

ISSN 2322-5718

Official Journal of Asia
Oceania Federation of
Nuclear Medicine and Biology

Asia Oceania Journal of Nuclear Medicine & Biology



Vol 4. Suppl 1. July 2016

Abstracts

15th Annual General Meeting of ARCCNM, Shenyang, China

Asia Oceania Journal of Nuclear Medicine & Biology
Official Journal of Asia Oceania Federation of Nuclear Medicine & Biology (AOFNMB)

Volume 4 Supplement 1 July 2016

Abstracts of

15th Annual General Meeting of ARCCNM

7th CJK Conference on Nuclear Medicine

July 15th, 2016

Shenyang, China

The abstracts published in this Supplement were not subject to the standard peer reviewing process of *Asia Oceania Journal of Nuclear Medicine & Biology*

Asia Oceania Journal of Nuclear Medicine & Biology

Official Journal of Asia Oceania Federation of Nuclear Medicine & Biology (AOFNMB)

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ISSN (print edition) 2322-5718
ISSN (electronic edition) 2322-5726

Abstracted and indexed in: DOAJ, EBSCO, Index Copernicus, ISC, IMEMR, Magiran

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Secretary: Ms.Nahid Jalalian
Asia Oceania Journal of Nuclear Medicine & Biology
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O_01

The Value of Cingulate Island Sign on Tc-99m ECD brain SPECT for Discriminating Dementia with Lewy Bodies and Alzheimer's disease

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Objective: Previous study had shown that relatively preserved metabolism of the mid or posterior cingulate gyrus (cingulate island sign; CIS) on FDG-PET was helpful for discriminating Dementia with Lewy bodies (DLB) and Alzheimer's disease (AD). However, it is still unknown whether CIS could be applied on SPECT. The purpose of this study aimed to evaluate the diagnostic value of CIS with Tc-99m ECD SPECT.

Methods: Seven patients with a clinical diagnosis of DLB and 8 with AD were enrolled for ECD SPECT. CIS was defined as preserved perfusion in mid or posterior cingulate gyrus on SPECT images. In addition, SPECT images were also analyzed by easy z-score imaging system for detecting occipital hypoperfusion (OH).

Results: CIS was noted in 6 of 7 DLB and 1 of 8 AD patients. OH was noted in 5 of 7 DLB and 1 of AD patients. The sensitivity, specificity and accuracy for diagnosing DLB were 86%, 88% and 87% for CIS; and were 71%, 88% and 80% for OH.

Conclusion: CIS seemed to be a promising marker for discriminating DLB and AD on ECD SPECT. Further study with larger patient populations should be warranted for confirming its diagnostic value.

O_02

Radiolabeling and characterization of cysteine and its derivatives with ^{99m}Tc and study its bio - distribution.

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Objective: Several studies are available, which highlight

the use of Schiff based as ligands for radio-labeling, but very little work has been reported with Marcepto compounds. It is desirable to include such compounds in the design of radiopharmaceuticals due to their importance in the biological system.

Methods: Equimolar L - cysteine and salicylaldehyde in distilled water and ethanol were heated to form a white colored ligand. The product formed was analyzed using FT – IR, thermo gravimetric analysis and elemental analysis. Radiolabeling of the ligand was performed using ^{99m}Tc from ⁹⁹Mo generator. SnCl₂.H₂O was used as a reducing agent. Radio TLC was performed using SG plates, 0.9% NaCl and acetone as the mobile phases. Geiger Muller counter detected the counts on the SG plates. After quality control the radiolabeled drug was injected IV into the animal ear. Scanning was performed under the gamma camera.

Results: Ligand synthesis was verified from IR indicating the presence of the closed ring structure Thiazolidine ring¹. IR showed absence of chromophore group hence the ligand was colorless. DSC peaks indicated the reaction type as endothermic. Ligand appeared to be stable in DMSO.

Effective radiolabeling was achieved using lyophilized tin chloride pyrophosphate cold kit in NaCl (0.9%). Optimization of pH, temperature and radioactivity was done using DOE. Maximum radiolabeling was achieved at pH 5. Animal study was performed for bio distribution of the radiopharmaceutical. ^{99m}Tc – ligand uptake was seen in the soft organs immediately after injection. The areas showing higher radiotracer uptake were kidney (20 %), liver (35 %), bones (15%) and brain (10 %). Delayed images showed the radiotracer retention in the soft organs as well as in the spine of the animals. Comparative study was performed using ^{99m}Tc – MDP and ^{99m}Tc PHYTATE.

Conclusion: Salicylaldicysteine is efficiently labeled with ^{99m}Tc and is suitable in simultaneous scanning of liver, kidney and brain. Due to uptake in all soft organs in dynamic flow followed with delay images, radiotracer retention in the brain is worth consideration. This indicates the ability of drug in crossing the blood brain barrier. This study also highlights the importance of sulfur containing ligands in brain scanning.

O_03

Diagnostic performance of ^{99m}Tc-MDM brain SPECT in Glioma: A cost effective substitute for PET Imaging for diagnostic workup of residual/recurrent glioma.

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Objective: To evaluate the diagnostic utility of bis-methionine-DTPA (^{99m}Tc-MDM) and its comparative evaluation with ceMRI and ¹⁸F-FLT-PET for the detection of recurrent/residual glioma.

Methods: This prospective study included 53 patients (34 M: 19 F, mean age=42.3±15.03yrs; range=8-72 y) having post-operative clinical suspicion of recurrent/residual glioma (34-Glioblastoma Multiforme-G-IV; 07-Astrocytoma/Oligodendrogloma-G-I/G-II; 08-Anaplastic Oligodendrogloma/Oligoastrocytoma-G-III; 04-Pilocytic astrocytoma-G-I) referred for ^{99m}Tc-MDM-SPECT and ceMRI at PGIMER, Chandigarh. ^{99m}Tc-MDM-SPECT and ceMRI was done in (41/53) patients after radical radiotherapy (RT) (54.0-60.0 Gy) with or without concurrent temozolamide and one patient was followed at 3-months. Sixteen (16/53) patients underwent F-18-FLT-PET and 2 underwent C-11-methionine PET. Twelve (12/53) patients underwent ^{99m}Tc-MDM-SPECT and ceMRI before RT and in which three patients underwent follow-up ^{99m}Tc-MDM-SPECT and ceMRI.

Results: The mean radio labeling efficiency of ^{99m}Tc labeled MDM was reserved to be 96.7± 1.6 % (n=64). MDM SPECT and ceMRI finding were concordant in 48 scans (25 positive & 23 negative). The findings were discordant in the remaining 9 patients, with positive ceMRI & negative MDM-SPECT in 5-scans and negative ceMRI & positive MDM-SPECT in 4-scans respectively. ^{99m}Tc-MDM-SPECT showed overall sensitivity, specificity, PPV, NPV and DA of 83.33% 85.19%, 86.21%, 82.14% & 84.2% respectively for the detection of recurrent/residual glioma.

Conclusion: The diagnostic utility of ^{99m}Tc-MDM-SPECT imaging was comparable with that of ceMRI and ¹⁸F-FLT-PET. The development of amino-acid based 'SPECT' radiotracers may offer an economical and reliable substitute to PET imaging which could be of special interest in peripheral hospitals/developing countries not having access to expensive PET/cyclotron technology.

O_04

Adenine nucleotide translocase2 as a novel molecular determinant of ¹⁸F-FDG accumulation in various cancer cells

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Objectives: Although the roles of GLUT-1 and HKII for FDG uptake in cancer have been associated, the molecular mechanisms that determine FDG uptake are not poorly understood. Adenine nucleotide translocase2 (ANT2) imports glycolytic ATP into mitochondria and was shown to be associated with glycolytic metabolisms. We investigated the association of FDG uptake with ANT2 expression in various cancer cell lines.

Methods: Human thyroid, brain, liver, prostate, and breast cancer cell lines were used. GLUT-1, HKII, and ANT2 expressions were measured by RT-PCR and western blot. ANT2 siRNAs and pcDNA3.1-ANT2 vectors were used to modify ANT2 expression. A gamma counter was used for measuring FDG uptake. Luciferase-expressing cells were subcutaneously grafted in BALB/c nude mice, and siRNA was directly injected into the tumors. PET and bioluminescent imaging were obtained. Immunostaining of GLUT-1, HKII, and ANT2 were performed in xenograft tumors.

Results: In each sets of various cancer cell lines, ANT2 expression was very well correlated with FDG uptake followed by GLUT-1 and HKII. Down-regulated cells treated with ANT2 siRNA decreased FDG uptake by 0.55-fold. On the contrary, up-regulated cells treated with pcDNA3.1-ANT2 increased FDG uptake by 1.7-fold. In the xenograft models, FDG PET images showed decreased FDG uptake by 0.75-fold after ANT2 siRNA injection. Immunostaining of tumor injected ANT2 siRNA confirmed decreased ANT2 expression without any changes of GLUT-1 and HKII expressions.

Conclusion: We showed that ANT2 expression correlated with FDG uptake in the various cancer cell lines. ANT2 can be used as a novel determinant for FDG PET positive tumors.

O_05

Monoclonal antibody conjugated magnetic nanoparticles could target MUC-1 positive cells in vitro but not in vivo

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Objectives: MUC1 antigen is recognized as a high-molecular-weight glycoprotein that is unexpectedly over-expressed in human breast and other carcinomas. In contrast, C595 a monoclonal antibody (mAb) against the protein core of human urinary epithelial mucin is commonly expressed in breast carcinomas. The aim of this study is to conjugate ultrasmall superparamagnetic iron oxide nanoparticles (USPIO) with C595 mAb, in order to detect *in vivo* MUC1 expression.

Methods: A dual contrast agent (the C595 antibody conjugated-USPIO and labeled with ^{99m}Tc) was prepared for targeted imaging and therapy of anti-MUC1-expressing cancers. The C595 antibody conjugated-USPIO had good stability and reactivity in the presence of blood plasma at 37°C.

Results: No significant differences were observed in immunoreactivity results between conjugated and non-conjugated nanoparticles. The T1 and T2 measurements show more than 79% and 29% increments (for 0.02 mg/ml iron concentrations) in T1 and T2 values for USPIO-C595 in comparison with USPIO, respectively.

Conclusion: The nanoprobe showed interesting targeting capability to find the MUC1 positive cell line *in vitro*. However, we found disappointing *in vivo* results (i.e. very low accumulation of nanoprobe in the targeted site while more than 80% ID/g were taken up by liver and spleen), not only due to the coverage of targeting site by protein corona but also because absorption of opsonin based proteins at the surface of nanoprobe.

Department of Nuclear Medicine The First Hospital of China Medical University, Shenyang, China

Objective: To evaluate ^{99m}Tc -MDP SPECT/CT image and planar scintigraphy in assessing indeterminate lesion in diagnosis of bone metastasis and conclude the best way to use SPECT/CT image to improve the diagnostic efficiency.

Methods: 105 patients with malignant history were enrolled in this study who had been found indeterminate lesions in the planar scintigraphy and underwent SPECT/CT image to this lesion. Two experienced nuclear medicine physicians independently interpreted both methods' image. It was used Rank sum test to compare the number of lesions. It was used χ^2 -test to compare the accordance rate of lesion and the lesion of different bone in the two methods.

Results: Difference in the number of lesions(802 vs 609), the accordance rate of benign(89.29 % vs 76.76 %), the accordance rate of bone metastases(86.50 % vs 57.99 %), the accordance rate of lesions(88.15 % vs 68.47 %), in the accordance rate of lesions on rib(86.31 % vs 62.10 %), thoracic(92.21 % vs 68.36 %), pelvic(90.97 % vs 66.67 %), in the accordance rate of multiple lesions group(87.96 % vs 68.75 %) and less lesions group(81.91 % vs 47.50 %) between SPECT/CT imaging and planar was statistically significant.

Conclusion: SPECT/CT image can increase the detectable amount of lesions, the detectable amount of rib and thoracic were increased more significantly. It can increase the accuracy diagnostic rate of the lesion on rib, thoracic and pelvic. Chest is the priority place to undergo SPECT/CT image when we don't have enough time.

O_07

A New method in production of Macroaggregated Albumin (MAA) Kit

Farzad Farajbakhsh Mamaghani*, Meysam Karamivand, Mohammad Reza Davarpanah, Hossein Abbasi

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Objective: Human albumin macroaggregates (MAA) labelled with ^{99m}Tc is a radiopharmaceutical widely used for the diagnosis of lung diseases. Usually, after radiolabeling ^{99m}Tc , particles will not carry onequal amounts of technetium-99m causes reduction in diagnosis efficacy. Reason is, the blood flow in the capillaries will preferentially carry the smaller particles, so, the larger particles travel with the slower rates of

O_06

Comparative study of ^{99m}Tc -MDP SPECT/CT image and planar scintigraphy in assessing indeterminate lesion in diagnosis of bone metastasis

Haoran Hong, Yaming Li

speed. This results in a non-uniform distribution of the technetium-99m which influences the scintigraphic reading of the condition of capillaries and tissues. It is, therefore, important to produce macroaggregated particles of essentially uniform size so that the radiolabeled particles will be evenly distributed in the capillaries and tissues and give a reliable reading of maximum diagnostic efficacy on the condition of the pulmonary system. In PARS ISOTOPE Co. a new method is found to overcome this problem.

Methods: The new method consists of 5 dedicated steps as below:

- 1) Purification of Human Serum Albumin by 30000MWCO filter
- 2) Aggregate Formation in 80 °C
- 3) Screening and Sizing; and add Tween 80 surfactant
- 4) lyophilization
- 5) Radiolabeling

Results: Specifications of the product obtained by this process were:

Number of particles/vial: 2 to 4 million, Mean particle size: 25 ± 5 microns, Radiochemical purity: >95%, Labeled Tc-99m MAA, at 10 minutes after injection, shows the following uptake in mice: Lungs:>95%, Liver : <1%, Kidneys:<1%

Conclusion: Pars-TCK1800 (MAA Kit) which produced by this method, has identical particle size, uniform distribution in the lungs and shelf-life of 12 months.

O_08

Value of ¹⁸F-FDG PET in the assessment of myocardial viability in patients with coronary artery disease

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Objective: the aim of this study was to determine the amount of viable myocardium is necessary in the ability of recovery of LV function among patients with coronary disease and LV dysfunction.

Methods: total 30 patients with diagnosis of CAD underwent to SPECT myocardial perfusion and FDG-PET scan for viability's assessment. Patients have been followed up EF% after 1 month, 6 months and 12 months.

Results: 66,7% of 30 patients had viable myocardium (mismatch) and underwent to revascularization. The percent of hibernating myocardium in large and moderate were 80% while this figure of small one is 20%. The improvement of EF% was significant after 6 months between groups of medical therapy and

revascularization. The EF% change was related to the amount of hibernating myocardium.

Conclusion: in patients with CAD and EF dysfunction, the amount of viable myocardium dictates the improvement in left ventricular function after revascularization.

Keywords: FDG PET, SPECT, viability, Coronary artery disease, Revascularization

O_09

Tc-99m MDP BONE SPECT IN DIAGNOSIS OF MENISCAL TEARS

Muhammad Khalid Bosan

Nuclear Medicine PAEC PAKISTAN

Objective: The study was designed to observe the role of SPECT bone imaging for the detection of meniscal tears.

Methods: This study was conducted at NORI hospital Islamabad in collaboration of Radiology and Orthopedic departments of leading hospitals of Islamabad and Rawalpindi. Radionuclide SPECT bone imaging with Tc-99m MDP was done on knees of 35 patients with suspected meniscal injuries. After SPECT scanning M.R.I of the patients were done and later on arthroscopies as it is the gold standard for diagnosis of meniscal injuries.

Results: The results of SPECT scanning were comparable to M.R.I imaging in diagnosis of meniscal tears. The sensitivity was 88% for SPECT scanning, 80% for M.R.I in diagnosis of meniscal tears on the basis of arthroscopy results. Specificity for M.R.I and SPECT was similar for both diagnostic modalities. However SPECT scanning was found to be 80.6% accurate and M.R.I was 74.2% accurate for diagnosis of meniscal tears. The Fischer's Exact Test was applied to compare the results of M.R.I with arthroscopy. P-value <0.05 was considered as significant.

Conclusion: There was insignificant difference between the results of M.R.I and arthroscopy and SPECT and arthroscopy as the P-value was .161 and .069 respectively. So the overall results revealed that SPECT scanning can be very useful in diagnosis of meniscal tears.

O_10

Unreported Renogram Pattern: Delayed accumulation segment. Report of four Cases

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Objective: We report four Diuretic Renogram Cases with previously unreported pattern in the second phase of the renogram along with the discussion. The uptake pattern was dependent on the type of region of interest for the computer generated renogram curve.

Methods: GE double headed gamma camera with Tc-99m MAG3 was used along with Lasix.

Results and Conclusion: The four cases under discussion show an unreported Renogram pattern that is explained in the light of recent literature.

O_11

Comparison of F-15 and F+10 diuretic renography findings in patients with hydronephrosis and analysis of factors influencing the findings: experience at our institute

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Objective: We compare the outcomes of two different diuretic protocols for renograms (F+10 and F-15) in patients with hydronephrosis and correlated them with operative findings.

Methods: Between March 2015 and March 2016, 1096 diuretic renograms were performed to evaluate unilateral grade 3–4 hydronephrosis (reflux, posterior urethral valves, post-pyeloplasty status excluded). All patients underwent F + 10 diuretic renography. Out of 1096 scan performed 22 patients had scans with equivocal findings for obstruction on F+10 scintigraphy and were subjected to F-15 scintigraphy.

Results: F-15 renogram was conclusive in 12 out of 22 equivocal scans. The number of interrupted studies was significantly less in F-15 scans. Relative function did not effect the inference on drainage. The function was preserved in most of the kidneys with equivocal findings on both the protocols. However most of these kidneys had grade III hydronephrosis on ultrasonogram.

Conclusion: The F-15 protocols are superior to the F + 10 protocol in reducing the number of equivocal curves, and reducing artifacts due to patient movement or voiding. F-15 study failed to provide conclusive results in patients with grade III hydronephrosis despite preserved function and cortical thickness.

O_12

Clinical significance of dual time point ¹⁸F-FDG PET/CT for the staging of esophageal cancer

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Objective: Clinical staging is critical issue for the treatment of esophageal cancer. ¹⁸F-FDG PET/CT is widely used for the staging of esophageal cancer. However, its relative low sensitivity to detect regional lymph node metastasis is one of the limitations. The purpose of this study is to investigate the diagnostic ability of dual time point ¹⁸F-FDG PET/CT to detect lymph node metastasis.

Methods: A total of 44 patients with pathologically confirmed esophageal squamous cell carcinoma were enrolled, sequentially. Dual time point ¹⁸F-FDG PET/CT (scan interval of initial and delayed scan; 60 min) was performed in all patients, pre-operatively. We obtained semi-quantitative parameters of the main mass and regional lymph nodal stations in both initial and delayed scans: SUV_{max}, SUV_{peak} in both time points, Retention index using SUV_{max} (RI_{max}), SUV_{peak} (RI_{peak}). Node metastases were confirmed on postoperative pathology. ROC curve analysis was done to evaluate the diagnostic performance and cut-off of those semi-quantitative parameters.

Results: For the total 44 esophageal lesions, no parameters showed significant difference according to the location or grade of the tumors (P=ns). For nodal (N) staging, total 257 nodal station of 28 patients who underwent surgical treatment without neoadjuvant chemotherapy were analyzed. Using ROC analysis, RI_{max} had the largest area under the curve (AUC) to detect metastatic lymphadenopathy (AUC 0.816, P<0.01), compared to AUC's of the conventional parameters and RI_{peak}. In subgroup analysis with 230 nodal station of non-calcified nodes, RI_{max} had the best power to detect node metastasis (AUC 0.810, cutoff value 0.06, P<0.001). By dual time point ¹⁸F-FDG PET/CT, N staging changed in the ten patients. At the optimal threshold, sensitivity and specificity was 78.9% and 91.9%, respectively.

Conclusion: Dual time point ¹⁸F-FDG PET/CT can improve N staging of esophageal cancer. Best diagnostic performance was achieved by exception of calcified lymph node with benign character.

O_13**Feasibility of Gene-transferred Glucagon-like Peptide 1 Receptor Gene as a Novel Radionuclide Reporter Gene for Molecular Imaging**

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Objective: The radiolabelled ligands of Glucagon-like peptide 1 receptor (GLP-1R) have been used to image the GLP-1R highly-expressing normal or abnormal tissues. Here, we firstly put forward the idea of utilizing GLP-1R gene as a novel reporter gene for broader application.

Methods: The human GLP-1R gene or enhanced green fluorescent protein (eGFP) gene were constructed into hybrid baculovirus-adeno-associated viral vectors (named BIGV or BlEV respectively). Human umbilical cord blood-derived mesenchymal stem cells (hUCB-MSCs) were infected with BlEV, then the infection efficiency were determined by flow cytometry, and the cytotoxicity was tested by CCK-8 assay. The BIGV-mediated GLP-1R expression level in hUCB-MSCs was compared with the insulinoma cells, and the receptor-ligand binding characteristics were detected by fluorescein-trp²⁵-exendin-4 (FLEX) combination. Furthermore, the BIGV-infected hUCB-MSCs were transplanted into nude mice and then imaged by micro-PET.

Results: Flow cytometry showed BlEV infection efficiency on hUCB-MSCs was up to $95.60 \pm 0.35\%$, and there was no obvious cytotoxicity. Real-time PCR revealed that BIGV-mediated GLP-1R expression level in hUCB-MSCs was about 6 or 10-fold higher than two insulinoma cell types. Moreover, the micro-PET imaging showed that the BIGV-infected hUCB-MSCs were clearly imaged after [¹⁸F]AlF-NOTA-MAL-Cys³⁹-exendin-4 administration with an excellent target-to-background ratio. In addition, several rodent endogenous GLP-1R expressing tissues like lung and pancreas were clearly imaged as well.

Conclusion: This study firstly introduced the gene-transferred GLP-1R gene as a novel radionuclide reporter gene, and proved its distinctive advantages and tremendous potential of being ideal and broadly accepted radionuclide reporter gene in molecular imaging.

O_14**The study of $\alpha_4\beta_2$ nAChRs mechanism of nicotine attenuating ischemic cognitive impairment in rats**

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Objective: The study investigated whether nicotine administration attenuated endothelin-1-induced ischemic cognitive deficits and explored potential $\alpha_4\beta_2$ nAChRs mechanism.

Methods: Sprague-Dawley rats were administrated endothelin-1 in thalamus. Then nicotine (0.5, 2, or 6mg/kg/d, s.c) or saline were administrated after the surgery in the treatment group and ischemia group. The control group were administrated the same dose saline. The Morris Water Maze was performed in the fourth day. 2-[¹⁸F]-A-85380MicroPET imaging was performed on the following day.

Results: The escape latency of all the groups were more and more shorten with the increase of experimental days in Morris water maze, the difference of escape latency between ischemia group and treatment group 1, 2 were significant, while compared with treatment group3, there was no statistically significant. The difference of the times of crossing the platform quadrant and the percentage of time exploring the platform quadrant between ischemia group and treatment group 1, treatment group 2 were significant. In microPET imaging, $SUV_{ave\ left\ thalamus}/SUV_{ave\ cerebellum}$, $SUV_{ave\ frontal\ cortex}/SUV_{ave\ cerebellum}$, $SUV_{ave\ whole\ brain}/SUV_{ave\ cerebellum}$ and the percentage reduction of $\alpha_4\beta_2$ nAChRs in left thalamus have significant between ischemia group and all the treatment groups.

Conclusion: Nicotine would attenuate ischemic memory deficits, which due to the up-regulation of $\alpha_4\beta_2$ nAChRs density in frontal cortex and thalamus.

P_01**An Semi-liquid Imaging Analysis of Gastric Emptying in Adult Diabetics**

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Objective: Diabetes can cause autonomic disorders of the gastrointestinal tract and gastroparesis, so it is of great important to pay more attention to gastric emptying in diabetic patients. Gastric emptying scintigraphy is the gold standard for measuring gastric emptying. This research was to explore the relationship between food and half-time gastric emptying with the method of semi-liquid imaging study.

Methods: A retrospective analysis was carried on four diabetic patients with delayed gastric emptying from October 2015 to December 4, aged 20 to 40 years old and had a history of diabetes over five years. Three cases mixed ^{99m}Tc -DPTA (2 mCi ~ 3 mCi) with 500 ml yogurt mix, one mixed in a mixture of protein flour (300 g) and water (300 ml). Patients kept a fast from last night, sat and perched on the probe at the time of acquisition. Dynamic acquisition continued 40 minutes including imaging from the mouth to the gastropyloric. Started the collection and oral administrated the semi-liquid food mixed with drugs, then drank water (about 500 ml) immediately in order to fill the stomach to reach two-thirds. Use First Derivative to speculate gastric emptying time.

Results: Patients taking yogurt mixed meal finished in 1 minute, and patient taking protein mixed meal finished in three minutes. Half-time of 3 patients taking stomach yogurt mixed meal were 35, 37, 48 min respectively and that of patient with stomach taking protein mixed meal half time was 38 min after calculated by built-in formula

Conclusion: gastric emptying imaging in patients with diabetic showed that the average half-time of semi-liquid meal was 39.5 min. There was no significant difference between the half-time of these two semi-liquids gastric emptying. There were several advantages perched sitting imaging. First, the back can be supported by the probe to ensure long time examination. However, the spine will block part of the count theoretically. Second, it can avoid the risk of pollution probe when eating if faced the probe or partial scan missing. Third, sitting imaging is in line with the human physiological gastric emptying and it avoids the risk of shake and fall. The probe angle can be adjusted in order to obtain a good imaging position when necessary. 40 min dynamic imaging avoids delayed imaging errors caused by postural changes, and saves inspection time. The rate of gastric emptying is related to the pressure difference on both sides of the pylorus. First derivative will be able to speculate stomach half-time relying on effective 30 minutes data. Although protein mixed meal is more suitable

for semi-liquid diet, yogurt mixed meal has a sample preparation and convenient eating and easier measuring of image gastric emptying peak on gastric emptying. It is recommended to use a yogurt mixture in nuclear medicine stomach empty semi-liquid measurement in clinic.

P_02**Evaluation of scatter and 2 attenuation corrections using an originally designed 3D striatal phantom with 3D printer for quantitative brain dopamine transporter SPECT**

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Objective: We evaluated with and w/o scatter correction (SC) and attenuation correction (AC) for quantitative brain SPECT.

Methods: SPECT imaging of an originally designed 3D striatal (ST) phantom covered with artificial skull was performed using a triple-head camera with and w/o SC and 2 AC. It has isolated bilateral caudate nucleus (CN), putamen (PU) and brain shell cavity (background:BG). Each compartment was filled with ^{123}I to obtain different ratios of ST (CN+PU) to BG : right CN; 4.3, right PU; 4.3, left CN; 3.0, left PU; 1.0 to BG; 1.0, respectively. Triple energy window (TEW) method was used as SC. SPECT images were reconstructed with three conditions:(1) without SC and AC, (2) with SC and filtered back projection (FBP) with Chang's AC, (3) with SC and FBP with AC using an CT image (CTAC). Fused CT based bilateral 3D ROIs were set in ST. SPECT-measured ratios of ST-to-BG counts were determined with and w/o SC and 2 AC and were then compared with the true ratios in RT and LT sides, respectively.

Results: W/o SC and AC, measured ST-to-BG ratios were underestimated by 28.3%(RT) and 39.8%(LT) due to effects of scatter and attenuation. SC and FBP with Chang's AC underestimated the ratios by 9.0%(RT) and 9.4%(LT) due to skull attenuation showing a significant improvement. SC and FBP with CTAC correction, the ratios were nearly identical to true ratios in RT and LT sides.

Conclusion: SC and CTAC significantly improves the ST-to BG ratios.

P_03

¹⁸Fluorodeoxyglucose Positron Emission Tomography/Computer Tomography (¹⁸F-FDG PET/CT) for extranodal non Hodgkin lymphoma in staging and treatment response assessment

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Objective: the aim of our study to investigate the role of ¹⁸F-FDG PET/CT for extranodal lymphoma non Hodgkin in staging and treatment response's assessment.

Methods: In our center, a total of 38 consecutive B-cell non- Hodgkin extranodal lymphoma patients were newly diagnosed between December 2013 to January 2016. All these patients were undergone ¹⁸F-FDG PET/CT scan before treatment, after 3- cycle and 6-cycle chemotherapy. The assessment criteria were followed by modified Ann Arbor for staging and Lugano 2015 for treatment response.

Results: there were 13,2% of patients in stage IE, 7,9% in stage II3, 21,1% in stage IIIE and 47,9% in stage IV. According to PET/CT staging, 56,2% of patients were upstaging in comparision to CT and 26,3% of patients have been changed in treatment's stratergies. Kappa statistics revealed that CT and PET/CT showed fair agreement for the detection of extranodal lymphoma. After 6-cycle chemotherapy, 26/38 patients had no evidence of residuals or relapse and 7/38 patients showed partial response and 5/38 patients was in advanced diseases on PET/CT imaging. The positive and negative PET/CT after 3 cylces chemotherapy may predicted the treatment's response after 6 cylces (p=0.4).

Conclusion: ¹⁸F-FDG PET/CT has higher value than CT for staging and important role in assessment of treatment's response of extranodal lymphoma non Hodgkin patients.

Keywords: non - Hodgkin lymphoma, Positron Emission Tomography/Computed Tomography, treatment response assessment.

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Introduction: Giant cavernous hemangiomas are relatively uncommon non-neoplastic vascular lesions of the liver, which can be strikingly large and mimic tumours. Some of the literature defines as a size >4 cm but others >6 or even >10 cm. Either way, they are examples of atypical hepatic haemangiomas. Giant hepatic venous malformations may contain areas of central necrosis, haemorrhage, peripheral calcification, fibrosis and thrombosis, resulting in heterogeneous appearance on ^{99m}Tc RBC scan as well as CT scan, showing atypical tracer uptake and contrast enhancement on RBC scan and CT scan respectively.

Kasabach Merrit syndrome is a complication of Giant cavernous hemangiomas which can be defined as consumptive coagulopathy causing thrombosis in the vascular lesion leading to thrombocytopenia. Once this complication occurs the hemangioma doesnot show uptake on RBC scan and doesnot show any enhancement on CT scan.

Objective: To establish the diagnosis of Giant cavernous liver hemangioma making use of tracer distribution pattern on RBC labeled scan and correlating it with the enhancement pattern of Triple phase CT scan and to establish the cause of thrombocytopenia by delineating the presence of thrombosed segments and involved liver percentage.

Method: 17 patients of Giant cavernous hemangioma were investigated in a period of 2 years who had thrombocytopenia. Triple phase CT scan of Abdomen was performed after initial assessment with ultrasound and about a week later all patients were evaluated with TC 99m RBC labeled scan.

Results: Out of 17 patients evaluated for the presence of Giant liver hemangiomas, all had hepatomegaly, 10 had the entire right lobe of liver involved and 7 had segment 5-8 involved. The diagnosis of Kasabach Merritt syndrome was established in 15 patients who had clinically diagnosed thrombocytopenia. 6 patients had hepatic arterial embolization, 7 patients had radiofrequency ablation of the enhancing segment, 4 patients died of complications (1 had rupture of hemangioma and 3 died of congestive heart failure). All 17 patients had platelet transfusions after diagnosis was established.

Conclusion: ^{99m}Tc RBC labeled scan correlated with Triple phase CT scan is an invaluable tool that can be used in the evaluation of Giant cavernous liver hemangiomas and identifying their complications leading to appropriate treatment decisions avoiding life threatening complications.

P_04

Role of ^{99m}Tc RBC labeled study and its correlation with Triple phase CT scan in diagnosis and evaluation of Giant cavernous liver hemangiomas and Kasabach Merritt syndrome

Ghazal Jameel, Yasir Sadaat, Zainab Zahur, Muhammad Ilyas

P_05**Inverse agonist of estrogen-related receptor gamma (ERR γ) enhances sodium iodide symporter function via mitogen-activated protein kinase signaling in papillary thyroid cancer cells**

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Objectives: Previously, we have reported that inverse agonist of estrogen-related receptor gamma (ERR γ) enhance the NIS function through MAP kinase signaling in anaplastic thyroid cancer cells. Herein, we report the role of ERR γ on the regulation of NIS function in papillary thyroid cancer (PTC) cells using an inverse agonist of ERR γ , GSK5182.

Methods: BCPAP cells were treated with various doses of GSK5182 for 24 h, followed by iodide uptake to determine their NIS function with or without of KClO₄ as a NIS inhibitor. The effects of GSK5182 on mitogen-activated protein (MAP) kinase pathway and NIS protein were evaluated by immunoblot assay. To check whether the MAP kinase pathway is crucial for the GSK5182-induced NIS functional activity, the MAP kinase activity and levels of iodide uptake were determined by the use of selective MEK inhibitors. The key proteins expression level involved in iodine and glucose metabolism were determined. ¹⁸F-FDG uptake was also performed. Finally, the cytotoxic effect of I-131 was determined by clonogenic assay.

Results: Treatment of GSK5182 led to the dose-dependent increase of iodide uptake, which were accompanied by the activation of extracellular signal-regulated kinase (ERK)-1/2. Both the increased iodide uptake and ERK-1/2 activation in GSK5182-treated BCPAP cells were completely inhibited by selective MEK inhibitors. Treatment of GSK5182 resulted in the marked increase of total and membrane NIS protein in BCPAP cells. Furthermore, the protein expression of GLUT1 and GLUT4 were reduced significantly in GSK5182 treated cells and decreased ¹⁸F-FDG uptake level. The results of clonogenic assay with I-131 demonstrated that pre-exposure of GSK5182 led to enhanced cytotoxic effects of

I-131.

Conclusion: We successfully demonstrated that an inverse agonist of ERR γ , GSK5182, enhance the function of NIS protein via up-regulation of the MAP kinase signaling and consequently increase the responsiveness of radioiodine therapy in papillary thyroid cancer cells.

P_06**Construction of Robust radioactive iodine nanoparticle for active targeting and therapy of dedifferentiated thyroid cancer**

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Objective: To observe whether the radioactive iodine labeled BSA nanocapsules has the therapy effect to DTC.

Methods: DTC cell FTC133 incubated into the armbit of nude mice to make tumorigenicity. we explored nBSA and achieved remarkably prolonged circulation of protein in vivo, whose outer layer was decorated by glucose analogs. In vitro immunocyte test was used to detect whether nanocapsules can evade the attacks of internal immune system. ¹²⁵I radiolabeled targeting nanocapsules injected into the dedifferentiated thyroid carcinoma mice via tail vein. We also used SPECT to image the biodistribution of nano-capsules and calculate biological half-life; radioactive nanocapsules of NS group, simple ¹³¹I group, ¹³¹I-nBSA group, ¹³¹I-nBSA-Glu group were injected into the dedifferentiated thyroid carcinoma mice through the tail vein, respectively. Tumor size of each groups were measured every day, meanwhile tumor curves and %ID/g of each organs were recorded everyday. The therapeutic of nanoparticle on dedifferentiated thyroid carcinoma were also assessed.

Results: nBSA was synthesized successfully, and tested through AGE, DLS, zeta potential measurement approaches. In vitro test confirmed that Glu-nBSA nanoparticle targeting synthesized by Glu which based on MPC can evade the immunocyte phagocytosis. Compared to normal saline group, simple ¹³¹I group, ¹³¹I-BSA group, tumors in ¹³¹I-BSA-Glu nanocapsules radioactive targeting groups grow slower, and smaller increasement in volume, with significant statistical differences in vivo experiments ($P<0.01$).

Conclusion: nBSA-Glu was made successfully based on MPC. This targeted radioactive nanocapsules can achieve long circulation in vivo and significantly inhibit the migration and proliferation of the dedifferentiated thyroid cancer.

P_07**Routine production of ^{153}Sm -EDTMP by irradiation of enriched Sm-152 in TRR for pain palliation of metastatic bone cancer**

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Objectives: ^{153}Sm -ethylenediaminetetramethylene phosphonate (EDTMP) has proven to be an effective radiotherapeutic agent in the treatment of metastatic bone cancer due to its selective skeletal uptake high lesion affinity and low toxicity. Routinely ^{153}Sm is produced in a research pool type reactor (Tehran Research Reactor) by irradiation of enriched $^{152}\text{Sm}_2\text{O}_3$ (99.99%) via $^{152}\text{Sm}(\text{n},\gamma)^{153}\text{Sm}$ reaction.

Methods: 5 mg of the target material was dissolved in 1 ml diluted nitric acid (1% V/V). It was then poured inside a quartz ampoule and heated in an oven up to 120-130°C for 4 hours. After the drying process the quartz ampoule was sealed and put into aluminum can then irradiated for 144 hours, at a thermal neutron flux of $4 \cdot 5 \cdot 10^{13} \times \text{n.cm}^{-2} \cdot \text{s}^{-1}$. Irradiated target was dissolved in HC1 0.1 N to obtain chloride form of the product, with a specific activity about 22.2-25.9 GBq (600-700 mCi) $^{153}\text{Sm}/\text{mg Sm}_2\text{O}_3$ and filtered through a 0.22 μm membrane. After filtration, $^{153}\text{SmCl}_3$ solution (4.4-5.55 GBq) was added to EDTMP kit (90-110 mg) in saline solution (pH=7-8). After 1 hour resting period, labeling process completed. The activity concentration in the final radiopharmaceutical solution was 1.48 to 2.22 MBq/ml.

Results: The radiochemical purity was determined by thin layer chromatography, using Whatman III paper and water:methanol:ammonium hydroxide (4:2:0.2) as solvents. The complex runs together with the solvent front ($R_f = 0.8\text{-}1.0$) while the Sm^{3+} remains on the origin ($R_f = 0$). The radiochemical purity was in all cases higher than 97%.

P_08**Use of mean Hounsfield Unit (HU) for detection of hepatocellular carcinomas (HCCs) in ^{18}F -FDG PET-CT: preliminary study**

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Objective: The detection of hepatocellular carcinomas (HCCs) in ^{18}F -FDG PET-CT is sometimes difficult because of the variety of uptake. It has been known that this is due to the degree of differentiation of HCC. We studies the detectability of HCCs considering the mean Hounsfield Unit (HU) as well as SUV_{\max} .

Methods: We retrospectively reviewed 19 patients from January 2014 to December 2015. There were a total of 27 pathology-proven HCCs. All PET, non-contrast CT, and fusion PET-CT images were analysed visually and both SUV_{\max} and HU_{mean} were measured for the areas of suspected abnormality on either PET-CT or CT. Locations of HCCs were confirmed by MRI or enhanced CT. Normal areas were also measured for comparison.

Results: Average SUV_{\max} of 16 HCCs were similar to those of normal liver (3.08 vs. 3.09, $P>0.05$). Other 11 lesions were definitely distinguished from normal liver (SUV_{\max} 9.2 vs. 2.9, $P<0.01$). However, average HU_{mean} was 41 for those 16 HCCs and was 40 for the rest 11 lesions, which showed no statistical difference ($P>0.05$). Total HCCs showed average HU_{mean} of 41 regardless of ^{18}F -FDG uptake. Normal liver showed average HU_{mean} of 57 ($P<0.01$). The ratio of HU_{mean} to SUV_{\max} were 13.4, 4.4, and 18.9 for non-FDG-avid, FDG-avid, and normal liver, respectively. Overall, the $\text{HU}_{\text{mean}}/\text{SUV}_{\max}$ was 7.4 for all HCCs.

Conclusions: In this preliminary study, HU_{mean} of HCCs showed lower values than that of normal liver, therefore, the lower ratio of HU_{mean} to SUV_{\max} without definite FDG uptake might be suspected. Further study is warranted.

P_09**The Selective Internal Radiation Therapy For Liver Cancer With Y-90 Microsphere At Bachmai Hospital**

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Introduction: Selective Internal Radiation Therapy (SIRT) for liver cancer is a method to inject Y-90 labeled resin microsphere into the hepatic arteries supplying the tumor. Cancer cells will be annihilated by irradiation with ionizing radiation emitted from Y-90.

Objectives: 1) To establish and standardize the procedure of SIRT with Y-90 microsphere for liver cancer.

2) To assess initial results of SIRT for liver cancer at the

Nuclear Medicine & Oncology Center, Bach Mai hospital.

Methods: The study was reported in 36 primary or secondary liver cancer patients from December 2013 to December 2015. These patients had been treated with Y-90 microsphere and assessed after every 3 months with mRECIST. Descriptive prospective study and establish a standard procedure of SIRT with Y-90 microsphere for liver cancer.

Results: 1 The procedure of SIRT with Y-90 microsphere for liver cancer has been standardized. Contents of protocol included indications and contraindications; The workflow of procedure: Arteriographic assessment to map tumor-perfusing vessels and assess portal vein patency; SPECT with ^{99m}Tc -MAA to optimize the treatment planning (by dosimetric evaluation) and evaluate hepatopulmonary shunting; inject Y-90 microsphere into the vessels supplying the tumor; SPECT or PET/CT to evaluate the distribution of Y-90 microsphere; Evaluate the outcomes and safety.

2 The initial treatment results of SIRT for primary liver cancer patients: 61,1% of patients had responded with treatment. The average of AFP level reduced from 4660, 3 ng/ml to 248,4 ng/ml; mean tumor size was decreased from 7,2 cm to 4,3 cm. Non seen severe side effect (abdomen pain 16,7%, nausea 8,3%, radiation pneumonitis 2,8%). PFS was $6,36 \pm 1,01$ months and OS was $12,8 \pm 2,02$ months (by Kaplan Meier analysis).

Conclusion: The selective internal radiation therapy with Y-90 microsphere for liver cancer is a new, effective and safe method. The procedure of the technique was standardized and applied routinely for liver cancer treatment at the Nuclear Medicine and Oncology Center, Bach Mai hospital, Vietnam.

Keywords: Y-90 microsphere, liver cancer, Selective Internal Radiation Therapy, SIRT.

likely to receive a dose of radiation exposure.

Methods: Collected 10 early breast cancer patients, all patients before surgery are subcutaneous and intradermal injection of a total of 1.0 mCi ^{99m}Tc -sulfur colloid 0.4 ml were pioneer lymph node surgery examination. TLD film used during a chapter ring and surgical staff to detect radiation torso and hands to accept the exposure dose using TLD film a chapter examining the patient abdomen to detect radiation exposure dose, use GM Geiger Prosecution and surgical detection device assistant, surgical scrub nurse body radiation exposure dose. The average measurement of radiation exposure doses and regulatory acceptance of the annual dose limit cross-references to the relevant staff projections, the operating room staff receiving doses of radiation protection and shall make no disposal.

Results: 1 ^{99m}Tc - sulfur colloid radioisotope medicines, pharmaceutical supplier has stopped production and imports, now the checks have switched ^{99m}Tc - phytate alternative, because both use the same dose, it does not affect the results. 2 Pioneer lymph nodes to check for relevant staff receive an average radiation exposure ratio of: (1) The average radiation exposure surgeons agent was $0.066 \mu\text{Sv}/\text{hr}$ radiation exposure of the hands of the average acceptance rate of $0.032 \mu\text{Sv}/\text{hr}$ (2) surgical assistant, surgical scrub staff somatic average radiation exposure rates were $0.301, 0.179 \mu\text{Sv}/\text{hr}$; (3) patients undergoing its belly for pregnant women fetal radiation exposure dose received an average of $0.082 \mu\text{Sv}/\text{hr}$.

Conclusion: Pioneer radioactive lymph nodes to check for surgery, the operating room staff and surgical patients for pregnant women whose fetuses likely to receive an average radiation exposure rate is far below regulatory limits, so take advantage of this radioactive preparation for breast Pioneer lymph node biopsy is safe and requires no special shielding and radiation protection.

P_10

Radiation safety for pregnant women and workers of Sentinel lymph node biopsy

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Objective: pioneer in the discovery process in the breast lymph node biopsy and surgery, the patients themselves pregnant women and their unborn baby care colleagues

P_11

Occupational Radiation Exposure of radiation workers working in the Department of Nuclear Medicine

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Objective: Occupational radiation exposure cannot be avoided while working in Nuclear Medicine Department. It can be optimized by implementing good

work practices and commitment by the management of the Nuclear Medicine facility. This study assessed the occupational radiation exposure and radiation safety of the employees working in Nuclear Medicine Department in the last ten years at my Institute.

Methods: All employees of Nuclear Medicine department were regularly and individually monitored using TLD and film badges. There are total of 25 employees working in the investigated department these workers include Nuclear Medicine Physicians, Nuclear Medicine Physicists, Nuclear Medicine Technologists , attendants and Radio Pharmacist. The Radiation doses were registered in the period of 2005 to 2015 and analyzed.

Results & Conclusion: Nuclear Medicine Technicians were found to be the largest exposed professional group whereas Radio Pharmacist received the highest annual doses. Some technicians received higher doses compared to others, their work practices were observed and they have been told to adopt procedures to minimize their doses received. The average annual radiation exposure to nuclear medicine physician, technologist, radio pharmacist, Physicist and staff are 1.05, 3.50, 5.12, 2.34 and 1.85 mSv respectively.

There was no case of an exceeded dose limit for any Radiation worker. Furthermore, improvement in work practices, efficient management and advance radiological protection procedures had significant impact on the reduction of doses for most of the employees at Nuclear Medicine Department.

Keywords: Radiation exposure, thermoluminescent dosimeter, radiation protection.

P_12

Correlation of Coronary CT calcium scoring with Technicium labelled sestamibi scan in prediction of future cardiac events

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Introduction: Coronary calcium is a marker for atherosclerosis. The presence and amount of calcium detected in a coronary artery by the CT scan, indicates the presence and amount of atherosclerotic plaque. These calcium deposits appear years before the development of symptomatic heart disease. A calcium score is computed for each of the coronary arteries

based upon the volume and density of calcium deposits. This can be referred to as calcified plaque burden. It does not correspond directly to the percentage of narrowing in the artery but does correlate with the severity of underlying coronary atherosclerosis.

Single-photon emission computed tomography perfusion scintigraphy (SPECT), using ^{99m}Tc-sestamibi, in stress and/or rest protocols, has consistently been shown to be an effective modality for identifying myocardial viability and guiding appropriate management

Objective: To establish the correlation of coronary CT calcium scoring with ^{99m}Tc sestamibi in prediction of future cardiac events

Methods: Total of 51 patients at risk of coronary artery disease were investigated in a period of 2 years who had diabetes and hypertension as major risk factors. CT scan was performed after initial assessment which detected the total calcium score (Agatston) and later all patients underwent ^{99m}Tc-sestamibi scan for ischemia.

Results: In 51 patients 255 coronary arteries were evaluated with CT scan and ^{99m}Tc-sestamibi. All patients had some risk factor for major cardiac event. 13 patients had 0 calcium score with minimal identifiable plaque. Out of them 4 had reversible ischemia on ^{99m}Tc-sestamibi. 21 patients had calcium score of 101 to 400 with moderate atherosclerotic plaque and mild coronary artery disease. ^{99m}Tc-sestamibi scan showed ischemia in 15 patients with normal uptake in 5. 6 patients had major myocardial ischemic event in next 1 year main vessel being left anterior descending artery. 17 patients had calcium score of more than 400, 15 had 500 to 800. These patients also showed ischemia in perfusion study with development of major ischemia in 14 in next 1 year.

Conclusion: Coronary CT calcium score correlated with ^{99m}Tc-sestamibi is a useful tool that can be used in prediction of major cardiac event in high risk population and guides appropriate treatment.

P_13

Case-based discussion: Combination of functional and anatomic imaging for appropriate therapy strategies of patients with coronary artery diseases

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With the development of noninvasive cardiac imaging techniques, morphological and functional imaging tools

provide different and distinct diagnostic information for the clinicians. Myocardial perfusion imaging (MPI) with SPECT or PET is a kind of typical functional technique to detect the coronary pathophysiological changes and integrality of cardiomyocytes, while CT coronary angiography (CCTA) is a rapidly developing technology for reflecting anatomies of coronary arteries in detail. How to correctly recognize the internal connections and disagreements between them is very important for the clinicians to select appropriate therapeutic strategies. In this speech, the speaker will try to depict the advantages and shortages of different techniques using practical and abundant case-based discussion way, such as MPI with PET or SPECT, and CCTA, and clarify the important values of joint-analysis of MPI and CCTA for guiding treatments of coronary artery diseases(CAD).

P_14

Natural killer cells derived exosomes inhibit highly aggressive melanoma in vivo and in vitro

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Objective: The extracellular secretion is a cell product with a biological effect, which is fused with the cell membrane or directly released from the membrane of the cell. Many evidence indicates that it plays an important role in the process of cell signal transduction, coagulation, disease resistance and even tumor immune escape. Normal human cells, such as T cells, B cells and epithelial cells secrete extracellular has been widely concerned and researched, however, the role of the NK cells derived exosomes has not been fully studied. In this study, we explore the natural killer cell derived exosomes anti-tumor effect to the aggressive melanoma in vitro and in vivo.

Methods: B16F10 cells were established by cotransfection with both effluc and Thy1.1 genes and selected the Thy 1.1 positive cells by using mrciobreads. The exosomes derived from the NK cell (NK-Exosome) by ultracentrifuge was used in this study. The characterization of the NK-Exosomes was confirmed by electron microscope, nanosight analysis and western blotting. The apoptosis process was confirmed by FACS. In vivo, we used the melanoma effluc cells xenograft model and the tumor growth process was monitored by

the IVIS lumina imaging system.

Results: Expression of effluc gene were assessed by using flow cytometry, RT-PCR, western blotting and luciferase activity. Western blot confirmed that NK cell-derived exosomes not only express typical exosomes proteins (i.e. CD63 and Alix) but also presented the NK functional proteins (i.e. Perforin and Fasl). The antitumor effect was certificated by the IVIS lumina imaging ($p<0.001$). We also show that this exosomes induced the process of apoptosis of tumor cells ($p<0.0001$). The results of in vivo experiments confirmed the theory. The tumors in the PBS control group significantly increased ($p<0.05$), compared with the ones in NK-Exosomes treatment group.

Conclusion: The result of present study suggested that NK cell derived exosomes had antitumor effect on the B16F10 cancer cell, and these data suggested that NK-Exosomes may be useful for as a therapeutic approach against melanoma tumor.

P_15

Prediction of neoadjuvant radiation chemotherapy response and survival using pre-treatment [¹⁸F] FDG PET/CT scans in locally advanced rectal cancer

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Objective: The aim of this study was to investigate metabolic and textural parameters of pre-treatment fluorine-18 fluoro-D-glucose positron emission tomography integrated with computed tomography (i.e., [¹⁸F]FDG PET/CT) scans for the prediction of neoadjuvant radiation chemotherapy response and 3-year disease

free survival (3-yr DFS) in locally advanced rectal cancer (LARC).

Methods: We performed a retrospective review of seventy-four patients diagnosed with LARC who were initially examined with [¹⁸F]FDG PET/CT, and underwent neoadjuvant radiation chemotherapy followed by complete resection. The standardized uptake value (mean, peak, and max), metabolic volume (MV), and total lesion glycolysis of rectal cancer lesions were calculated using the isocontour method with various thresholds. Using 3-dimensional texture analysis, about 50 texture features were calculated for PET images. Response to neoadjuvant radiation chemotherapy, as assessed by histological tumour regression grading (TRG) after surgery and 3-yr DFS, was evaluated using univariate/multivariate binary logistic regression and univariate/multivariate Cox regression analyses.

Results: A significant association of MV with TRG was observed as measured by threshold of mean standardized uptake value of liver + 2 standard deviations (SDs), and mean standard uptake of liver + 3 SDs. Textural parameters from histogram-based and co-occurrence analysis were significantly associated with TRG. However, multivariate analysis revealed that none of these parameters had any significance. On the other hand, MV measured by various thresholds was significantly associated with 3-yr DFS, while MV calculated by higher threshold tended to be more strongly associated with 3-yr DFS. In addition, textural parameters including Kurtosis of absolute gradient (GrKurtosis) were significantly associated with 3-yr DFS. Multivariate analysis revealed that GrKurtosis could be a prognostic factor for 3-yr DFS.

Conclusion: Metabolic and textural parameters of initial [¹⁸F]FDG PET/CT scans could be potential indexes to assess tumour heterogeneity for the prediction of neoadjuvant radiation chemotherapy response and recurrence in LARC.

P_16 Withdrawn

P_17

Visualization and biodistribution of tumor derived extracellular vesicle in real-time using a novel imaging reporter in mouse

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Objective: Extracellular vesicles (EVs) are released from cells into extracellular space, and are capable of carrying protein, mRNA and miRNA. Numerous studies have found that tumor-derived EVs transfer to distance organs. *In vivo* biodistribution and eventual fate of extracellular vesicles are still largely unknown and require reliable *in vivo* tracking techniques.

Methods: In this study, *in vivo* bioluminescence imaging (BLI) using *Renilla* luciferase (Rluc) was developed and applied to monitoring of EVs derived from anaplastic thyroid cancer (CAL-62 cells) in nude mice after intravenous administration and was compared with a dye-based labeling method. EV-Rluc were analyzed by TEM and ELS. Rluc expression in EVs determined by WB and BLI. To visualize and track the distribution of EVs *in vivo*, EV-Rluc, EV-DiR or PBS was I.V injected over different time points and organ distribution of EV-Rluc/EV-DiR was determined, imaged under IVIS imaging system.

Results: *In vivo* distribution of the EVs, as measured by BLI, was consistent with the results of *ex vivo* organ analysis. Thirty minutes after the administration, a strong signal in the lung region was detected, followed by the liver and spleen region according to *in vivo* BLI. *Ex vivo* organ analysis showed a pattern similar to that in *in vivo* analysis. Dye (DiR)-labeled EVs showed a drastically different distribution pattern both *in vivo* and *ex vivo* compared to bioluminescent EVs. Fluorescent signals were predominately detected in the liver and spleen regions. BLI was shown to be more sensitive than fluorescent imaging.

Conclusion: This novel reporter-imaging approach to visualization of EVs in real time is expected to pave the way for monitoring of EVs during emerging EV-based treatments.

P_18

Establishment of high-throughput drug screening by a novel dual reporter for enhancing sodium/iodide symporter (NIS)

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Objectives: The incidence rate of thyroid cancer is constantly increasing in worldwide. Even if the mortality rate of thyroid cancer is low compared with other cancers, relapse disease may arise in 20~30% of patients affected by this disease. Anaplastic thyroid cancer (ATC), which is the most aggressive type of thyroid cancers, does not respond to radioiodine treatment and shows poor prognosis. Since sodium iodine symporter (NIS) plays important role in iodide accumulation, expression of NIS confers for the diagnostic and therapeutic application of radioactive iodine. Although ATC has insufficient NIS expression, enhancement of NIS expression is able to make the ATC susceptible to radioiodine therapy. The aim of this study is to develop high-throughput drug screening (HTS) platform for NIS expression enhancer using dual reporter gene system in ATC.

Methods: 8505C cells (ATC) were transfected with a plasmid vector having NIS promoter driven firefly luciferase (Fluc) gene and CMV promoter driven renilla luciferase (Rluc) gene system (pNIS-Fluc-TurboFP635-pCMV-Rluc plasmid). Stably transfected cells were established by selecting with 600 μ g/ml geneticin (8505C-pNIS-pCMV cells) and expression of the reporter system was confirmed by FACS, bioluminescence and fluorescent imaging. To detect strong NIS enhancers among thousands of tyrosine kinase inhibitor (TKI) candidates, 8505C-pNIS-pCMV cells were used as a screening platform. In vitro BLI signal of F-luc and R-luc of 8505C-pNIS-pCMV cells detected under various TKIs at 25 μ M concentration for 24 hrs. Then Real-time PCR and Western blotting of NIS and radioactive 125 I uptake assay was performed with 8505C-pNIS-pCMV cells before and after exposure to screened TKIs.

Results: 8505C-pNIS-pCMV cell line having the dual reporter gene system was stably established. The luciferase activities (Fluc and Rluc) and TurboFP635 expression were confirmed by bioluminescent and fluorescent imaging, respectively. In vitro BLI signals of Fluc ($R^2=0.9245$, $p<0.0001$) and Rluc ($R^2=0.9820$, $p<0.05$) increased by increase of cell number and FACS analysis confirmed stable expression of TurboFP635. Among exposed TKI candidates in 8505C-pNIS-pCMV cells for 24hrs, one chemical (called as 220541 chemical) which enhance hNIS promoter activity more than 2 fold were selected by HTS platform. 220541 chemical showed more than 2 fold change of hNIS mRNA expression compared with control under 6.25 μ M and 12.5 μ M treatment. Radioiodine uptake significantly increased dose-dependent manner by 220541 chemical treatment. hNIS protein expression also effectively

increased compared with control by 220541 chemical treatment. Quantification analysis of the band intensity showed 2.05-fold and 2.94-fold increases of hNIS protein under 6.25 μ M and 12.5 μ M treatment in 8505C-pNIS-pCMV cells.

Conclusion: We developed high-throughput NIS enhancer screening platform using the optical dual reporter gene system. And we successfully screened TKI chemicals which enhance NIS expression among numerous candidates. The chemicals can be applied to restore iodine avidity to the ATC and the modified ATC can be successfully treated with I-131.

P_19

Tetracycline regulated thymidine kinase suicide gene genetically engineered in mesenchymal stem cell therapy for anaplastic thyroid cancer

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Objectives: Anaplastic thyroid cancer (ATC) is the most aggressive malignancy and are undifferentiated tumors of the thyroid follicular epithelium. ATC has a very poor prognosis due to its aggressive behavior and poor response to conventional therapies. Therefore, new therapeutic modality is urgently need for the cancer and gene-directed enzyme/prodrug therapy mediated by genetically engineered mesenchymal stromal cells (MSC) influence be one of promising therapeutic modalities. Aim of this study was to develop therapeutic MSC having suicidal gene which can be induced by an artificial cue and to validate the therapeutic gene expression by the cue *in vitro* and *in vivo* models using optical molecular imaging for ATC.

Methods: We first developed the TetOn system in retroviral vector fused Herpes simplex virus thymidine kinase (HSV-sr-39tk) with dual reporters (GFP-Fluc2). Then mouse bone marrow derived MSC was transduced with retrovirus. After viral transduction cells were screened and characterized. Then engineered MSC were co-cultured with Cal62/Rluc ATC cells in the presence of prodrug ganciclovir after stimulation with doxycycline. The transduced MSCs (MSC-Tet-TK/Fluc2) was injected into the ATC xenograft of nude mice and 1mg/kg of doxycycline (Dox) and ganciclovir (GCV) were IP injected. MSC-Tet-TK/Fluc2 was visualized

by bioluminescence imaging (BLI). The therapeutic efficiency was evaluated by Rluc activity from Cal62/Rluc with BLI.

Results: MSC-Tet-TK/Fluc2 was established and confirmed the Fluc activity with and without Dox. Further demonstrated the enhanced therapeutic effect to Cal62/Rluc cells by Dox and GCV treatment. *In vivo* BLI successfully revealed expression of TetOn/Off TK-Fluc2 in the transduced MSC cells *in vitro* and *in vivo* models. In addition, Cal62/Rluc and MSC-Tet-TK/Fluc2 injection coupled with Dox and GCV administrations significantly decreased the tumor growth compared to with Dox as well as control tumor.

Conclusion: We successfully developed the MSC having enzyme/prodrug (TK/GCV) in TetOn system. The therapeutic effect was shown in ATC tumor both *in vitro* and *in vivo* models. The inventive therapeutic approach using the TetOn system can reduce adverse effects by artificial controlling of the suicidal TK gene expression by DOX.

P_20

^{99m}Tc-DPD Scintigraphy and SPECT/CT in Patients with AL and ATTR Type Amyloidosis: Potential Clinical Implications

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Objective: Although pathological confirmation is a gold standard for diagnosis of amyloidosis, there is a need for relevant imaging modality for identification of involved organs and evaluation of disease extent. We prospectively investigated imaging findings of ^{99m}Tc-DPD scintigraphy in AL and ATTR amyloidosis.

Methods: Total number of subjects was 21 with pathologically confirmed AL and ATTR amyloidosis. Pretreatment whole body ^{99m}Tc-DPD planar scan and regional SPECT/CT were acquired in all subjects. For alleged involved organs, ^{99m}Tc-DPD uptake was visually and semiquantitatively evaluated with a 4-point scale (grade 0: no uptake, 1: uptake less than spines, 2: uptake similar to spines, and 3: uptake more than spines).

Results: There were 29 organs in AL and 12 organs in ATTR. Significant ^{99m}Tc-DPD uptake was found in 24 organs (sensitivity = 82.8%) in AL and 9 organs (sensitivity = 75.0%) in ATTR. Additional SPECT/CT was

helpful to ensure of abnormal DPD uptake in the involve organs which were uncertain by attenuation in planar images. Degree of the ^{99m}Tc-DPD uptake was significant higher in ATTR compared with AL amyloidosis ($p = 0.017$). Diffuse soft tissue uptakes with photon defect in the liver area was found in ATTR amyloidosis only.

Conclusion: ^{99m}Tc-DPD scintigraphy showed good sensitivity in various organs with primary systemic AL and ATTR amyloidosis. Additional SPECT/CT significantly improved the diagnostic efficacy of ^{99m}Tc-DPD scintigraphy. Uptake grade of involved organs and background activity might help to differentiate between AL and ATTR subtypes.

P_21

Cervical Lymph Node Metastasis and Younger Age are Negative Predictor for Remnant Ablation with rhTSH 100 mCi Protocol in Korean Patients with Intermediate-risk Papillary Thyroid Cancer Classical Subtype; Preliminary result

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Objective: The reimbursement for the use of recombinant human thyroid hormone (rhTSH) in preparing patients for radioiodine remnant thyroid ablation has been made possible in Korea since 2013. We investigated preliminary clinical outcomes of rhTSH 100 mCi fixed dose protocol in patients with intermediate-risk papillary thyroid cancer.

Methods: Among the patients using rhTSH 100 mCi fixed dose protocol for remnant ablation, papillary thyroid cancer classical subtype with microscopic extra-thyroid extension (Microscopic ETE) or cervical lymph node metastasis (pN1) were analyzed retrospectively. Successful ablation was considered when there was no visible uptake on RxWBS and undetectable off-Tg (<1.0 ng/mL). Various factors including age, pre-ablative

off-Tg (pre-Tg), pN1 were analyzed to predict ablation success rates.

Results: There were 44 successful ablations (66.7%) of 66 patients. Among age, sex, Microscopic ETE, pN1, pre-Tg, pre-ablative urinary I/Cr ratio, age (55.5 ± 10.9 vs. 44.0 ± 9.5 , $p=0.000$), pN1 (20/44 case vs. 20/22 case, $p=0.000$), pre-Tg (0.7 ± 1.5 vs. 5.2 ± 14.5 , $p=0.044$) was significant in univariate analysis. Age (OR = 1.071, 95% CI = 1.004 - 1.144, $p=0.036$) and pN1 (OR = 7.683, 95% CI = 1.338 - 44.129, $p=0.022$) remained significant in multivariate analysis. In pN1 negative and age > 52 subgroup ablation success rate was 95% (19/20). In pN1 positive and age ≤ 52 subgroup, ablation success rate was 33.3% (9/27).

Conclusion: According to our preliminary result, pN1 and younger age was significant negative predictor for successful remnant ablation in intermediate-risk patients. In case of pN1 negative and younger subgroup, other strategy such as multi-stage ablation et al can be considered due to low ablation success rate.

P_22

Degree of Fever plays a Positive Role in Contributory ^{18}F -FDG PET/CT in FUO patients

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Objectives: The diagnosis of patients with fever of unknown origin (FUO) remains a challenging medical problem, which was originally defined by Petersdorf and Beeson in 1961 as a condition that temperature higher than 38.3°C and lasting longer than three weeks, with an appropriate diagnosis that remains uncertain after one week of investigation in hospital. The cause of FUO is mainly classified into four categories including infection, malignancy, noninfectious inflammatory disease (NIID), and unknown cause. We aimed to evaluate the diagnostic value of fluorine-18 fluorodeoxyglucose (^{18}F -FDG) positron emission tomography/computed tomography (PET/CT) in FUO and to explore the contributory factors for true positive PET/CT results.

Methods: This is a retrospective cohort study conducted between December 2013 and October 2015 including 160 patients with FUO (89 men and 71 women; age: 54.9 ± 18.07 years). All the patients were examined by ^{18}F -FDG PET/CT scan and the results were compared with the final diagnosis which was established by additional procedures or clinical follow-up for more

than 6 months. The evaluated predictor variables such as age, gender, fever characteristic including maximal fever, duration of fever, and the degree of fever, physical examination, lab testing and medication before were ^{18}F -FDG PET/CT were recorded. The diagnostic accuracy, sensitivity, and specificity of the PET/CT were calculated. Univariate and multivariate analyses were performed to identify variables associated with a positive contributory finding on PET/CT.

Results: A final diagnosis was established for 142 patients, including 42 patients with infectious diseases, 67 with malignancies, and 16 with non-infectious inflammatory diseases and 17 with other conditions. The true positive, false positive, false negative, and true negative of ^{18}F -FDG PET/CT were 65.7%, 12.7%, 10.1%, and 12.0%, respectively. ^{18}F -FDG PET/CT had a sensitivity of 86.6% (103/119), specificity of 48.7% (19/39), and accuracy of 77.2% (122/158) in FUO. Among the true-positive PET/CT studies, there were 30 cases located infection, 63.3% (19/30) were pneumonia, occupies the majority proportion. Three cases of tuberculosis, five cases of lymphnoditis, one case liver abscess, arthritis 1 and one case of multiple nocardial abscesses. There were 61 cases of malignancies, which demonstrated that PET/CT was contributory to diagnosis of malignancies in 91% (61/67) of the cases. Among them, 19 cases were lymphoma. 31 cases were lung cancer, 5 cases were digestive system neoplasm, one case of thyroid cancer, including 15 cases metastatic. one case of myeloma. Notably, the four noninfectious inflammatory diseases included 2 case giant cell arteritis, one exacerbation of Crohn' disease which was finally confirmed by biopsy. Another case of polymyalgia rheumatica which defined by autoimmune series test and effective for glucocorticoid therapy. Last the others were four case of hemophagocytic syndrome and four case of Adult still' disease. Univariate analysis showed the only variables found to be significantly correlated with positive contributory PET/CT results were age, with a mean age of 57.42 ± 18.38 for a contributory PET/CT compared to all others (vs. 51.00 ± 16.74). The duration of fever for a positive contributory PET/CT was lower than non-contributory PET/CT (45.59 ± 38.43 vs. 69.59 ± 87.86). Interestingly, there was a significantly difference in the degree of fever (Moderate: 30.4% vs. 5.6%, Hyperpyrexia: 25.9% vs. 26.6%, Ultra hyperpyrexia: 8.2% vs. 2.5%) in contributory PET/CT compared to all others ($P<0.001$). The co-morbidity including arthralgia and myalgia was difference between the two groups (13 vs. 15, 9 vs. 20, respectively). Also ESR was significantly higher in contributory PET/CT (77.39 ± 34.01 vs. 56.35 ± 36.93) compared to the non-contributory group. On multivariable analysis, significant predictors of a positive PET/CT contributory to diagnosis were degree of fever, presence of the myalgia and higher level of ESR.

Conclusion: ^{18}FDG PET/CT is a valuable imaging tool for the identification and location of the potential lesion in FUO and is helpful for the etiological diagnosis, especially in the diagnosis of malignant lesions. Degree of fever, presence of the myalgia and higher level of ESR may have a contributory for positive PET/CT diagnosis.

0.34 ± 0.10 percentage injected dose/gram, $P < 0.05$) than healthy or normal lung at 1 h after injection. The tissue radioactivity of group treated with losartan were lower than control group ($p < 0.05$).

Conclusions: The $^{68}\text{Ga-NOTA-PRGD}_2$ can detect pulmonary fibrosis, losartan was effective in the treatment of pulmonary fibrosis.

P_23

Evaluating the efficiency of losartan in pulmonary fibrosis with $^{68}\text{Ga-NOTA-PRGD}_2$

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Objectives: $^{68}\text{Ga-NOTA-PRGD}_2$ can be specifically bonded to the $\alpha\beta\gamma$ integrin, which is a transmembrane heterodimeric receptor highly expressed on the surface of fibrocyte, which plays an important role in the overall disease pathology of pulmonary fibrosis. The angiotensin II receptor blocker (ARB) losartan was found to effectively reduce ALI induced by SARS-CoV and avian influenza H5N1 virus. This study first applied $^{68}\text{Ga-NOTA-PRGD}_2$ to detect the pulmonary fibrosis, and evaluate the therapy response of losartan in pulmonary fibrosis.

Methods: Six-old C57 mice ($n=10$) were instilled through endotracheal with 1 unit/kg body weight of bleomycin (Nippon Kayaku Co. Ltd) on day 0 and 7 respectively to induce pulmonary fibrosis, another 10 C57 mice were set as control. After 2 weeks, C57 mice models were intravenously injected with 100 μCi of $^{68}\text{Ga-NOTA-PRGD}_2$ and imaged after 1h by Inveon Micro PET (Siemens). After imaging, C57 mice models were divided into two groups randomly, one group was treated with losartan 2mg/kg body weight for ten consecutive days, the other group was control group. On the 11th day of treatment, all C57 mice models underwent imaging. After imaging, mice were sacrificed by humane euthanasia, cervical dislocation. Lungs were then removed, samples of tissues and cells were collected for further analysis. The tissue radioactivity was calculated and expressed as decay-corrected percentage injected dose per gram of tissue (%ID/g).

Results: The $^{68}\text{Ga-NOTA-PRGD}_2$ accumulated at higher levels in the lung of pulmonary fibrosis models (0.49 ± 0.13 vs.

P_24

$^{99m}\text{Tc-MDP}$ combined Chinese herbal fumigation improve clinical and radiographic results for patients with Hepple type V osteochondral lesions of the talus

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Objective: Treatment of Hepple type V osteochondral lesions of talus (OLT) remains challenging. $^{99m}\text{Tc-MDP}$, a decay product of $^{99m}\text{Tc-MDP}$, which is widely used for bone scan, is effective in the clinical treatment of rheumatoid arthritis. The purpose of the study is to investigate the effects of $^{99m}\text{Tc-MDP}$ treatment on Hepple type V OLT.

Methods: From March 2012 to January 2015, 51 patients with Hepple type V OLT who failed appropriate nonoperative treatment and surgery were retrospectively included and treated with intravenous injection of $^{99m}\text{Tc-MDP}$ and Chinese herbal fumigation (CHF). The effects of $^{99m}\text{Tc-MDP}$ and CHF on Hepple type V OLT were evaluated by the American Orthopedic Foot and Ankle Society Ankle-Hindfoot Score (AOFAS), visual analog scale (VAS), $^{99m}\text{Tc-MDP}$ SPECT/CT and CT. Radiographic changes were also assessed by the transverse long diameter of the cyst on CT.

Results: All patients had two courses of treatment. At the last follow up, AOFAS, VAS improved significantly from 68.05 ± 9.85 to 93.44 ± 5.36 ($p < 0.01$), and 3.13 ± 0.34 to 1.64 ± 0.48 ($p < 0.01$). The average diameter of the cysts decreased from 9.55 ± 4.61 mm to 4.70 ± 3.32 mm ($p < 0.01$).

Conclusion: The retrospective study indicates that a combination treatment of $^{99m}\text{Tc-MDP}$ and CHF is effective in pain relief and return of function in a short term of follow up for patients with Hepple type V OLT. The cystic lesions of Hepple type V OLT with increased uptake of $^{99m}\text{Tc-MDP}$ on SPECT/CT can be well treated by $^{99m}\text{Tc-MDP}$ and CHF, which has effectiveness for patients with Hepple type V OLT. This novel technique has the potential as an effective conservative treatment for Hepple type V OLT without adverse effects.

P_25**Screening, nuclide imaging and targeted therapy research of small molecular tumor-inhibitory peptides basing on multiple targets**

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Objective: To screen out peptides to apply in nuclide imaging and targeted therapy of tumor.

Methods: Two peptides(screened out by bioinformatics through modifying VEGF₁₂₅₋₁₃₆ and verified by competitive receptor binding assay and ³H-TdR)were labeled with ^{99m}Tc and ¹⁸⁸Re, γ imaging and competitive inhibition imaging on tumor-burdened nude mice were used to test their tumor targeting properties; anti-tumor effect of ¹⁸⁸Re-peptides was investigated by survival analysis; Co-IP was used to study the interaction between peptides and VEGFR1/VEGFR2;RNAi silenced VEGF expression,CCK-8 was used to investigate whether peptides could inhibit cells proliferation through other pathways besides VEGF/VEGFR; bioinformatics was used to predict potential targets.

Results: The two peptides(QKRKRKKSRRKH,RKRKRKKSRYIVLS)could combine to VEGFR and the combining affinity was higher than VEGF₁₂₅₋₁₃₆(6 and 2.5 times);they could inhibit cells proliferation(inhibitory ratio>40%);radionuclide-labeled peptides were gathered in mice tumor sites;¹⁸⁸Re-peptides could prolong mice lifetime; both VEGFR1 and VEGFR2 were their targets; after VEGF silenced, peptides could inhibit A549 cells proliferation and the inhibitory ratios were no difference than before ($P>0.05$); they might have some new targets: EGFR, $\alpha v \beta 3$, FLT-3, HGFR, Tie-2R and VIPR-2.

Conclusion: The two peptides(QKRKRKKSRRKH,RKRKRKKSRYIVLS) are tumor-targeted and can inhibit tumor growth significantly; they may have multiple targets including VEGFR; as molecular probes or targeted drugs, they can be used in nuclide molecular imaging and targeted therapy of tumor.

P_26**Stress perfusion cardiac magnetic resonance Imaging for detection of coronary artery disease: comparison with single-photon emission computed tomography: A prospective study**

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Objective: To assess the diagnosis performance of stress CMR for evaluating CAD compared with SPECT.

Methods: 51 symptomatic consecutive patients were prospectively enrolled with known and suspected CAD underwent sequential CMR, SPECT and CAG. we compared the diagnostic performance of stress CMR and SPECT for detecting CAD on a per-patient and per-vessel basis. For diagnostic performance assessment the AUC was calculated respectively using CAG as the reference standard.

Results: First, on a patient-based analysis, CMR for detection of CAD had sensitivity of 90.0% and specificity of 75.0% versus the sensitivity of 74% and specificity of 75% of SPECT. The diagnostic performance (=AUC) of CMR 0.879 was similar to SPECT 0.818 ($P=0.3377, n=51$). On a vessel-based analysis, CMR had a sensitivity of 79.0% and specificity of 83.0% versus a sensitivity of 71.0% and specificity of 79.0% of SPECT. The AUC of CMR 0.827 was slightly superior to SPECT 0.767 ($P=0.1284, n=51$), for LAD vessel, The AUC of CMR 0.849 was superior to SPECT 0.688 ($P=0.0141, n=51$).

Conclusion: Stress cardiac MRI and SPECT are both useful and valuable in CAD patients. Compared with SPECT, stress CMR had better sensitivity and similar specificity based on patient analysis, and better sensitivity and specificity based on vessel analysis, especially for LAD vessel.

P_27**Radio-labeling Micro-PET Study of Ga-68 Labeled Somatostatin Analogue Pasireotide-DOTA for Tumor Imaging**

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Objectives: The purpose of this work was to develop a new somatostatin analogue for tumor imaging. Although Octreotide has been widely used for somatostatin

receptor positive tumors, it only has a higher affinity for SSTR2 among the five somatostatin receptors. Recently, Pasireotide was reported to have a better affinity of SSTR1, 3, 5 than Octreotide. Herein, we developed novel Ga-68 labeled Pasireotide conjugated with p-SCN-Bn-DOTA for imaging of somatostatin receptor positive tumors.

Methods: The samples Pasireotide and DOTA-Pasireotide were analysed by liquid chromatography-mass spectrometry (LC-MS) before being radiolabeled and the ⁶⁸Ga labeled compounds was determined by radio-HPLC (Figure.1). The precursor DOTA-Pasireotide was labeled with Ga-68 in sodium acetate buffer (pH 4.0) by heating at 100 °C for 20 min. After purification by a Sep-pak C18 Column, every 12.95 MBq of ⁶⁸Ga-DOTA-Pasireotide was injected intravenously to one group of BALB/c nude mice bearing human HT29 colon tumors via tail vein and the control group of nude mice were injected with the same radioactivity of ⁶⁸Ga-DOTA-Pasireotide and 1 mg DOTA-Pasireotide. The positron emission tomography (PET) images were taken 2 and 4 hours after radiotracer injection.

Results: ⁶⁸Ga was radiolabeled with DOTA-Pasireotide in 98% radiochemical purity as determined by radio-HPLC. In vitro stability experiments showed in 2 hours ⁶⁸Ga-DOTA-Pasireotide was stable in 5% human serum, NaAc (pH 5.5) and PBS (pH 7.4). In vivo, the HT29 cell xenograft tumors uptake of ⁶⁸Ga-DOTA-Pasireotide increased with time, and was clearly visualized by 4 h postinjection. The accumulation of ⁶⁸Ga-DOTA-Pasireotide in HT29 tumor could be blocked with an excess amount of DOTA-Pasireotide.

Conclusion: In this study, we described the synthesis and characterization of ⁶⁸Ga labeled cyclic peptide ⁶⁸Ga-DOTA-Pasireotide. We found that ⁶⁸Ga-DOTA-Pasireotide could be taken up by HT29 cell exonograft tumors and blocked by excess DOTA-Pasireotide. In brief, the somatostatin analogue ⁶⁸Ga-DOTA-Pasireotide may be useful for imaging somatostatin receptor positive tumors such as neuroendocrine tumors.

P_28

Contrast research of the diagnostic value of ¹⁸F-FDG PET/CT and tumor markers for lung disease

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Objective: By comparing the value of PET/CT ¹⁸F-FDG

and lung cancer tumor markers in the diagnosis of lung disease, in order to provide useful reference for improving the diagnostic accuracy of PET/CT diagnosis.

Methods: We retrospectively analyzed the 135 cases of patients between September 2013 to January 2016 due to lung disease lined ¹⁸F PET/CT in our hospital PET center, and we collected the serum tumor markers(Cyfra211, NSE and CEA) examination results in imaging two weeks. There were 84 cases of male, 51 cases of female, age from 39 to 78, average age 59.4±8.7 years old. All patients including 100 cases of malignant tumor, having definite pathological results, 61 cases confirmed by surgery pathology, 29 confirmed by endoscopy and 9 cases confirmed by biopsy cytology, 1 case confirmed by cancer cells in pleural effusion. There were 35 cases of benign lesions, 14 cases had pathological results (13 cases were confirmed by operational pathology, 1 cases was diagnosed as tuberculosis by endoscopy), and the other 21 cases were typical pulmonary benign lesions. With the final diagnosis as standard, we compared the diagnostic value of PET/CT, Cyfra211, NSE, CEA, Cyfra211+NES+CEA in pulmonary lesions. All measurement data expressed as mean ± standard deviation (X±s). We used SPSS 19.0 software to carry out data processing, two samples with independent sample t test, two samples' rate using chi-square test for statistical analysis, and P<0.05 as the difference has statistical significance.

Results: The serum tumor markers levels in patients with benign and malignant are as follows: Cyfra211: 2.21±1.50, 4.83±6.94 (P<0.01) ; NSE: 14.61±5.15, 18.47±10.18 (P<0.01) ; CEA: 1.82±1.17, 18.95±67.52 (P<0.05) , and all had statistical differences. With the sensitivity, specific, accuracy, positive predictive value, negative predictive value as order, the diagnostic value of PET/CT, Cyfra211, NSE, CEA, Cyfra211+NSE+CEA were as follows: 97.0%(97/100), 82.6%(29/35), 93.3%(126/135) , 94.2%(97/103), 90.6%(29/32); 36.0%(36/100) , 88.6%(31/35), 49.6%(67/135) , 90.0%(36/40) , 32.6%(31/95); 33.0%(33/100), 91.4%(32/35) , 48.1%(65/135), 91.7%(33/36), 32.3%(32/99) : 23.0%(23/100), 100%(35/35), 43.0%(58/135) , 100%(23/23), 31.3%(35/112); 56.0%(56/100) , 82.9%(29/35), 63.0%(85/135), 90.3%(56/62) , 39.7%(29/73). In terms of sensitivity, accuracy, and negative predictive value, the diagnostic value of PET/CT were significantly higher than that of tumor markers (P <0.001). In terms of specificity, the diagnostic value of CEA was higher than that of PET/CT (P <0.05). And there were no statistical difference in other groups compared with PET/CT. In terms of positive predictive value, PET/CT and tumor markers

have no obvious difference ($P > 0.05$).

Conclusion: For the diagnosis of patients with lung diseases, PET/CT is superior to the tumor markers. Positive tumor markers have good support for the diagnosis of lung cancer, but the negative have no value for the exclusion of lung cancer. Therefore, the diagnosis of pulmonary lesions should be given priority to PET/CT image characteristics.

P_29

Sleeping Beauty-Baculovirus mediated NIS gene for long-term expression

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Objective: In the present study, sleeping beauty (SB) was introduced in the recombinant baculovirus to make NIS gene for long-term monitoring transplanted cells.

Methods: The constructed plasmid pFast-NIS-SB100X-Nero and pFast-eGFP-SB100X-Nero were transfected into sf9 cells to obtain Bac-NIS-SB100X-Nero and Bac-eGFP-SB100X-Nero. After infected U87 glioma cells, G418 was used for screening stable cell lines. At the 1st and 26th week after successfully screening, the stable Bac-eGFP-SB100X-Nero-U87 cells was measured by flow cytometry. The stable Bac-NIS-SB100X-Nero-U87 cells was performed with dynamic ¹²⁵I uptake, perchlorate inhibition assays, RT-PCR and western blot in different weeks. Finally nude mice with transplanted Bac-NIS-SB100X-Nero-U87 cells was performed by ¹³¹I SPECT imaging.

Results: The percent of GFP positive in stable Bac-eGFP-SB100X-Nero-U87 cells at 1st and 26th week were (96.03±0.21)% and (97.43±0.81) %, respectively. The radioiodide was functionally accumulated by NIS protein and significantly inhibited by perchlorate. Dynamic ¹²⁵I uptake showed peaking at 30min and no decreasing during 30min to 480min. The radioactive uptake was significantly correlated with Bac-NIS-SB100X-Nero-U87 cell number ($R^2=0.997$). The level of mRNA and protein of NIS gene in Bac-NIS-SB100X-Nero-U87 cells was no obviously changed at 1st, 4th, 7th, 14th and 28th weeks. ¹³¹I SPECT imaging revealed stable Bac-NIS-SB100X-Nero-U87 cells effectively accumulated radioiodide in vivo.

Conclusion: The sleeping beauty - baculovirus hybrid vector mediated NIS gene can achieve long-term expression and own great value in molecular imaging of transplanted cells.

P_30

Determination of serum levels of human M-type phospholipase A2 receptor antibody by a time resolved immunoassay

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Objective: To establish a time resolved fluoroimmunoassay (TRF) method for detecting M-type phospholipase A2 receptor (PLA2R) and to investigate the diagnostic value of serum PLA2R for idiopathic membranous nephropathy (IMN).

Methods: Using microplates coated with recombined PLA2R antigen and streptavidin labeled with Eu³⁺, a dual-antigen sandwich-type was established. The serum concentrations of PLA2R antibody in 63 IMN patients and 90 healthy volunteers were quantitatively analyzed. The software Origin8.0 and SPSS19.0 were used to analyze the data.

Results: The range of anti-PLA2R-TRF was 0-10ug/mL with the sensitivity of 0.005ng/mL, while ED20, ED50 and ED80 of the standard curve were 0.144±0.012, 0.707±0.029 and 3.466±0.098ug/mL, respectively. The CV of inter and intra assay were 5.1% and 10.8%, respectively. The average concentration of serum PLA2R antibody in healthy volunteers was 0.483±0.204 ug/mL, but in IMN patients it was 6.920±11.149 ug/mL, which was significantly higher than that in former ones (Mann-Whitney U=1469, Z=-3.688, $P<0.05$). Meanwhile, the serum levels in IMN patients were positive relation to disease progression and age increase ($P<0.05$). Refer to the ROC curve, the diagnostic cut-off was set at 0.80ng/mL for IMN detection, so the sensitivity and specificity of PLA2R antibody TRF were 73.0% and 91.1%, respectively.

Conclusion: Serum PLA2R assay by TRF in dual antigen sandwich model is well established. This quick and easy-performance method could increase the diagnostic accuracy for IMN.

Fund Program : Clinical medicine science and technology projects in Jiangsu province (BL2014022)

P_31

Experimental Research on Ectopic Bone Formation in Rhesus by ¹⁸F-FDG PET/CT

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Objective: To evaluate the value of PET/CT in observing ectopic osteogenesis with 3D printing bone tissue-engineering scaffold.

Methods: 3D printed poly lactic-co-glycolic acid/tri-calcium phosphate (PLGA/TCP) and 3D printed tri-calcium phosphate (TCP) incorporated with rhBMP-2 (recombinant human bone morphogenetic protein-2) were implanted in the latissimus dorsi muscle of the rhesus monkeys. PET/CT was used to detect the SUV (standard uptake value) of the implanted position. Six male rhesus monkeys were randomly divided into two groups, and scaffolds were implanted respectively in the latissimus dorsi muscle as follows: Group A, 3D-PLGA/TCP-BMP, Group B, 3D-TCP-BMP. Every monkey received intravenous injection of ¹⁸F-FDG at 4, 8, 12 weeks post-surgery, and 60 min after injection, PET/CT was exploited to take the scintigraphy of the whole body. SUVs of the implanted position in each group were statistically analyzed. SPSS 16.0 statistical software was used to conduct the *t* test, and values of *P* < 0.05 were taken to indicate statistical significance.

Results: PET/CT images of the two groups both showed varying degrees of bone metabolism enhancement. At each time point post-surgery, SUV of the Group B was bigger than that of Group A (*P* < 0.05).

Conclusion: PET/CT can detect the enhanced blood supply and metabolism in the implanted areas. Also, early vascularization of 3D printed TCP scaffold is much better than that of the 3D printed PLGA/TCP scaffold. This approach provides a new choice for observing the vascularization of the 3D printing tissue-engineered bone in the clinic.

P_32

Study on ROI extraction and weighing in thyroid SPECT scintigraphy

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Objective: The treatment effect of hyperthyroidism is

closely related to the dose of medicine. In determining the dose, the mass of thyroid is an important factor. There are several methods of measuring the mass of the thyroid, Palpation, ultrasound, SPECT planar imaging, SPECT volume integral or a combination of the methods above. As a method widely used in clinic, the key technology of SPECT planar imaging is the edge extraction of thyroid ROI, currently in the traditional method this process requires senior physicians observe the planar images and outline the contours of ROI manually, then calculate the mass of the thyroid with the help of the internal software of the medical equipment. Physicians complete this work just according to their own experience and different physician may give different results. This method increases the workload of physicians and brings artificial errors to the results. In this paper, we proposed a method of ROI extraction and weighing in thyroid SPECT scintigraphy based on digital image processing to improve the efficiency and accuracy.

Methods: The thyroid planar images were provided by The Second Affiliated Hospital of Xi'an Jiaotong University. Patients completed thyroid SPECT examination by a SPECT camera of GE equipped with a universal low energy collimator. The energy was 140 KeV, window width of ±10% and the matrix was 128×128, magnification was set to 2.0, the time of the examination was strictly controlled to ensure the static maximum number of pixel was limited to 300 K. The thyroid planar images produced by the SPECT camera were converted to gray scale images. Global threshold segmentation can pick up the preliminary thyroid ROI which contained noises, by comparing 80 cases of binary thyroid images converted from gray scale images, 209 was set as the global threshold in binarization. Due to the imaging properties of SPECT, there were background noises and ROI internal noises in the thyroid planar images. We should simplify the image data, maintain the basic characteristics of the thyroid and remove extraneous structures at the same time. The binary thyroid planar images were filtered with the application of mathematical morphology, by this method the background noises and the ROI internal noises were filtered out and the contour of ROI becomes smooth, which made it closer to the true organ. After that the edge of ROI was extracted and pixels the ROI contained were counted by digital image processing and then the area of thyroid ROI could be calculated. The mass of thyroid was estimated by a medical formula in which the area of ROI is a significant parameter. Finally the contour of ROI was outlined in the original image and the mass was illustrated as well.

80 cases of thyroid images were processed the method of ROI extraction and weighing and the traditional method. In the traditional method, in order to reduce

artificial errors, each case was operated by two different senior physicians and the mean of the results were recorded. We compared the two sets of weighing results by statistical analysis.

Results: The mass estimated by the method of ROI extraction and weighing is 44.42 ± 19.28 (mean \pm standard deviation) while that estimated by the traditional method is 44.07 ± 19.67 (mean \pm standard deviation). The mean of the difference between the two sets of weighing results is 0.35 and the standard deviation is 3.55. The correlation analysis showed that the two sets of data were highly correlated ($r=0.984$, $p<0.001$). The paired sample T test indicated that there was no significant difference between the two sets of data ($t=0.654$, $p>0.05$).

Conclusion: As shown by the examinations, the method of ROI extraction and weighing can apply to the images produced by the existing equipment directly, extract the ROI in the thyroid planar images, estimate the mass of thyroid, outline the contour of ROI and illustrate the results in the original image automatically. The mass estimated by this method has no significant differences compared with the results by the traditional method. This is an accurate and efficient method, and may contribute to the treatment of hyperthyroidism in clinic.

P_33

Diagnostic Value of Serum PCT and IL-6 in early diagnosis of neonatal infective diseases

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Objective: This study explored the correlation and diagnostic value of PCT and IL - 6 in the neonatal infectious diseases.

Methods: There were 81 cases to be regarded as neonatal infection group in our hospital pediatric children from January 1, 2014 - December 31, 2015, and they were divided into the severe group of the 33 cases and mild case group of the 48 cases. The diagnosis accorded with the standards established by the neonatal collaboration. The 35 cases from healthy neonates of obstetrics were regarded as the control group for the same period in our hospital .The contents of serum PCT and IL - 6 were detected by using Roche Elecsys 601 immunity analyzer and the original supporting reagents and we compared the difference of the serum PCT and IL - 6 in two groups.

Results: 1. Both of acute infection group was obviously higher than that of the recovery and the control group,

however the differences of the two indicators about the recovery and control group was no statistical significance.

2. Both in severe patients group were significantly higher than that in mild group; and both in mild group were significantly higher than that of control group.
3. Sensitivity f PCT was 61.4%and the specificity was 88.1%; nevertheless the sensitivity of IL- 6 was 82.4% and the specificity was 42.3%.

Conclusion: Combining detection of two indicators was able to make up for the influence of the window phase to improve the detection rate That is why there was higher value in early diagnosis of neonatal infectious diseases, treatment response and prognosis, in a word, combining detection of two indicators is worth popularization in clinical application.

P_34

Quantitative 99m Tc-Galacto-RGD2 SPECT/CT to Evaluate Lung Cancer Physiology and Malignancy: A Comparative Multi-center Study with 18 F-FDG PET/CT

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Objectives: 99m Tc-Galacto-RGD2 (RGD) has been reported as a feasible tracer to assess tumor angiogenesis and metastasis, but limited to quantitatively evaluate tumor physiology and malignancy by only conventional SPECT/CT imaging. We aim to quantify integrin- $\alpha v\beta 3$ expression in lung tumors with quantitative RGD SPECT and compare physiological parameters with glucose metabolism by FDG PET.

Methods: Twenty-eight biopsy-confirmed patients with non-small cell lung cancer were enrolled to receive both RGD SPECT/CT and FDG PET/CT scans at three medical centers in China. RGD SPECT images were reconstructed with full physical corrections (attenuation, scatter, collimator blur and noise) while PET images were processed according to the clinical routine. All SPECT, SPECT/CT and PET/CT cameras were

pre-qualified to enter the study and cross calibrated imaging factors to measure radionuclide concentration in (Bq/ml). Localization of tumors in lung regions was performed by SPECT-CT and PET-CT image fusion. RGD and FDG SUV_{max}, SUV_{mean} and metabolic volume (MTV, threshold≥45% SUV_{max}) were measured and compared to assess the malignancy of lung tumors.

Results: When measuring ^{99m}Tc and ¹⁸F radionuclide concentration in cylindrical phantom, all SPECT, SPECT/CT and PET/CT cameras were able to achieve >97% accuracy. Total number of lung tumors (41 vs 43), SUV_{max} (7.74±3.38 vs 8.81±2.91), SUV_{mean} (3.67±1.23 vs 4.46±1.38) found by RGD SPECT and FDG PET were comparable. Among matched tumors (n=38), linear correlation of RGD and FDG SUV_{max} was strong ($y=0.49x$, R=0.78) while correlations for SUV_{mean} and MTV were moderate (SUV_{mean}: $y=0.38x$, R=0.67; MTV: $y=0.97x$, R=0.28) (All p<0.0001). Increased RGD SUV_{max} highly corresponded with increased FDG SUV_{max} to indicate elevated tumor malignancy.

Conclusion: Quantitative ^{99m}Tc-Galacto-RGD2 SPECT/CT with full physical corrections is a feasible approach to measure tumor integrin- $\alpha v\beta 3$ expression. It can provide another insight to quantitatively assess tumor physiology and malignancy beside FDG PET/CT scan.

P_35

Application of ¹⁸F-NaF PET/CT in carotid atherosclerosis: correlation with plaque pathology

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Objective: To detect carotid plaques by ¹⁸F-NaF PET/CT and explore the imaging diagnosis value of ¹⁸F-NaF PET/CT in carotid artery vulnerable plaque.

Methods: Eight patients with ischemic stroke were determined the formation of carotid artery plaque by the neck vascular ultrasound or CTA. After ¹⁸F-NaF PET/CT examination, these patients proceeded unilateral carotid endarterectomy within three weeks. Postoperative carotid plaques were investigated by HE staining, Masson staining, alizarin red staining and immunohistochemistry (α -SMA, Mac-3). Compared the pathologic results of carotid artery plaque with SUV uptake values and TBR values of ¹⁸F-NaF.

Results: SUV_{max}, SUV_{mean}, TBR_{max} value of ¹⁸F-NaF uptake in carotid plaque showed positively correlation with collagen fibers positive IOD ($P<0.05$). TBR_{mean} value and collagen fibers positive IOD had no significant correlation ($P>0.05$). SUV_{max}, SUV_{mean} value of ¹⁸F-NaF

uptake and positive IOD and positive area of calcification had no correlation ($P>0.05$), and TBR_{max}, TBR_{mean} value and positive IOD and positive area of calcification had positive correlation ($P<0.05$). SUV_{max}, SUV_{mean}, TBR_{max}, TBR_{mean} value of ¹⁸F-NaF uptake and the positive IOD of smooth muscle cells had negative correlation ($P<0.05$), and the positive area of smooth muscle cells also negatively correlated ($P<0.05$). SUV_{max}, SUV_{mean}, TBR_{max}, TBR_{mean} value of ¹⁸F-NaF uptake and the positive IOD of macrophages had no correlation ($P>0.05$), and the positive area of macrophages also no correlated ($P>0.05$).

Conclusion: The degree of ¹⁸F-NaF uptake in carotid plaque and its vulnerability is positively correlated. Therefore, ¹⁸F-sodium fluoride PET/CT as a noninvasive method for detection of carotid plaque stability is applicable.

P_36

Comparative Study of the ¹⁸F-FDG PET/CT Imaging Characteristics in Isometabolic Liver Lesions

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Objective: To compare and analysis the imaging characteristics of isometabolic liver lesions in ¹⁸F-FDG PET/CT imaging.

Methods: Prospective study was conducted in patients with isometabolic liver lesions in ¹⁸F-FDG PET/CT imaging from November 2014 to May 2015 in nuclear medicine department of our hospital. The clinical data were retrospectively followed-up and analyzed. According to the pathologic diagnosis, clinical diagnosis, imaging examination result and the follow-up result, these isometabolic liver lesions were divided into benign and malignant group. The clinical data and imaging characteristics of ¹⁸F-FDG uptake and factors influencing isometabolism were reviewed and the specificity factors to improve the diagnostic value of ¹⁸F-FDG PET/CT imaging were found.

Results: 73 cases of isometabolic liver lesions in 69 patients were enrolled in this study which included 7 malignant lesions and 66 benign lesions (2 cases of liver cell dysplasia, 50 cases of liver cyst and 14 cases of liver hemangioma). Isometabolism was defined as no difference in SUV_{mean} between lesions and the right lobe of the liver ($P>0.05$). The 7 malignant lesions performed the low density shadow in CT, and 2 of the ambulant liver carcinomas had the increased SUV_{max} in delay imaging.

Both liver cysts and hepatic hemangioma perform low density shadow with clear edge, and respective present none enhanced, quick in quick out in the enhanced CT. The 2 cases of LCD respective performed the unclear edged low density shadow and clear edged high density shadow. The lesion size, T/N_{max} and CT value of isometabolic liver lesions had significant statistical differences ($P<0.05$), The SUV_{max} , SUV_{mean} and T/N_{mean} of isometabolic liver lesions had no statistical difference ($P>0.05$).

Conclusion: Hepatocellular carcinoma, liver metastasis, liver cyst, hepatic hemangioma, liver cell dysplasia can all present as isometabolic liver lesions in ^{18}F -FDG PET/CT imaging. The Lesion size, T/N_{max} and CT value do help to diagnosis the benign and the malignant liver isometabolic lesions.

Keywords Liver; Fluorodeoxyglucose F18; Standard Uptake Value; Positron Emission Tomography; Computed Tomography.

P_37

A Study of Baculovirus-Sleeping Beauty 100× Transposon Hybrid Vector-Mediated Reporter Gene Imaging for Long-Term Monitoring

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Objectives: Reporter gene imaging usually require long-term monitoring for dynamic investigation. Baculovirus vector (BV) is a novel transient viral vector with numerous distinctive superiorities. Here, we significantly prolonged the BV-mediated reporter gene imaging period with Sleeping Beauty 100× (SB) transposon gene.

Methods: The cells were infected by BSeN (BV-SB-eGFP-NeoR) for achieving eGFP stably-expressing cells (FTC-133-eN and U87-eN cells), as well as by other different structural BVs. The infection effects were evaluated by flow cytometry and PCR. The U87-eN cells were long-termly imaged by optical imaging system after transplantation, and tumors frozen section analysis was finally performed. BSGN [BV-SB-glucagon-like peptide 1 receptor (GLP-1R)-NeoR] was used to achieve GLP-1R stably-expressing FTC-133-GN cells, and long-termly imaged by micro-PET after transplantation.

Results: Flow cytometry showed FTC-133-eN and U87-

eN cells maintained eGFP expression for at least 180 days. CCK-8 assay indicated that there was no adverse effects with all BVs. The optical imaging at day 1, 14 and 35 after U87-eN cells transplantation showed stable imaging effects with a high target/background ratio, and further tumor frozen section analysis showed high eGFP positive percentage. And Real-time PCR revealed that GLP-1R expression level in FTC-133-GN cells was about 6 and 11-fold higher than two insulinoma cell types. At day 50 after FTC-133-GN cells transplantation, the micro-PET imaging showed the transplantation site were clearly imaged with excellent target/background ratio, which further confirmed by radioactivity biodistribution assay. **Conclusion:** The BV-SB hybrid vector could prolong reporter gene expression, which might broad the application of BV in reporter gene imaging.

P_38

Predictive value of salivary glands damage by post-therapeutic ^{131}I whole-body scan in patients with DTC

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Objective: The aim of this study is to predict the value of salivary glands damage after ^{131}I therapy using the post-therapeutic ^{131}I whole-body scan images (TWS) in patients with differentiated thyroid cancer (DTC).

Methods: 24 patients with DTC, who accepted ^{131}I therapy only one time and underwent ^{131}I whole-body scan after ^{131}I treatment 2-3 days were recruited from the First Hospital of China. All patients had normal salivary gland function on salivary glands scintigraphy (SGS) performed in the day before ^{131}I treatment. 3 patients didn't perform SGS after ^{131}I treatment. Based on SGS images or clinical manifestations we analyzed the TWS by visual analysis and quantitative analysis by calculating the salivary gland-to-background uptake ratios (SUR).

Results: Visual analysis couldn't predict salivary glands damage accurately. We found that SUR in parotid dysfunctional glands were significantly higher than in other glands with normal function (4.2 ± 2.35 Vs 2.99 ± 1.29 , $P=0.045$). Submandibular glands ^{131}I uptaking level had nothing to do with whether submandibular glands function decline or not ($P=0.885$). On the TWS, SUR of parotid glands in patients with parotitis were significantly higher than in other patients (3.85 ± 1.95 Vs 2.51 ± 0.65 , $P=0.002$), the sensitivity for predicting parotitis by quantitative analysis was 59%. The SUR of patients who had sialadenitis of submandibular

glands were significantly higher than in other patients (5.44 ± 3.11 Vs 3.22 ± 1.34 , $P=0.006$), the sensitivity for predicting sialadenitis of submandibular glands by quantitative analysis were 64%.

Conclusion: We can evaluate salivary glands situation by TWS.

P_39

Comparative study of efficacy of ^{32}P colloid and ethanol in the treatment of thyroid cysts

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Objective: To evaluate the efficacy and safety of ultrasound-guided percutaneous ^{32}P colloid and ethanol for treating thyroid cysts.

Methods: 151 cases of thyroid cysts were treated with ^{32}P colloid and ethanol from February 2012 to December 2014. 151 cases were divided into two groups by randomization. 76 cases were treated with ^{32}P colloid, and remaining 75 cases with ethanol. The efficacy and side effects were observed and recorded during follow-up. Treatment results were included three categories: cure, efficiency and inefficiency. Rank sun test was used to compare the efficacy of treatment and Chi-square test was used to compare the rate of complications between the two groups.

Results: The rate of cure, efficiency and inefficiency of ^{32}P colloid group were 86.9%, 10.5% and 2.6%, respectively, ethanol group were 70.7%, 6.7% and 22.6%, respectively, and there was significant difference between two groups ($z=-2.428$, $P=0.015$). The incidence of neck discomfort (13.2%) in the ^{32}P colloid group was significantly lower than ethanol group (29.3%), and drunk like reaction (6.7%) was only found in ethanol group, and the difference was statistically significant ($P<0.05$). However, there were no significant difference between two groups in needle hematoma bleeding (7.9% vs. 10.7%), bleeding hematoma (1.3% vs. 2.7%) and post infection (0% vs. 1.3%), and the difference was not statistically significant ($P>0.05$).

Conclusion: The efficacy of ultrasound-guided percutaneous ^{32}P colloid for treating thyroid cysts is better than ethanol, and the former is relatively higher safety. Ultrasound-guided percutaneous ^{32}P colloid, which is a safe and effective minimally invasive treatment, is worthy of clinical application.

P_40

Radioimmunotherapy for CD133⁺ cancer stem cells can effectively inhibit colonic cancer developing

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Objective: The purpose of this study was to evaluate to whether radioimmunotherapy(RIT) for cancer stem cells (CSCs) have some effects on colorectal cancer developing.

Methods: We utilized N-succinimidyl-3-tri-n-butylstannyl (ATE) to radioiodinated AC133.1mAb, which targets colonic CSCs marker-CD133 specially. Two therapy studies were applied to determine the Maximum tolerated dose (MTD) in HCT116-bearing nude mice and evaluate the therapeutic response respectively. Therapeutic effect was reflected by survival time and the tumor volume doubling time (VDT), SPECT-CT imaging were used for monitoring the therapeutic response. At the end of experiment, tumor tissue were analysed for flow cytometry and histological stain.

Results: The MTD of HCT116-tumor bearing nude mice was 450 μci . The average survival time of ^{131}I -AC133.1mAb group(44.83 ± 3.54 d), tumor volume doubling time(VDT) (11.37 ± 2.22 d) and its CD133 expression($6.25\% \pm 2.24\%$) were statistically significant difference than other group ($P<0.05$). Tumor tissue HE dyed shown large central necrosis area in ^{131}I -AC133.1mAb group, but none of necrosis area was observed in control group. SPECT-CT could trace the tumor until the 9th day. The cumulative absorbed radiation dose of tumor was 5946cGy.

Conclusion: RIT for CSCs was a promising approach, which could effectively inhibit tumor developing.

P_41

Incremental value of SPECT/CT fusion imaging with dual-phase and dual-tracer technique in the diagnostic localization of parathyroid lesions in patients with hyperparathyroidism

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Objective: To investigate the incremental value of SPECT/CT fusion imaging with dual-phase and dual-

tracer technique for the localization of parathyroid disease in an unselected patient cohort with hyperparathyroidism.

Methods: According to the prospective trial study, the patients with biochemically confirmed hyperparathyroidism were included in the trial. Baseline values of all laboratory parameters had been determined about 1-2 weeks before ^{99m}Tc -MIBI parathyroid scintigraphy was done. Patients without special preparation, 40-60 MBq $^{99m}\text{TcO}_4$ was injected with static thyroid image acquisition started at 20 min, followed by 600 MBq ^{99m}Tc -MIBI injection, SPECT/CT was acquired immediately, at 120 min after injection ^{99m}Tc -MIBI additional delayed imaging were acquired. Patients underwent subtraction protocol. Surgical and histological findings were used as the standard of comparison, the sensitivity and specificity were calculated, and a McNemar test was used to compare them, with a significant level of 0.05.

Results: Between March 2015 and October 2015, the study group consisted of 8 men and 20 women with a mean age of 54.8 ± 14 years, range 27–80 years. Upon surgical exploration, a total of 40 enlarged parathyroid glands were found in 28 patients. 21 patients had a single adenoma while 7 had a multi-gland disease. The ability to detect parathyroid disease dual-phase accurately diagnosed 19 of 40 histological samples, the sensitivity and specificity for localization of parathyroid disease were 47.5 % (19/40) and 86.7 % respectively, the positive predictive value and negative predictive value were 98.0 % and 38.2 %. In dual-phase diagnosis patients with negative results, the subtraction-phase detect the other 5 lesions, increasing lesion detection sensitivity. SPECT/CT fusion imaging diagnosed 26 of 40 histological samples, the sensitivity, specificity, positive predictive value and negative predictive value were 65.0 %, 93.3 %, 96.2 %, 50.0 %, which compared with dual-phase's diagnostic value, the differences were statistically significant ($65.0\% \text{ vs } 47.5\%, P=0.031$; $93.3\% \text{ vs } 86.7\%, P=0.04$). The double-phase and subtraction combined analysis detection of 25 hyperparathyroidism's lesions, dual-phase combined with SPECT/CT fusion imaging, accurately diagnosed 26 of 40 histological samples. subtraction combined with SPECT/CT fusion imaging and all combined scintigraphy's diagnostic value were the same performance, the sensitivity and specificity compared with double-phase to improve had statistically significant difference ($47.5\% \text{ vs } 67.5\%, P=0.016$; $86.7\% \text{ vs } 93.3\%, P=0.04$).

Conclusion: with no neck surgery or complicated with other thyroid diseases in primary hyperparathyroidism underwent double phase combined with early SPECT/CT fusion of neck surgery, or complicated with other thyroid diseases in patients undergoing dual phase combined with early SPECT/CT fusion based early-

phase maximum benefit.

Keywords: Hyperparathyroidism; Parathyroid Scintigraphy; SPECT/CT fusion imaging; parathyroid adenoma.

P_42

PET of HER2 Expression with a Novel ^{18}F Al-Labeled Affibody

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Objective: Various PET radioisotopes labeled ZHER_{2:342} affibodies have used for detecting HER2-positive lesions. However, few studies have explored the relationship between imaging and histopathology. Herein, the biological properties of a novel Al¹⁸F-labeled ZHER_{2:342} were investigated in a variety of tumor models and the correlations between quantitative PET data and HER2 status were also evaluated.

Methods: ZHER_{2:342} was modified with a hydrophilic linker and then conjugated with MAL-NOTA. The affibody molecule, MZHER_{2:342}, was then radiolabeled with Al¹⁸F complex. The binding specificity of the tracer, ¹⁸F-Al-NOTA-MAL-MZHER_{2:342} with HER2 was primarily characterized using in vitro cells uptake studies. MicroPET imaging were also performed in nude mice bearing tumors after iv injection.

Results: ¹⁸F-Al-NOTA-MAL-MZHER_{2:342} can be efficiently produced within 30 min with a non-decaycorrected yield of about 10% and a radiochemical purity of more than 95%. In vitro experiments revealed that the modified affibody retained the specific affinity to HER2 and a significant correlation existed between %AD values and HER2 levels in tumor cells. PET imaging showed that SKOV-3 and JIMT-1 xenografts were clearly visualized with excellent contrast and low abdomen backgrounds. On the contrary, the signals of MCF-7 tumor was difficult to visualize. A significant linear correlation between %ID/g values and relative HER2 expression level obtained from PET quantification and Western analysis respectively was found in all tumor-bearing mice.

Conclusion: ¹⁸F-Al-NOTA-MAL-MZHER_{2:342} is a promising tracer for evaluation of HER2 status with the advantage of facile synthesis, favorable pharmacokinetics and in vivo accurate differential diagnosis of tumors with different HER2 levles.

P_43**Data-driven Identification of Intensity Normalization Region based on Longitudinal Coherency of ^{18}F -FDG Metabolism in the Healthy Brain**

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Objective: In brain ^{18}F -FDG PET data intensity normalization is usually applied to control for unwanted factors confounding brain metabolism. However, it can be difficult to determine a proper intensity normalization region as reference for the identification of abnormal metabolism in diseased brains. In neurodegenerative disorders, it remains challenging to differentiate disease-related changes in brain metabolism from age-associated natural changes. This study proposes a new data-driven method to identify proper intensity normalization regions in order to improve separation of age-associated natural changes from disease related changes in brain metabolism.

Methods: 127 female and 128 male healthy subjects (age: 20 to 79) with brain ^{18}F -FDG PET/CT in the course of a whole body cancer screening were included. Brain PET images were processed using SPM8 and were parcellated into 116 anatomical regions according to the AAL template. It is assumed that normal brain ^{18}F -FDG metabolism has longitudinal coherency and this coherency leads to better model fitting. The coefficient of determination R^2 was proposed as coherence coefficient and the total coherence coefficient (overall fitting quality) was employed as an index to assess proper intensity normalization strategies on a single subject and a group basis. Age-associated longitudinal changes of normal subjects were derived using the identified intensity normalization method correspondingly.

Results: Intensity normalizations by paracentral lobule and cerebellar tonsil, both regions derived by the new data-driven coherency method, showed significantly better coherence coefficients than other intensity normalization regions and especially better than the most widely used global mean normalization. Intensity normalization by paracentral lobule was the most consistent method within both analysis strategies (group-based and subject-based). In addition, the proposed new intensity normalization method using paracentral lobule generates significant higher differentiation from the age-associated changes than

other intensity normalization methods.

Conclusion: Proper intensity normalization can enhance the longitudinal coherency of normal brain glucose metabolism. Paracentral lobule followed by cerebellar tonsil is proved to be the two most stable intensity normalization regions concerning age-dependent brain metabolism. This may provide the potential to better differentiate disease-related changes from age-related changes in brain metabolism, which is of relevance in the diagnosis of neurodegenerative disorders.

P_44**Mechanism of ^{18}F -FDG uptake reduction of the acquired tamoxifen-resistant human breast cancer cell T47D-TamR**

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Objective: To establish the acquired tamoxifen (TAM)-resistant human breast cancer cell T47D-TamR, and compare the ^{18}F -FDG cell uptake rate between T47D-TamR and its parental cell T47D, meanwhile, to study the preliminary mechanism.

Methods: Long-term step rise drug stimulation was used for cell line T47D-TamR establishment and then the cell proliferation and resistance index were determined by MTT assay. The uptake rate of ^{18}F -FDG between T47D-TamR and its parental cell T47D were measured in the setting of different cell count, reaction time, ^{18}F -FDG radioactivity and glucose concentration. Western blot was used to examine the expression of estrogen receptor α (ER α), glucose transport protein 1 (GLUT1), phosphorylated AMP-activated protein kinase (p-AMPK) and phosphorylated mammalian target of rapamycin (p-mTOR) between T47D-TamR and its parental cell T47D. $P<0.05$ was considered as statistically significance for two group comparison.

Results: T47D-TamR cell line was successfully established and its drug resistant index was 1.97 ± 0.08 , which showed a significantly decreased cell proliferation efficacy. Significantly differences were found between T47D-TamR and its parental cell T47D when changing the cell count, reaction time, and ^{18}F -FDG radioactivity ($p<0.05$). The relative expression of ER α , GLUT1, p-AMPK, p-mTOR was 0.26 ± 0.03 , 0.41 ± 0.02 , 0.29 ± 0.02 , 0.64 ± 0.05 in T47D, and 0.17 ± 0.02 , 0.24 ± 0.01 , 0.66 ± 0.06 , 0.42 ± 0.03 in T47D-TamR cell, which showed a significant difference ($p<0.05$).

Conclusion: T47D-TamR cell showed lower cell uptake rate of ¹⁸F-FDG, decreased expression of ER α , GLUT1, p-mTOR and increased expression of p-AMPK than parental cell, indicating the decreased glycolysis ability in TAM-resistant breast cancer cell.

P_45

The Study of Relationship between SIX1 Expression and Prognosis in Esophageal Squamous Cell Carcinoma and The Mechanism of SIX1 Induced Radioresistance

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Objectives: 1. To observe the effect of SIX1 on the prognosis of esophageal squamous cell carcinoma. 2. To explore the mechanisms of SIX1 induced radioresistance.

Methods: 1. Immunohistochemical method was used to detect the expression of SIX1. 2. Western blot was used to detect the expression of proteins. MTT assay and colony formation assay were used to detect the cells' proliferation. Transwell invasion assay was used to detect the cells' invasion. Flow cytometry analysis technique was used to detect the change of radioresistance after 4 Gy irradiation.

Results: 1. The patients with high SIX1 expression had poorer prognosis. 2. Up-regulating the expression of SIX1 promoted the proliferation and invasion, and down regulating the expression of SIX1 inhibited the proliferation and invasion. 3. Up-regulating the expression of SIX1 decreased apoptosis, and down regulating the expression of SIX1 increased apoptosis after 4 Gy irradiation. 4. Up-regulating the expression of SIX1 promoted the expression of cyclin E, MMP-2, Bcl-2 and inhibited the expression of Bim. Down regulating the expression of SIX1 inhibited the expression of cyclin E, MMP-2, Bcl-2 and promoted the expression of Bim. 5. Up-regulating the expression of SIX1 activated the AKT signaling pathway and then promoted the expression of Bcl-2.

Conclusion: High expression of SIX1 shows poorer prognosis and SIX1 increases radioresistance through AKT/Bcl-2 signaling pathway.

P_46

Glucose Metabolism and Resting-state fMRI BOLD Signal changes in normal brain aging

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Objective: To reveal glucose metabolism and functional MRI BOLD signal changes with the normal aging by PET and rs-fMRI .

Methods: Eighteen healthy subjects were selected based on availability of data. Regional homogeneity (ReHo), amplitude of low frequency fluctuations (ALFF), fractional amplitude of low frequency fluctuations (fALFF), and degree of centrality (DC) maps were generated from the rs-fMRI data, and rate of glucose metabolism (rGM) was provided by FDG PET. Linear correlations were performed between the age and the five metrics voxels cross subjects.

Results: (1) The strongest positive correlation between rGM and age was found in left calcarine, right cerebellum posterior lobe, lingual gyrus, cingulate gyrus. There was significant age-related decline of rGM values in right precentral gyrus, supplementary motor area. (2) The negative correlation between ALFF and age was found in left temporalis medius gyrus, temporalis inferior gyrus, calcarine, right precuneus. (3) The negative correlation between fALFF and age was found in right frontalis superior gyrus, frontalis medius gyrus, calcarine. (4) The positive correlation between rGM and age was found in right frontalis superior gyrus, temporalis medius gyrus, supramarginal gyrus. The negative correlation between fALFF and age was found in right frontalis superior gyrus, frontalis medius gyrus, left precuneus lobe, calcarine. (5) The positive correlation between rGM and age was found in left precentral gyrus, frontalis superior gyrus. The negative correlation between fALFF and age was found in left calcarine, right lingual gyrus, frontalis medius gyrus. **Conclusion:** FDG PET and resting-state fMRI can be sensitively used to measure the signal changes during aging. The analysis results also showed wider metabolism changes than fMRI metrics in normal brain aging.

P_47

The radiological features and differential diagnosis of invasive adenocarcinoma present as pure ground glass nodules.

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Objective(s): To retrospectively investigate the radiological features and differential diagnostic value of invasive adenocarcinoma present as pure ground glass nodules (pGGNs).

Methods: Collected 45 pGGNs in 40 patients from November 2010 to April 2016 in our center. According to the different clinical prognosis was divided into two groups, adenocarcinoma in situ (AIS), micro invasive adenocarcinoma (MIA) group (23pGGNs) and invasive adenocarcinoma group(22pGGNs). Retrospectively analysis of the lesions clinical characteristics, radiological features and FDG metabolism (SUVmax). Statistical analysis was performed by using SPSS19.0, P <0.05 was considered statistically significant.

Results: Clinical data including age, male and female incidence rates, smoking history in two groups had no significant difference($P>0.05$). Of 45 lesions, no statistically significant difference was observed between two groups in terms of the three-dimensional ratio, location and SUVmax($P>0.05$). The morphological features showed that the frequency of vascular convergence sign ($P=0.027$) in invasive adenocarcinoma group was significantly higher than AIS, MIA group, but lobulation, spiculation, air bronchogram, bubble lucency, pleural indentation between two groups had no significant difference($P>0.05$). The size and the mass of invasive adenocarcinoma group were significant larger than that of the AIS, MIA group($P<0.01$). ROC showed that the optimal cut-off point of the size and the mass were 17.3mm and 0.69g. Sensitivity and specificity was respectively 73%, 73%, 87%, 91%.

Conclusion: Combined with the size, the mass, and vascular convergence sign were helpful to detect invasive adenocarcinoma present as pGGNs, to provide the theoretical basis for individualized treatment.

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Objective: We performed a meta-analysis to compare the performance of WB-MRI with that of FDG-PET/CT for lesion detection and initial staging in patients with Hodgkin lymphoma, aggressive non-Hodgkin lymphoma and indolent non-Hodgkin lymphoma.

Methods: We searched MEDLINE, EMBASE and LILACS databases for identification of studies that compared WB-MRI and FDG PET/CT for lymphoma staging. The methodological quality of the studies achieved were assessed using the Quality Assessment of Diagnostic Accuracy Studies 2. The sensitivity and specificity of PET/CT and WB-MRI for lesion detection were calculated using Review Manager version 5.3. Stata version 12.0 was used to calculate meta-analytic estimates of combined sensitivity (μ) of WB-MRI and FDG-PET/CT for initial staging and to assess possible heterogeneity (χ^2) across included studies.

Results: 9 studies including 350 patients were identified. On a per-lesion basis, the sensitivity of WB-MRI ranged from 84% to 97% and the specificity ranged from 99% to nearly 100%. In terms of staging, the meta-analytic sensitivities of WB-MRI and FDG-PET/CT for Hodgkin lymphoma and aggressive non-Hodgkin lymphoma were 97% (95% CI, 94%-100%) and 97% (95% CI, 94%-100%), respectively. The pooled sensitivity of FDG-PET/CT dropped to 86% (95% CI, 73%-98%) for staging in patients with indolent lymphoma, while that of WB-MRI remained to be 94% (95% CI, 88%-100%).

Conclusion: WB-MRI is a less histology-dependent functional imaging test than FDG-PET/CT and may be the imaging test of choice for staging in patients with indolent lymphoma. As a radiation-free imaging modality, WB-MRI can also serve as a viable alternative to FDG-PET/CT for staging of Hodgkin lymphoma and aggressive non-Hodgkin lymphoma especially in younger patients.

P_48

Whole-Body Diffusion-Weighted MRI versus FDG-PET/CT for Pretherapeutic Assessment and Staging of Lymphoma: A Meta-Analysis

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P_49

Correlation between PET / CT metabolic parameters with MR-DWI and the Application Value of Hybrid to diagnosis of regional LN involvement in Rectal cancer primary tumor

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Objectives: Rectal cancer is one of the most common digestive cancers incidence increased year by year. Rectal cancer regional LN involvement is an important prognostic factor. The judgment of the regional LN involvement with conventional imaging methods has its own limitations, with positron emission tomography (PET / CT) flourishing, the diagnosis of a variety of malignant disease LN involvement has showed its significance, MR-DWI as the " PET-like" imaging, have a high sensitivity to metastases, the advantages of no radiation has been attached attention, the present study was designed to study the correlation of rectal cancer metabolic parameters (such as SUV_{max} , MTV, TLG) and MR-DWI ,and a combination of both in the diagnosis of rectal cancer regional LN involvement.

Methods: From January 2014 to January 2016, the Tumor Hospital Affiliated to the Harbin Medical University colorectal surgical patients admitted to carry out a prospective rectal cancer MRI and PET / CT joint study, the inclusion criteria is biopsy-proven rectal cancer based on colonoscopic findings and no previous treatment of this tumor. All cases received rectal MR and body ^{18}F -FDG PET / CT before surgery, the two inspections interval is less than one week; within 5 weeks after surgical resection. Finally, a total of 34 patients met the criteria included in our study. PET / CT image after passing GE PET-VCAR software application fixed threshold value method to determine the optimum primary tumor boundary, the software automatically generates the measured lesion ROI of SUV_{max} , metabolic tumor volume (MTV) and total lesion glycolysis (TLG) to $SUV_{max} \geq 2.5\text{ g / ml}$ (MTV2.5 and TLG2.5), $SUV_{max} \geq 3.0\text{ g / ml}$ (MTV3 and TLG3), $SUV_{max} \geq 3.5\text{ g / ml}$ (MTV3.5 and TLG3.5) for the automatic cut-off point suitable outlined region of interest (ROI), with an average SUV mean value of 3 measurements of the average SUV (SUV_{mean}). We assessed the relations between PET / CT and metabolic parameters ADC_{mean} , ADC_{min} of the rectal tumors by computing the Spearman ρ correlation coefficient. $p < 0.05$ was considered statistically significant; the gold standard is pathology where the regional LN involvement in 10 cases. Univariate analysis was used to analyze the associations of every factor in regional LN involvement group and no regional LN involvement group. Variables with $p < 0.2$ in univariate analysis were included logistic multivariate analysis; ROC curve analysis the diagnostic performance of significant factors.

Results: We found a slight negative correlation between SUV_{max} and ADC_{mean} ($\rho = -0.340$, $p = 0.049$), MTV2.5 ($\rho = -0.464$, $p = 0.006$), MTV3 ($\rho = -0.457$, $p = 0.007$), MTV3.5 ($\rho = -0.465$, $p = 0.005$), TLG2.5 ($\rho = -0.524$, $p = 0.001$), TLG3 ($\rho = -0.516$, $p = 0.002$), TLG3.5 ($\rho = -0.536$, $p = 0.001$) and has a moderate negative correlation with ADC_{mean} .

In univariate analysis , T stage, MTV, TLG, ADC_{mean} were factors significantly associated with regional LN involvement ($F=12.128-2.016$, $p <0.05$),However,in multivariate analysis, MTV, TLG, ADC_{mean} were factors significantly associated with LN involvement in rectal cancer ($p <0.05$), ROC of MTV2.5、MTV3、MTV3.5、TLG 2.5、TLG 3、TLG 3.5 and ADC_{mean} to diagnosis of regional LN involvement, cut-off point is 33.69、23.12、20.95、187.97、166.31、173.77and0.86, respectively; the AUC is 0.779、0.800、0.817、0.854、0.846、0.862 and 0.837,respectively;compared the AUCs with Z test, the difference was not statistically significant ($p> 0.05$), the diagnostic sensitivity was 80%、90%、90%、100%、100% and 80%; accuracy were70.83%、62.50%、70.83%、62.50%、62.50%、75% and 79.17%.

Conclusion: There is a negative correlation between PET / CT metabolic parameters and ADC_{mean} . In multivariate analysis, MTV, TLG and ADC_{mean} ,the facors to diagnosis of regional LN involvement,can provide a reference for clinical work with good accuracy,the relationship between PET / CT metabolic parameters and MRI-DWI parameters, its intrinsic mechanism needs further study.

P_50

Distinct Cerebral ^{18}F -FDG PET Metabolic Patterns in Anti-*N*-methyl-*D*-aspartate Receptor Encephalitis Patients with Different Trigger Factors

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Objective: Anti-*N*-methyl-*D*-aspartate receptor (anti-NMDAR) encephalitis is a subgroup of treatable autoimmune encephalitis, characterized by rapid development of psychosis, cognitive impairments and seizures. Etiologically, anti-NMDAR encephalitis could be divided into three subgroups, which are paraneoplastic (especially associated with ovarian teratoma), viral encephalitis-related and cryptogenic. Each type is different in clinical course, treatment strategies and prognosis. Cerebral glucose metabolic abnormalities have been reported in patients with anti-NMDAR encephalitis using ^{18}F -fluorodeoxyglucose (FDG) positron emission tomography (PET) imaging. While previous studies commonly demonstrated a general pattern of FDG PET abnormalities associated with the disease, this study aim to investigate distinct

cerebral metabolic patterns of encephalitis patients confirmed with antibodies against NMDAR according to different trigger factors.

Methods: Twenty patients with anti-NMDAR encephalitis from Huashan Hospital, Shanghai were consecutively recruited in this study. All patients were diagnosed based on clinical manifestations and positive anti-NMDAR antibodies both in serum and in CSF samples. Each patient was classified into an etiological subgroup (paraneoplastic, viral encephalitis-related and cryptogenic) by two senior neurologist based on clinical and laboratory information. ¹⁸F-FDG PET brain imaging was performed after confirmed diagnosis. To evaluate the cerebral metabolic activity of recruited patients, the PET images of individual patients were compared with those of the same ten normal controls using a voxel-wise statistical parametric mapping analysis, respectively.

Results: Twelve patients with anti-NMDAR encephalitis were divided into cryptogenic group, four patients were paraneoplastic and the remaining four were considered secondary to virus infection of central nervous system. Both groups of patients with cryptogenic and paraneoplastic anti-NMDAR encephalitis showed bilateral hypermetabolism in the frontal-temporal lobes and basal ganglia, covarying with bilateral hypometabolism in the occipital regions. Notably, the changes of hypermetabolism in the cortical and subcortical regions were usually asymmetric in the patients with cryptogenic encephalitis, but relative symmetric in those associated with tumor. Moreover, the anti-NMDAR encephalitis patients secondary to viral encephalitis presented with significant hypometabolism in the bilateral occipital regions, as well as in the unilateral temporal lobes and basal ganglia (also is virus infection side), but hypermetabolism in the contralateral temporal areas and basal ganglia.

Conclusion: This study revealed that anti-NMDAR encephalitis patients triggered by different factors presented distinct cerebral metabolic patterns. We propose that awareness of these patterns may help to better understand the various occurrence and development of anti-NMDAR encephalitis in each subgroup, and could offer valuable information to the diagnosis, treatment and prognosis of this elusive, but treatable disorder.

P_51

Subregional patterns of preferential striatal DAT loss differ in PD, MSA and PSP

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Objectives: Parkinson disease (PD), multiple system atrophy (MSA) and progressive supranuclear palsy (PSP) are all known to affect dopaminergic neurons and often present with similar clinical features. And making an accurate diagnosis is critical, not only for choosing treatment regimens and assessing prognosis but also for understanding pathogenesis and developing new therapeutic strategies. Dopamine transporter (DAT) imaging can demonstrate presynaptic dopaminergic neuronal loss in PD, MSA and PSP. However, differentiating atypical parkinsonism from PD is often difficult. In this study, we investigated differences in striatal subregional DAT loss in PD, MSA and PSP, as well as the diagnostic value of ¹¹C-CFT PET imaging in the differential diagnosis of parkinsonism.

Methods: Brain ¹¹C-CFT PET imaging was performed in 206 patients with parkinsonian disorders. Their medical records were available. The severity of motor symptoms was evaluated with the motor portion of the Unified Parkinson Disease Rating Scale, Part III(UPDRS III), immediately before PET and after antiparkinsonian drugs had been discontinued for at least 12 h (considered "off medication"). 17 healthy people (healthy controls) were selected from our PET center. Healthy controls had no neurologic or psychologic diseases. This study was approved by the institutional review board, and written informed consent was obtained from each subject. ¹¹C-CFT PET was performed with a Biograph 64 HD PET/CT camera. All subjects were intravenous injection 370 MBq ¹¹C-CFT PET. All subjects have rest 60 min in a dark and quietness room before the scans were obtained. Emission PET data were acquired for 10 min in the 3-dimensional mode after brain CT, which was performed in the spiral mode at 120 Kvp and 300mAs. Quantitative analyses were based on volumes of interest (VOIs), which were defined on the basis of a template in standard space. Image processing was performed with SPM5 within MATLAB 7.4.0.287 for Windows. Images of patients were reoriented so that the striatum contralateral to the symptomatic side was on the left side of the brain. If no laterality was present, then the anatomic left became the more affected side. The PET images were spatially normalized and a standardized set of regions of interest (ROIs) were defined bilaterally for the caudate, anterior putamen (AP), posterior putamen(PP), ventral putamen (VP), dorsal putamen (DP) and occipital cortex. The nondisplaceable binding potential (B_{ND}^* ; defined as the ratio of (striatum-occipital)/occipital radioactivity counts) of each striatal subregion and intersubregional ratio (ISR; defined as

the ratio of the BP_{ND} of one subregion to that of another subregion) were calculated. After the imaging, these patients were assessed by blinded movement disorders specialists for a mean of 2.3 years before a final clinical diagnosis was made. The accuracy of DAT imaging-based classification was assessed by comparison with the final clinical diagnosis. Continuous variables among groups were compared with 1-way ANOVAs. The Bonferroni correction and Dunnett's correction were applied to a post hoc analysis of between-group comparisons. The ROC curves were used to evaluate the sensitivity and specificity of the method. A P value of less than 0.05 was considered statistically significant. Data for the study variables were expressed as mean \pm SD. We used SPSS version 19.0.

Results: 122 patients had a final clinical diagnosis of PD, 50 MSA, and 34 PSP with severity matched. The BP_{ND} of all ROIs in healthy controls group were significantly higher than those in the PD MSA and PSP groups. We have not found significantly differences between affect side and other side. The BP_{ND} of caudate in the PSP group was significantly lower than those in the PD and MSA groups. The ISR of each subregional putamen/caudate in the PSP group was significantly higher than those in the PD and MSA groups. At the cutoff value of 1.16, the AP/C ISR had 87% sensitivity and 93% specificity for differentiating PSP from PD. The classifications were also accurate for PP/C (0.63; 80% sensitivity, 88% specificity), VP/C(1.13; 87% sensitivity, 92% specificity) and DP/C (0.87; 87% sensitivity, 90% specificity) ISRs. At the cutoff value of 1.23, the AP/C ISR had 81% sensitivity and 87% specificity for differentiating PSP from MSA. The classifications were also accurate for PP/C (0.78; 68% sensitivity, 84% specificity), VP/C (1.15; 84% sensitivity, 86% specificity) and DP/C (0.98; 81% sensitivity, 82% specificity) ISRs. The BP_{ND} of DP and the ISRs of DP/non-DP subregions in the MSA group were significantly higher than those in the PD group. At the cutoff value of 0.81, the DP/AP ISR had 76% sensitivity and 82% specificity for differentiating MSA from PD. The classifications were also accurate for DP/C (0.76; 71% sensitivity, 75% specificity) and DP/VP (0.87; 76% sensitivity, 76% specificity) ISRs.

Conclusion: The BP_{ND} of all ROIs in healthy controls group were significantly higher than those in the PD MSA and PSP groups. PD, MSA and PSP have different preferential subregional decreases in striatal DAT binding when examined by ^{11}C -CFT PET imaging. The ISRs could provide valuable information to distinguish parkinsonian disorders, even in earlier stages of disease.

P_52

The clinical efficiency of 125-iodine seeds transperineal puncture brachytherapy for prostate cancer refractory endocrine therapy

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Objective: To observe the value of 125-iodine seeds transperineal puncture brachytherapy guided by transrectal ultrasonography for prostate cancer refractory endocrine therapy.

Methods: A retrospective analysis was carried on 38 patients who were diagnosed as prostate cancer by biopsy and experienced 0.5 to 2.0 years endocrine therapy from Nov 2013 to Jan 2016. These 38 patients were aged from 64 to 89 years old with the mean age 75.2 ± 7.53 years old. The Gleason scores were from 6 to 10. The serum level of T-PSA of these patients were from 0.88 to 331ng/ml. There were 28 cases in stage C and 10 cases in stage D. After routine examination, all patients were treated by transrectal ultrasound guided prostate 125-iodine seeds brachytherapy combine with TPS guided. The prescription dose was 145Gy, the radioactivity ranged $1.295 \times 10^7 - 1.665 \times 10^7$ Bq, the number of implantation of each patient were from 50 to 122. All patients were followed-up for 3 months after brachytherapy.

Results: 1. Curative effects and Complication: A total of 38 prostate cancer patients were recruited, the CR rate, the PR rate, the SD rate, the PD rate and the mortality rate were 71.05% (27/38), 13.16% (5/38), 5.26% (2/38), 5.26% (2/38) and 5.26% (2/38) respectively. The survival rate of PSA progression free was 89.47% (34/38). The side effect was mild and transitory symptom, such as urinary irritation (75.00%, 27/36), acute urinary retention (13.89%, 5/36), rectal irritation (11.11%, 4/36), and there were none of urinary obstruction, rectal bleeding and seeds drifting happened. 2. T-PSA and F-PSA were detected before and after the therapy: In CR group, the level of T-PSA and F-PSA decreased significantly ($p < 0.05$). The PR group was no significant differences ($p > 0.05$). In SD group, there was significant difference in the level of T-PSA ($p < 0.05$), but there was no significant difference in the level of F-PSA ($p > 0.05$). In the PD group, the level of T-PSA and F-PSA were increased significantly after brachytherapy ($p < 0.05$). 3. WBC and PLT were detected before and after the therapy: There were 2 cases of dead in all patients after 3 months of brachytherapy, in the other 36 patients, the counts of WBC and PLT in blood were mild raise but there were

not statistically different than before ($p>0.05$) .
Conclusion: 125-iodine seeds transperineal puncture brachytherapy for prostate cancer refractory endocrine therapy is effective, and there is no effect in the activity of bone marrow hematopoietic function.

P_53

Correlation between Thyroid SUV Value and FT3 in Patients with Hyperthyroidism Measured by SPECT/CT, A prospective study

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Objectives: To measure the SUV value in patients with hyperthyroidism using SPECT/CT, to analyze the correlation between FT3 hormone level and the thyroid SUV value, and to compare the difference in thyroid SUV value between normal subjects and patients with hyperthyroidism.

Methods: 14 cases of untreated patients with hyperthyroidism and 6 cases of healthy volunteers were prospectively enrolled. All samples undertaken a $^{99m}\text{TcO}_4^-$ SPECT/CT thyroid fusion imaging. Q.Metrix software (an advanced, quantitative software) was adopted for reconstruction and correction of the SPECT/CT data to obtain the thyroid SUVmean value. SPSS software (SPSS Statistics 22.0) was applied.

Results: Pearson correlation analysis indicated there is a significant, positive correlation between FT3 value and the SUV_{mean} value, with the correlation coefficient of 0.846 ($P<0.001$). The regression equation is: Value (SUV_{mean}) = 7.475Value (FT3)+27.552, $P<0.001$. As the upper limit of normal FT3 value is 7.50 pmol/L, we obtained the theoretical upper limit of normal human thyroid SUV value of 83.61 according to the regression equation. All of the thyroid SUV values of the comparative trial were smaller than 83.61 while the 14 cases of patients were all greater than 84.61.

Conclusion: For patients with hyperthyroidism, there was distinct positive correlation between the FT3 value and the thyroid SPECT/CT SUV value. The regression equation was as follows: Value (SUV_{mean})=7.475Value (FT3)+27.552. The theoretical upper limit of normal human thyroid SUV value obtained according to the regression equation was 83.61, which could be treated as the cut-off value to differentiate the SUV value between the normal subjects and patients with hyperthyroidism.

P_54

Kit-like ^{18}F -labeling of estradiol derivative as a potential PET imaging agent for estrogen receptor-positive breast cancer

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Objectives: Estrogen receptor- α (ER α) is overexpressed in more than half of human breast cancers and is an important prognostic factor for diagnosis and treatment. Currently, 16α -[^{18}F]fluoroestradiol ([^{18}F]FES) has been developed for targeting ER $^+$ breast cancer as a PET imaging agent in clinical. However, radiosynthesis of [^{18}F]FES often requires two-step from the precursor and suffers from tough experimental conditions. Recently, ^{18}F - ^{19}F isotope exchange on organotrifluoroborate was shown to be a facile radiofluorination strategy, with good radiochemical yield and without HPLC purification. So a new estradiol derivative of ^{18}F -AmBF₃-FES was designed and radiosynthesized by broadly applicable one-step ^{18}F -labeling method.

Methods: 100-300 mCi fluoride ion was eluted with 200 uL PBS (pH 2.5) from anionexchange resin trapping (QMA) into a polypropylene tube. The precursor of AmBF₃-FES (50-100 nmol) was added to the tube. The tube was placed in a heating block at 85 °C for 20 min. The reaction mixture was loaded onto a C18 light cartridge which was washed with water (3 × 10 mL). Radiochemically pure product was eluted with 1:1 ethanol/saline (0.5 mL) into a glass vial to provide the tracer, total time: 30 min. The small tracer was removed for quality-control analysis by HPLC. The cell uptake was investigated under the conditions of 1×10^6 MCF-7 cells, 0.1 μCi of ^{18}F -FES-BF₃ and incubation for 120 min.

Results: HPLC for quality analysis showed that a single peak in both radioactive and ultraviolet modes with the retention time of 19.2 min. And an excellent radiochemical purity (>99%) of the tracer was obtained. The radiochemical yield of the tracer is over 60% (corrected for decay). The radiochemical purity of the freshly prepared radiotracer was still larger than 95% at 3 h after storage at room temperature. The uptake rate of ^{18}F -AmBF₃-FES was $3.1\pm 0.1\%$. It indicated that ^{18}F -FES-BF₃ could target ER $^+$ breast cancer cells.

Conclusion: ^{18}F -AmBF₃-FES was successfully prepared and obviated HPLC purification in high yield within half hour via a facile isotope exchange reaction. The radiotracer is quite stable for further biological studies. Cellular uptake studies of the tracer suggested that it may be a potential PET imaging agent for ER $^+$ breast cancer.

P_55**Differential diagnostic value of ¹⁸F-FDG PET/CT in patients with cardiac tumor**

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Objective: To evaluate the clinical value of ¹⁸F-FDG PET / CT in differentiating benign lesions from the malignant lesions in patients with cardiac tumor.

Methods: ¹⁸F-FDG PET / CT data of 27 consecutive patients with cardiac or pericardiac lesions were retrospectively analyzed. The diagnostic criteria for ¹⁸F-FDG PET/CT was established, and its' diagnostic value for identifying malignancies or benign lesions was evaluated, based on the final clinical diagnosis.

Results: ¹⁸F-FDG PET/CT found single cardiac lesion in 8 cases, and cardiac lesion associated with systemic multiple lesions in 19 cases. Six of 8 patients with cardiac single lesion were diagnosed as benign tumor, while 18 of the 19 patients with cardiac lesion associated with systemic multiple lesions, were malignant tumors . The average SUV_{max} in malignant lesions was significantly higher than benign lesions (7.0 ± 5.0 vs 2.9 ± 2.6 ; $t = -2.8$, $P < 0.05$). According to the current diagnostic criteria, the differential diagnostic value of ¹⁸F-FDG PET/CT reached a sensitivity of 100%, specificity of 85.7% and accuracy of 96.3%.

Conclusion: ¹⁸F-FDG PET / CT has an important role for differentiating benign lesions form the malignant lesions in patients with cardiac tumors. However, tumor SUV_{max} was overlapped between benign and malignant lesions. Therefore, we should pay attention to general lesions and other clinical examinations in the diagnosis procedure.

P_56**The diagnostic value of combined whole body bone scintigraphy and serum CA15-3,CEA in breast cancer with bone metastases**

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Objective: To explore the diagnostic value and efficiency evaluation of combined whole body bone scintigraphy and the CA15-3,CEA level in breast cancer patients with

bone metastases.

Methods: 90 cases confirmed by pathology or cytology of breast cancer patients from September 2013 to July 2015 in our hospital. The results of whole body bone scintigraphy and CA15-3, CEA test results were analyzed.

Results: 56 patients with bone metastases were found in 90 cases of patients with breast cancer and the bone metastasis rate was 62.22% (56/90). Serum CA153 and CEA levels in the bone metastases group higher than the non- bone metastases ($P < 0.05$) . By Soloway grading standards, M1, M2 and M3 groups of CA15-3 and CEA levels rise step by step, at all levels between the difference had statistical significance ($P < 0.05$). The sensitivity, specificity and accuracy in diagnose bone metastases of whole body bone scintigraphy were 89.26%,76.47%,85.56%respectively, While combining whole body bone scintigraphy and the CA15-3,CEA level were 96.43%、88.24% and 92.22% respectively. Through the ROC curve analysis, the whole body bone imaging combined CA15-3 and CEA detection diagnosis efficiency is significantly higher than the single examination ($P < 0.05$).

Conclusion: CA15-3 and CEA for monitoring bone metastases of breast cancer have a certain value; The whole body bone imaging combined CA15-3 and CEA detection more help than each individual test detection of bone metastases of breast cancer.

P_57**Brain blood flow perfusion SPECT imaging of subclinical seizure : a report of three patients**

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Introduction: Subclinical seizures is ictal electrographic discharges lacking clinical seizure signs or subjective symptoms. The reports of subclinical seizure were mostly from electroencephalogram. Some scholars had pointed out the clinical value of subclinical seizure in both of localizing the onset zone and surgical outcome prognosis. Nuclear medicine had been used to provided some information of functional imaging for patients with epilepsy, but nuclear medicine imaging about subclinical seizure were rare reported. Though subclinical seizure were detected in a few cases of brain ¹⁸F-FDG PET/CT imaging, the clinical value of localizing the onset zone was uncertain. Considering hemodynamic factor of ¹⁸F-FDG, the imaging may be

reflected mixed information including interictal, ictal and postictal. Comparing with ¹⁸F-FDG, ^{99m}Tc-ECD had well time resolution, so brain ^{99m}Tc-ECD SPECT imaging revealed cerebral blood flow perfusion of the point in time that imaging agent injected. In the clinical practice for localization of epileptogenic zone in patients with intractable epilepsy, we founded three cases of cerebral blood flow SPECT with subclinical seizure, which was performed under the video-electroencephalogram (VEEG) monitoring.

Clinical data: Case 1: A 46-year-female with 34 years history of epilepsy, whose onset characterized by loss of consciousness and limbs twitch, was treated by antiepileptic drugs up to now. Poorly controlled, thus the patient planed to surgical treatment. Brain MRI findings were normal. Long-term VEEG monitoring revealed interspersed spike and slow wave from left frontal lobe during awake and sleep phases. In order to localizing epileptogenic zone further clear, ^{99m}Tc-ECD cerebral blood flow perfusion imaging was performed. The brain ^{99m}Tc-ECD SPECT study showed a hyperperfusion focus in the left frontal lobe. Although the patient was asymptomatic during the scan, later review of VEEG recording revealed subclinical seizure twice in one minute after imaging agent injected.

Case 2: A 6 -year- boy that the first epileptic seizures after fever, whose performance of epileptic seizures by loss of consciousness, limbs twitch, head turn to right and gaze of the eyes to the right. Though the patient had been medication to control seizures, there were still attacks sometime. Long-term VEEG monitoring founded plenty of spike wave discharge from left frontal lobe during awake and sleep phases. Brain MRI revealed hypoplasia of corpus callosum and bilateral hippocampal volume reduction. In order to gain more information about epileptogenic zone, ^{99m}Tc-ECD cerebral blood flow perfusion imaging was performed. The brain ^{99m}Tc-ECD SPECT study showed a hyperperfusion focus in the left frontal lobe. Although the patient was absence of clinical symptoms, later review of VEEG recording revealed spike and slow wave from the left frontal lobe at the time of imaging agent injected, indicating subclinical seizure episode.

Case 3: A 14-year-boy with 10 years history of epilepsy, whose onset characterized by loss of consciousness, limbs twitch, eyes peering upwards, foaming at the mouth and trismus, was treated by antiepileptic drugs up to now. Due to the irregular medication, the seizure frequency was increased recently, thus the patient planed to surgical treatment. Brain MRI was no positive findings. Long-term VEEG monitoring revealed abnormal electrical activity from right frontotemporal lobe always and interspersed spike and slow wave from left frontotemporal lobe during awake and sleep phases. In order to localizing epileptogenic zone further clear,

^{99m}Tc-ECD cerebral blood flow perfusion imaging was performed. The brain ^{99m}Tc-ECD SPECT study showed hyperperfusion focus in the both frontal lobe, especially the left one. Although the patient did not seem to have seizure clinically, later review of VEEG recording showed frequent seizure discharge from right hemispheres at the time of imaging agent injected. Overall consideration, we thought the epileptogenic zone was in the right frontal lobe, however the hyperperfusion focus in the left frontal lobe was 'mirror-focus'.

Discussion: So far, subclinical seizure of ^{99m}Tc-ECD cerebral blood flow perfusion SPECT imaging had not been reported. ^{99m}Tc-ECD had well time resolution, and brain ^{99m}Tc-ECD SPECT imaging revealed cerebral blood flow perfusion of the point in time that imaging agent injected. Thus in this way, we could gain all imaging of different state of epilepsy patients, including interictal, ictal and postictal. Though ^{99m}Tc-ECD SPECT imaging had been used widely for the presurgical evaluation of epileptic onset zone in patients with intractable epilepsy, there were still some problems in clinical practices. Among that, the most important one is how to determine which state that the epilepsy patients in, further we can describe the imaging accurately and provide more information for clinical. Considering the question above, we performed cerebral blood flow SPECT imaging under the video-electroencephalogram (VEEG) monitoring. In our prior study, we had proved that ^{99m}Tc-ECD SPECT imaging could provide more information about epileptogenic zone and surgical outcome prognosis in this way.

Conclusion: Brain activity of epilepsy patients is miscellaneous, including different state of interictal, ictal and postictal. Thus to evaluate cerebral blood flow perfusion situation at a certain moment, it is important to refer to VEEG recording.

P_58

PET/CT imaging features of primary ureteral lymphoma and literature review

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Objective: we report and analyze the dual-time-point FDG PET/CT imaging of primary ureteral lymphoma(PUL), to discuss the value of PET / CT in diagnosis, staging and therapy assessment of it.

Methods: one case of primary ureteral lymphoma with complete clinical and imaging data was reported and the related literature was reviewed, and we pay

a special attention to the performance of PET/CT in ureteral lymphoma.

Results: ureteroscopy showed that about 5 cm away from the entrance of the bladder, the left ureter narrowed apparently, but no mass was found. The before and after contrast enhanced CT demonstrated that the size of the left ureteral mass increased and the condition of hydronephrosis became worse. Whole body FDG PET/CT only showed a middle left uretal mass with moderate FDG uptake. A punch of biopsy of the mass confirmed it to be Non-Hodgkin's Lymphoma.

Conclusion: primary ureteral lymphoma is extremely rare, PET/CT plays an important role in diagnosis, clinical staging and therapy assessment of it.

Keywords: ureteral neoplasm ureteral lymphoma PET PET/CT imaging diagnosis.

P_59

Hepatic Ectopic Pregnancy on ¹⁸F-FDG PET/CT

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Objective: Abdominal ectopic pregnancies are extremely rare. Only less than 30 hepatic pregnancies have been reported in the English medical literature over the past 60 years

Methods: A 31 year old woman had acute abdominal pain and distention. Laboratory examination showed significantly increased serum betaHCG. Both ultrasound and magnetic resonance imaging identified a lesion located in the right lobe of liver. FDG PET/CT was performed to determine whether the other causes of elevated beta-human chorionic gonadotropin (beta-HCG), which showed an oval mass with mid, peripherally-increased FDG activity.

Results: The patient underwent a laparotomy to remove the mass. Histopathology examination showed chorionic villi in the hepatic tissue, consistent with pre-surgical diagnosis of ectopic hepatic pregnancy.

Conclusion: Many diseases can lead to high levels of blood beta-HCG, including gestational choriocarcinoma, hepatoblastoma, and even breast cancer and lung cancer. FDG PET/CT has relatively high sensitivity and specificity in the detection of malignancies. The negative findings in other parts of the body on the FDG PET/CT scan in our case strengthened confidence of the pre-surgical diagnosis that a hepatic ectopic pregnancy was the culprit causing increased beta-HCG and the patient's symptoms.

P_60

Differential diagnosis between PD and MSA using imaging of glucose metabolism and nigrostriatal dopaminergic integrity

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Objective: To explore the value of imaging with cerebral glucose metabolic pattern, nigrostriatal dopamine transporter and D2 receptor availability in differential diagnosis between PD and MSA.

Methods: Imaging of Patients with clinically confirmed PD(20 cases) and MSA(15 cases) were retrospectively analysed. All patients received nigrostriatal dopamine transporter and D2 receptor imaging accompanied with FDG whole brain scan. Both visual assessment and voxel-based measurement were used in image interpreting.

Results: Both PD and MSA patients showed reduced striatal dopamine transporter density, while more asymmetric in PD than MSA. Upregulated striatal dopamine D2 receptor expression was seen in PD but symmetrically reduced in MSA. As to cerebral network glucose metabolic change, PD patients showed normal or hypermetabolic change in basal ganglia while MSA patients showed hypometabolic region in both basal ganglia and cerebellum cortex.

Conclusions: PD and MSA showed different nigrostriatal dopaminergic and cerebral glucose metabolic change which can be detected accurately by a combination of different tracers imaging.

Keywords: Parkinson's disease, Multiple system atrophy, Dopamine transporter, Dopamine receptor, Cerebral glucose. Positron emission tomography.

P_61

Application of ⁶⁴Cu labeled PSMA targeted molecular probe for non-invasive Micro-PET imaging of gastric cancer

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Objective: DKFZ-PSMA-617 is an effective PSMA-targeted precursor and ⁶⁸Ga radiolabeled conjugates

have been extensively applied in clinical prostate cancer PET imaging. The focus of this paper is on labeling DKFZ-PSMA-617 with attractive radionuclide ^{64}Cu ($T_{1/2}=12.7\text{h}$) to have a prolonged non-invasive imaging of gastric cancer cell BGC-823 bearing nude mice.

Methods: ^{64}Cu , produced via the $^{64}\text{Ni}(\text{p}, \text{n})^{64}\text{Cu}$ reaction on a HM-20 cyclotron, was adjusted to pH=5.5 with NaAc buffer. Then the mixtures were incubated with DKFZ-PSMA-617 at 95°C for 10min. The label efficiency and in vitro stability of ^{64}Cu -PSMA-617 were analyzed by radio-HPLC. Partition coefficient ($\lg P_{\text{ow}}$) was also evaluated. Also, Micro-PET imaging was performed at 1, 4, 24, and 48 h after intravenous injection of 7.4 MBq ^{64}Cu -PSMA-617.

Results: The labeling yield was up to 80% and the radiochemical purity was over 99% after purification. ^{64}Cu -PSMA-617 proved to be a water-solubility substance and showed excellent in vitro stability in sodium chloride solution, the radiochemical purity maintained above 90% at 24h post incubation. Also, Micro-PET imaging showed specific uptake in the xenograft tumor and it was gradually increased over time.

Conclusion: ^{64}Cu -PSMA-617 proved to be a potential probe for PSMA targeted imaging, especially for delayed time points imaging according to long half-life of ^{64}Cu . The results also showed that ^{64}Cu -PSMA-617 may provide a new method for the diagnosis of gastric cancer.

Results: 90% of the 20 cases of initial diagnosis showed a positive examination outcome. In the 14 patients who had been confirmed pathological grade of tumor, result of PET/CT of the patients with G1 or G2 tumors was negative while that of the whole patients with G3-tumors was positive. Among the 19 patients who had been confirmed TNM stage, the SUV_{max} of the 3 patients with stage I and II tumors which is 3.62 ± 2.18 was less than the one of the other 16 patients with stage III and IV tumors which was 8.73 ± 4.04 , and there was a statistic difference between them. All 9 G3 patients who had undergone treatment before ^{18}F -FDG PET/CT examination had a elevated uptake, which accorded with the fact that they were all tumor recurrence or metastasis. The SUV_{max} of primary leisions including remaining or relapse is 6.06.15 lymph node which had a elevated uptake were proved meatstasis except out 2 false positive ones with the accuracy is 86.67%. Of 2 G3 patients, one with poor differentiated neuroendocrine tumor had a negative presentation, the other one had a weakly positive presentation with the SUV_{max} of the lesions in the bilateral lung is 1.5 and the lymph node is 3.0.

Conclusion: ^{18}F -FDG PET/CT plays a significant role on the diagnosis of G3 neuroendocrine tumors. ^{68}Ga -DOTA-NOC PET/CT behaves unsatisfactory on the 2 patients with G3 neuroendocrine tumors.

P_62

The clinic value of ^{18}F -FDG PET/CT imaging on diagnosis of poor differentiated neuroendocrine tumors (the imging analysis of ^{68}Ga -DOTA-NOC PET/CT of 2 patients with G3 tumors is enclosed)

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Objective: To study the clinic value of ^{18}F -FDG PET/CT imaging on diagnosis of G3 neuroendocrine tumors.

Methods: 29 patients who had underwent ^{18}F -FDG PET/CT imaging between January 2006 and December 2014, divided into 2 groups with one group contained 20 initial diagnosed patients and the other group contained 9 patients who have received clinical administration, were retrospectively analyzed to evaluate the high uptake feature of neuroendocrine tumors and analyze the relationship between SUV_{max} and TNM staging. 2 patients with G3 neuroendocrine tumors were injected ^{68}Ga -DOTA-NOC and imaged 1 h later.

P_63

Imaging of $^{99\text{m}}\text{Tc}$ -Z_{HER2:2891} Affibody Molecule for HER2-Positive tumors

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Objectives: Human epidermal growth factor receptor type 2 (HER2), also known as ErbB2 or neu, overexpression has been reported in various malignant tumors. The aim of this study was to develop an improved method labeling a decorated Affibody molecule Z_{HER2:2891} with Technetium-99m ($^{99\text{m}}\text{Tc}$) using -G(Gly)GGC(Cys) as a chelator, and to evaluate its imaging characteristic in HER2 xenografts.

Methods: The HER2-binding Z_{HER2:2891} Affibody molecule with a C-terminal chelating sequence -G(Gly)GGC(Cys), called Z_{HER2:2891}-C, was synthesized by Fmoc/tBu solid phase synthesis. The molecular Z_{HER2:2891}-C was labeled with $^{99\text{m}}\text{Tc}$. The labeling efficiency and radiochemical purity were analyzed by reversed-phase high performance liquid chromatography (RP-HPLC).

Molecular imaging studies were performed in BALB/c nude mice bearing SKOV3 (high HER2 expression) or MCF-7 cells (low HER2 expression) carcinoma xenografts. In molecular imaging studies, five BALB/c nude mice (tumor diameter 1.5-2.0 cm) with SKOV3 or MCF-7 xenografts were randomly chosen and injected with $^{99m}\text{Tc-Z}_{\text{HER2:2891}}$ via the tail vein. In addition, 5 mice bearing the SKOV3 tumor xenografts were pre-injected with excess of non-labelled $\text{Z}_{\text{HER2:2891}}$, to saturate the HER2 receptors of tumors. At 1, 2, 4, 6 and 8h after injection, the mice were anesthetized and imaged. The ratio of radioactive counts in the tumor to that in the contralateral equivalent region (target to nontarget ratio [T/NT]) were calculated by drawing regions of interest (ROI) at each time point. All numeric data were expressed as mean \pm SD and were performed with A Student *t* (or *t'*) test or Wilcoxon rank sum test using SPSS (version 13.0) and GraphPad Prism (version 5.0). *P* values of less than 0.05 were considered significant.

Results: The molecular probe was successfully synthesized and stably labeled with ^{99m}Tc with the labeling efficiency of $99.29 \pm 0.43\%$ (*n*=6). The SPECT imaging showed clear localization of $^{99m}\text{Tc-Z}_{\text{HER2:2891}}$ in the SKOV3 xenografts shortly after injection but not in liver and other organs except for the kidneys or bladder. In vivo imaging, SKOV3 tumor-bearing mice were visualized as early as 1 h and were shown most clearly at 8 h after the administration of $^{99m}\text{Tc-Z}_{\text{HER2:2891}}$. Ratios of $^{99m}\text{Tc-Z}_{\text{HER2:2891}}$ radioactive counts in SKOV3 tumors to those in the contralateral equivalent non-tumour regions (T/NT ratios) were 3.78 ± 0.71 , 7.57 ± 1.69 , 9.98 ± 3.22 , 12.07 ± 3.47 , and 13.23 ± 4.20 , at 1, 2, 4, 6 and 8 h, respectively. The molecular imaging showed high uptake in HER2-expressing SKOV3 xenografts, whereas the MCF-7 xenografts with low HER2 expression were moderately imaged at any time after the injection of $^{99m}\text{Tc-Z}_{\text{HER2:2891}}$. The T/NT ratios in MCF-7 xenografts were 1.29 ± 0.12 , 2.11 ± 0.31 , 3.79 ± 0.67 , 5.29 ± 1.10 , 4.94 ± 1.04 , at 1, 2, 4, 6 and 8 h, respectively. Meanwhile, the SKOV3 xenografts could be blocked by pre-saturation of receptors with unlabelled $\text{Z}_{\text{HER2:2891}}$, and were weakly imaged and the T/NT ratios were 1.50 ± 0.19 , 2.64 ± 0.33 , 2.32 ± 0.26 , 2.82 ± 0.45 , 3.38 ± 1.21 , at 1, 2, 4, 6 and 8 h, respectively. The tumors in SKOV3 tumor-bearing mice accumulated obviously more radioactivity than did the MCF-7 xenografts or the blocked SKOV3 xenografts, with significantly difference T/NT ratios between the two types of xenografts at all time points (*p* < 0.05, *n*=5).

Conclusion: This study showed that $^{99m}\text{Tc-Z}_{\text{HER2:2891}}$ is a promising imaging agent for HER2 over-expression tumors. It may be a potentially radiopharmaceutical agent, and transfer to clinical for imaging HER2-expressing tumors.

P_64

Compare the value of SPECT, SPECT/CT and ultrasound image in the diagnosis of hyperparathyroidism

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Objective: to compare the value of SPECT、SPECT/CT and ultraoun-d image in the diagnosis of hyperparathyroidism(HPT).

Methods: retrospective an-alysis 43 patients(15 male,28 female) with suspected hyperparathyroidism between August 2014 and April 2016.they all did neck surgery with definitive histol-ogy reports.and before preration they also did parathyroid $^{99m}\text{Tc-methoxyisobut-ylysonitrile}({}^{99m}\text{Tc-MIBI})$ double-phase scan,parathyroid SPECT/CT fusion scan, ultrasound imaging, PTH detection.using the definitive histology reports as the "gold stander"to analyse and compare the value of the three checking methods in the diagnosis of HPT.

Results: The majority of PHPT(Primary hyperparathyrod-ism) most showed single adenoma,SHPT(secondary hyperparathyroidism) is giv-en priority to with hyperplastic lesions.SHPT is higher than PHPT for the ave-rage of PTH.the sensitivity of SPECT/CT diagnose HPT is far higher than S-PECT(*P*<0.05),adenoma detection rate is significantly higher than the hyperplast-ic lesions in SPECT(*P*<0.05).SPECT/CT and ultrasound imaging have a simliar sensitivity for diagnose the parathyroid hyperplastic lesions and they were sign-ificantly higher than SPECT(*P*<0.05).19 HPT with thyroid disease patients and 8 HPT negative but have thyroid disease patients,each has a lesion,SPECT/CT misdiagnosed as HPT but ultrasound diagnosis consistent with the pathological results.

Conclusion: in the diagnosis of HPT,SPECT/CT fusion imaing can repla-ce the SPECT planar scan,SPECT/CT and ultrasound imaging have their own advantages it is better to combination in order to povide more accurate info-rmation with the preoperative diagnosis of HPT patients.

Keywords: hyperparathyroidism; SPECT; SPECT/CT; ultrasound imaging.

P_65**Usefulness of ¹⁸F-FDG PET/CT in idiopathic inflammatory myositis**

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Objective : Idiopathic inflammatory myopathies (IIMs) is a group of connective tissue diseases, in which characterized by proximal muscle weakness. IIMs are occasionally complicated with extramuscular lesions, such as interstitial lung disease (ILD) and malignancy. ¹⁸F-FDG PET/CT, a standard tool for evaluating malignancies, can also detect inflammatory lesions. However, its usefulness in evaluating malignancies and inflammatory lesions in IIMs, especially the imaging feature and its predictive value in prognosis of ILD, has not been well established. The aim of this study is to investigate the usefulness of ¹⁸F-FDG PET/CT in clinical course of IIMs.

Methods: Twenty-nine patients with diagnosis of IIM were retrospectively studied, including 10 males and 19 females with an average age of 56.0 ± 12.0 years (range 24 to 83 years). Twenty-two healthy people were enrolled as control group. ¹⁸F-FDG PET/CT and pulmonary high-resolution computed tomography (HRCT) were undergone in a maximum of 2 days interval. Abnormal FDG uptake suspected of malignancy was firstly recorded. FDG uptake in proximal limb muscles was visually evaluated using mediastinum blood vessels as a positivity criterion and the maximum standard uptake value (SUV_{max}) was calculated. ¹⁸F-FDG PET and pulmonary HRCT were correspondingly analyzed. Intensity and distribution of FDG uptake were determined as well as the CT imaging features. According to clinical classification criteria, polymyositis (PM) and dermatomyositis (DM) were defined and DM was divided into classic DM (cDM) and clinical amyopathic dermatomyositis (CADM). Histopathologic examination was undergone in all patients with suspected malignancies. Pulmonary infection was diagnosed according to clinical sign, laboratory examination and response to antibiotic therapy. ILD was identified by pulmonary HRCT. If the interval between onset of respiratory symptom and respiratory failure were less than 3 months, rapidly progressive interstitial lung disease (RP-ILD) was diagnosed.

Results: Three PM, 11 cDM and 15 CADM were clinically diagnosed. Twenty-two cases accompanied with ILD, in which 6 cases were diagnosed RP-ILD. ¹⁸F-FDG PET/CT identified malignant tumor in 6 patients. In 17 of 29 patients (3 PM, 9 cDM and 5 CADM) abnormal uptake in proximal limb with SUV_{max} ranged from 1.3 to 5.3. Mean SUV_{max} in PM/cDM patients was higher than

CADM ($t=2.540$, $P=0.022$) and control group ($t'=3.751$, $P=0.002$). And muscle FDG uptake in CADM patients was also higher than control group ($t'=3.107$, $P=0.007$). ¹⁸F-FDG PET/CT detected avid pulmonary lesions in 24 of 29 (82.8%) patients with IIM. Twenty-one of them showed homogenous uptake with SUV_{max} ranged from 1.0 to 3.3 and the other 3 patients showed inhomogenous uptake with SUV_{max} ranged from 2.6 to 4.3. In 29 patients, HRCT identified 22 ILD, including all 21 cases of homogenous phenotype and 1 case with inhomogenous uptake. The other 2 cases with inhomogenous uptake were finally diagnosed of infectious disease. FDG uptake of Lung lesion in RP-ILD was relatively higher than those in chronic ILD ($SUV_{max}: 2.7 \pm 0.3$ versus 2.0 ± 0.9 , $t=2.815$, $P=0.010$). Use a cut-off value of $SUV_{max} \geq 2.5$ to predict RP-ILD, the diagnosis sensitivity, specificity and accuracy was 100%(6/6), 81.2%(13/16) and 86.4%(19/22), respectively.

Conclusion: In patients with IIM, ¹⁸F-FDG PET/CT is useful in detecting malignancies and ILD, evaluating severity of inflammatory in muscle, and may predict the outcome of ILD.

P_66**A novel peptide targeting GPC3 for HCC NIR and PET/CT imaging**Yushuang Qin¹, Yesen Li², Sijuan Zou¹, Dongling Zhu¹, Hua Wu², Lei Zhu³, Xiaohua Zhu^{1,*}

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Objective: Glycan-3 (GPC3) is considered to be a specific bio-marker of hepatocellular carcinoma (HCC). Based on our previous study, we aim to optimized the panning procedure to screen a peptide targeting GPC3 with better affinity using a phage display peptide library, and then to develop the NIR and the PET probe for HCC imaging, respectively.

Methods: A phage display 12-peptide library was screened against both GPC3-positive HepG2 xenograft in vivo and recombinant GPC3 protein in vitro. The selected peptide, TJ12P2, was synthesized according to the DNA sequence, the binding affinity was evaluated with GPC3 protein by ELISA. The fluorescence imaging

probe, Cy5.5-TJ12P2 and the PET imaging probe, ¹⁸F-AIF-NOTA-TJ12P2 were developed in vitro and in vivo imaging respectively, and their targeting ability were also identified.

Results: TJ12P2 had a high affinity with GPC3 protein, which the apparent Kd value was 158.2 ± 26.25 nM. For Cy5.5-TJ12P2, there were obvious fluorescence signals on the member surface of human hepatocellular carcinoma cell line HepG2 and SMMC-7721 showing GPC3 high expression, no fluorescence signals were observed in the blocking group and the group of human prostate carcinoma cell line PC3 showing low GPC3 expression. Similar results were demonstrated in human tissue of hepatocellular carcinoma (GPC3 positive), cholangiocarcinoma (GPC3 negative) and normal liver (GPC3 negative). In vivo fluorescence imaging, there were significantly high tumor accumulation in HepG2 and SMMC-7721 tumors, and little fluorescence signals were observed in PC3 tumors and the blocking group after intravenous injection of Cy5.5-TJ12P2 (n=3/group). The fluorescence signals in tumors peaked at 4 h post-injection (p.i.) and then decreased. At 12 h p.i., fluorescent signal could only be observed in the tumors. Tumors dissected from the HepG2 and SMMC-7721 xenografts had higher uptakes of Cy5.5-TJ12P2 than the blocking control or the PC3 control group.

For ¹⁸F-AIF-NOTA-TJ12P2, its labeling yield was 36.6~43.2%, radiochemical purity was above 95% as well as the log P value was -4.265 ± 0.248 . The dynamic PET imaging showed that HepG2 and SMMC-7721 tumors were clearly visualized from 10 to 60 min p.i while quite low radioactivity in the liver and intestines, as well as ¹⁸F-AIF-NOTA-TJ12P2 was excreted through the kidneys. On the PET/CT imaging at 30 min p.i, the tumor uptake values in mice bearing HepG2, SMMC-7721 without or with blocking were 1.825 ± 0.296 %ID/g, 1.575 ± 0.520 %ID/g, 0.446 ± 0.074 %ID/g, 0.379 ± 0.051 %ID/g, respectively, 0.533 ± 0.078 %ID/g was displayed in PC3 tumors (n=3/ group).

Conclusion: A novel peptide targeting GPC3, TJ12P2, was obtained using phage display library and identified in vitro and in vivo imaging, with high affinity and specificity for GPC3 protein of HCC. Cy5.5-TJ12P2 or ¹⁸F-AIF-NOTA-TJ12P2, would potentially be a novel imaging probe for fluorescence Imaging or PET imaging targeted HCC in vivo, showing promising application for early HCC diagnosis and targeting therapy.

P_67

Anti-tumor effects against A549 cells of human lung adenocarcinoma with I-131 labeled Tyr-cNGQGEQc

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Objective: To study the specific binding of I-131-Tyr-cNGQGEQc with A549 cells and its inhibition effects.

Methods: A549 cells were incubated with I-131-Tyr-cNGQGEQc for 0.5h, 1h, 3h, 6h at 37°C, and then the combining and Internalization were determined. I-131-Tyr-cNGQGEQc with radioactivity of 1uCi, 5uCi, 10uCi, 5uCi and 20uCi was co-cultured with A549 cell, respectively, then inhibitory effect was determined by MTT method, and then the relative inhibition rate (IC50) was calculated. At the same time flow cytometry was used in the analysis of tumor cell cycle change.

Results: The percentage of cell combining of I-131-Tyr-cNGQGEQc with A549 cell was, respectively, (17.5 ± 3.14) %, (12.9 ± 2.64) %, (10.9 ± 1.54) %, (6.7 ± 2.85) % and (4.3 ± 0.06) % at 0.5h, 1h, 2h, 4h and 6h. And the internalization rate was, respectively, (0.5 ± 0.07) %, (0.4 ± 0.04) %, (0.5 ± 0.04) %, (0.4 ± 0.12) % and (0.3 ± 0.01) %. The inhibitory rate was, respectively, 52.0%, 51.7%, 56.6%, 51.7% and 72.5% at 1uCi, 5uCi, 10uCi, 15uCi and 20uCi. The IC50 (2.06uCi) in I-131-Tyr-cNGQGEQc was significantly lower than that (6.84uCi) in I-131. In I-131-Tyr-cNGQGEQc the ratio of G0/G1 phase cell was (75.0 ± 3.58) %, and G1/S phase cell (24.7 ± 2.99) %.

Conclusion: I-131-Tyr-cNGQGEQc is combined with A549 cells on the cell membrane, and there is no cell internalization. I-131-Tyr-cNGQGEQc has inhibitory effect on A549 cells with the time- and dose- effects relationship. This study may provide experimental basis for I-131-Tyr-cNGQGEQc as the tumor targeted radiotherapy mediated by receptor.

P_68

The ¹³¹I Radiotherapy Effect and Prognosis of DTC Complicated by Abnormal Thyroid Autoimmunity

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Objectives: To explore the patients' recurrence or metastasis status and prognosis of the coexistence of

AITD with DTC, explicit the association between DTC and the abnormal thyroid Autoimmunity.

Methods: 132 DTC patients who had undergone thyroidectomy with positive TgAb were divided into two groups as A1(n=84) and A0(n=48) according to whether the patient present with concurrent AITD or not. Evaluate the patients' recurrence or metastasis status according to ^{131}I whole body scan(^{131}I -WBS), SPECT/CT tomography fusion imaging and ultrasound examination. Compared TgAb levels, the incidence of recurrence or metastasis and the median time for disappearance of TgAb between the two groups.

Results: Of the 132 DTC patients with positive TgAb, 84(63.3%) were concurrent with AITD. There was no significant difference between the two groups($t=1.613, p=0.110$) in TgAb levels. The incidence of recurrence or metastasis between group A1 and group A0 were 42.9%(36/84) and 22.9%(11/48) respectively, the difference was statistically significant($\chi^2=5.297, p=0.021$). The median time for disappearance of TgAb of the patients who had followed-up regularly in 6-27 months(n=85) were 12.75 months in group A1 and 20.74 months in group A0, the difference was statistically significant($p=0.040$).

Conclusion: The existence of elevated levels of TgAb in DTC patients may indicates the coexistence of AITD. DTC patients concurrent with AITD probably have a greater incidence of recurrence or metastasis, while the enhanced thyroid autoimmune reactions may also produce a protective effect on the prognosis of DTC patients.

P_69

Correlation between the change of CT value of osteolytic bone metastasis after zoledronic acid therapy and bone metabolism before therapy in lung cancer patients

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Objective: To explore the correlation between the change of CT value of osteolytic bone metastasis after the treatment of zoledronic acid and bone metabolism before treatment in lung cancer patients.

Methods: 26 lung cancer patients with osteolytic bone metastases were diagnosed by $^{99\text{m}}\text{Tc}$ -MDP bone scintigraphy and $^{99\text{m}}\text{Tc}$ -MDP SPECT/CT (Contain 16-slice spiral CT) for the first time entered this study, after treatment of zoledronic acid for 3~12 months with the same method, $^{99\text{m}}\text{Tc}$ -MDP bone scintigraphy and $^{99\text{m}}\text{Tc}$ -MDP

SPECT/CT were performed in the 26 lung cancer patients again with the same CT scan parameters(voltages: 120kV, tube currents: 80mA, pitches:3.75mm). With using regions of interesting (ROI) technique, the T/NT value of osteolytic bone metastases in the first $^{99\text{m}}\text{Tc}$ -MDP bone scintigraphy were measured. The CT value of same ROI before and after zoledronic acid therapy were measured(CT1 and CT2), and the change of CT value (ΔCT , $\Delta\text{CT}=\text{CT2}-\text{CT1}$) were calculated. The correlation between them were analyzed. SPSS 16.0 was applied for variance and linear correlation analyses.

Results: 1.A total of 58 lesions of osteolytic bone metastases were detected in the 26 lung cancer patients by the first $^{99\text{m}}\text{Tc}$ -MDP bone scintigraphy and $^{99\text{m}}\text{Tc}$ -MDP SPECT/CT. The CT value before therapy was significantly higher than that after therapy((392 ± 117) vs (98 ± 62), $t=9.25$, $P<0.01$).

2,The change of CT value after therapy was positively correlated with and the T/NT value of osteolytic bone metastasis($r=0.851$, $P<0.01$).

Conclusion: $^{99\text{m}}\text{Tc}$ -MDP bone scintigraphy provides an effective method to predict the efficacy of zoledronic acid for lung cancer patients with osteolytic bone metastases. The lung cancer patients with high bone metabolism should be recommended zoledronic acid therapy, conversely should not be recommended.

P_70

The clinical value of 6h hepatobiliary imagining after pre treatment of ursodeoxycholic acid combined with serum ALP/r - GT ratio in the diagnosis of biliary atresia

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Objective: To investigate the clinical value of 6h hepatobiliary imagining with technetium - 99m - diethyl - iminodiacetic acid ($^{99\text{m}}\text{Tc}$ -EH IDA) combined serum alkaline phosphatase (ALP) / glutamyl transpeptidase (γ -GT) in diagnosis of congenital biliary atresia (BA).

Methods: Retrospectively analyze the cases from March, 2013 to June, 2014 concerning 187 infants (male 111, female 76, aged from 5 to 325 days, mean age 58.9d) who were hospitalized first for the persistent jaundice over two

weeks, hepatosplenomegaly and dysfunction of liver in the Children's hospital of Jiangxi Province. According to final diagnosis, all cases were divided in to BA group (118 cases) and infant hepatitis syndrome (IHS) group(69 cases), and all patients underwent ^{99m}Tc -EHIDA hepatobiliary imaging after treated with ursodeoxycholic acid etc drugs for 7-10 days. The γ -GT , ALP content and ALP/r-GT ratio between the two groups were analyzed by T test and ROC curve with SPSS 17.0. The diagnostic efficiency of 6 h hepatobiliary imaging, serum γ -GT content , ALP/r - GT ratio and 6h hepatobiliary imagining combined with serum ALP/r - GT ratio to BA were comparated .

Results: There were significantly difference in the ALPy-GT content and ALP/r-GT ratio between the two groups(respectively , $p<0.05$, $p<0.001$, , $p<0.001$) , γ -GT content and ALP/r-GT ratio have good diagnostic value of BA (AUC^{ROC} 0.811and 0.763, respectively) , ALP has lower diagnostic value (AUC^{ROC} 0.632) 。 The sensitivity, specificity, accuracy, positive predictive value and negative predictive value of 6h hepatobiliary imagining, surem γ -GT content and ALP/r-GT ratio in the diagnosis of BA were 91.53% (108/118) 、 73.91%(51/69) 、 85.03% (159 /187) 、 85.71% (108 /126) 、 83.60%(51/61), 70.34%(83/118)、 79.71% (55/69) 、 73.80% (138/187) 、 85.56% (83/97) 、 61.11% (55/90) and 77.97%(92/118)、 88.41% (61/69) 、 81.82% (53/187) 、 92.00% (92/100) 、 70.11% (61/87), respectively. The diagnostic efficiency of 6h hepatobiliary imagining to BA was significantly higher than or equivalent to that of γ -G content and ALP/ γ -GT ratio , but the specificity significantly lower than that of ALP/ γ -G ratio. After 6h hepatobiliary imagining combined with serum ALP/r - GT ratio ,the diagnostic sensitivity to BA is not reduced, the accuracy and specificity were increased significantly, respectively was 95.65%(66/69) and 94.65%(177/187),it has better diagnostic value of BA (AUC^{ROC} 0.847)than that of γ -GT content and ALP/r-GT ratio.

Conclusion: The diagnostic value of 6 h hepatobiliary imagining combined with serum ALP/r - GT ratio to BA was significantly higher than 6h hepatobiliary imagining only ,while It was more simple ,better economic and safer, therefore , has definitely clinical practical value.

P_71

Tumor Response Monitoring using ^{99m}Tc -3PRGD₂ SPECT-CT in Patients with Her- 2 Positive Breast Cancer

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Objective: A new SPECT-CT system (Siemens Symbia Intevo) was recently introduced as the first commercially available quantitative modality of its kind. The XSPECT Quant technique provides easy-to-acquire index such as Maximum Standard Uptake Value (SUV_{max}). The aim of this study was to evaluate the reproducibility of SUV_{max} and to investigate whether ^{99m}Tc -3PRGD₂ SPECT-CT could be used to predict tumor response in HER-2 positive breast cancer patients to neoadjuvant chemotherapy.

Methods: Thirty-six HER-2 positive breast cancer patients were scheduled to undergo ^{99m}Tc -3PRGD₂ SPECT-CT at baseline and one week after initiating NCT. Among them, 14 patients with 24 discrete lesions were available for a repeat scan prior to NCT to study reproducibility. Coefficients of variation and difference in SUV_{max} between the repeat scans were calculated. For therapy response assessment study, SUV_{max} was analyzed according to primary lesion and ALN metastasis. Receiver operator characteristic analysis was used to evaluate the power to identify responders by SUV_{max} and changes in SUV_{max} .

Results: The coefficient of variation (mean \pm SD) for SUV_{max} between the two reproducibility scans were $8.3\pm3.4\%$. The corresponding difference between scans were 0.01 ± 0.43 . Surgery was performed after four cycles of NCT and pathological analysis revealed 20 responders and 16 non-responders. For primary lesion, the sensitivity and specificity of ΔSUV_{max} in identifying responders were 80% and 85%, respectively. The corresponding ROC-area under the curve (ROC-AUC) was 0.68. For ALN metastases, the sensitivity and specificity of ΔSUV_{max} in identifying responders were 92% and 90%, respectively. The corresponding ROC-AUC was 0.91.

Conclusion: In patients with HER-2 positive breast cancer, serial ^{99m}Tc -3PRGD₂ SPECT-CT studies are reproducible with relatively low variability. ^{99m}Tc -3PRGD₂ SPECT-CT could predict tumor response as early as 1 week after starting neoadjuvant chemotherapy.

P_72

Radiation dosimetry and bio-distribution of ^{99m}Tc -Glu-c(RGDyK)-bombesin peptide in breast cancer patients

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Objective: ^{99m}Tc -Glu-c(RGDyK)-bombesin (^{99m}Tc -RGD-bombesin) was a novel radiopharmaceutical for cancer

imaging. This study was to report the human data of ^{99m}Tc -RGD-bombesin in breast cancer patients.

Methods: Six breast cancer patients were examined and the safety was assessed. Whole-body scans were acquired at 10, 30, 60, 120 and 1440 min post-injection. Blood and urine samples were taken at 1, 3, 5, 10, 15, 30, 60, 120 min and 0-2, 2-4, 4-8, 8-12 and 12-24 h post-injection. Regions of interest (ROI) were delineated for various source organs and the tumor. Tumor-background (T/B) ratios of all imaging time points were calculated. The OLINDA/EXM software was used to estimate the equivalent organ doses and the effective dose. No serious adverse events were reported during the study.

Results: ^{99m}Tc -RGD-bombesin showed rapid clearance from the blood and continuous increasing in urine. Bladder and kidney demonstrated predominant uptake, whilst uptake in heart and brain was low. The primary tumor was well visualized and the ideal time point was 120 min with highest T/B ratio. The highest absorbed radiation dose was in the kidneys ($2.43 \times 10^{-2} \text{ mGy/MBq}$) and the effective dose was $4.51 \times 10^{-3} \text{ mSv/MBq}$.

Conclusion: ^{99m}Tc -RGD-bombesin appears safe with acceptable dosimetric and bio-distribution properties as a diagnostic breast cancer imaging agent.

levels were detected by UPLC. After injection of ^{99m}Tc -Duramycin, rabbits were applied in abnormal aorta SPECT/CT imaging in vivo and ex vivo, ^{99m}Tc -Duramycin in lesions (%ID/kg) were also calculated. Then Histochemical examination with HE, Oil Red O, Masson, CD68, α -actin and TUNEL staining were performed. Protein expression of GRP78 and CHOP in plaques were also measured.

Results: Atherosclerotic vulnerable plaque model was successfully established. DES could reduce both of ASM and Ceramide levels. ^{99m}Tc -HYNIC-Duramycin SPECT/CT showed no radioactive uptake in aorta of Control group, whereas intense uptake in VP group and slight uptake in VP+DES group. ^{99m}Tc -HYNIC-Duramycin levels were also significantly reduced by DES treatment. Histological examination indicated that DES significantly decreased vulnerable index, increased the number of apoptotic cells. Additionally, DES treatment were blocked by elevated levels of GRP78 and CHOP, which elevated in VP group.

Conclusion: Inhibition of ASM could enhance plaque stability through attenuation of Ceramide levels and cell apoptosis in plaque, and suppression of endoplasmic reticulum stress.

P_73

Assessment of The Effect of Acid Sphingomyelinase on Atherosclerotic Plaque Stability by Using ^{99m}Tc - Duramycin SPECT/CT Imaging

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Objective: Acid sphingomyelinase (ASM) is involved in the apoptosis of atherosclerotic plaques. We investigate the effect of ASM on vulnerable plaque by using ^{99m}Tc -Duramycin SPECT/CT Imaging and the underlying mechanism.

Methods: We established a vulnerable plaque model by abdominal aorta balloon injury in rabbits fed a high-cholesterol diet. Rabbits were randomly divided into four groups: vulnerable plaque(VP) group , vulnerable plaque with ASM inhibitor Desipramine(DES) treatment (VP+DES) group , control group and DES group. At the end of 12th week, plasma and tissue ASM and Ceramide

P_74

The research of ^{131}I treatment of differentiated-type thyroid cancer: postoperative radiation protection*

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Objective: To investigate the radiation protection measures of ^{131}I therapy in patients with differentiated thyroid carcinoma(DTC) after operation by measuring the patients' vitro radiation level and relevant personnel exposure dose, so as to reduce the radiation hazards to a reasonable minimum level in the clinical treatment process.

Methods: 10 patients with study included three aspects: Use 451P-DE-S1-YGG ionization chamber survey instrument to measure the dose equivalent rate in vary distance and times after treatment; Use personal dose agent to measure the personal dose within 30 days; Use gamma spectrometer to measure the ^{131}I activity in the medicine chamber.

Results: The dose of radiation were reachable 2000 $\mu\text{Sv}/\text{h}$ after taking the medicine immediately.

After 5 days, the radiation dose rate were less than $5\mu\text{Sv}/\text{h}$ distance from the patients 200cm. The dose of DTC patients were $26.78\sim61.96(46.25\pm11.58) \text{ mSv}$ and their accompanying persons were $0.35(0.29\sim0.43)\text{mSv}$. The ^{131}I activity in the medicine chamber were $42.6\text{Bq}/\text{m}^3$,the effective dose of the staff were 0.019 mSv due to suction ^{131}I .

Conclusion: There were high levels of radiation dose in the ^{131}I treatment process, we should improve the staff、patients and the accompanying officials radiation protection consciousness to reduce unnecessary exposure.

Keywords: differentiated thyroid carcinoma; ^{131}I treatment; radiation protection.

P_75

SPM analysis of Cerebral Glucose Metabolism in Obsessive-Compulsive Disorder

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Objective: The goal of this study was to observe the characteristics of local cerebral glucose metabolism in OCD and to analyze the clinical features or local cerebral metabolism with SPM software.

Methods: Twenty-three patients fulfilling the DSM-V criteria for OCD were recruited, 10 untreated or stopped treatment for 5 half-life periods, 13 receiving unstandardized treatments. 11 controls were all healthy volunteers. All 23 patients and 11 controls received a PET scan and neuropsychological tests, 23 patients were rated with YBOCS at the time of the PET scan. Only 7 patients received the second PET scan and neuropsychological tests. We utilized statistical parameter mapping software (SPM, the 8th version) for the statistics and evaluation of significant differences of the PET images.

Results: Compared with the control group, the significant increased fields of local cerebral metabolism in the untreated OCD patients group were mainly located in putamen and precuneus of right hemisphere, orbitofrontal cortex, inferior temporal gyrus and paracentral lobule of left hemisphere ($p<0.001$), significant decreased fields were mainly in bilateral cuneus and right thalamus ($p<0.001$); the significant increased fields of local cerebral metabolism in the OCD patients under treatment group were mainly located in bilateral cingulate, supplementary motor area of right hemisphere and cuneus of left hemisphere ($p<0.001$); significant decreased fields were mainly located in inferior temporal gyrus and occipital lingual of left

hemisphere and right thalamus ($p<0.001$). There was no significant difference between before and after treatment group of OCD patients ($p<0.001$). The OCD symptoms of 7 patients after treatment improved and the YBOCS declined rates were more than 35%. Compared with the untreated patients group, the significant increased fields of local cerebral metabolism in the OCD patients under treatment group were mainly located in supplementary motor area of right hemisphere and cuneus of left hemisphere ($p<0.001$), and significant decreased fields were mainly located in superior temporal gyrus, inferior temporal gyrus, supramarginal of right hemisphere and inferior parietal gyrus of left hemisphere ($p<0.001$).

Conclusion: The cerebral functional fields of OCD whose glucose metabolism increased were located in cingulate, orbitofrontal and basal ganglia, whose glucose metabolism partly increased and partly decreased were located in temporal and parietal lobule, whose glucose metabolism decreased were located in thalamus and occipital lobule. After treatments, the cerebral functional fields of OCD whose glucose metabolism changed comparing with that before treatments were located in temporal and parietal lobule, partly increased and partly decreased.

Keywords: OCD, Neuropsychological tests, cerebral metabolism imaging, SPM.

P_76

A pilot study about the effect of pioglitazone on ^{18}F -FDG uptake in lung cancer cells and macrophages

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Objective: The goal of this study was to investigate the effect of pioglitazone on ^{18}F -FDG uptake in A549 lung cancer cells and RAW264.7 macrophages in the short term.

Methods: Five different concentrations of pioglitazone solution were made up by 0.5%(vol/vol) DMSO solvent(concentration-1: 10ug/ml; concentration-2: 20ug/ml; concentration-3: 50ug/ml; concentration-4: 100ug/ml; concentration-5: 200ug/ml). A549 lung cancer cells and RAW264.7 macrophages were treated with 0.5% DMSO solvent and different concentrations of pioglitazone respectively for 1 hour, after that treated with ^{18}F -FDG for another 1 hour, finally ^{18}F -FDG uptake in the two cells was measured in turn by a γ counter. The two cells were treated with 100ug/ml pioglitazone for 1 hour, then ^{18}F -FDG uptake in the two cells was measured separately by the γ counter at six different

¹⁸F-FDG point-in-time (treatment with ¹⁸F-FDG worked for 1 hour, 2 hour, 3 hour, 4 hour, 5 hour and 6 hour). **Results:** No statistically significant changes were found in two cells' ¹⁸F-FDG uptake between the 0.5% DMSO group and the control group (both P>0.05). The differences on ¹⁸F-FDG uptake between the control group and different concentrations of pioglitazone groups were statistically significant in A549 lung cancer cells (P<0.05), further pairwise comparison indicated ¹⁸F-FDG uptake of five different concentrations of pioglitazone groups were both higher than that of the control group (both P<0.05). There were also statistically significant differences between the control group and different concentrations of pioglitazone groups in RAW264.7 macrophages' ¹⁸F-FDG uptake (P<0.05), further pairwise comparison revealed no statistically changes were discovered in macrophages' ¹⁸F-FDG uptake between the control group and the concentration-1 group, the concentration-2 group, the concentration-3 group (both P>0.05), but ¹⁸F-FDG uptake of the control group was less than that of the concentration-4 group and the concentration-5 group (both P<0.05). At Six different ¹⁸F-FDG point-in-time ¹⁸F-FDG uptake of the pioglitazone groups were both higher than that of the control groups (both P<0.05) in A549 lung cancer cells, however compared with the control groups, ¹⁸F-FDG uptake of the pioglitazone groups had no statistically significant changes in RAW264.7 macrophages (both P>0.05).

Conclusion: Pioglitazone can increase the ¹⁸F-FDG uptake of A549 lung cancer cells in a short term, but decrease the ¹⁸F-FDG uptake of RAW264.7 macrophages or make them unchanged.

Keyword: pioglitazone; ¹⁸F-FDG; lung cancer cells; macrophages.

P_77

Evaluate the diagnostic performance of Dual-phase ^{99m}Tc-MIBI SPECT/CT scintigraphy and Ultrasound in patients with Secondary Hyperparathyroidism

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Objective: The aim of this study was to evaluate the diagnostic performance of ^{99m}Tc-MIBI SPECT/CT and ultrasound in patients with secondary hyperparathyroidism. Explore the diagnostic value of ^{99m}Tc-MIBI SPECT/CT for hyperparathyroidism patients

in localization lesions preoperative. And exploration the factors affect the diagnostic performance.

Methods: A retrospectively collected database of 225 patients who underwent parathyroid ^{99m}Tc-MIBI scintigraphy because the elevated of PTH level or existing abnormal parathyroid through ultrasonography at the Shanghai Ren Ji Hospital of China was reviewed between December 2012 and January 2016. Medical record review included patient demographics, clinical history, imaging, laboratory values, operative and pathological results and outcomes. At last, filter out 89 patients with SHPT caused by chronic renal failure. Of these patients, 51 patients did the surgical parathyroidectomy that the pathology results confirmed to be SHPT. The rest patients were confirmed by follow-up results. Count the true focus of each patient, and calculate the diagnostic performance. Using the Pearson correlation analysis the PTH level with other clinical data and serum information of these patients. According to the lesion whether had a ^{99m}Tc-MIBI uptake and the uptake level, the diameters data were divided into four groups. The ANOVA results showed a statistically significant that the larger of the lesion diameter, the higher of the ^{99m}Tc-MIBI uptake value. The diameter optimal cutoff value for predicting positive ^{99m}Tc-MIBI scintigraphy results was evaluated using ROC analysis.

Results: Among 89 patients, only 5 patients had a negative ^{99m}Tc-MIBI SPECT/CT result. In the 67 patients who did the ultrasonography, there were 24 patients who had a negative result. The sensitivities of ^{99m}Tc-MIBI SPECT/CT and ultrasonography were 94.18 % and 64.18 %, respectively. In the patients who have information of the serum calcium and phosphorus, we find that the percentage of patients in the serum calcium and phosphorus who were higher than the normal person were 38.36 % (28/73) and 77.26 % (55/71), respectively. The serum calcium average level in SHPT patients was higher in normal (2.54 vs. 2.31, P < 0.01), the same as serum phosphorus (2.05 vs. 1.29, P < 0.001). All the 51 patients who did surgery were confirmed by surgical findings and pathologic results. Only 2 patients do the parathyroid subtotal resection, the rest were full parathyroid resection and autologous transplantation. Eventually, there were 173 lesions confirmed to be parathyroid hyperplasia, 5 lesions in 4 patients confirmed to be parathyroid adenoma. ^{99m}Tc-MIBI scintigraphy displayed 109 positive lesions in the 51 patients, among them 104 lesions proved to be true positive. For the 5 false positive lesions, two lesions proved to be thyroid issue, one lesion was lymph node, and the other two was fat and fibrous tissue. And there were 74 lesions behaving negative ^{99m}Tc-MIBI uptake proved to be parathyroid hyperplasia or adenoma. Therefore, on a per-lesion basis analysis, the sensitivity and specificity of ^{99m}Tc-MIBI scintigraphy were 58.43

% and 80.77 %, respectively. At the same time, the correlation between PTH level and various factors were analysis. The Pearson correlation analysis between PTH level and various factors results showed that the serum AKP level and PTH level exhibit significant liner association ($r = 0.713, P < 0.001$). The lesions diameters, the number of lesions confirmed by pathology results and the lesions uptake value scores of each patients have no significant liner association with PTH levels. The ANOVA results showed a statistically significant that the larger of the lesion diameter, the higher of the ^{99m}Tc -MIBI uptake value. Lesion diameter was a statistically significant predictive factor in predicting positive ^{99m}Tc -MIBI SPECT/CT. Following ROC analysis, the optimal cutoff values of maximum tumor diameter for predicting positive ^{99m}Tc - MIBI was 9.2 mm (AUC 0.805, 95 % CI 0.719 – 0.874; sensitivity = 71.72 % and specificity = 83.33 %).

Conclusion: As shown by the above results, the ^{99m}Tc -MIBI SPECT/CT had a higher sensitivity in the diagnosis of SHPT patients than ultrasonography on a per-patient analysis (94.18 % vs. 64.18 %). On a per-lesion basis analysis, the sensitivity and specificity of ^{99m}Tc -MIBI SPECT/CT were 58.43 % and 80.77 %, respectively. Therefore using ^{99m}Tc -MIBI scan positioning the lesion was an effective means pre-surgical in SHPT patients. But there also was a limitation for ^{99m}Tc -MIBI SPECT/CT in identify the lesions. The Pearson correlation analysis between PTH level and various factors results showed that the serum AKP level and PTH level exhibit significant liner association. This study also suggested that ^{99m}Tc -MIBI SPECT/CT closed correlated with lesion diameter. The optimal threshold for lesion diameter by ROC analysis was 9.2mm.

P_78

The value of ^{99m}Tc -MDP SPECT /CT ROI semi-quantitative analysis method in the early diagnosis of prostate cancer patients with bone metastases

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Objective: From the ^{99m}Tc -MDP SPECT / CT bone imaging, to research the clinical application value of SPECT / CT ROI half quantitative analysis method for the diagnosis of prostate cancer bone metastases.

Methods: The results of ^{99m}Tc - MDP SPECT/CT and other clinical data about 43 prostate cancer patients

were analysed retrospectively. The patients were hospitalized in the first clinical hospital of shanxi medical university nuclear medicine from September 2013 to February 2016. Using the ROI semi-quantitative analysis, to Study the difference of ^{99m}Tc - MDP intake level (tumour/nontumour, T/NT) between malignant lesions of positive patients bone metastases and benign lesions of negative patients with prostate cancer. And using ROC curve, to obtain a best diagnostic boundary value for prostate cancer bone metastasis .

Results: (1)The T/NT of malignant lesions was significantly higher than that of benign lesions ($P < 0.05$); (2) The area under the ROC curve of the T/NT is 0.951, when 2.94 is as the best diagnostic boundary value ,the sensitivity and specificity is 90.2% and 76.9% respectively.

Conclusion: The T/NT of malignant lesions and benign lesions is significant different in SPECT/CT. In this paper, the author thinks that the T/NT is 2.94 or higher, ^{99m}Tc -MDP SPECT /CT semi-quantitative analysis method has good diagnostic value for malignant lesions.

Keywords: SPECT /CT; Region of interest (ROI) half quantitative analysis method; Prostate cancer bone metastases.

P_79

Synthesis and characterization of multifunctional dendrimer-entrapped gold nanoparticles modified with duramycin targeting apoptotic cells

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Objective: Early monitoring of tumor response to therapy is essential for the timely identification of the most efficacious treatments. Phosphatidylethanolamine (PE) exposure is one of the most ubiquitous fingerprints of dying cells, making it an attractive target for apoptosis imaging. Duramycin, which is a 19-amino-acid and disulfide cross-linked peptide, can bind to PE on cell membrane with high affinity and high selectivity. We recently developed a novel apoptosis tracer, dendrimer-entrapped gold nanoparticles conjugated with duramycin peptide. In this study, we characterized these

nanoparticles and analyzed their targeting for apoptosis cells induced by chemotherapy.

Methods: The generation five amine-terminated poly (amidoamine) (G5.NH₂ PAMAM) dendrimers were used as a platform to be sequentially conjugated with polyethylene glycol (PEG), targeting agent duramycin and DTPA for radiolabeling with ^{99m}Tc in future. Then the multidunctional dendrimers were used as templates to entrap gold nanoparticles. ¹H nuclear magnetic resonance (NMR) spectrum, zeta potential and dynamic light scattering (DLS) were conducted for characterization of these nanoparticles. MTT assay was used to assess the cytotoxicity of Au DENPs-Duramycin in human glioblastoma U87 cells. *In vitro* confocal microscopy study and flow cytometric analysis were performed to determine the binding of FITC-Au DENPs-Duramycin and FITC-Au DENPs to U87 cells treated with 10nM paclitaxel for 16h. The expression level of cleaved caspase-3 in U87 cells with or without paclitaxel treatment was evaluated by western blot analysis.

Results: ¹H NMR spectra confirmed the characteristic peaks of targeted Au DENPs-Duramycin and untargeted Au DENPs. The hydrodynamic sizes of Au DENPs-Duramycin and Au DENPs were 327nm and 287.9nm, respectively. The surface potential of Au DENPs-Duramycin and Au DENPs were 11.933 mV and -0.107mV, respectively. MTT assay demonstrated that U87 cells displayed a relatively high viability (>90%) after treatment of Au DENPs-Duramycin or Au DENPs at the concentration up to 200μM. On the basis of flow cytometric analysis, U87 cells treated with 10nM paclitaxel for 16h displayed significantly stronger fluorescence intensity in FITC- Au DENPs-Duramycin group than those in FITC -Au DENPs group. Confocal microscopy also demonstrated much higher uptake of FITC-Au DENPs-Duramycin than FITC-Au DENPs in U87 cells. Western blot analysis further showed that cleaved caspase-3 increased significantly after treatment, suggesting that paclitaxel induced apoptosis in U87 cells.

Conclusion: Au DENPs-Dramycin displays excellent cytocompatibility and can specifically target apoptotic cells induced by chemotherapy due to the attached duramycin. In further study, radionuclide such as ^{99m}Tc will be labeled on Au DENPs-Dramycin and *in vivo* SPECT/CT imaging will be investigated to monitor the response of chemotherapy.

P_80

The Inhibiting Effect on Human Glioblastoma Xenograft by ¹³¹I-c(RGD)₂

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Objective: Integrin α_vβ₃ plays a key role in the progress of angiogenesis and tumor metastasis and is therefore an important target for new therapeutic and diagnostic strategies. In our previous work, we have designed and synthetized a new Arg-Gly- Asp(RGD) peptide that can specifically bind integrin α_vβ₃ with high affinity. The aim of this study is to investigate the inhibiting effects of ¹³¹I-c(RGD)₂ on human glioblastoma U87 xenograft.

Methods: Animal xenograft model was established by injecting 1×10⁶ U87 MG cells subcutaneously into the right forearm of nude mice. When the tumor reached about 14 mm in diameter, 20 nude mice were randomly divided into 4 groups: normal saline control group, The tumor bearing mice were intravenously injected with normal saline, ¹³¹I-c(RGD)₂ 11.1 MBq group: The tumor bearing mice were intravenously injected with 11.1 MBq ¹³¹I-c(RGD)₂, ¹³¹I-c(RGD)₂ 18.5 MBq group: The tumor bearing mice were intravenously injected with 18.5 MBq ¹³¹I-c(RGD)₂, ¹³¹I-scrambled peptide group: The tumor bearing mice were intravenously injected intravenously with 18.5 MBq ¹³¹I-YKAREC. Tumor volume in all groups was measured every day and calculated as 1/2 × length × width². At the 28 days after treatment, the mice were sacrificed and the tumors were weighted. The inhibition rate was calculated as (tumor mass of the untreated group - tumor mass of the other group)/ tumor mass of the untreated group × %. The tumor masses of four groups were compared with SPSS17.0 software.

Results: At the beginning of the study, the tumor volumes of the four groups had no significant differences (P>0.05). The tumor volume increased with time and the normal saline control group was fastest, followed by ¹³¹I-scrambled peptide group, and ¹³¹I-c(RGD)₂ 18.5 MBq group was slowest. At the end of the treatment, the tumor masses of normal saline control group, ¹³¹I-c(RGD)₂ 11.1 MBq group, ¹³¹I-c(RGD)₂ 18.5 MBq group and ¹³¹I-scrambled peptide group were (12.08 ± 3.35) g, (7.64 ± 1.86) g, (7.08 ± 1.55) g and (11.68 ± 1.71) g, respectively. The tumor mass of ¹³¹I-c(RGD)₂ 11.1 MBq group and ¹³¹I-c(RGD)₂ 18.5 MBq group were significantly lower than that of normal saline control group and ¹³¹I-scrambled peptide group (P<0.05), but there was no significant difference between ¹³¹I-c(RGD)₂ 11.1 MBq group and ¹³¹I-c(RGD)₂ 18.5 MBq group (P>0.05). The tumor inhibition rates after 28 d treatment were 36.75%, 41.39% and 3.31% for ¹³¹I-c(RGD)₂ 11.1 MBq group, ¹³¹I-c(RGD)₂ 18.5 MBq group and ¹³¹I-scrambled peptide group, respectively. **Conclusion:** ¹³¹I-c(RGD)₂ could effectively inhibit tumor growth in human glioblastoma tumor bearing mice and

might be of potential in treatment in the future.

Keyword: glioblastoma; tumor angiogenesis; radionuclide therapy; ^{131}I -c(RGD)₂; nude mice.

P_81

Killing Effects on Human Glioblastoma Tumor Xenograft by ^{131}I -c(RGD)₂ and Its Combination with Radiation-inducing Gene Expression

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Objective: To increase the tumor radiosensitivity, recombinant lentivirus E8-codA-GFP were transfected into U87 MG tumor cancer in nude mice and investigate the synergistic anti-tumor effects of ^{131}I -c(RGD)₂ and the gene therapy.

Methods: Thirty mice bearing U87 MG xenografts were established, and randomly divided into six groups when the tumor reached about 14 mm in diameter: ①normal saline control group, ② ^{131}I -c(RGD)₂ 11.1 MBq group, ③ ^{131}I -c(RGD)₂ 18.5 MBq group, ④ ^{131}I -c(RGD)₂ 18.5 MBq + LV: The xenografts were infected with the lentivirus vector by intratumor injection of 2×10^8 TU/25 μL of E8-codA-GFP LV for two days and were injected intravenously with 18.5 MBq ^{131}I -c(RGD)₂, ⑤ ^{131}I -c(RGD)₂ 18.5 MBq + LV + 5-FC: the xenografts were disposed as ④, and then 10mg prodrug 5-FC was injected i.p. for seven days. ⑥ ^{131}I -scrambled peptide 18.5 MBq group (sequence: YKAREC). Tumor volume, weight and net weight were measured.

Results: The tumor inhibition rates after 28 d treatment were 36.75%, 41.39%, 43.63%, 44.87%, 3.31% for ②, ③, ④, ⑤ and ⑥ group, respectively. The tumor weight were compared between this groups, significant difference were observed between ① and ②, ③, ④, ⑤ group ($P < 0.05$), but no significant difference were observed between ②, ③, ④ and ⑤ group ($P > 0.05$).

Conclusion: ^{131}I -c(RGD)₂ could effectively inhibit tumor growth in human glioblastoma tumor bearing mice and might be of potential in therapy in the future. But combined with radiation sensitive promoter E8 promoter, and CD/5-FC suicide system for the treatment of tumor cells did not reach statistically expected effect, this may be attributed to the big tumor volume and relatively low viral quantity.

P_82

Correlation of ^{18}F -FDG PET/CT metabolic parameters with expressions of ERCC1 and RRM1 in non-small-cell lung cancer

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Objective: ^{18}F -FDG PET/CT has been widely applied in NSCLC as a non-invasive imaging examination. Recently, some researchers supposed that the SUV_{max} of FDG maybe has close correlation with the chemotherapy resistance associated biomarkers. However, very few literatures investigated the value of FDG avidity of NSCLC on ERCC1 and RRM1. Here we investigate the relationship between metabolic parameters (SUV_{max}, MTV and TLG) of ^{18}F -FDG and expression of chemotherapy resistance associated biomarkers (ERCC1, RRM1) in patients with NSCLC.

Methods: Eighty-nine patients with curatively resected stage I and II adeno- or squamous cell NSCLC, of whom paraffinembedded lung cancer tissues and preoperative PET/ CT scans were available. SUV_{max}, MTV, TLG of all cases were calculated. ERCC1 and RRM1 expression was measured by immunohistochemical staining. Then we analyzed the relationship between SUV_{max}, MTV, TLG and ERCC1, RRM1.

Results: The median SUV_{max} was 9.6 (range, 0.7 to 36.2), the median values of the MTV was 25.9 (range, 0 to 264.8), and the median TLG was 163 (range, 0 to 1407.6). ERCC1 staining was found in nuclear, and RRM1 staining in cytoplasmic. Of the 89 NSCLC, 67 (75.3%) were ERCC1-positive and 63 (70.8%) were RRM1-positive. No significant correlation has been found between SUV_{max}, MTV, TLG and the expression of ERCC1 ($P=0.135$, 0.170, 0.422). RRM1 expression correlated negative with SUV_{max} ($R=-0.360$, $P=0.001$), MTV ($R=-0.290$, $P=0.006$), TLG ($R=-0.315$, $P=0.003$). Binary logistic regression analysis revealed that SUV_{max} is the optimal index reflecting the expression level of RRM1. Receiver operating characteristics (ROC) curve analysis demonstrated the optimal cut-off value of SUV_{max} predicting RRM1-negative was 10.2, which was associated with 73.1% sensitivity and 68.3% specificity.

Conclusions: ^{18}F -FDG PET/CT might serve as a simple and practical non-invasive method for predicting RRM1 expression in NSCLCs, and provide valuable information for the gemcitabine-containing chemotherapy resistance.

Keyword: Non-small cell lung cancer, excision repair crosscomplementary group1, ribonucleotide reductase subunit M1, ^{18}F - Fluorodeoxyglucose, Positron emission tomography/computer tomography.

P_83**⁶⁴CuS-labeled nanoparticles: a new sentinel lymph node-mapping agent for PET/CT and photoacoustic tomography**

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Objective: Determining sentinel lymph node (SLN) status is critical to cancer staging and treatment decisions. Recently, an emerging technique that combines positron emission tomography (PET) and photoacoustic tomography (PAT; PET/PAT) may offer accurate information in detecting SLNs. Herein, we report a kind of ⁶⁴CuS-labeled nanoparticles (⁶⁴CuS-NPs) for the detection of SLNs with PET/PAT.

Methods: We subcutaneously injected ⁶⁴CuS-NPs into the rats' forepaw pads. After 24 h, the rats underwent micro-PET (μ PET)/CT imaging. Rats were sacrificed after microPET/CT imaging, their axillary lymph nodes were surgically identified, and then PAT was employed to discover ⁶⁴CuS-NP-avid SLNs, which was embedded inside tissues. Biodistribution, autoradiography, and copper staining analyses confirmed the SLNs' high uptake of ⁶⁴CuS-NPs.

Results: μ PET/CT imaging indicated that ⁶⁴CuS-NPs had an excellent specificity to SLNs with high signal-to-background ratio (SLN-to-muscle ratio = 28.7). The uptake values of the right axillary LNs on μ PET/CT (3.34 ± 0.46 %ID/g) were substantially higher than those of the left axillary lymph nodes (0.85 ± 0.25 %ID/g). In addition, the photoacoustic signal intensity was greatly significantly higher in lymph nodes with the CuS NP uptake versus the lymph nodes without CuS NP (7.85 ± 3.78 vs. 2.46 ± 0.73 a.u., $p = 0.026$). Result of biodistribution, autoradiography and copper stain confirmed the distribution of ⁶⁴CuS-NPs in the LNs.

Conclusion: Our study indicates that ⁶⁴CuS-NPs is a promising dual-function agent for both PET/CT and PAT and could be used with multi-modal imaging strategies such as PET/PAT to identify SLNs in a clinical setting.

P_84**Improvement of diagnostic accuracy in coronary artery disease by PET-CT image fusion and absolute quantification of****coronary flow reserve**

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Objective: We evaluated whether re-addressing vascular territories by image fusion with coronary computed tomography (CT) and absolute quantification of coronary flow reserve (CFR) can improve diagnostic accuracy of N-13 ammonia myocardial perfusion Positron Emission Tomography (PET) in coronary artery disease (CAD).

Methods: We prospectively included 42 arterial studies of 14 patients with coronary artery disease (CAD). They underwent N-13 ammonia PET, coronary CT and invasive coronary angiography (CAG) with not more than 1 month interval between the studies. The presence of coronary stenosis was predicted by different methodologies including coronary CT, N-13 ammonia PET, fused PET-CT images, PET only + CFR, fused PET-CT + CFR. The gold standard was >50% and >75% stenosis on CAG, the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and diagnostic accuracy were analyzed.

Results: Significant improvement of specificity and accuracy were observed by adding MBF quantification and image fusion especially in patients having >75% stenosis. The respective diagnostic accuracy was 71.4%, 57.1%, 71.4%, 78.6% and 81.0% for coronary CT, N-13 ammonia PET, fused PET-CT images, PET only + CFR, fused PET-CT + CFR. The main improvement was observed in specificity. The respective specificity was 58.6%, 37.9%, 62.1%, 82.8% and 89.7%.

Conclusion: Addition of image fusion and absolute CFR quantification improved diagnostic accuracy and specificity regarding coronary stenosis.

P_85**The clinical statistics and characteristics of female patients referred for PET/CT at CNUHH**

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Objective: The aim of this study was to report the statistics of female cancers among the patients attending Nuclear Medicine department of CNUHH from

September to December 2015.

Methods: Retrospective analysis of 395 female patients who had ¹⁸F-FDG PET/ CT in CNUHH were done. Age, indication of Study, diagnosis, histological types of disease, PET/CT findings with tumor size in SUV and pattern of metastases were recorded.

Results: Out of 1598 referred patients who underwent PET/CT studies, 395(24.7%) were female with age ranging from 4 to 88 (mean \pm SD, 56.1 \pm 14.63) years. Among them 205(51.9 %) were referred for cancer staging, 128 (32.4 %) for restaging, 56(14.2%) for evaluation and 6(1.5%) for cancer screening. Patients were divided into 4 sub groups according to age and major sites of cancer were noted. Sub groups included women of 0-14 years, 15-34years, 35-64 years and 65 and above. Incidence of breast cancer (33.9%), cervical cancer (12.2%) and ovarian cancer (8.6%) diagnosed highest during this period, while colon cancer (6.8%), lymphoma (6.1%), endometrial cancer (6.1%), gastric cancer (4.6%) and lung cancer (3.8%) were next few frequently occurring types. However, incidences varied in different age groups. Infiltrating ductal carcinoma (31.4%) of breast, adenocarcinoma (20.3 %) and squamous cell carcinoma (10.9%) in different organs predominated. Tumor size ranged from 0.9cm to 33.3 (mean SUV \pm SD, 4.61 \pm 4.7) cm with various intensities of metabolic uptake.

Conclusion: This study demonstrated the clinical trends of female cancers in a single institute where PET/CT provided important information.

Keywords: PET/CT, cancer statistics, Korean female population.

P_86

Withdrawn

P_87

Evaluation of F-18 PET-CT scan in Pediatric Lymphoma-Preliminary Experience at National Institute of Nuclear Medicine and Allied Sciences, Dhaka, Bangladesh

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Objective: The objective of the study was to observe the role of PET-CT in staging and treatment response of lymphoma in Bangladeshi children.

Methods: Diagnosed cases of total 10 patients with pediatric lymphoma were recruited for baseline PET-CT imaging at National Institute of Nuclear Medicine and Allied Sciences from January to May 2016. After 4 hours fasting 3 MBq/Kg body weight F-18 FDG (flurodeoxyglucose) was administered intravenously. Imaging was performed with PET-CT scanner with LYSO crystal on integrated 128-slices CT. Images from vertex to toe according to IAEA pediatric protocol were taken. Before PET acquisition low dose CT scan without contrast was performed for attenuation correction.

Results: All 10 patients were male baby; among them 9 patients were histopathology and immunohistochemistry proven Hodgkin lymphoma (HL) and one patient was diagnosed as non-Hodgkin lymphoma (NHL). PET-CT scan revealed 6 patients at stage-IV, 3 patients at stage-II and one patient at stage-IIIS. Standardized Uptake Value (SUV)_{max} of key lesion of patients with stage-IV showed higher value, ranged 6-35 (mean-16), SUV_{max} in stage-II ranged 2.6-7.6 (mean, 4.6) and stage IIIS, SUV_{max}-14. Interim PET-CT scan after 2 cycles of ABVD chemotherapy had been done in 3 HL patients during this period. Among them one patient with stage-II showed complete response to chemotherapy (Deauville score-1). Two patients (one stage-II and one with stage-IV) showed partial response.

Conclusion: Baseline and interim PET-CT scan are useful modality to evaluate the baseline staging as well as to see the treatment response and disease progression in pediatric lymphoma.

P_88

Initial Experience of PET-CT in Differentiated Thyroid Carcinoma Patients with High Serum Thyroglobulin and Negative Iodine Whole Body Scan

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Objective: The objective of this study was to find out FDG avid metastatic lesions at ^{18}F -FDG PET-CT scan in patients with differentiated thyroid carcinoma (DTC) with high serum thyroglobulin (Tg) and negative diagnostic and posttherapy ^{131}I whole-body scan (WBS).

Methods: The study included 6 patients (4 female, 2 male, average age 49 years, range 25-77) with DTC after total thyroidectomy and ^{131}I ablation who developed elevated Tg and negative WBS (3 Diagnostic, 3 posttherapy) at different follow up stages. Recent Tg levels of all patients ranged for 23.7 ng/ml to >300 ng/ml. After 4 hours fasting ^{18}F FDG was administered intravenously. Imaging was performed with PET-CT scanner with LYSO crystal on integrated 128-slices CT. From vertex to thigh with 9 bed positions, 2 minutes per bed images were taken. Serum blood glucose level was normal in all cases at the time of FDG injection. Images were reviewed in the transaxial, coronal and sagittal planes.

Results: All 6 patients showed FDG avid lymph nodes either in neck (4 patients) or upper chest (1 mediastinal, 1 subcarinal). SUV_{max} of the most intense lesions was 42 (left level III and IV). FDG avid skeletal metastases were evaluated in four patients- C₇ (SUV_{max} 6), T₁₁ (SUV_{max} 8.9), L₃ (SUV_{max} 10.7), right 5th rib posteriorly (SUV_{max} 7.7), medullary cavity of lesser trochanter of left femur (SUV_{max} 2.9).

Conclusion: PET-CT imaging gives valuable information about hypermetabolic lymph nodes those are non-iodine avid and plays an important role in further decision making regarding management.

noninvasive means of early detection & staging of σ -1 receptor related neurodegenerative diseases. The purpose of the study was to develop a radiobromine labeled benzovesamicol analogue as a new neuroimaging probe with the high affinity for σ -1 receptors.

Methods: *ortho*-bromo-trans-benzovesamicol (OBBV) was synthesized from 4-(2-bromophenyl)piperidine. Bromo substituent of OBBV was replaced by a trimethylstanny group to obtain OTBV. Treatment of OTBV with iodine in chloroform at room temperature yielded OIBV. [^{77}Br]OBBV was radiosynthesized by the tin-bromine exchange reaction from OTBV. VACHT and σ receptors affinities of OBBV and OIBV were evaluated through *in vitro* competitive binding assays using radioligands: (-)-[^3H]vesamicol, (+)-[^3H]pentazocine, and [^3H]1,3-di-*o*-tolylguanidine (DTG), respectively. In VACHT and σ -1 receptor binding assays, the mixture of rat cerebral membranes, each radioligand and inhibitors were incubated at 37 °C for 60 min and 90 min, respectively. In σ -2 receptor binding assay, the mixture of rat liver membranes, a radioligand and inhibitors were incubated at 37 °C for 90 min. Lipophilicity of [^{77}Br]OBBV was also measured.

Results: In *in vitro* competitive binding studies, OIBV showed no selectivity and poor affinity to VACHT and σ receptors. On the contrary, OBBV showed high affinity to the σ -1 receptor, which was almost comparable to that of (+)-pentazocine. Compared to DTG & (\pm)-pentazocine, OBBV showed higher affinity to the σ -1 receptor. The log P_{ow} [^{77}Br]OBBV was found 2.26 ± 0.05 .

Conclusion: OBBV have the potential as PET neuroimaging probe with high affinity and selectivity to σ -1 receptor.

P_89

Introduction of radiobromine labeled benzovesamicol analogue as a new and prospective neuroimaging probe with the high affinity for sigma (σ) -1 receptor.

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Objective: Sigma (σ) -1 radio ligands can be a potential

P_90

Withdrawn

2016FANMB_01

Patterns of stress related injuries of lower limbs on skeletal scintigraphy

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Objective: To determine the patterns of stress related injuries of lower limbs on skeletal scintigraphy and ascertain injury prone sites. Study design was Retrospective, cross sectional. Place and duration of study were Nuclear Medical Centre, AFIP Rawalpindi. Jul 2004 to Dec 2012.

Methods: A total of 297 positive cases on 3-phase skeletal scintigraphy were included in study whereas negative cases were excluded. ^{99m}Tc -MDP, in 20 mCi dose was injected intravenously followed immediately by radionuclide angioscintigraphic and equilibrium blood pool imaging of the involved site with subsequent delayed imaging after 2 hours. Acquisition was done on Siemens E-Cam ® and Scintronix ® Gamma Cameras. Uptake of radiotracer in a localized focal pattern was labeled as stress fracture and in linear pattern along the periosteum as sub-periosteal reaction or periostitis. Linear uptake in posteromedial distal tibial aspects was diagnosed as medial tibial stress syndrome or shin splints. Radiotracer accumulation at insertion sites of major lower limb muscles was labeled as activity induced enthesopathy.

Results: Stress fractures constituted 80.13% cases with bilateral middle third tibiae as the commonest site. Bilateral shin splints were present in 21.88% of cases and sub-periosteal reactive changes in bilateral proximal tibial halves comprised 14.47% of the patients. Activity induced enthesopathy was present in 4.20% of patients with bilateral quadriceps femoris enthesopathy being more prevalent.

Conclusion: Most common overuse injuries are stress fractures followed by shin splints, sub-periosteal reactive changes and activity induced enthesopathy respectively in descending order. Middle third of tibia is commonest site prone to stress fractures and overall right lower limb is frequently involved as compared to left in all stress induced injuries.

Keywords: Bone scan, overuse injuries, stress fracture.

2016FANMB_02

Molecular imaging of Estrogen Receptor with [^{18}F] fluoroestradiol PET-CT in breast cancer patient: A prospective comparative study with [^{18}F] Fluorodeoxyglucose

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Background: Breast cancer has become a leading cancer in many cities in females in India. Imaging is the most crucial in correct staging and treatment planning. Molecular imaging by targeting estrogen receptors through FES PET-CT scan may have a higher specificity and incremental value in aiding decision making as compared to the existing FDG PET-CT.

Methods: We enroll 12 female breast cancer patients prospectively and did FES PET-CT and FDG PET-CT within one week interval time. Lesion detection sensitivity was compared for total number of lesions and for non hepatic lesions only by McNemar test. Incremental value analysed by identifying FES exclusive lesions and by characterization of FDG indeterminate lesions. Spearman rank test was used to correlate ER expression and SUV_{max}.

Results: Of a total of 154 lesions considered as disease sites, FDG picked up 142 lesions (sensitivity 92.21%), whereas FES picked up 116 lesions (sensitivity 75.32%) and this difference was statistically significant (p value 0.0004). Due to high physiological FES uptake in liver, lesions appeared cold and were poorly detected. On analyzing non-hepatic lesions (n=136) detectability, FDG picked up 124 (sensitivity 91.18%) whereas FES picked up 116 (sensitivity 85.29%) lesions with no statistically significant difference (p value 0.2159). FES exclusively picked up 12 lesions. Besides this, FES also characterized 41 FDG positive indeterminate lesions (7 were FES negative and 34 were FES positive). Overall FES had an impact on 20% patient management. Positive correlation was found between ER expression and FES median SUVmax. Positive trend was also seen with FES SUVmax with ER expression and negative with FDG SUVmax.

Conclusions: FDG has overall better sensitivity than

FES PET-CT, however for non-hepatic metastatic sites difference was not statistically significant. FES PET-CT showed incremental value in characterizing 27.5% of FDG positive lesions and also showed 7.4% exclusive lesions. With this, it has impacted patient management in 20% cases. We conclude that FES PET-CT can be used along with FDG PET-CT in strongly ER expressing patients for better specificity, evaluation of disease extent and impact on treatment.

2016FANMB_03

Post-therapy PET/CT Analysis with the Deauville 5-Point Scale is Better Able to Predict Outcomes than IHP Criteria and SUV-based Assessment in Patients with Extranodal Natural Killer/T Cell Lymphoma

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Objective: To assess the prognostic capacity of three methods of 18F-FDG PET/CT analysis performed after the administration of therapy in patients with extranodal natural killer/T-cell lymphoma (ENKTL). The three methods of PET/CT analysis included the International Harmonization Project (IHP) criteria, the Deauville 5-point scale (5-PS), and SUV-based assessment.

Methods: Fifty-nine patients with newly diagnosed ENKTL were enrolled. Each patient underwent three 18F-FDG PET/CT scans: (1) baseline, (2) after 2–4 cycles of chemotherapy (early response assessment), and (3) end of treatment (evaluation of final response). Post-therapy 18F-FDG PET/CT results were determined based on IHP criteria, 5-PS, and change in the maximum 18F-FDG uptake (Δ SUVmax). IHP criteria, 5-PS, and Δ SUVmax were then examined for their ability to predict progression-free survival (PFS) and overall survival (OS).

Results: Over a median follow-up of 25 months, post-therapy PET/CT results based on 5-PS and Δ SUVmax but not IHP were significant predictors of PFS and OS. After multivariate analysis, 5-PS was able to independently predict PFS ($P = 0.008$) and OS ($P = 0.002$). Δ SUVmax (using a 53.3% reduction as a cutoff) was found to be an independent predictor of PFS ($P = 0.019$) but not OS and had a lower accuracy and positive predictive value than 5-PS.

Conclusion: Post-therapy PET/CT analysis using the 5-PS is better able to predict survival than analysis with IHP or Δ SUVmax in ENKTL patients.

Keywords: Deauville 5-point scale, Post-therapy

PET/CT, extranodal natural killer/T-cell lymphoma, prognosis, response assessment.

2016FANMB_04

Retrospective Review of Differentiated Thyroid Cancers Cases with Elevated Serum Thyroglobulin Levels and Negative Whole Body Scans: A Malaysian Tertiary Hospital Experience

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Introduction: The mainstay of treatment for differentiated thyroid cancers (DTC) has always been and remains radioactive iodine (RAI) therapy after definitive surgery management. However, clinicians frequently face difficulties in managing patients with elevated serum thyroglobulin (Tg) levels but negative whole body scans (WBS) as these patients are less responsive to radioiodine therapy.

Objective: The aim of the study was to determine the prevalence of such cases in our local setting and to determine the outcome of these patients post-PET-CT.

Methods: The data from DTC patients treated in the Department of Nuclear Medicine, Penang Hospital from 1st December 2010 till 1st December 2014 were reviewed. Only the data from patients who had negative WBS with elevated Tg levels were collected. These patients had also undergone fluoro-18-deoxyglucose (FDG) positron emission tomography – computed tomography (PET-CT) during their course of management.

Results: There were only twenty patients (4.7%) who fulfilled the inclusion criteria from 423 patients who were being treated in Penang Hospital during the study period. There were fourteen women (70%) and the ages ranging from 27 to 76 years old with median of 47 years old. Sixteen patients (80%) had papillary thyroid cancer (PTC) and another four had follicular thyroid cancer (FTC). The use of FDG PET-CT revealed 8 patients (40%) with FDG avid metastases suggesting dedifferentiation of thyroid cancers. Four patients with grossly elevated Tg levels but negative WBS and FDG PET-CT, were given trials of high-dose RAI with little success as none showed RAI uptake nor reduction in Tg levels. Similarly, patients demonstrating FDG-avidity showed poor response to chemo-radiation.

Conclusion: In view of the high prevalence of patients with FDG-avid metastases, FDG PET-CT should always be performed in patients with elevated Tg and negative WBS. Nevertheless, the outcome for these patients remains relatively poor in comparison to those with RAI-avid disease.

2016FANMB_05

Dual-time-point ¹⁸F-FDG PET/CT for Detecting Aortic Graft Infection

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Background: ¹⁸F-FDG PET/CT is a promising tool in detecting aortic graft infection. Current study investigates the value of dual-time-point ¹⁸F-FDG PET/CT imaging (DTPI) with delayed imaging in assessing aortic graft infection.

Methods: Twenty-nine patients with suspected aortic graft infection were prospectively enrolled in this DTPI study. Two nuclear medicine physicians read all the images and achieved consensus about the measurement of maximal standardized uptake value (SUV_{max}) and grading of image qualities. The percentages of SUV_{max} change between initial and delayed images were recorded as retention index (RI); sensitivity, specificity, and accuracy were calculated base on reference standard.

Results: All the five infected aortic grafts had positive RIs, which were generally higher than that of non-infected grafts. Those non-infected grafts had variable RIs. Image qualities were improved in delayed imaging in seven patients. DTPI with delayed image detected all the infected grafts, with improved specificity (88%) and accuracy (90%).

Conclusion: Infected aortic grafts may have typically high ¹⁸F-FDG uptake and retention. DTPI with delayed imaging may improve accuracy, imaging qualities, and provide additional information in diagnosing aortic graft infection.

2016FANMB_06

The role of radiosynovectomy in the treatment of hemophilic arthropathy.

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Background: Chronic hemophilic synovitis is a debilitating disease that requires aggressive

treatment to prevent permanent articular destruction. Radiosynovectomy is a local form of radiotherapy that is used to treat the disease when conservative therapy has failed. This study is to evaluate the effectiveness of radiosynovectomy using Yttrium-90 (Y-90) and Rhenium-186 (Re-186) colloid in hemophilic arthropathy in terms of bleeding frequency, pain score, range of motion and performance score.

Methods: 68 consecutive patients with hemophilic synovitis were included in this prospective cohort study from June 2012 to Dec 2013. Y-90 colloid was used in the knee joint and Re-186 sulfide colloid in the ankle, elbow and hip joints. Therapeutic effectiveness was assessed at 6 months interval. The collected data was analyzed using paired-samples t-test and Wilcoxon signed rank to compare the mean score of bleeding frequency, pain scale, range of motion and performance scale for overall and individual joints.

Results: The frequency of intraarticular bleeding and pain score were significantly reduced by 85% and 87% respectively at 6 months follow up ($p<0.005$). A marked decrease (80-100% decrease) in bleeding frequency was seen in 66.2% of patients, 14.7% of patients had moderate decrease (51-79% decrease) and mild decrease (30-50% decrease) was seen in 14.7% of patients. Frequency of intraarticular bleeding was unchanged in only 4.4 % of cases. The Karnofsky and Lansky performance scales were also improved by 9-10% at 6 months follow up ($p<0.005$). No adverse events were reported in this study.

Conclusion: Radiosynovectomy is a safe and effective procedure in limiting bleeding frequency, reducing pain and increasing performance scale.

2016FANMB_07

Multiplex Molecular Target Detection of Colorectal Cancer by Simultaneous Fluorescence-Raman Endoscopy

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Objectvie: We have developed a simultaneous fluorescence-Raman endoscopic system (FRES) by modifying a commercial confocal laser endomicroscope and herein demonstrate its value in an orthotopic colorectal cancer (CRC) xenograft model.

Methods: In a CRC xenograft model, epidermal growth

factor receptor (EGFR) and vascular endothelial growth factor (VEGF) were targeted with antibody-conjugated fluorescence and surface-enhanced Raman scattering (F-SERS) dots to evaluate the efficacy of the FRES.

Results: Our results demonstrate that FRES showed fast signal detection and a multiplex targeting ability by fluorescence and Raman signals, respectively. In addition, FRES showed a multiplex targeting ability even in a subcentimeter-sized CRC, using a half spraying dose.

Conclusions: By the FRES, molecular characteristics of tumor cells (EGFR in the cancer cell membrane) and tumor microenvironments (VEGF in the extracellular matrix) can be simultaneously investigated while performing colonoscopy.

2016FANMB_08

Dysfunction of Right Ventricular Failure

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Background: L-carnitine is indispensable for energy metabolism and mitochondrial function in the myocardium. Although carnitine deficiency has been implicated in development of left ventricular failure, little is known about the role of L-carnitine in the right ventricular failure in pulmonary arterial hypertension.

Methods and Results: Experimental pulmonary hypertension develops in male Sprague-Dawley rats subjected to a single subcutaneous injection of monocrotaline (60 mg kg⁻¹, MCT group). Compared with the vehicle group, by day 21, MCT group developed higher right ventricular systolic pressure (34±5 mmHg versus 19±4 mmHg, P<0.001) and right ventricular hypertrophy (0.51±0.13 versus 0.28±0.05, P<0.001). In MCT group, L-carnitine levels were significantly decreased in both the right ventricular myocardium (159±47 nmol/g vs 435±76 nmol/g, P<0.05) and plasma (7±3 umol/l vs 16±10 umol/l, P<0.05), indicating L-carnitine deficiency was associated with the right ventricular failure. To evaluate whether

supplementation with L-carnitine could attenuate right ventricular failure, we treat the rats received monocrotaline with either L-carnitine (500mg kg⁻¹ day⁻¹, L-carnitine MCT group) or saline (saline MCT group) for 14 days. In comparison with saline MCT group, the mean pulmonary arterial pressure and the right ventricular systolic pressure decreased by 34% (P=0.04) and 25% (P=0.01) in the L-carnitine MCT group, respectively. The right ventricular hypertrophy index and right ventricular free wall thickness decreased by 25% (P=0.02) and 14% (P=0.03) in the L-carnitine MCT group, respectively. Furthermore, the myocardial PET/ CT demonstrated that SUV_{RV} / LV of L-carnitine MCT group reduced by 15% when compared with saline MCT group (P<0.05).

Conclusion: The L-carnitine deficiency may aggravate development of pulmonary hypertension. Supplementation with L-carnitine could improve pulmonary arterial hypertension by reversing energy metabolism dysfunction of right ventricular failure.

Keywords: L-carnitine; energy metabolism dysfunction; right heart failure; pulmonary arterial hypertension.

2016FANMB_09

Pattern of Lung Metastase and Its Influence to DTC Treatment outcome

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Background: Thyroid cancer is the most common endocrine neoplasm. RAI therapy has been widely used for metastatic differentiated thyroid cancer (DTC). Metastases sites of DTC are lung and bone respectively. The aim of this study was to evaluate outcome of RAI therapy in lung metastatic DTC regarding its pattern and survival rate.

Methods: DTC patients with lung metastases were enrolled from 2005 – 2010. The subjects were divided into two groups based on uptake pattern of metastatic lesion: macro and micronodule. Outcome of RAI therapy was evaluated by serum thyroglobulin measurement and visually radioiodine uptake changes on post RAI therapy whole body scan or diagnostic I-131 whole body scan with minimal one year of follow up period.

Results: There were 286 patients of DTC from 2005 – 2010, 15 of them had lung metastases (age 9 – 61, mean 43.5; 13 female and 2 male). Histopathology result showed papillary thyroid cancer (PTC) in 11 patients and follicular thyroid cancer (FTC) in 4 patients.

From all patients, there were 11 patients showed lung metastases and 4 patients showed both lung and bone metastases. Micronodules were found in 10 of 11 patients with lung metastases and 2 of 4 patients with both lung and bone metastases. Most of micronodules (9/11 and 2/4) showed decreased serum thyroglobulin level and radioiodine uptake. Two patients showed no metastatic lesion on their last follow up scan result (one patient in 2.5 years, while another patient in 6 years after their first radioiodine treatment).

Conclusion: Micronodules metastatic lesion show better response of RAI therapy.

Keywords: Differentiated Thyroid Carcinoma, RAI, Tiroglobulin.

showed abnormal activity in 30 patients, while 7 cases were negative. The sensitivity of 99m Tc-HYNIC-TOC scintigraphy in the evaluation of TIO is therefore 81.0%. The tumors were recurrence or metastasis, which detected(17 in 30 cases) during follow-up period. 7 in 30 cases were identified after the second scans, because the surgical treatment was not performed without other imaging support (CT, MRI, etc) in the first abnormal 99m Tc-HYNIC-TOC imaging. 5 cases were positive finding during follow-up period which were negative in the first scintigraph. One patients got negative finding after surgery while the positive one before surgery.

Conclusion: 99m Tc-HYNIC-TOC imaging is valuable in the follow-up of occult tumors causing TIO.

2016FANMB_10

The Clinical Value of 99m Tc-HYNIC-TOC Scintigraph to Follow-up Patients with Tumor-induced Osteomalacia

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Background: Tumor-induced osteomalacia (TIO) is an endocrine disorder caused by tumors producing excessive fibroblast growth factor-23 (FGF-23). The causative tumors are generally small, slow-growing benign mesenchymal tumors. Complete tumor resection was the more effective surgical approach. When this was not feasible, tumor curettage with wide curettage margins could be considered, though persistent or recurrent disease might be more likely. These tumors are extremely difficult to localize due to their small sizes and rare locations. But the Since these tumors are known to express somatostatin receptors, this research was undertaken to evaluate efficacy of [$Tc-99m$]HYNIC-octreotide (99m Tc-HYNIC-TOC) scintigraph in follow-up patients with TIO.

Methods: Images of 99m Tc-HYNIC-TOC scans and clinical chart from 37 patients with hypophosphatemia and clinically suspected TIO were performed. The scan findings were compared to the results of histopathological examinations and clinical follow-ups.

Results: More than twice 99m Tc-HYNIC-TOC scintigraph were performed in all 37 (24 male and 16 female) patients identified TIO, with an average age of 42 years. The tumors were isolated in either soft tissue (16 patients) or bone (16 patients) and combined soft tissue and bone invasion was observed in 5 patients. The tumors were distributed in the extremities (27 cases), craniofacial regions (6 cases) and torso (4 cases), respectively. The 99m Tc-HYNIC-TOC scintigraphy

2016FANMB_11

Safety and utility of stress myocardial perfusion scintigraphy in patients presenting with unthrombolyzed recent myocardial infarction

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Introduction: Patients with myocardial infarction (MI) fail to get thrombolyzed primarily due to delay in arrival to the emergency. These patients may harbor significant amount of ischemic myocardium, which can be salvaged, if identified early. INSPIRE trial described the role of adenosine myocardial perfusion scintigraphy (MPS) patients with recent myocardial infarction. However, the role of physical stress in these patients has not been clearly defined.

Objective: Evaluating safety and utility of stress MPS in patients with myocardial infarction who were not thrombolyzed due to delay in presentation to the hospital. Study design was Prospective.

Methods: 150 patients who were not thrombolyzed after documented myocardial infarction were studied. 25 patients were excluded because of contra-indications to physical stress. Physical stress using treadmill (TMT) was given as per standard Bruce protocol. 99m Technetium labelled Sestamibi was the radio-pharmaceutical utilised. Single day stress - rest protocol was utilised. 7mCi of 99m Tc-Sestamibi was injected at peak stress and imaging was performed at 60 minutes in a dual head gamma camera fitted with low energy high resolution collimators (GE Infinia Hawkeye-4). Rest imaging was performed 75 after injection of 21 mCi of 99m Tc-Sestamibi at rest, 3 hours after the stress injection. Imaging was performed using the standard protocol and attenuation

correction performed using X-ray source (SPECT/CT). **Results:** 125 patients (110 males, 15 females; Mean age 49 yrs; range 32 to 62 yrs) underwent stress MPS. The average time from MI to stress MPS was 23 days (range 9-30 days). The average stress achieved was 6.1 Metabolic equivalents (METS) (Range 2.4 to 10.1 METS). 90 patients (72%) achieved atleast 5 METS. Average heart rate at peak stress was 81% of the Maximum predicted heart rate (MPHR) (Range 64% to 100% of MPHR). 75 patients (60%) achieved atleast 80% of MPHR. Mild symptoms (giddiness, breathlessness, chest pain) were present in 14 patients. None of the patients had severe / life threatening symptoms requiring any pharmacologic intervention.

Average size of myocardial perfusion defect was 35% (Range 20% to 57% of LV myocardium). Reversible ischemia was found in 50 patients (Mean size was 10% (Range 2%-20%). Thirty patients (24% of the study group) had $\geq 10\%$ reversible ischemia and were subjected to revascularization. Significant positive correlation was noted between the Summed stress score and defect size ($r = 0.786$) Summed difference score and reversible ischemia($r = 0.859$). No correlation between the degree of stress achieved, in METS, and the size of the perfusion defect. Negative correlation was noted between the defect size and ejection fraction calculated. **Conclusion:** Patients who are not thrombolysed after MI, often have extensive perfusion defects. Approximately one fourth of these patients had significant quantity of ischemic myocardium to warrant revascularization. Physical stress is safe, well tolerated and cost effective in patients with recent MI while subjecting them to stress rest myocardial perfusion scintigraphy.

2016FANMB_12

Prognostic value of metabolic parameters of F-18 FDG PET/CT and apparent diffusion coefficient of MRI in hepatocellular carcinoma

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Objective: The aim of this study was to predict the survival of hepatocellular carcinoma (HCC) using metabolic PET parameters and apparent diffusion coefficient (ADC), pathologic grade and serologic

markers.

Methods: From January-2011 to December-2012, 52 pathologic confirmed HCC patients (age, 57.9 ± 10.7 ; 43 male) who underwent diffusion-weighted MRI, F-18 FDG PET/CT were included in this retrospective study. Tumor-to-normal liver standardized uptake value ratio (TLR) from F-18 FDG PET/CT and mean value of ADC from diffusion-weighted MRI were obtained. Edmonson grade and alpha-fetoprotein (AFP) at initial diagnosis were also obtained. Survival analysis was performed using cox-proportional hazard regression.

Results: Thirty-two patients were died during follow-up period. In this study, TLR [Hazard ratio(HR), 1.527; 95% Confidence Interval(CI), 1.264-1.844; $p < 0.001$], mean ADC (HR, 0.998; 95% CI, 0.997-1.000; $p = 0.026$), AFP (HR, 1.527; 95% CI, 1.264-1.844; $p < 0.001$), size (HR, 1.121; 95% CI, 1.060-1.185; $p < 0.001$) were significantly associated with overall survival of HCC patients. However, age, gender and Edmonson grade were not significant predictor for the overall survival. In multivariate analysis, TLR showed significant association with the overall survival of HCC patients (HR, 1.402; 95% CI, 1.114-1.764; $p = 0.004$).

Conclusion: Higher TLR and lower mean ADC in HCC showed worse outcome. And TLR was the only independent prognostic factor in HCC patients.

2016FANMB_13

Evaluation of cerebral perfusion pressure index in adult patients with asymptomatic and hemorrhagic moyamoya disease

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Background: We have reported the hemodynamics in adult patients with ischemic moyamoya disease (Piao S., et al. Ann Nucl Med 2004). To our knowledge, however, only a limited number of studies have assessed the hemodynamics in adult patients with asymptomatic and hemorrhagic moyamoya disease. Clinical and experimental studies (Gibbs JM, et al., 1984; and Schumann P, et al., 1998) have indicated that regional ratio of cerebral blood flow (CBF) to cerebral blood volume (CBV), as measured by PET, is a marker of local cerebral perfusion pressure (CPP). We investigated the CBF/CBV ratio in adult patients with asymptomatic and hemorrhagic moyamoya disease.

Methods: We studied 5 patients with asymptomatic moyamoya disease (2 men/3 women, mean age 46.2 ± 6.0 y), 5 patients with hemorrhagic moyamoya disease (3

men/2 women, mean age 36.2 ± 14.8 y) and 9 healthy volunteers (5 men/4 women, mean age 47.0 ± 1.2 y) by using PET with H2150, 1502, and C150. Regions of interest (ROI) were set on regions of the anterior (ACA), middle (MCA) and posterior (PCA) cerebral arteries, basal ganglia (BG), white matter (WM), cerebellum, brain stem (BS) and thalamus.

Results: CBF was not significantly lower in patients with hemorrhagic moyamoya disease than healthy volunteers except in thalamus. CBV was significantly higher in asymptomatic and hemorrhagic moyamoya disease than healthy volunteers in cerebellum, BG, WM, ACA, MCA anterior, PCA areas. CBV was significantly higher hemorrhagic moyamoya disease than asymptomatic moyamoya disease in BG. CBV was significantly higher in asymptomatic moyamoya disease than healthy volunteers in thalamus. CBV was significantly higher in hemorrhagic moyamoya disease than healthy volunteers in MCA posterior area. The CBF/CBV ratio was significantly lower in asymptomatic and hemorrhagic moyamoya disease than healthy volunteers in thalamus, BG, WM, ACA and MCA anterior, MCA posterior, PCA areas. No significant difference in CBF/CBV ratio was found between asymptomatic and hemorrhagic moyamoya diseases.

Conclusion: The present study indicated that the CBF/CBV ratio was significantly lower in asymptomatic and hemorrhagic moyamoya disease than healthy volunteers. Different from patients with ischemic moyamoya disease, CBF reduction was not found in most regions. Normal CBF associated with reduced perfusion pressure and vasodilatation was characteristic in patient with hemorrhagic moyamoya disease.

2016FANMB_14

Evaluation of Tc-99m Dextran Lymphoscintigraphy in detection of sentinel lymphoscintigraphy in patients with malignant melanoma

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Background: The sentinel node biopsy is useful to staging in malignant melanoma patients. The sentinel node detection can be performed by radioisotope or blue dye techniques. The purpose of this study is to use Tc-99m dextran lymphoscintigraphy to evaluate sentinel node detection in patients with malignant melanoma patients in Siriraj Hospital.

Methods: The retrospective study of 16 patients with malignant melanoma stage I-III was performed. All patients underwent surgery, preoperative Tc-99m dextran lymphoscintigraphy and pathological examination. Eleven patients underwent sentinel node detection by blue dye. In patient who cannot be identified sentinel node, patient had elective node dissection.

Results: There were 4 men and 12 women (age ranged 42-93 years) in this study. The location of tumor at foot, hand and eyelid were 12, 3 and 1, respectively. The sentinel node detection rate were 94% (15 patients) by using Tc-99m dextran lymphoscintigraphy while 73% (8 patients) by blue dye technique. One case was false positive (6%) by Tc-99m dextran lymphoscintigraphy technique.

Conclusions: The sentinel node detection by radioisotope tend to be more efficient than that by blue dye technique.

2016FANMB_15

Comparison of FDG-PET/CT and Diffusion-weighted Imaging Indexes for Differentiation between Benign Pheochromocytomas and Other Benign Adrenal Tumors

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Background: To compare diagnostic performances of FDG SUV_{max} ratio of adrenal to liver SUV_{max} (A/L SUV_{max}) and apparent diffusion coefficient (ADC) from diffusion-weighted imaging to differentiate adrenal pheochromocytomas and other benign tumors.

Methods: The subjects were 20 adrenal tumors (10 pheochromocytomas, 10 other benign) of 17 patients. Diagnostic performance was evaluated using Mann-Whitney's U test and receiver operating characteristic analysis.

Results: Pheochromocytomas showed significantly higher SUV_{max} and A/L SUV_{max} and lower ADC than other benign tumors (SUV_{max}: 11.6 ± 9.2 vs. 3.6 ± 1.8 , $P=.001$; A/L SUV_{max}: 4.2 ± 3.6 vs. 0.9 ± 0.5 , $P=.002$ and ADC: 1.06 ± 0.23 vs. 1.39 ± 0.31 , $P=.019$). Sensitivity and specificity for diagnosing pheochromocytoma were 100% and 80% for both SUV_{max} and A/L SUV_{max}, and 70% and 100% for ADC. No significant differences in area under the curve

were found between FDG indices and ADC.

Conclusion: FDG indices and ADC may be equally useful in differentiating pheochromocytomas from other benign adrenal tumors.

distinguishing the presence or not of predisposing causes of lymphatic obstruction in patients with lower extremities lymphedema.

2016FANMB_16

Lymphoscintigraphic Imaging Patterns According to Predisposing Factors in Patients with Lower Extremity Lymphedema

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Background: Lymphoscintigraphy can be used to diagnose and determine the degree of lymphatic obstruction by image-based pattern recognition. However, characterization of lymphoscintigraphic findings according to the predisposing factors of lymphatic obstruction is not clearly demonstrated. Our aim was to investigate the potential of using visual score to characterize the causes of lower extremity lymphedema.

Methods: A total of 30 patients with clinically diagnosed lower extremity lymphedema who underwent lymphoscintigraphy during October 2015 and February 2016 were retrospectively reviewed. Lymphatic obstruction was found in 36 lower limbs; which were classified into 2 groups according to the predisposing factors for lymphedema. Group I had no predisposing factor ($n=19$) and group II had predisposing factors ($n=17$). Lymphoscintigraphic imaging patterns of delay, ascending, collateral lymphatic vessels, dermal backflow and decreasing of inguinal lymph node uptake were assessed visually using a 0- to 3-point scale. Scores of each imaging pattern and the total point scores were compared among the two groups.

Results: There was no significant difference of visual scores of any imaging patterns between groups (eg. decreasing of nodal uptake had P -value of 0.195). Likewise, no statistically significant difference in the mean total visual point scores was found (group I: 3.05 ± 1.35 and group II: 3.35 ± 1.38 , $P = 0.302$). There was significant negative correlation between the presence of collateral channels and decreasing of lymph node uptake ($r = -0.428$, $P = 0.009$), and between delay, ascending and the presence of collateral channels ($r = -0.394$, $P = 0.017$).

Conclusion: Interpretation of lymphoscintigraphy by using 3-point visual scoring system is not useful for

2016FANMB_17

Peptide Receptor Radionuclide Therapy using ^{177}Lu and ^{90}Y -DOTATATE in metastatic treatment-refractory Medullary Thyroid Cancer

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Objectvie: Medullary thyroid carcinoma (MTC) represents about 3-16% of thyroid cancer. Distant metastases are present in 13% of patients at initial diagnosis and portend a poor prognosis, with a 10-year survival rate of only 40%. Somatostatin receptor type 2 (SST2) was expressed with moderate intensity in most of MTC, making it a promising therapeutic target, particularly in advanced cases wherein all treatment options are futile. Hence, this study was aimed at assessing the efficacy (response and survival) of PRRT in patients with treatment-refractory metastatic medullary thyroid cancer.

Methods: We retrospectively analyzed a consecutive cohort of 28 patients (14 males, 14 females, mean age - 47.9 years, age range – 26 to 72 years), between 2004 and 2012, with histopathologically proven recurrent medullary thyroid cancer with widespread distant metastases, who were referred for PRRT. All patients had either undergone primary surgery and/or conventional chemotherapy and radiotherapy treatment regimes, depending on the stage at presentation. In addition, patients had received site-specific treatments. SSTR expression was confirmed on ^{68}Ga -DOTATOC PET/CT. Patients were treated with PRRT (until 5 times) at our center using Y-90/Lu-177 DOTA-TATE. Primary end point was treatment response assessed on follow up ^{68}Ga -DOTATOC PET/CT; with survival statistics being the secondary end point. Comprehensive relevant clinical information was gathered from the referred medical profiles and during follow-up periods (until death) at our institute.

Results: Based on the EORTC criteria, 17/28 (60.7%) patients showed Stable Disease (SD), 5/28 (17.7%) showed partial response (PR), while 6/28

(21.4%) showed disease progression (PD). Thus 22/28 patients showed non-progression, which was a significant outcome, considering the baseline pre-PRRT disease status. The median survival in patients with SD was 36 months and with PR was 72 months. The median survival for patients with PD is 24 months.

Conclusion: PRRT was effective for treatment-refractory metastatic MTC, as indicated by the response seen on ⁶⁸Ga-DOTATOC PET/CT. There was significant survival benefit noted, especially since these patients had exhausted all possible therapeutic options.

2016FANMB_18

Retrospective analysis of evaluation for the characteristics of primary brain tumor using PET/CT and MR imaging

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Background: It is well known that the preoperative evaluation and diagnosis of brain tumor is very important for patient's management, but sometimes it's still challenging. The purpose of this study was to evaluate the diagnostic utility of ¹¹C-methionine-PET/CT and ¹⁸F-FDG-PET/CT for assessing tumor malignancy and the characteristics of primary brain tumors in comparison with MRI.

Methods: Fifty patients with primary brain tumors were enrolled. We measured SUV and calculated the tumor-to-normal ratio (T/N ratio) on each PET image. In addition, apparent diffusion coefficient (ADC) values and the results of perfusion MRI were used for evaluation. We compared these results and evaluated their relationships with tumor malignancy.

Results: It was confirmed that the T/N ratio on PET/CT could be used to accurately evaluate tumor malignancy to distinguish between benign and malignant lesions. The tumors' T/N ratios and ADC values were significantly correlated, and both parameters were correlated with tumor grade.

Conclusion: We found a good correlation between the T/N ratio and ADC value of each tumor. PET/CT

and DW-MRI are potentially useful for preoperative evaluations of the malignancy of brain tumors.

2016FANMB_19

Integrin receptor imaging of breast cancer using ^{99m}Tc-3PRGD2 SPECT/CT: compared with ¹⁸F-FDG PET/CT

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Objecctive: A prospective study was designed to evaluate ^{99m}Tc-3PRGD2, a new tracer that targets integrin $\alpha_v\beta_3$ receptor, in imaging of breast cancer via SPECT/CT, and it was compared with ¹⁸F-FDG PET/CT of the same patients.

Methods: Thirty-nine female patients with 66 suspicious breast lesions on Molybdenum target X-ray or B-ultrasonography were enrolled with informed consent. Whole-body planar scanning and chest SPECT/CT were performed one hour after intravenous injection of 11.1 MBq/kg ^{99m}Tc-3PRGD2. ¹⁸F-FDG PET/CT were underwent within one week for comparison.

Results: The tumor to normal breast ratios (T/B) of ^{99m}Tc-3PRGD2 were significantly higher in breast malignancies (3.2 ± 1.9 , n=34) than those of benign lesions (1.7 ± 0.7 , n=32; P=0.0005). There were significant correlations between the ^{99m}Tc-3PRGD2 accumulation and the ¹⁸F-FDG uptake in both malignancies and benign lesions (P=0.004 and 0.003, respectively). ^{99m}Tc-3PRGD2 SPECT/CT detected 38/40 of the true positive lymph-node metastasis on PET/CT. Receiver operating characteristic (ROC) analysis and z statistics showed that ^{99m}Tc-3PRGD2 SPECT/CT had similar efficacy as ¹⁸F-FDG PET/CT in diagnosis of breast cancer (P=0.154). The ^{99m}Tc-3PRGD2 uptake in the breast malignancies with lymph-node metastasis (patient number=15) were significantly higher than those without lymph-node involvement (patient number =12) (P=0.021), and the ^{99m}Tc-3PRGD2 accumulation in the primary tumor had significant correlation with those of the metastatic lymph-nodes ($r=0.810$, P=0.005). While for the ¹⁸F-FDG uptake, there were no significant difference of uptake between the breast tumors with and without lymph-node involvement (P=0.263) and between the primary tumors and involved lymph-nodes (P=0.09).

Conclusion: ^{99m}Tc-3PRGD2 SPECT/CT has similar

efficacy as ¹⁸F-FDG PET/CT in differentiation of breast tumor and detection of lymph-node metastasis. Moreover, it seems to have a preferable advantage over ¹⁸F-FDG PET/CT by indicating the metastatic characteristics of breast cancer.

Keywords: ^{99m}Tc-3PRGD2; SPECT/CT; integrin $\alpha v\beta 3$ receptor; breast cancer; ¹⁸F-FDG; PET/CT.

2016FANMB_20

The value of FDG PET/contrast-enhanced CT in initial pre-operative staging of colorectal cancer comparison with contrast-enhanced CT

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Background: FDG PET/CT is in equivocal stage to recommend in staging of colorectal cancer as compare to contrast-enhanced CT (ceCT). This study was intended to evaluate the value of FDG PET/ceCT in colorectal cancer staging as compared to ceCT alone.

Methods: PET/ceCT was performed in 61 colorectal cancer patients who prospectively enrolled in the study. Three patients were excluded due to loss follow-up. PET/ceCT findings and ceCT findings alone were read separately. The treatment planning was then determined by tumor board consensus. The criteria for T staging were determined by the findings in ceCT. Nodal positive by PET/ceCT imaging was determined by visual analysis of FDG uptake greater than regional background blood pool activity. The diagnostic accuracy of T and N staging was determined only in patients who received surgery without any neoadjuvant treatment.

Results: Of 58 patients, there were 40 colon cancers including sigmoid cancers and 18 rectal cancers. PET/ceCT in pre-operative staging detected bone metastasis and metastatic inguinal lymph node (M1a) that undepicted on CT in 2 patients (3%), clearly defined 19 equivocal lesions on ceCT in 18 patients (31%) and excluded 6 metastatic lesions diagnosed by ceCT in 6 patients (10%). These resulted in alteration of management plan in 18 out of the 58 patients (31%) e.g. neoadjuvant treatment, changing extension of surgery and avoid futile surgery. Forty four patients underwent

surgery within 45 days after PET/CT. The diagnostic accuracy for N staging of PET/ceCT and ceCT alone was 66% and 48% with false positive rate of 24% (6/25) and 76% (19/25) and false negative rate of 47% (9/19) and 21% (4/19), respectively. All of the false negative lymph nodes were subcentimeter in size and located in peri-lesional region. The diagnostic accuracy for T staging was 82%. The sensitivity of the peri-lesional fat stranding sign in determining T3 stage was 94% and the specificity was 54%.

Conclusion: Our study suggested promising role of PET/ceCT in pre-operative staging of colorectal cancer by better diagnostic accuracy and changing the management plan.

2016FANMB_21

Usefulness of the metabolic heterogeneity to select patients for radiotherapy dose-escalation in stage III non-small cell lung cancer

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Objective: We evaluated the value of intratumoral metabolic heterogeneity assessed using area under the curve of cumulative SUV-volume histogram (AUC-CSH) in FDG PET/CT to select patients for radiotherapy dose-escalation in patients with inoperable stage III non-small cell lung cancer (NSCLC).

Methods: Fifty-nine patients with inoperable stage III NSCLC, who underwent pretreatment FDG PET/CT before starting concurrent chemoradiotherapy between 2005 and 2012 were retrospectively reviewed (60 Gy: 27; 66 or 70 Gy: 32). For the classification of metabolic heterogeneity of primary tumor, median value of AUC-CSH was used. Progression-free survival (PFS), locoregional recurrence-free survival (LRFS), and distant metastasis-free survival (DMFS) curves were produced using Kaplan-Meier methods and survival difference between groups was assessed by Wilcoxon test.

Results: Twenty-seven patients had metabolically homogeneous primary tumors (AUC-CSH>4489) and 32 patients had heterogeneous tumors (AUC-CSH<4489). In Kaplan-Meier analysis, higher radiation dose (66 or 70 Gy) was associated with improved PFS

($p=0.032$), but not with LRFS ($p=0.112$) and DMFS ($p=0.183$). In metabolically homogeneous tumor group, higher radiation dose was strongly associated with improved PFS ($p=0.003$) and LRFS ($p=0.026$). However, in metabolically heterogeneous tumor group, higher radiation dose was not associated with improved PFS ($p=0.952$) and LRFS ($p=0.949$).

Conclusion: This preliminary study suggests that radiotherapy dose-escalation in concurrent chemoradiotherapy can improve PFS and LRFS not in the patients with metabolically heterogeneous primary lung tumor but in the patients with homogeneous tumor.

2016FANMB_22

Tc-99m Dtpa Uptake In Patient With Graves' Ophthalmopathy

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Background: Differentiation active from inactive Graves' ophthalmopathy is very important in the management of Graves' ophthalmopathy.

Objectives: The aim of this study is to determine the differences between Tc-99m DTPA uptake in active and inactive Graves' ophthalmopathy based on Clinical Activity Score (CAS).

Methods: Evaluation of CAS was conducted by an ophthalmologist on twenty seven proptosis patients (54 orbits). The patients then underwent Tc-99m DTPA orbital scan. Statistical analysis was done using the Mann-Whitney method.

Results: In this study showed a very significant difference in Tc-99m DTPA orbital uptake between active and inactive Graves' ophthalmopathy ($p<0.002$). Tc-99m DTPA uptake was higher in the active group compared to the inactive group.

Conclusion: Tc-99m DTPA orbital scan can be used to differentiate active and inactive Graves' ophthalmopathy.

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Background: Prognostic significance of ^{18}F -FDG PET imaging in anal canal SCC has been evaluated in several studies. In the current study we reviewed the pertinent literature in this regard and reported the results in a systematic review and meta-analysis format.

Methods: A comprehensive literature search of MEDLINE and Scopus was done by the following keywords: "anal AND FDG". Relevant articles concerning the prognostic performance of FDG-PET in anal canal SCC were included into the study. No language restriction was used.

Results: Six articles had enough prognostic information and included into the systematic review. PET metabolic response (incomplete vs. complete response based on FDG-PET uptake) was an important prognostic factor for both overall survival (OS): pooled HR=6.58[2.14-20.24], $p=0.001$ and progression free survival (PFS): pooled HR=4.56[1.79-11.58], $p=0.001$. Inguinal uptake of FDG-PET was another prognostic factor for PFS although statistically non-significant: pooled HR=1.41[0.81-2.43], $p=0.21$. SUV_{max} and metabolic tumor volume (MTV) of the primary tumor was also associated prognosis in two reported studies, however data was incomplete to perform a meta-analysis.

Conclusion: FDG-PET can be of prognostic importance in anal canal SCC. PET metabolic response, inguinal uptake, SUV_{max}, and MTV of the primary tumor were all associated with prognosis. Larger multicenter studies are needed to validate the results of the current systematic review.

2016FANMB_26

^{18}F -FDG PET-CT in the Diagnosis of Spinal Cord Involvement Secondary to Non Hodgkins Lymphoma- A Case Report

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Background: Spinal cord involvement secondary to non Hodgkin's lymphoma (NHL) is rare and associated with quick development of neurological defects. The overall risk of central nervous system relapse in aggressive NHLs ranges 2%-27% and is associated with a poor prognosis. It is therefore important to identify involvement of the central nervous system for staging and prognostication. The purpose of this case study is to emphasize the usefulness $^{18}\text{FFDG}$ PET-CT in restaging and follow-up of patients with

2016FANMB_23

Prognostic significance of ^{18}F -FDG PET imaging in anal canal squamous cell carcinoma (SCC): a systematic review and meta-analysis of the literature

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NHL.

Case report: This reported case was a 35 years male, diagnosed as peripheral T cell lymphoma on June 2014 and was treated with chemotherapy. In January 2016 he developed swelling of lower limbs and paraparesis with bladder and bowel involvement. Duplex color Doppler of legs showed normal flow and complement fixation test (CFT) for filariasis was negative. MRI T2W showed hyperintensity signal extending from lower cervical to all dorsal cord. The ¹⁸F-FDG PET-CT was performed to restage the disease and showed intense FDG uptake ($SUV_{max}=7.9$) in the spinal cord, extended from the lower cervical to 11th thoracic and at the level of 3rd and 4th lumbar vertebrae. The spinal cord hypermetabolism observed on PET scan correlated with MRI characteristics and significantly aided in the diagnosis of spinal cord involvement.

Conclusion: The diagnosis of secondary extranodal lymphoma including spinal cord remains challenging due to varying metabolic behavior among the histologic types. PET-CT imaging can reliably identify hyper-metabolic central nervous system involvement and help not only to restage patients but also to guide new therapeutic strategies.

Keywords: Spinal cord, extranodal, lymphoma, FDG PET-CT.

2016FANMB_30

The Diagnostic Performance of Dual Phase ¹⁸F-FDG PET-CT in The Diagnosis of Lung Nodules

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Background: A total of 21,773 cancer cases were diagnosed in Peninsular Malaysia in the year 2006 by the National Cancer Registry. The cancer was the 3rd principle cause of death in Malaysian Hospitals. The five most common cancers among the population are breast, colorectal, lung, cervix and nasopharynx (National Cancer Registry, 2006). The lung is the second most common site for tumour metastasis after the liver, and 20-54% of oncologic patients will have a lung metastasis diagnosed at some point in the natural history of their disease, thus some form of surveillance of the lung is recommended (Fortes *et al.*, 2008)2008.

The hybrid of Positron Emission Tomography (PET) and Computed Tomography Imaging helps in determining the cause of solitary or multiple lung nodules more accurately

than either of these tests alone (Acker and Burrell, 2005). Advances in the hybrid PET-CT have improved characterization of lung nodules, helping in differentiating benign from malignant lung nodules, non invasively (Girvin and Ko, 2008)..

Methods: It is a prospective longitudinal study using dual phase ¹⁸Flourine-Fluoro-deoxyglucose (FDG) PET-CT examination using GE PET-CT Discovery ST. The PET-CT started with standard whole body scan post one hour (-/+15 mins) FDG injection followed by dual phase scan of thoracic region only, post 2 hour (-/+15 mins) of FDG administration. The ROI of the lung nodule is measured.

The SUV1, SUV2 and retention index (RI) of the lung nodules is calculated. The selected patients had history of malignancy with suspicious lung nodules. Total patients recruited following the inclusion criteria were 91 patients.

Results: Ninety-one patients (56 men and 35 women; mean age 55 years) were evaluated using the dual phase PET-CT scan. Sixty patients (66.0%) were follow-up clinically without biopsy (*Fisher exact test*, $P<0.001$) whereas 31 (34.1%) patients underwent biopsies (*Fisher exact test*, $P<0.001$). Eighteen were malignant (19.8%), 2 (2.2%) false positive result and 11 were benign nodules (14.3%). The sensitivity, specificity, accuracy, positive predictive value (PPV), and negative predictive value (NPV) of dual phase were 100%, 84.6%, 93.5%, 90.0% and 100% respectively. The *Mann Whitney U-test* showed SUV2 and RI influenced in the diagnosis of malignant lung nodules ($P<0.001$). The ROC analyses showed ($RI \geq 10\%$) with sensitivity and specificity of 95% and 47% respectively and ($SUV2 \geq 2.5$) with sensitivity and specificity of 60% and 82% respectively. The SUV2 and RI did not differentiate the malignant lung nodule from tuberculosis lung nodules (*The Mann-Whitney U-test*, $P>0.05$).

Conclusion: The hybrid FDG PET-CT showed benefits in the diagnosis of malignant from benign lung nodule non-invasively. The low SUV2 (<2.5) and RI ($<10\%$) values in benign lung nodules offered for clinical follow up and help in reduction of unnecessary invasive procedure. The high SUV2 (≥ 2.5) and RI ($\geq 10\%$) values in the selective malignant lung nodules have aided in biopsy, histopathological examination and molecular typing. A close follow-up, clinical correlation and invasive procedure may be needed in the selective lung nodule with infection/inflammation such as Tuberculosis infection.

2016FANMB_32

Pattern of Secondary Peritoneal Disease on FDG PET-CT

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Introduction: Peritoneum is the preferred site of metastatic deposits in various malignancies. CECT and MRI have shown low and variable sensitivity in diagnosing peritoneal disease. We have observed the distinctive features on FDG PET-CT to suggest the peritoneal disease.

Objective: To study the spectrum findings on FDG PET-CT characteristic of secondary peritoneal involvement in a known case of malignancy.

Methods: The retrospective analysis incorporated 57 patients with known malignancies with suspicion of secondary peritoneal involvement based on clinical and imageological findings. There were 33 Males, 24 Females with Mean age 45+/- 5 years. This study included patients with Ca Ovary, Ca Cervix, Colon Cancer, Lymphoma, Ca Gall Bladder, Ca Breast, Ca Lung and Pancreatic Cancer.

Results: Reviewing the PET-CT findings, there were fourteen distinct pattern of peritoneal involvement were recognized.

- 1) Ascites
- 2) Ascites with increased FDG uptake along the thickened parietal peritoneum
- 3) Diffuse photopenia matching with distended abdominal outline
- 4) Diffuse low grade smudgy FDG uptake within abdomen on PET component
- 5) FDG avid peri-hepatic and peri-splenic soft tissue density deposits
- 6) FDG avid deposits along the insertion of falciform ligament and at porta-hepatis
- 7) FDG avid reticulations under surface of anterior abdominal wall
- 8) FDG avid diffuse omental pan-caking
- 9) FDG avid soft-tissue density nodular or plaque like deposits over bowel surfaces
- 10) FDG avid soft tissue density nodular deposits in Pouch of Douglas
- 11) NON-FDG avid thin walled cystic lesions in pelvis and abdomen
- 12) FDG avid discrete mesenteric/peritoneal nodules
- 13) NON-FDG avid and enhancing soft tissue mesenteric nodules/masses.
- 14) FDG avid nodes at unusual anatomic locations like pre-hepatic, retro-crural stations

Conclusion: Recognition of these metabolic and morphological pattern on FDG PET-CT, help in accurate diagnosis of secondary peritoneal involvement.

2016FANMB_33

Functional Dyspepsia: Impaired Intra-gastric Distribution or Impaired Gastric Emptying- an Attempted Evaluation by Nuclear Scintigraphy

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Background: Functional Dyspepsia (FD) is a heterogeneous

disorder and is a diagnoses of exclusion. By definition, presence of symptoms originating in the gastro-duodenal region in the absence of any identifiable cause - should explain the condition. Some patients have delayed gastric emptying, but overall, there seems to be little relation between rate of emptying and symptoms. This study is an attempt to find the cause of symptoms of FD.

Methods: We examined 18 patients, having symptoms of bloating and epigastric discomfort and 08 volunteers. All of them were served Tc-99m DTPA mixed food. Then, they were asked to stand upright in front of gamma camera, and imaged for 1 minute over the area of upper abdomen, every 10 minutes, for a total of 90 minutes. Then, the images were divided into upper 1/3 (proximal) and lower 2/3 (distal) gastric portions and the time-activity curves (TAC) were obtained for upper 1/3rd, lower 2/3rd and total stomach region.

Results: TAC of total stomach region between patients and volunteers was not significantly different in its information but TAC of distal stomach region (lower 2/3rd) was. In the volunteers, food remained predominantly in the proximal half and then moved towards the distal half; however in the patient sub-group, food moved quickly from the fundus to the antrum and showed stasis of food for longer duration (in antrum).

Conclusion: Our study indicates that the primary cause of FD is the intra-gastric maldistribution of food (stasis in the distal stomach and antrum) rather than the abnormal gastric emptying.

2016FANMB_34

Quantification of Genetic and Environmental Influence on the Regional Brain Uptake of 2-deoxy-2-[¹⁸F]fluoro-D-glucose: a PET Study in Twins

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The magnitude of genetic and/or environmental influence on cerebral glucose metabolism are unknown. We attempted to quantify these influences in elderly twins by means of positron emission tomography (PET) using 2-deoxy-2-[¹⁸F]fluoro-D-glucose (FDG) and the structural equation modeling. FDG uptake was studied in 59 pairs of volunteer twins (41 monozygotic and 18 dizygotic pairs) aged 30 years or over. The brain PET images were analyzed by voxel-based statistical analysis with automated region-of-interest setting. The

mean FDG uptake in each cerebral lobe and cortical regions based on the functional localization (primary motor cortex, premotor and supplementary motor cortex, frontal eye fields, prefrontal cortex, primary somatosensory cortex, somatosensory association cortex, angular gyrus, supramarginal gyrus, primary visual cortex, secondary visual cortex, associative visual cortex, lateral temporal cortex, medial temporal cortex, anterior cingulate cortex and posterior cingulate cortex) was semi-quantified. Structural equation modeling was applied to investigate the degrees of genetic, shared environmental, and unique environmental influences on the regional FDG uptake in the brain. We found not only unique environmental, but also genetic and shared environmental influences on the FDG uptake by the brain, with the degree of genetic and environmental influence differing among these regions. Genetic influences were strong in bilateral primary motor cortex, bilateral premotor cortex, and all parietal regions except right supramarginal gyrus, while environmental influences played a major role in most of the other regions.

2016FANMB_35

Observation of ^{131}I Treatment effect in Middle and Older-aged Patients with Graves' Hyperthyroidism

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Objective: To evaluate the ^{131}I treatment effect in middle and older-aged patients with Graves' hyperthyroidism.

Methods: Retrospective analysis was carried out to evaluate that fine and individual ^{131}I treatment effects on the senile Graves hyperthyroidism in 167 cases of middle and older-aged patients. Based on the thyroid size, texture, age, course, antithyroid drugs (ATD) treatment, complication, operation and effective half-life of patients, the individual treatment correction coefficient was introduced to correctly adjust the dose of ^{131}I . The one-year follow-up after treatment was followed. The recurrence of symptoms, side-effects, improvement of thyroid function were used to evaluate the curable effects.

Results: The clinical symptoms in 167 cases of senile Graves hyperthyroidism patients were significantly improved with fine individual ^{131}I treatment after 3, 6 and 12 months. The serum levels of FT_3 , FT_4 and TSH in patients after treatment were significantly lower than that of pre-treatment ($P < 0.05$).

Conclusion: Fine individual ^{131}I treatment for middle

and older-aged patients with Graves' hyperthyroidism has good curative effect, and is worth popularization in clinical treatment.

2016FANMB_36

Accuracy of left ventricular function from electrocardiography-gated myocardial perfusion SPECT by MyoMetrix in Chinese

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Objective: To determine threshold values for the accurate measurements of left ventricular (LV) end-diastolic volume (EDV), end-systolic volume (ESV), and ejection fraction (EF) from electrocardiography-gated myocardial perfusion imaging (MPI) in Chinese, these data was compared with those of echocardiography.

Methods: A total of 110 patients with definite or suspected coronary artery disease (CAD) were referred for both gated MPI and echocardiography within 1 week. The EDV, ESV, and EF automatically measured by MyoMetrix and echocardiography were analyzed using Bland-Altman plot correlation and paired-*t* test.

Results and conclusion: These parameters quantified by MyoMetrix software were moderately to highly correlated with those on echocardiography (ρ , $r \geq 0.75$, $P < 0.01$). However, the EF was not significantly correlated between them as post-exercise MPI ESV was < 15 mL or resting MPI ESV was < 20 mL. When ESV equal or greater than above-mentioned value, EF was underestimated by MyoMetrix ($t \geq 4.60$, $P < 0.01$). In a word, a small ESV was underestimated by MyoMetrix, which could lead to EF overestimation. On the contrary, a normal or large ESV was overestimated by MyoMetrix, which led to EF underestimation.

Keywords: myocardial perfusion imaging; left ventricular function; software.

2016FANMB_38

Prognostic Value of Metabolic Tumor Volume and Total Lesion Glycolysis on Patients with Resectable Pancreatic Ductal Adenocarcinoma Cancer by Preoperative FDG PET/CT

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Introduction: In this study we aimed to evaluate prognostic value of metabolic tumor volume and total lesion glycolysis measured from F-FDG PET/CT in patient with resectable pancreatic cancer.

Methods: Fifty one patients with pancreatic cancer who underwent FDG PET/CT and curative operation were retrospectively enrolled. In our study, we have all pancreatic cancer patients who underwent FDGPET CT for staging work up before surgical treatment. We excluded patients who had pancreatic cancer other than ductal adenocarcinoma, who had unresectable who undergone palliative surgery from our study. Recurrence was diagnosed when local or distant lesions suggestive of recurrent pancreatic cancer in imaging modalities or biopsy were found. When recurrence was suspected by contrast-enhanced CT or serum CA19-9 level, further examination such as FDG PET/CT, magnetic resonance imaging, or biopsy, was performed. Recurrence-free survival was determined from the day of the surgical resection of the pancreatic cancer to the day recurrence of the pancreatic cancer was detected. Afterward, the patients were clinically assessed every 6 months with diagnostic examinations including contrast-enhanced CT and blood tests. When recurrence was suspected by contrast-enhanced CT or serum CA19-9 levels, further examination, such as FDG PET/CT, magnetic resonance imaging, or biopsy, were performed. Recurrence was diagnosed when local or distant lesions suggestive of recurrent pancreatic cancer in imaging modalities or biopsy were found. According to data, we found that 33patients (64.7%) were recurred

and 18 patients (35.3%) were not recurred.

Finally we had 51 patients to access TLG, MTV as a prognosis factors for resectable pancreatic cancer that did not underwent neoadjuvant chemotherapy. The maximum standardized value (SUVmax), MTV and TLG were measured from FDG PET/CT. The prognostic significance of the PET/CT parameters and other factors for recurrence free survival (RFS) and overall survival (OS) were evaluated by univariate and multivariate analysed.

Results: Of the 51 patients, 33 patients experienced recurrence during the follow-up period. 29 patients were died from the disease during the follow-up period. On the univariate analysis, tumor size, MTV and TLG were associated with RFS. On multivariate analysis, only TLG was significant factor for RFS. Only MTV and TLG were associated with OS in the univariate analysis.

Conclusion: MTV and TLG were significant prognostic factor for RFS and OS in resectable pancreatic cancer.

2016FANMB_39

¹⁸F-FDG PET/CT used in localization and etiologic diagnosis of suspected pacemaker-related infection

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Objective: To evaluate clinical significance of ¹⁸F-FDG PET/CT in localized and etiologic diagnosis of suspected pacemaker-related infection.

Methods: Fifteen patients suspected pacemaker-related infection were retrospectively included and compared with 7 controls. ¹⁸F-FDG uptake in device-related region was visually interpreted, as well as abnormal ¹⁸F-FDG uptake out of the implantation region. The final diagnosis was obtained according to modified Duke's criteria and correlated with imaging interpretation.

Results: Of the patients suspected pocket infection, 5/7 were demonstrated hot foci in pocket site, either in superficial skin and/or deep soft tissue, 2/7 were negative. Of the patients with fever and/or adherent mass found by echocardiography that suspected infective endocarditis, 3/9 were demonstrated diffuse FDG uptake in left atrium, right atrium, and right ventricle, 3/9 were found abnormal FDG uptake in other sites than the implantation regions, and 3/9 were negative. In patients with suspected pacemaker-related infection, ¹⁸F-FDG PET/CT made correct diagnosis in 7/7 cases of

pocket infection and 8/9 cases of infective endocarditis. **Conclusion:** ¹⁸F-FDG PET/CT imaging is useful in localization and etiologic diagnosis in patients suspected of pacemaker-related infection. It may guide clinical management.

2016FANMB_40

Role of ⁶⁸Ga PSMA PET/CT scan in lesion characterization and initial staging of prostate cancer.

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Background: Role of ⁶⁸Ga PSMA PET/CT in evaluation of recurrent prostate cancer (PCa) is well established. We have assessed ⁶⁸Ga PSMA PET/CT in evaluation of suspected cases of PCa and staging work up of biopsy proven PCa patients.

Method: We have included patients clinically suspected to have PCa for lesion characterisation and biopsy proven PCa patients referred for initial staging.

Results: *Lesion characterisation;* 58 consecutive patients with a median age of 69 years (58-90 years) and median serum PSA 16.5 ng/mL (2.96 to 4156 ng/mL) were included. 26 patients (45%) were scan negative for PCa and biopsy was avoided in them and put on follow up. 32 (55%) patients were scan positive for PCa. 25/32 patients underwent biopsy and was positive for malignancy in 23 patients (92%). 7 / 25 patients showed uptake outside the prostate gland suggestive of metastases. **Initial staging:** 65 patients were included in the study - median age 68yrs (Range: 37-85yrs). 64 /65 patients (98.5%) had abnormal tracer uptake in the prostate suggestive of primary site. In 41 patients there was no other site of abnormal tracer uptake, qualifying them as organ confined disease. In the remaining 23 patients there were various combinations of lymph nodal, skeletal and organ metastases.

Conclusion: ⁶⁸Ga PSMA PET/CT is an excellent tool in the evaluation of suspected cases of PCa and helps in avoiding unnecessary biopsy. ⁶⁸Ga PSMA PET/CT is a single stop imaging modality for comprehensive staging work up of PCa patients.

ARCCNM Symposium 1. Neurology

Clinical usefulness of dual phase F-18 FP-CIT PET Imaging

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Atypical parkinsonian disorders (APD), such as progressive supranuclear palsy (PSP) and multiple system atrophy (MSA), which account for a significant proportion of parkinsonian cases, exhibit drug resistance and fatal neurodegenerative course. Therefore, it is important to make an accurate diagnosis not only for deciding treatment regimens and assessing prognosis, but also for developing new therapeutic strategies.

F-18 FP-CIT PET/CT, which is the most commonly used DAT imaging in routine clinical practice in Korea, has better spatial resolution than SPECT. Delay phase FP-CIT PET image shows significant loss of striatal DAT in Parkinson's disease, PSP, and MSA and also more prominent and earlier DAT loss of the anterior caudate and ventral putamen in PSP and MSA, compared with Parkinson's disease by striatal subregional analysis. Early perfusion dominant phase FP-CIT PET image also shows relatively different uptake pattern of striatum, mid-brain, cerebral and cerebellar cortex among Parkinson's disease, MSA and PSP as like FDG PET.

Therefore, dual-phase F-18 FP-CIT PET imaging is useful for demonstrating striatal DAT loss in neurodegenerative parkinsonism and also differentiating APD, particularly MSA and PSP from Parkinson's disease.

ARCCNM Symposium 1. Neurology

PET imaging in Parkinson's Disease

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Recent advances in functional imaging especially PET have greatly improved our ability to assess normal functions of the basal ganglia, diagnose parkinsonian syndromes, understand the pathophysiology of parkinsonism and detect and monitor disease progression. Radionuclide imaging is the best way to detect and monitor dopamine deficiency, and will probably continue to be the best biomarker for assessment of the effects of disease-modifying therapies. Voxel-based analysis with FDG PET enable the separation of patients with Parkinson's disease

from healthy controls, and show great promise for differentiation between Parkinson's disease and other akinetic-rigid syndromes. Moreover, functional imaging associated with neuroinflammation and abnormal protein deposition is increasingly used to assess underlying pathological processes in parkinsonism, which maybe the next promising approach to assess the effects of treatments designed to slow disease progression.

Keywords: PET imaging, Radionuclide imaging, Parkinsonism, Parkinson's Disease

ARCCNM Symposium 1. Neurology

New horizon of nuclear medicine in dementia

Hiroshi Matsuda

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Nowhere is the serious social problem of dementia more acute than in Japan, where an estimated one fourth of elderly persons already have or show signs of developing it. The prevalence of dementia has increased over the past few decades, either because of greater awareness and more accurate diagnosis, or because increased longevity has created a larger population of the elderly, the age group most commonly affected. More aging will develop from now on, and so it is predicted that 7 million elderly persons will be demented by 2025 in Japan. Although the diagnosis of dementia is still largely a clinical one, based on the history and disease course, neuroimaging has dramatically changed our ability to accurately diagnose it. The role of neuroimaging in dementia nowadays extends beyond its traditional role of excluding neurosurgical lesions. Neuroimaging in dementia is recommended by most clinical guidelines. Moreover new neuroimaging methods facilitate diagnosis of most of the neurodegenerative conditions after symptom onset and show promise for diagnosis even in very early or presymptomatic phases of some diseases. Under these conditions, all clinicians and researchers who are involved in neuroimaging for dementia should decide which patients to scan, when imaging patients is most useful, which modality to use, how to handle imaging data from many institutions, and which analytical tool to use. I would like to give a presentation from brain perfusion SPECT to the latest modalities such as tau and amyloid PET imaging for the diagnosis of Alzheimer's disease and other dementias, and also provides information on analyzing imaging data.

ARCCNM Symposium 1. Neurology

eZIS Analysis of Brain SPECT in Clinical Routine: a Preliminary Experience

Guang-Uei Hung

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Plenty of published literatures have been showing that brain perfusion SPECT was useful for detection and differential diagnosis of neurodegenerative disease. However, visual interpretation of brain SPECT is subjective, non-quantitative and less reproducible. In addition, the images of brain SPECT are blurring due to partial volume effect caused by limited spatial resolution of SPECT. These drawbacks prolonged the learning curve of image readers and limited its clinical utilization.

Easy z-score imaging system (eZIS) is statistical image analysis software developed by Prof. Hiroshi Matsuda in national center of neurology and psychiatry in Japan. Using age-classified database of normal volunteers for comparison pixel-by-pixel, the perfusion abnormality on patient's brain SPECT was converted to "z-score image" superimposed on MR template. After analysis of eZIS, the interpretation of brain SPECT becomes objective, quantitative and reproducible. In the past few years, eZIS has been widely used for facilitating image interpretation of brain SPECT in Japan and has made brain SPECT a reliable and important clinical imaging tool.

The rapid growth in the clinical utilizations of brain perfusion SPECT in Japan has made it as the 3rd most commonly used among all NM imaging tests with a total amounts of more than 200,000 cases in a year. In contrast, the total cases of brain perfusion SPECT were less than 2,000 in Taiwan according to the latest data of nationally annual investigation, accounting for only 0.5% among all NM imaging tests. For elucidating the etiology of poor SPECT utilization in Taiwan, we visited Prof. Hatazawa, the president of Japanese society of nuclear medicine, in Osaka University. We concluded that statistical analysis software was one of the key reasons, and "eZIS" was considered as the treatment of choice.

After 6 months of eZIS application in clinical routine, the preliminary effects were tremendous. Diagnosis of dementia disorders by brain SPECT became much easier for nuclear medicine physician. Besides, the images of eZIS analysis were attractive and straight forward for both neurologists and patients. The quality of care for dementia patients improved due to better diagnosis and consequently the amounts of brain perfusion SPECT increased. Although the preliminary experience was

just a beginning, we believed that the bright future of brain SPECT augmented by eZIS in Taiwan should be expectable.

ARCCNM Symposium 2. Radionuclide Therapy

Precision radiotherapy and predicting radiotherapy responses via real-time monitoring the damage of ionizing radiation by PET imaging products (^{15}O and ^{11}C) of photonuclear reactions in vivo

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In clinical practice, radiotherapy planning is based on CT images of tumor morphology without considering of individual response (both tumor and normal tissues) to ionizing radiation. After whole-body or local X-ray irradiation, we found there were huge disparities of radiobiological effects among individuals (mice, rats and rabbits) and in tissues. All these effects can be predicted by PET sensitive scanning of ^{15}O and ^{11}C activity residuary in tissues soon after beforehand low dose 45 MV X-ray irradiation. The ^{15}O and ^{11}C residuary in tissues was the products of photonuclear reactions, and more importantly as a result of the damage by ionizing radiation. Before triggering of radiobiological effects, the tiny ionizing damage can be detected with PET scanning of ^{15}O and ^{11}C residuary in vivo. The supposed mechanism behind ^{15}O residuary is the free radical attack, which is the primary cause of the huge disparities of irradiation response. ^{15}OH radicals and $^{15}\text{O}_2$ (generated through H_2O radiolysis by 45 MV X-ray) attack to molecular targets to form ^{15}O "labeled" compounds (i.e. the ^{15}O residuary) through hydroxylation and/or oxidation. Meanwhile, $^{11}\text{CO}_2$ and ^{11}C -debris is the consequence of direct damage to molecules by 45 MV X-ray. Lipid peroxidation plays an important role in ^{11}C residuary in tissues. For future clinical personalized precision radiotherapy, the tiny ionizing radiation damage can be monitored real-time by PET imaging of ^{15}O / ^{11}C residuary before radiotherapy planning to predict radiotherapy response of tumor and radio-toxicity of normal tissues.

Keywords: PET imaging, photonuclear reaction, radiobiological effect, personalized precision radiotherapy.

ARCCNM Symposium 2. Radionuclide Therapy

Peptide Receptor Radionuclide Therapy (PRRT) for Neuroendocrine Tumors (NET) in India

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Neuroendocrine tumors (NET) are a rare but very heterogeneous group of neoplasms. NETs are generally slow growing tumors having a relatively good prognosis. Although many of the NETs are clinically silent, those presenting with symptoms of mass effect or distant metastasis, often lead to debilitating symptoms like diarrhoea and flush which affects the patients quality of life. Surgery of the primary is performed in non metastatic disease and cold somatostatin analogues are primarily used for reducing the symptoms and stabilizing the disease in disseminated disease. Somatostatin receptor scintigraphy has been considered as the gold standard for staging NET. However in the earlier days SSTR imaging was not very popular in India due to the limited availability and cost of Indium octreotide. The practice of Nuclear Medicine both diagnosis and therapy has evolved many folds in India in the last decade. The popularization and availability of PET CT imaging in India in the early 21st century and the availability of Gallium generator made the receptor PET-CT popular and is now available in many centres in the country. Simultaneously the Lu-177 was made available from the Indian reactors and the peptide labelling procedures were standardized. With the indigenous availability of Lu-177 and the standardized labelling procedure, PRRT started becoming popular in the country. The institutions, where radionuclide therapy facilities were available for high dose radioactive iodine, became a centre for PRRT as well in many institutions. At the present moment no specific radiation safety guidelines are available for PRRT as to the need for isolation, availability of delay tank and discharge limits for patients. Therefore we are following the radioiodine therapy guidelines for the PRRT as well. The regulatory authorities are also giving permission to such institutions to perform PRRT who have these facilities. Each institution has standardized its own labelling protocol based on the Lu-177 which is used, whether indigenous from the Indian reactor in Bhabha Atomic Research Centre (BARC) or imported from Turkey or Germany etc. Cost of PRRT is a limiting factor especially when imported Lu-177 is used. Many a times the treating oncologist prefers to treat patients with cold somatostatin analogues until disease progression, thus not getting the desired outcome as it would have when the disease volume was lower. In this presentation I will be discussing the utility and standardization of the indigenous Lu-177 labelled DOTATATE and its efficacy vis-à-vis the imported Lu-177,

the clinical protocol which is followed across institutions and the outcomes achieved so far. Predictions as to how PRRT would become an integral part of multimodality management of NET will also be addressed.

ARCCNM Symposium 2. Radionuclide Therapy

Present status and strategy to develop targeted radionuclide therapy (TRT) in Japan

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Due to regulatory hurdles for radionuclide usage in clinic, not enough doctor's fee for TRT, limited number of TRT facilities and anxiety of the public to radiation, there are not many doctors or scientists who are interested in TRT in Japan although more doctors are recently coming into this field than ever because of gradual changes in these issues. However, not a few patients go abroad to undergo TRT with ¹⁷⁷Lu-DOTATATE/TOC PRRT which is not available in Japan. The Japanese Society of Nuclear Medicine (JSNM) has been making efforts to improve this situation for many years. Along with requirement of patients, the Japanese government has been gradually understanding the importance of TRT, and the situation is going to change. In my talk, I would like to inform JSNM activities in this regard, and exchange with you the idea how we can develop TRT in this region.

ARCCNM Symposium 2. Radionuclide Therapy

Radioimmunotherapy for Lymphoma

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Radioimmunotherapy has proved its excellence in that it facilitates the effective treatment to both indolent B-cell non-Hodgkin lymphoma (NHL) and histologic transformation. There are 2 agents that have been approved in the United States for the employment in indolent NHL as well as histologic transformation. Y-90 ibritumomab tiuxetan and I-131 tositumomab were proved its efficacy through some clinical trials. Y-90 ibritumomab showed superior result to Rituximab alone treatment for relapsed or refractory follicular lymphoma or transformed NHL. This clinical trial was performed in terms of randomized multicenter study.

The Y-90 ibritumomab treatment showed better overall response rate (80% vs. 56%) and higher complete response rate (30% vs. 16%). I-131 tositumomab revealed superior efficacy than tositumomab alone for relapsed or refractory NHL. The I-131 tositumomab demonstrated higher overall response rate (55% vs. 19%) and better complete response rate (33% vs. 8%).

The third agent is I-131 rituximab which has been researched widely in clinical trials, but is not commercially available. This agent was made by a group of researchers in order to solve the problem of human anti-mouse antibodies response after mouse monoclonal antibody application. This agent was actively utilized in Fremantle Hospital in Australia.

In Korea, this I-131 rituximab was applied for clinical trial at Korea Cancer Center Hospital from 2004. From May 2004 to October 2006, 24 patients with B-cell NHL (including 11 diffuse large B cell lymphoma patients) received single treatment with I-131 rituximab. The overall response rate was 29%. It showed better results for low grade B-cell NHL (46%) than higher grade NHL (9%). We observed that patients with higher grade NHL revealed good therapy response shortly, but as times went by these patients showed relapse a few months after I-131 rituximab treatment. These findings suggested the advantage of repeated treatment. Afterwards 31 patients with relapsed or refractory B-cell NHL were treated by radioimmunotherapy repeatedly. Repeated radioimmunotherapy yielded twofold increases in response rate (68%) and in median response duration (8.6 months). These repeated radioimmunotherapy enabled the higher response rate and longer duration of response and expanded its usefulness to the patients with aggressive histology.

This presentation will summarize studies which have showed the usefulness of radioimmunotherapy to lymphoma in diverse aspects. These results strongly indicate that the radioimmunotherapy including I-131 rituximab treatment may improve the prognosis of patients with NHL and I-131 rituximab treatment has special role for managing the lymphoma patients.

CJK Symposium 1. Oncology

Tyrosinase reporter gene for multimodality imaging

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Multimodality molecular imaging is a new approach using various combinations of different imaging

modalities to provide rich information of biological process. However, for both direct and indirect imaging strategy, most of the multimodality imaging agents reported so far is complicated constructed and needed to add different functional groups. It is very important to obtain a simple molecular probe with easily construction. Tyrosinase (TYR) is a key enzyme in melanin synthesis. After transduction of tyrosinase gene into cells and encoding an active tyrosinase, melanin could synthesis. Based on photoacoustic effect, photoacoustic imaging could be achieved for melanin could absorb light energy. PET imaging could be obtained because melanin could bind with 18F-labeled benzamide specifically. MRI imaging could be obtained based on the characteristic that melanin could combine with iron due to a large number of anion on its surface. TYR may be used as a new and promising probe for multimodality imaging.

CJK Symposium 1. Oncology

Current Updates of PET Oncology

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Positron emission tomography (PET) is widely used as diagnostics tools in oncology. Whole body FDG PET/CT imaging is now widely used for oncologic diagnostic studies, including staging, detecting recurrence, restaging, treatment monitoring, and estimating prognosis. There are many studies that FDG PET can predict prognosis of patients with cancer. Generally, the higher the FDG uptake, the poorer the survival outcome. Since SUVmax represents only one value of single pixel in ROI, values representing tumor burden in whole body were developed. Recent studies showed that metabolic tumor volume (MTV) and total lesion glycolysis (TLG) reflected patients' outcome better than SUVmax. Recently, 68Ga-labeled somatostatin analogs has been developed for PET imaging of neuroendocrine tumors., 68Ga-DOTA-TOC PET/CT detected more lesions which were not detected by 111In-DTPA-octreotide scan and SPECT/CT. PET/CT exhibited a significantly higher sensitivity than SPECT/CT. Nowadays, PET/MRI is also developed and commercially available. PET/MRI has an advantage in the point of view of radiation safety, because patients receive no radiation from MRI studies. 64Cu, a positron emitter with a half-life 12.7 hours, is a good radionuclide to monitor drug delivery systems using PET, especially for preclinical imaging. Developing albumin based drug delivery using 64Cu will be reviewed.

CJK Symposium 1. Oncology

Differential diagnostic value of ¹⁸F-FDG PET/CT in patients with cardiac tumor

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Objective: Cadiac tumors are rare, primary cardiac tumors have been found in autopsy at an incidence ranging from 0.001%~0.028%, and the assessment of cardiac tumor malignancy and tumor expansion by imaging provide valuable information for the planning of clinical treatment. The use of ¹⁸F-FDG PET/CT to assess cardiac tumor is infrequently reported at single cases, the aim of this study was to evaluate the clinical value of ¹⁸F-FDG PET / CT in differentiating benign lesions from the malignant in patients with cardiac tumor.

Methods: ¹⁸F-FDG PET / CT data of 27 consecutive patients with cardiac or pericardiac lesions were retrospectively analyzed, including 15 men and 12 women, mean age 47.6±18.5 years(rang14-83 years). All patients underwent PET/CT tests were fasting at least 4 hours before the injection, and the blood glucose level at the trace injection were less than 150 mmol / L. Each patient received 5.55 MBq / kg of 18F-FDG intravenously. After trace injection, patients rested on a comfortable bed during the FDG uptake period, and the exam started at 60-90 min after ¹⁸F-FDG administration using the GE-Discovery VCT imager (General Electric Company). CT data were acquired first, non-enhanced CT image were obtained from the patients' skull base to mid-thigh using a standard protocol: tube voltage 140 kV, tube current automatically set by SmartCT system. Immediately after CT, PET images were acquired covering the same transverse field of view during quite breathing , acquisition time was 3min /table position , for 6-7 incremental beds ,following the brain images were collected 8 min . The image reconstructed by the iterative method tripartite tomographic images, including PET, CT and integration of the two images, the image thickness was 3.3 mm.

PET/CT images were interpreted by the consensus of at least three experienced nuclear medicine physician , First is the systematic observation, in order to make clear if the body present systemic multiple lesions in addition to the cardiac lesion . When the lesions were found we should record the lesions' information as follows: the maximum standard uptake value (SUV_{max}), location, size, focus number and the CT imaging findings.

For the diagnosis of abnormal uptake lesion of cardiac or pericardiac, PET/CT judgment based on the following criteria: ① history of malignancy and / or elevated serum tumor markers; ② CT images showed ≥2 strips

of occupying signs (lesions with irregular shape ; intra/extracardiac infiltration ; density mixed with necrosis or hemorrhage ; pericardial effusion) ; ③ $SUV_{max} \geq 3.5$; ④ multiple lesions . Patients who meet two or more diagnostic criteria showed above were believed to be malignant, otherwise considered to be benign. Based on the final clinical diagnosis, the PET/CT diagnostic value for identifying malignancies or benign lesions was evaluated.

Results: Final clinical diagnosis on the basis of histopathological examination (cardiac tumor tissue in 5 cases, pathology of metastatic lesions in 15 cases) or more than 6 months of clinical follow-up (7 cases). Twenty patients were finally diagnosed as malignant tumour, including 13 cases of metastatic tumor (lung cancer 6 cases; liver cancer 2 cases; leiomyosarcoma and malignant angiosarcoma, spindle cells of osteosarcoma, colon cancer and ovarian cancer 1 case), 6 cases of lymphoma and 1 case of atrial angiosarcoma. Seven patients were finally diagnosed as benign tumour, including atrial myxoma 2 cases, lipoma 2 cases, Webster's granuloma 1 case, pericardial cyst 1 case, pericardial pseudoaneurysm 1 case.

^{18}F -FDG PET/CT found single cardiac lesion in 8 cases, and cardiac lesions associated with systemic multiple lesions in 19 cases. 6 of 8 patients with cardiac single lesion were diagnosed as benign tumor, while 18 of the 19 patients with cardiac lesions associated with systemic multiple lesions were malignant tumors. The average SUV_{max} in malignant lesions was significantly higher than benign lesions (7.0 ± 5.0 Vs 2.9 ± 2.6 ; $t = -2.8$, $P=0.01$).

According to the current diagnostic criteria, the differential diagnostic value of ^{18}F -FDG PET/CT reached a sensitivity of 100%, specificity of 85.7% and accuracy of 96.3%.

Conclusion: ^{18}F -FDG PET / CT has an important role for differentiating benign lesions from the malignant lesions in patients with cardiac tumors. However, tumor SUV_{max} was overlapped between benign and malignant lesions. Therefore, we should pay attention to general lesions and other clinical examinations in the diagnosis procedure.

CJK Symposium 1. Oncology

Tumor blood flow of lung cancer by means of ^{15}O - H_2O PET: pre- and post-chemotherapy comparison

Keiko Matsunaga, Masahiro Yanagawa, Jun Hatazawa, Eku Shimosegawa

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of Radiology, Department of Nuclear Medicine and Tracer Kinetics, Osaka University Graduate School of Medicine, Japan

Bevacizumab (BEV) is a humanized monoclonal antibody that targets circulating vascular endothelial growth factor (VEGF) (Ferrara et al., Nat Rev Drug Discov, 2004). BEV has been reported to affect tumor blood flow (Van der Veldt et al., Cancer Cell, 2012, Batchelor et al., PNAS, 2013). The relationship between tumor blood flow change after BEV and the prognosis is unclear in patients with lung cancer. The aim of the present study was to evaluate tumor blood flow change in patients with non-small cell lung cancer (NSCLC) after administration of BEV using ^{15}O - H_2O PET and to study tumor blood flow change and time to tumor progression (TTP). Between April 2012 and July 2014, 11 patients (7 men, 4 women; mean age $\pm SD$, 59 ± 11 y) with stage IV NSCLC were enrolled. Of these, 6 had BEV with standard chemotherapy, and 5 had standard chemotherapy alone. Tumor blood flow after BEV treatment was significantly reduced in this patient population. The patients with large blood flow reduction had short time to tumor progression, indicating the poor prognosis. Mean tumor blood flow did not change significantly after standard chemotherapy.

CJK Symposium 2. General Nuclear Medicine

Case-based discussion: Combination of functional and anatomic imaging for appropriate therapy strategies of patients with coronary artery diseases

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With the development of noninvasive cardiac imaging techniques, morphological and functional imaging tools provide different and distinct diagnostic information for the clinicians. Myocardial perfusion imaging(MPI) with SPECT or PET is a kind of typical functional technique to detect the coronary pathophysiological changes and integrity of cardiomyocytes, while CT coronary angiography (CCTA) is a rapidly developing technology for reflecting anatomies of coronary arteries in detail, and cardiac MRI(CMR) also provides details of tissues. How to correctly recognize the internal connections and disagreements between them is very important for the clinicians to select appropriate therapeutic strategies. In this speech, the speaker will try to depict

the advantages and shortages of different techniques using practical and abundant case-based discussion way, such as MPI with PET or SPECT, and CCTA or CMR, and clarify the important values of joint-analysis of MPI and CCTA or CMR for guiding treatments of coronary artery diseases(CAD).

CJK Symposium 2. General Nuclear Medicine

Precision Medicine through Theranostic Nuclear Medicine

Byeong-CheolAhn

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Precision medicine refers to the tailoring of medical treatment to the individual characteristics of each patient and requires the ability to classify individuals into subpopulations that differ in their susceptibility to a particular disease.

Tailored personalized therapy, which can obtain the highest efficacy and the lowest adverse effects in certain patients, is a fascinating concept. Theranostics, which is able to integrate diagnostic testing to detect molecular targets for particular therapeutic modalities, is one of the key technologies that contribute to the success of the personalized medicine. The theranostics can customize healthcare practices to an individual patient either by eliminating unnecessary treatments for whom a standard therapy is not appropriate to apply, or by optimizing a therapeutic plan for a particular patient. Theranostic approach began to be used for thyroid cancer management using radioiodine imaging more than 60 years ago, based on iodine avid characteristics of malignant thyroid follicular cells. In addition, the radioiodine has been successfully applied to treat differentiated thyroid cancer. The radioiodine theranostics is the representative model for precision medicine.

This presentation would focus on the inception of theranostic radioiodine as well as recent updates of its applications for differentiated thyroid cancer, which is one of outstanding example of precision medicine.

CJK Symposium 2. General Nuclear Medicine

Screening, Nuclide Imaging and Targeted Therapy Research of Small Molecular Tumor-inhibitory Peptides Basing on Multiple Targets

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Objective: To screen out small molecular tumor-inhibitory peptides , as the candidate molecular probes or targeted drugs, to apply in nuclide imaging and targeted therapy of tumor.

Methods: Based on target VEGFR, VEGF125-136 was modified by molecular docking method and surface group interaction method in bioinformatics, two peptides having higher affinity to VEGFR and stronger inhibitory ability to tumor cells proliferation were screened out which were verified by the methods of competitive receptor binding assay and 3H-TdR; the two peptides were labeled with radionuclides ^{99m}Tc and ¹⁸⁸Re respectively, then tumor targeting properties of the two peptides were tested by body distribution in vivo, γ imaging, and competitive inhibition imaging of the tumor-burdened nude mice; the anti-tumor effect of ¹⁸⁸Re-peptides was investigated by survival analysis of the tumor-burdened nude mice; co-immunoprecipitation was used to study the interaction between peptides and VEGFR1,VEGFR2; RNAi technology silenced VEGF expression, then CCK-8 experiment was used to investigate whether there existed other ways to inhibit 549 tumor cells proliferation by the two peptides besides VEGF/VEGFR pathway; molecular docking method and dynamic simulation technology were used to predict potential targets of the two peptides, then competitive receptor binding assay was used to verify the targets preliminary.

Results: Twenty peptides having higher affinity to VEGFR in theory were screened out by bioinformatics, two of them(QKRKRKSRKKH,RKRKRKKSRYIVLS) could combine to VEGFR and the combining affinity was 6 and 2.5 times higher than VEGF125-136 respectively which were confirmed by competitive receptor binding assay. 3H-TdR showed that the two peptides could inhibit A549 cells proliferation and the inhibitory ratio was more than 40% ; body distribution in vivo, γ imaging, and competitive inhibition imaging displayed that the two peptides were gathered in the tumor sites of the tumor-burdened nude mice; survival analysis implied that ¹⁸⁸Re-peptides could prolong the lifetime of the tumor-burdened nude mice significantly and had obvious killing effects to tumor. Co-immunoprecipitation

confirmed that VEGFR1 and VEGFR2 were the targets of the two peptides, but before and after VEGF silenced by siRNA(blocking the secretion of endogenous VEGF and no exogenous VEGF in medium),CCK-8 showed that QKRKRKSRKKH's inhibitory ratio to A549 cells proliferation were (16.57 ± 4.48) % and (20.98 ± 5.76) % ($P>0.05$) respectively, RKRKRKSRVIVLS's inhibitory ratio to A549 cells proliferation were (16.66 ± 4.81) % and (15.58 ± 3.94) % ($P>0.05$) respectively, which meant that both the two peptides could inhibit A549 cells proliferation whether there existed VEGF or not in medium and the inhibitory abilities did not have any obvious difference, so the anti-tumor effect of the two peptides might not only act through competing and inhibiting VEGF's promoting tumor proliferation effect, but through some other pathways besides VEGF/VEGFR; molecular docking method and dynamic simulation technology predicted that the two peptides might have some new candidate targets as follow: EGFR, $\alpha\beta3$, FLT-3, HGFR, Tie-2R and VIPR-2.

Conclusion: The two screened small molecular peptides (QKRKRKSRKKH and RKRKRKSRVIVLS) have tumor targeting properties and can inhibit tumor growth significantly, they may have some multiple action targets including VEGFR, so as the candidate molecular probes or targeted drugs, the two peptides can be used in nuclide molecular imaging and targeted therapy of tumor.

CJK Symposium 2. General Nuclear Medicine

Clinical usefulness of SPECT/CT scanning -Representative cases of daily clinical practice

Hiroshi Toyama

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There are 3 merit in "Scintigram" for daily clinical practice as follows.

1. morphological images including functional information
2. possibly quantitative measurement images (ex. cerebral blood flow measurement: ml/100g brain/min)
3. high sensitivity images (ex. images of very tiny amount of dopamine transporter in the brain)

There are 3 demerit in "Scintigram" as follows.

1. relatively low resolution as compared with other modalities (sometimes difficult to identify the region)
2. assuring accurate quantification is difficult due to attenuation and scatter

3.long scanning time

By using recently developed SPECT/CT equipments, we can enhance the merit of "Scintigram" and get over these demerit except for long scanning time.

In this presentation, clinical significance of scatter collection and attenuation collection using X-ray CT, fusion images with X-ray CT for bone, Ga-67, cerebral blood flow, Tc-99m MIBI parathyroid, and I-131 thyroid and Sr-89 SPECT images for daily clinical practice are presented.

FANMB Session

Development of radioactive iodine therapy database in Asia-Oceania region

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The radioactive iodine therapy (RAIT) has been performed after surgery in patients with differentiated thyroid cancer (DTC) for ablation or therapeutic purposes. National regulations and protocols for RAIT are markedly heterogeneous according to countries or even hospitals in the same country. These variations in RAIT practice make it difficult to perform multicenter clinical studies for the evaluation of clinical usefulness of RAIT in DTC patients.

Recently questions were raised about the clinical usefulness of RAIT. Finding evidence for clinical efficacy or optimal indication of RAIT is a challenge for nuclear medicine (NM) physicians. It is only possible to make by well organized clinical researches, for which we need to develop strategies for overcoming the variations of therapeutic protocols and related regulations.

We suggest two-step approaches: The first step is a survey to find the therapeutic protocols or related regulations in each hospital. The second step is registration of clinical data from enrolled hospital with standardized templates. First step is very important because we have to know how to identify the factors affecting RAIT and develop a basic source by classifying hospitals into specific groups based on study purposes. In this step, we shall retrieve and summarize the information with focus on the therapeutic protocols and regulation of each country. In the second step, we shall collect the data with well-designed manners according to consensus of research topic from selected hospitals which share the acceptable protocols or regulations.

Keywords: Differentiated thyroid cancer, radioactive iodine therapy, Database

FANMB Session

Multicenter Clinical Trial of Brain Imaging using eZIS

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Easy z-score imaging system (eZIS) is statistical image analysis software, which used age-classified database of normal volunteers for pixel-by-pixel comparison and then converted perfusion abnormality on SPECT into "z-score image" superimposed on MR template. After eZIS analysis, image readers of brain SPECT could easily provide objective, quantitative and reproducible interpretation. In the past few years, eZIS has been widely used in Japan and has made brain SPECT a reliable and important clinical imaging tool. According to the national investigation by JSNM, brain perfusion SPECT has become the 3rd most commonly used among all NM imaging tests in Japan, with a total amounts of more than 200,000 cases in a year. In contrast, the total cases of brain perfusion SPECT were less than 2,000 in Taiwan according to the latest data of nationally annual investigation, accounting for only 0.5% among all NM imaging tests.

For promoting the appropriate utilization of brain perfusion SPECT, we have been working with Prof. Hatazawa and Prof. Matsuda during the past one year. First, we collaborated with the neurology and dementia societies for organizing some meetings. The lectures by Prof. Hatazawa and Prof. Matsuda successfully attracted the eye balls of neurologists and acknowledged them the powerful utilities of eZIS. Second, English version of eZIS-E developed by Fujifilm RI Radiopharma was authorized to JSNM for providing to Asian countries for research purpose. In Taiwan, some hospitals were initially selected as the core demonstration sites for promoting eZIS. In Chang Bing Show Chwan Memorial Hospital, eZIS has been applied in the daily clinical routines for analyzing brain perfusion SPECT and the preliminary effects were tremendous. The utilizations of brain SPECT grew rapidly, increased from < 1 case/month to > 10 cases/month after eZIS. The workshops of eZIS training have been continuing to be organized for sharing the successful experience of Japan and my hospital to others in Taiwan. Finally, the Taiwan Society of Nuclear Medicine will be collaborating with Taiwan Dementia Society on a multi-center clinical trial for building up a normal biomarker bank of Taiwanese people, including brain perfusion SPECT and MRI. Once the normal database dedicated for our own people population is accomplished, we believe that eZIS will be more reliably used in clinical practice and the bright future of brain SPECT augmented by eZIS in Taiwan should be expectable.

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- Letter to the *AOJNMB*: Letters to the editors on controversial issues which is published in the *AOJNMB* in the previous issues (no later than 12 months)
- Others: Editorials, History and perspectives, book reviews, upcoming events, meeting reports and news items may be considered for publication.

6- Manuscript submission

All manuscripts should be submitted online using online submission system at <http://aojnmb.mums.ac.ir>. You need to sign up and log into the system for submission of your manuscript. Please follow the on screen instructions during submission.

After completion of manuscript submission, you can track the status of the manuscript by logging into the system. For any further enquiry you can send an email to aojnmb@mums.ac.ir

7- Manuscript preparation

The manuscript should have the following sections: Title, Abstract, Main document,

Acknowledgement, References, Figures and Tables.

7-1: Title page

Title page should include in following order : Title (please keep it short and informative), Full first name and surname (and middle name initials) of all authors, Affiliation (s) and e-mail address(es) of all authors, Corresponding author's Full name, postal address, e-mail address, Telephone and Fax number(s) and a short running title of no more than 40 characters.

7-2: Abstract

It should contain a Maximum of 350 words divided in 4 sections preceded by headings: Objective, Methods, Results and conclusion. For review articles and case reports an unstructured abstract with a maximum of 200 words is required. Three to five keywords are necessary for all abstracts. Word count should be written at the bottom of abstract page.

7-3: Main document

7-3-1: The abstract must be the first page of Main document. For original articles, the following sections should be included: Introduction, Methods, Results, Discussion and Conclusion. For reporting Clinical Trials, please follow reporting requirements published by CONSORT: <http://www.consort-statement.org/consort-statement> (There is no maximum word limit, but it is preferable to keep Maximum word count at 6000 and Maximum references at 40).

7-3-2: For short communications and technical notes, the following sections should be included: Introduction, Methods, Results, Discussion and Conclusion. (Maximum word count 3000 and Maximum references 20)

7-3-3: For case reports, three sections of Introduction, Case report and Discussion are required. (Maximum word count 3000 and Maximum references 20)

7-3-4: For Meta-analyses, Introduction, Methods, Results, Discussion and Conclusion should be included. Please use PRISMA statement for reporting your work: <http://www.prisma-statement.org/statement.htm> (There is no maximum word limit, but it is preferable to keep Maximum word count at 6000 and Maximum references at 40)

7-3-5: For review articles: (There is no maximum word limit, but it is preferable to keep Maximum word count at 6000 and Maximum references at 40)

7-4: Formatting

- Use MS Word 97 or later versions.
- Use plain normal fonts (12 Times New Roman) with double space formatting

throughout the document including abstract, manuscript and references.

- Leave 3 cm margin on each side of the page.
- Number pages consecutively, beginning from the Abstract and put it in right upper corner of the page.
- Do not use field function, do not use the space bar, instead use tab stops.
- Cite every reference in the text in parenthesis using Vancouver style in the order they appear in the text. Using Endnote for citation is encouraged.
- Paragraphs should begin with an indentation (One tab of at least five-spaces length).
- Use the equation editor or MathType for inserting equations.
- The abbreviations should be used according to Système Internationale (SI) nomenclature and units and they should be explained the first time they are used in the manuscript. All units of radioactivity should be based on the SI system *i.e.*, Bq, Gy, Sv, etc. Chemical formulae should be written according to the recommendations of the American Chemical Society.

7-5: Acknowledgement

Acknowledgements, sponsorship or grants should be written after the main text and before the references.

7-6: References

The references should be listed consecutively in order of citation in the manuscript. All references must be cited either in text, table or figures. Unpublished data and personal communications cannot be cited. The AOJNMB uses Vancouver style for references. For citation of journals, all authors should be listed if the number of authors were 6 or less. If not, please list the first 6 authors followed by *et al*. A paper published online but not in print can be cited using the Digital Object Identifier (DOI). A web document can be cited using the URL address. Using ENDNOTE or similar soft ware and selecting the Vancouver style (parenthesis) in Bibliographic Output Style will facilitate correct reference citation.

Here are samples of citation styles:

- a) Journal article (With 6 or less authors)
Palestro CJ. In vivo leukocyte labeling: The quest continues. *Journal of Nuclear Medicine*. 2007; 48(3):332-4.
- b) Journal article (With more than 6 authors)
Intenzo C, Jabbour S, Miller JL, Ahmed I, Furlong K, Kushen M, et al. Subclinical hyperthyroidism: Current concepts and scintigraphic imaging. *Clinical Nuclear Medicine*. 2011; 36(9):e107-e113.
- c) Book
Walsh G. *Proteins: biochemistry and*

biotechnology. 2nd ed. Chichester: John Wiley & Sons; 2002.

- d) Book chapter
Moallem SA, Balali Mood K. Opioids and opiates. In: Mozayani A, Raymon LP, editors. *Handbook of drug interactions: A clinical and forensic guide*. 1st ed. Totowa: Humana Press Inc; 2004. p. 123-149.
- e) Epub; Article by DOI:
Daliri M, Shafiei S, Zakavi SR, Dabbagh Kakhki VR, Sadeghi R. Application of (99m)Tc-denatured red blood cells scintigraphy in the evaluation of post-traumatic spleen auto-transplantation. *Rev Esp Med Nucl Imagen Mol*. 2012 Nov 12. doi:pii: S2253-654X(12)00212-0. 10.1016/j.remn.2012.09.004.
- f) Online document:
RCT critical appraisal sheet In: Critical Appraisal Sheets, Center for Evidence Based Medicine 2012. <http://www.cebm.net/index.aspx?o=1157>. Accessed 3 Dec 2012.

7-7: Figure legends

Figure legends should be written after references, each in a separate sheet preceding with figure number (Figure 1). The figure legends will be published below the figure. The legend should not be included in the figure file. All figures must be cited in the manuscript and numbered consecutively using Arabic numerals.

7-8: Tables

Tables should not be sent as figures or as separate file, they should be inserted at the end of the manuscript, each in a separate sheet. Tables are expected to be self explanatory, should supplement and not duplicate the text and numbered consecutively in order of appearance in the text and using Arabic numerals. Put horizontal line at the top of the table, below column headings and at the bottom of it. Do not use vertical line in the tables.

8- Figures and artworks

Figures and artwork should be submitted as separate files in JPG or TIFF format. Figures should be utilized only if they augment understandability of the text. Drawings and graphs should be professionally prepared in deep black and white with no shading. Professionally designed computer generated graphs with a minimum of 300 DPI laser printer output is preferable. Color photographs are welcomed. Vector graphics containing fonts must have the fonts embedded in the files. For lettering the figures, use 8-12 point (only one size) Helvetica fonts. Name each figure with the word "Fig" followed by figure number without punctuation: "Fig1". If you include a figure from previous

publication, you must provide permission from the copyright owner(s) for both the print and online format.

9- Supplementary materials

Video clips, sound records, excel or SPSS files and other supplementary materials could be sent for electronic linking to the manuscript in the website. MPEG-1 format (.mpg) should be used for video clips. Supplementary documents are encouraged to be sent as .PDF files if possible. Please name each supplementary file beginning with the name of first author (eg. Bom-video.mpg, Sadeghi-data.xls, etc). In text files you should enter the full name of the article and the authors as a header.

10- Cover letter

All manuscripts should be accompanied by a cover letter. In the cover letter signed by corresponding author on behalf of all authors, it must be mentioned that the article is not submitted to any other journal. A sample of cover letter could be found in: <http://aojnmb.mums.ac.ir/journal/authors.note>

11- Peer review process

All manuscripts will be peer reviewed prior to publication. Authors are encouraged to suggest names of three expert reviewers, but selection remains a prerogative of the Editor. The whole review process depends on receiving referees' comments and revising the manuscripts based on these comments to the author and may take few months. AOJNMB will try to make the time between submission and final decision as short as possible. On receipt of the revised article from the author, and after final approving by the referees, the letter of acceptance is issued to the author.

12- Acceptance/Rejection

You will be notified regarding acceptance or rejection of the article by e-mail. Upon acceptance and after editorial amendments, galley proof will be sent to the corresponding author for final correction. No major change in content or title is accepted at this stage without editor's approval. Any addition or removal of an author from the list of authors must be accompanied with a written and signed agreement of the author(s) to be added or deleted.