## Others-Informal Scientific Presentation

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**SE 15 OT-01**

**Brain metabolite changes in subcortical regions after exposure to cuprizone for 6 weeks: potential implications for schizophrenia**

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Cuprizone is a copper chelating agent able to selectively damage the white matter in the mouse brain. Recent studies have reported behavioral abnormalities relevant to some of schizophrenia symptoms. While associating white matter damage to the behavioral abnormalities, these previous studies did not rule out the possible impairment in neuronal functions in cuprizone-exposed mice. The aim of this study was to examine brain metabolites of the cuprizone-exposed mice by proton magnetic resonance spectroscopy (¹H-MRS). The examined brain regions were the caudoputamen, midbrain, and thalamus; these subcortical regions showed different susceptibilities to cuprizone damage in terms of demyelination and oligodendrocyte loss in previous studies. Young C57BL/6 mice were fed a standard rodent chow without or with cuprizone (0.2%) for 6 weeks. At the end, open-field and Y-maze tests were performed to emotional and cognitive behaviors of the animals, followed by ¹H-MRS procedure to evaluate the brain metabolites. Cuprizone exposure increased anxiety levels and impaired spatial working memory. The same treatment increased T2 signal intensity in the cerebral cortex, hippocampus, and caudoputamen, but not in the thalamus. Cuprizone-exposure decreased the concentrations of NAA and NAA + NAAG in caudoputamen, but not in thalamus and midbrain. It decreased levels of Cr + PCr, GPC + PCh and myoinositol in all the three brain regions. These results provided neurochemical evidence for the impairment in neuronal functions by cuprizone treatment.

**SE 15 OT-02**

**Neuronal metabolic characterization in the peritumoral area of brain gliomas using ¹H MRS at 7 tesla: a rat glioma model**

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This study aimed to use a reproducible rat glioma model to investigate the metabolic characteristics in different areas of brain gliomas and preliminarily analyze if the addition of metabolic information improved the definition of glioma extent, using high field proton magnetic resonance spectroscopy (¹H-MRS) at 7T. Rat C6 glioma cells were stereotactically implanted into the right basal ganglia of SD rats. The SD rats sequentially underwent ¹H-MRS at an animal-dedicated 7T MR scanner 7 days after operation. Neuronal metabolites were measured from the
tumor center, tumor solid parts, and peritumoral normal-appearing tissue, as well as contralateral white-matter. All spectra data were then quantified by LCModel and analyzed by SPSS. The spectral lines acquired were fitted by jMRUI software. A gradual increase in N-acetylaspartate (NAA), totalt creatinine (tCr) and a decrease in alanine (Ala) from the tumor center to the contralateral normal white matter were observed. Moreover, the lowest level of inositol (Ins) and taurine (Tau) were found in the tumor periphery. The highest glutamate and glutamine (Glx) levels appeared in the tumor periphery. The highest level of choline (Cho) and lactate (Lac) appeared in the tumor solid part and tumor center respectively. The analysis of spatial distribution of metabolites by 7T 1H-MRS helps to discriminate among different tissues, offering information not available with conventional MRI. Ins, Tau and Glx may supply specific biomarker about the location of glioma potential border.

SE 15 OT-03
Multi-channel near-infrared spectroscopy imaging system for improving diagnostic accuracy of prostate cancer in xenograft model
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PURPOSE: To develop PSMA-targeting Gold Nanorods (GNRs) and verify its diagnostic capability of prostate cancer in xenograft mice model using a multi-channel NIR (Near-Infrared) imaging.

MATERIALS AND METHODS: We developed a new multi-channel NIR system using near-infrared wavelength of 785 nm. Each wavelength had 8 channels and shared 4 detectors. A computer software named Labview (National Instrument, USA) was used to develop graphic user interface which can process incoming signals and display them on the same monitor simultaneously. We applied the NIR system to xenograft mice model. GNRs were synthesized and conjugated with prostate-specific membrane antigen (PSMA-GNRs). Nude mice were injected subcutaneously into the right flank with suspensions of LnCap, a PSMA-expressing and PC-3, a PSMA negative human prostate cancer cell lines. After injection, mice were monitored until tumors reach size about 1 cm. Ultrasoundography (US) and NIR imaging were done simultaneously. Then, PSMA-GNRs and GNRs were injected and imaging were done again after 30 minutes.

RESULTS: B-mode US images revealed the tumors without evidence of degeneration or hemorrhagic change in both cell lines. In NIR imaging, more NIR absorption were received after injection of GNRs and PSMA-GNRs. More NIR absorption was greater in the tumor of LnCap than PC-3 cell lines after injection of PSMA-GNRs. The selective accumulation of PSMA-GNRs within tumor tissue was verified by the silver enhancement staining.

CONCLUSION: This study reports in vivo NIR imaging of prostate cancer in a selective manner using PSMA-targeting GNRs and demonstrates its utility for future clinical application.

SE 15 OT-04
Closing the gender gap: increased female authorship in AJR and Radiology
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PURPOSE: To evaluate gender differences in the authorship of original research articles by radiologists in two major American radiology journals, AJR American Journal of Roentgenology (AJR) and Radiology.

MATERIALS AND METHODS: Our study was a retrospective bibliometric analysis that did not involve human subjects and was exempt from the need for Institutional Review Board approval. All original articles published in the AJR and Radiology during three 3-year periods (1991–1993, 2001–2003, and 2011–2013) were reviewed to determine the gender of the first and corresponding radiology authors. In addition, radiological subspeciality and country of the authors were also abstracted from each article.

RESULTS: The gender of the first and corresponding authors could be determined for 10,043 (98.5%) of the 10,228 radiology authors of original research. Between 1991–1993 and 2011–2013, the percentage of female authors significantly increased from 20.4% to 34.4% among first authors (p < 0.0001) and from 18.0% to 28.7% among corresponding authors (p < 0.0001). There was a significant correlation between the gender of the first and corresponding authors (p < 0.05). In the 2011–2013 period, the proportion of female authors was the highest in “breast” (64.2%) and “cardiac” (48.2%) and the lowest in “vascular/interventional” (18.5%) and “pediatric” (21.0%) subspecialties. The proportion of female authors was the highest in the Netherlands (47.3%), South Korea (37.9%), Italy (37.0%), and France (36.2%).

CONCLUSION: There was a significant increase in the female authorship of original research articles in two major American radiology journals from 1991–1993 to 2011–2013.
SE 15 OT-06
Role of MRI in management of optic neuritis
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PURPOSE: 1. MRI evaluation of patients diagnosed as optic neuritis on fundoscopy examination. 2. Grading abnormal signal intensity as per optic neuritis treatment trial.

INTRODUCTION: Optic neuritis is an inflammatory demyelinating condition that causes acute, usually monocular vision loss. It is strongly associated with multiple sclerosis. Optic neuritis is the presenting feature of MS in 15 to 20 percent of patients and occurs in 50 percent at some time during the cause of their illness. The diagnosis of optic neuritis is usually made on clinical grounds, supplemented by fundoscopy examination findings. MRI of the brain provide information that can change the management of optic neuritis.

MATERIALS AND METHODS: 28 Patients with optic neuritis clinically evaluated with fundoscopy underwent MRI with T1 weighted, T2 weighted and FLAIR sequence. Inclusion criteria Patients with clinical diagnosis of optic neuritis exclusion criteria patient with any other neurological or ophthalmologic disease. MRI report was reviewed for Number of lesions, location of lesion (orbit only. Intracranial only, orbit and canal both, canal and intracranial both, all the segments) and enhancement length of optic nerve were evaluated prospectively and were graded in accordance with the standardized classification employed in optic neuritis treatment trial. As per ONTT grading: grade 0, No signal intensity abnormality; grade 1, subtle signal intensity abnormality; and grade 2, gross signal intensity abnormality. Post gadolinium T1-weighted sequence were also analyzed for the presence of enhancement

RESULTS: Of the 28 patients, 16 of them had ON in the left eye and 12 in the right eye. Mean age of all patients is 33 (22-50). Two third patients were female. 12/28 patients were idiopathic, 5/28 had multiple sclerosis, 8/28 were infective, and 3/28 had autoimmune cause. Location of optic nerve enhancement were orbit only (13/28), canal only (5/28), intracranial only (2/28), orbit and canal only (6/28), canal and intracranial only (2/28). Length of optic nerve enhancement < 10 mm were seen in 15/28 patients, > 10 mm in 11/28 cases, > 17 mm in 2/28 patients. In the evaluation of brain abnormalities 40% were classified grade 0, 20% grade-1, 20% grade-2, 6.7% grade-3 and 13.3% grade-4.

CONCLUSION: The number of authors significantly and consistently increased in two leading radiology journals over the last two decades.

SE 15 OT-07
A collaborative initiative to improve radiographers’ hand-hygiene compliance during portable X-ray in a tertiary referral center
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INTRODUCTION: Portable X-ray is a potential source of infectious disease transmission. Radiographers play an important role in preventing disease transmission by practicing good hand-hygiene.

OBJECTIVE: To improve radiographers’ hand-hygiene compliance when performing portable X-ray in Queen Elizabeth Hospital, Hong Kong.

METHODOLOGY: Collaborative meetings were conducted in crafting a practical, efficient and effective hand-hygiene routine.

RESULTS & OUTCOME: Three approaches were launched in May 2014 to improve the hand-hygiene compliance by radiographers when performing portable X-ray: 1. Refining the hand-hygiene protocol: The preexisting protocol included 4 hand-washing steps for each patient - 1) before establishing contact, 2) after cassette insertion, 3) before cassette removal and 4) before attending the next patient. The WHO Guidelines recommendations for hand-hygiene duration are 40–60 seconds with soap and water, or 20–30 seconds with alcohol-rub. A radiographer attends to up to 50 patients per shift. In this high-volume setting, these time-consuming steps could reduce efficiency and discourage full compliance. The number of steps is reduced under the new streamlined routine, while similarly effective sterilization is maintained. Hand-hygiene is performed at 2 instances per patient - 1) before establishing contact and 2) before attending the next patient. The ‘high touch’ areas of X-ray machines are kept sterile in between patients by cleansing with disinfectant wipes by X-ray assistants. The time required for hand-hygiene is reduced by 50% (up to 120 seconds reduction per patient), greatly enhancing efficiency and minimizing the radiographer’s risk of developing dermatitis.

2. Enhancing availability of equipment: Alcohol hand-rub and disinfectant wipes are placed on portable X-ray equipment, ensuring these useful tools are within easy-reach.

3. Improving education: New hand-hygiene signs and reminders are placed on portable X-ray equipment. Improvement in hand-hygiene by radiographers has been achieved. According to the Infection Control
CONCLUSION: Overall improvement in radiographer’s hand-hygiene compliance rate is achieved. Development of more innovative approaches could help in further enhancing hand-hygiene compliance.

SE 15 OT-08
Evaluating the effectiveness of on-site-education for improving quality assurance for cancer screening imaging
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PURPOSE: Some medical institutes repeatedly failed in tests for quality assurance of imaging examinations, even lecture method instructions are given. Therefore, the national cancer control institute planned on-site-education for these medical institutes. The purpose of this study was to evaluate the usefulness of the on-site-education for the clinical imaging evaluation on the quality assurance of screening imaging examinations for early cancer detection.

MATERIALS AND METHODS: Only selected medical institutes were included in this study due to the nature of the demonstration project. Thirty eight medical institutes underwent on-site-education in 2012 for the quality assurance test of clinical imaging evaluation on the quality of screening imaging examinations for early cancer detection. Failure rates and mean scores of the clinical imaging evaluation were compared using the Friedman test and the paired t-test. After annual survey of 2012, on-site-education was performed by expert radiologists who were involved in quality assurance test for more than three years. Then, repeated survey was done for evaluating the effect of on-site-education. Failure rates and mean scores of the clinical imaging evaluation for screening examinations of 2011 survey, 2012 survey before and after on-site-education, and 2013 survey were compared. Failure rate were compared using the Friedman test and the paired McNemar’s test and means scores were compared using the Wilcoxon signed rank test and the one-way repeated measure analysis of variance (ANOVA). P-values less than 0.05 were considered as statistically significant results.

RESULTS: Similar tendency and pattern of failure rates and mean scores were observed in all three imaging examinations. The failure rates of 2012 surveys before and after on-site education and 2013 survey were better than those of 2011 survey. Mean scores of 2012 survey after on-site education were better than those of 2012 survey before education. Mean scores of 2013 survey were still better than that of 2012 survey on-site-education, however, they were poorer that those of 2012 survey after on-site education.

CONCLUSION: On-site-education positively impacts on the failure rate and scores of the clinical imaging evaluation of the screening imaging evaluation for early cancer detection. However, the impact may be reduced after time and repeated, annual education might be helpful to maintain the quality of screening imaging examinations.

SE 15 OT-09
Pelvis AP radiographic technique for optimized radiation dose in DR system
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PURPOSE: With the development of digital radiography (DR) equipment, justification and optimization are becoming more important for the patient dose. This study compared the quality and radiation dose of pelvis anteroposterior (AP) X-rays using various shooting conditions, and suggested a pelvis AP radiographic technique with appropriate quality and the optimized radiation dose.

MATERIALS AND METHODS: We use the pelvis AP shooting conditions (tube voltage and current) most commonly used according to a Korean nationwide survey. Changing the tube voltage, tube current, and type of filter, the entrance surface dose (ESD) and dose area product (DAP) were calculated using a Rando phantom and optical stimulation dosimeter. The Philips DR has tube voltages of 85, 81, 77, and 73 kVp, tube currents of 16, 20, 25, and 32 mAs, a 0–2 mm aluminum filter, a 0–0.2 mm copper filter, a fixed focal distance (FFD) of 110 cm, and a field of view (FOV) of 153 × 35 cm.

RESULTS: With a tube voltage of 85 kVp, 16 mAs, and combined 1 mm aluminum and 0.2 mm copper filters, the ESD is 0.704 mGy and the DAP is 4.294 mGy · cm², which is the lowest radiation dose. With a tube voltage of 81 kVp, 16 mAs, and the same filters, the ESD is 0.585 mGy and the DAP is 3.371 mGy · cm². With a tube voltage of 77 kVp under the same conditions, the ESD and DAP are 0.504 mGy and 3.182 mGy · cm², respectively. With a tube voltage of 73 kVp, the ESD and DAP are 430 mGy and 2.661 mGy · cm², respectively. The radiation dose was lowest at 16 mAs at the same tube voltage, and the lowest dose was at 73 kVp. The combination of 1 mm aluminum and 0.2 mm copper filters gave the lowest dose. While the radiation dose is lowest at 73 kVp, the exposure index is higher (1250), and exceeded the standard recommended range (400–800). Consequently, the image quality is worse than at 77 kVp.

CONCLUSION: For DR systems, it is important to develop an optimized radiographic technique that gives the best image quality and smallest radiation dose. For pelvis AP X-rays, we recommend settings of 77 kVp and 16 mAs combined with 1 mm aluminum and 0.2 mm copper filters.
SE 15 OT-12
Reduce the Number of Unnecessary Intravenous Steroid Premedication for Contrast CT Examinations: Can You Do It?
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SE 15 OT-12
Reduce the Number of Unnecessary Intravenous Steroid Premedication for Contrast CT Examinations: Can You Do It?  
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BACKGROUND: In the past decade, the Radiology Department of Hong Kong Baptist Hospital (HKBH) would routinely premedicate patients with any atopic history, asthma, food and contrast allergy regardless of the severity of prior reactions before contrast CT scans. Thus, patients with such history, who were about to undergo contrast CT scans and had not been premedicated with steroid by referring clinicians, would receive a single dose of intravenous (IV) hydrocortisone by the attending radiologist as premedication. This has led to a high consumption of IV hydrocortisone. In August 2013, a total of 939 contrast CT scans were performed in our Department, and 280 injections (29.8%) of hydrocortisone were given to patients with such history.

METHOD: Upon reviewing international guidelines, including the Manual on Contrast Media 2013 by American College of Radiologists, Premedication Policy of Yale School of Medicine, Department of Radiology, and Guidelines for Use of Steroid Premedication by Coordinating Committee in Radiology, Hong Kong Hospital Authority, more stringent criteria for steroid premedication were adopted. Two sessions of detailed discussion with radiologists, radiographers and nursing staff were made in 2014, such that only patients with prior mild to moderate iodinated contrast allergic reaction and prior severe reactions to other allergens would be premedicated with
Steroid. Clinicians were informed of the change of premedication guidelines in the HKBH newsletter August 2014 issue.

RESULTS: After implementation of new guidelines, there was a significant drop in hydrocortisone injections. In August 2014, a total of 953 contrast CT scans were performed in the Radiology Department of HKBH, and 120 injections (12.6%) of single dose hydrocortisone were given to patients with such allergic history. Further drop was observed in January 2015: a total of 1018 contrast CT scans were performed, and 10 injections (0.98%) were made.

CONCLUSION: Implementation of new guidelines resulted in a significant reduction in intravenous steroid injections in patients undergoing contrast CT scans from 29.8% to 0.98%.

SE 15 OT-13
Imaging characteristics of abdominal and extraabdominal desmoid tumors
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PURPOSE: To evaluate of imaging features of various image modalities including CT, MRI, PET-CT of the pathologically confirmed desmoid tumors.

MATERIALS AND METHODS: This study included pathologically confirmed 26 desmoid tumors, evaluated with at least one imaging modality among CT, MRI, and PET-CT. There were 10 men and 16 women (mean, 45.42 years; 20–80). With review of medical record, the histories of familial adenomatous polyposis (FAP), colon cancer, and prior surgical operation were checked. Two radiologists reviewed the images of desmoid tumors in regard to shape, multiplicity, size, location, the degree of enhancement, the presence or absence of calcification or hemorrhage and the signal intensity (SI) on MR T1- and T2-weighted images. ADC value on ADC map and standardized uptake value (SUVMax) on PET-CT image of the tumors were measured.

RESULTS: Radiologists reviewed 23 CT, 11 MRI and 8 PET-CT images. Six patients underwent diffusion-weighted image (DWI). The mean size of tumors was 6.9 ± 5.25 cm. The location of tumor was divided into peritoneal cavity (14), abdominal wall (8) and extraabdominal regions (5, chest wall, neck, axilla and shoulder). Four patients were related to FAP and the others were sporadic desmoid tumors. Eleven patients had prior operation history. Tumor shape classified into mass-like (17), infiltrative (4) and combined shape (5). Four patients showed multiplicity. Twenty one showed homogeneous enhancement and 5 showed heterogeneous enhancement. Two showed calcifications and two showed hemorrhage within the tumor. On MRI, all showed low SI on T1-weighted images but, various SI on T2-weighted images (1 low, 4 intermediate, 4 high). All appeared hyperintense on DWI and intermediate to high signal intensity on apparent diffusion coefficient (ADC) map. The mean ADC value of the tumors is about 1.508 ± 0.18 × 10⁻³ mm²/s.

On PET-CT, all tumors showed intermediate SUV uptake (mean, 3.7 ± 0.72).

CONCLUSION: Most of desmoid tumors showed relative homogeneous enhancement and characteristic whirling pattern on T2-weighted images. However, infiltrative growth pattern and atypical features were also observed. Apparent high SI with high ADC value on ADC map and intermediate SUV uptake on PET-CT are helpful for differential diagnosis.

SE 15 OT-14
Skin temperature alarm module based on MR temperature in MR-guided focused ultrasound surgery (MRgFUS)
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PURPOSE: Magnetic resonance-guided focused ultrasound surgery (MRgFUS) is a non-invasive treatment of fusion technologies: focused ultrasound of temperature sufficient to achieve tissue ablation and magnetic resonance imaging (MRI) of image-guidance and on-line thermometric imaging. This real-time temperature map provides can therapeutic effect as well as possible MRgFUS-related thermal complication. However, in current MRgFUS system, there is no real-time alarm system of abnormal high temperature region or pixel during the MRgFUS. The objectives are (1) to introduce a skin temperature alarm module based on MR temperature in MRgFUS and (2) to evaluate the practical feasibility in the simulation of the MRgFUS.

MATERIALS AND METHODS: The module is working in real-time during MRgFUS. This module detects any hot pixel (i.e., in case of any pixel with high temperature) around the skin line. An open-source macro program was applied to the design for this alarm module for temperature-related complication in MRgFUS system. The software was performed according to the flowchart below: (1) detection of the skin line which should be protected from abnormal temperature, (2) real-time monitoring during the sonication of MRgFUS, (3) selection of a significant high temperature pixel, and (4) warning pop-up window on operation system in case of a significant high temperature pixel. The principal processes are worked as flowchart (Figure). To evaluate the practical feasibility, this module was run in the MRgFUS simulator in 10 sessions of 10 temperature maps of MRgFUS.

RESULTS: This program successfully acts as assistant software for the MRgFUS, and performed well on the MRgFUS simulator. An MRgFUS operator was warned if any hot pixel would be seen around the skin line. The detection accuracy was 100% in the 10 temperature maps.

CONCLUSION: A real-time skin temperature alarm module is helpful during MRgFUS, and could be utilized for prevention of possible complication of MRgFUS.
How reliable is the radiogenomic analysis?:
impact of image segmentation technique
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PURPOSE: Objective and reliable quantification of imaging phenotype is an essential part of radiogenomic studies. We compared the reproducibility of two semi-automatic segmentation methods for quantitative image phenotyping in magnetic resonance imaging (MRI) of glioblastoma multiforme (GBM).

MATERIALS AND METHODS: MRI examinations with T1 post-gadolinium and FLAIR sequences of 10 GBM patients were downloaded from the Cancer Image Archive site. Two semi-automatic segmentation tools with different algorithms (deformable model and grow cut method) were used to segment contrast enhancement, necrosis and edema regions by two independent observers. A total of 21 imaging features consisting of area and edge groups were extracted automatically from the segmented tumor. The inter-observer variability and coefficient of variation (COV) were calculated to evaluate the reproducibility.

RESULTS: Inter-observer correlations and coefficient of variation of imaging features with the deformable model ranged from 0.953 to 0.999 and 2.1% to 9.2%, respectively, and the grow cut method ranged from 0.799 to 0.976 and 3.5% to 26.6%, respectively. Coefficient of variation for especially important features which were previously reported as predictive of patient survival were: 3.4% with deformable model and 7.4% with grow cut method for the proportion of contrast enhanced tumor region; 5.5% with deformable model and 25.7% with grow cut method for the proportion of necrosis; and 2.1% with deformable model and 4.4% with grow cut method for edge sharpness of tumor on CE-T1W1.

CONCLUSION: Comparison of two semi-automated tumor segmentation techniques shows reliable image feature extraction for radiogenomic analysis of GBM patients with multiparametric brain MRI.