	Dose rate (microSv/h) during		
	Calibration	Perfusion	
Position	Mean	Mean	Range
Surgeon on the right side	0.6	3.8	2.5-4.4
Over the perfusion circuit	0.3	11.2	7.4-17.5
Perfusionist (120cm from P-C)	0.1	0.8	0.5-1.1
80 cm from patient's feed	0.1	0.5	0.3-0.6
Instrumentist on the left side	0.1	1.7	0.5-3.5
Surgeon on the left side	0.3	1.7	0.6-3.7
Rest position of the instrumentist (90cm from bed)	0.2	0.6	0.4-1.1
Nuclear medicine physician (140cm from patient's hip)	0.1	0.4	0.2-0.7
Head of the patient	0.6	1.2	0.6-3.7
Anaesthesia instruments area (50cm from patient's head)	0.1	0.3	0.1-0.6
Anaesthetist (90cm from patient's head)	0.1	0.1	0.0-0.1

Conclusion: The highest occupational radiation levels were found at the surgeon's working place. In the worst scenario (5 hours of occupational factor), the dose received would be 22 microSv/procedure. Therefore, considering the public dose limit of 1 mSv/year and the number of treatments carried out in our institution (15/year), surgical staff involved in ILP treatments do not require the classification of "exposed workers".

499

Assessment of neutron spectra produced by a cyclotron using bubble detectors

F. Vigliaturo[1], **G. Cicoria**[2], D. Pancaldi[2], D. Mostacci[1], M. Marengo[2]; [1]Department of Nuclear Engineering, University of Bologna, Bologna, ITALY, [2]University Hospital "S.Orsola - Malpighi", Bologna, ITALY.

Aim Neutrons are the most important radiation emission around non self-shielded cyclotrons. However, relatively few data on the measured spectral distribution of neutrons have been published, due to either the relatively complexity and cost of portable electronic spectrometers or the time consuming procedures need by indirect methods. We investigate the neutron spectra produce in the reactions $^{18}O(p,n)^{18}F$, $^{14}N(p,\alpha)^{11}C$ and $^{16}O(p,\alpha)^{13}N$, and on the cyclotron collimation system, using a relatively easy to use and inexpensive bubble detector spectrometer. Materials and methods The spectrometer we used consist of a set of 6 bubble detectors (BDS, BTI Bubble Technology Industries), with different energy threshold (10, 100, 600,1000, 2500, 10000 keV). The BDS provide instant visible detection and measurement of neutron dose. Inside the detector, tiny droplets of superheated halocarbour are dispersed throughout a clear polymer. The interaction between neutrons and polymer nucleus produce the droplet's vaporization forming a visible gas bubble trapped in the polymer. The number of droplets provides a direct measurement of the tissue-equivalent neutron dose. A standard unfolding allows evaluation of the neutron fluence (neutrons/cm2) in each energy interval. After exposure, the spectrometers can be re-used through recompression in a pressure chamber. Thick water target were irradiated for the $^{18}O(p,n)^{18}F$ and $^{16}O(p,\alpha)^{13}N$ reactions, while a thick gas target was used in the case of $^{14}N(p,\alpha)^{11}C$. The collimation system elements are made in Tantalum and special irradiation were performed, in order to drive the beam to hit only a collimator and not a target. To increase the statistical accuracy, for each reaction studied, the set of dosimeters was exposed 3 times; irradiation time was optimized for each nuclear reaction in order to get an optimal number of bubbles in each dosimeter, avoiding saturation. Results According to nuclear evaporation theory, measured spectra can be fitted by a maxwellian distribution function, $N_v(E) = A \cdot E \cdot \exp(-E/k \cdot t)$. In particular, for $^{18}O(p,n)^{18}F$, we obtained a nuclear temperature of approximately 1.5 MeV and a neutron fluence about 5 times higher than in the others reactions. For the Tantalum collimator, the great majority of the neutrons emitted was in the energy bin 1.0 - 2.5 MeV, and the temperature parameter resulted 0.9 MeV. In conclusion, bubble detectors are relatively inexpensive, easy to use and proved to be useful in detection of neutrons around a biomedical cyclotron. A spectrometer based on these detectors makes possible sufficiently accurate field measurement of neutron spectra, providing relevant data for planning of new facilities.

1801 – Wednesday, October 14, 2008, 12:00 - 13:00, Hall 1

Plenary 4: Highlights Lecture

500

Highlights of EANM'08

O. Schober (GE)

TECHNOLOGISTS ORAL PRESENTATIONS

T1 - Sunday, October 12, 2008, 11:30 - 13:00, Hall 14c

Technologists Oral Session 1

T01

Reducing patient movement on a SPECT camera dedicated to cardiac imaging

I. Vito, M. Hall, A. McDowell, D. McCool, J. Buscombe; Royalfree Hospital, London, UNITED KINGDOM.

In the past 12 months there have come to the Nuclear Medicine market a number of small gamma cameras dedicated to performing myocardial perfusion imaging. One of these machines the Siemens C-cam images the patient in a semi-reclining position (with a 20° incline) using a chair and not on a horizontal couch. It was noted that whilst this position helped to reduce the gut activity seen in the image during acquisition there was more patient movement seen on the images than was typically seen when the patient was imaged supine. The aim of this study was to identify methods by which patient movement can be minimized when imaged on a new dedicated cardiac SPECT machine. The SPECT acquisitions of 319 patients were analyzed each patient was assigned to a different strategy for reduction of patient movement. The stress and rest imaging was studied and movement was assessed in each of these acquisitions. Three strategies were devised. Position A: both arms elevated above the head. Position B: Both arms above the head and the use of a chest strap. Position C: Left arm above the head, right arm down by the side of the patient and chest strap. Patient movement was assessed by the lead technologist as none, mild, moderate or severe. The results are tabulated below

Position	n (scans)	Movement (%)			Total
		Mild	Moderate	Severe	
A	256	42	33	5	80 (31%)
B	182	30	11	2	43 (24%)
C	204	9	8	1	18 (9%)

In Position A, there was movement in both studies in 14 patients, stress in 29 and rest in 15, in Position B, there was movement in both studies in 11 patients, stress in 10 and rest in 10, In Position C there was movement in both in 3 patients, stress 7 and rest 5. When performing cardiac myocardial perfusion SPECT on a dedicated machine with a semi-recumbent couch most movement occurs after stress imaging though patients who move in the stress acquisition tend to move in rest. The best strategy for reducing movement is to adopt Position C (Left arm above the head, right arm down by the side of the patient and chest strap) .

T02

Parameters Optimization of Filtered Back Projection in Myocardial Perfusion Imaging Reconstruction

L. F. Metello[1], L. Cunha[1], D. Vieira[1], A. Fonseca[1], A. Tavares[1], S. Soares[1], I. Amorim[2], R. Castro[2], A. M. Abrantes[3], M. F. Botelho[3]; [1]Nuclear Medicine Course, High Institute of Allied Health Technologies of Porto, ESTSP-IPP, Porto, PORTUGAL, [2]Nuclear Medicine Dept, St. Anthony Hospital, Porto, PORTUGAL, [3]Department of Biophysics and Biomathematics, IBILI, Medical Faculty, University of Coimbra, Coimbra, PORTUGAL.

Introduction: Nowadays, even if it is noticed an increasingly wider use of Iterative Methods (IM), a significant number of NM Departments is still routinely using Filtered Backprojection (FBP) as the method of choice in what concerns image processing in MPI. Several authors recommend the use of same filter parameters, no matter what the patient physical characteristics are. Assuming that images acquired for a patient weighting 120kg and 170cm high shouldn't be processed with identical filtering parameters as the ones acquired from a patient with 55kg for the same 170cm, it has been decided to develop the present work, allowing to study the relationship between filtering parameters and the Body Mass Index (BMI). **Material and Methods:** First part of the study consists on the collection of several samples of myocardial perfusion scintigraphies, all of them obtained using the same ^{99m}Tc agent, using doses and acquisition conditions in strict accordance with the suggested on the related EANM Guidelines, coming from patients with very distinct BMI. Patients were divided into distinct groups: Group A integrates patients with a BMI until 23, Group B integrates patients with BMI between 23 and 30, Group C integrates patients with BMI between 30 and 40 and Group D, enrolling patients with BMI of more than 40. All studies were processed with Butterworth filters, with different order and cut-off frequencies. A medical committee of three different expert-clinicians, evaluated the final results and the clinical value of the images, in order to obtain a situation of clinical adequacy and constancy. **Conclusions:** A "correspondence table" between filtering parameters and BMI, to be applied on MPI, in situation of application of ^{99m}Tc agents and using Butterworth filters and FBP was created and it is proposed as starting point.**Keywords:** image processing, filtered backprojection, myocardial perfusion imaging

T03

Calculation of Ventricular Ejection Fraction in Nuclear Medicine: Evolving Procedures

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Aim: Ventricular Ejection Fraction(EF) is a strong indipendent prognostic predictor in heart diseases for hard events. Over these years, it have been accurately obtained by various nuclear medicine procedures: First-Pass RadioNuclideAngiography(FPRNA), Gated-Blood-Pool RadioNuclideAngiography (GBPRNA) and Myocardial Perfusion(MP) gated-SPECT. Purpose of this study is to compare these techniques to identify the most reliable and complete for diagnosis-prognosis for an individual patient. **Methods**: FPRNA, similarly to radiological ventriculography, is performed by dynamic ECG-gated acquisition (Single-Head Gamma Camera equipped with LEHS collimator) following iv injection of bolus of Tc^{99m}-tracer (usually DTPA) into a central vein (brachial/giugular) for a total time of 30-45sec with high time-resolution framing (30-40 f/sec). Instant right-left EF are calculated at rest and during stress together with parametric imaging in RAO view. Standard GBPRNA is more simple to be performed after in-vivo red-blood cells labelling (single or double-head Gamma Camera(GC) equipped with LEHR/GP collimator). ECG-

gated best-septal planar view is acquired at rest and then during stress to obtain the same data as FPRNA, in LAO view. Recently GBPRNA is acquired with tomographic technique to obtain short-and-long axis oblique slices and 3-D imaging of ventricles At present with Myocardial Perfusion(MP) gated-SPECT it is possible to study simultaneously ventricular function and perfusion at rest and after stress. **Results:** FPRNA suffers from limitations: bolus quality, patient's positioning, number of cycles accepted/rejected during a very short interval. Lung perfusion can be visualized during pulmonary transit phase as well as left-to-right shunt can be quantified. Regarding GBPRNA crucial issue is quality of in-vivo red-blood cells labelling due to drugs (heparin….). SPECT GBPRNA allows to study more accurately right-left ventricular function (EF, volumes) at rest, only. Quantification of ventricular function and identification of site, extent of myocardial infarction and/or ischaemia represents peculiarity of MP gated-SPECT. Different methods-algorithms are available: the most used, validated is Cedars Sinai, by Germano et.. Differently from RNAs main issue of stress ventricular function assessed by MP is "time": interval (30min) elapsed between injection-acquisition. Actually EF represents ischaemic stunning dysfunctional myocardium. **Conclusions:** At present because of increasing growth of other techniques (Echo, CT, MRI) FPRNA and GBPRNA are being used lesser and lesser for evaluation of ventricular function, and limited to selected groups of patients (pharmacological cardiotossicity, timing for surgery in some valve diseases, specific trials). MP gated-SPECT is still technique of choice to diagnose ischaemia and, particularly, for risk assessment of coronary artery disease adding ventricular function data.

T04

Normal LVEF values on planar radionuclide ventriculography are different from tomography and depend on the framing rate

S. RAC, N. Girotto, A. Avdic, A. Smokvina; CLINICAL HOSPITAL CENTRE RIJEKA, RIJEKA, CROATIA.

The **Aim** of the study was to compare left ventricular ejection fraction (LVEF) values obtained with planar and SPECT radionuclide ventriculography and to establish possible advantages of tomography over planar radionuclide ventriculography. In 38 **Patients** with no previous history of cardiac disease (14 men, 23 women), referred to Tc-tagged red blood cell imaging due to suspected intrahepatic hemangioma, a SPECT radionuclide ventriculography was additionally performed with double-headed Siemens ECAM gamma camera (detectors at 90°, noncircular orbit), with 16 frames/cycle. In the first subgroup of patients (N = 22) planar imaging was also performed, with 16 frames/cycle, and in the second subgroup (N = 16) with 32 frames/cycle. **Methods**: LVEF values from tomography were calculated with 4DM SPECT quantification program, after iterative reconstruction of the data. For planar LVEF calculation, left ventricular region of interest was determined with a semiautomatic edge detection method, after marking the center of the left ventricle. A comparison of SPECT and planar LVEF values was made, separately for the data acquired with 16 frames and for the data with 16 frames SPECT and 32 frames planar study. The **Results** showed statistically significant difference between planar and SPECT LVEF values obtained with 16 frames/cycle (mean LVEF values were **53** and **57%**, respectively; $p<0.05$) in the first subgroup. The difference between the mean LVEF value between planar 32 frames and SPECT 16 frames study in the second subgroup of patients also turned to be statistically significant (mean LVEF values were **59** and **56%** respectively; $p<0.01$). The **Conclusions** are that with the same frame rate, higher LVEF values are obtained with tomography, but when the frame rate is higher in planar imaging, tomographic LVEF values are lower. Therefore, LVEF values depend on framing rate and on the method used, and cannot be used interchangeably in the follow up of the patient. However, the advantages of tomography include no need for the "best septal" projection adjustment, and probably more accurate LVEF calculation due to the three dimensional nature of imaging. Finally, tomography includes the possibility of right ventricular ejection fraction calculation.

T05

Technical procedures in the management of Zevalin dosimetry and therapy

C. Del Mastro[1], F. Cicone[2], I. Baldazzi[1], G. Franchi[1], P. Ragni[1], M. Pacilio[3], M. Betti[2], G. Di Santo[2], A. Lenza[1], F. Scopinaro[2]; [1]Sant'Andrea University Hospital, Rome, ITALY, [2]Sapienza University of Rome, Rome, ITALY, [3]San Camillo-Forlanini Hospital, Rome, ITALY.

Aim. To challenge technological procedures for Zevalin dosimetry before and after immunotherapy. Materials and Methods: Step one: Calibration of a double-headed gamma-camera Philips Forte. For each patient, 10 MBq ^{111}In point source was used to check the intrinsic uniformity. The source was positioned at 2,5 m from detectors until the acquisition of 10000Kcounts. A Plexiglas Phantom filled with 100 MBq of ^{111}In was used to test FOV uniformity with collimator; a total-body scan (TB) of this uniform source was acquired. Before ^{111}In administration, the same acquisition was repeated to obtain a transmission map on each patient. To avoid collisions, a dedicated support was used to position the flood. Step two: Counter calibration. Two test-tubes were filled with 1,85 MBq (50 µCi) ^{111}In. Test-tube-A was counted after manual dilutions ranging from 1/100 to 1/100000 and weighted on electronic balance. Test-tube-B was measured after 8 decays and once a day for 1 month. Step three: TB and blood samples collection. After administration of ^{111}In-Zevalin, nine whole body scans were acquired from 10 minutes to 134 hours and blood samples collected. TB were performed with MEGP, scan speed: 10 cm/min., matrix 512x512 pixel x16 bits, 15% window energy centered at 173 and 274 KeV. Additional TB (MEGP, scan speed: 10 cm/min., matrix 512x512 pixel x16 bits, 9% window energy centered at 140 KeV) were acquired to evaluate the Compton contribution. Step four: Acquisition of "Bremsstrahlung" TB. After immunotherapy, patients were scanned for "Bremsstrahlung" scintigraphy at 24, 48, 72, 96 and 120 hours (MEGP, scan speed: 10 cm/min, matrix 512x512 pixel x16 bits, 15% window energy centered at 180 KeV). Results and Conclusions: The most accurate counter calibration curve was obtained with test-tube-B: the counter response was linear for values between 18,5 KBq ($5x10^{-1}$ µCi) and 18,5 Bq ($5x10^{-4}$ µCi), thus in the range of blood sample activity. Additional TB scans for Compton contribution required a two-fold increase of the acquisition time, whereas the provided information were negligible. Thus, we suggest to perform them only with a camera that acquires two different images at the same time. Bremsstrahlung scans showed the highest ratio target/background at 96 hours. Clinical data seem to evidence a favourable prognosis for lesions evidenced by Bremsstrahlung; moreover, this image may be useful by reassuring patients about drug uptake. On account of this, we recommend to acquire Bremsstrahlung scans only after 96 hours, as a definitive image of Zevalin distribution.

T06

Optimalisation of I-131-Iodine therapy in patients with Graves' hyperthyroidism.

C. P. W. Cox, J. W. van Isselt, M. G. E. H. Lam; UMC Utrecht, Utrecht, NETHERLANDS.

Aim Graves' disease patients with medically resistant hyperthyroidism are treated with I-131-Iodine. Different treatment strategies are being used. Some use a fixed dosage, others use pre-treatment evaluation for dosage calculation. The aim of this study was to evaluate our treatment strategy in order to develop a more accurate dosage calculation. Methods The pre-treatment evaluation consists of thyroidal scintigraphy (120 MBq Tc-99m-pertechnetate) for diagnosis and weight calculation, and a test dose (0.4 MBq I-131-Iodine) to measure the Iodine uptake after 5h and 24h. The therapeutic dosage is calculated with the formula: (thyroid weight / 24h uptake) * 100 * 3.7. The results of 185 Graves' disease patients from our hospital were retrospectively reviewed. 126 patients received a single dosage. The nuclear medicine physician decided to give a double dose in 59 cases, because of the high uptake ratio 5h/24h or high thyroid weight. The correlation between the therapy outcome and the thyroid weight as well as the outcome and uptake ratio were analysed. Results In the single dosage group the mean dosage was 270 MBq (70-1295) and the mean follow up 7 months (1-40). During follow up 35% of the patients developed hypothyroidism; they had a mean uptake ratio of 0.65 (0.35-0.98) and a mean thyroid weight of 27 grams (11-55). 23% became euthyroid; with a mean uptake ratio of 0.72 (0.32-0.96) and a mean thyroid weight of 46 grams (16-185). 42% became hyperthyroid; with a mean uptake ratio of 0.84 (0.36-2.02) and a mean thyroid weight of 46 grams (12-189). In the double dosage group the mean dosage was 431 MBq (170-1277) and the mean follow up 6 months (1-29). During follow up 44% developed hypothyroidism; they had a mean uptake ratio of 0.85 (0.49-1.14) and a mean thyroid weight of 36 grams (15-82). 17% became euthyroid; with a mean uptake ratio of 0.95 (0.73-1.07) and a mean thyroid weight of 61 grams (38-156). 39% became hyperthyroid; they had a mean uptake ratio of 0.98 (0.76-1.45) and a mean thyroid weight of 45 grams (15-110). Patients with a high uptake ratio and a high thyroid weight have a higher chance of recurrent hyperthyroidism. Conclusion To optimize Iodine therapy, patients with a high thyroid weight and a high uptake ratio must be treated with a higher dosage. These parameters should be included in the dosage calculation method. In order to define cut off values more patients will be evaluated.

T07

Optimising Imaging of Amyloidosis with I-123 SAP using SPECT-CT.

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Amyloidosis describes a group of disorders characterised by the deposition of amyloid protein fibrils within various organs throughout the body, and I-123 serum amyloid P component (SAP) is a specific nuclear medicine tracer for amyloid. A dedicated GE Hawkeye 4 SPECT-CT scanner was commissioned at the National Amyloidosis Centre (NAC) London in 2007, and we report here our experience in optimising the imaging protocols and preliminary results of combined I-123 SAP SPECT-CT in patients with systemic amyloidosis. Whole body imaging was performed at either 6 or 24 hours following administration of 100-250 MBq of I-123 SAP depending on the amyloid type. Whole body images were acquired at a rate of 5 cm/min using medium energy collimators. SPECT-CT imaging was then performed on selected patients after a physician had reviewed the planar whole body images. The SPECT image was acquired first using 30 seconds per step and 30 steps per detector. A helical 90 slice, low dose CT was then acquired using 140 kV and 2.5 mA with a total exposure time of 251 seconds. SPECT-CT reconstruction and fusion was performed using the integral GE software. Since May 2007 over 1300 I-123 SAP examinations have been performed, among which 57 had proceeded to SPECT-CT. Of these 57 studies, 33 were of the abdomen/pelvis, 13 were of the chest, 10 were of the head and neck and 1 was of the legs. The SPECT-CT images provided superior localisation of amyloid deposits in numerous locations, notably including bones and in other 'atypical' anatomical sites such as the brain. These encouraging early findings suggest that dual modality I-123 SAP SPECT-CT imaging has the capacity to improve localisation and quantification of amyloid deposits as compared with planar scintigraphy.

T08

Whole Body SPECT with 111In-Pentetreotide in NET

A. Massaro, S. Cittadin, E. Banti, G. Grassetto, L. Rampin, D. Rubello; S. Maria della Misericordia Rovigo Hospital, Rovigo, ITALY.

Tomographic (SPECT) examination is even more used in nuclear medicine daily practice, mainly due to the availability to multi-head gamma camera. In the present study, we reported our experience using whole body SPECT 111In-pentetreotide in neuroendocrine (NET) tumours. For the purpose of the present study we re-evaluated all the 111In-pentetreodide scan performed during the last 43 months. Over a total of 235 111In-pentetreotide scans, in 176 patients were systematically performed SPECT of the head & neck, of the chest, and of the abdomen/pelvis other than planar imaging Of the 176 patients: 103 had pancreatic lesion(s), 32 had bowel lesion(s), 23 had pulmonary lesion(s), and 18 had pituitary lesion. In 22 patients a MEN I syndrome was suspected. Patient was injected with 150 MBq of 111In-pentetreotide. Whole body and spot planar imaging was obtained at 4 and 24 hours P.I.. Scintigraphy was performed by a dual-head gamma-camera (E-CAM, Siemens, IL, USA) coupled with medium energy collimators, adopting a step-and-shoot acquisition protocol with no circular orbit, matrix 64x64, 30 sec. per view for a total of 64 views. Reconstruction of SPECT imaging was performed by FBP adopting Butterworth filter with different cut-off (0.5 - 0.8) and order values (7 - 10), depending on patient's weight and bio-distribution of 111In-pentetreotide that showed a wide variability in the abdomen. Comparing the planar imaging with the SPECT imaging, 198 positive lesions were

detected at planar imaging while 234 at SPECT imaging. Of the 39 lesions detected only at SPECT, 24 of them where located in the pancreatic/peri-pancreatic and liver districts, 9 in the abdomen and pelvis, whereas in the other 6 cases the pituitary adenoma was visualized at SPECT only (while not at planar imaging also using the lateral view of the head). Another advantage of SPECT imaging was the possibility to establish a cut-off limit of normality in pituitary vs. pituitary adenomas: this was done considering as normal controls the patients without a pituitary disease. Of note, in 5 patients with suspected MEN I syndrome, SPECT analysis allowed to early discover unknown and asymptomatic NETs. In conclusion, in agreement with some previous study, our data indicate the higher sensitivity of 111In-pentetreotide scan performed using SPECT. Moreover, SPECT is strongly recommended in patients with suspected MEN I syndrome to early identify very small NETs.

T2 - Monday, October 13, 2008, 11:30 - 13:00, Hall 14c

Technologists Oral Session 2

T09

18F-fluoride PET/CT protocol for orthopedic patients with unclear foot pain

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Aim: The aim of the study is to describe the 18F-fluoride PET/CT protocol used in our institution to image orthopedic patients with unclear foot pain. **Materials and Methods:** In 25 patients with unclear foot pain an 18F-fluoride PET/CT was performed with an integrated PET/CT scanner (Discovery STX, GE Medical Systems). The patients underwent no special preparation before the examination. 100 MBq 18f-fluoride was injected in the antecubital vein. After 30-45 min. uptake time patients were positioned on the scanner in supine position. In a first step a low-dose attenuation-CT was performed over both feet (40 mAs). In the second step the emission data were acquired in 1-2 PET FOV's with a acquisition time of 1.5 min. for each field. In a third step a diagnostic high resolution CT(slice thickness 0.625mm, increment 1.375mm) was performed. The axial slices of these CT have been reformatted in coronal and sagittal planes and dedicated bone windows. All date were transfered to a AW workstation for further postprocessing and PET/CT fusion. **Results** With exact symmetric positioning of the feet and instruction to the patient not to move we obtained diagnostic image quality in all patients. No relevant mismatch between the PET and CT part was observed in our patients. Total time from fluoride injection to the end of the examination was between 50-70 minutes. Unless the patients underwent multiple other investigations before like conventional X-rays and MRI we detected unknown bone lesions responsible for the patients symptoms in 16 of 25 patients. Active osteoarthritis or tendinitis were the predominant found lesions. The investigation was tolerated very well by all patients. **Conclusion** The dedicated 18F-fluoride PET/CT protocol is well tolerated, feasible and quicker compared with a conventional bone scan. The combination of the scintigraphic information from the PET part and the anatomic information of the CT part provides important information for the orthopedic surgeon.

T10

Oral Diazepam to reduce ^{18F}FDG brown fat uptake in breast cancer patients

S. Baank, R. A. Valdes Olmos, C. A. Hoefnagel, W. V. Vogel, A. Lafeber, M. Sonneborn; Netherlands Cancer Institute, Amsterdam, NETHERLANDS.

Aim: PET-CT may become inconclusive when ^{18F}FDG uptake in brown fat occurs in cancer patients. This uptake may also involve axillary and supraclavicular areas which are particularly critical in breast cancer patients. The aim of this study was to asses the incidence of brown fat ^{18F}FDG uptake in breast cancer patients referred for PET-CT and to see if optimizing the preparation protocol by oral administration of 10 mg Diazepam reduces the occurrence of brow fat in this group. **Methods**: In 2007 fourteen patients diagnosed with breast cancer underwent a PET-CT, seven out of fourteen patients showed brown fat uptake (50%). In the period January until March 2008 an intervention started by administering 10 mg of Diazepam in combination with the regular measures taken during the pre-injection ^{18F}FDG preparation. PET, CT and PET-CT fused images where evaluated by a panel of 3 nuclear physicians. **Results**: In 2008 twenty-four patients diagnosed with breast cancer underwent a PET-CT, only one out of twenty-four patients showed brown fat uptake (4%), whereas in 2007 50% of the breast cancer patients showed brown fat uptake. **Conclusion**: Brown fat uptake of ^{18F}FDG appears to be successfully reduced by oral administration of 10 mg Diazepam in the preparation period before ^{18F}FDG injection. At the Netherlands Cancer Institute the preparation protocol is now adjusted and 10 mg Diazepam is structurally administered to breast cancer patients referred for ^{18F}FDG PET-CT.

T11

Is head to toe scanning FDG-PET/CT necessary in the study of upper body melanoma?

M. Carta, F. Santagata, C. Costanza, N. F. Pisu, P. F. Chapelle, L. Ruffini; Nuclear Medicine Department and PET Center, Cagliari, ITALY.

PET scanning is a well estabilished diagnostic tool for the staging and management of malignant melanoma. In many institutions the routine imaging procedure is the head-toe scanning, from the skull vertex to feet. The protocol has some practice implications, as it requires two separated scans, with a long acquisition time and consequent restriction in patient's scheduling. Moreover, the lower limbs scan implies an additional radiation dose. **AIM:** Aim of the study was to assess impact of head-toe PET scan on the management of patients with upper body malignant melanoma and to evaluate patients who can benefit from the head-toe scan by detection of isolated lower limbs lesions. **MATERIAL AND METHODS:** One hundred and eighty-nine consecutive melanoma patients were referred for FDG-PET/CT imaging between May 2005 and March 2008. Sitxty-one PET/CT studies concerning patients with lower body melanoma were excluded from the analysis. One PET examination was excluded due to indeterminated site of the primary lesion. The remaining 127 PET/CT were evaluated considering as positive PET scan with unknown hypermetabolic lesions in lower body identified in the head-toe examination; we also evaluated if the additional information could potentially change patient's management (i.e.: detection of unique lesion susceptible of surgical treatment). **RESULTS:** - 75 out of 127 PET studies were negative for FDG-avid lesions - 41 out of 127 studies detected hypermethabolic lesions in the upper district and none in the lower body - 11 out of 127 detected FDG-avid lesions in the lower limbs. Nevertheless, in all of them PET imaging showed widespread disease (multiorgan and/or multiple bone /soft tissue lesions and/or multiple nodal lesions). Thus, the additional information on the presence of one or more lower limbs FDG-avid lesions didn't lead to a change of management in any of these patients. **CONCLUSIONS:** Even if larger case studies would be necessary, our results show no practical benefits of performing head to toe scanning in the management of patients with upper body malignant melanoma. In conclusion, we would suggest to reconsider the routine use of head-toe PET acquisition modality in this subset of patients with melanoma. Routine skull base to upper thigh images may be sufficient.

T12

Dose Reduction by Combining PET-CT and Liver 4-fase CT

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Dose reduction of combined PET/CT and 4-fase Liver CT de Jong WM[1], MSc J.B.A. Habraken[1], MSc E. Scheepers[1], Dr. H.W. Venema[2] [1]Department of Nuclear Medicine, Academic Medical Center, Amsterdam; [2]Medical Physics Department and the Radiology department, Academic Medical Center, Amsterdam **Aim:** Assessing the implications on absorbed dose by combining a PET/CT with a 4-fase liver CT. **Methods:** 4-fase liver CT and PET/CT are performed in patients with liver tumors. PET/CT examinations were performed using a Philips Gemini TF 16-slice-CT. A 4-fase liver CT scan contains a blank CT and a 30, 60 and 270 seconds contrast delayed CT, performed at 120 kV, 200 mAs with Z-DOM disabled. Choice between a High-Dose or Low-Dose wholebody-CT depends on the indication of the specific patient. Contrast PET/CT protocols are performed at 120 kV, with 200 mAs for High-Dose CT and 60 mAs for Low-Dose CT, both Z-DOM enabled. We choose to combine the 4-fase liver CT with the PET/CT. In the combined 4-fase PET/CT the wholebody-CT of the PET-CT is used as the 60 seconds delayed scan of the 4-fase-CT. For that reason all wholebody-CT are performed with diagnostic parameters (200 mAs, Z-DOM enabled). We evaluated the consequences on the absorbed dose of this combined protocol, using Impact CT Patient Dosimetry (version 0.99x). This program is based on a standardized patient of 70 kg and 170 cm tall. A patient with similar proportions was used to assess the impact of the dose modulation software of the Philips 16-slice CT (Z-DOM). PET Dose calculations are based on injection of 180 MBq 18F-FDG for a 70 kg patient. **Results:** 4-fase CT liver results in a dose of 22.4 mSv. The dose of the administered 18F-FDG is 3.4 mSv. The results of the High-Dose and Low-Dose PET/CT are14.2 and 6.7 mSv, respectively. The total dose of a 4-fase CT Liver with a separate High-Dose PET/CT is 36.6 mSv, and with a separate Low-Dose PET-CT is 29.1 mSv. The combined 4-fase liver PET-CT results in a dose of 31.0 mSv. **Conclusions:** The combined 4-fase liver PET/CT results in a dose reduction of 15.3% compared with the separate protocols and a High-Dose PET/CT. The combined protocol results in a dose increase of 6.1%, compared to the Low-Dose PET/CT, delivering more discriminative power for positive lymph nodes and glands. Furthermore, the diagnostic combination is convenient and less invasive for the patient, because the patient gets only one exam.

T13

Optimization of technologists' hands exposure : impact of vial shielding when preparing ^{18}F-FDG doses

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Aim : The use of ^{18}F-FDG in routine raised new radiation safety concerns for Nuclear Medicine Technologists (NMTs). With a penetrating ability being 10 times higher than the 140 keV emissions from ^{99m}Tc, 511 keV annihilation photons result in a high and sometimes underestimated radiation risk for staff. Hands doses higher than the annual limit (500 mSv) have been reported in our country since the introduction of PET. Therefore, specific shielding devices and handling procedures must be developed to reduce NMTs hands exposure to an acceptable level. The aim of this study was to evaluate the efficiency of surface shielding of the vial when drawing ^{18}F-FDG manually into a syringe. **Material and methods :** 2 caps especially manufactured by Medisystem according to our instructions were compared, a 30 mm lead cap (C1) with a 8 mm hole and a 20 mm tungsten cap (C2) with a 5 mm hole. Five series of measurements were performed in the range of activities 92 to 2553 MBq using a dose ratemeter (PRM301 - NE Technology), without shielding on contact and at 10 cm of the vial; with shielding on contact and at 10 cm of the vial corresponding to the position of the operator's fingers when filling the syringe. Dedicated TLD rings were used to monitor NMTs hands exposure during the drawing step. One thousand syringes with an average activity of 354.38 ± 84.64 MBq were prepared using the tungsten cap in 2007. **Results** : The mean exposure rate at 10 cm is 5.95 ± 0.10 $\mu Sv.h^{-1}.MBq^{-1}$ without shielding, 1.55 ± 0.20 $\mu Sv.h^{-1}.MBq^{-1}$ with C1 and 0.397 ± 0.057 $\mu Sv.h^{-1}.MBq^{-1}$ with C2. With the tungsten cap used in routine, the mean dose to the hands was 0.16 $\mu Sv.\ MBq^{-1}$(right hand) and 0.31 $\mu Sv.MBq^{-1}$ (left hand). **Conclusion** : The average dose to the hands can be divided by 3.84 using the lead cap and by 15.0 using the tungsten one. If the same NMT had prepared 1000 syringes, the average dose to the hands wouldn't have been in excess of 57 mSv on the right hand and 110 mSv on the left one. Without shielding, doses would be 15 times higher and far over the annual limit. Surface shielding of the vial is mandatory to minimise hands exposure.

T14

Respiratory movements cause significant misregistration and altered SUVs in thoracic PET-CT studies with ^{18}F-DG.

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PET-CT with ^{18}F-DG studies are frequently used in the management of patients with lung malignancies. Unfortunately respiratory movements may influence significantly disease

evaluation, particularly during longitudinal follow-up. Our aim is to investigate the influence of forced inspiration (I) and expiration (E) on shallow breathing (S) results (anatomic registration and SUV calculation). We included 18 patients, 15 male and 3 female, with ages between 40 and 78 years, with pulmonary and hepatic lesions. Data was acquired on a GE Discovery LS/4 PET-CT Scanner starting 60 to 90 minutes after the i.v. administration of ^{18}F-DG (5 MBq/Kg of patient weight). CT acquisition used 120 kV, 80 mA and 1.5 pitch and PET acquisition on 2D mode included 5 to 6 AFOV (4 minutes per bed position). A further 1 to 2 late AFOV (> 2 hours p.i.) acquisition was routinely undertaken on S and complemented by 2 other attenuation maps with CT, 120 kV, 60 mA and 1.5 pitch, in I and E. PET images (always on S) were acquired in 2D mode, 1 or 2 AFOV/6 minutes. Three emission image sets were then reconstructed with OSEM and MAC using the 3 attenuation maps. Each lung was divided in 3 segments - Superior, Medial and Inferior, and the liver lesions classified in Superior and Deep. Images were then analysed according to lesion anatomic registration, and lesion SUV calculated on I, E and S. Our preliminary results show significant difference between SUV values (p=0.0154) of hepatic lesions located in superior segments in I and E. Lung lesions in the superior segment were better registered in S than in I or E. The worst misregistrations were observed in the inferior segments of the lung, with deviations up to 1,5 cm between I and E. Conclusion: respiratory movements impact significantly in image registration and SUV calculation of lung and hepatic lesions, depending on their regional localization. Failure to correct adequately for respiratory movements in follow-up longitudinal studies may cause significant evaluation errors. A well defined and "rigid" protocol must be used for longitudinal studies.

T15

A new integrated protocol to perform the Virtual Simulation CT, for the radiotherapy planning, during the PET/CT scan

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During the last years, the use of FDG-PET/CT in the definition of the target volume has become more popular for radiotherapy planning purposes. The importance of a very precise delineation of the target volume has become more evident thanks to the increased use of sophisticated three-dimensional conformal radiotherapy techniques and intensity modulated radiation therapy IMRT. Thanks to a good collaboration among Radiotherapy and Nuclear Medicine departments of Santa Maria Nuova Hospital in Reggio Emilia a new integrated protocol has been established to perform the virtual simulation CT during the PET/CT examination. What follows is the new protocol used to combine the two metodologies as an integrated study. Radiotherapy Physician analyses the clinical and diagnostic situation of the patient. If he thought there would be the right conditions, he will adress the patient to Nuclear Medicine ward to start the virtual simulation CT combined to PET/CT scan. After a medical examination by Nuclear Physician, the patient is injected with 225-370 MBq of 18F-FDG. Then he undergoes an uptake phase in a recumbent position for approximately one hour. The patient is then setup in the radiotherapy treatment position on the PET/CT's table to acquire data. During this positioning phase, the technologist applies the imobilization's system that has been created *ad hoc* for the patient and that will be used during the following radiotherapy treatment. Now, the technologist performs the CT scan following the standard protocol. CT images are sent to the radiotherapy workstation, where Phisicist and Radiotherapy Physician make the contouring and determine the set-up plane. Then, they send the file, including isocenter's coordinates, to laser system of the PET/CT scanner. The technologist signes cutaneous projections that the lasers perform on patient's skin or on the system imobilisation. The last step is the acquisition of 3D PET data. This new protocol has many advantages. From a clinical point of view, we have a more precise matching of PET and CT images that are acquired in the same condition. In this way the possibility of making mistakes in the patient's setup is clearly reduced. At the other hand, this new protocol requires less time and stress for the patient that is subjected to virtual simulation CT and PET/CT scan at the same time.

T16

Technical Aspects of PET/CT Images Aquisicion for External Radiotherapy Planning Procedures

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Positron Emission Tomography (PET) is a powerful and versatile imaging tool that offers the opportunity to visualise and measure pathophisiology and biological parameters that influence disease diagnosis. Recently, the role of PET in radiotherapy management of patients with lung carcinoma has been investigated/evaluated. An accurate definition of the volume to be irradiated is even more important, considering that lungs are highly sensitive to radiation. **Aims:** Differences between diagnostic and treatment equipments must be taken into account when FDG-PET/CT scan is used in the planning of radiation therapy. The present study discusses some of the technical aspects that could happen when PET is incorporated into the planning of radiation therapy in lung cancer. **Methods**: 414 patients (310 [[Unsupported Character - ♂]], 104[[Unsupported Character - ♀]])with diagnosis of lung carcinoma were includ in this study. 131 of then were refered for staging. For PET based planning, a combined PET-CT scan was performed (*SIEMNENS BIOGRAPH 6 HiRez*) either in diagnostic process alone or both in the diagnostic process and radiotherapy simulation/planning. Patients had to be fasting for at least 6h before the exam. The total activity of ^{18}F-FDG injected was proximately 370 MBq, adjusted according to the body weight. After a rest period of 60 min, PET and CT images were acquired. Patients were positioned supine on an acrylic supplementary table, similar to the radiotherapy table, and the arms were positioned along the body but lightly apart. To allow an appropriate fusion between PET/CT images and simulation in the radiotherapy planning (*Planning System Eclips-VARIAN*), the patient positioning can be adequately reproduced in the different examinations and radiotherapy rooms. We use compatible software to send the images in *DICOM* format to the radiotherapy department. The images are reconstructed and analysed in the Dosimetry Department to establish target volumes for treatment planning. **Conclusion**: PET has a significant role to play in the diagnosis, staging and evaluation of response to therapy in lung carcinoma. Mutual protocols between nuclear medicine and radiotherapy departments with ^{18}F-FDG PET may improve the patients care. Reduces the number of CTs performed, hospital comings and thus may be coast-effective.

T3 - Tuesday, October 14, 2008, 11:30 - 13:00, Hall 14c

Technologists Oral Session 3

T17

Scanning body contours by means of a single tube phantom

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Aim Malignant melanomas of the trunk may have their sentinel nodes in the axilla and / or in the groin. Displaying the trunk in a single image requires the scan mode to be employed. Therefore phantoms for the delineation of the body contours must be moved simultaneously. Using a dual head camera, one detector can be employed for imaging and the other for moving the phantoms. Since 57-Cobalt phantoms are expensive and homogeneity phantoms are heavy, we looked for an inexpensive and light alternative. Methods We fixed a pressure tubing of 1mm in diameter and 70 cm in length on a plastic batten of 600 mm in length, 3mm in width and 2mm in height and filled it with 500 MBq of 99m-Tc04 in saline solution. After positioning the patient we started the scan and when the patient table began to move after 5 minutes, we aligned the tube to the cranial edge the FOW of the lower detector. To obtain a scan of 100 cm in length we had to choose a scan length of 140 cm. The examination time was 20 minutes. Results The pulse density in the field alongside the patients was 1800 cts/ cm². Sentinel nodes could be depicted easily. During the last 40 cm of the scan virtually no counts were registered outside the patient. Conclusions The results of the single tube phantom scan looked promising. The body contour could be depicted satisfactorily. However, the scanning time was deemed to be to long. There were 5 minutes wasted at the beginning and another 5 at the end of the procedure. And placing a radioactive line source on a detector in motion can lead to unexpected contaminations. Therefore we now use an upgraded type of the line source: It consists of a plastic frame of 50 by 60 cm and a tube of 19 m arranged in 18 parallel loops.

T18

A comparison of three different methods for measuring whole body radiation exposure

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Aim Whole body radiation dose to scanner technologists is an ongoing issue in a PET and PET/CT department. Therefore, we wanted to compare the dose levels registered from two different national recognized institutes. Furthermore, we wanted to test if the personal electronic dose meters were able to give a reliable estimate of the radiation exposure. Materials and methods Eight scanner technologists participated in this prospective study, which took place from September to November 2007. During this 3 month period, all scanner technologists were monitored by standard film badges from the National Institute of Radiation Hygiene (NIRH) (reported monthly), dose badges containing TLD tablets from Department for Medical Physics, Aarhus (reported monthly), and personal electronic dose meters (RADOS 51, 50s or 60 s). All three dose monitors were worn at the breast level close to each other. The RADOS dose meters were reset at the start of the study, and remained on during the entire period. The acquired values of µSv were recorded every morning before start of work, and every afternoon at the end of the working day. During night and weekends all dose meters were stored in a normal background area. The TLD background was corrected from a badge placed in the same area. The film background was estimated by NIRH from a set of film badges including the secretary staff in the department. The doses recorded by RADOS were corrected for background, and cumulated for each month. Results

(Values in mSv)	September	October	November	Total
Film	2.4	2.7	1.3*	6.4
TLD	2.5	2.3	2.1	6.9
RADOS	2.4	2.2	2.2	6.8

There was a good correlation between the three different methods when we look at results for the entire period of three months. However, looking at results for each month, we found that in one month (November) the result of the film badges from NIRH was significantly lower (p< 0.001) than the two other methods. This result can be ascribed to the limited precision of the film background estimate (detection limit approximately 0.1 mSv). Conclusion During a period of three months, there was a good correlation between the three different methods. However, for one month, the result from NIRH was too low compared to the two other methods. The RADOS personal dose meter was found to be a reliable and practical instrument, providing immediately readable results for (whole body) dose consistent with film and TLD.

T19

Searching the best fit between the counts rate on the Whole Body Bone Scintigraphy initial position and the scan speed

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Aim: Whole Body (WB) Bone Scintigraphy (BS) represents about 25% of all Nuclear Medicine examinations performed in our department. According to the European Association of Nuclear Medicine (EANM) procedure guidelines, WB scan speed should be adjusted to a level that would allow obtained images to contain at least 1,5MCts. Furthermore, since our department integrates a Quality Management System, we consider important to systematize procedures. Accordingly, the aim of this study was to optimize the WB scan speed, using a simpler and faster method, reducing time loss, in order to systematically obtain the total counts number recommended by EANM. **Methods:** This study's sample totalled 260 patients. We intended to correlate the counts rate on WB initial position (*head* view) with the time exposure per pixel (i.e., scan speed). Firstly, we measured the correlation between thorax and head counts rate, trough static images at anterior and posterior views for geometric mean calculation. If this correlation proves to be positive and high, we could use head counts rate instead of thorax counts rate, simplifying procedures. Secondly, we calculated a formula that correlates head counts rate and time

exposure per pixel, in order to obtain at least 1,5MCts. Finding geometric means for all patients, before starting WB scan, is a very time consuming task. Therefore, we finally measured the correlation between head counts rate geometric mean and head counts rate posterior view. If this correlation proves to be positive and high, we could simply use the head posterior view counts rate as a proxy for the geometric mean counts rate. **Results:** we measured a positive and high correlation (R^2=0.9019) between thorax and head counts rate. The best fit between head counts rate and time exposure per pixel, as been illustrated by the expression $Y=317.01x^{-0,7536}$ (R^2=0.9100). We also found a positive and high correlation between head geometric mean and head posterior view counts rate (R^2=0.9837). Finally, we observed a speed changing (more than 10% faster) on about 60% of the analysed patients. **Conclusion:** We believe to have found a way in which it is possible to take knowledge of the ideal WB scan speed, easily and reducing time loss. This could be attained through the simple visualization of the WB initial position counts rate, allowing us to systematically obtain the recommended total counts number.

T20

Vertebral fracture assessment in supine position: comparison with semiquantitative and visual radiograph assessment

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Background Vertebral fracture assessment (VFA) is a fast, patient-friendly, semi-quantitative technique for the diagnosis of vertebral fractures with very low radiation exposure. It allows bone mineral density assessment and determination of the vertebral fracture status in a single short session. Previous studies comparing the performance of VFA to radiographs were mainly performed with the patient in a lateral position, which often creates obliquity problems caused by lumbar sagging. In this study we evaluated the accuracy of the VFA technique with the patient in a supine position, using visual and semi-quantitative conventional radiography of the spine for comparison. ***Methods*** We evaluated 250 consecutive patients (190 women (76%), mean age 62 (25-89) years) who were suspected of osteoporosis, and who underwent both VFA and radiography of the spine. VFA and semiquantitative radiograph assessment (SRA) were analysed by a six marker point method to describe the shape and deformity of each vertebra. Visual radiograph assessment (VRA) of the lateral spine radiographs was performed by an experienced radiologist. To allow bilateral comparison, all data of VFA, VRA and SRA were transformed into a Genant class. ***Results*** A total of 183 (6%) vertebrae were considered unreadable for VRA, 42 (1%) were unreadable for VFA and 383 (12%) were unreadable for SRA, due to severe scoliosis, deformities or extreme adiposity. VRA identified 92 (37%) patients with at least one vertebral fracture (mean 1.8 fractures per patient). Most fractures were present in T7, T12, and L1. Excellent agreement was found between VFA and VRA, with 98% concordance and a kappa of 0.82 (95% CI 0.69 to 0.94, SEM 0.065). VFA and SRA were in agreement in 97% of the patients, at kappa of 0.81 (95% CI 0.68 to 0.93, SE 0.066), and VRA and SRA agreed in 98% at kappa 0.85 (95% CI 0.72 to 0.97, SEM 0.064). Sensitivity, specificity, positive and negative predictive values for VFA compared with VRA were 83%, 99%, 84%, and 99%. Sensitivity, specificity, positive and negative predictive values for VFA compared with SRA were 81%, 100%, 91%, and 99% respectively. ***Conclusion*** VFA with patients in the supine position is a very accurate method to detect vertebral fractures, as compared to conventional spine radiographs. Its convenient combination with bone mineral density measurement in a single short session and low radiation dose constitutes significant practical advantages.

T21

Man versus mouse: the difference in nuclear imaging

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At nuclear medicine departments performing research in small animals, there is an increase in the use of dedicated equipment for small animal imaging. At our department we recently obtained a micro SPECT camera with slit collimation (Linoview), a micro SPECT-CT camera (Bioscan NanoSPECT/CT) and a micro PET camera (Siemens Inveon). Several technologists from the clinical part of the department have been given the opportunity to work at the research section with this specialized equipment. Aim: we compared clinical imaging and small animal imaging and monitored how the technologist can optimally participate in translational research, especially in small animal imaging. Methods: clinical versus small animal SPECT equipment were compared, as were micro SPECT and micro PET compared using different tracers and protocols. We observed the way the images were created on the various cameras and how that affected spatial resolution, sensitivity and the quantification of the images. The role of the technologist was monitored by regular consultation with the head of the department and / or colleagues. Results: the use of multipinhole apertures, multiplexing and helical acquisition results in a much higher resolution in small animal imaging compared to parallel hole clinical SPECT. Due to the small body of the rodents the gamma radiation interacts less, making it more suitable for quantification. Physical aspects of positron decay results in a resolution of the micro PET that is lower compared to that of micro SPECT. The technologists knowledge and experience in clinical imaging is not sufficient for small animal imaging. However, basic knowledge of nuclear medicine makes the transfer to small animal imaging feasible. Besides acquisition, reconstruction and protocol optimization, also processing of the scan data and reporting of the results are tasks of the technologist. Conclusion: the various cameras differ in essential aspects from each other, requiring a different approach. The technologists have their own role within the research team. Their challenge is to find the optimal imaging solutions for each specific research situation. The activities of the technologists are therefore broadened and deepened with this new role.

T22

The Role of the Technologist in Experimental Nuclear Medicine

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The experimental nuclear medicine plays important role at our clinic this days. The reason is the necessity of new radiopharmaceuticals, which can potentially have a clinical application in the everyday use in the fields of nuclear medicine. The key parts of efficient experimental design are observation, design of experimental model, experimental manipulation, homology and number of animals needed. Further, a detailed protocol would be required. As an experimental animal model, we usually use rats. So far, rat animal models were used for: stasis induced thrombus in the femoral vein after injection of thrombin; experimental model of dialysis related amiloidosis; several animal model of infection and inflammation; collagen-induced arthritis as a model for inflammatory arthritis. The technologist has a great role in manipulation, preparing and making the design and imaging the animal model. The validity of the results depends on their experience in working with gamma cameras and knowing the protocol of each camera for animal imaging, as well as the protocol of the study. The experimental nuclear medicine is the main way to introduce and test new radiopharmaceuticals in which the technologists play an integral part.

T23

Guaranteeing quality of all-round technologist

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Background Lately there have been many changes in nuclear medicine. This is also the case at our department. In the past 5 years we have tripled manpower, introducing pet/ct. Legislation as GMP and radiation protection, has been tightened up considerably. In our group of 17 technologist 5 shifted from full-time to part-time. Furthermore, activities in the past done by nuclear medicine physician shifted to technologist (administration of radioactivity and sentinel node procedure). It is hard to keep and/or get competences at high level without specialisation. **Aim** Our goal was to optimise the skills of all technologists and offering variety of activities in a comprehensive team. **Methods** Personal development and progress of technologists are described in a personal file and the progress will be discussed annually. Intercollegiate education and specified refresher courses have being organised on monthly base. Daily routine, complications and management information have been discussed regularly . Technologist have their own area and responsibility for special attention (for instance hot lab). An extensive introduction program has been developed for new technologists. Furthermore, the presence of sufficient professional literature, internal audits, the presence of comprehensive protocols, team days, satisfactions research under the employees, customer satisfaction research have been implemented. **Results** The personal file helps technologists to monitor their development and specifies strong and/or weak competences. Special attention will be focussed on the weak parts. Responsibility for specials tasks improves labour joy and satisfaction. A professional introduction program combined with internal and external education improves personal skills and have broadened and improved the whole group. **Conclusion** Investment in good education and development of technologists remains necessary. It helps to cope with the fast changes in nuclear medicine and it improves the competences and skills of individual technologists as well as those of the whole team.

T24

On-line Distance Assisted Training (DAT) to meet training needs in SPECT/CT & PET/CT

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Aim: With the rapid evolution and widening global adoption of dual modality imaging there is need to provide relevant training accessible to diverse regions. A Distance Assisted Training (DAT) programme for Nuclear Medicine Technologists (NMT) covering all aspects of Nuclear Medicine is already widely adopted as a means of in-service training for NMTs. DAT is a unique experiential learning program with an effective training approach focusing on factors which are important in clinical practice. The approach benefits technologists by promoting good techniques in everyday practice. Our aim is to present work-in-progress to extend DAT with inclusion of modules on SPECT/CT and PET/CT. Equally important is the development of an internet resource to facilitate delivery of the training materials, which includes complementary teaching aids, on-line assessments and a general training resource that can be adapted for national use. Method: The extended course will introduce the principles of CT and its integration with SPECT and PET, developing an understanding of standard procedures and suggesting strategies for optimizing protocols and workflow. Complementary teaching aids and exercises will assist the understanding of difficult concepts with on-line access for image reconstruction and display of fused images (courtesy of Nuclear Diagnostics). On-line access will be available to registered participants as part of national and regional DAT programmes. The on-line facility will permit direct student assessment and ongoing monitoring of progress as well as encouraging student interaction. A global pilot study will be conducted during 2009 through the Research Institute for Asia and the Pacific (RIAP), University of Sydney, Australia. Results: The original basic and advanced subjects, of this sustainable DAT program have been adopted as the national training program for nuclear medicine technologists in a growing number of countries around the world. The DAT programme has already involved >600 technologists with translation to several languages. Recently with support of the EANM countries in Eastern Europe have been introduced to DAT. The development of problem solving skills, improved self esteem and confidence are experiences reported by previous DAT participants. The extended dual modality subjects will complement this core content. Conclusion:DAT is a formalized structured training course offering a unique opportunity to harmonize global training in Nuclear Medicine. The extension of this programme to include state-of-the-art procedures will provide a unique and much needed resource that will have appeal to many national training programmes. The adoption of on-line facilities will optimize implementation and global monitoring of progress.