ANZSNM – ORALS PRESENTATIONS

Technologists’ Symposium & Radpharm Awards (Session B1)

O1 ‘AN OLDIE BUT A GOODIE’: BONE SCANS ARE STILL TOPS
T Mead, Auckland District Health Board, Auckland, New Zealand
A 16-year-old female from Tonga presented to the Nuclear Medicine department with increasing pain in her lower limbs and tenderness over both lower tibiae and mid humeri bilaterally. X-rays had shown excessive cortical thickening in long bones and diffuse calvarial thickening and sclerosis in the skull. A bone scan was performed showing increased uptake in the skull and appendicular skeleton, appearances suggestive of Camurati-Engelmann disease. Camurati-Engelmann disease (CED) is a rare condition involving the diaphysis of long and short tubular bones and the skull. It is caused by mutations in the gene encoding for transforming growth factor β1 (TGFβ1), which influences osteoblast and osteoclast function and which is thought to act as a coupling factor between bone deposition and resorption. The bone scan was instrumental in the diagnosis of CED and was the best imaging system to show the extent of the disease.

O2 YOUNG WOMAN WITH LOWER BACK PAIN
G Roff, Royal Perth Hospital, Perth, Australia
A twenty-five year old female presented at the Nuclear Medicine Department for a Bone Scan. She complained of pain in her right lower back which radiated into her right hip. This had been progressing over the last seven months. A CT from an external practice showed an expansile lesion in the right physis of the tibiae and mid humeri. A bone scan was requested to find out if there were any secondary abnormalities which would then dictate what treatment the patient would need.

O3 CARDIAC 123I-MIBG SCINTIGRAPHY
R Wyborn, Hunter Imaging Group
Introduction: Parkinson’s disease and Multiple System Atrophy are debilitating neurodegenerative diseases. Despite extensive diagnostic criteria, differentiation of the two diseases remains difficult in those patients who present with unusual symptoms. This presentation provides insight into the value of Cardiac 123I-MIBG Scintigraphy for the differentiation of Parkinson’s Disease and Multiple System Atrophy.
Methods: Planar imaging of the chest was performed at 20 minutes and 4 hours post intravenous injection of 123I-MIBG. Regions of interest were drawn over the mediastinum and myocardium, allowing for quantitative analysis of the sympathetic nerve function of the myocardium. Results: Myocardial uptake of 123I-MIBG is significantly reduced in patients with Parkinson’s Disease, as the postganglionic neurons responsible for 123I-MIBG uptake have been damaged by the disease process.
Conclusion: Cardiac 123I-MIBG Scintigraphy is an effective tool in the differentiation of Parkinson’s disease from Multiple System Atrophy. A range of imaging modalities have been utilised to image Parkinsonian syndromes, but findings thus far suggest that they are ineffective for differential diagnosis. The two diseases result in neurodegeneration and produce similar symptoms; however the treatment plans required are different. Therefore, a definitive diagnosis provided by Nuclear Medicine is valuable for effective management.

O4 HIDA IMAGING FOR LIVER LESIONS: A CASE STUDY
T Smith, The Queen Elizabeth Hospital
Background: Liver lesions occur in up to 20% of the population and are common incidental findings in medical imaging. Most of these are benign, but they are not easily differentiated because blood test results and imaging appearances vary widely. While biopsy can be useful, there is a high risk of bleeding and a risk of seeding with some malignancies. Hepatic Haemangioma (HH) and Focal Nodular Hyperplasia (FNH) rarely have complications and do not require treatment. Hepatic Adenoma (HA), however, has frequent complications such as haemorrhage and malignancy, necessitating more radical treatment. It is therefore crucial to differentiate liver lesions accurately and quickly, to ensure the correct patient management. Tc99m-labelled red cell studies with SPECT easily diagnose HH. HA and FNH, however, are more difficult to differentiate. Tc99m-Sulphur Colloid studies show inconsistent patterns of uptake, frequently not allowing confident differentiation of these two lesions.
Aim: A 47 year female with abdominal pain presented to our department to help differentiate the nature of a solitary liver lesion found on Computed Tomography.
Methods: A Tc99m-labelled red cell study ruled out HH. A Tc99m-HIDA scan was then performed a few days later to help differentiate between HA and FNH. Static imaging at 10 minutes was acquired, followed by 1 hour delayed static images and SPECT/CT.
Results: HA contains normal or small amounts of hepatocytes, therefore rarely accumulating increased Tc99m-HIDA relative to the liver. In this patient, a focal area of increased uptake was visualised in the right lobe of the liver, which is consistent with FNH.
Conclusion: The Tc99m-HIDA study confirmed the diagnosis of FNH, which is benign and rarely requires treatment. The Tc99m-HIDA study should not be overlooked when attempting to differentiate between liver lesions.

O5 SPHINCTER OF ODDI DYSFUNCTION – A ROLE FOR NUCLEAR MEDICINE
S Yoong, Department of Nuclear Medicine and Centre For PET
Persistent right upper quadrant pain post cholecystectomy is not an uncommon clinical scenario. This may be caused by partial biliary obstruction, either structural or functional, due to Sphincter of Oddi Dysfunction (SOD). In the past manometry has been considered the ‘gold’ standard for the diagnosis of SOD. However this is an invasive and uncomfortable technique. In this case study, hepatobiliary scintigraphy was used to investigate SOD. The patient was a 37 year old woman with a history of cholecystectomy, who presented with persistent right upper quadrant pain and mildly dilated common bile duct on ultrasound. The hepatobiliary study consisted of an initial infusion of cholecystokinin, to induce bile flow, followed by administration of 203MBq of 99mTc-Doliprane and dynamic image acquisition for 60 minutes. A time activity curve was produced from these images. The resultant image analysis produced an activity curve that was evaluated against criteria from the Sostre scintigraphic scoring system. The overall score was suggestive of a SOD. This case study demonstrates that a scintigraphy based protocol maybe a useful and less invasive test for screening patients for SOD who present to the department with abdominal pain post cholecystectomy.

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41st ASM of Australian and New Zealand Society of Nuclear Medicine
HEAT DENATURED RED BLOOD CELL SPECT/CT IMAGING IN DETECTING SPLENUNCIULI – A CASE STUDY

P Russell, Royal Brisbane and Women’s Hospital, Brisbane, Australia

Aim: An 81 year old male presents 13 years post splenectomy with refractory, relapsed Idiopathic Thrombocytopenic Purpura (ITP). After a series of investigations, Nuclear Medicine was called upon to provide a pathway for determining the cause of the relapse by investigating for the presence of splenunculi; and therefore to potentially guide the next step in the patient’s management.

Method/Results: A 99mTc-labelled heat denatured red blood cell scan was performed, which utilised a hybrid imaging system to acquire planar and SPECT/CT data. A combination of functional and anatomical information enabled the detection of 3 splenunculi which were present in the region of the splenic bed.

Conclusion: The use of this relatively new technological development has given new life to an old procedure; and has demonstrated the way of the future for Nuclear Medicine. This case demonstrates the value and utility of Nuclear Medicine as a functional imaging modality, harnessing physiological processes in order to provide information that other investigations cannot.

The study was able to provide definitive results, which assisted the patient’s management team in evaluating the options to ultimately attempt to cure this patient’s chronic disease.

INMED AWARD 2010: A PROSPECTIVE STUDY INVESTIGATING THE CORRELATION BETWEEN MYOCARDIAL 18F-FDG UPTAKE AND THE PHYSIOLOGICAL CHANGE FROM GLUCOSE TO FATTY ACID METABOLISM DURING THE FASTED STATE

L Henderson, Royal Brisbane & Women’s Hospital QLD PET Service

Background: Primary cardiac lymphoma is a rare malignancy in which extranodal B-cell non-Hodgkin’s lymphoma is located primarily within the heart or pericardium. F18-FDG highlights cellular glucose metabolism and many cancer cells utilise glucose at a higher rate than normal cells. However, some conditions also accumulate FDG. In particular, the heart, especially the left ventricular myocardium, commonly exhibits intense physiological myocardial F18-FDG uptake. A study in 2008 (*) investigated the effect of high fat, low carbohydrate diets immediately prior to fasting periods before PET scan to suppress physiological myocardial uptake of the PET tracer. This was based on promoting a switch to fatty acid metabolism in the fasted state.

Additionally it is known that the presence of urinary ketones indicates a metabolic process in order to provide information that other investigations cannot.

Aim: The aim is to determine the most effective method for fasting of non-diabetic PET patients referred for cardiac tumour or mediastinal pathologies.

Methods: Ninety-eight non-diabetic patients who were referred to the QLD PET service for an oncology study were investigated. Patients were asked to provide a urine sample before their F18-FDG injection and this sample was analysed for the presence of urinary ketones. The number of hours each patient had fasted was recorded along with their urine analysis. The PET/CT scan was performed on a Philips Gemini GXL PET/CT scanner. Standard uptake values (SUVs) were recorded from regions over the left ventricular myocardium over three slices and an average representative SUV was calculated.

Results: Myocardial SUVs were plotted against hours fasted prior to the PET scan. A correlation coefficient was calculated of –0.1 indicating no correlation between fasting time and myocardial F18-FDG uptake. Only four patients were found to have urinary ketones present after fasting. All of these displayed no myocardial uptake greater than normal blood pool activity. However, the other 35 patients who had no myocardial uptake had no urinary ketones present.

Conclusion: The results of this study suggest prolonged fasting alone is of no benefit in reducing normal physiological myocardial uptake of F18-FDG. Urine analysis testing has shown that patients who did have urinary ketones present did not have any myocardial uptake. However, this was such a small percentage of patients that this may not be significant. The importance of this study to the QLD PET Service is that we will no longer ask patients who are referred for cardiac or mediastinal pathologies to fast for longer than our usual departmental protocol, together with analysis of urine for the presence of ketones, to confirm the body’s switch to fatty acid metabolism.

NOCTURNAL LEG PAIN – A CASE STUDY

J Crouch, Oceanic Medical Imaging

A 75 year old male presented with nocturnal leg pain and increased calcitonin levels. X-ray identified lytic lesion in the right femur, biopsy confirmed metastatic medullary thyroid carcinoma and CT showed metabolises. The patient underwent a thyroidectomy and right radical neck dissection, radiotherapy to the femur, ribs and thoracic spine. Post treatment the patient still had extreme bone pain. Treatment options were considered limited. A bone scan identified low grade uptake in the spine and ribs prohibiting the use of Samarium-153 EDTMP and Strontium-89 as palliative treatment options. A Tc-99m DMSA – V scan also identified low grade uptake, negating the suitability of Rhenium-188 DMSA – V therapy. An Indium-111 Octreotide scan was performed to identify any somatostatin positive tumours. The patient’s scan showed uptake in the right neck, ribs, leg and pelvis suggesting that he was likely to respond to Octreotide therapy. A further positive breast lump and calcitonin levels of >4000 confirmed the appropriateness of this treatment option. After four cycles of Lu-177 Octreotide radiopharmaceutical therapy the patient’s symptoms improved markedly. This presentation will discuss the significant contribution of Nuclear Medicine to diagnosis and treatment decisions in this patient and how the determination of the presence of tumour receptors can lead to targeted therapy.

DETERMINING A PATIENT’S PREGNANCY STATUS PRIOR TO DIAGNOSTIC IMAGING

D James, The University of Newcastle, Hunter New England Imaging

Aim: The aim of this study was to investigate current practice for verifying a patient’s pregnancy status in Australia and NMS knowledge of policy and foetal radiation exposure.

Methods: Semi-structured interviews were conducted with Chief NMS’s and staff NMS in eight (8) nuclear medicine departments throughout Australia. Questions were based around five areas: regulations and policy, foetal radiation exposure, questioning of the patient, difficulties in determining
pregnancy status, and the impact of the use of hybrid imaging. Audiocassettes of the interviews were transcribed and coded using QSR NVivo8.

Results: Questioning of the patient was performed via a written form in one department. Two departments used verbal questioning only whilst the majority used a combination of verbal and a signature. Only four participants (25%) routinely asked for last menstrual period dates. Routine pregnancy testing was not performed. Ninety-four percent of participants were unaware of any national guidelines or policy. Fifty percent of participants said there was no specified age range to question in their department. Teenage patients were considered to be the most problematic for questioning. One participant could provide specific information on the possible biological effects of foetal irradiation.

Conclusion: There is a wide variation in practice between, and within, departments. Participants demonstrated a lack of knowledge and awareness of departmental and national policy and of foetal radiation exposure and its possible biological effects. This study identified a need for a consensus approach to verifying a patient’s pregnancy status across the profession. Continuing education programs are also required to keep NMS knowledge up-to-date.

O10

**68Ga-Octreotate in Neuroendocrine Tumour Imaging: A Case Study**

A. Evans, P. Maton, N. Lenzo, Oceanic Medical Imaging

A 54 year old male with a suspected neuroendocrine tumour (NET) who was experiencing symptoms consistent with carcinoid syndrome presented to our department for an **68**F-FDG PET scan. Although multiple liver lesions had been previously identified on a CT scan, the FDG images failed to demonstrate abnormal tracer distribution. The patient returned ten days later for a **68**Ga-Octreotate PET scan. The images from this scan demonstrated multiple areas of increased Octreotate uptake throughout the liver which corresponded to those lesions seen on the previous CT. Furthermore, a possible primary tumour of neuroendocrine origin was identified in the pancreas. The patient’s diagnosis and management was significantly influenced by the results of the Octreotate scan. Research has shown that **68**Ga-Octreotate is a superior neuroendocrine imaging agent when compared to both **18**F-FDG and **111**In-DTPA-OC (Octreoscan). This case presentation will discuss the benefit of performing **68**Ga-Octreotate PET imaging in patients with suspected NETs when the FDG scan is negative. We will also briefly discuss why PET imaging with Octreotide is more likely to demonstrate NETs than FDG and why Octreotide is superior to conventional nuclear medicine imaging with Octreoscan. With the increasing availability and clinical use of **68**Ga as a PET agent it is important to consider implementing **68**Ga-Octreotate PET imaging as routine practice for the diagnosis and management of patients with suspected neuroendocrine tumours.

O11

**Determining Our Own Future: The Nuclear Medicine Profession**

S. Cowell, E. Read, G. Mandarano, J. Sim, RMIT University

Introduction: Nuclear medicine has always been an innovative profession due to the regular introduction of new radiopharmaceuticals and the continual evolution of its technology. However current and future advances in hybrid imaging combined with a range of other factors such as; an aging workforce, a shift in the type of medical specialist involved in nuclear medicine, increased demand for services and the introduction of national registration provides the opportunity for nuclear medicine scientists to broaden their areas of expertise and responsibility. At the same time there is a real danger that the alignment of these factors could result in the profession being subsumed by medical imaging or other professions. The aim of this paper was to identify available options and to propose possible solutions to ensure the future of the nuclear medicine profession.

Methods: A mixed method approach was undertaken involving (a) an analysis of available literature in workforce planning, changes in technology with a focus on hybrid imaging and the move to targeted radionuclide therapy as well as trends in higher education and (b) a survey of current students, recent graduates and practitioners and (c) an industry focus group.

Results: The results of the study found widespread evidence that hybrid technology SPECT/CT, PET/CT and PET/MRI was driving change in the profession. Workforce studies linked with population data showed an aging Australian population including the nuclear medicine profession with predictions of a doubling of demand for nuclear medicine services by 2020. The results also found an increase in the number of dual qualified practitioners particularly in the private sector with a commensurate increase in income. The survey found a mixed reaction between students and early career practitioners and some late career practitioners with regard for the need for more innovative approaches to education. Specifically their attitudes to graduate entry programs and degrees that lead to multiple qualifications. The focus group were largely in agreement about the impending problem of staff shortages and technology driven change. However there was variation in findings about how to approach national registration.

Conclusions: The study set out to identify available options and to propose possible solutions. All were agreement that technology driven change is a reality that can not be ignored. We will need to be innovative, strategic and articulate in our choice of options if our common goal is ensure the future of our profession.

O12

**Low Dose V/Q SPECT for Pregnant Patients**

A. Culperson, S. White, Sir Charles Gairdner Hospital & W.A. P.E.T Service

Context: Current guidelines for ventilation and perfusion scintigraphy in pregnant patients recommend performing a low dose perfusion scan, with a ventilation scan performed the following day only if the perfusion images are abnormal. At Sir Charles Gairdner hospital in 2008 of 20 pregnant patients investigated with scintigraphy for pulmonary embolism, 50% of patients were required to return to the department for a ventilation study the following day due to abnormal perfusion images. For the pregnant patients undergoing lung scintigraphy at Sir Charles Gairdner Hospital, the majority are referred from King Edward Memorial Hospital for Women, and require ambulance transfer and nurse escort between the two hospitals. For patients returning for ventilation scans this adds to the burden on resources such as the ambulance service, nursing staff, oncall staff over weekends etc as well as increased costs of these resources. Out of the 10 perfusion only studies performed only 1 demonstrated definite PE and 1 homogeneous perfusion to the lungs and hence a normal study. The remaining 8 were reported to have mild irregularities or small perfusion defects thought to be due to artefacts, atelectasis or airways disease. With V/Q SPECT being reported as having increased sensitivity, specificity and accuracy compared to static imaging, the department implemented SPECT imaging for pregnant V/Q studies in order to help characterise the mild irregularities and small defects and reduce the number of intermediate reports.

Objectives: As 50% of pregnant patients were returning for ventilation studies and with a number of intermediate perfusion only studies, a low dose 1 day V/Q SPECT protocol was implemented using a LEAP collimator, a low ventilation dose of 0.5-1Kcnts/s and a perfusion dose titrated to provide the minimum number of counts required for perfusion acquisition. Perfusion doses injected ranged from 50-80MBq, which is within the departments guidelines for **99m**TcMAA perfusion doses for pregnant women of 40–90MBq.

Discussions: Low dose V/Q SPECT imaging was possible and well tolerated by patients. Acquiring a low dose ventilation and perfusion scan the same day provides similar doses to pregnant patients as a 2 day protocol. The addition of SPECT imaging has increased reporter confidence and has led to being able to detect small perfusion defects as subsegmental pulmonary emboli.
A SURVEY OF NUCLEAR MEDICINE PHYSICIANS OPINION ON THE DEVELOPMENT OF A CATEGORY OF ADVANCED PRACTICE FOR NUCLEAR MEDICINE SCIENTISTS IN AUSTRALIA

D Lyall, University of Newcastle
T Smith, Highlands Nuclear Medicine
D James, University of Newcastle
E Adams, Charles Sturt University

Introduction: The aim of this survey was to identify areas Nuclear Medicine Physicians (NMPs) consider appropriate for advanced practice roles for Nuclear Medicine Scientists (NMSs). The development of an advanced practice role for NMS in Australia is important, as there has been significant advancement in role extension and advanced practice for NMSs in the UK & United States, as well as in other allied health professional such as radiography in Australia.

Methods: An online survey of NMPs was conducted in 2010 to investigate support for the development of a category of advanced practice for Nuclear Medicine Scientists (NMSs) and identify areas NMPs consider appropriate for advanced practice NMS roles. Based on the literature and data from the 2009 NMS survey 15 possible areas were nominated for NMPs to comment on as potential advanced practice areas.

Results: Twenty five (25) NMPs from Australia and New Zealand responded, with 52% of respondents working in a private practice environment. 76% of NMPs surveyed indicated support for the development of an advanced practice role for NMSs. The data showed greater variation when examining NMPs responses to which areas they consider appropriate for advanced practice roles. 88% of NMPs responded they supported NM educator as an advanced practice role, 82% support radiation safety officer, 70% supported radiopharmacy and only 25% supported clinical pharmacist as an advanced practice role. When asked if they would be willing to mentor/supervise NMS training in advanced practice roles 79% of respondents answered ‘Yes’. NMP’s indicated the minimum professional experience required for a NMS prior to commencing training/education for the following advanced practice roles, would be up to 5 years professional experience for Diagnostic CT 81%, PET/CT for RT Planning 86%. 60% of NMPs responded the NM education role would require 5–10 years of professional experience as a minimum.

Conclusion: The survey results clearly demonstrate NMPs strong support for the development of an advanced practice role for NMSs. NMPs reported a strong commitment to advanced practice education/training with 79% of respondents stating they would be willing to mentor/supervise NMSs training in advanced practice roles.

THE PROCESS OF ACQUIRING A DATASET OF ‘NORMAL’ CEREBRAL FDG PET/CT SCANS IN CHILDHOOD

K London, The Children’s Hospital at Westmead; and Discipline of Paediatrics and Child Health, Sydney University Medical School, R Howman-Giles, The Children’s Hospital at Westmead; Discipline of Paediatrics and Child Health, Sydney University Medical School; and Discipline of Imaging, Sydney University Medical School

Context: The changing pattern of cerebral FDG distribution occurring throughout normal childhood development is incompletely understood. Existing reports are sparse and typically involve the description of small numbers of children who have undergone cerebral FDG PET/CT imaging to evaluate a neurological event and/or receiving anti-epileptic medication. A database of normal paediatric cerebral FDG PET/CT scans is sorely needed to provide a reference against which abnormal cerebral scans can be identified. Such a database could also be used in comparative model-based morphometric analyses such as statistical parametric mapping (SPM).

Objectives: We aimed to recruit a dataset of ‘normal’ cerebral FDG PET/CT scans for the purposes of (i) describing patterns of brain glucose metabolism during normal childhood development and (ii) potential use in SPM analysis.

Methods: Patients referred for a whole body PET/CT scan investigating suspected or proven extra-cranial solid tumours prior to chemotherapy with normal neurological co-morbidities, no CNS metastases and not taking anti-epileptic medication were included. The dedicated cerebral FDG PET/CT scan performed as part of their whole body scanning protocol was retrieved and considered to represent a map of cerebral glucose utilisation for a normal child at their age at the time of the scan.

Results: 43 scans were eligible (mean age 9.3yrs, range 11mths–16yrs). These included Patients with Hodgkin’s Disease (9), Non-Hodgkin’s Lymphoma (7), soft tissue sarcoma (4), Ewing’s sarcoma (4), osteosarcoma (2), primitive neuroectodermal tumours (2), germ cell tumour (2), Langerhan cell histiocytosis (2) and 1 each of Wilms’s tumour, renal cell carcinoma, nasopharyngeal carcinoma, neuroblastoma, malignant peripheral nerve sheath tumour and melanoma. 6 patients with eventual diagnoses of non-malignant conditions were also included (mesenteric adenitis, reactive adenopathy, haemangioma, non-specific weight loss). Possible confounding factors which challenge the validity of the ‘normal’ dataset include recent administration of anaesthetic agents and the psychological state of children meeting the inclusion criteria.

Discussions: Normal FDG PET/CT cerebral scans have not been adequately described. The dataset so far (43 scans) can serve as a reference for qualitative visual assessment, particularly useful in the younger age range where patterns of normal FDG uptake may be considerable different from older children/adults. When more patients are included, descriptive SPM analysis by age group will be useful to statistically characterise changes in regional brain glucose utilisation that occur during normal development.
ACCELERATED PROTOCOL FOR 99mTc-MIBI REST MYOCARDIAL PERFUSION IMAGING (Mallinkrodt Award Entry)

A. Osley, A. Campbell, W. Macdonald, Royal Perth Hospital, Perth, Australia

Aim: To assess if rest images in myocardial perfusion scans using 99mTc-MIBI can be acquired immediately post-injection rather than waiting 1h post-injection. The aim was to prove that there was no difference in image quality gained by waiting 1h, that the sub-diaphragmatic extra-cardiac activity did not significantly impair the early images and also to see if the consumption of 400 ml of water before acquiring the early images improved the image quality.

Methods: Resting gated myocardial perfusion SPECT images were acquired on 73 subjects 5 min following injection of a standard dose of 99mTc-MIBI and repeated at 60min. Half the subjects consumed 400 ml of water prior to early image acquisition to see if this reduced interference from gut activity. Images were reconstructed using AutoQuant software. Regions of interest were drawn over the myocardium on the first projection of the 5 minute and 60 minute acquisitions and the decay corrected total counts compared. Four experienced Nuclear Medicine physicians evaluated the early and late images in a blinded fashion for image quality using a 4-point rating scale, ranging from 0 (no activity) to 3 (severe extracardiac activity interfering with image interpretation). Each left ventricular territory was rated as normal, reversible defect, infarct or attenuation artefact. Any acquisitions considered as non-diagnostic were excluded from further analysis.

Results: There was no difference in decay-corrected myocardial count statistics between the early (5min) and delayed (1h) images. 12 studies were considered non-diagnostic – there was a trend in favour of water consumption for a diagnostic quality image, however, this did not reach statistical significance (p = 0.08). Of those studies considered diagnostic, there was no significant interference in the overall ratings of cardiac image quality between studies acquired at 5min and those acquired at 1h. Consumption of water prior to image acquisition improved interference from bowel activity at 5min (p < 0.002) but not at 1h (p = 0.40). Water consumption did not improve interference from hepatic activity at either time point.

Patients with significant or severe extra-cardiac activity

<table>
<thead>
<tr>
<th>Time</th>
<th>Liver</th>
<th>Bowel</th>
</tr>
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<tbody>
<tr>
<td>5min + H₂O</td>
<td>17/35 (48.5%)</td>
<td>3/35 (8.5%)</td>
</tr>
<tr>
<td>5min</td>
<td>14/38 (36.8%)</td>
<td>20/38 (52.6%)</td>
</tr>
<tr>
<td>60min + H₂O</td>
<td>10/35 (28.5%)</td>
<td>6/35 (17.1%)</td>
</tr>
<tr>
<td>60min</td>
<td>8/38 (21%)</td>
<td>15/38 (39.4%)</td>
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Auto-contouring using the AutoQuant software package was successful 99% of the time at 1h, but only 74% of the time at 5min (p = 0.002) due to interference from hepatobiliary (but not bowel) uptake. Consumption of 400ml of water immediately prior to 5min image acquisition in half of the patients did not improve auto-contouring performance in AutoQuant. Among those studies considered diagnostic there was no significant difference in summed rest scores, nor in the visual ratings of the presence/absence of perfusion defects by the nuclear medicine physicians.

Conclusions: Rest myocardial perfusion images can be acquired 5min following injection of 99mTc-MIBI. There is no significant difference in the overall quality of cardiac images acquired at 5min compared to those acquired at 1h. Consumption of 400ml water prior to 5min image acquisition improves interference from adjacent bowel activity, but not from the liver. Auto-contouring of myocardial activity using AutoQuant software is less successful at 5min due to hepatobiliary activity, which may affect the accuracy of resting left ventricular function assessment. Early image acquisition is likely to significantly improve departmental workflow.
of PCI, and preference for medical management, in the patient with a negative FFR (FFR > 0.75) in preference for medical management. However, the use of FFR remains a class III indication (not recommended) in the presence of an unequivocally positive MPI, and is limited in its assessment of a series of stenoses.

Aim: To examine the use of FFR and MPI in an Australian tertiary hospital, and their comparative ability to predict future symptoms and cardiac events. In addition, we aimed to explore whether there may be a role for a strategy of positive MPI/intermediate FFR (currently negative FFR) to guide revascularisation.

Methods: A retrospective analysis of consecutive patients undergoing cardiac catheterisation over a 30 month period (January 2008–July 2010) was undertaken and identified 32 patients who had FFR performed for assessment of an intermediate coronary lesion. This patient cohort was then compared with the nuclear database to identify 20 patients that underwent MPI during the same investigation process, and a chart review of all 32 patients was performed. FFR ≤ 0.75 was considered a positive test. Follow up to a period of 6 months post FFR was undertaken, assessing for cardiac end points (CE) which were defined as angina (use of sublingual GTN >2 times/week), unplanned cardiac readmission and unplanned revascularisation.

Results: 32 patients were identified, 20 of who also underwent MPI. 59% were male. There were no deaths or myocardial infarcts. A planned revascularisation occurred in 14 patients, 7 with +ve MPI and 7 with no MPI. None of these patients had a CE. 1 patient was managed medically with positive MPI and positive FFR due to lack of symptoms. 1 patient with positive MPI was medically managed, as FFR was technically unsuccessful, with recurrent angina in the follow up period. A total of 7 (22%) patients had CE at 6 months follow up.

Table 1. CE by functional assessment method

<table>
<thead>
<tr>
<th>FFR +ve</th>
<th>FFR –ve</th>
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<tbody>
<tr>
<td>MPI +ve</td>
<td>1 (n = 6)</td>
</tr>
<tr>
<td>MPI –ve</td>
<td>0 (n = 0)</td>
</tr>
<tr>
<td>No MPI</td>
<td>0 (n = 7)</td>
</tr>
</tbody>
</table>

p = not significant. FFR +ve = FFR ≤ 0.75; FFR –ve = FFR > 0.75.

Of the 10 patients with positive MPI and negative FFR, 8 were managed medically with the other 2 having planned revascularisation. All 6 CE occurred in the medical management cohort.

Conclusion: FFR assessment of angiographic intermediate lesions is sometimes employed in a patient with a positive MPI, despite a class III indication. In this small tertiary cohort, positive MPI correlated with CE at 6 months, regardless of therapy. There were differences with increased CE in patients with positive MPI and negative FFR managed medically compared to those undergoing revascularisation. Further study could address this patient cohort with MPI +ve/FFR –ve who may benefit from revascularisation despite FFR > 0.75. There may exist an intermediate FFR value that in addition to positive MPI could direct intervention to improve cardiac morbidity.

O21 QUALITATIVE ICTAL SPECT COMPARISON TO SISCOM ANALYSIS FOR SEIZURE FOCUS LOCALISATION IN AUSTRALIAN PATIENTS WITH TEMPORAL LOBE EPILEPSY (ANZAPNM Award Entry)

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M Newton, S Berkovic, Department of Neurology, Austin Health, Melbourne, Australia

Background: Subtraction ictal SPECT CO-registered to MRI (SISCOM) is an imaging tool developed to help localise seizure foci in patients being evaluated for epilepsy surgery. SISCOM is validated in North American and Japanese populations however the heterogeneity of the Australian demographics and different imaging infrastructure may alter its performance in the local environment.

Aim: The aim of the study is to validate the use of SICOM analysis compared to qualitative interpretation of ictal SPECT in patients with temporal lobe epilepsy being evaluated for epilepsy surgery.

Methods: The study cohort consisted of patients with temporal lobe epilepsy evaluated at the Comprehensive Epilepsy Program at Austin Health who underwent surgery between 2004 and 2008. The seizure focus localised on ictal SPECT, MRI and SISCOM was validated against the outcome of temporal lobectomy with all patients having at least 2 years of clinical follow-up. The visual interpretation was based on the clinical report which was reported by an experienced nuclear medicine physician. SISCOM analysis had a threshold Z value of >2. Successful surgery was defined as seizure freedom or improvement in seizure frequency or intensity by at least 50%. Pathologic correlation was also performed.

Results: A cohort of 31 patients were entered into the study. Significant clinical improvement following surgery was reported in 28/31 (90.3%) with 3/31 (9.7%) of patients have ongoing seizures. Of the 28 patients who responded to treatment, 24/28 (85.7%) were seizure free for 2 years, while 4/28 (14.3%) had an improvement in seizure frequency/intensity by at least 50%. Prospectively, visual interpretation of the ictal and interictal SPECT correctly lateralised the ictal focus in 23/28 (82.1%) while SISCOM correctly lateralised the ictal focus in 18/28 (64.3%).

Conclusion: Visual interpretation of ictal SPECT accurately localises the epileptogenic focus and is predictive of seizure freedom over at least 2 years. SISCOM does not contribute to seizure focus localisation above visual interpretation in Australian patients with temporal lobe epilepsy undergoing temporal lobectomy.
FDG PET IN CUTANEOUS MALIGNANT MELANOMA: TO DETERMINE THE PREDICTIVE VALUE COMPARED TO PATHOLOGIC T STAGE AT INITIAL ASSESSMENT: THE RECURRENCE INTERVALS ON FOLLOW-UP IMAGING (ANZAPNM Award Entry)

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A Campbell, Royal Perth Hospital Nuclear Medicine Department, Perth, Australia
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Introduction: FDG PET imaging has been shown to have a role in the initial staging of advanced (AJCC III and IV) CMM. There is limited evidence for the use of FDG PET in early stage disease (AJCC I and II) and for the use of FDG PET in follow up of patients with no clinical evidence for recurrence.

Aim: To determine the predictive value of FDG PET in the initial staging and follow up of CMM compared to pathologic T Stage.

Methods: All FDG PET scans in patients with CMM, performed between December 2002 and June 2009 were reviewed. Patients were excluded if CMM was diagnosed more than 12 months prior to the PET study being performed, if there was evidence of metastatic disease (clinical assessment, diagnostic or highly suspicious imaging findings or histopathology) at the time of initial referral, previous history of melanoma or other metastatic malignancy or if the timing of initial surgery could not be obtained. Patient demographics including sex, age, lesion location were obtained. Breslow depth was recorded where available. Of the 1199 patients (2310 FDG PET scans), 307 were included. The clinical report of the initial staging PET scan was used to determine presence or absence of metastasis, equivocal cases having blinded consensus review. A subset of patients with initial positive scans were followed up until the lesions were determined as true positive or false positive based upon histology or pathology at the time of initial referral, previous history of melanoma or other metastatic malignancy or if the timing of initial surgery could not be obtained. Patient demographics including sex, age, lesion location were obtained. Breslow depth was recorded where available. Of the 1199 patients (2310 FDG PET scans), 307 were included. The clinical report of the initial staging PET scan was used to determine presence or absence of metastasis, equivocal cases having blinded consensus review. A subset of patients with initial positive scans were followed up until the lesions were determined as true positive or false positive based upon histology or sequential imaging. Patients negative for metastasis at initial assessment had follow up FDG PET imaging during the study period. These scans were reviewed to determine the time interval between initial diagnosis and a positive study.

Results: Breslow depths were available for 129 patients. 67% of these had a Breslow depth exceeding 2 mm, indicating the majority of subjects referred for PET imaging had advanced CMM (AJCC stage III & IV). At initial FDG PET assessment 65 patients (21%) had studies positive for metastasis. 34 of these were subject to follow up and in this group metastasis was confirmed in 27 cases, indicating a positive predictive value of 79%. Of this group 83% were advanced stage, the majority being Stage 4. 242 patients were negative for metastasis at initial assessment and 93 of these had follow up imaging performed within the study period. The median number of follow-up PET scans was 3 (range 2–14 scans). 15% were performed between 2–5 months, 30% between 6–9 months 25% between 10–12 months and 30% >12 months. During the follow up period, 38 patients returned a positive PET scan. For this group, positive PET scans at the following durations following initial assessment, 2–5 months, 30% 6–9 months, 15% 9–12 months, 18%, 12–18 months 24% and 40% exceeding 18 months. Performing a Spearman rank correlation revealed a weak but statistically significant negative correlation between the time to a positive PET scan and Breslow depth (rho = −0.322, p = 0.048).

Conclusion: Our preliminary results confirm that FDG PET imaging is of value in the initial staging of CMM with an overall positivity rate of 21% with an overall positive predictive value of 79%. In the whole patient group the median follow up interval was 9 months (range 1–45 months) with the highest positivity rate at around 12 months. These results suggest there is little value in performing follow up PET imaging prior to 6 months following an initial negative PET scan.
O24
ANZSNM WEBSITE FOR QUALITY ASSURANCE OF CLINICAL STUDIES
P Collins, Department of Nuclear Medicine, PET and Bone Densitometry, Royal Adelaide Hospital
R Barnett, Department of Nuclear Medicine and Ultrasound, Westmead Hospital

It is important that clinical studies are evaluated to ensure both their accuracy and reproducibility. Audits are used for benchmarking against National standards, internal validation of new software releases and training of operators within a site. They can be conducted either locally or nationally but considerable resources are usually required to manage this process. The aim of this project was to develop an online software tool for evaluating clinical studies that can be used by both Society members and approved International participants. The software enables users to (i) participate in an existing audit (ii) test their study results against a training dataset or (iii) setup and administer their own audit (currently only ANZSNM members). Open source software (PHP, MySQL and Moodle) is employed – with a modular design so that additional data entry and report forms can be added without changing the existing code. Datasets are downloaded from the website, processed on the users clinical workstation and the results entered online. Gated blood pool and renal datasets are currently available (in Interfile and DICOM format). Datasets are used to evaluate clinical software and/or operator proficiency. A future addition to the website will include datasets to test a physician in interpreting studies where there is minimal post acquisition analysis (for example planar bone scan images). In conclusion, an online software tool (http://apps.anzsnm.org.au/sqa) has been developed that allows users to conduct/participate in small to large audits, or test their analysis skills against ‘expected’ values using training datasets.

O25
ESTIMATED EFFECTIVE RADIATION ABSORBED DOSES FOR LOW DOSE CT PROTOCOLS
A Culverson, P Brayshaw, J Boucek, Sir Charles Gairdner Hospital & W A P E T Service

Context: Currently low dose CT is becoming widely implemented in Nuclear Medicine as part of hybrid PET/CT and SPECT/CT imaging. Sir Charles Gairdner Hospital currently has 3 Siemens SPECT/CT sychias and 1 Siemens PET/CT Biograph, with a second PET/CT to be installed this year. With no guidelines or protocols established for low dose CT parameters, the department used recommendations from the vendors applications specialists and from parameters stated in clinical publications on SPECT/CT imaging. Although there are numerous publications on the clinical value of low dose CT fused with SPECT, to date there has only been one publication on the radiation dose exposure of low dose CT protocols.

Objectives: At SCHR Charles Gardiner hospital written protocols were established for all low dose CT scans and parameters compared to Australian Institute of Radiology CT guidelines. Estimates of effective radiation absorbed dose were calculated using the ImPACT program for each protocol.

Discussions: By reviewing low dose CT protocols, comparing to AIR guidelines and DICOM issues, it is important to ensure that the patients are receiving appropriate dose that is within the national guidelines. The summary of dose absorbed for common low dose CT protocols is shown in the table below.

O26
NUCLEAR MEDICINE PHYSICIAN INTERPRETATION OF PLANAR LUNG PERFUSION SCANS – A QUALITY ASSURANCE STUDY
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S Harvey, Centre for Medical Radiation Physics, Faculty of Engineering, University of Wollongong, Wollongong, Australia; and Department of Nuclear Medicine, Wollongong Hospital, Level 1 Block C, Crown Street, Wollongong, Australia
A Rosenfeld, Centre for Medical Radiation Physics, Faculty of Engineer- ing, University of Wollongong, Wollongong, Australia

Background: Quality Assurance (QA) is an important consideration in order to maintain high quality diagnostic results. The accuracy of image interpretation is part of the quality QA process. A QA study was conducted using an anthropomorphic lung phantom, manufactured in 2009 at the Centre for Medical Radiation Physics, University of Wollongong. The phantom was purposely built to simulate mismatch defects in lung perfusion scans of patients with suspected pulmonary embolism (PE).

Aim: The aim of the study was to evaluate the phantom as a useful QA tool by comparing lung perfusion scan interpretations in a group of Nuclear Medicine Physicians. The planar imaging modality was chosen for the study as it is the main method used to diagnose mismatch lung perfusion defects at the Department of Nuclear Medicine, Wollongong Hospital.

Methods: The lung phantom was assembled and prepared with Tc-99m solution prior to each planar scan. The scans were carried out using an ADAC Forte dual head gamma camera. Firstly three cases with suspected PE were simulated. Next, two intermediate probabilities and one high probability of PE events (based on the revised PIOPED criteria) were simulated. Physicians were blinded and asked to diagnose the six sets of planar perfusion images. The physicians were required to identify the PE probability stage of each set based on the revised PIOPED criteria. Assumptions with the planar perfusion images were that i) all defects were mismatches and ii) the chest radiograph was normal. In the revised PIOPED criteria percentages for segmental mismatch defect (SMD) < 25% = small, moderate = 25–75% SMD and ≥ 75% = large. As an example, ≥ 2 large SMD are borderlinc interme- diate to high probability. Misdiagnoses of SMD percentages may lead to misinterpretation of scintigraphic images.

Results: Interpretation of segmental defect percentages affect the probability of PE stage in the revised PIOPED criteria. All bronchopulmonary segments were not of the same size. Misdiagnosis of the PE probability stage appeared high when a larger size of bronchopulmonary segment defect was interpreted as two large segmental defects. Misdiagnoses of lung perfusion scan was also high in a situation where 1 large + 1 moderate defects were interpreted as 2 large defects.

Conclusions: The study was aimed at obtaining an accurate interpretation of segmental defect percentages. Preliminary QA results show that diagnosis of the simulated lung perfusion images was often misinterpreted due to the borderline probability of PE based on the revised PIOPED criteria. The borderlines are i) borderline at intermediate to high probability of PE and ii) borderlinc at low to intermediate probability of PE. Physicians from other hospitals were then invited to participate in the study and further results will be presented in due course.

Radiopharmaceutical Sciences – Free Papers
(Session B6)

O27
“GA-DOTATATE: SYNTHESIS, AUTOMATION, AND QUALITY CONTROL
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D Macfarlane, Royal Brisbane & Women’s Hospital, Queensland, Australia
M Combs, A Yordanov, Bioscan, Inc, Washington DC, United States

Background: PET/CT with [Ga-68]DOTA-Tyr(3)-Thr(8)-octreotate), a somatostatin receptor binding radio-tracer, is superior to Thr(8)-octreotate, a somatostatin receptor binding radio-tracer, is superior
to conventional SPECT imaging in the assessment of neuroendocrine tumours. This and the availability of Ga-68 via commercially available generators have influenced an increase in clinical demand for [Ga-68]DOTAtate. The result is a proliferation of Ga-68/Ga-68 generators and radio-synthesis techniques in Australia. At present, there is a range of commercially available radio-synthesis modules. These modules are expensive and often dedicated to F-18, C-11, or Ga-68 labelling, and hence a more versatile module is very attractive.

**Aims:** The aim is to automate [Ga-68]DOTAtate synthesis on a ReFORM™ module designed originally for C-11 and F-18 radio-labelling and to develop a comprehensive and robust QC method.

**Methods:** The fully automated synthesis was achieved using a modified ReFORM™ (Bioscan) synthesis module coupled to a Ge-68/Ga-68 generator (Eckert & Ziegler) and peristaltic pump. DOTAtate precursor (ABX) was labelled using the method of Decristoforo et al. (2007)* with purification using a Sep-Pak® Light C18 cartridge (Waters), followed by sterile filtration via a Millex-GV® (Millipore) filter. QC testing included pH, radiochemical purity by both HPLC and TLC, and radio-nucide purity. Gradient HPLC was performed with a Gemini 4.6 × 150mm, 3μm column (Phenomenex) and a mobile phase of water/ACN with 0.1% TFA. TLC was used to test for colloidal Ga-68 using TLC-SC® (Varian) strips and 1 M NH₄Ac/MethOH (1:1). Further, Ge-68 breakthrough was determined by gamma counting 24 hours post-synthesis. Product samples were tested for sterility and apyrogenicity.

**Results:** [Ga-68]DOTAtate was synthesised in 40% non decay-corrected radiochemical yield in 20 minutes (320MBq product from 800 MBq generator elution) including purification, formulation and sterile filtration. Production of [Ga-68]DOTAtate was supported by a robust QC method achieved in 20 minutes. All product specifications were met with a radiochemical purity >95% and Ge-68 not detected.

**Conclusion:** Fully automated synthesis of [Ga-68]DOTAtate with high radiochemical and radio-nucide purity was achieved on the ReFORM™ module. A comprehensive and robust QC method was developed, suitable for routine clinical application. The versatile ReFORM™ module supports GMP, is easy to set-up, and is easy to clean due to the use of disposable cassettes. Further work is required to optimise the radiochemical yield however the immediate benefit of automation is the reduced radiation dose to the operator.


**O29 INITIAL CHARACTERISATION OF AN AUTOMATED 68Ga-DOTATATE GMP SYNTHESIS PROCEDURE**

G Snowdon, E Bailey, D Bailey, P Roach, Department of Nuclear Medicine, Royal North Shore Hospital, Australia. J Kaufmann, Eckert & Ziegler, Europe GmbH, Berlin, Germany.

**Aim:** To introduce, validate and characterise a GMP-compliant automated synthesis module for the manufacture of [68Ga]DOTATATE for imaging somatostatin-expressing (sst2) neuro-endocrine tumours with PET/CT.

**Methods:** The ‘Modular Lab PharmTracer®’ cassette-based, computer controlled, modular, automated radiopharmaceutical production unit has been installed in our PET radiopharmacy. Installation included HPLC and TLC for in-house quality control. A 1.11GBq Eckert & Ziegler [68Ga]Ga generator required 6 hours after initial training, characterisation included radiochemical yield and purity. 68Ga-DOTATATE radiochemical purity was consistently greater than 90% on HPLC. The synthesis took approximately 30 minutes followed by HPLC and TLC analysis. Production yield was approx. 80%. Minimal free [68Ga]Ga was detected in the final product. Minor, unidentified, [68Ga]Ga-peptide fragments were also present. The new [68Ga]Ga generator required approx. 7 hours between elutions to achieve optimal yield but can be shortened to 2 hours and still provide sufficient [68Ga]DOTATATE for 2 patient doses (approx. 200MBq each) from an individual disposable cassette. We anticipate only one patient dose will be produced per cassette as the generator anticipates the working life of the generator is approx. 12 months.

**Conclusions:** The unit installed appears suitable for providing sufficient [68Ga]DOTATATE for a moderate workload in the PET facility (1–2 patients per day). The modular nature is also adaptable in the future to produce other compounds, including radiolabelled therapies.
Results:

Table 1. Biodistribution of $^{123}$I-PAl2 and $^{131}$I-PAl2 Δ CD-loop in PC-3 prostate adenocarcinoma tumour bearing mice. Tumour expression in percent of injected dose per gram of tissue (%ID/g) (n = 4/5)

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>Tumour</th>
<th>Blood</th>
<th>Liver</th>
<th>Kidney</th>
<th>Thyroid</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;sup&gt;123&lt;/sup&gt;I-PAl2</td>
<td>5</td>
<td>4.4 ± 0.6</td>
<td>20.39 ± 3.22</td>
<td>9.78 ± 1.23</td>
<td>17.11 ± 5.10</td>
</tr>
<tr>
<td>10</td>
<td>9.0 ± 0.3</td>
<td>6.13 ± 0.99</td>
<td>4.89 ± 0.47</td>
<td>22.64 ± 2.24</td>
<td>2.65 ± 0.55</td>
</tr>
<tr>
<td>60</td>
<td>1.08 ± 0.36</td>
<td>5.03 ± 0.94</td>
<td>3.41 ± 0.31</td>
<td>21.85 ± 3.54</td>
<td>4.13 ± 3.47</td>
</tr>
<tr>
<td>180</td>
<td>0.34 ± 0.07</td>
<td>1.29 ± 0.16</td>
<td>0.53 ± 0.35</td>
<td>5.87 ± 0.99</td>
<td>2.73 ± 1.46</td>
</tr>
<tr>
<td>360</td>
<td>0.01 ± 0.00</td>
<td>0.02 ± 0.00</td>
<td>0.02 ± 0.01</td>
<td>0.06 ± 0.01</td>
<td>0.08 ± 0.01</td>
</tr>
<tr>
<td>&lt;sup&gt;131&lt;/sup&gt;I-PAl2 Δ CD-loop</td>
<td>5</td>
<td>0.71 ± 0.16</td>
<td>17.28 ± 1.48</td>
<td>15.45 ± 2.53</td>
<td>33.38 ± 2.66</td>
</tr>
<tr>
<td>10</td>
<td>0.88 ± 0.12</td>
<td>4.01 ± 0.49</td>
<td>0.96 ± 0.01</td>
<td>34.41 ± 5.39</td>
<td>3.02 ± 1.51</td>
</tr>
<tr>
<td>60</td>
<td>0.44 ± 0.17</td>
<td>1.15 ± 0.15</td>
<td>2.33 ± 0.31</td>
<td>7.73 ± 1.20</td>
<td>1.14 ± 0.06</td>
</tr>
<tr>
<td>180</td>
<td>0.10 ± 0.04</td>
<td>0.17 ± 0.05</td>
<td>0.46 ± 0.05</td>
<td>0.69 ± 0.20</td>
<td>2.86 ± 0.38</td>
</tr>
<tr>
<td>360</td>
<td>0.10 ± 0.01</td>
<td>0.16 ± 0.01</td>
<td>0.41 ± 0.11</td>
<td>0.74 ± 0.17</td>
<td>5.7 ± 2.03</td>
</tr>
</tbody>
</table>

Conclusion: Both $^{123}$I-PAl2 and $^{131}$I-PAl2 Δ CD-loop showed low uptake in PC-3 prostate adenocarcinoma. Major differences in tissue distribution were seen comparing the two radiotracers, however generally no significant change in tumour uptake or patterns of clearance from blood or extracellular systems was found, although PAΔ2Δ CD-loop did exhibit a more rapid elimination. Low thyroid uptake at late time points indicates that the radiotracer is being excreted intact and overall the rapid clearance from auxiliary organs makes PAΔ2Δ CD-loop an ideal candidate for further modifications in attempt to increase tumour accumulation of the radiotracer for application in diagnostic imaging.

PET Technology – Free Papers (Session B7)

O31 ATTENUATION CORRECTION ARTEFACTS IN PET IMAGES USING CONTRAST-ENHANCED CT – A PICTORIAL ESSAY

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Context: Usually attenuation correction (AC) of images acquired by a hybrid positron emission tomography/CT scanner (PET-CT) is performed using a contemporaneously acquired non-enhanced low dose CT scan. This AC however can be performed using a full dose iodinated contrast-enhanced CT (CECT) performed at the same patient visit (Berthelsen et al. EJNMMI 2005). While there are obvious benefits in having a fused PET-CECT image in terms of lesion localisation and interpretation, this technique does have the potential to create artefacts and imaging appearances that are different to routine PET images. This may lead to reporting problems and errors in interpretation if these are not appreciated and understood.

Objectives: The aim of this essay is to document and highlight important issues related to performing AC of PET images using a full dose CECT versus the low dose non-enhanced CT that is routinely acquired. Potential problems may arise as administered contrast attenuates the CT x-ray source much more than 511keV photons in PET and this leads to “overcorrection” because the algorithm erroneously corrects for tissues of higher density than are in fact located where there are high contrast concentrations. In addition the distribution of intravenous iodinated and oral contrast is not static, but this is of lesser importance. Also the CT scan length and area of body coverage are usually not the same for CECT compared to the low dose CT in PET. Patient movement or positioning may also vary leading to misregistration, particularly with single breath-hold versus quiet respiration acquisitions, peristaltic movement and positioning of the arms. The imaging protocol used for the CECT acquisition is important in minimising some of these factors. It must also be appreciated that calculated values such as SUV may vary slightly on images that have had AC performed using CECT versus low dose CT. This has implications that are likely more important for research than in clinical interpretation, but may be relevant to therapeutic monitoring. Imaging examples of the issues identified are illustrated. Another important issue is that of patient radiation exposure when a full dose “diagnostic” CECT is performed for AC. If this however replaces a separate diagnostic CT study then the overall patient dose may in fact be reduced, as the low dose CT for the PET-CT would be omitted. The CECT would ideally be co-reported with the PET scan, and necessarily by a Radiologist or dual-trained Nuclear Physician. A possible area of initial application of this technique is primary staging of colonic carcinoma.

Discussions: Contrast-enhanced PET-CT is feasible and has potential benefits. A number of potential image artefacts and practical limitations of the technique need to be identified. Quantified results such as SUV will be affected. Overall patient dose is not necessarily increased, although duplication of studies needs to be avoided when applied in clinical practice.

O32 INCREMENTAL BENEFIT OF HIGH RESOLUTION PET/CT THROUGH THE LIVER USING A NEW GENERATION TOF SCANNER

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Background: While the benefit of dual time point PET imaging in detection of hepatic metastases has been described with previous generation scanners, its value with the newer time-of-flight (ToF) scanners is unknown.

Aim: To evaluate the incremental benefit of high resolution PET/CT acquisition through the liver after routine whole body FDG PET/CT imaging using new generation ToF scanners.

Methods: A total of 33 patients with known or suspected hepatic metastases underwent 35 whole body FDG PET/CT’s on a Siemens Biograph mCT/64 ToF scanner, immediately followed by a single bed FDG PET/CT of the liver. At 60 minutes after FDG injection (dose 250–350 MBq), a routine whole body scan (120–150 seconds per bed position) was performed and, 20–25 minutes later, an additional liver bed PET study was acquired for 240 seconds. The 70 scans (2 scans per patient) were reviewed separately by 2 experienced nuclear medicine specialists. Lesions were classified as malignant, benign or equivocal with a 4 point scale used to describe reporter confidence. Detection rates and reporter confidence were compared between routine whole body and single bed liver studies. Where available, lesions were correlated with diagnostic post contrast CT and MRI.

Results: A total 122 lesions were identified on routine whole body FDG PET/CT in or near the liver. The high resolution PET/CT scans of the liver demonstrated 123 lesions, with 5 lesion discrepancies (4%) identified in 5 of 35 studies (14%). Lesion analysis showed that the discrepancies included 2 equivocal liver lesions seen on whole body PET not present on the high resolution liver PET or diagnostic CT (most likely due to noise artefact) as well as an additional 2 liver metastases and 1 peritoneal metastasis which were resolved only on the high resolution PET/CT scans. On a per patient basis, the high resolution PET/CT protocol significantly altered the interpretation of only 1 study (3%), where an additional liver metastasis was the only relevant finding. There was no significant change in either reporter’s confidence between the whole body and single liver bed studies.

Conclusion: High resolution PET/CT imaging of the liver adds little to the diagnostic accuracy and scan interpretation of routine whole body PET/CT scans performed on the new generation ToF PET/CT scanner. An additional liver image is not recommended for routine clinical practice in most patients.

O33 AN OBJECTIVE EVALUATION OF THE IMPACT OF POST-RECONSTRUCTION FILTERING ON TIME-OF-FLIGHT PET

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Aim: Time-of-Flight (ToF) PET is being more commonly used in PET/CT. The aim of this study was to evaluate the impact of post reconstruction filtering on image quality and quantitative results using low-dose ToF PET.

Methods: A retrospective study using data acquired as part of a routine clinical oncology PET/CT scan. Patients were injected with approximately 250 to 300 MBq [18F]-FDG and scanned at 60 minutes after injection using a Siemens Biograph mCT (64 slice) acquired at 120 seconds per bed position. The study was reconstructed using a ToF, 3D, UltraHD resolution recovery iterative reconstruction algorithm at 21 subsets and 2 iterations,
PET NON-FDG & Therapy – Free Papers
(Session B8)

O34
64 SLICE, TIME OF FLIGHT FDG PET/CT OF THE HEAD AND NECK – COMPARISON OF WHOLE BODY PET/CT WITH A DEDICATED HEAD AND NECK PET/CT

A Lee, S Hain, Royal North Shore Hospital, Australia

Aim: To assess if a dedicated head and neck PET/CT study improves accuracy and diagnostic confidence compared with a standard whole body PET/CT study in head and neck cancers when using a new generation time of flight PET/CT camera.

Methods: 30 consecutive patients (males 26, females 6, mean age 58, range 32–78) referred for a PET/CT for primary staging of a head and neck cancer were reviewed. A standard whole body study (WB) was done 60 minutes after injection of 250–300 MBq F18-FDG, followed by a 4 minute image of the head and neck study (H&N). Sites of nodal uptake, the number of nodes and the degree of diagnostic confidence were compared using a 4 point scale.

Lesions were characterized as either definite or equivocal subtle and diagnostic confidence assessed.

Results: A total of 123 lymph nodes were identified as being either definite or equivocal. These involved 78 lymph node regions on the WB studies and 82 regions on the H&N studies. An additional 18 and 22 equivocal nodes were detected on the WB and H&N studies respectively. The additional H&N study increased confidence in 7 patients and reduced it in only 1 patient. When only definite nodal lesions were analysed, a total of 72 lymph nodes were visualized (involving 44 regions) on the WB study compared with 77 lymph nodes (involving 50 regions) on the H&N studies. The H&N study increased confidence by in 4 patients and decreased confidence in 1 patient.

Conclusion: A dedicated H&N image detected additional involved lymph nodes in only a small number of patients compared to standard WB scanning when using a new generation time-of-flight scanner. However, the H&N image provided better separation of contiguous nodes and increased diagnostic confidence in many patients.

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O36 IMRT DOSE PAINTING FOR LOCALISED PROSTATE CARCINOMA USING 11C-CHOLINE PET SCAN
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S Gong, Centre For PET. Austin Health, Victoria, Australia
N Anderson, Radiation Oncology Centre, Austin Health, Victoria, Australia
I Davis, Ludwig Institute for Cancer Research, Austin Hospital, Victoria, Australia
D Clousten, Focus Pathology, Victoria, Australia
B Bolton, Department of Urology, Austin Health, Victoria, Australia
C Hamilton, Radiation Oncology Centre, Austin Health, Victoria, Australia
V Khoo, Department of Clinical Oncology, Royal Marsden Hospital Trust & Institute of Cancer Research, London, United Kingdom, London, UK
A Scott, Centre For PET, Austin Health, Victoria, Australia; and Ludwig Institute for Cancer Research, Austin Hospital, Victoria, Australia

Background: There is a clear dose-response relationship between radiation dose and biochemical tumour control rates in prostate cancer. ‘Dose painting’ is a strategy that has been proposed to enable the delivery of high radiotherapy doses without giving an unacceptably high risk of toxicity. This is the concept of using functional imaging to identify regions within the conventional target volumes that may have different biology and thus may require escalated doses of radiation to achieve tumour control.

Aim: To demonstrate the technical feasibility of IMRT dose painting using [11C]-choline PET scans in patients with localized prostate cancer.

Methods: This was a radiotherapy planning study of eight patients with intermediate to high risk prostate cancer who had [11C]-choline PET scans prior to radical prostatectomy. Two different contours were semi-automatically generated on the basis of the PET scans for each patient: 60% and 70% of the maximum standardized uptake values (SUVmax and SUV70%); Three IMRT plans were generated for each patient: PLAN1, which consisted of whole prostate radiotherapy to 78 Gy; PLAN2, which consisted of whole prostate radiotherapy to 78 Gy, a boost to the SUVmax to 84 Gy and a further boost to the SUV70% to 90 Gy; and PLAN3, which consisted of whole prostate radiotherapy to 72 Gy, a boost to the SUVmax to 84 Gy and a further boost to the SUV70% to 90 Gy. The technical feasibility of these plans was judged by their ability to reach prescription doses while adhering to published dose constraints. Tumour control probabilities based on PET scan-defined volumes (TCPPET) and on prostatectomy-defined volumes (TCPpta), and rectal and bladder normal tissue complication probabilities (NTCPpta) were compared between the plans.

Results: All plans for all patients reached prescription doses while adhering to published dose constraints. The TCPPET values for PLAN1, PLAN2, and PLAN3 were 71%, 97% and 89%, respectively. Both PLAN2 and PLAN3 had significantly higher TCPPET (p < 0.002 and 0.001) and TCPpta (p < 0.001 and 0.014) than PLAN1. PLAN1 and PLAN2 were not significantly different in terms of TCPPET or TCPpta. There were no significant differences in rectal or bladder NTCPpta between the three plans.

Conclusions: IMRT dose painting for localized prostate cancer using [11C]-choline PET scans is technically feasible. Dose painting results in higher TCPs without higher NTCPs and therefore higher therapeutic ratios.

O37 IMMUNOPET IMAGING OF ANTI-LEY hu3S193 MUTANTS: IMPACT OF Fc:FcRn INTERACTIONS ON PHARMACOKINETICS AND TUMOUR UPTAKE
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P Ramsland, Structural Immunology Laboratory, Macfarlane Burnet Institute for Medical Research, Melbourne, Australia
A Scott, Ludwig Institute For Cancer Research, Austin Hospital, Heidelberg, Australia; and Centre for PET, Austin Hospital, Heidelberg, Australia

Background: The humanized monoclonal antibody 3S193 (hu3S193) specifically binds the Lewis-γ (Leγ) antigen and has shown a long half-life in Phase I first-in-man trials. Our previous laboratory results have shown that alnine-mutations to residues I253, H310 and H435 shortened the half-life of hu3S193 in mice. We have extended this work to explore the impact of a series of novel Fc mutations on Fc:FcRn interactions, in-vivo half-life and biodistribution, and molecular imaging of Leγ expression on tumour cells in mouse models.

Methods: Homology modelling of FcRn binding to hu3S193 Fc fragment identified specific amino acids likely to be involved in FcRn binding. Site-directed mutagenesis was performed to derive novel constructs, which were transiently produced in 293 Freestyle cells (Invitrogen) and tested for Leγ binding using FACS and BIACore analysis. Pharmacokinetic studies were performed by quantitative measurement of blood clearance using BALB/c mice (female 4–5 weeks, nu/nu). Tumour uptake of mutants was analysed by biodistribution studies, and PET imaging with [18F]-labelled hu3S193 mutants using an animal positron emission tomography (microPET)/CT was also performed.

Results: Analysis of combined hu3S193 alanine mutants by BIACore and PACS showed retention of Leγ antigen binding ability both to synthetic Leγ-BSA antigen and physiological antigen on Leγ-expressing A431 cells. Pharmacokinetic studies demonstrated a significantly faster blood clearance of double mutants compared to single Fc:FcRn binding site mutants. Tumour uptake of hu3S193 Fc mutants was correlated with pharmacokinetic properties. Tumours (~50 mm3) were clearly visible in PET images using both the parental and hu3S193 Fc mutant IgG constructs.

Conclusion: This data provides compelling evidence of the potential ability to modulate hu3S193 pharmacokinetics through site-directed mutagenesis of hu3S193 Fc:FcRn binding sites, without altering antigen binding. Molecular imaging of small tumours with PET techniques provides non-invasive quantitation of tumour concentration of antibody, and improved lesion detection.

O38 EVALUATION OF RENAL TUMOUR USING 11C-ACETATE AND FDG PET IMAGING
N Okama, N Takahara, U Hasegawa, Y Miwa, H Akino, H Okazawa, University of Fukui
Y Fujibayashi, National Institute of Radiological Sciences

Introduction: We assessed the usefulness of positron emission tomography (PET) with [11C]-acetate (AC) and [18F]-fluorodeoxyglucose (FDG) in the evaluation of renal cell carcinoma (RCC).

Methods: A total of 40 patients with renal tumours were enrolled in this study. Three patients had extrarenal tumour extension, with metastasis to a paraaortic lymph node, metastasis to the spinal bone at level Th11, and tumour thrombosis of the inferior vena cava (IVC) in one case each. All patients underwent both AC PET scan and FDG PET scan, followed by nephrectomy or partial nephrectomy.

Results: In total 43 renal tumours were evaluated. Thirty-eight of 43 renal tumours were diagnosed as renal cell carcinoma (clear cell carcinoma; 35, papillary cell carcinoma; 2, chromophobe cell carcinoma; 1), 1 tumour as squamous cell carcinoma and 1 tumour as metastatic tumour. Three tumours were diagnosed as benign tumour. AC PET findings were positive in 29 of these 38 RCCs (76%), while FDG PET was positive in only 7 (18%). With regard to macroscopic tumour size of resected tumours, 23 of 25 RCCs had a tumour size of 1.5 cm had positive AC PET findings. Both AC and FDG PET findings were negative for a case of metaplastic adenoma. One case of oncocyotoma showed positive AC PET and negative FDG PET.
findings. With regard to extrarenal lesions, AC PET findings were positive for all lesions in three cases, while FDG PET findings were positive for the spinal bone disease but negative for the paraaortic lymph node metastasis and IVC tumour thrombus.

Conclusion: AC PET demonstrated a pronounced increase in tracer uptake in RCC, particularly when renal tumour size was over 1.5 cm, and higher sensitivity than FDG PET. AC PET also delineated extrarenal tumour lesions even when FDG PET was negative. These preliminary data show that 13C-acetate may be a useful PET tracer for the detection of RCC, and may provide more useful information for RCC staging than FDG PET.

039
STATE-OF-THE-ART IMAGING OF POST-RADIOEMBOLIZATION 90Y MICROSPHERE BIODISTRIBUTION USING 90Y TIME-OF-FLIGHT PET/CT: EARLY SINGAPORE EXPERIENCE

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Context: Internal pair production by Yttrium-90 (Y-90) permits PET/CT imaging of Y-90 microsphere biodistribution after selective internal radiation therapy (SIRT), with superior spatial resolution than bremsstrahlung SPECT/CT. Y-90 time-of-flight (TOF) PET/CT is an emerging modality for post-SIRT imaging of hepatic Y-90 microsphere biodistribution. To date, optimal Y-90 TOF PET/CT imaging protocols have not been defined.

Objectives: This presentation highlights the early experience of Y-90 TOF PET/CT for post-SIRT imaging of hepatic Y-90 microsphere biodistribution at Singapore General Hospital. Scans acquired using different Y-90 TOF PET/CT protocols will be presented, and compared to bremsstrahlung SPECT/CT. Potential clinical applications Y-90 TOF PET/CT, including post-SIRT hepatic Y-90 quantitation, will be discussed.

Figure legend: A patient multifocal hepatocellular carcinoma underwent whole-liver Y-90 SIRT with 1.6 GBq of Y-90 resin microspheres. Fig. 1A: Y-90 TOF PET maximum intensity projection (MIP) in anterior view depicts heterogeneous hepatic Y-90 microsphere biodistribution in high resolution. Fig. 1B: Bremsstrahlung SPECT/CT depicts Y-90 activity with diffuse and overlapping margins due to low spatial resolution. Fig. 1C: Y-90 TOF PET/CT depicts Y-90 activity as discrete foci due to high spatial resolution.

Discussions: Post-SIRT imaging of hepatic Y-90 microsphere biodistribution using Y-90 TOF PET/CT is feasible and yields high resolution images for a variety of potential clinical applications. Further work is necessary to refine the Y-90 TOF PET/CT protocols.

040
PRECLINICAL ASSESSMENT OF EARLY THERAPEUTIC EFFECT OF SUNITINIB TO RENAL CELL CARCINOMA USING 18F-FUROTHYMIDINE IN XENOGRAFT MODEL

Y Hasegawa, N Oyama, N Takahara, Y Miwa, H Akino, Y Kiyono, University of Fukui

Y Fujibayashi, National Institute of Radiologic Sciences

Introduction: Monitoring the early therapeutic effect of sunitinib, a multi-targeted receptor tyrosine kinase inhibitor, in renal cell carcinoma (RCC) is important for better management of cancer patients. This study was undertaken to determine whether 18F-fluorothymidine (FLT) is useful for early response assessment in RCC following sunitinib therapy in vivo biodistribution and animal PET studies using tumour-bearing mice.

Methods: ACHN tumour, a well established human RCC cell line, was implanted in athymic male mice. Approximately 4 weeks after tumour implantation, the mice were treated with oral sunitinib once dairy (sunitinib group) or vehicle only (control group), and tumour volume was calculated. After the treatment, FLT was administered via tail vein and tumour tracer uptake was determined with gamma counter 1 h after injection. To establish a non invasive assessment of FLT uptake in those mice, animal PET imaging was also performed. The tumours were immunohistochemically assayed for proliferation activity (PCNA), vascular density (CD34) and apoptosis status (TUNEL). Thymidine kinase 1 (TK1) expression of the tumour was also determined with real-time PCR simultaneously. All these parameters of two groups were compared.

Results: There was a significant increase of implanted tumours in size in control group, while there was a minimal change of the tumours in sunitinib group. The biodistribution study showed a marked reduction of FLT uptake in tumours after 7-day-treatment with sunitinib. FLT animal PET images clearly delineated the tumours from the surrounding tissue. Animal PET showed the similar tendency of biodistribution study. In the immunohistochemical analyses, there was a significant decrease of proliferation activity of the tumour on day 7, while no changes were seen in apoptotic status, vascular density. TK1 expression of tumours was also correlated with FLT uptake.

Conclusion: These results of in vivo studies indicate that FLT is a promising tracer in monitoring the early therapeutic effects of sunitinib to renal cell carcinoma. 18F-FLT PET imaging may have a potential to visualize early-phase changes in proliferation activity of renal cell carcinoma after sunitinib therapy.

041
68Ga: THE ‘OTHER’ PET TRACER

K Jasper, Peter MacCallum Cancer Centre

Since the arrival of a 68Ga-68Ge generator at the Centre for Molecular Imaging (Peter MacCallum Cancer Centre, Melbourne) in 2008, 68Ga has evolved from a research based isotope with minimal clinical impact, to an integral component of our weekly imaging schedule. There are several tracers that are being used; the most popular at present being 68Ga-DOTATATE. This presentation aims to provide an overview of 68Ga, the radiochemicals in use at our centre (including tracer production), clinical applications, and scanning considerations to demonstrate why its popularity as a PET scanning agent has increased. Case studies will be used to highlight the variety of clinical indications where 68Ga-DOTATATE has been useful, including two cases of oncogenic osteomalacia, where the scan was instrumental in a curative diagnosis.

Conclusion: Due to its generator production and expanding clinical applications and impact, 68Ga is becoming an important adjunct to 18F tracers in the PET scanning department.
O42 ROLE OF ⁶⁸Ga-DOTA-NOC AND ¹⁸F-FDG PET/CT IN THE EVALUATION AND MANAGEMENT OF NEUROENDOCRINE TUMOURS (NETS). INDIVIDUAL AND COMPARATIVE ASPECTS.

What have we learnt?
A Nazar, N Naswa, P Kundu, A Kurnar, R Kumar, C Bal, G Bandopadhyaya, A Malhotra, All India Institute of Medical Sciences, New Delhi, Delhi, India

Aims and Objectives: A retrospective analysis in 70 patients to evaluate the role of functional imaging using PET/CT using two different radiotracers ⁶⁸Ga-DOTA-NOC (somatostatin receptor based) and ¹⁸F-FDG (glucose metabolism) in the imaging of patients with NETs.

Material and Methods: Seventy patients (48 male, 22 female; mean age: 55 years) were analyzed retrospectively. All patients had elevated biochemical markers, histological confirmation of their diagnosis and were referred either for staging, restaging or evaluation of treatment response. Results of ⁶⁸Ga-DOTA-NOC PET/CT were available for all patients. 27 patients had ⁶⁸Ga-DOTA-NOC and ¹⁸F-FDG PET/CT scans while in 23 patients pre-therapy and post-therapy ⁶⁸Ga-DOTA-NOC PET/CT comparison was made for those treated either with cold octreotide or PRRT.

Results: ⁶⁸Ga-DOTA-NOC PET/CT was positive in 63 out of the 70 patients referred for evaluation (detection rate of 90%) with a higher detection rate of lesion when compared to conventional imaging modalities (CT/MR) both for the primary and the metastatic lesions. Out of the 27 patients who underwent ⁶⁸Ga-DOTA-NOC and ¹⁸F-FDG PET/CT study, 20 patients had positive ⁶⁸Ga-DOTA-NOC and negative ¹⁸F-FDG PET/CT scan with most of them showing a stable pattern of disease on follow-up. Five patients were positive for both ⁶⁸Ga-DOTA-NOC and ¹⁸F-FDG PET/CT while in 2 patients only ¹⁸F-FDG PET/CT study showed lesion uptake. Of these 7 patients 3 had evidence of progression on the next imaging session with 1 patient died in another 3 months.

Conclusion: ⁶⁸Ga-DOTA-NOC PET/CT can be considered as a gold standard non invasive imaging investigation in the preliminary diagnosis/staging/restaging of patients with NETs. Comparison with ¹⁸F-FDG PET/CT is useful in characterizing the level of cellular differentiation, prognostication of patients, and choosing the appropriate mode of treatment. Patients with only positive ⁶⁸Ga-DOTA-NOC PET/CT can be effectively managed with either cold or radioactive octreotide treatment while patients with only FDG positive PET/CT can be switched to alternative chemotherapy. In addition for patients treated with either cold octreotide or PRRT a lesion SUVmax/spleen SUVmax ratio seems a better tool to follow up than lesion SUVmax alone.

O43 VENTILATION AND PERFUSION PET/CT WITH GALLIGAS AND ⁶⁸Ga-MAA: A PILOT STUDY WITH COMPARISON TO CONVENTIONAL SPECT/CT (ANSTO Award Entry)

M Hofman, R Hicks, Peter MacCallum Cancer Centre; and Dept of Medicine, University of Melbourne
J Beauregard, T Barber, O Neels, P Eu, Peter MacCallum Cancer Centre

Background: PET/CT offers an opportunity to further improve the quality and accuracy of ventilation and perfusion (V/Q) imaging owing to its superior imaging characteristics and speed compared to conventional V/Q SPECT/CT.

Aim: To assess the feasibility of performing V/Q PET/CT imaging in a routine clinical setting, and compare image quality and diagnostic utility compared with V/Q SPECT/CT in patients referred with clinical suspicion of PE.

Methods: 10 patients were prospectively recruited. Ga-68 labelled carbon nanoparticles (Galligas) was prepared using a modified technique in a Technegas synthesis unit. PET/CT acquisition was acquired following inhalation. Ga-68 labelled macroaggregated albumin (GaMAA) was administered intravenously and imaging repeated. SPECT/CT and PET/CT Images were reviewed according to a predefined standardised scoring system. Blinded to the SPECT/CT results, a diagnosis of presence or absence for pulmonary embolism was recorded, and compared with the final diagnosis obtained following review of subsequent medical records.

Results: V/Q PET/CT was performed within 24 hours of SPECT/CT in 7 patients, and at 2, 6 and 8 days in the remaining patients. Based on the SPECT/CT report, diagnosis was acute pulmonary embolism (2 patients), chronic pulmonary embolism (1 patient) and no evidence of pulmonary embolism (7 patients). PET/CT results were concordant in all patients and agreed with the final diagnosis, except for the patient with chronic PE, which was interpreted as obstructive airways disease on PET/CT. V/Q PET/CT image quality was superior with more homogeneous radiotracer distribution, and identification of smaller ventilation and perfusion defects.

Conclusion: PET/CT V/Q scanning with Ga-68 labelled radiotracers is feasible and is easily performed in clinical practice. Compared to conventional V/Q scanning, advantages include higher resolution, fully tomographic images and faster acquisition. Ga-68 facilitates more flexible acquisition protocols that may further decrease radiation exposure. Quantitation and 4D respiratory gating can also be performed. Further study is needed to assess whether V/Q PET/CT can improve diagnostic algorithms for patients with suspected PE.

O44 CORONARY ARTERY CALCIUM SCORING PERFORMED TOGETHER WITH CT ATTENUATION CORRECTED SPECT MYOCARDIAL PERFUSION IMAGING MAY PROVIDE USEFUL ANATOMIC DIAGNOSTIC INFORMATION WITHOUT ADDITIONAL RADIATION

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E Hasche, Department of Cardiology, Bankstown -Lidcombe Hospital, NSW, Australia
J Kilian, R Dunn, H Tie, Department of Cardiology, Bankstown -Lidcombe Hospital, NSW, Australia

Aim: To prospectively evaluate the additional diagnostic value of CACS, performed simultaneously on a hybrid SPECT/CT camera, in patients who have no prior documented CAD and who are referred for stress MPI.

Methods: 130 consecutive patients with suspected CAD referred for stress MPI had CACS performed in conjunction with CT-AC SPECT on the Philips Precedence (6 slice) SPECT/CT camera. There were 70 female and 60 male patients with a mean ± SD age of 67.3 ± 10.4 years. Patients each had a single low-dose (1 mSv) prospective ECG gated CT acquisition performed with a 12 second breath hold. This CT data was used both for attenuation correction of the SPECT images and for CACS. Total coronary artery calcium score (Agatston) was calculated using Heart Beat-CS (Philips Medical Systems) software. MPI was performed using rest-stress Tc-99m tetrofosmin protocol, and analysed with 4DM-SPECT (INVIA Medical Imaging Solutions) software.
Myovation demonstrated underestimation of LVEF values which were low & overestimation of LVEF which was high. ECT showed significant overestimation in general.

Conclusions: Both automated ECT and Myovation derived LVEF demonstrated good correlation with GCBPS. However limited agreement suggests that MPS derived calculated LVEF can be considerably different from GCBPS LVEF and thus may not be routinely exchangeable.

O46
REPRODUCIBILITY OF LEFT VENTRICULAR EJECTION FRACTION (LVEF) MEASUREMENTS IN THE SUPINE AND PRONE POSITIONS ON GCBPS, GATED SESTAMIBI AND Tl-201 MYOCARDIAL PERFUSION STUDIES (MPS) OBTAINED ON A CZT SOLID STATE CARDIAC CAMERA (CZT)

J Ky, M Chek, P Campbell, Y Yap, C McGrath, V Kalff, The Alfred Hospital Department of Nuclear Medicine

Aims: To determine the reproducibility of gated LVEF measurements obtained in the supine and prone positions during Tl-201/Sestamibi MPS obtained on CZT and GCBPS on a standard gamma camera.

Methods: Following informed consent, patients were randomized to either initial prone or supine position. Resting automated (auto) and blinded operator optimized (opt) LVEF measurements were obtained in 55 Sestamibi (8 MBq/Kg) and 50 Tl-201 (0.8 MBq/Kg) 8 minute 8 frame gated MPS cases referred for evaluation of IHD via ECToolbox on a Discovery NM530c workstation. Bland-Altman and Pearson correlation statistical analysis was used to determine reproducibility of Sestamibi, Tl-201 MPS and 52 GCBPS patients (400 MBq Tc99m pertechnetate, 16 frame) LVEF measurements in the supine and prone positions. For Sestamibi cases, operator optimization was performed by altering the valve plane in 23 supine and 37 prone cases and adjusting the centre/radius in 4 supine and 6 prone cases. For Tl-201 cases, operator optimization was performed by altering the valve plane in 31 supine and 30 prone cases and adjusting the centre/radius in 2 prone cases.

Results:

<table>
<thead>
<tr>
<th>Sup vs prone</th>
<th>R</th>
<th>SD of differences</th>
<th>95% CI</th>
<th>Linear regression</th>
<th>Mean LVEF (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIBI MPS auto</td>
<td>0.72</td>
<td>10.5</td>
<td>-22.5 to 18.8</td>
<td>Prone = 13.35 + 0.75 Supine</td>
<td>61.2/59.4</td>
</tr>
<tr>
<td>MIBI MPS opt</td>
<td>0.84</td>
<td>7.4</td>
<td>-14.1 to 14.9</td>
<td>Prone = 7.20 + 0.89 Supine</td>
<td>61.5/61.9</td>
</tr>
<tr>
<td>Tl-201 MPS auto</td>
<td>0.71</td>
<td>9.6</td>
<td>-19.7 to 17.9</td>
<td>Prone = 16.24 + 0.74 Supine</td>
<td>66.8/65.9</td>
</tr>
<tr>
<td>Tl-201 MPS opt</td>
<td>0.77</td>
<td>7.8</td>
<td>-15 to 15.4</td>
<td>Prone = 11.28 + 0.84 Supine</td>
<td>67.9/68.1</td>
</tr>
<tr>
<td>GCBPS</td>
<td>0.93</td>
<td>5.4</td>
<td>-11.5 to 9.9</td>
<td>Prone = 5.064 + 0.89 Supine</td>
<td>53.9/53.1</td>
</tr>
</tbody>
</table>

Conclusions: MPS measurements of LVEF by either Sestamibi or Tl-201 requires visual QC and despite this still has poorer reproducibility than for GCBPS thus requiring at least 15% absolute change to be considered clinically significant.

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15
O47

VALUE OF VENTILATION SPECT SCINTIGRAPHY IN PREGNANT PATIENTS WITH SUSPECTED PE
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Objectives: To minimise the radiation dose to both mother and foetus, V/Q scanning in pregnant women with suspected pulmonary embolism (PE) is often done using reduced administered doses, or the ventilation scan is omitted altogether. With V/Q SPECT replacing planar scintigraphy in many centres, the aim of this study was to determine whether a perfusion-only SPECT was adequate to confidently diagnose or exclude PE in pregnant patients.

Methods: V/Q SPECT studies (Technegas & Tc-99m MAA) were performed in 27 pregnant women. The perfusion SPECT study alone was reviewed by two experienced and blinded nuclear medicine physicians with an assessment made of the likelihood of PE (using a 5 point scale – definitely negative, probably negative, indeterminate, probably positive and definitely positive for PE). The complete V/Q SPECT was then viewed and the likelihood of PE assessed using the same 5 point scale. Final diagnosis was based on clinical assessment, imaging findings and follow-up.

Results: Compared to perfusion SPECT alone, the addition of ventilation data increased the number of pregnant patients who could be classified as definitely negative (22% to 44%) or definitely positive (4% to 7%) for PE. Thus overall, adding ventilation data increased the total number of patients classified in a definite category from 26% to 51%. The number of patients in the probably positive and probably negative categories reduced in total from 63% to 37%. Of the 27 patients studied, only 22% had perfectly normal perfusion SPECT studies.

Conclusions: The addition of ventilation SPECT significantly increased the number of pregnant patients who could be classified as definitely positive or definitely negative. Only a minority of pregnant patients in the cohort had perfectly normal perfusion SPECT studies. V/Q SPECT scintigraphy in pregnancy should include a ventilation study to improve reporter confidence and overall diagnostic accuracy.

O48

OUTCOME OF MATCHED AND MISMATCHED DEFECTS ON SEQUENTIAL VQ SPECT SCINTIGRAPHY
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Objectives: In patients with PE, the fate of matched and mismatched defects identified on SPECT imaging has not been previously investigated.

Methods: 50 patients with acute PE had V/Q SPECT was performed using Technegas and Tc-99m-MAA, at baseline and in a follow-up study performed 3 to 6 months later. Matched and mismatched defects were assessed by 2 experienced observers and scored on the basis of both defect size (1 = <25% segment, 2 = 25–50%, 3 = 51–75% and 4 = 75–100%) and severity (1 = normal, 2 = mild perfusion loss, 3 = moderate perfusion loss, 4 = absent perfusion).

Results: In the baseline study, a total of 286 matched defects and 72 matched defects (out of 900 segments) were identified (ranging from 1 to 18 segments per patient). Of the mismatched defects, 75 (26%) and of the matched, 12 (41%) involved 50% or less of a segment.

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Matched defects (&lt;25%)</th>
<th>Matched defects (&gt;25%)</th>
<th>Mismatched defects (&lt;25%)</th>
<th>Mismatched defects (&gt;25%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>12 (37.5%)</td>
<td>5 (12.5%)</td>
<td>13 (17.3%)</td>
<td>23 (10.9%)</td>
</tr>
<tr>
<td>Partial</td>
<td>2 (6.3%)</td>
<td>10 (25.0%)</td>
<td>6 (8.0%)</td>
<td>46 (21.8%)</td>
</tr>
<tr>
<td>Complete</td>
<td>18 (56.3%)</td>
<td>25 (62.5%)</td>
<td>56 (74.7%)</td>
<td>142 (67.3%)</td>
</tr>
</tbody>
</table>

The rates of resolution based on defect size were not significantly different. There were 4 patients who demonstrated 7 new perfusion defects on the follow up study. When resolution was compared to the age of the patients, there was a significantly higher chance of defect resolution in younger patients.

Conclusions: Utilising V/Q SPECT, complete defect resolution in seen in 69.2% of mismatched defects and 59.7% of matched defects. There was no significant different in resolution rates of small or large defects. 8% of patients had new mismatched defects on follow up studies.

O49

THE CLINICAL ROLE OF 67Ga SPECT/CT IN THE INVESTIGATION OF HEAD AND NECK OSTEOMYELITIS
P Yogaratnam, Westmead Hospital

Background: SPECT/CT has proven to be useful in localising disease in many patients of the body with complex anatomy and therefore should be clinically useful in evaluation of osteomyelitis in the head and neck. Gallium67 citrate remains a useful radiopharmaceutical in subacute or chronic infections as occurs in the head and neck region.

Aim: To assess the clinical usefulness of Gallium 67 single photon emission/ computer tomography (Ga SPECT/CT) osteomyelitis of the head and neck region.

Methods: Over a period of three years, Gallium 67 citrate studies performed for suspected osteomyelitis of the head and neck region were analyzed retrospectively to compare Ga SPECT/CT with Ga SPECT alone and Ga SPECT with a concurrent bone scan (Ga SPECT-BS). A total of 32 studies in 22 patients were reviewed. In six progress studies there were no bone scans performed. There were 13 cases of osteomyelitis confirmed by a combination of surgical finding (5), bacteriology and clinical follow up (8).

Results: With Ga SPECT alone there were 11 positive, 14 negative and 7 equivocal studies. In the 26 Ga SPECT-BS studies, 8 were positive, 13 negative and 5 equivocal. For Ga SPECT-CT there were 11 positive, 19 negative and 2 equivocal studies. Five equivocal studies on Ga SPECT alone were changed to negative on SPECT/CT. Three equivocal studies of the 26 Ga SPECT-BS were changed on SPECT CT; 2 became negative and 1 positive.

Conclusion: In the investigation of head and neck osteomyelitis, Ga SPECT/CT was shown to be of clinical benefit in approximately 15% of studies by decreasing the number of equivocal results.

O50

IMPACT OF SPECT/CT BONE SCINTIGRAPHY ON IMAGING OF FEET
R Babicheva, O Chiam, K Lee, B Ellison, C Bui, H Dixson, M Dobson, B Bedford, Bankstown/Lidcombe Hospital

Background: Foot pain is not an uncommon complaint and treatments vary depending on the aetiologies.

Aim: Our aim was to evaluate the diagnostic value of SPECT/CT camera for patient feet studies.

Methods: SPECT/CT was performed on 92 patients with foot pain using a 6 slice Philips Precendence camera and cases were reviewed to compare SPECT versus SPECT-CT. Cases were evaluated by the reporting doctor with respect to 'change in diagnosis', 'more accurate diagnosis' and 'increase in diagnostic confidence'.

Results: Diagnoses were altered in 22 patients, such as unsuspected bilateral tarsal coalition. SPECT-CT had no impact on change in SPECT diagnosis, did not increased accuracy in diagnosis or diagnostic confidence in 9 patients. CT helped with localising uptake including demonstration of abnormalities on CT such as unsuspected fractures, which allowed more accurate diagnoses in 54 cases. The reporting doctor was reassured of the diagnosis in 7 cases. In addition, CT effective dose (E) in mSv was calculated for each patient using the formula, E = EDLPxDLP, where EDLP is the region-specific, DLP normalised effective dose and DLP is dose length product. Mean E measured from 0.004 mSv to 0.360 mSv, with a mean of 0.120 mSv.

Conclusion: CT aided in the management of patients with foot pain by changing the diagnosis in 24% and confirming SPECT findings by localising the pathology with very low additional radiation.
051 EARLY AND LATE LYMPH NODE ASSESSMENT IN PATIENTS WITH LYMPHOEDEMA AFTER AXILLARY CLEARANCE

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Aim: Lymphoedema is a debilitating side effect that occurs in approximately two thirds of women following axillary clearance as treatment for breast cancer. Currently, there are a range of methods to make the diagnosis of lymphoedema but no gold standard. In particular, assessment of early lymphoedema can be problematic. An independent and reproducible test for lymphoedema would be useful to assist in early recognition and treatment as well as for further research into modification of the progress of this disorder.

Methods: As part of an ongoing trial into correlates of lymphoedema, we have examined a number of patients with secondary lymphoedema and a small number of normal controls. The methodology is described in the abstract by Singh et al. For the purpose of this study, anterior and posterior images of the chest were acquired at 45 minutes and 100 minutes after subcutaneous hand injections of $^{99m}$Tc-antimony sulphur colloid. The number of draining lymph nodes were assessed for both the surgical and non-surgical side. Geometric mean images were generated and a ratio of uptake between surgical and non-surgical side calculated.

Results: 50 patients have been studied to date. The mean number of nodes identified at 45 minutes were 1.6 nodes on the surgical side and 3.4 on the non surgical side. At 100 minutes, there were 2.2 and 4.3 nodes identified respectively. When the data were further broken down based on the severity of lymphoedema with category 0 = no increase in size of affected arm, 1 = 0–2 cm, 2 = 2–4 cm and 3 = >4 cm, significant differences were identified in category 2 and 3 arms in the early images and in categories 1 to 3 on delayed images. When ratios were calculated, there was again a marked difference evident between category 0 patients and other categories both early and late.

Mean number of nodes identified

<table>
<thead>
<tr>
<th>Lymphoedema grade (0-3)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>45 minutes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgical side</td>
<td>3.25</td>
<td>1.63</td>
<td>0.90</td>
<td>0.60</td>
</tr>
<tr>
<td>Non-surgical side</td>
<td>3.00</td>
<td>2.83</td>
<td>4.20</td>
<td>3.40</td>
</tr>
<tr>
<td>100 minutes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgical side</td>
<td>4.00</td>
<td>2.25</td>
<td>1.80</td>
<td>1.50</td>
</tr>
<tr>
<td>Non-surgical side</td>
<td>3.90</td>
<td>4.50</td>
<td>4.40</td>
<td>4.70</td>
</tr>
</tbody>
</table>

Conclusion: The number of nodes identified in patients following axillary surgery correlates with the presence or absence of measurable lymphoedema. There is a trend towards fewer nodes with increasing lymphoedema grade. Uptake ratios of surgical to non surgical side also exhibit categorical differences.

052 $^{99m}$Tc-TEKTROTYD IMAGING AT SOUTHLAND HOSPITAL, NEW ZEALAND

K Worthington, Southland District Health Board, New Zealand

Nuclear Medicine department at Southland Hospital is the most southern department in NZ. Geographically this brings added challenges with consistent delivery of radio-nuclides to our facility. It was through such challenges that lead to our opportunity to instigate imaging practices using $^{99m}$Tc-Tektrotyd for tumours that over-express somatostatin receptors. This presentation is intended to share our experience with this relatively new radiopharmaceutical product. Primarily, topic discussion highlights the advantages of $^{99m}$Tc based labels.
**Methods:** Nineteen patients who underwent neoadjuvant chemotherapy and deemed suitable for colorectal liver metastasectomy in 2006–2007 at the Austin Hospital, in Melbourne were included in this retrospective study. Semi-quantitative analyses of $^{18}$F-FDG PET scans performed within 4 weeks prior to surgery were assessed to obtain the maximum standardized uptake (SUV$_{max}$) and total glycolytic volume (TGV). Correlation of these variables to overall survival and disease-free survival was assessed by Analysis of Variance. Receiver operating characteristics (ROC) was used to define cut off values to determine Kaplan-Meier survival analysis.

**Results:** Median disease-free survival and overall survival was 27 and 34 months respectively. Median follow up time was 35 months. The preoperative mean TGV and SUV$_{max}$ were significantly lower in the survivors as well as in those who were disease-free. ROC analysis determined cut off values for TGV at 40 cm$^3$ and SUV$_{max}$ of 4, which were highly predictive of overall survival (p = 0.01 and 0.02 respectively). Cut off values for TGV at 28 cm$^3$ and SUV$_{max}$ at 3.9 were similarly predictive of disease-free survival (p = 0.005 and 0.005 respectively).

**Conclusions:** Avidity and glycolytic volume of $^{18}$F-FDG uptake on preoperative PET correlates with prognosis in patients undergoing resection of colorectal liver metastases. Along with its current use in detecting metastatic colorectal cancer, FDG PET imaging may assist in prognostically stratifying patients with liver only metastatic disease being considered for hepatic resection.

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**056 MOLECULAR IMAGING OF DEATH RECEPTOR 5 (DR5) OCCUPANCY IN-VIVO BY HUMANIZED MONOCLONAL ANTIBODY CS-1008**

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**Aims:** Validation of CS-1008 (Tagatuzumab), a humanised monoclonal IgG1 antibody agonistic to the human Death Receptor 5 (DR5), has shown anti-tumour efficacy in a wide range of preclinical models, and is currently in Phase I/II trials. To assist in clinical development, this study aimed to determine the pharmacokinetics and quantitative tumour targeting properties of CS-1008 in a mouse model, and assess the effects of antibody dose on DR5 receptor saturation in-vivo through molecular imaging.

**Methods:** CS-1008, parental antibody mTRA-8, and an isotype control IgG1 antibody were radiolabelled with $^{111}$In and $^{18}$F, and characterised for DR5 binding and labelling efficiency on DR5 $^{+}$ COLO205 cells. Pharmacokinetic and biodistribution studies were performed in BALB/c nude mice, bearing COLO205 or DR5 $^{−}$ CT26 colon tumours, with CS-1008 and isotype control antibody. Dose levels of 0.2, 1.0 or 10.0 mg/kg of antibody were explored, with gamma camera/CT imaging also performed to allow quantitative dosimetry of whole body, liver and tumour regions up to 10 days post infusion.

**Results:** Labelling efficiency of 99% was obtained for the radiol conjugates, with $^{111}$In-CS-1008 specific activity in the range 2.7–3.4 mCi/mg, and stable in serum for up to 11 days. Scatchard analysis showed high and low affinity binding sites for $^{111}$In-CS-1008 (Ka = 3.3 $\times$ 10$^{10}$ M$^{-1}$ and 2.0 $\times$ 10$^{9}$ M$^{-1}$), $^{111}$In-CS-1008 showed high, specific uptake in COLO205 tumours at 0.2 mg/kg dose (up to 26%ID/g), with prolonged retention at >20%ID/g over 14 days. Tumour uptake at 48hrs post injection of $^{111}$In-CS-1008 at 0.2 mg/kg was significantly higher than 1 mg/kg and 10 mg/kg (p = 0.001). No differences in tumour clearance were observed between dose levels. Gamma camera/CT imaging demonstrated no normal tissue uptake of $^{111}$In-CS-1008, and excellent uptake in COLO205 tumours which continued up to 10 days. No specific uptake of $^{18}$F-CS-1008 was observed in control CT26 tumours. Dosimetry calculations of quantitative imaging datasets revealed saturable DR5 receptor occupancy in tumour by $^{111}$In-CS-1008 occurring above 1 mg/kg, reaching 40% at 10 mg/kg.

**Conclusions:** $^{111}$In-CS-1008 provides optimal information on the in-vivo behaviour of systemically injected CS-1008 in mouse DR5 $^{+}$ tumour models. Importantly, DR5 receptor saturation can be demonstrated in-vivo with molecular imaging of $^{111}$In-CS-1008. These results have direct implications for clinical development and optimal dose and patient selection for trials of DR5 targeting antibodies.

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**057 THE CLINICAL IMPACT OF FDG PET/CT IN THE ASSESSMENT OF CUTANEOUS MALIGNANT MELANOMA**

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**Background:** Current treatment paradigms and prognosis of melanoma patients are heavily reliant upon diagnostic imaging techniques to accurately demonstrate the extent of malignancy especially for surgically resectable disease. The combined fluorodeoxyglucose positron emission tomography/computed tomography (FDG PET/CT) scanner has become an increasingly popular choice for melanoma clinicians. This study attempts to assess the incremental value of this modality with conventional evaluation and, thus determine its use in routine clinical practice.

**Aims:** To evaluate the incremental value of FDG PET/CT in the staging and restaging work-up of patients with cutaneous malignant melanoma, with regards to:
- Alterations in AJCC TNM stage/disease distribution
- Changes in patient management

**Methods:** We prospectively identified 119 consecutive patients who underwent 130 PET/CT scans for cutaneous malignant melanoma between August 2002 and July 2003 as part of their initial staging work-up or restaging investigation for recurrent disease at Peter MacCallum Cancer Centre (PMCC). The patient’s pre-PET TNM stage/disease distribution based on conventional diagnostic techniques was prospectively collected along with a proposed management plan. Images were performed in a combined PET/CT scanner (Discovery LS) with one nuclear medicine physician interpreting the images as per routine clinical practice. Management plans before and after PET/CT were evaluated for any changes using the PMCC PET centre’s criteria of impact. Clinical impact was considered ‘high’ if PET/CT changed treatment modality or intent, and ‘medium’ if treatment modality was unchanged but modified in some way. The validity of the PET/CT findings was subsequently confirmed within 6 months using any clinical, pathological or radiological follow-up information available.

**Results:** A total of 42 staging scans were evaluated with a breakdown of these scans based on pre-PET TNM stage groups revealing five stage I, thirteen stage II, twenty-three stage III and one stage IV classification. PET/CT led to a TNM stage alteration in 11.9% (5/42). Management changes occurred in 16.7% (4/24) of patients with advanced stage disease (Stage III/IV) with three being high impact while only one early stage patients (Stage I/II) had a management change. Eighty-eight restaging scans were performed. When sorted by pre-PET disease distribution, there were 4 local recurrence, 31 locoregional disease, 27 metastatic disease (resectable), 12 metastatic disease (unresectable) and 14 no active disease scans. PET/CT led to an alteration in disease distribution in 28.4% (25/88) with 14 scans upstaged and 11 scans downstaged. Six out of thirty-one locoregional disease scans (19.4%) were upstaged to metastatic disease. PET/CT reclassified 16.1% (10/62) of resectable disease scans as surgically unresectable. Overall, PET/CT guided management changes occurred in 31.8% (28/88) with 24 scans classified as high impact. When stratified by pre-PET disease distribution, disease status alterations and management changes occurred in all scan subgroups except for local recurrence scans.

**Conclusion:** This study demonstrates the utility of PET/CT in assessing locoregional and metastatic disease as it frequently leads to changes in management, especially for restaging patients and staging of advanced stage melanoma. Our results support the incorporation of FDG PET/CT into the conventional evaluation of patients with advanced cutaneous malignant melanoma.
Aims: The study aims to 1) assess the prevalence of distant metastases post early restaging PET/CT scan following CRT. 2) document the location of these metastases and 3) explore the potential use of a ‘limited’ scan range covering the head and neck to base of lungs ‘above diaphragm scan’ – to achieve both adequate assessment of the disease with least radiation exposure (from limiting the scan length for the CT component of the examination) and improve the throughput of busy clinical scanners by reducing scan times.

Methods: Retrospective analysis of 240 patients with HNSCC both staged and restaged following CRT with FDG PET/CT. Patients with previous HNSCC, unknown primary and known distant metastatic disease were excluded. Patients with PET/CT findings suggestive of distant disease were confirmed on either follow-up clinical or radiological findings.

Results: The mean time between the two PET/CT studies was 6.4 months (1SD = 2.9 months). 196 (81.7%) of the patients demonstrated nodal metastases at time of staging with a significant portion having bilateral or contralateral disease (n = 58, 24.2%). Following CRT, 31 patients (12.9%) had either findings to strongly suggest distant metastases (n = 16, 6.7%) or non-specific FDG avidity that was not clearly benign warranting follow-up (n = 15, 6.3%). Further clinical and/or radiological follow-up of these 31 patients confirmed distant disease in 13 out of 16 patients with PET/CT suspected disease and only 1 out of 15 in those with a non-specific FDG avidity. 12 patients had disease ‘above the diaphragm’ while the other two subjects had disease both ‘above and below the diaphragm’. No patient from our series had metastatic disease only below the diaphragm. In addition, no other unrelated but significant pathology was demonstrated.

Conclusion: Early manifestations of distant metastatic disease are relatively uncommon in HNSCC, even in a patient group such as ours with a high prevalence of cervical nodal metastases. The majority of distant disease was within the chest and not a single patient in this series had distant metastatic disease only below the diaphragm. Based on our experience, a limited ‘above diaphragm’ scan for early assessment following CRT may be safely considered. The benefits of this tailored approach flow onto both the patients and the health system as it can improve resource allocation by increasing scanner availability and patient throughput and reduces cumulative patient radiation exposure.