methods:** Radiation detection technology that...
provides great information to identify radionuclides and medical radiation from their passive gamma ray emits. In this study, MCNP-X has been used as Monte Carlo code for calculations. By considering clinical CT facility and physical parameters, we defined a simple geometry and calculated the dose rates due to distance factor from CT gantry by using Monte Carlo method. Results: As a result, we obtained that MC method is capable for identification of critical points during dose distribution in CT facility. A good agreement has been obtained between experimental and measured data. Conclusions: It can be conclude that MC method is strong and suitable method for future studies.

Key words: Monte Carlo, CT, Medical Radiation

P169
Effective Dose Exposure due to Recurrent Ct Scans in Hematology Patients
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Purpose: Since the patients who are diagnosed with hematologic malignancies have low thrombocyte and leucocyte counts, they undergo multiple CT examinations in order to rule out cranial/retroperitoneal hemorrhage, fungal pneumonia etc very often. There is risk of secondary malignancies due to the stochastic effect of radiation. Our purpose is to determine the total exposure in hematologic patient group.

Materials & Methods: We search for the hematology inpatients who undergone multiple ct examinations during their hospital stay using the hospital electronic recording system. There were 156 patients who were meeting our criteria between January 2015-January 2016. We noted CTDI (CT dose index), DLP (Dose Length product) values, scan areas and calculated ED (Effective Dose) exposure from the dose report page of CT scans.

Conclusions: Patients who are diagnosed with hematologic malignancies, usually face long hospital stays and due to the complications of chemo-radiotherapy there is need of multiple CT scans. Clinicians should consider that there is risk of secondary malignancies after recurrent exposure to radiation and order CT scan after careful evaluation.

Key words: Radiation dose, Hematologic patients, Effective dose, Radiation exposure.

P170
Certification system of facilities optimizing medical exposure dose
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Purpose: Gaining the public’s trust in radiological examination requires a variety of measures, such as technological support for maintaining and improving the quality of radiological examination for determining appropriate tests; optimization of exposure factors for examination purposes; quality control of radiologic equipment; and appropriate explanations to alleviate patients’ anxiety regarding testing. By certifying and releasing the names of medical facilities which have demonstrated that they satisfactorily perform the above measures, the Japan Association of Radiological Technologists can ease the public’s fears regarding radiological examination.

Materials & Methods: Facilities which apply for certification first submit self-completed documents for a preliminary inspection; facilities which pass this inspection then undergo an on-site inspection. Inspection items are divided into “justification of actions” and “optimization of protection”; for the latter, inspections are conducted for each modality. In order to ensure authenticity, fairness, and continuity, certification must be renewed every 5 years.

Results: From 2005 to March 2016, a total of 64 facilities (including 19 renewals) across Japan obtained certification. All certified facilities receive a certificate and a plaque, which are displayed at the entrance of the facility or other such locations in order to appeal to examinees.

Conclusions: The Japan Association of Radiation Technologists certification system enables all engaged in radiological examination to renew their awareness of medical exposure and to use medical radiation appropriately. The medical exposure dose in testing can also be displayed to patients, which could be a major contribution to public health care.

Key words: Optimization of medical exposure dose, Reduction of medical exposure dose, Quality control of radiologic equipment, Radiation safety manager, Medical imaging and Radiologic system Manager

P171
Operator Radiation Dose during Digital Subtraction Angiography
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Purpose: The interventional radiology procedures need anaesthesitst participation, so it is important to know the radiation dose for anaesthetists. In this study, we measured radiation dose to operators whether there are differences on patient’s left or right side.

Materials & Methods: This study collected radiation dose use GE INNOVA3131 digital fluoroscopic imaging system in a regional teaching hospital in Taiwan. Radiation data were collected using ATOMTEX Dosimeter AT1121. Placed on the table left side or right side, from the ground 100cm and 150cm. Fluoroscope radiation dose measured at the time of 30seconds were measured 10 times. Collected data use SPSS190 statistics software analysis.

Results: In this study, the operators stand closer to the patient’s right side (near tube side) are receive the highest radiation dose at the two height (P<0.01). Furthermore, it is found the 100cm height position radiation dose higher then 165cm position at the both sides (P<0.05).

Conclusions: In general, operators stand to the patient’s right side will receiver lower radiation dose, but this study finding is opposite result. Maybe it is related with the X-ray tube position of GE INNOVA3131 digital fluoroscopic imaging system. In the future, it is still needed to study the radiation dose relation with different beam projection used.

Key words: Radiation dose, Angiography

P172
Investigation of Medical Neutron Radiation
Doses Using Neutron Optically Stimulated Dosimeter
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Purpose: This study is concerned with the measurement of photon/electron contamination emitted from a Elekta Synergy medical linear accelerator, using various photons and electrons and neutron optically stimulated dosimeter (OSLN) albedo dosimeter. The OSLN is the recommended detector for personal neutron dosimetry.

Materials & Methods: Firstly, 10-MV photon radiation fields of 40×40 cm2, 30×30 cm2, 20×20 cm2, 10×10 cm2, 5×5 cm2, and 0.4×0.4 cm2 were measured electron energies of 6, 9, 12, 15, and 18 MeV, irradiated by 10 cm2 electronic-cone, to probe for the equivalent dose of neutrons in the center during quality examination. After measuring the equivalent dose of neutrons, the equivalent dose of neutrons changed depending on the irradiated field and energy in 10-MV photon.

Results: The equivalent doses at 40×40 cm2 and 0.4×0.4 cm2 were 937 ± 34 and 212 ± 20 μSv per Gy X-ray, respectively. Using 12, 15, and 18 MeV electrons, the equivalent doses were 1.8 ± 1.1, 8.9 ± 2.8 and 16.3 ± 2.5 μSv per Gy-electron, respectively. When electron energy was below 9 MeV, the amount of neutron pollution was lower than its detection limit.

Conclusions: Neutron equivalent doses decreased as the irradiated field became smaller, and increased as the electron energy increased. The result of this study can be regarded as a reference for estimating neutron pollution for dose quality assurance.

Key words: Neutron dose, Neutron optically stimulated dosimeter, Linear accelerator

P173
Evaluation of Radiation Dose by Using Low-Dose Multislice Computed Tomography
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Purpose: Low-dose multislice computed tomography (LDCT) has been widely used in the early lung cancer screening. The aim of this study was to evaluate the radiation doses at various slice computed tomography (CT) system.

Materials & Methods: This study randomly selected 100 (aged 20-76 years) similar body mass index (BMI) subjects without pulmonary symptoms. All subjects were divided into two groups prior to performing LDCT. Two CT systems, dual source 128-slice (Definition Flash, Siemens Healthcare, Forchheim, Germany) and dual source 64-slice (Definition, Siemens Medical Solutions, Forchheim, Germany), were at the same exposure factors known as 1.2 kVp fixed tube voltage and automatic exposure control system of tube current. The difference of radiation dose was examined by using independent t-test analysis.

Results: There was the similar BMI of the subjects (24.1 ± 2.7 kg/m2 vs. 23.4 ± 2.8 kg/m2, p = 0.199). We observed that 128-slice had significantly lower CTDIVOL than 64-slice (1.30 ± 0.23 mGy vs. 1.90 ± 0.43 mGy, p<0.0001). Similarly there was significant lower effective dose at 128-slices than 64-slices (0.62 ± 0.1 mSv vs. 0.95 ± 0.23 mSv, p<0.0001).

Conclusions: Our study demonstrated that the higher CT slice number, the lower radiation dose. We suggested more slices CT would reduce radiation dose and maintain high image quality on early lung cancer screening.

Key words: Low-dose computed tomography, Lung cancer, radiation dose, Body mass index

P174
Assessment of Breast Dosimetry for Diffident Mammographic Units
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Purpose: In mammography, the average glandular dose (AGD) can be estimated using PMMA slabs of appropriate thickness that requires the same exposure parameters as the breast. The average equivalent PMMA thickness of breast of Taiwanese women was 40 mm which is less than that reported for American women (>40 mm). The aim of this study is to evaluate the AGDs using 40 and 45 mm PMMA slabs for diffident mammographic units.

Materials & Methods: In this study, 40mm and 45mm PMMA slabs were imaged at four mammographic units: Senograph 2000D (GE), Giotto Image 3DL (GIOTTO), Mammomat Novation DR (Siemens), and Mammomat Inspiration (Siemens). The incident air kerma (Kf ) was measured for each mammographic unit. The AGD were calculated using equivalent breasts of the same exposure parameters as the breast. The AGD values were calculated using PMMA slabs of appropriate thickness.

Results: Results from this study showed that the measured incident air kerma ranged from 0.03 to 0.14 mGy/mAs. The calculated AGD ranges were 0.94-1.22, 1.31-1.55, 1.72-2.57, and 1.61-1.27 mGy for the Senograph 2000D, Giotto Image 3DL, Mammomat Novation DR, and Mammomat Inspiration, respectively. For the same mammographic unit, calculated AGDs of the equivalent breasts for the 45-mm PMMA slab were higher than calculated AGDs of the equivalent breasts for the 40-mm PMMA slab. The AGDs obtained from the Mammomat Novation DR unit were higher than other units due to the target/filter combination of Mo/Mo was applied.

Conclusions: The calculated AGDs of the equivalent breast of Taiwanese female is significantly lower than the calculated AGDs of the equivalent breast of American female for the surveyed mammographic units. This information may be useful for AGD assessment in Taiwan using PMMA phantoms.

Key words: Mammographic units, Average glandular dose, PMMA phantoms

P175
Evaluation of Clinical Radiation Dose on Liver Tumor Scan by 64-MDCT
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Purpose : Since the computed tomography (CT) scan invention, it becomes the indispensable role in diagnostic radiology. However, it should be attention that the radiation dose of CT is several hundred times than that of plain X-ray.

Materials & Methods : Here we collected 80 patients with liver tumors and body mass index (BMI)<24kg/m². The participants were divided into waistline<80cm and>80cm groups and received 64-slice computed tomography (64-CT) inspection with automatic tube current modulation (ATCM). The volume computed tomography dose index (CTDIvol) of artery phase (A) and vein phase (V) and the image quality, i.e., the signal-to-noise ratio (SNR) and contrast noise ratio (CNR), to the liver and pancreas were recorded. SPSS17.0 was used to analyze the correlation and regression.

Results : For waistline>80cm, A SNRLiver and V CNRPancreas showed a positive and negative correlation with CTDIvol (0.011, 0.025<α = 0.05), respectively. The regression model lowered the maximal CTDIvol (12mGy) to the revised CTDIvol (9.45mGy) with the image score of 3.5. Tube current could be adjusted from 210mAs to 160mAs with the comparable image quality for achieving low dose scanning purpose.

Conclusions : With automatic tube current modulation, the tube current and the CTDIvol could be lowered for patients with liver tumors, waistline>80cm, and body mass index (BMI)<24kg/m² by 64-CT.

Key words : 64-slice computed tomography, Automatic tube current modulation (ATCM), Computed tomography dose index (CTDIvol), Liver, Pancreas, Waistline, Tube current (mA).

P176

Evaluation on the Possibility of Clinical Applications for the KERMA-based Radiation Dose Management System for Monitoring of Real-time Patient Dose
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Purpose : In recent clinical, Suitable image quality has been achieved using radiography even in poor conditions; radiation dose creep phenomenon that unnecessarily exposes patients to radiation has been continuously reported. Due to this global trend, there is an increasing need to study dose management systems that enable radiation exposure reduction and facilitate disease diagnosis. In the present study, the characteristics of the existing ionization-based system were compared to those of a kinetic energy released per unit mass (KERMA) based system. Furthermore, the feasibility of using the KERMA-based system for patient radiation dose management was verified.

Materials & Methods : In the present study, the characteristics of the existing ionization-based radiation dose management system and a KERMA-based system were compared. In addition, an ion chamber (XR-Sensor) was placed on top of the phantom to evaluate the ionization-based system; this setup was used to measure the absorption dose. To evaluate the KERMA-based system, a dose area product (DAP) meter was attached to the collimator to measure the dose area. The entrance skin dose (ESD) was utilized as an evaluation index to compare the calculation methods of two system mechanisms.

Results : These results indicate that ESD of DAP is relatively higher than ESD of ion chamber and that the discrepancy between the calculation methods increases as the radiation dose increases; Overall, the differences between the radiation doses measured by the two systems ranged from 2.7% to 20.8%, depending on the radiation condition variations.

Conclusions : The KERMA-based radiation dose management system could possibly overestimate patient radiation doses due to radiation condition changes. Therefore, if a correction factor describing the correlation between the systems is applied to resolve this issue, then a radiation dose management system can be developed that enables real-time patient radiation exposure measurement in addition to the acquisition of diagnostic images.

Key words : General radiographic imaging system, Management system, Patient exposure dose, Entrance Skin Dose, Kinetic Energy Released per unit MAss

P177

Comparison of radiation dose with Automatic Exposure Control based on the Noise Index according to various body weight in abdominal CT
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Purpose : The aim of this study is to compare radiation dose according to different weight in abdominal CT using Automatic Exposure Control (AEC) based on the Noise Index(NI).

Materials & Methods : From November 2015 to April 2016, Total 1500 patients which underwent abdominal CT using 64-MDCT (Light speed VCT XT), GE healthcare, Waukesha, USA were retrospectively analyzed. We divided these patients into 3 groups according to Noise Index(NI:10.5,12.8,14.8) and also classified as 5 groups according to different weights(group1:40~49.9 kg, group2:50~59.9kg, group3:60~69.9kg, group4:70~79.9kg, group5:80~89.9kg). The mean value of CT dose index (CTDIvol) were compared respectively.

Results : In group 1, according to NI variation(10.5, 12.8, 14.8) CTDIvol was 6.77 mGy, 3.90 mGy, 3.43 mGy and respectively the difference was 42.43 % between A and B, 12.10 % between B and C. In group 2, CTDIvol was 8.67 mGy, 5.90 mGy, 4.37 mGy and the difference was 31.98 % between A and B, 12.10 % between B and C. In group 3, CTDIvol was 12.52 mGy, 7.66 mGy, 6.55 mGy and the difference was 38.90 % and 14.38 % respectively. In group 4, CTDIvol was 13.80 mGy, 11.05 mGy, 9.08 mGy, and the difference was 19.92 % and 17.84 % respectively. In group 5, CTDIvol was 15.05 mGy, 13.85 mGy, 10.16 mGy, and the difference was 31.98 % and 25.94 % respectively.

Conclusions : The radiation dose significantly increase when selecting lower NI. In addition, there is little difference in radiation dose between NI12.8 and NI14.8. On the other hand, radiation dose significantly increase when selecting lower NI in patients over 70kg. Therefore, when we set NI between 12.8 and 14.8 in abdominal CT, we can acquire relatively high-quality images by choosing lower NI without sacrifice of radiation exposure in patients under 70kg.

Key words : Automatic Exposure Control, Noise Index, CTDIvol, Abdominal CT
ABSTRACTS

P178
The After-treatment Research for the Sensitivity Improvement of a-Se Sensor
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Purpose : This research enforced in order to solve a weak point from a-Se detector at the time of X-ray investigation about the actual condition where the detection efficiency and sensitivity decrease. After X-ray investigation at the time of a-Se film long time X-ray exposure which does bias the after-treatment stration company bitterly respectively in the Book of Psalms about recovery effect of the sensitivity which decreases to experiment, also temperature at the time of X-ray investigation sensitivity of a-Se semiconductor of Psalms measured in the Book of Psalms which heats especially.

Materials & Methods : In order to evaluate the efficiency of the sensor which is produced in order for this research enforced the measurement and a sensitivity measurement of leakage current. In order to measure a leakage current around the high voltage occurrence equipment to maintain in dark room situation (3033B, Protek) about under using with 500V/μm voltage at the time of authorization after Keane electro-meter (6517A, Keithley and USA) about under using measured a leakage current and a sensitivity to a-Se sample.

Results : When from this research at the time of sensitivity measurement of the case a-Se semiconductor material heat treatment heat treatment than, increased. When by the X-ray investigation which is continuous eliminates the photon which has become the enemy in a-Se semiconductor material of Psalms than about under using with high efficiency will be able to remove the photon which has become the enemy confirmed the white light of the fixed wavelength. Certainly be also caused by leakage current optical band gap averagely about 10% reduces confirms possibly must remove a leakage current.

Conclusions : The sensitivity by more than 40℃ heat treatment from a-Se sensor according to effect and ostensible form of thickness of the Book of Psalms which becomes heat treatment can show the considerable difference becomes feed the fact that.

Key words : A-se, Sensitivity, Lightning, Post processing, Dark current

P179
Scattered Radiation to the thyroid Gland and the Gonads by Incubator Acrylic Cover
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Purpose : In these examination, when scattered radiation generated Portable X-ray on the incubator acrylic cover was exposed to the surgeon, as well as degrade the quality of the image, there was a possibility to add to the radiation exposure. In this report, according to the Portable examinations incubator acrylic cover to investigate the differences in space scatter dose of thyroid and gonads.

Materials & Methods : The shooting conditions is 55kVp, 5mA, collimation range 8x10, SID between Tube and Cassette conducted a test to 70Cm. Incubator (Model: Giraffe Omnibed) along the acrylic cover to investigate whether the X-ray was measured 15 times the space of the gonads and thyroid doses. The experimental device is SHIMADZU CR Portable (Mobile Plus MUX-100H) and dosimeters (FH 40 F4, Eberline) completed the calibration were used

Results : Covered with an acrylic cover of incubator space, the average dose to the thyroid during the inspection 5.61mR/h, the gonad was measured in 5.44mR/h. Open the acrylic cover an average area of the thyroid dose during the inspection 3.82mR/h, the gonad was measured in 3.47mR/h. Close the cover acrylic thyroid dose of space was by checking over the area dose of 1.79mR/h, it can be seen through the gonads to increase the measurement 1.97mR/h.

Conclusions : To cover the acrylic cover in the incubator during the treatment to prevent infections caused by prematurity of the Cassette or equipment. As a result, the scatter dose of the thyroid gland and the gonads of the technican’s dose is increased. Thus, if a technician to check ourselves and determine the proper shielding on gonads and organs of premature babies it will be reduced a little bit of risk for stochastic effects on newborn.

Key words : Incubator, Scattered radiation, Radiation protection

P180
Cumulative Dose of the Working Area in Hybrid Room
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Purpose : Hybrid room is the growing trend surgical and medical treatment and surgery for collaboration In domestic as well as overseas. An operator, nurses, radiological technologists aims mainly to look out the cumulative dose of the working area in hybrid room.

Materials & Methods : All procedure were analyzed fluorotime, DAP, AK in Hybrid room From December 2015 to February 2016. When the procedure in hybrid room, work mainly in the areas operator, nurses, radiological technologists each location was covered with an acrylic cover of incubator space, the measurement 1.97mR/h. The Cumulative dose was 1.79mR/h, it can be seen through the gonads to increase the measurement 1.97mR/h.

Results : In 2 months a total of 210 cases of examination and treatment have been performed total fluorotime 189,172sec, total AK was 395,454mGy, total DAP was 19,470,359mGy/cm². Cardiac Resynchronization Therapy (CRT) the longest average AK has been measured to 3720.5 ± 1403.1sec. Coronary Angiography (CAG) the the most amount average AK has been measured to 2528.3±18974.0 mGy. Endovascular Aneurysm Repair(EVAR) the the most amount average DAP has been measured to 348471.5±344491.9 mGy/cm², The Cumulative dose was measured operator working area glass dosimeter attached was 24.54mSv, nurses 3.99mSv, radiological technologists 0.545mSv.

Conclusions : The most common cumulative dose operator and nurses, radiological technologists were order In hybrid room.

Key words : Hybrid room, Cumulative dose, Fluorotime, DAP, AK
P181
Evaluation of Radiation Dose for the Same Physical Condition in Abdomen & Pelvis CT
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Purpose: To investigate radiation dose for the patients with the same physical condition in the same CT scan and to find out the way to reduce the radiation on patients
Materials & Methods: Between October and December, 2015, 735 patients of 60 kg and 150~170cm who underwent abdomen & pelvis CT scans were enrolled in this study. By using CTDI and DLP values displayed on the CT scanners, radiation dose was investigated and compared. We set up a standard for data analysis by CTDI and DLP values of 50 male and 50 female patients with height of 160 cm and weight of 60 kg in abdomen & pelvis CT.
Results: Overall mean radiation dose, height, and weight were 528 mGy, 160.8 cm, and 60 kg, respectively. Radiation dose ranged from 391 mGy to 858 mGy, with mean dose of 497.9 mGy and 556 mGy in male and female patients, respectively. For the same physical condition (160 cm, 60 kg), mean radiation dose of overall, male, and female patients were 518 mGy, 492 mGy (range: 318 mGy~749 mGy), and 545 mGy (range: 391 mGy~858 mGy), respectively.
Conclusions: In spite of the same height and weight, radiation dose differs for each patient according to their sex and physical characteristics. High quality images can be acquired with lower radiation dose by adjusting the amount of radiation with consideration of not only patient’s weight and height, but also patient’s sex and physical characteristics.
Key words: Radiation Dose, Physical condition, DLP

P182
Evaluation of the Radiation Dose Using MDCT with Moving Tube Collimation
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Purpose: Over-scanning is essential in spiral mode of CT exam, but over-scanning cause unnecessary radiation dose upper & lower part beside scan range. Purpose of this study is to assess a method which can reduce this unnecessary radiation dose using moving tube collimation and to find a desirable utilization in clinics.
Materials & Methods: 64 MDCT & 128 MDCT with moving tube collimation and 16 MDCT without this item were used in study. All scanners were made by Siemens. To measure radiation dose, ion chamber is used. These experiments were carried out changing a beam collimation and pitch in same condition. Effectiveness of moving tube collimation was assessed with DLP values which were presented in monitor. All scanners were evaluated through the measured radiation dose involved in DLP value.
Results: Among the three scanners, the highest figure of the over-scanning dose is 38 mGy*cm using 1.5 beam collimation in 16 MDCT. When 1.2 beam collimation is adapted in both 64 MDCT and 128 MDCT, each figure is 10.8 ~ 11.6 mGy*cm which is the lowest value and 18.5 ~ 19.5 mGy*cm. regardless of a beam collimation and a pitch, the highest radiation dose was presented by dosimeter in whole scan range when using 64 MDCT.
Conclusions: We found way to prevent unnecessary radiation dose from over-scanning using moving tube collimation in this study. However, it is on the result from the functional presence or absence in a scanner with same detector width. In spite of using the moving tube collimation, the more detector size is increasing, the higher the overs-canning dose is. If you have a chance to use different CT scanners, it is important to understand the feature of the scanner and to select advantageous equipment in terms of radiation dose.
Key words: Moving tube collimation, Overs-canning Dose, Over-scanning

P183
Radiation Dose Reduction in CT with Tube Current Optimization of Pre-Contrast Enhancement for CT Brain Angiography Subtraction Technique
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Purpose: This study was to optimize tube current not to influence brain blood vessels while reducing radiation dose irradiated before contrast enhancement in computed tomography(CT) brain angiography subtraction technique(BAST).
Materials & Methods: We rendered 3D angiography with CT BAST by fixing tube voltage and performing tube current to 100 mAs, 70mAs, 50mAs and 30 mAs during the examination of pre-contrast enhancement. We verified a significant difference by measuring and comparing the average diameter of both Ant. and Post. cerebral artery and Basilar artery and carrying out paired t-test depending on changes in tube current by using exclusive 3D software. Also for radiation dose, weighted CTDI values depending on changes in tube current were measured by using CT dedicated ion chamber and head phantom with a diameter of 16cm
Results: There was no significant difference for the average diameter of Lt. Post. cerebral artery (from 100mAs to 70mAs, 50mAs, 30mAs; p=.265, .466 and .460), Rt. Post. cerebral artery (from 100mAs to 70mAs, 50mAs, 30mAs; p=.163, .132 and .773), Lt. Ant. cerebral artery (from 100mAs to 70mAs, 50mAs, 30mAs; p=.151, .814 and .766), Basilar artery (from 100mAs to 70mAs, 50mAs, 30mAs; p=.423, .234 and .320). In addition measured weighted CTDI values are 8.9mGy in 100mAs, 6.24 mGy in 70mAs, 4.71mGy in 50mAs, 2.63mGy in 30mAs and could be reduced up to 70.5%.
Conclusions: It was found that even if testing by reducing tube current of pre-contrast enhancement to 30 mAs during CT BAST, it does not affect 3D CT and this radiation reduction technology is expected to implement safer CT angiography for patients.
Key words: CT brain angiography, Subtraction technique, Tube current, Radiation reduction.
P184

Measurement of Environment Radiation and Research of Awareness
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Purpose : Measurement of environmental radiation and research of awareness according to the increase of concerns about the radiation of the nations.

Materials & Methods : We have utilized Personal Electronic Dosimeter from Tracerco, which enables the measurement of real-time radiation amount from 0.01μSv/hr to 100mSv/hr as the dosimeter. We have utilized our own school, Eulji University Seongnam Campus, the subway, and other facilities frequently used by the people as the place to measure radiation amount.

To research the knowledge and the awareness of the people regarding environmental radiation, survey was conducted for the Radiation major students. The statistic analysis was analyzed by using SPSS(PASW Statistics 18. Release 18.0.0).

Results : These are the results of the amount of environmental radiation according to the buildings. The average measurement value had been 0.14μSv/hr for the old buildings, and 0.15μSv/hr for the new buildings. These are the environmental radiation result according to the subway stations. The environmental radiation result according to the subway stations, Bupyeong Station showed the lowest value of 0.07 Sv/hr, and Central Park Station showed the highest value of 0.14 Sv/hr. The average amount of radiation had been 0.05μSv/hr, and the average value of the 6 stations when there is no subway train was 0.05μSv/hr, and the average value of the 6 stations had been 0.13 μSv/hr. Results of the 3 convenience facilities. The average amount of radiation had been 0.09μSv/hr. The results of research on knowledge and awareness regarding environmental radiation. The knowledge of radioactivity had the P value of 0.05 or lower.

Conclusions : The measured values of the environmental radiation revealed figure which is similar to average value of Seoul area. In addition, danger’s awareness of environmental radiation in the survey did not show significant differences depending on the grade. Therefore, the hazards of radiation in convenience stores and leisure facilities are low, but we feel that management and caution is needed always.

Key words : Environmental Radiation, Convenience facilities, Awareness, SPSS

P185

Analysis of Radiation Exposure and Cancer Risk of Patients during Therapeutic ERCP
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Purpose: Therapeutic endoscopic retrograde cholangiopancreatoscopy (ERCP) requires fluoroscopic and radiographic exposures, which impose radiation risks to patients. The aim of the study was to calculate radiation doses for patients and cancer risk for patients during procedures by department.

Materials & Methods: In this study, a total of 288 patients (Male: 182, female: 106), conducted using a ERCP system from January to March of 2016, were analyzed. A total of 288 patients were eligible, regardless of gender, with an average age of 61.2±13.4 (19-91) years. The procedures were performed in the radiology department using a fluoroscopy X-ray machine (multidetector ELEVA FD). In study, fluoroscopy time, DAP (Dose area product) values, effective dose and cancer risk by department were measured. DAP measurements can be used to estimate an effective dose (ED) and cancer risk to patients undergoing ERCP.

Results: Mean fluoroscopy time of all departments was 7.05±7.7 min (0.4-71.2 min). LTS (liver transplantation & hepatobiliary surgery) had the highest fluoroscopy time with 10.58±7.93 min, and HBP (hobatobiliary pancreatic surgery) had the lowest fluoroscopy time with 3.38±1.93 min (p<0.01). Mean DAP values of all departments was 8.40±7.77 mGy·cm². LTS had the highest DAP value with 11.96±9.03 mGy·cm², and HBP had the lowest DAP value with 4.15±2.73 mGy·cm² (p<0.01). Mean effective dose of all departments was 0.68±0.63 mSv. LTS had the highest effective dose with 0.97±0.73 mSv, and HBP had the lowest effective dose with 0.34±0.22 mSv (p<0.01). Mean cancer risk of all departments was 1.007±0.006 times, and LTS had the highest cancer risk with 1.01 times (p<0.01).

Conclusions: LTS had the highest cancer risk with 1.01 times but the risk is low in the approximate 1.0 times. Therapeutic ERCP procedure is beneficial to the patient, but may be necessary comprehensive management and efforts to reduce radiation dose.

Key words: DAP (Dose area product), ED effective dose, Radiation Dose, Cancer Risk, LTS (liver transplantation & hepatobiliary surgery), HBP (hepato-biliary pancreatic surgery)

P186

Comparative Analysis of Regional Soil Components and Radioactivity
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Purpose : This study investigated, by area and soil component, the specific radioactivity consequent to the soil composition of the surrounding spaces of daily life, such as schoolyards, parks, and green areas.

Materials & Methods : The whole country was divided into six areas and, from the soil of each area, comparative analyses were done based on the specific radiation concentrations of 40K, 137Cs, and 226Ra, and 13 basic soil components. Samples were extracted from 86 sites with high transient populations in the six areas. From 28 of these sites, to determine the correlation of natural decay series radon, the specific radiation concentration of the soil sample porous layer and the radiation concentration of 226Ra were compared with the soil components analysis, based on specific radiation analyses of 222Rn, 222Rn fast, and 226Ra, and 13 basic soil components. Samples were analyzed using XRF, and the specific radiation concentration of 40K, 137Cs, and 226Ra were compared with the soil components analysis, based on specific radiation analyses of 222Rn, 222Rn fast, and 220RnT nuclides.

Results : In order to distinguish the differences in radiation amount depending on soil components, sites containing similar soil components were clustered together, and distinct characteristics of clusters by area were determined through a hierarchical cluster analysis, based on the 13 soil components, by differentiating them into 13 clusters on the basis of average group distance using Euclidian distance. As a region with a high specific
radiation value for its soil, the Seoul metropolitan area has the distinct characteristics of Cluster 4 among the 13 clusters. The Jeju area, with a low specific radiation value, was determined to have the characteristics of Clusters 12 and 13. From these results, the Jeju area was found to have lower SiO₂, K₂O, and Cr₂O₃ levels, among the 13 soil components, compared to the Seoul area. 

Conclusions: It is also possible to use it, by quantifying the specific radiation contained by each component, as basic material for establishing the evaluation standards of internal radiation exposure effects and radiation environment effects, as well as for epidemiological surveys of radiation ecology.

Key words: Playgrounds, Environment radiation, 40K, 137Cs, 226Ra, 222Rn, Soil components

P187

The Effect of Vertical Off-Centering in CT Simulation of Accelerated Partial Breast Patients

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Purpose: To demonstrate how vertical off-centering during CT simulation of patients receiving accelerated partial breast irradiation may influence patient breast dose.

Materials & Methods: An adult anthropomorphic phantom was utilized with thermoluminescent dosimeters (TLD’s) that were placed and exposed in various locations and depths in phantom breast tissue. Exposures were compared to the optimal mid-line exposure.

Results: Eighty-Five TLD’s were analyzed. When compared to setting CT isocenter midline, lowering the CT scanner table increased TLD exposure 1-23%. Conversely, raising the table decreased TLD exposure 1-17%.

Conclusions: Conclusion Keeping in mind that breast tissue is sensitive, care should be given to positioning accelerated partial breast patients in the center of the CT bore. Lowering the CT table has the potential to increase breast dose: whereas raising the table has the potential to exclude the area of interest. Accelerated partial breast patients often enjoy long disease free survival. Care should be taken in radiation oncology to minimize the patient’s lifetime dose. Limiting CT simulation procedures in favor of non-ionizing imaging studies (i.e. ultrasound) and utilizing proper CT optimization has the potential to reduce radiation dose to breast tissue.

Key words: CT simulation, Breast, Dose, Centering, Optimization

P188

Dosimetric Comparison of the AAA and PBC Algorithm in Breast Cancer Treatment Planning using the 3D Field-in Field Technique.

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Purpose: This study aimed to investigate whether the same level of dosimetric plan quality was attainable using the AAA compared to PBC for breast cancer radiation treatment planning using 3D field in field technique.

Materials & Methods: Treatment plans of five breast cancer patients planned with identical beam angles were computed by both AAA and PBC algorithms in Eclipse version 8.9.08 Treatment Planning system. First, initial dose calculation of the optimized plans was performed by AAA. The AAA plans were then normalized such that 90% of the prescribed dose covers the 100% of the PTV (V90=100%), and monitor units (MUs) from the normalized AAA plans were recorded. Second, the PBC plans were calculated using the identical beam setup and same number of MUs as in the normalized AAA plans. The dose calculation grid was set to 0.25cm for all cases. The prescribed total dose was 40Gy, 267 Gy per fraction, 15 fractions. Dose distribution was displayed in colour wash and the tangential beam angles used was 305 and 128 degrees.

Results: The DVH analysis demonstrated that almost the same target coverage can be achieved by both AAA and PBC plans, except in superior area. Nevertheless, lack of coverage in the superior area of the breast or chest-wall found in the AAA plan was due to lack of scatter contribution from the contralateral breast, which is taken into account more accurately by AAA than PBC. The dose distribution also showed differences in various areas, the mean dose both to the heart and opposite breast was lower in the AAA plan than the PBC.

Conclusions: Comparing AAA with the PBC, although the same PTV coverage could be reached by both algorithms, AAA was found to be more accurate and faster in dose calculation. However, the lung volume receiving low dose is larger with AAA dose calculations.

Key words: Breast cancer, Anisotropic analytical algorithm, Pencil beam algorithm, Dose volume histogram

P189

The Use of Educational Video Prior to Radiation Therapy Planning Procedure to Improve Patient Knowledge and Satisfaction: A Randomized Controlled Study

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Purpose: Although radiation therapy (RT) is a non-invasive and painless form of cancer therapy, patients often experience anxiety before their first planning session. They also have many queries about the procedure. Conventionally, educational intervention is consisted of consultation with a radiation therapist. Currently, videos are often incorporated in education intervention because it is able to give patients a visual impression. The aim of this study was to assess the effects of educational video on patient knowledge regarding the planning procedure, anxiety level and satisfaction.

Materials & Methods: This study was a patient-blinded, randomized controlled study involving 106 consecutive patients underwent RT planning procedure. Patients were randomized on a weekly basis to either a control group (N=50) or a video group (N=56). The control group had a therapist-led educational intervention as standard care. The video group viewed a three-minute video on RT planning procedure before the educational intervention. After the planning procedure, both groups completed a questionnaire assessing their knowledge of the procedure, anxiety level and satisfaction. Education levels of both groups and individual intervention time were also recorded for comparison.

Results: Patients in the video group had higher test scores...
of the knowledge questions than the control group (P=0.01). Higher percentage of patients in video group demonstrated agreement that the video was informative and useful although there was no statistical significant difference obtained. Anxiety levels before and after the intervention were similar for both groups. There was no correlation between test score and education levels, as well as test score and intervention time in both groups. A weak negative correlation was found between education level and briefing time in control group.

Conclusions: Educational video can significantly improve patients’ knowledge and should be included prior to RT planning procedure.

P190
Lung SBRT with 4D CBCT Imaging - an NCIS Experience
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Purpose: To describe our experience with treating lung cancer patients using stereotactic body radiation therapy (SBRT) with four-dimensional cone-beam computed tomography (4D CBCT) as image-guided radiation therapy (IGRT).

Materials & Methods: Our centre has started the use of 4D CBCT technology to aid in the treatment of our SBRT lung cancer patients since 2014. We will describe the processes involved in the treatment. Firstly, simulation and immobilisation techniques involving patient selection, equipment used to immobilise patient and scan protocol would be elaborated upon. Next, treatment planning strategies involving delineation and purposes of planning target volume (PTV), internal target volume (ITV) and planning algorithm used would be described. Lastly, 4D CBCT acquisition processes and imaging protocol used for the treatment and delivery of treatment using volumetric modulated radiation therapy (VMAT) would be explained. Specific details regarding workflow, personnel and multi-disciplinary responsibilities to ensure a smooth process and implementation of 4D CBCT would also be provided.

Results: 37 lung SBRT cases are treated between 2014 till April 2016 using 4D CBCT guided treatment with a total of 315 4D CBCT scans acquired. All 4D CBCT scans are reviewed online by both radiation therapist (RT) and radiation oncologist (RO).

Conclusions: 4D CBCT shows the real-time motion of the lung tumour before treatment. It provides a better comparison of the target movement with the ITV intended by the RO compared to 3D CBCT. RO’s involvement in online review of 4D CBCT for lung SBRT patients helps to ensure accuracy in treatment delivery.

Key words: Lung SBRT, 4D CBCT, Imaging

P191
The Use of Spacers in the Optimization of Rectal Dose during Prostate Cancer Irradiation
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Purpose: Dose-escalation during radiation therapy of the prostate improves disease control. However, this concept of dose escalation brings to the fore issues with rectal toxicity because of the direct proximity of the rectum to the prostate. The aim of this study is to review the use of spacers in the optimization of rectal dose during prostate irradiation.

Materials & Methods: First and foremost, this study reviews the literature on the use of spacers. Secondly, it also reviews its role together with strict optimization objectives during treatment planning, all aimed at reducing rectal toxicity. Thirdly, this study throws more light on the importance of spacers, the different types available, the procedure itself and whether there are severe side effects associated with it or not.

Results: Rectal toxicity is a significant problem when delivering high dose to the prostate. Severe complications from the use of spacers are not common. The use of spacers are a good method of completely separating the rectum from the prostate during radiotherapy, thereby resulting in rectal dose being reduced. There is also no detrimental impact on health-related quality of life.

Conclusions: Due to the high dose delivered to the prostate during dose escalation, it is important that the radiation is delivered only where it is intended to be. The combined effect of the distance created by the spacers together with strict optimization objectives, resulted in reduced dose to the rectum. This study also provides insights and ideas for all radiotherapy centres especially in Africa which are attempting to improve the practice of dose escalation in their units.

Key words: Spacers, Optimization, Rectal toxicity, Dose escalation, irradiation.

P192
Simplification Patient-Specific IMRT QA Procedures from Point Dose with Prostate Cancer.
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Purpose: As a method of IMRT QA (intensity modulated radiotherapy quality assurance), water absorption dose assessment and by the ionization chamber dosimeter, film and dose distribution verification using a two-dimensional or three-dimensional detector is the most popular method of verification. In this study, statistical analysis of the dose verification results for the purpose of simplification and omission of IMRT QA for prostate IMRT, were examined.

Materials & Methods: Radiation therapy device Vero4DRT (MHI) using has implemented prostate IMRT at a fixed 7 gate by step and shoot. The water absorbed dose assessment used the ionization chamber dosimeter PTW 31010 (0.125cc, PTW) and water equivalent cylindrical phantom (Taisei medical). Tolerance (all gate<3%, each gate<5%) and, to target the 89 cases, calculated each gate and all gate, the proportion of the Pass. Evaluation point is IC and any Point X, Point Y. Analysis method was evaluated by using the Box Plot and Histogram.

Results: Water absorbed dose evaluation of all port 89 cases evaluation point IC, Point X, Point Y. Analysis method was evaluated by using the Box Plot and Histogram.

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Results: Rectal toxicity is a significant problem when delivering high dose to the prostate. Severe complications from the use of spacers are not common. The use of spacers are a good method of completely separating the rectum from the prostate during radiotherapy, thereby resulting in rectal dose being reduced. There is also no detrimental impact on health-related quality of life.

Conclusions: Due to the high dose delivered to the prostate during dose escalation, it is important that the radiation is delivered only where it is intended to be. The combined effect of the distance created by the spacers together with strict optimization objectives, resulted in reduced dose to the rectum. This study also provides insights and ideas for all radiotherapy centres especially in Africa which are attempting to improve the practice of dose escalation in their units.

Key words: Spacers, Optimization, Rectal toxicity, Dose escalation, irradiation.
difference from the calculated value in the IC evaluation point of all gates in the 89 cases was 0.798 ± 0.468%.
Conclusions: It is difficult to omit the absolute dose measurement at this stage from the present results. However, a case where the difference from the calculated value in the IC evaluation point does not exceed 0.798 ± 0.918% (2SD), we consider in that case can be simplified to perform only the IC measurement.
Key words: IMRT QA, Vero4DRT, Prostate Cancer

P193
A Quality Assurance Program for the kV and MV Imager of Image-Guided Radiation Therapy System
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Purpose: Image-guided radiotherapy (IGRT) system attached on linac is widely applied in radiation therapy to manage tumor position and variations. Hence, accuracy of IGRT system is essential to ensure patient safety and patient treatment fidelity. The objectives of this study were to establish an IGRT quality assurance program to ensure that the imaging systems, including both of hardware and software, safety and functionality, geometric accuracy and image quality can perform as accepted and commissioned.
Materials & Methods: The IGRT quality assurance procedures and tolerances of linac system were designed according to AAPM TG-142 and TG-179 reports. The imaging systems of 2D kV/kV, 2D MV/MV, and 3D kV cone-beam CT (CBCT) are included in this study. The daily quality assurance includes collision interlocks, imaging and treatment isocenter coincidence. The monthly quality assurance includes imaging and treatment coordinate coincidence for cardinal angles, geometric accuracy, image orientation accuracy and couch shifting accuracy. Tests of image quality of low and high contrast resolution, uniformity and noise, and CT number accuracy are included in annual quality assurance. Phantoms such as Penta-Guide phantom, TOR 18FG, Las Vegas and Catphan are used in this study. The daily quality assurance includes collision interlocks, imaging and treatment isocenter coincidence. The monthly quality assurance includes imaging and treatment coordinate coincidence for cardinal angles, geometric accuracy, image orientation accuracy and couch shifting accuracy. Tests of image quality of low and high contrast resolution, uniformity and noise, and CT number accuracy are included in annual quality assurance.
Results: The results of imaging and treatment isocenter coincidence showed less than 1 mm differences for cardinal gantry angles. The accuracy of geometric size and couch shifting could be less than 1 mm. Image orientation accuracy was within 0.5 degrees. Tests of low and high contrast resolution demonstrated image quality of those images were acceptable. Uniformity and CT number accuracy of CBCT could be within ±20 HU and ±30 HU, respectively.
Conclusions: A quality assurance program of image-guidance systems has been established, with focus on geometry, image quality, system operation, and safety. System performance baselines of image quality in this program were obtained. Based on the results, Varian linac with image-guidance system has a well performance in IGRT.
Key words: IGRT, Quality assurance

P194
Respiratory Motion Impact on Liver Tumor Target Volume Definition in Different Liver Segments in Radiation Therapy

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Purpose: The purpose of this study was to explore the liver tumor movement depending on the patient’s respiratory and liver segment, in which the tumor is located. This objective was put to task to compare the liver tumor target volume, obtained by CT and MRI, and determine the tumor position changes depending on liver segment.
Materials & Methods: Free breathing Four-dimensional CT (4DCT) based planning and pre-treatment MRI were performed for 35 patients with 44 malignant lesions. The Clinical Target Volume (CTV), and the Internal Target Volume (ITV) were contoured on the basis of the MRI co-registered with Maximum Intensity Projection (MIP) CT study. It was determined in tumor volume increase due to respiratory movement and position changes in the amplitude differences of liver segments and hilus of the liver.
Results: Each segment of the existing CTV deflection amplitude average value of L, AP; C: directions on MRI: 1S - 9, 6; 10, 4; 8, 9mm, 25 - 15, 6; 11, 6; 1, 3mm, 3S - 9, 6; 10, 2; 9, 3mm, 4S - 13, 6; 10, 9; 5, 0mm, 5S - 6, 5; 8, 1; 10, 8mm, 6S - 6; 8, 9; 10, 9mm; 75 - 8, 1; 8, 3; 11, 8mm, 8S - 9; 4; 11, 0; 10, 6mm, hilus of the liver 17, 4; 11, 4; 22, 2mm. CTV/ITV average value: 1S - 3.7/13.6cm³, 2S-10, 5/30, 8cm³, 3S - 5, 9/22, 8cm³, 4S - 6, 3/29, 3cm³, 5S - 12, 2/27/2cm³, 6S - 6, 8/16, 8cm³, 7S-9, 3/19, 9cm³, 8S - 6, 4/55, 2cm³, hilus of the liver - 4, 8/28, 6cm³. The mean reduction of CTV and ITV volumes, achieved by use of MRI, was 25%.
Conclusions: It is very important to define precisely the ITV before radiation therapy, which includes all liver tumor position changes during breathing.

P195
An Insight into Prone Breast Irradiation at Queen Elizabeth Hospital, Hong Kong
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Purpose: To share our experience on prone breast irradiation at Queen Elizabeth Hospital, Hong Kong. It has been noted that patients with large pendulous breast often lead to increased lung dose which may be clinically unacceptable. Therefore, we have initiated the use of prone breast board as an alternative to conventional treatment in the supine position. We compared the mean lung and heart doses between supine and prone position of early breast cancer patients undergoing postoperative whole breast irradiation.
Materials & Methods: Since 2014, we have treated 12 breast cancer patients using the prone breast board (CIVCO Horizon). Our selection criteria include large pendulous breast that do not require regional node treatment and for patients with a lateral breast fold that extends more than half of the mid-axillary line when lying supine. We compared the mean lung V20 dose and heart V15 dose between both supine and prone breast treatment plans.
Results: In our study, we were able to compare 10 patients (9 Left
Breast, 1 Right Breast) who have had an initial supine planning CT, but was later changed to prone position after assessing the lung volume irradiated. With our standard prescription of 42.56 Gy in 16 fractions, the mean lung V20 dose was 20.08% and 3.05% for supine and prone breast respectively. A significant difference was established in comparing lung doses using paired sample T-test (p=0.001). For left breast cases, the mean heart dose V15 was 5.81% and 5.36% for supine and prone breast respectively showing an insignificant difference (p=0.829).

Conclusions: In this study, prone breast irradiation has led to a decrease in mean lung dose compared to supine position in women with pendulous breast. However, the difference in the heart dose between supine and prone position remain insignificant. Prone breast irradiation seems to be more advantageous for reducing lung dose more than heart dose.

Key words: Prone Breast Irradiation, Breast Cancer, Pendulous breast

P196 Determination of The Boost Volume Margin With The Impact on Tumor Bed Location and Breast Thickness in Adjuvant Breast Radiotherapy Using Image-Guided System

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Purpose: To investigate the position uncertainty of tumor bed in simultaneously integrated boost (SIB) breast treatments.

Materials & Methods: Forty-nine early-stage (T1-2, N0) breast cancer patients received adjuvant SIB breast treatments were enrolled in this study. The prescribed dose to tumor bed and whole breast were 58.8 and 50.4 Gy in 28 fractions, respectively. Tumor bed was defined by seroma and the adjacent surgical clips. Pretreatment orthogonal kV images were acquired. The treatment position was guided by image registration based on the alignment of bony landmarks around the whole breast. The 3D set-up errors for tumor bed were derived. A total of 1409 registration records were analyzed, standard deviations (SDs) of the random (σ), systemic (Σ) were calculated in directions of left-right [Lat], cranial-caudal [Lng] and anterior-posterior [Vrt]. Planning margins of tumor bed account for position uncertainty of the random (σ), systemic (Σ) were calculated in directions of Vrt, Lng, Lat should be added respectively.

Results: The planning margins (cm) in directions of Vrt, Lng, Lat, and for different locations and breast thicknesses were 0.58, 0.90, 0.85, 0.77 (UI); 0.73, 1.03, 0.56 (LO); 0.47, 1.07, 0.83 (II); 0.56, 1.28, 0.67 (<2cm); 0.70, 1.05, 0.98 (>2cm) and 0.48, 0.90, 0.66 (<3cm), respectively.

Conclusions: In order to have adequate dose coverage to tumor bed in SIB treatment, margins of about 8, 10 and 9 mm in directions of Vrt, Lng and Lat should be added respectively. Patient with smaller breast (thickness<3cm) could reduce the margin accordingly.

Key words: Breast cancer, Fiducial, IGRT, Simultaneously integrated boost irradiation, Planning margin.

P197 Radiation Therapy in Trinidad and Tobago within the CARICOM Region

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Purpose: To highlight Radiation Therapy development in Trinidad and Tobago over the last 10 years. In addition to our CARICOM member states Our continued growth in the CARICOM region in the field of Radiation therapy.

Materials & Methods: IAEA- Setting Up Radiation Therapy Programme Data acquired through pictures, population size and staffing from CARICOM member states.

Results: Using the IAEA guidelines and comparing it to what we have in the region Our future goals On our way to being centres of excellence.

Conclusions: Obtaining the necessary accreditations of Diamond Standard are Centre of Excellence for which our Ministry of Health has been gathering information from the public centre.

P198 Laterality Incidence of Breast Cancer Patients At The Oncology Department of Komfo Anokye Teaching Hospital, Ghana.

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Purpose: To determine the incidence of Breast Cancer laterality among Breast Cancer Patients at the Oncology Department of the Komfo Anokye Teaching Hospital, Ghana.

Materials & Methods: Breast Cancer laterality was studied retrospectively in relation to demographic factors, Staging, Parity and Medical History of Breast Cancer Patients. 269 breast cancer cases were identified and data analysed in relation to laterality.

Results: The overall age range was 26-90. The incidence of left breast cancer occurrence was more (N=135: 50.4%) compared to Right breast (N= 133: 49.6%). Stage III cancers were significantly high (N=142: 53%) and Stage IV, the metastatic stage was (N=63: 23.5%). Lt Breast recorded more stage III disease (N=77: 57%) than that Right breast (N=65: 48.9%). The early stage breast cancer in the overall analyses was less than 10%. Medical history of hypertension and diabetic status was more in the Left sided breast (N=27: 20%) than Right sided (N=16: 16%).

Conclusions: Postmenopausal had somewhat higher incidence or relation with left breast than right breast. Hence left breast occurrence is more than right breast. Late stage diseases are higher.

Key words: Breast, Cancer, Laterality, Incidence, Stage

P199 Investigation of the Geometric Distortions in MRI Images, and the Effects of the Distorted MRI Images on Dose Distribution

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P200

Effects of Neural Regeneration in a Nerve Conduit across a Large Gap of the Transected Sciatic Nerve in Rats with a Light-Emitting Diode Phototherapy

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Purpose: This paper proposes a novel biodegradable nerve conduit made using genipin-cross-linked chitosan and carbon nanotubes (GCC, nerve guide conduit). The aim of this study was to evaluate the influence of 640 nm wavelength light-emitting diode phototherapy using on the neurorehabilitation of transected sciatic nerves after bridging the GCC nerve guide conduit in rats.

Materials & Methods: The proposed GCC nerve guide conduit has a cylindrical shape, dark blue in color, the interior of the nerve bridge was hollow to aid in guiding damaged nerve fiber growth.

The rats were divided into three groups: a sham-irradiated group (GCC/Sham group); an experimental group undergoing light-emitting diode (LED) phototherapy (GCC/LED group); a control group undergoing autologous nerve grafts (AUTO group). Each group consisted of six rats for a total of 18 rats.

Results: Twelve weeks after implantation, the mean SFI (sciatic functional index) of the GCC/LED group was higher than the mean SFI of the GCC/Sham in each period after surgery. Compared with the GCC/Sham group, the GCC/LED group and AUTO group exhibited a significant reduction in muscle atrophy (P<0.05). The histomorphological assessments revealed that the GCC/LED group had undergone more rapid nerve regeneration than the GCC/Sham group.

Conclusions: This study investigated the effectiveness of different modes of LED phototherapy on the repair of damaged sciatic nerves. The motor function, muscular reinnervation, and histomorphometric assessments demonstrate that LED phototherapy can accelerate the repair of a transected peripheral nerve in rats after being bridged with GCC conduit.

Key words: Light-emitting diode (LED) phototherapy, Peripheral nerve repair, Sciatic nerve, Nerve conduit

P201

The Clinical Experience of Using Respiration Control with Different Methods

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Purpose: Intrafraction motion is an issue that is becoming increasingly important in the era of image-guided radiotherapy. The need for normal tissue sparing is of increasing importance because of the growing use of concomitant chemotherapy. There is evidence that technologies that allow an increased dose to the tumor while sparing normal tissue will improve the balance between complications and cure. Methods that account for respiratory motion in radiation oncology comprise one such technology class. Methods that we use in the management of respiratory motion include real-time tumor-tracking method with Synchrony Respiratory Tracking System integrated with the CyberKnife robotic linear accelerator, active-breathing control (ABC) method, and respiratory gating method with Varian Real-Time Position Management (RPM) system. We present our clinical experience of using respiration control with these three methods.

Materials & Methods: We treated 244 patients with real-time tumor tracking method with Synchrony Respiratory Tracking System since November 2009. We treated 128 patients with ABC method and 38 patients with respiratory gating method with RPM system since November 2010.

Results: Patients having irregular breathing are not good candidates for real-time tumor-tracking method with Synchrony Respiratory Tracking System or respiratory gating method with RPM system. Patients having shallow breathing are not good candidates for ABC method.

Conclusions: Stereotactic body radiation therapy is being increasingly used in our department and usually combined with one of these three methods. It is important to select an appropriate method for patients. Although it takes time to use these methods, we still frequently use them to get high quality treatment. Long-term follow-up is needed to determine the clinical outcomes of patients using these methods.
Key words: Synchrony, CyberKnife, Active-breathing control, Real-time position management

P202
The Cross-strait Cooperation of Radiation Oncology: Report of a Successful Case
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Purpose: The purpose of this paper is to share the experience of a cross-strait cooperation of radiotherapy specialty, between a hospital in Mainland China, and a hospital in Taiwan. Chen-zhou No.1 People’s Hospital, Hunan, China and Yee-Ren Hospital in Taiwan signed a cooperation agreement in 2014. The experience is reported.

Materials & Methods: The cooperation was initiated in June 2014. A team was sent to the center in Hunan. These included personnel training in Taiwan, design of department management, procurement of equipment, department promotion, department culture development and introduction of medical humanities, development of a SOP of radiotherapy treatment procedure, standardization of target delineation, setting up radiotherapy subspecialty, evidence based practice of ra-diotherapy, 75 management of department, and professional lectures including radiation biology and physics.

Results: In the early 2016, patients waiting time has been reduced to seven days compared to twenty days or more before cooperation. Radiotherapy was performed based on medical evidence, and an OPD system has also been established. The standardization of target delineation, weekly international journals reading, department 75 management and medical humanism spirit sharing were set up after cooperation. All radiation oncology trainees passed the state qualifications examination. The staff satisfaction is high, and revenue has doubled.

Conclusions: The cooperation has resulted in many positive changes. This model may be used for international healthcare cooperation elsewhere.

Key words: International Health Cooperation, Radiation oncology

P203
Skin Surface Dose Evaluation for Breast Cancer Patients after Intensity Modulated Radiation Therapy and Volume Modulated Radiation Therapy
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Purpose: The aim of this study was adopted a spherical polystyrene phantom to simulate breast cancer patients, and evaluate the skin surface dose after intensity modulated radiation therapy (IMRT) and volume modulated arc therapy (VMAT).

Materials & Methods: A spherical polystyrene phantom was adopted to simulate: computed tomography (CT) images in different CT slice thicknesses (1.25, 2.5, 3.75, 5 mm); six shrinkage margins of planned target volumes (PTV0, PTV1, …, PTV5) (total 0-5 mm, 1 mm/step); and the best calculations of PTVs between IMRT and VMAT radiotherapies in order to evaluate the differences of coverage and surface doses. The results of spherical polystyrene phantom simulation were applied to 10 patients with right breast cancers. A dual - arc VMAT (Full SmartArc (FSA) or Partial SmartArc (PSA), 2° or 4°/arc, y arcs calculated based on every x° spacing, i.e. FSAy - x° or PSAy - x° in VMAT) using computerized therapeutic system Pinnacle3® SmartArc (SA) and six-field IMRT (coplanar-fixed angles design: 24°, 260°, 280°, 20°, 40°, 60°), total 8 different treatment planning systems were used in this study. Parameters for the comparisons between the advantages and disadvantages of IMRT and VMAT systems included tumor coverage, conformity index (CI), homogeneity index (HI), and skin surface dose.

Results: If we used PTV5 as an experimental model, the best CI of PSA2 - 2° and PSA2 - 4° were 1.34 and 1.33, and the best HI were 1.06 and 1.06 respectively. In addition, the treatment planning system between radiotherapies in the high dose area (above V40) was IMRT>SA₂>SA₁.

Conclusions: This study showed that 5 mm superficial shrinkage of PTV in spherical polystyrene phantom simulation could achieve 95% of PTV coverage as standard requirement and effectively reduce the surface dose of skin.

Key words: Skin surface dose, Intensity modulated radiation therapy (IMRT), Volume modulated arc therapy (VMAT)

P204
Aggressive Skin Care by Combined Efforts of Oncological Nurse and Radiological Technologist: Decreasing Severe Radiation Dermatitis in Head and Neck Cancer Patients
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Purpose: Acute radiation dermatitis, resulting in erythema, desquamation, and potential ulceration, is painful for irradiating head and neck cancer patients. Skin care and nursing education are essential procedures in radiotherapy, especially in managing head and neck cancer patients. However, for conducting a better care, combined efforts of radiological technologist, oncological nurse, and radiation oncologist are required. This study intended to decrease severe skin reactions by using aggressive during-radiotherapy multidisciplinary intervention.

Materials & Methods: Between Sep. 2012 and Jan. 2013, we retrospectively collected 37 non-metastatic head and neck cancer patients treated with curative radiotherapy in conjunction with surgery and/or chemotherapy. Of these, 6% patients had severe skin reactions during their radiotherapy course. Although the majority of skin reactions tend to subside after a few weeks, some can be prolonged, uncomfortable and distressing, thereby affecting a patient’s quality of life. Thus, after detail discussion in our head and neck cancer board, we decided to decrease the severe skin reactions rate by using PDCA quality-improving methods. Therefore, our Planning
and Doing were as follows: 1) increase in during-radiotherapy multidisciplinary intervention (including efforts from radiological technologist and oncology nurse) in addition to prior only one session of pre-irradiation nursing education, 2) aggressive nursing education for home care, and, 3) aggressive symptoms care including in-patient management, if indicated. The skin toxicities were graded by using CTCAE 3.0 and recorded by radiation oncologists at their weekly O&P follow-up.

Results: After our Planning and Doing, we preliminarily observed that average severe radiation dermatitis was decreased from 6% (between Sep. 2012 and Jan. 2013) down to 4% (between Feb. 2013 and Dec. 2013, P > 0.05). Thus, we kept our improving methods. Finally, we gained a statistically significant improvement in the maintaining period - from 6% (between Sep. 2012 and Jan. 2013) down to 1% (between Jan. 2014 and Oct. 2014).

Key words: Radiotherapy, Radiation dermatitis, Skin care

P205
Effects of Treatment Aids (Yoga Pad) during Radiotherapy in Patients with Severe Cancer Pain: a Patient-center Pilot Study
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Purpose: Pain-induced comfortless may lead the patient to move slightly on the table. This may impair Radiotherapy (RT) precision, resulting in unnecessary treatment toxicities. Thus, using suitable treatment aids to fix these patients by a more comfortable way is helpful. However, using treatment aids (i.e., a soft pad between patient and table) might also impair treatment precision.

Materials & Methods: From 2014/02 to 2015/01, we prospectively allocated eight cancer patients who had severe cancer pain while lying down. The eight patients were prospectively treated with trunk RT with a treatment aid of yoga pad (the experiment group). For historical comparison, from 2013/01 to 2013/12, we identified 13 patients who had similar conditions into the conventional-treatment group; these patients were also treated with trunk RT but without a use of yoga pad. Institute review board (IRB) approved the study before study initiation. Inform concerns were signed as the IRB requirement.

Results: When compared treatment precision by using OBI data, mean setup errors in three axes showed no statistical difference between the yoga and conventional-treatment groups: vertical, 0.45 vs. 0.41 cm, P = 0.69; longitudinal, 0.34 vs. 0.38 cm, P = 0.61; and lateral, 0.35 vs. 0.29 cm, P = 0.18. However, patients with an aid of yoga pad did show a slightly larger error in rotation: 1° vs. 0.36°, P = 0.0004.

Conclusions: For patients with severe cancer pain, our data demonstrated that a use of yoga pad is able to provide adequate patient comfort and also keep an acceptable treatment precision, shedding a light for providing patient-center care. Further case allocation is required and ongoing.

Key words: Radiotherapy, Patient-center care, Yoga pad, Cancer pain, Treatment precision

P206
A study on Variation of Intrafraction in Stereotactic Body Radiation Therapy for Spine Metastasis
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Purpose: Uncertainty of tumor position could deteriorate the precision of radiation therapy. The objective of this study was to figure out variation of intrafraction in stereotactic body radiation therapy for spine metastasis by using the image guidance system which is able to correct movements of patients during the treatment.

Materials & Methods: The X-ray images were acquired during treatments from spine metastasis patients (n=57) who had stereotactic body radiation therapy. 8, 26, and 23 of them were treated for cervical spine, thoracic spine, and lumbar spine, respectively. 413, 1,068, and 994 X-ray images were acquired from cervical spine, thoracic spine, and lumbar spine, respectively. When these images were acquired, the extent of intrafraction was recorded. It was expressed as three translational directions (L/R, S/I, A/P) and three rotational directions (roll, pitch, yaw). To evaluate these records comprehensively, root sum square (RSS) of three translational directions and three rotational directions were calculated, respectively. From the start of treatment to 35 minutes after the treatment begins, the trend of these values were analyzed in each section which was divided into every 5 minutes.

Results: In case of cervical spine, there is sudden increase of variation in 15 minutes after the treatment starts in rotational direction. In case of thoracic spine, there is no significantly variable section. However, variation increases gradually with the passage of time. In case of lumbar spine, sharp increase of variation is seen in 20 minutes in translational direction.

Conclusions: This study shows that variation of intrafraction of cervical spine, and lumbar spine increased sharply in 15, and 20 minutes after the treatment starts, respectively. To reduce the effects of uncertainty from intrafraction, treatment time should be less than these durations, especially in some devices which are not able to correct intrafraction during the treatment.

Key words: Spine metastasis, Stereotactic body radiation therapy, CyberKnife, Intrafraction

P207
Comparison of Image Quality for Electronic Portal Imaging Devices (EPID) in Radiation Therapy
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Purpose: Digital radiography (DR) is a common worldwide technology and has gained popularity in megavoltage X-ray imaging (MVI). The purpose of this study was to comparison of modulation transfer function (MTF), the noise power spectrum (NPS), and the detective quantum efficiency (DQE) in megavoltage X-ray imaging (MVI).

Materials & Methods: We used an edge block, which consists of tungsten and measured the pre-sampling MTF at 6 MV
Proton Therapy, 3D-CRT, Prostate, Rectal balloon, Sun Young KIM, Myonggeun YOON

Contrast media, 3D CRT (3D conformal radiation & Neck and Prostate Cancer

P209
Rectal dose

rectal balloon is very useful for bladder and rectal sparing for
Conclusions :

mean dose reduction.

is less significant comparative to rectum revealing about 6%

dose reduction in bladder due to the balloon insertion

20 % after the insertion of the water filled balloon. This result

Results :

target volume was changed due to the insertion of the balloon

Parotid 3.4%, SMG 4.2%, tongue 1.1%, spinal cord 0.3%,

Compensation : Radiation therapy (RT) devices such as TrueBeamTM

energy. Radiation therapy (RT) devices such as TrueBeamTM (Varian), BEAMVIEWPLUS (Siemens), iViewGT (Elekta) and Clinac® IX (Varian) were used.

Results : As for MTF results, the MTF (1 mm-1), for Varian TrueBeamTM FFF, Varian TrueBeamTM flattening filter, Siemens BEAMVIEWPLUS, Elekta iViewGT, and Varian Clinac® IX at1000 were 0.22, 0.16, 0.09, 0.08 and 0.05, respectively. NPS spectra of the DR group were limited to spatial frequency of 1.2 mm-1. The DQE of the Elekta iViewGT for a spatial frequency of 1mm-1 shows the highest value of 0.00014 , and while those for Varian TrueBeamTM FFF, Siemens BEAMVIEWPLUS, Varian TrueBeamTM flattening filter and Varian Clinac® IX at1000 were 4.32E-05, 2.32E-05, 2.29E-05 and 5.07E-06.

Conclusions : MTF measurements allowed for fast computations of the DQE, a fundamental metric for detector image quality, and they allowed for inclusion of the DQE into routine clinical QA. Therefore, this study could be incorporated into used in clinical QA requiring performance and EPID development research.

Key words : Modulation transfer function (MTF), Noise power spectrum (NPS), Detectible quantum efficiency (DQE)

P208
Evaluation of Proton Therapy for Prostate Cancer

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Purpose : The dose sparing of normal organs such as bladder and rectum is very important concerns for radiation treatment in pelvis sites. The aim of the study was to investigate the dose volume effects of a water-filled rectal balloon in the rectum and quantify the balloon induced decrease in rectum dose.

Materials & Methods : We inserted water filled balloon (100cc volume with 10cm length) inside a rectum for 10 prostate cancer patient treated by proton treatment planning. The treatment planning system was Eclipse proton planning system (Ver. 7.5). Two sets of 3-mm-thick CT images before and after ballooning were used where rectum and bladder volumes were delineated. Dose volume histogram (DVH) of rectum was compared between with and without balloon in rectum for prostate cancer patient in proton therapy.

Results : The CT images shows that the shape of the organ and target volume was changed due to the insertion of the balloon inside a rectum and mean dose in rectum was decreased about 20 % after the insertion of the water filled balloon. This result indicates that the balloon effectively moves the rectum away from the radiation field and reduces the actual dose inside rectum. Dose reduction in bladder due to the balloon insertion is less significant comparative to rectum revealing about 6% mean dose reduction.

Conclusions : Proton therapy decreased integral dose and the minimize exposes of normal tissue. The results suggest that the rectal balloon is very useful for bladder and rectal sparing for prostate cancers treated by proton therapy.

Key words : Proton Therapy, 3D-CRT, Prostate, Rectal balloon, Rectal dose

P209
Influence of CT Contrast Media on Dose Calculations of Radiation Therapy Plans for Head & Neck and Prostate Cancer

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Purpose : In treatment planning for radiation therapy (RT), Computed tomography (CT) scan with the CT contrast media (CM) helps to contour the outline of the target volume (TV) and normal tissue with the high accuracy. This study is to evaluate the effect of a CTCM on dose calculations and its clinical significance in RT plans for head & neck (H&N) and prostate cancer.

Materials & Methods : Pinnacle 8.0 system was used to measure the change of electron density (ED) of the tissue for CM. To determine the effect of dose calculation due to CM, we did the RT planning for 30 patients (H&N and prostate cancer). To compare the ED and dose calculations of RT plans, 3D conformal radiation therapy (3D CRT) and Intensity-modulated radiation therapy (IMRT) plans were do with pinnacle and Tomotherapy planning system.

Results : Mean difference of ED between enhanced and unenhanced CT was less than 5%: target volume(TV) 2.5%, parotid 3.4%, SMG 4.2%, tongue 1.1%, spinal cord 0.3%, esophagus -0.5% and prostate, TV 0.75%, lymph node 1.0%, bladder 0.2%, rectum 0.1%, small bowel 1.1%, colon 1.6%, penile bulb 1.0%, femoral head 0.1%. The dose difference between RT plan using CTCM and without CTCM showed an increase of dose in TV. The rate of increase was less than 2%. (3D CRT: H&N 0.5~1.6%, prostate 0.5~1.0%, IMRT: H&N 0.5~1.1%, prostate 0.2~0.5%)

Conclusions : RT plans using a CM has the insignificant effect on the dose to the organs and TV, so this error is allowable clinically. However, the much more accurate plan is possible as to image fusion (CM and without CM images) to ROI contour and when dose calculation, use the without CM image. Using the function of ‘ROI import’ perform calculations on without CM, it will be able to reduce the error caused by the CM.

Key words : Contrast media, 3D CRT (3D conformal radiation therapy), IMRT (Intensity-modulated radiation therapy), Head & Neck cancer, Prostate cancer

P210
Comparison of Photoneutron Dose for Radiation Therapy Technique of Prostate Cancer.

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Purpose : This study is to provide basic information regarding photoneutron doses in terms of radiation treatment techniques and the number of portals in intensity-modulated radiation therapy (IMRT) by measuring the photoneutron doses.

Results :

Comparing dose calculation of photoneutron by planning system.

Radiation therapy (3D CRT) and Intensity-modulated radiation therapy (IMRT) by measuring the photoneutron doses. In treatment planning for radiation therapy (RT), the number of portals in intensity-modulated radiation therapy (IMRT) by measuring the photoneutron doses.
Materials & Methods: Subjects of experiment were 10 patients who were diagnosed with prostate cancer and have received radiation treatment for 5 months from September 2013 to January 2014 in the department of radiation oncology in S hospital located in Seoul. Thus, radiation treatment plans were created for 3-dimensional conformal radiotherapy (3D-CRT), volumetric-modulated arc radiotherapy (VMAT), IMRT S, 7 and 9 portals. The average difference of photon dose was compared through descriptive statistics and variance analysis, and analyzed influence factors through correlation analysis and regression analysis.

Results: In summarized results, 3D-CRT showed the lowest average photon dose, while IMRT caused the highest dose with statistically significance (p<0.1). The photon dose by number of portals of IMRT was 4.37 ± 1.08 mSv in average and statistically showed very significant difference among the number of portals (p<0.01). Number of portals and photon dose are shown that the correlation coefficient is 0.570, highly statistically significant positive correlation (p<0.01).

As a result of the linear regression analysis of number of portals and photon dose, it showed that photon dose significantly increased by 0.373 times in average as the number of portals increased by 1 stage.

Conclusions: In conclusion, this study can be expected to be used as a quantitative basic data to select an appropriate IMRT plans regarding photon dose in radiation treatment for prostate cancer.

Key words: OSLD, Number of portal, Photo nuclear reaction, Radiation treatment techniques

P211 Evaluation of Skin Dose between VMAT and Tomotherapy Techniques
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Purpose: The purpose of this study was to evaluate dose to skin between volumetric-modulated arc therapy (VMAT) and helical tomotherapy (HT) techniques according to location of tumor.

Materials & Methods: VMAT (1 arc vs 2 arc) and HT (Field widths 1.05, 2.5, 5.02 cm) techniques with prescription of 50 Gy/25fx were planned using (IMRT Phantom/JA Dosimetry, Germany) at each other two tumor location both center and lower side. For the measurement of skin doses we used Glass dosimeters on the 3 points of IMRT Phantom 3 mm from surface with covered around the bolus 0.5 cm.

Results: Both VMAT and HT plans were provided uniform target doses and improved normal organ sparing. Regardless of arc number VMAT delivery showed the same or less average of skin doses compared with planning. But, HT can increase the skin dose (16 -21.69 cGy) with smaller field width as compared to VMAT (11-17 cGy).

Conclusions: We found that using HT leads to higher skin doses probability compared with VMAT. In conclusion, depending on the portion of the target with HT, we need to be more effort to verify skin doses as well as other normal organ sparing.

Key words: Skin dose, VMAT, Tomotherapy, glass dosimeter

P213 An Accuracy Analysis of Tumor Tracking Algorithm
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Purpose: In this study, derived type the optimal patient breathing through the precision analysis of tumor tracking algorithm in accordance with the respiratory type was applied to the Cyber-Knife Synchrony™ respiratory tumor tracking therapy.

Materials & Methods: Materials and Methods: For the measurement, by End to End measurement method program of Cyber-Knife manufacturer using Dynamic Thorax and Gafchromic Film, Treatment Targeting Error (TTE) and Superior/Inferior Direction Error (SIDE) were analyzed at 90% and 95% dose thresholds, respectively.

Results: 90% TTE in the Respiratory group(regular) is 0.86±0.18 ~ 1.67±0.12, SIDE is -1.4±0.18 ~ -0.3±0.13, 95% error range of TTE is 1.05±0.19 ~ 2.34 ± 0.23, SIDE is -2.09±0.17 ~ -0.3±0.24. In the Respiration group (stop) for aerobic respiration in 90% error range of TTE is 1.5±0.04 ~ 2.02±0.19, SIDE is -0.1±0.01 ~ 1.5±0.01, 95% error range of TTE is 1.31±0.13 ~ 2.33±0.13, SIDE is -0.05±0.34 ~ 1.67±0.2. In addition, in the Respiration group III (SI / RE) 90% error range of TTE is 1.29±0.39 ~ 2.32±0.24, SIDE is -1.31±0.18 ~ 1.24±0.21, 95% error range of TTE is 1.37±0.26 ~ 3.17±0.19, SIDE is -1.79±0.24 ~ 1.28±0.25.

Conclusions: Patients should fully understand the importance for a stable respiration and are well-informed of respiration prior to a 4-D CT scan and radiation therapy, and it is judged that it is very important to do tumor-tracking radiation therapy. After training them in respiration so that they come near to
Respiration group through the advance respiratory training and have a stable respiration type.

Key words: Tumor tracking system, Respiration type, Treatment, Targeting Error (TTE), Sup

P214
Estimation of Body composition Using Ultrasoundography
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Purpose: This study is Aimed to assessment and Estimate reference ultrasound measurement of (subcutaneous fat at abdomen and abdominal fat) to body composition (BMI & Fat percentage ) by using anthropometric measurement and generate equation correlate between ultrasound measurement and anthropometric measurement and fat percentage measurement.

Materials & Methods: At the morning 61 fasting volunteer men with different age were measured using weight scale and meter to measure (height, weight, body mass index, fat percentage, waist and neck circumference) ultrasound was done to volunteer to measure abdominal subcutaneous fat and abdominal fat using convex 3.5 Mhz transducer.

Results: from result of 61 cases with mean age 21.5 ± 2 year. the BMI was found to be 24 ±10 . SPSS correlation test was found there significant correlation between BMI with subcutaneous and intra-abdominal fat with P-value < .005 BMI & Body fat percentage linear regression using plot scatter chart to predict equation all plot show positive correlation higher in subcutaneous measure (R²=.76) with fat and BMI (R²=.57). The equations obtained are: y = 9.952x2 + 4.2091 x+ subcutaneous = y BMI = 9.7486x + 14.153 x = subcutaneous y = Body fat percentage using mean of subcutaneous and intra-abdominal fat for fat % and BMI according to standardization was categorize on table class.

Conclusions: researchers found that ultrasound is reliable to assess and estimate body composition, and less time consume. From the result researchers found there strong correlation between ultrasound measurement and anthropometric measurement. Body composition classification can be use with ultrasound measurement. Researchers predicted equation with high correlation when use subcutaneous fat measurement to predict body composition (BMI,Fat percentage ).

Key words: Ultrasound, Fat percentage, Body composition, Obesity

P215
Transvaginal Ultrasound in Advanced Practice
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Purpose: In order to add the use of transvaginal ultrasound to the daily tasks of sonographers, a study was conducted to demonstrate the ability of technologists to recommend transvaginal ultrasound as a complement to standard pelvic ultrasound. Understanding the various indications of transvaginal ultrasound is another big step to autonomous practice for technologists.

Materials & Methods: Thanks to our radiology information system, we conducted a retrospective study of 340 pelvic and transvaginal ultrasound examinations spread over a three-month period between November 2015 and February 2016. The exams are conducted jointly between technologists and radiologists in the department of Radiology of Charles Lemoyne hospital. The different justifications to choose the transvaginal recommended by technologists are gathered, analyzed and confirmed by the agreement of radiologists. In addition, a questionnaire was distributed to the technologists to know their choices from the transvaginal. The recommendations of using the transvaginal ultrasound is settled as a part of the Advanced Practice in Medical Radiation Technology.

Results: Out of a total number of 1020 pelvic ultrasound examinations carried out during a period of 3 months, sonographers, with different years of experience, have made 87% (878 exams). The recourse to transvaginal, performed by radiologists, noted in 1/3 of the cases (340 exams) with technologist recommendations in 85%. Several major indications led technologists to assign the exams to radiologists: a lack of pathological details (43%), a lack of anatomical details (4%) an unfilled bladder in case of emergency (18%), other causes (8%). The questionnaire responses showed use of transvaginal after the inability to visualize anatomical structures in 78% of cases among less experienced technologists (under 5 years). The most experienced technologists (more than 5 years) recommend transvaginal for specifying a pathology in 81% of cases.

Conclusions: Perform a transvaginal ultrasound, remained for a long time a purely medical procedure, can be entrusted to the technologist.

Key words: Technologists, Transvaginal ultrasound, Advanced Practice

P216
The Detectability of Lesion and the Reproducibility by Automated Breast Volume Scanner
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Purpose: Automated Breast Volume Scanner (ABVS) is an ultrasound device dedicated to breast screening. The system makes it possible to scan automatically but also to read multi-planar images reconstructed from volume data. Automatic scan promises operator independence. The aim of this study is to analyze lesion detectability and its reproducibility of the system.

Materials & Methods: In terms of detectability, the authors reviewed and analyzed 1,659 cases that underwent both ABVS and Hand-held US from May 2014 to February 2016. In terms of reproducibility, we reviewed selected 20 cases from March to February 2016. Well experienced ABVS technicians visually analyzed and gave scores (0 to 5) observing the coronal images.

Results: The authors had 28 cases diagnosed as category 4 and over in mammography or ABVS. 15 cases out of them underwent Hand-Held US scrutiny. The two findings were confirmed by the agreement of radiologists. In addition, a questionnaire was distributed to the technologists to know their choices from the transvaginal. The recommendations of using the transvaginal ultrasound is settled as a part of the Advanced Practice in Medical Radiation Technology.

Conclusions: ABVS in B mode had equal detectability to that of Hand-held US. The same images enable to obtain even in the different technician only slightly to practice how to position and press the probe at the time of inspection. ABVS achieves a high-precision breast US screening comparable to Hand-held US. It is especially useful for medical checkup, where detectability is important.

Key words: Automated Breast Volume Scanner, Detectability, Reproducibility.
P217
The Clinical Features of Takotsubo Cardiomyopathy
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Purpose: Takotsubo cardiomyopathy (TTC) is typically triggered by an acute emotional or physical stress events. Clinical characterized by transient LV dysfunction and mimics acute myocardial infarction with symptoms. TTC is rare; female are more than male to experience the sudden intense chest pain or shock, that can be caused by an emotionally trigger event, such as the death of a loved one, accident, or constant anxiety.

Materials & Methods: Ten patients who presented with left ventricular dysfunction after sudden stress were evaluated. All patients underwent echocardiography (Philips iE33 ultrasound machine) and cardiac catheterization (Phillip Allura Xper FD 10/10-D5 X-ray system). The EKG shows ST elevations and abnormal cardiac enzyme, insignificant coronary artery disease, and atherosclerosis demonstrated apical ballooning with stress-related myocardial dysfunction.

Results: The median age of patients with stress-induced cardiomyopathy was 62 years, and 100 percent were women. Twenty-five percent mild hypokinesis, 50 percent severe hypokinesis, 25 percent akinesia were measured after the onset of symptoms (median, day 4). The average heart rate was 78 beats/min. Ninety percent were emotion trigger, 10 percent were physical stress, 10 percent were diabetes.

Conclusions: Emotional stress can trigger severe, reversible left ventricular dysfunction in patients without coronary disease. Exaggerated sympathetic stimulation is probably to the cause of this syndrome.

Key words: Takotsubo, Cardiomyopathy, Chest pain, Stress

P218
The Influence of Compression Stress on Shear Waves of Ultrasound Elastography
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Purpose: Elastography is a relative new ultrasonographic technique to evaluate tissue elasticity. The two most widely used techniques of ultrasound elastography are strain and shear wave elastography. Precompression of tissue is known to affect the strain wave of elastography that may result in misinterpretation of the results. The purpose of the study is to evaluate whether the precompression and the amount of transduction gel may result in variability on shear wave velocity of elastography.

Materials & Methods: Three operators (two radiologists with 3 and 5 years’ experience and one technician with 3-month experience of diagnostic ultrasonography) performed this study. A Blue Phantom ultrasound training model was used to evaluate the elastographic imaging in the tissue-like phantom. The evaluation was performed on Acuson S2000/3000 ultrasound system (Siemens AG, Erlangen, Germany) by three operators with experienced ultrasound imaging. Three conditions of precompression were used for the assessment: minimal compression (0-cm thick gel); no compression (0.5 cm thick gel) normal compression. The measurement was performed on three masses in the Blue Phantom with five spots in the mass’s middle line. One-way ANOVA was used to assess the differences among the 3 conditions of compression.

Results: A total of 135 spots were measured in 3 masses by 3 different conditions of compression. No significant difference was found among the shear waves elastography velocity by the 3 conditions (p=0.392, 0.641 and 0.323 for mass 1,2 and 3, respectively).

Conclusions: The preliminary results of the current study suggest that the stress of compression and thickness of conduction get does not affect the shear wave result in ultrasound elastography on the phantom. Further study will be conducted to evaluate if the elastography will be affected in real tissue using various stress of compression.

Key words: Elastography, Shear waves, Precompression

P219
Prevalence Rate and Morphological Distribution of Gallbladder Polyps in Busan and Gyeongnam Areas
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Purpose: With the aging population and a growing interest in health, the researches for detecting a cancer early have continued. Since gallbladder cancer is difficult to be detected early and its cause is not clear, several researches have been conducted on the risk factors of gallbladder cancer. A gallbladder polyp, one of the risk factors of gallbladder cancer is prevalence rates vary depending on the region, race, lifestyle, etc. Therefore, we intend to investigate the prevalence rate of gallbladder polyp in Busan and Gyeongnam areas and its morphological patterns as shown in abdomen ultrasonography.

Materials & Methods: The prevalence of GB polyp was measured for the patients who were diagnosed with GB polyp by abdomen ultrasonography among the patients who came to the Paik hospital in Busan during January 1, 2013 to March 4, 2016. For 200 patients who were randomly selected among them, we classified their GB polyps into the categories of homogeneity, neck, eco pattern, quantity and size for studying the morphological distribution. When abdomen ultrasonography was conducted Philips IU22 and GE LOGIQ9 were utilized.

Results: All the patients who had abdomen ultrasonography in the period were 35,543. The GB polyps were found in a total of 1,016, which shows 2.86% of prevalence rate. Among the GB polyp types, the hyperechogenic and homogeneous pattern with neck was the largest as shown from 55 (27.5%). And two GB polyps were shown most from 77 patients (38%). When the sizes of GB polyps were classified by maximum diameter, 5 to 10mm of max.

Conclusions: Among 35,543 patients who received abdomen ultrasonography, the GB polyps were found in a total of 1,016, which shows 2.86% of prevalence rate. Among them, the hyperechogenic and homogeneous pattern of with neck was the most shown as 27.5%. Two GB polyps were shown most and 5 to 10mm of max.

Key words: Ultrasonography, Gallbladder cancer, GB polyp, Prevalence rate
P220
Comparative Study of Transient Elastography (TE) and liver biopsy in diagnosing liver fibrosis

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Purpose: Transient elastography (TE) by analyzing the results of liver fibrosis and liver biopsy to evaluate the results with accuracy and usefulness of the TE for diagnosing liver fibrosis.

Materials & Methods: 304 patients who underwent biopsies before and after the TE among patients who underwent liver fibrosis confirmed by liver biopsy between approximately August 2014 to August 2015 was a retrospective analysis in this study. Liver biopsy on the basis of the results presented in liver tissue technical instructions for Pathology F0, F1, F2, F3, divided into steps of F4. TE uses Fibroscan F2≥, 7.2 kPa; F3≥, 9.6 kPa; F4, were separated by 14.5 kPa step. Statistical analysis SPSS ver. 18.0 was processed using the software for, the P-value for each statistical significance level was defined as less than 0.05.

Results: The sensitivity of the TE to cirrhosis of the liver also is 94.80%, a specificity of 77.08%, 90.95% accuracy, positive predictive value of 93.71% and the negative predictive value was 80.43%. Approximate 95% confidence interval of the TE is 0.933, cut-off value was 0.859 at 0.786, respectively approximate significance probability of 0.730, 0.000, significant probability of two diagnostic methods was found to have a significant correspondence (p<0.05).

Conclusions: Cirrhosis of liver biopsy is also used in the diagnosis of invasive methods such side effects occur in the course of representation issues and biopsy diagnosed with cirrhosis of liver, some organizations only. Therefore, the correspondence with TE looks to cirrhosis of the liver biopsy results also think that it would be more effective to use a substitute measure.

Key words: Fibrosis, Liver biopsy, Transient elastography, Fibroscan.

P221
Usability Evaluation of Self-designed Pocket type Liquid Pad in Extremity Ultrasound - For Small and Curved Parts

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Purpose: When the inspection area is extruded or smaller than transducer and curved, often it is difficult to diagnosis in musculoskeletal ultrasound. Although the gel pad is used to apply the inspection area, it is inconvenient to use and also have narrow coverage. In this study, we evaluate usability of applying self-designed pocket type liquid pad for small and curved parts.

Materials & Methods: We choose a pocket type material that transmitting an ultrasonic wave and flexible. And make a tool using acrylic panel to fix the liquid pad. Then fill the sterile distilled water into the pocket. Study was performed Phillips EPIQ 5G and Linear prove L18-5. Each group (group A: 10 radiologist, group B: 10 radiologic technologists) evaluated the images and filling out a questionnaire. The qualitative analysis was performed as Likert 5 point scale. The statistical significance was verified by Mann-Whitney U-test using SPSS (ver.24.0).

Results: According to gel pad on 3-point basis, the qualitative analysis of pocket type liquid pad was performed. It points average 4.27, 4.43 in terms of convenience and quality, and overall satisfaction was 4.3 in group A. And it points average 4.83, 4.43 in terms of manufacture and management, and overall satisfaction was 4.8 in group B. All results in this study were statistically significant by Mann-Whitney U-test (p<0.05).

Conclusions: Gel pad that currently being used is difficult to diagnose because discomfort in small and curved portion. The result of applying pocket type liquid pad on ultrasound showed that high availability. Based on this, it will be helpful for clinical diagnosis in other small and curved parts. And it is expected superficial lesion on musculoskeletal section, AVF or superficial vein on cardiovascular section in case make various size and shape.

Key words: Extremity ultrasound, Pocket type, Liquid pad.

P222
Quantitative Evaluation of Penetration Depth and Resolution According to Change of Frequency

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Purpose: It was aimed to raise value of ultrasonography in diagnosis territory through enhancement of image accuracy at ultrasonography targeting clinical patients through quantitative evaluation of penetration depth of sound wave and formed image resolution at object according to change of frequency.

Materials & Methods: ACCLVIX V10, an ultrasonic device was used and search unit was used in range of 2-5Hz. A multipurpose ultrasound phantom ATS-539 was used. As test method, identified were axial resolution, lateral resolution and penetration depth at frequencies 2Hz, 3Hz and 4Hz by fixing search unit using fixing frame, and quantitative measure was taken of resolving power and penetration depth adopting image analysis program Image J.

Results: As a result of this study, when setting up 1-6 from shallow territory to deep territory, resolving power got improved due to increase of distance by 0.818% according to increase of frequency at territories 2Hz, 3Hz and 4Hz, in zone No. 1 and 2, and distinguishing ability got better due to increase of distance by 1.882% according to increase of frequency in zone No. 2 and 3, and no territory was distinguished in zone No.4 and 5. Whereas, distinguishing ability got improved due to increase of distance by 0.633% at 3Hz and 4Hz. No distinguishing could be made at all territories in zones No. 5 and 6.

Conclusions: Assessment was taken to be able to acquire more clarified image due to improvement of distinguishing ability of neighboring zone by depths as frequency gets bigger, at the same condition through fixing frame of search unit internally made using acrylic. Application of suitable territory of frequency according to affected part and seriousness of patient at practical clinical test is expected to take more accurate diagnosis through this.

Key words: Frequency, Penetration depth, Resolution, Ultrasound Phantom, Image J.

P223
Medical Imaging Technology Professional Medical Combination of Interdisciplinary Talents Cultivation Model of Technology Exploration

Sun CUNJIE

Purpose: The sensitivity of the TE to cirrhosis of the liver also is 94.80%, a specificity of 77.08%, 90.95% accuracy, positive predictive value of 93.71% and the negative predictive value was 80.43%. Approximate 95% confidence interval of the TE is 0.933, cut-off value was 0.859 at 0.786, respectively approximate significance probability of 0.730, 0.000, significant probability of two diagnostic methods was found to have a significant correspondence (p<0.05).

Conclusions: Cirrhosis of liver biopsy is also used in the diagnosis of invasive methods such side effects occur in the course of representation issues and biopsy diagnosed with cirrhosis of liver, some organizations only. Therefore, the correspondence with TE looks to cirrhosis of the liver biopsy results also think that it would be more effective to use a substitute measure.

Key words: Fibrosis, Liver biopsy, Transient elastography, Fibroscan.
Compared to the oscilloscope, our system worked. We designed and developed non-rigid phantom. The deformable and ventilation phantom shows a variety of displacement for each landmark (1 mm-20 mm). The mean TRE was 4.5 ± 4.7 mm (Maximum: 12.3 mm). The relationship between the JD and the HU change shows high correlation. (R=-0.86). At the several landmarks where TRE values were over 3 mm, the correlation was poor.

Conclusions: The phantom may be a useful QA tool to validate CT-V imaging. We will improve our deformable image registration program for CT-V imaging with the efficient way using the phantom.

Key words: CT-Ventilation, Lung, Deformable image registration, Target registration error, Non-rigid phantom

P225
Estimation of the Accuracy of Respiratory-gated Radiotherapy for Irregular Respiratory Patterns
Tomoyuki KUROSAWA, Hidenobu TACHIBANA, Shunsuke MORIYA and Masanori SATO
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Purpose: Irregular respiratory patterns affects dose outputs in respiratory-gated radiotherapy and there is no commercially available quality assurance (QA) system for it. We designed and developed a patient specific QA system for respiratory-gated radiotherapy to estimate irradiated output.

Materials & Methods: Our in-house QA system for gating was composed of a personal computer with the USB-FSIO electronic circuit connecting to the linear accelerator (ONCOR-K, Toshiba Medical Systems). The linac implements a respiratory gating system (AZ-733V, Anzai Medical). During the beam was on, 4.2 V square-wave pulses were continually sent to the system. Our system can receive and count the pulses. At first, our system and an oscilloscope were compared to check the performance of our system. Next, basic estimation models were generated when ionization-chamber measurements were performed in gating using regular sinusoidal wave patterns (2.0, 2.5, 4.0, 8.0, 15 sec/cycle). During gated irradiation with the regular patterns, the number of the pulses per one gating and dose per the gating window were assessed to generate the estimation model. Finally, two irregular respiratory patterns were created and the accuracy of the estimation was evaluated.

Results: Compared to the oscilloscope, our system worked similarly. The basic models were generated with the accuracy within 0.1%. The results of the gated irradiations with two irregular respiratory patterns show good agreement within 0.4% estimation accuracy.

Conclusions: Our developed system shows good estimation for even irregular respiratory patterns. The system would be a useful tool to verify the output for respiratory-gated radiotherapy.

Key words: Radiotherapy, Respiratory-gated radiotherapy, Quality assurance, Ionization chamber, Irregular respi

P226
A Feasibility Study of Gold Nanoparticle Radiosensitizer under Clinical X-ray Irradiation
Masashi HAYANO, Masaki MISAWA, Morihito SHIMIZU and Masanori SATO

Purpose: To train inter-disciplinary talents majoring in medical imaging technology, who are versed in the fields of engineering and medicine in order to meet the growing demands of the current society, this research aims to optimize the systems of education and practical skills training, and innovate the models of instruction.

Materials & Methods: This study conducted an investigation of the employment of the graduates (Year 2003, Year 2004 and Year 2005, students) who had received five-year education on medical imaging technology at Xuzhou Medical College, with an intention to consult the employers for the information about their appraisement of the graduates' comprehensive competence and their requirements for knowledge and skills, which the students of medical imaging technology were supposed to acquire.

Results: The study shows that although the graduates possess a solid foundation of professional knowledge and proficient skills, they need more engagement in scientific research and update of their professional knowledge.

Conclusions: It is requisite to reform the models of instruction to adapt the students specializing in medical imaging technology to meet the employment demands.

Key words: Medical imaging technology professional, medical combination, interdisciplinary talents cultivation

P224
Design and Development of a Non-rigid Phantom Ventilating Air to Evaluate CT Pulmonary Ventilation Imaging
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Purpose: We designed and developed non-rigid phantom ventilating air in this study. We evaluated accuracy of the CT-Ventilation image using the phantom.

Materials & Methods: The phantom consisted of an acrylic cylinder filled with polyurethane foam designed to pulmonic alveoli and a polyurethane membrane was attached to the inferior end of the phantom to simulate a lung diaphragm. Also, trachea-shaped polyurethane tubes were covered by the foam and the tubes passed through the outside in order to exchange a gas. Lung arteries were also modeled with polyurethane and were located adjacent to the trachea model. Two 3D-CT scans were performed at exhale and inhale using an air contrast agent of xenon gas, respectively. The exhale 3D-CT was deformed to the inhale 3D-CT using the in-house program with the NiftyReg. Sixteen landmarks were assigned around trachea and lung arteries in the inhale image and the deformed exhale image.

Target Registration Error (TRE) for each landmark between the two images was calculated for commissioning of our program. CT-V image was generated using Jacobian determinant metrics (JD). Subsequently, HU value change between the two images was measured. The correlation coefficient was calculated between the JD and the HU change.

Results: The deformable and ventilation phantom shows a...
Purpose: In recent years, with the increase of elderly cancer patients, a growing attention is paid to the low-invasive radiotherapy. However its application would be limited when radiation doses become critical around the risk organs. One of the solutions is to use radiosensitizers allowing for increased radio sensitivity and enhanced ionization in tumors. In particular, advanced radiosensitizers with targeting moiety are expected to selectively accumulate and distribute in tumors at the molecular level, preventing poor prognosis and recurrence after surgical resection. In this study, we investigated the feasibility of gold nanoparticles as a radiosensitizer.

Materials & Methods: First, generation of reactive oxygen species (ROS) under X-ray irradiation was measured in the presence of varied sizes and concentrations of GNPs.

Results: Particle size in gold nanoparticles of 20 ~ 80 nm was found that 5-8 times the ROS is generated than distilled water. We found that ROS generation was enhanced by a factor of 5-8 compared to that of water alone in concentration- and dose-dependent manners. Next, HeLa cell viability exposed to GNPs under X-ray irradiation was measured by CFU. Then, the sensitivity enhancement ratio (SER) was computed from the area under curve fitted by the linear quadratic model. The resulting SER was 1.4 for 40nm GNPs.

Conclusions: The above results indicated that the GNPs have a potential to serve as a radiosensitizer through enhanced generation of ROS under X-ray irradiation.

Key words: Radiotherapy, Gold nanoparticles, liposome, radiosensitizer, Reactive oxygen species

P227

Anode Heel Effects of the Irradiation Condition and Radio-sensitivity Using Automatic Exposure Control System in a Digital Radiography

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Purpose: To investigate the anode heel effects of the irradiation condition and radio-sensitivity using automatic exposure control system in a digital radiography.

Materials & Methods: Chest digital radiography was performed at focus-film distance 180cm for the largest field size. First examination was contrasted with comparison group for the conditions of tube voltage 125kVp, sensitivity 200, tube current 0.6mA, applying the automatic exposure control system, and the distribution of heel effects was analyzed by experimental test changing the tube current in 0.3, 0.8, 1.4. Second examination was evaluated kVp and mAs in the thorax 1, 7, 12th level in chest phantom to mimic clinical study. Radiographic images were analyzed the region of interest for the upper and lower of the left, middle, right side of experimental group were respectively increased by 26.06%(357.85), 22.74%(276.28), 14.95%(249.26), respectively. The reinforcement analysis showed the greatest difference between T1 and T2 that increased mean value 6.72% (244.16) under the condition of 125kVp, S200, while the lowest growth rates under the condition of 70kVp, S1000 showed by increasing 2.29%(86.003).

Conclusions: In this study, we confirmed experimentally heel effects of digital radiography. The clinical test should be set the conditions of examination that considered sensitive and heel effects depending on the thickness of the inspection area or the compensation.

Key words: Digital Radiation System, Auto Exposure Control System, Heel Effect

P228

A Study on the Minimum Exposure Point of Medical Personnel during Brain CT Scan

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Purpose: Because of a patient necessary AMBU bagging for low SPO2 during the CT scan, medical personnel inevitably received dose of radiation. Thus we aimed to find the place that medical personnel received a minimum radiation dose.

Materials & Methods: The equipment used for the purpose of this research used 128-MDCT SOMATOM DEFINITION AS+ (SIEMENS, Erlangen, Germany), X-ray protection apron (HOSHINA, Turku, Finland)From the center of the CT equipment section was divided into 4 section : Front (LA) of gantry and rear(LP) of that on the right side of couch. Radiation dose was measured on the basis of the long axis of the reference line to couch isocenter in each different three angle : 20°, 40°, Max angle in 75 cm away ten times.

Results: Average values were based on the criteria isocenter angle of distance 75 cm which were respectively measured RA - 20° 40° Max(27, 16.4, 4.1 uSv), RP - 20° 40° Max(12.9, 14.1, 17.8 uSv), LA - 20° 40° Max(15.8, 19.3, 20.8 uSv), LP - 20° 40° Max(16.3, 4.8, 1.3 uSv). RA Max(4.1 uSv), LP Max(1.3 uSv)were gauged a minimum value. Overall, the average values were via SPSS Statistics version.23 that the test resulted in significant levels of 0.05.

Conclusions: The result measured that the larger isocenter angle is the lower dose of radiation on the RA&LP but higher radiation dose on the RP&LA. According to dose distribution diagram around gantry, medical personnel can reduce unnecessary radiation dose by using AMBU bagging on the place that the minimum dose of radiation is measured.

Key words: ART Phantom, Protector Apron, Dose distribution, Dosimeter, Isocenter angle
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• 고객센터: voc@dk.co.kr
This medical device is intended for use by medical imaging and diagnostic health professionals. FlowSens® • Class: II b • CE Certificate, in compliance with directive 93/42/EEC • Certifying organization: LNE GMed (CE 0459) • Technical data: CT dualheaded soft bag injector - Hydraulic technology: Use with prefilled bags, bags and vias. - Installation: ceiling-mount / pedestal. - Flow rate: 0.3 to 10mL/s. - Maximum pressure: 21Bar / 2100KPa / 300PSI. - Limit of pressure: programmable. - Pressure monitoring: graphical & numerical. - Bag maximum capacity: 500mL. - Number of phases: 6. - Volume per phase: 1 to 220mL. - Air detection: automatic. - Number of filling speeds: 3. - Filling: manual / automatic. - Priming: manual / automatic. - Delay between phases: 0 to 900s. - Protocol programming modes: 3 - Memory capacity (protocols): 20 libraries, 4000 protocols. - Memory capacity (historical & statistics): 24000 injections, 300000 events. - Voltage: 230V AC. - Power frequency: 50/60Hz. - Power consumption: 1000VA. - Injectors pedestal dimensions / weight [H x W x D]: 1422 x 750 x 750mm / 72kg. - Injector ceiling mounting dimensions / weight [H x W x D]: 1016 x 358 x 503mm / 60kg. - Remote console dimensions / weight [H x W x D]: 355 x 300 x 249mm / 3.5kg. - Power unit dimensions / weight [H x W x D]: 554 x 68 x 356mm / 70Kg. - Complying with European Directive 2002/96/EC, amended by Directive 2012/96/EC (WEEE) • Manufacturer: MEDEX - 240 allée Jacques Monod - 69980 Saint-Priest - France • Document creation date: 2014 • For complete information about precautions and optimal usage conditions for this medical device, we recommend consulting the instructions notice/user's manual.
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