Abstracts

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BNMS Young Investigators’ Prize 2020, presented at BNMS Online Spring Meeting 18th-19th May 2021

1. [18F] fluorocholine (FCH) PET/CT in persistent/recurrent primary hyperparathyroidism
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Purpose: Re-do parathyroid surgery in patients with persistent/recurrent primary hyperparathyroidism (pHPT) has a lower cure rate and higher surgical risk. Re-intervention without pre-operative localisation is ill-advised. Recently [18F] fluorocholine -PET/CT has shown potential for non-invasive localisation of parathyroid adenomas. We assessed the detection rate of [18F] fluorocholine -PET/CT in a tertiary centre cohort with persistent/recurrent pHPT.

Methods: Retrospective review of [18F] fluorocholine -PET/CT studies in 29 consecutive patients with persistent/recurrent pHPT. Studies were categorised by two experienced observers as positive, negative, or equivocal. The location and SUV max of positive tissue were recorded. Results of other localisation techniques (ultrasound, [99mTc]Tc-MIBI [sestamibi], 4DCT, angiography and selective venous sampling [ASVS]) and patient outcomes were documented.

Results: FCH-PET/CT was positive in 18/29 cases (detection rate 62%; average SUV max 6.9, range 3.0-15.5). Of these, 12 were eutopic, 4 neck ectopic, and 2 ectopic mediastinal. To date, 7 patients have had successful re-do surgery.

2/29 cases were equivocal, with ASVS planned for 1 patient and medical management for the other.

9/29 were negative, of which 1 had subsequent positive ultrasound-guided FNA for PTH and 2 await invasive localisation (ASVS or FNA for PTH).

Results of alternative localisation techniques prior to [18F] fluorocholine -PET/CT were available in 22/29 cases. Of these, [18F] fluorocholine -PET/CT was positive in 15, all following negative/ equivocal first-line imaging (ultrasound or sestamibi). 11/22 had prior 4DCT, with 4 being positive.

Conclusion: [18F] fluorocholine -PET/CT shows promise in localising parathyroid adenomas in patients with persistent/recurrent pHPT and negative/equivocal imaging using other modalities.

2. Impact on SPECT Reconstruction of Iterative Metal Artefact Reduction
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Vendors have introduced metal artefact reduction software to improve CT image quality. The effects of such software on CT-based attenuation correction (CTAC) of SPECT data have yet to be evaluated. This study evaluated qualitative and quantitative effects of Siemens Metal Artefact Reduction software (iMAR) on SPECT reconstruction.

An in-house designed hip phantom, featuring different metal prostheses (stainless steel, cobalt chromium and titanium), was imaged using a clinical protocol. The phantom was imaged without metal to provide reference values. Additionally, six clinical bone SPECT/CT studies with metal implants present were evaluated. All images were reconstructed with and without iMAR. Standardised Uptake Values (SUVs) and Hounsfield Units (HUs) were analysed and Wilcoxon Signed-Rank Tests performed. Qualitative comparisons of the reconstructions were also undertaken.

The phantom study demonstrated that the presence of metal introduced statistically significant changes in SUV. SUVs were closer to reference values when using iMAR CTAC, though percentage improvement was not clinically relevant. Quantitative analyses of clinical studies demonstrated statistically significant changes in HUs in regions affected by metal when iMAR was applied. Visual analysis revealed that when iMAR CTAC was applied, metal artefacts were reduced on both studies with no clinically relevant changes seen in SPECT data. However, new artefacts were introduced on CT in the phantom study.

No qualitative changes and only minimal quantitative changes were seen when using iMAR CTAC for SPECT reconstruction. Application of iMAR was quantitatively and qualitatively significant on CT. Therefore, iMAR
Radioiodine 131I therapy is a common procedure undertaken by Nuclear Medicine for the treatment of hyperthyroidism. The Study Centre has undertaken radioiodine therapy for over 20 years but a formal service evaluation has never been conducted. This study aims to assess the performance of the service in terms of efficacy and patient experience. Efficacy was determined by analysing the clinical outcomes of 274 patients treated with ~600 MBq radioiodine between 2012-2015. This includes resultant thyroid condition 3 years after therapy and baseline T3/T4 levels. Patient experience was assessed using questionnaires completed both before, and 2 weeks after therapy. The failure rate of therapy was 6.2%, hypothyroid rate of 63.1% and euthyroid rate 30.7%. Patients referred with Graves’ disease were more likely to become euthyroid (P=0.01). to become hypothyroid after therapy, whilst toxic goitre was assessed using questionnaires completed both before, and 2 weeks after therapy. The failure rate of therapy was 6.2%, hypothyroid rate of 63.1% and euthyroid rate 30.7%. Patients referred with Graves’ disease were more likely to become euthyroid (P=0.01).

4. Validation of the Siemens e7-tools off-line PET image reconstruction software

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5. The clinical utility of [18F]FDG-PET/CT in MDR-TB patients with residual CT abnormalities

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Multidrug resistant tuberculosis (MDR-TB) requires complex prolonged treatment and has poorer outcomes. We describe the utility of [18F]FDG-PET/CT scans near the end of treatment in 53 consecutive patients over ten years.

Methods: 22 patients had [18F]FDG -PET/CT to assess persistent residual HRCT abnormalities near end of treatment (median 658 days; IQR 567.75-720.25). A 6-point PET visual score and quantitative analysis (SUVmax) was performed by a single experienced observer. Follow up data (clinical, microbiological and bronchoalveolar lavage (BAL)) was documented.
Results: The PET Scores were Score 1: None (no uptake) in 4/22, Score 2: Minimal (>background lung < mediastinal blood pool (MBP)) in 4/22, Score 3: Mild (>MBP but < liver) in 3/22, Score 4: Moderate (similar to background liver) in 4/22, Score 5: High (> liver but <2 x background liver) in 5/22, Score 6: Very High (> 2 x background liver) in 4/22.

In the 9/22 cases with high/very high visual scores of which 8 had a directed BAL. 7/8 cases were acid fast bacilli (AFB) and culture negative but 3 had a positive non-mycobacterial culture. 1 case was positive for TB culture indicating treatment failure.

A negative \(^{18}F\)FDG-PET/CT (None-Moderate) had a 100% negative predictive value (NPV) for treatment failure, and a positive \(^{18}F\)FDG-PET/CT only had a positive predictive value (PPV) of 11%.

Conclusion: Near end of treatment \(^{18}F\)FDG-PET/CT in MDR-TB has excellent NPV which is useful for guiding treatment completion. The PPV is low but FDG-PET/CT can be useful to direct BAL and detect other infections.

6. Multi-modality Diagnostic Characterization of \(^{18}F\) FDG-avid Thyroid Incidentalomas in relation to the British Thyroid Association Guidelines
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Purpose: British Thyroid Association (BTA) guidelines recommend investigation of all \(^{18}F\)FDG-avid thyroid incidentalomas (FDG+TI) with ultrasound (US) and fine-needle aspiration cytology (FNAC). We aim to correlate PET, US (BTA U-grading), cytological, histological findings to investigate the rate of malignancy in FDG+TI.

Method: Retrospective analysis of 12,288 PET/CT reports (2014-2019) identified 817 reports containing the word ‘thyroid’. FDG+TI were identified after excluding known primary thyroid disease, non-avid goitre, and symmetrical diffuse uptake. US, cytology, histology findings of FDG+TI were reviewed.

Results: 59 (M=27, F=32) FDG+TI were identified: 9/59 (15.2%) malignant or suspicious (U4/5); 11/59 (18.6%) indeterminate (U3); 34/59 (57.6%) benign (U2); 5/59 (8.5%) had no nodule (U1).

FNAC of 27/59 FDG+TI (45.8%) revealed: 5/27 (18.5%) suspected/malignant cytology (Thy4/5); 11/27 (40.7%) possible neoplastic features (Thy3/3a/3f); 6/27 (22.2%) benign (Thy2); 5/27 (18.5%) non-diagnostic cytology (Thy1). Only 11/34 (32%) U2 had FNAC (Thy3f -3, Thy3a -1, Thy3 - 1; Thy2 - 4; Thy1 - 2).

Histology in 12/59 (20%) patients identified 6/12 (50%) malignancies (PTC-4, MTC-2) and 6/12 (50%) benign adenomas. Histology for one U2 nodule was reclassified from Hurthle cell carcinoma to Hurthle cell adenoma after review.

Conclusion: The incidence of FDG+TI at our institution is low (0.5%). The decision to investigate with FNAC was largely based on suspicious US features and patient co-morbidities. The rate of histologically confirmed malignancy in those investigated with FNAC and surgically treated was 22.2% and 50% respectively. Larger studies are required to establish malignancy rates in FDG+TI and the relationship with sonographic features.

BNMS Online Spring Meeting 2021 Poster Presentations

P01. \(^{68}Ga\)-THP-Pam: A PET radiotracer for imaging vascular calcification
George Keeling, Friedrich Baark, Orestis Katsamenis, Andrew Reader, Gareth Smith, Samantha Terry, Philip Blower, Rafael Torres Martin de Rosales

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"Theragnostics Ltd, Bracknell, United Kingdom

P02. Imaging chronic cardiovascular disease using hypoxia targeting PET tracers
Friedrich Baark, Richard Southworth, James Clark
"King’s College London, London, United Kingdom

P03. Targeting mitochondrial dysfunction with \(^{99m}Tc\) sestamibi SPECT imaging to detect anthracycline cardiotoxicity
Edward Waters, Friedrich Baark, Thomas Eykyn, Richard Southworth
"King’s College London, London, United Kingdom

P04. Dual phase Sestamibi study for the detection of parathyroid adenomas, a retrospective analysis from a single centre
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P05. The Role of [18F] Choline PET-CT in Primary Hyperparathyroidism

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P06. Exploiting non-canonical pathways of NIS regulation to enhance radioiodide uptake and identify predictive markers of thyroid cancer recurrence

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P07. [18F]FDG PET-CT radiomic applications in Hodgkin Lymphoma: evaluation of intra-patient lesions' similarity and outcome prediction at baseline

Matteo Birolì¹, Noemi Gozzì², Lara Cavinato², Martina Sollini¹, Margarita Kirienko¹, Fabrizia Gelardi¹, Francesca Ricci², Francesca Ieva³, Carmelo Carlo-Stella¹, Arturo Chiti¹,²
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P08. High grade pituitary uptake on [18F]FDG PET-CT in immunotherapy-related hypophysitis - case report and literature review

Amanda Jewison¹,², Sabina Dizdarevic¹, Nitasha Singh¹, Maryam Jessop¹, Emma Simpson¹, Faye Cuthbert¹, Tim Larner¹, Stewart Redman², Sabina Dizdarevic³
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P09. The significance of incidentally detected prostatic uptake on [18F]FDG PET-CT.

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P10. Pictorial review of Artefacts in PET-CT imaging

Farzad Dehghani Sani, Shaunak Nakalkisoor, Gopinath Gnanasegaran, Bruno Ferreira
The Royal Free Hospital, London, United Kingdom

P11. Impact of [18F]FDG PET-CT on therapeutic management of patients with urinary bladder carcinoma and its prognostic value

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P12. Optimisation of [99mTc]Tektrotody Somatostatin Receptor SPECT-CT

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P13. Exploring the radiochemistry of thallium-201 for its potential use in targeted radionuclide therapy (TRT)

Alex Rigby, Julia Blower, Philip Blower, Samantha Terry
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P15. Long Covid hallmarks on [18F]FDG PET-CT: a case-control study

Fabrizia Gelardi¹,², Martina Sollini¹,², Silvia Morbelli³, Michele Ciccarelli³, Maurizio Cecconi¹,², Alessio Aghemo¹,², Paola Morelli¹,², Silvia Chiola¹,², Arturo Chiti¹,²
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P16. Muscular sarcoidosis on [18F]FDG PET-CT: A two-case series of a rare presentation
Richard Chaytor1, Laura Gelletr2, Patrick Rogers2, Brent Drake1
1Derriford Hospital, Plymouth, United Kingdom.
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P17. Pictorial review of FDG PET-CT findings after COVID-19 vaccination
Shah Sweni, Sherif Elsobky, Thomas Wagner, Deborah Pencharz, Malavika Nathan, Teresa Szyzko
Royal Free London NHS Foundation Trust, London, United Kingdom

P18. The Metabolic Amyloid Signature of [18F]FDG PET-CT in Alzheimer’s Disease
Sara Pacella
ASST Ovest Milanese, Legnano, Milan, Italy. University of Milano Bicocca, Milan, Italy

P19. An interesting case of applying 99m Tc red blood cell scintigraphy in the diagnosis of cavernous sinus haemangioma at a regional tertiary neurosciences centre during the COVID pandemic.
Devleep Mukherjee, Marko Berovic, Mohamed Halim, Desmond Owusu, Alex Zeinati, Benjamin Corcoran, Nicola Mulholland, Sachin Kamat
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P20. Image-derived input functions from dynamic 15O-water PET scans using penalised reconstruction
Peter Young1,2, Lieuwe Appel3, Andreas Tolf4, Joachim Burman5, Michael Schöll1,5, Mark Lubberink3
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2Hôpital de la Cité-de-la-Santé, Laval, Canada

P22. The Validation of Nanoparticles for Pulmonary Drug Delivery using Fluorine-18 Positron Emission Tomography
George Herbert1,2, Juozas Domarkas1,2, John Wright1,2, Dave Roberts1,2, Steve Archibald1,2,3
1Department of Biomedical Science, University of Hull, Hull, United Kingdom.
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3Hull University Teaching Hospitals NHS Trust, Hull, United Kingdom

P23. The effect of radioiodine therapy in patients with subclinical hyperthyroidism.
Barbara Emilia Nikitiuk, Paula Mantiuk, Karolina Niedzielska, Joanna Magdalena Rucinska, Hubert Niewinski, Saeid Abdelrazeck
Medical University of Białystok, Białystok, Poland

P24. Peptide Receptor Radionuclide Therapy (PRRT) in patients with Chronic Kidney Disease (CKD); How low is too low to treat?
Shahad Alsadik1, Gopinath Gnanasegaran1, Luohai Chen1, Christos Toumpanakis1, Martyn Caplin1, Shaunak Navalkissoor1
1Royal Free Hospital, London, United Kingdom.
2University College London, London, United Kingdom

P25. Single centre outcome of 177Lu-DOTA-TATE therapy in treatment of progressive metastatic neuroendocrine tumors (NETs): survival, toxicity, and prognostic factors
Shahad Alsadik1, Gopinath Gnanasegaran1, Luohai Chen1, Dalvinder Manda1, Christos Toumpanakis1, Martyn Caplin1, Shaunak Navalkissoor1
1Royal Free Hospital, London, United Kingdom.
2University College London, London, United Kingdom

P26. Auger electrons for molecular radionuclide therapy: the potential of the radionuclide 99mTc
Ines Costa1, Noor Siksek1, Alessia Volpe1, Francis Man1, Katarzyna Osytek1, Giuseppe Schettino2,3, Gilbert Fruhwirth1, Samantha Terry1
1King’s College London, London, United Kingdom.
2National Physical Laboratory, Teddington, United Kingdom.
3University of Surrey, Guilford, United Kingdom

P27. Streamlining [99mTc] Nanocolloid Sentinel Node Lymphscintigraphy in Penile Cancer
Zeeshan Shah1, Karen Marshall1, Oliver Kayes2, Ian Eardley2, Mamoun Elmamoun2, Andrew Scarsbrook1
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2Università di Genova, genova, Italy
1Department of Nuclear Medicine, Leeds Teaching Hospitals NHS Trust, Leeds, United Kingdom.
2Department of Urology, Leeds Teaching Hospitals NHS Trust, Leeds, United Kingdom

P28. Vulval sentinel node lymphoscintigraphy – is delayed imaging required?
Karen Marshall1, Zeeshan Shah1, Amudha Thangavelu2, David Nugent2, Andrew Scarbsbrook1
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2Department of Gynaecological Oncology Leeds Teaching Hospitals NHS Trust, Leeds, United Kingdom

P29. Influence of the Convolutional Neural Network topology in 99mTc-DPD amyloidosis classification
Eva Sousa1, Ann Twedde1, Ged Aven1,2, Alexander Turner1, Stephen J. Archibald1,2
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2Castle Hill Hospital, Hull University Teaching Hospitals NHS Trust, Kingston Upon Hull, United Kingdom.
3Computer Science Department, University of Nottingham, Nottingham, United Kingdom

P30. Development of novel dual modality PET/Fluorescence mitochondrial membrane potential (MMP) dependent tracers labelled with [18F]fluorine
Juozas Domarkas1,2, Charlotte Hepple3, Jennifer F. Wallis1, John Wright1,2, David Roberts1,2, Francesca Gasparin1, Annabelle Matern1, Lee J. Higham1, Steve J. Archibald1,2
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P31. UK Clinical Studies in Nuclear Medicine from 2015 to 2020: Examination of Data from Clinical Trial Repositories
Jennifer Young1,2, Maite Jauregui-Osoro3,2, Michelle Ma4,2, Philip Blower1,2
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2National Cancer Imaging Translational Accelerator, Cancer Research UK, United Kingdom.
3Imperial College London, London, United Kingdom.
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P32. Determination of the accuracy of PET scanner measured brain SUVRs using a novel anthropomorphic ‘painting’ phantom
Anton Paramithas1, Alan Britten1,2
1St. George’s University Hospitals NHS Foundation Trust, London, United Kingdom.
2Ph6 Ltd., London, United Kingdom

P33. A simulator system using radioactive aerosols to test the efficacy of face masks to block the emission of coughed or exhaled aerosols
Alan Britten1, James Hubber2
1Ph6 Ltd, London, United Kingdom.
2St Georges University Hospitals, London, United Kingdom

P34. Validation of Radionuclide Contaminant Analysis using a Fidelis Secondary Standard Radionuclide Calibrator
G Woolley1,2, L Kenning2,1, GA Wright1,2, SJ Archibald1,2
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2Hull University Teaching Hospitals NHS Trust, Hull, United Kingdom

P35. Initial experiences with Digital PET-CT scanner
Peter Strohalm1, Nicola Mulholland2, Marko Berovic2, Mohamed Halim3, Danielle Leavart3, Silvana Santos3, Clare Webber1
1Alliance Medical, Warwick, United Kingdom.
2KING’S COLLEGE HOSPITAL NHS FOUNDATION TRUST, London, United Kingdom.
3Alliance Medical, Sidcup, United Kingdom

P36. Developing a regulatory compliant nuclear medicine clinical research service
Rachel Bidder, Neil Hartman
Swansea Bay University Health Board, Swansea, United Kingdom

P37. Assessment of occupational exposure from shielded and unshielded syringes for clinically relevant Positron Emission Tomography (PET) Isotopes – Monte Carlo EGSnrc simulation and measurements.
Ann McCann1,2, Sean Cournane1,2, Luis Leon Vintro2, Julie Lucey1
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Joseph O’Brien, Dr Bill Thomson, Gregory James Sandwell & West Birmingham Hospitals NHS Trust, Birmingham, United Kingdom
P39. Service evaluation to assess effect of raising of upper blood glucose threshold for FDG PET-CT imaging on workflow and scan quality
Teresa Szyszko, Sachin Modi, Bruno Ferreira
Royal Free Hospital NHS Foundation Trust, London, United Kingdom

P40. Effect on patient outcomes in the investigation of pulmonary embolism from suspending ventilation imaging during the Covid-19 pandemic
Gareth Pawson, Matthew Memmott, Parthiban Arumugam
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