Asia Oceania Journal of Nuclear Medicine & Biology

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

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

Abstracted and indexed in: Pubmed, Scopus, Doaj, EBSCO, ISC, IMEMR, Magiran

Editorial Office
Asia Oceania Journal of Nuclear Medicine & Biology
Nuclear Medicine Research Center
Ghaem Hospital, Ahmadabad Ave, Mashhad, Iran
Postal Code: 91766-99199
Tel: ++98-51-38400494
Fax: ++98-51-38419521
E-mail: aojnmb@mums.ac.ir

http://aojnmb.mums.ac.ir

Abstracts

Of

The 15th Asia Oceania Congress of Nuclear Medicine and Biology (AOCNMB 2023)

5th -7th October 2023

Amman, Jordan

Welcome Message

Dear Esteemed Colleagues,

We are delighted to extend a warm welcome on behalf of the Scientific Program Committee to the most anticipated event of the year. This Congress marks the 15th meeting of the AOCNMB, and it promises to be a spectacular gathering of minds and innovation.

This year, we have received an overwhelming response, with over a hundred abstract submissions pouring in from various corners of Asia Oceania countries. We have carefully selected about 50 outstanding scientific and educational abstracts from among these to be presented at the Congress. These abstracts will be presented by young nuclear medicine professionals from Asia and Oceania, as well as approximately 40 renowned guest speakers from around the world who will share the most recent outstanding developments in our nuclear medicine specialty.

The Asia Oceania region is currently at the forefront of Nuclear Medicine and Molecular Imaging development and expansion. It is an exhilarating moment to be involved in this lively community. You are cordially invited to AOCNMB 2023 in Amman, where you can form new bonds and reunite with like-minded allies in the pursuit of advancing the field.

I eagerly anticipate our encounter in Amman, Jordan.

Warm regards,

Prof. Dr. Akram Al-Ibraheem,
MD, FEBNM, DCBNC, and FANMB
President of the 15th AOCNMB 2023

Department of Nuclear Medicine and PET/CT
King Hussein Cancer Center (KHCC), Amman, Jordan

Preliminary comparison of ^{68}Ga-FAPI-46 against ^{18}F-FDG, ^{68}Ga-DOTATATE, and ^{68}Ga-Pentixafor PET/CT/MR imaging in the assessment of various cancer types

Habibollah Dadgar[1], Nasim Norouzbeigi[1], Majid Assadi[2], Batool Al-balooshi[3], Akram Al-Ibraheem[4,5], Yehia Omar[6], Heidar Muhsin Al-Alawi[7,8], Sharjeel Usmani[9], Andrea Cimini[10], Maria Ricci[11], Hossein Arabi[12], Habib Zaidi[12,13,14,15]

[1]Cancer Research Center, Razavi Hospital, Imam Reza International University, Mashhad, Iran
[2]The Persian Gulf Nuclear Medicine Research Center, Department of Molecular Imaging and Radionuclide Therapy, Bushehr Medical University Hospital, Bushehr University of Medical Sciences, Bushehr, Iran
[3]Dubai Nuclear Medicine and Molecular Imaging Center, Dubai Academic Health Corporation, UAE
[4]Department of Nuclear Medicine, King Hussein Cancer Center, Amman, Jordan
[5]Division of Nuclear Medicine, Department of Radiology and Nuclear Medicine, University of Jordan, Amman, Jordan
[6]PET-CT Department at Misr Radiology Center, Heliopolis, Egypt
[7]Nuclear Medicine Department, Amir Al-Momineen Specialty Hospital, Al-Najaf Governorate, Iraq
[8]Middle Euphrates Cancer Hospital, Al-Najaf Governorate, Iraq
[9]Department of Nuclear Medicine, Sultan Qaboos Comprehensive Cancer Care and Research Center, Seeb, Oman
[10]Nuclear Medicine Unit, St. Salvatore Hospital, 67100 L'Aquila, Italy
[11]Nuclear Medicine Unit, Cardarelli Hospital, Campobasso, Italy
[12]Division of Nuclear Medicine and Molecular Imaging, Department of Medical Imaging, Geneva University Hospital, CH-1211 Geneva 4, Switzerland
[13]Geneva Neuroscience Center, Geneva University, CH-1205 Geneva, Switzerland
[14]Department of Nuclear Medicine and Molecular Imaging, University of Groningen, University Medical Center Groningen, 9700 RB Groningen, Netherlands
[15]Department of Nuclear Medicine, University of Southern Denmark, Odense, Denmark

Background: ^{68}Ga-FAPI PET/CT imaging allows for effective lesion detectability in the cancer microenvironment owing to the relatively high intra-tumoral uptake and low background. This work reports on a preliminary comparison between ^{68}Ga-Pentixafor and ^{68}Ga-FAPI-46 PET radiotracers against commonly used ^{18}F-FDG and ^{68}Ga-DOTATATE PET radiotracers in the assessment of various cancer types.

Materials and Methods: Eleven patients with histopathologically confirmed breast cancer, gastric, cervical, glioblastoma multiform, well-differentiated adenocarcinoma, papillary thyroid carcinoma, Ewing's sarcoma, colon, and medullar thyroid cancer were retrospectively studied. Nine patients were scanned with ^{18}F-FDG, eleven patients with ^{68}Ga-FAPI, three patients with ^{68}Ga-DOTATATE, and one patient with ^{68}Ga-Pentixafor on a Siemens Biograph 6 PET/CT scanner. PET/CT images were evaluated by two nuclear medicine physicians to identify malignant lesions and perform semi-quantitative analysis to calculate the maximum standardized uptake value (SUV_{max}) and target-to-background ratio (TBR).

Result: The evaluation of the eleven subjects demonstrated the effectiveness of ^{68}Ga-FAPI-46 compared to ^{18}F-FDG for the detection of metastasis in the lymph nodes (55 vs. 49), liver (4 vs. 3), and bone (4 vs. 3). ^{68}Ga-Pentixafor and ^{68}Ga-DOTATATE PET/CT scans exhibited no significant differences with both being inferior to ^{68}Ga-FAPI-46 PET radiotracer in terms of metastasis detection. Semi-quantitative analysis showed that the TBR and SUV_{max} were significantly higher in ^{68}Ga-FAPI-46 PET than IN ^{18}F-FDG PET for bone metastases and lymph nodes. ^{18}F-FDG and ^{68}Ga-FAPI-46 images exhibited similar SUV_{max} in liver metastases. However, the TBRs were significantly higher in ^{68}Ga-FAPI-46 images than in ^{18}F-FDG images.

Conclusion: Improved malignancy detection rates for metastases in the liver, lymph nodes, and bone were observed for ^{68}Ga-FAPI-46 PET compared to ^{68}Ga-DOTATATE, ^{18}F-FDG, and ^{68}Ga-Pentixafor PET.

Comparing the Diagnostic Efficacy of ^{99m}Tc-PSMA SPECT/CT Scanning After 75 Minutes and 4 Hours of Radiotracer Injection in Men with Prostate Cancer

Atena Aghaee[1]

[1]Nuclear Medicine Research Center, Mashhad University of Medical Sciences, Mashhad, Iran

Background: Prostate-Specific Membrane Antigen (PSMA) is overexpressed in primary and metastatic prostate carcinoma (PCa) and can be targeted by a [^{99m}Tc]Tc-HYNIC-PSMA-11 scan for the detection of metastases. Despite extensive studies, data on the most appropriate interval between radiopharmaceutical injection and image acquisition is scarce. We compared the metastasis detection rates of the [^{99m}Tc]Tc-HYNIC-PSMA-11 scan between 75-minute and 4-hour intervals of radiopharmaceutical injection.

Materials and Methods: We studied 30 men with pathologically confirmed PCa who were referred to our tertiary hospital for a PSMA scan due to primary staging, biochemical recurrence, pre-^{177}Lu-PSMA therapy, or surveillance. This study was conducted between May 2021 and May 2022, and all participants had given their consent. Following the injection of the radiopharmaceutical, 75-minute and 4-hour [^{99m}Tc]Tc-HYNIC-PSMA-11 SPECT-CT scans were performed. The metastasis detection rates of scan were evaluated in 75-minute and 4-hour intervals.

Result: The mean age of patients was 68.43±9.61 years, with a median prostate-specific antigen of 4.19 ng/ml and a median Gleason Score of 8. Nine cases had negative [^{99m}Tc]Tc-PSMA-11 scans, while 21 had positive scans (8 cases with bone, 2 with lung, 4 with lymph node, and 7 with multiple organ metastases). All metastases were detected in both checkpoints, except for one patient, in whom 75-minute images detected three pelvic metastatic lymph nodes, while four were seen in the 4-hour scan. This small missed right external iliac lymph node did not change the patient's management.

Conclusion: We found no significant difference in the detection rate of metastatic lesions in 75-minute and 4-hour intervals. These findings could help decrease crowdedness, provide efficient scheduling, and improve patient satisfaction in nuclear medicine departments.

Pre-treatment [^{68}Ga]Ga-PSMA-11 PET/CT prognostic value in predicting response to [^{177}Lu]Lu-PSMA-I&T therapy and patient survival

Seyed Ali Mirshahvalad[1,2*], Roya Eisazadeh[1], Simon Gampenrieder[3], Gundula Rendl[1], Lukas Lusuardi[4], Gregor Schweighofer-Zwink[1], Christian Pirich[1], Mohsen Beheshti[1]

[1]Division of Molecular Imaging and Theranostics, Department of Nuclear Medicine, University Hospital, Paracelsus Medical University, Salzburg, Austria
[2]Joint Department of Medical Imaging, University Health Network, University of Toronto, Toronto, Canada
[3]Department of Oncology, University Hospital, Paracelsus Medical University, Salzburg, Austria
[4]Department of Urology, University Hospital, Paracelsus Medical University, Salzburg, Austria

Background: To determine whether pre-treatment [^{68}Ga]Ga-PSMA-11 PET/CT can predict prostate cancer patients' response to [^{177}Lu]Lu-PSMA-I&T, as well as to evaluate its prognostic value in overall survival (OS).

Materials and Methods: This retrospective study comprised 60 metastatic castration-resistant prostate cancer (mCRPC) patients who underwent [^{177}Lu]Lu-PSMA I&T therapy and pre-treatment [^{68}Ga]Ga-PSMA-11 PET/CT. Semi-quantitative PET parameters, including SUVs and SULs of the most PSMA-avid lesion, SUV_{mean} of the parotid gland and healthy liver (backgrounds), PSMA tumor volume (PSMA-TV), and total lesion PSMA (TL-PSMA), were analyzed. Age, ISUP-grade, pre- and post-therapy PSA, previous treatment, and the site of metastases were considered clinical factors for multivariate analysis. For response assessment, PSA (PCWG3) combined with [^{68}Ga]Ga-PSMA PET/CT (RECIP 1.0) were evaluated. Progressive disease was defined as a PSA increase of ≥ 25% or RECIP-PD.

Result: The imaging and clinical data of 60 mCRPC patients (mean age:73±8 years, baseline pre-treatment PSA:185±371) were assessed. Patients received a median of four treatment cycles (range:1-6). Overall, 30/60 (50%) of patients were progressive. In the univariate analysis, the highest SUL_{max} (p-value=0.046), highest SUV_{max}-to-liver (p-value=0.024), highest SUL_{max}-to-liver (p-value=0.021), highest SUV_{max}-to-parotid (p-value=0.023), and highest SUL_{max}-to-parotid (p-value=0.020) were significantly correlated with the response. In the multivariate analysis, only the highest SUL_{max}-to-liver significantly predicted treatment response (p-value=0.038; cut-off=8, AUC=0.71; low-ratio correlated with disease progression). There was no significant correlation between clinical factors and therapy response. With a median follow-up of 360 (91-1114) days, 11/60 (18%) deaths occurred. In the multivariate survival analysis, only the SUL_{max}-to-parotid ratio was a significant predictor of OS (cut-off=2.4, p-value=0.043; hazard ratio=4.0, 95%CI=1.1-15.0).

Conclusion: The tumor-to-background ratio proved significantly prognostic. Thus, calculating the SUL_{max}-to-background ratios of the hottest lesions may potentially help identify suitable individuals and modify the management approach for patients who are unlikely to get significant benefits from [^{177}Lu]Lu-PSMA-I&T therapy alone.

Molecular docking studies for evaluating amino-pyridyl alkene derivatives as a fluorine radio-ligand with high protein binding affinity to alpha-synuclein related to Parkinson's disease

Mohammad Rahimi[1]

[1]Faculty of Chemistry, Bu-Ali Sina University, Hamedan, IRAN

Background: Alpha-synuclein is a protein associated with synucleinopathies and plays a crucial role in diseases related to Lewy bodies, such as dementia with Lewy bodies, Parkinson's disease, and multiple system atrophy. Therefore, the availability of radiopharmaceuticals that target alpha-synuclein aggregates is crucial and contributes significantly to the prompt diagnosis of Parkinson's disease.

Materials and Methods: The selection of an appropriate crystallographic structure is crucial for the accuracy of virtual screening. Furthermore, the key point in reliable docking is the selection of a crystallographic structure that is similar to the compounds in the structural database under investigation. In this regard, to select the best crystallographic structure for the enzyme alpha-synuclein (αS), structure ID: 6vp9 was extracted from the Protein Data Bank. Using the model face software, all amino acid corrections were made, and the co-crystallized ligand and water were removed. Subsequently, using the ADT software, nonpolar hydrogen atoms were merged into the corresponding carbon atom, and the whole electrostatic and solvation parameters were calculated. Finally, the macromolecule file was saved in pdbqt format.

Result: Comparative performance evaluation of radiopharmaceuticals is growing rapidly. In this study, a molecular docking based on comparative evaluation between synucleinase inhibitors and the effectiveness of different radiopharmaceuticals for their inhibition was performed on alpha-synuclein receptors. The docking results showed that the compound 3-((2-Amino-5-(1-methyl-1H-pyrazol-4-yl) pyridin-3-yl) ethynyl)-N-(3-(2-fluoroethoxy)-phenyl)-4-methylbenzamide had better performance among amino pyridyl alkynyl derivatives. Ligand-receptor interaction is both ionic and covalent, indicating a strong bond between them. The main participating amino acids in the reaction include arginine and aspartic acid.

Conclusion: Docking validation was performed using the root mean square deviation parameter, which was consistent with the data results, and the obtained results were desirable.

Radioiodinated Iodoresiniferatoxin (^{131}I-RTX), a Semi-Synthetic Capsaicin Analog and an Eligible Candidate as Radiotheranostic Agent in Vanilloid Receptor 1 Overexpressing Tumors

Mohsen Mohammadgholi[1]

[1]Department of Radiopharmacy, Faculty of Pharmacy, Mazandaran University of Medical Sciences, Sari, Iran

Background: This study aimed to develop ^{131}I-RTX to create a suitable opportunity for simultaneous therapeutic and diagnostic targeting of a wide range of Vanilloid Receptor 1 (VR1) overexpressing tumor cells.

Materials and Methods: ^{131}I-RTX was prepared with high radiochemical purity (RCP) using the well-known isotopic exchange direct radiolabelling. RCP and stability were assessed by thin-layer chromatography (TLC) and also confirmed by reversed-phase high-performance liquid chromatography. The radioligand cytotoxicity and affinity toward the MCF-7 breast cancer cell line with overexpression of the VR1 were also evaluated using MTT and saturation radioligand binding assays, respectively. Moreover, biodistribution studies were investigated in both normal and MCF-7 xenograft tumor-bearing nude mice to track the distribution of ^{131}I-RTX in various organs and the tumor site. After the treatment of ^{131}I-RTX, the mice were divided into two groups. The first group underwent a histopathological evaluation, while the second group was chosen for imaging after 2 to 10 days, depending on the injected dose.

Result: Radiolabelling was achieved with high purity and without further purification or filtering. ^{131}I-RTX binding to MCF-7 cells expressing VR1 exhibited a high affinity in the nanomolar range. In-vivo studies showed that ^{131}I-RTX was mainly cleared from the bloodstream through the hepatobiliary pathway. Despite the high affinity of ^{131}I-RTX for VR1, its retention was not considerable in tumor tissues or certain organs, such as the spleen, pancreas, or lungs. This may be due to the rapid in vivo metabolism of ^{131}I-RTX. Moreover, ^{131}I-RTX is unable to reach its target in sufficient concentration because of its lipophilic nature and extensive plasma protein binding.

Conclusion: High deiodination of I-RTX during hepatobiliary metabolism deprives it of being applied as a radiopharmaceutical for diagnostic and therapeutic purposes.

Quantitative vs. Semi-Quantitative Derived Parameters in Dual Time-Point [^{18}F]FDG PET/CT Imaging

Rezvan Samimi[1], Alireza Kamali-Asl[1], Parham Geramifar[2]

[1]Department of Radiation Medicine Engineering, Shahid Beheshti University, Tehran, Iran
[2]Research Center for Nuclear Medicine, Shariati Hospital, Tehran University of Medical Sciences, Tehran, Iran

Background: Dual time-point (DTP) imaging has been used to differentiate inflammatory lesions from malignant tumors and to enhance the specificity of [^{18}F]FDG PET imaging by determining a retention index (RI). We aimed to evaluate a framework for metabolic uptake rate (Ki) derivation from DTP images (DTP-Ki) through clinical assessment and to evaluate whether the use of DTP [^{18}F]FDG PET/CT with the calculation of DTP-Ki would provide some advantages with respect to semi-quantitative parameters, such as standardized uptake value (SUV) and RI.

Materials and Methods: A total of 81 lesions were determined on 17 dynamic PET/CT scans obtained from nine patients with liver metastases of colorectal cancer, one with lymphoma, and one with liver metastasis and coincidental thyroiditis. The patient data were first analyzed from full dynamic PET data (Patlak-Ki), and then, depending on the given scan duration, the DTP of data was selected for the estimation of the DTP-Ki. The correlation and Passing–Bablok regression analysis were performed to compare DTP-Ki and semi-quantitative parameters, such as RI, SUV_{max}, and SUV_{mean} in PET-1 ($SUV_{max\text{-}1}$ and $SUV_{mean\text{-}1}$) and PET-2 ($SUV_{max\text{-}2}$ and $SUV_{mean\text{-}2}$).

Result: The results showed strong correlations ($r \geq 0.833$, $P < 0.0001$) between Patlak-Ki and DTP-Ki. The mean Ki derived by the Patlak method was linearly related to those derived by our DTP method with a slope of 1.022 and intercept of -2×10^{-4}. A poor correlation ($r < 0.726$, $P < 0.0001$) was obtained between the DTP-Ki and RI, SUV_{max}-1, $SUV_{mean\text{-}1}$, $SUV_{max\text{-}2}$, and $SUV_{mean\text{-}2}$. The slope and intercept of the Passing-Bablok plot were (0.057, 0.641, 0.478, 1.080, 0.687) and (1.7 × 10−3, -0.972, -0.651, -1.613, -0.954), respectively.

Conclusion: This study demonstrated the feasibility of a simple and clinically practical method based on DTP [^{18}F]FDG PET imaging for Ki quantification as a complementary and probably superior parameter compared to RI and SUV in the diagnostic performance of DTP PET/CT.

Exploring the Potential of Body Composition Change in Pre- and Post-Ablation State of Thyroid Carcinoma Patients

Afroza Naznin Akhee[1], Azmal K Sarker[2], Hosne Ara Rahman[1]

[1]Institute of Nuclear Medicine and Allied Sciences, Mitford, Dhaka, Bangladesh
[2]Institute of Nuclear Medicine and Allied Sciences, Gopalganj, Bangladesh

Background: The current standards of management put thyroid cancer patients into thyroidectomy-induced hypothyroidism for a brief period before Radioiodine ablation therapy (RAIT), followed by an iatrogenic lifelong status of subclinical hyperthyroidism. Thyroxine is a known influencer of our body composition. This study aimed to comprehend the potential change in body composition of patients subjected to peri-RAIT seesawing of thyroxine.

Materials and Methods: This study was conducted during January-May 2023. Six thyroid cancer patients referred for post-surgery RAIT were scanned with Dual Energy X-ray Absorptiometry for body composition analysis, including total body fat, lean and bone percentage, fat mass index (FMI), and visceral adipose tissue volume. The scan was done twice, at a pre-therapy state with very high serum TSH level (≥100 mIU/L) and three months post-therapy when serum TSH level was suppressed (≤0.01 mIU/L).

Result: All six patients had a history of papillary thyroid carcinoma, with a male-to-female ratio of 1:2 and a mean age of 36.3±17.4 years. Despite the reversal of the hypothyroid state, four patients' body mass index (BMI) remained the same or even increased, while that of two patients decreased. Three cases showed a decrease in total body fat percentage and the corresponding increase in lean percentage. However, visceral adipose tissue volume was decreased in five patients regardless of changes in weight, BMI, or FMI.

Conclusion: This study was part of a larger study investigating body composition change in thyroid cancer patients. Though the sample size was too small to outline any significant trend, it attracted our attention to visceral adipose tissue volume as a potential early indicator of positive change in body composition.

Analysis of Referral Pattern of Thyroid Disorder in Children in a Tertiary Nuclear Medicine Institute of a Developing Country

Shamsun Nahar Bailey[1]

[1]National Institute of Nuclear Medicine and Allied Sciences, BAEC, Dhaka, Bangladesh

Background: This study focused on a subset of children with differentiated thyroid carcinoma, highlighting the importance of early detection and treatment.

Materials and Methods: This was an institute-based descriptive study including the referred children with thyroid disorders who were enrolled between January 2022 to June 2023. A thyroid profile consisting of free triiodothyronine, free thyroxin, and thyroid stimulating hormone levels, high-resolution ultrasound of the neck, technetium-99m thyroid scan, and radioiodine thyroid uptake were done in the thyroid division.

Result: In this study, a total of 233 children were referred to the thyroid division in the Nuclear Medicine Institute with clinically suspected thyroid disorders and histopathology-proven differentiated thyroid carcinoma (DTC). Congenital anomalies of the thyroid gland were noted in 25 patients (female=15 and male=10). Thyroglossal duct cysts were found in 12 patients (female=6, male=6), agenesis of the thyroid gland was noted in 5 patients (female=3, male=2), and 8 patients (female=6, male=2) were diagnosed with an ectopic thyroid gland. Thyroiditis was found in 19 patients (female=16, male=3), diffuse thyromegaly in 39 (female=29, male=10), and nodular goiter in 21 (female=18, male=3). Biochemically, hyperthyroidism was detected in 52 children (female=35, male=17), hypothyroidism in 16 (female=13, male=3), and euthyroidism in 30 (female=18, male=12). A total of 40 children (female=32, male=8) with DTC were enrolled for radioactive iodine therapy within the mentioned period. Papillary thyroid carcinoma with or without lymph node metastases was observed in 37 patients (female=29, male=8), one patient had papillary microcarcinoma, and three other patients had follicular thyroid carcinoma (all female).

Conclusion: In summary, this study comprehensively evaluated thyroid disorders in children, revealing a range of conditions from congenital anomalies to differentiated thyroid carcinoma.

Assessment of Perfusion Abnormalities in Autism Spectrum Disorder using ^{99m}Tc ECD Brain SPECT: A Landmark Case in Bangladesh

Sheikh Mohammad Adnan[1], Ashrafi Anar[1], Urans Islam[1], Rahima Perveen[1], Nasreen Sultana[1]

[1]National Institute of Nuclear Medicine and Allied Sciences. Block-D, BSMMU Campus, Dhaka-1000, Bangladesh

Background: This study aimed to assess regional cerebral blood flow abnormalities in individuals with autism spectrum disorder (ASD) using radionuclide brain single photon emission computed tomography (SPECT) imaging. Additionally, it seeks to establish a connection between these abnormal blood flow patterns and the symptom profile exhibited by autistic patients.

Materials and Methods: Based on a systematic review, the prevalence of ASD in Bangladesh has been observed to range from 0.15% to 0.8%. Brain SPECT is a validated nuclear neuroimaging technique used for evaluating brain perfusion and holds potential as a diagnostic tool for ASD.

Result: A three-year-old male child diagnosed with ASD was referred to the National Institute of Nuclear Medicine and Allied Sciences for a brain perfusion scan. The procedure followed the standard protocol, involving the administration of ^{99m}Tc ECD (2 mCi) intravenously, along with a low dose of sedation. Dynamic sequential SPECT images were acquired over 30 min, capturing 20 frames per second from the vertex to the base of the skull. The acquired images from Digital Imaging and Communications in Medicine were analyzed using the e-ZIS (easy Z-score Imaging System) software. The analysis revealed multiple focal areas of reduced radiotracer concentration (hypo-perfusion) in regions including both frontal lobes, the left temporal lobe, the right parietal region, the right precuneus, and both hypothalamus. The application of the e-ZIS software indicated a severity of regional cerebral blood flow decrease of 1.64 in specific voxels, such as the parietal lobes, precuneus, and posterior cingulate gyri.

Conclusion: If a discernible link can be established between regional cerebral blood flow abnormalities and ASD symptoms, it could potentially empower physicians to provide more targeted and advanced interventions.

One-Year Observations of HIDA Scans at NINMAS, Bangladesh

Urnas Islam[1], Sharmin Reza[1], Rahima Perveen[1], Nasreen Sultana[1], Sadia Sultana[1]

[1]National Institute of Nuclear Medicine and Allied Sciences, BSMMU Campus, 7th to 10th Floor, Block-D. Shahbag Dhaka-1000, Bangladesh

Background: The primary goal of this research was to validate the effectiveness of hepatobiliary scintigraphy (HIDA Scan) in assessing the outcomes and success rate of the Kasai operation for Biliary Atresia cases at the National Institute of Nuclear Medicine and Allied Sciences (NINMAS).

Materials and Methods: In this retrospective study, 150 patients referred to NINMAS for HIDA Scan between January 2022 and December 2022 were assessed. Comprehensive evaluations, including medical history, physical exams, liver function tests, ultrasonography, hepatobiliary scintigraphy, and liver biopsy, were conducted for Biliary Atresia diagnosis. Of these, 16 patients had prior Kasai operations and underwent follow-up HIDA Scans.

Result: Among the 150 patients, 103 were male and 47 were female. The mean age was 8.33±2.34 months. Age distribution included 77 patients aged 0 to 2 months, 45 patients aged 3 to 5 months, 18 patients aged 6 to 11 months, and 9 patients aged over 1 year. Following the HIDA Scan, 35 patients exhibited bowel activity within 2 h, indicating patent biliary channels. Conversely, the remaining 115 patients were diagnosed with biliary atresia as their bowel activity was not observed within 2 h during the HIDA Scan. Of these 115 patients, 65 were also experiencing hepatic insufficiency, with 49 of them falling within the 0-3-month age range. Additionally, among the positively identified cases, 16 patients had undergone the Kasai operation for follow-up, all within the 0-2-month age range. Post-Kasai operation, 15 patients displayed positive outcomes, while only one patient, older than 6 months, experienced a recurrence of biliary atresia, which was verified through HIDA Scan.

Conclusion: This study underscores the significance of age in effectively managing Biliary Atresia.

Outcome of radioiodine treatment in well-differentiated childhood thyroid malignancy in a tertiary nuclear medicine establishment in Dhaka

Shaila Sharmin[1], Afroza Akhter[1], Mohana Hossain[1], Rawnak Afrin[1], Sabrina Islam[1], Rubina Begum[1], Jasmine Ara Haque[1], Faridul Alam[2]

[1]Institute of Nuclear Medicine and Allied Sciences, Dhaka, DMCH Campus, Bangladesh
[2]Bangladesh University of Health Sciences, Bangladesh

Background: This study was designed to check the prognosis and outcome of disease after the radioiodine (RAI) treatment of well-differentiated thyroid malignancy in children treated in nuclear medicine establishments.

Materials and Methods: This was a retrospective study conducted on pediatric differentiated thyroid cancer patients who had been given therapeutic RAI treatment at the Institute of Nuclear Medicine, Dhaka, from January 2005 to December 2014. The study was performed by reviewing the patient's information and treatment file, who had received treatment from January 2005 to December 2014. The follow-up record of at last 10 years was considered for study.

Result: A total of 40 pediatric patients were studied, of which 34 and 6 were female and male, respectively (F: M: 5.6:1, age range: 9-18 years, mean age: 13±1 years). Patients referred after total thyroidectomy for thyroid malignancy treatment by RAI therapy. Among them, 24 patients (female=21, male=3, 60%) had papillary thyroid carcinoma (PCT), 3 patients (female=2 male=1, 7.5%) had follicular thyroid carcinoma, 12 patients (female=10, male=2, 30%) had PCT with lymph node metastasis, and one female patient had medullary thyroid carcinoma. One year after the initial radioiodine therapy, 29 (74.3%) patients achieved excellent response, while 10 (25.64%) patients showed recurrence. None of the participants passed away during the study period.

Conclusion: The prognosis for thyroid carcinoma in children is excellent. Proper treatment and regular follow-up are needed for better outcomes of this disease.

Variation of metabolic activity of F-18 FDG in hyperglycemic diabetic cancer patients after administration of short-acting insulin

Fatema Zohra[1]

[1]Institute of Nuclear Medicine and Allied Sciences, Dhaka, DMCH Campus, Bangladesh

Background: This cross-sectional retrospective study quantitatively evaluated the F-18 FDG metabolism in diabetic cancer patients who required Pre-Scan Blood Sugar Adjustment and Insulin (PSAI) and compared with those from non-diabetic cancer patients who did not require PSAI.

Materials and Methods: We retrospectively enrolled 201 cancer patients. Among them 78 were diabetic (Group A) who had fasting hyperglycemia (RBS>10 mmol/L) requiring PSAI with intravenous (IV) injection of short-acting insulin 60 min before the IV injection of F-18 FDG. The 123 non-diabetic patients (Group B), who were euglycemic, did not require a PSAI before the IV injection of F-18 FDG. Whole-body positron emission tomography (PET) scan was done in all patients 60 min after the IV injection of F-18 FDG along with a 128-slice oral contrast CT scan in Philips Ingenuity TF. The whole-body PET images were used to obtain the SUV_{max} from the bilateral gluteus maximus, bilateral lumbar muscles, right and left heart ventricles, both lobes of the liver, spleen, pancreas, ascending and descending colon, both kidneys, and urinary bladder in all patients, as well as bilateral testes in male patients. Mann-Whitney test was applied to test the differences in metabolic activity between the two groups.

Result: SUV_{max} was significantly higher ($P<0.05$) in all patients from Group A in their bilateral gluteus maximus, bilateral lumbar muscles, right ventricles, both lobes of the liver, spleen, pancreas, and urinary bladder compared to patients from Group B. SUV_{max} was significantly lower ($P<0.05$) in male patients from Group A in the bilateral testes compared to those from Group B.

Conclusion: We characterized the variation of metabolic activity of F-18 FDG in hyperglycemic diabetic cancer patients requiring PSAI.

Assessment of Recurrence/Metastases in Postsurgical Female Breast Carcinoma Patients in Relation to Immunohistochemical Characteristics Using ^{18}F-FDG PET/CT Scan

Papia Akhter[1], Shamim M F Begum[2], Md. Abu Bakker Siddique[3], Pupree Mutsuddy[4], Tapati Mandal[1], Mohammad Sajjad-Al-Mishal[5], S. M. Arifur Rahman[5]

[1]Assistant Professor and SMO, National Institute of Nuclear Medicine and Allied Sciences (NINMAS), Block-D, BSMMU Campus, Shahbag, Dhaka-1000
[2]Member (Planning), Bangladesh Atomic Energy Commission
[3]Professor and CMO, NINMAS
[4]Associate Professor and PMO,NINMAS
[5]Medical Officer, NINMAS

Background: The objective of this study was to observe the ^{18}F-FDG positron emission computed tomography (PET/CT) findings in relation to immunohistochemical characteristics (IHCs) in postoperative breast carcinoma (BC) patients at the National Institute of Nuclear Medicine & Allied Sciences (NINMAS).

Materials and Methods: This retrospective study aimed to assess the metastases or recurrence regarding IHCs of postoperative BC patients using an ^{18}F-FDG PET/CT scan.

Result: A total of 163 patients were included in this study. Age ranged from 26 to 86 years with an average of 52.07 ± 11.8, and most common age group was between 41-50 years (30.67%). Out of 163 patients, metastases were observed in 44 (26.99%) patients. Most common site of metastases was in axillary lymph nodes (63.64%), followed by bone (43.18%), lung (36.36%), and liver (9.09%). The mean CA 15-3 was higher (137 U/ml) in patients with metastases compared to patients without metastases (13.7 U/ml). 16 out of 49 Triple negative patients had metastases. 3 out of 10 Triple positive patients had metastases. The HER-2 negative with metastases was present in 26 (59.09%) cases, and HER-2 positive with metastases was observed in 18 (40.09%) cases with different combination of ER and PR characteristics. Local recurrence was found in three cases, and all were HER-2 negative. Follow up period ranged from six months to 19 years. In case of HER-2 negative patients, 53.85% developed metastases within two years, which was 38.88% in HER-2 positive patients. The mean SUV_{max} of metastatic site was also higher in HER-2 negative (SUV_{max}: 7.5) than HER-2 positive cases (SUV_{max}: 5.5). No significant difference was observed in the pattern of metastases. Moreover, no individual factor was found independently associated with sites of metastases.

Conclusion: Based on the findings of the present research, HER-2 negative with different combination of ER and PR characteristics, and triple negative cases showed more metastases and recurrence than HER-2 positive cases.

Deep learning-based detection of clinically significant prostate cancer in ^{68}Ga PSMA PET/CT delayed imaging by analysis of radiomic features

Arivan Ramachandran[1]

[1]Department of Nuclear Medicine, Post Graduate Institute of Medical Education and Research, Chandigarh, India

Background: To assess the utility of convoluted neural network (CNN) in differentiating clinically significant and insignificant prostate cancer in patients with ^{68}Ga PSMA PET/CT targeted prostate biopsy-proven prostate cancer.

Materials and Methods: In this retrospective study, we selected 98 patients who underwent ^{68}Ga PSMA PET/CT targeted prostate biopsy. Based on histopathology, the patients were categorized into two groups, i.e., Insignificant prostate cancer (n= 29 with Gleason Score = 6) and clinically significant prostate cancer (n = 69 with Gleason Score ≥ 7). Freeware was used for extracting radiomic features (RF) from delayed ^{68}Ga PSMA PET/CT images. Radiomic features of 88 patients were fed to an in-built CNN of the software for computation and results were achieved. Independent set of 10 patients' radiomic features was used for testing.

Result: A total of 124 RF were extracted from the delayed ^{68}Ga PSMA PET/CT images. The accuracy of the CNN was 86.4% to differentiate clinically significant and clinically insignificant prostate cancer with the sensitivity, specificity, positive predictive value and negative predictive value of 95.2%, 65.4%, 86.8% and 85.0% respectively. The accuracy of the CNN to differentiate the patients in independent test set was 80.0%.

Conclusion: CNN is a feasible pre-biopsy screening tool for identifying clinically significant prostate cancer and can be used as an adjunct in the initial diagnosis and early treatment planning.

Enhancing the tumor uptake of a ^{177}Lu-labeled-porphyrin derivative by conjugating with nuclear localization signal (NLS) sequence: a systemic in-vitro and in-vivo evaluation

Naveen Kumar [1,2], Amit Kumar Sharma[1,2], Mohini Guleria[1,2], Avik Chakraborty[3], Drishty Satpati[1,2], Tapas Das[1,2]

[1]Radiopharmaceuticals Division, Bhabha Atomic Research Centre, Trombay, Mumbai - 400085, India
[2]Homi Bhabha National Institute, Anushaktinagar, Mumbai - 400094, India
[3]Radiation Medicine Centre, Bhabha Atomic Research Centre, Parel, Mumbai - 400012, India

Background: Nuclear localization signal (NLS) sequences belong to a class of highly cationic and objective of the present work is to evaluate the ability of the radiolabeled NLS peptide-porphyrin conjugate towards facilitating the delivery of an in-house synthesized porphyrin derivative in the tumorous lesions.

Materials and Methods: An in-house synthesized porphyrin derivative namely, 5-carboxymethyelene-oxyphenyl-10,15,20-tris(4-methoxyphenyl) porphyrin (UTriMA) was utilized for conjugation with NLS sequence [PKKKRKV]. The synthesized compounds in the present work namely, NLS, UTriMA and NLS-UTriMA were coupled with DOTA, a bi-functional chelating agent and were evaluated for cellular toxicity, photocytotoxicity and fluorescence cell imaging studies in HT1080 cancer cells. DOTA-UTriMA, UTriMA-DOTA-Lys-NLS and DOTA-Lys-NLS were also radiolabled with ^{177}Lu followed by their evaluation in tumor bearing animal model.

Result: In-vitro studies revealed the minimal dark toxicity for all the compounds. However, UTriMA-DOTA-Lys-NLS exhibited significantly higher light dependent toxicity. Cell imaging studies revealed higher cellular accumulation for the NLS conjugated porphyrin derivative. During animal studies, ^{177}Lu-labeled-UTriMA-DOTA-Lys-NLS exhibited significantly higher tumor accumulation as compared to ^{177}Lu-labeled-DOTA-Lys-UTriMA and DOTA-Lys-NLS complexes. SPECT-CT images revealed time dependent accumulation of the radiolabelled tracer from the blood pool to the tumor site. Tumor regression studies showed reduction in tumor size in the treated group of animals.

Conclusion: The results of present work revealed the significant enhancement in the targeting ability as well as radiotherapeutic efficacy of porphyrin derivative upon conjugation with NLS.

Analysis of Long-term Outcomes and Prognosis of Age-matched Medullary Thyroid Cancer Patients based on RET Mutation

Meghana Prabhu[1]

[1]Department of Nuclear Medicine, Institute of Liver and Biliary Sciences, New Delhi, India

Background: Medullary Thyroid Cancer (MTC) occurs in sporadic/hereditary form. Therefore, long-term outcomes and prognosis of age-matched MTC patients based on RET mutation status was analyzed.

Materials and Methods: Data retrieved from prospectively maintained Nuclear Medicine Clinic thyroid cancer database (1998-2019). Age-matched (±1y) sample of 50 patients' long-term follow-up data was analyzed.

Result: The median age of the studied group was 31 years (range: 16-52), and the median follow-up duration was 48 months. Clinicopathologic characteristics and surgery details were compared. Long-term clinical outcomes of 49 patients were assessed. Progression-free survival (PFS) was 57.1% in total (62.5% in RET positive and 52% in RET negative group, P=0.667). Univariate analysis revealed presence of lymph nodal (LN) metastasis and stage to be significant predictors of disease recurrence; however, multivariate analysis demonstrated the presence of metastases (local/distant) as the only significant predictor of recurrence.

Conclusion: Medullary Thyroid Cancer patients have relatively favorable long-term outcomes. The PFS was similar irrespective of RET mutation status in this study. Presence of metastases appeared to be the strongest predictor of PFS, followed by presence of LN metastases and stage of the disease.

Comparative evaluation and validation of AI mediated radiomics in PET/CT images of carcinoma gallbladder cases

Maitri Bhardwaj[1], Satywati Deswal[1], A K Shukla[1], Devesh Chandra Bhatt[1], Aastha Upadhyay[1]

[1]Department of Nuclear Medicine, Dr. Ram Mahonar Lohia Institute of Medical Sciences, Lucknow, India

Background: In the era of artificial intelligence, radiomics is considered to be a novel tool enabling extraction and analysis of quantitative data from PET/CT images. Radiomics holds potential in enhancing diagnostic information and response evaluation to optimise diagnostic inference. The present study was aimed at undertaking comparative evaluation of AI mediated radiomics PET/CT images and diagnostic report of clinicians in carcinoma GB patients. The indices of FDG PET/CT like SUV_{max}. which describe tumour burden/ metabolic activity of lesion, would be a focal parameter to enable disease evaluation.

Materials and Methods: The lesions reported by physician were compared with lesions reported by LIFEx platform utilising the index maximum standardized uptake value (SUV_{max}) in primary lesions, lymph nodes and distant metastatic lesions in 30 patients of carcinoma GB who underwent ^{18}F-FDG PET/CT as part of staging work-up prior to treatment at our institution between January 2018 and June 2023. These cases were retrospectively analysed. Each lesion was examined using an automated volume of interest (VOI) that covered entire lesion in the axial, sagittal, and coronal planes. For every lesion visualised, SUV_{max}. was calculated both by reporting clinician and LIFEx version 7.4.0.

Result: Out of 30 cases reported both by clinician and LIFEx platform, a difference of SUV_{max}. (having value > 5.0)was observed in 3 subjects (10%). Cases were again reviewed by clinician and report revised in 1 subject (3.33%).

Conclusion: The validity of AI LIFEx platform was demonstrated by near matching values of SUV_{max}. in various lesions in most cases whereas differential values were observed in 3 cases prompting the clinician to review and revise the reports. Efficacy and lesion delineation at sub-centimetric level resulted in findings to help optimising treatment/staging of patients with carcinoma GB.

Revisiting ^{99m}Tc PSMA-T4 SPECT/CT imaging in comparison with conventional ^{99m}Tc-MDP imaging in prostate cancer

Nayyar Rubab[1]

[1]Department of Nuclear Medicine, PINUM Cancer Hospital, Faisalabad, Pakistan

Background: This prospective study aimed to compare ^{99m}Tc-PSMA scan with ^{99m}Tc-MDP scan and assess their role in staging and management of patients with prostate cancer.

Materials and Methods: Twenty-two patients with histologically confirmed prostate cancer underwent imaging with both radiopharmaceuticals. Planar imaging was performed with additional regional SPECT/CT 3-4 hours post-tracer injection. Planar whole body, accompanied by spot views and SPECT/CT imaging, were analyzed, and scans were reported as positive, negative, or equivocal for metastasis.

Result: Our results showed that ^{99m}Tc-PSMA detected more total and mean number of bone lesions than ^{99m}Tc-MDP (Total 160 vs. 152; mean 7.41±3.67 vs. 6.95±3.95). However, ^{99m}Tc-PSMA provided additional information about soft tissue metastasis. In 95.4% (21/22) patients, ^{99m}Tc PSMA-T4 SPECT/CT scans detected at least one PSMA-positive lesion. Equivocal findings were reported in two patients on ^{99m}Tc-MDP, which showed no avidity on ^{99m}Tc-PSMA scans.

Conclusion: ^{99m}Tc-PSMA has advantage over conventional ^{99m}Tc-MDP bone scan in characterizing equivocal lesions seen on ^{99m}Tc MDP bone scan as benign or malignant lesion, as well as depicting extraosseous metastasis. ^{99m}Tc-PSMA imaging helped us in excluding the false positive bone scan lesions.

Role of I-131 therapy to reduce thyroid volume in non-toxic multi nodular Goiter under Thyrogen cover

Warda Ahmed[1]

[1]University Institute of Biochemistry and Biotechnology (UIBB), Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi, Pakistan

Background: The present research was conducted to discover the effectiveness of rhTSH stimulation prior to I-131 therapy in reducing the volume of non-toxic Multinodular Goiter (MNG).

Materials and Methods: A total of 55 patients with non-toxic MNG were included in this study. The thyrogen group (n=34) was given 0.2 mg of rhTSH 24 h prior to 29 mCi of ^{131}I, while the control group (n=21) was given the same activity of ^{131}I alone. The thyroid, the volume of the largest nodule, and the collar size were determined at baseline and subsequent follow-ups.

Result: Thyroid volume reduction of -19.74% ± 33.19 (P=0.0001) and -39.44% ± 36.34 (P=0.0000) was observed in thyrogen and -19.21% ± 13.14 (P=0.0000) and -30.44% ± 18.36 (P=0.000) in control groups at second and third follow-ups, respectively with 56% increased relative reduction in thyrogen group. Although an increased reduction in largest thyroid nodule volume after I-131 was seen in thyrogen group than control group at second (-6.75±5.81 ml vs. -6.19±5.65 ml; P=0.75) and third follow-ups (-14.88 ± 10.18 ml vs. -9.95 ± 9.79 ml; P=0.11), it was not statistically significant. Neck/collar size reduction was significantly higher in thyrogen than control group at third follow-up (-2.50±1.29 cm vs. -1.44±1.38 cm; P=0.01).

Conclusion: Pre-stimulation of non-toxic MNG with rhTSH before I-131 therapy results in significantly higher reduction in goiter size, measured in terms of its volume and neck size than I-131 alone. However, the impact of rhTSH pre-stimulation in reducing the largest nodule volume is not statistically significant.

Therapeutic efficacy and safety results of ^{177}Lu-PSMA-617 radioligand therapy in metastatic castration-resistant prostate cancer patients after two cycles: Initial experience from Pakistan

Arzoo Fatima Saleem[1]

[1]Department of Nuclear Medicine and PET/CT, Institute of Nuclear Medicine and Oncology Lahore, Pakistan

Background: The present study aimed to prospectively evaluate the therapeutic efficacy and safety results of ^{177}Lu-PSMA therapy in metastatic castration-resistant prostate cancer (mCRPC) patients after two cycles.

Materials and Methods: In this prospective, single-arm, single-institutional study, 35 mCRPC patients with progressive disease (PD) on second-line hormonal therapy and/or docetaxel chemotherapy were recruited. All patients underwent diagnostic ^{68}Ga-PSMA PET/CT before inclusion for therapy. The following outcome parameters were evaluated pre- and post-therapy to assess efficacy: Prostate-specific antigen (PSA), Eastern Cooperative Oncology Group (ECOG) performance status, Visual Analogue Score (VAS), and Analgesic Quantification Scale (AQS). The safety profile was assessed by documenting haemoglobin (Hb), total leukocyte count (TLC), platelets, and serum creatinine levels pre- and post-therapy. Paired sample t-test was used for statistical analysis.

Result: Patients received two cycles of ^{177}Lu-PSMA-617 therapy with a mean dose of 6.84 GBq. Mean PSA level prior to therapy was 157 ng/ml. Biochemical response assessment was made through PSA levels, and partial response (PR) was seen in 16/35 (45.7%), stable disease (SD) in 11/35 (31.4%), and progressive disease (PD) in 8/35 (22.8%) patients. Clinical response was assessed by using ECOG, VAS, and AQS scores. Significant difference was seen in ECOG, VAS, and AQS scores ($P<0.001$). Safety profile was assessed by documenting bone marrow and nephrotoxicity. Grade 1 and 2 bone marrow toxicity was seen in 7/35 (20%) and 9/35 (25.7%) patients, respectively. No patient developed grade 3 or 4 bone marrow toxicity. Grade 1 and 2 nephrotoxicity was seen in 1 patient each. No significant nephrotoxicity was observed in patients ($P=0.558$).

Conclusion: Based on the obtained results,^{177}Lu-PSMA-617 is an effective and safe treatment approach for mCRPC patients.

Clinical utility of metabolic tumor volume (MTV) and total lesion glycolysis (TLG) in lymphoma using artificial intelligence (AI) in [^{18}F]FDG PET/CT: An initial experience at tertiary care hospital of Pakistan

Javaid Iqbal[1], Hasnain Dilawar[1], Murk Laghari[1], Akhtar Ahmed[1], Salman Habib[1], Talal Abdul Rehman[1], Imran Hadi[1], Noor Nisa[1], Shazia Fatima[1]

[1]Department of Nuclear Medicine and Molecular Imaging, Karachi Institute of Radiotherapy and Nuclear Medicine

Background: This study aimed to calculate metabolic tumor volume (MTV) and total lesion glycolysis (TLG) using artificial intelligence by automated Multi-Foci Segmentation Software (MFS) to compare baseline and post chemotherapy MTV and TLG in patients with Hodgkin and non-Hodgkin Lymphoma.

Materials and Methods: We prospectively included 29 patients (mean age 49 ± 15.5 years, 21 males) who underwent the baseline and post chemotherapy [^{18}F] FDG PET/CT scan. Median difference of MTV and TLG at baseline and post-chemotherapy were explored using Wilcoxon signed-rank test. Mann-Whitney U test was applied to discover the median difference of MTV and TLG among patients who reported Complete Metabolic Response (CMR) versus those who reported Partial Metabolic Response (PMR). Chi-square or Fisher exact test was also applied to see the relationship of responses with baseline characteristics.

Result: Of 29 patients, majority of the patients 9 (31%), had non-Hodgkin lymphoma, whereas 20 (69%) had Hodgkin lymphoma, and 20 (69%) showed CMR while, 9 (31%) patients showed PMR. The median MTV at baseline and post-chemotherapy was significantly higher among patients who reported PMR, as compared to those who reported CMR ($P<0.05$). Similarly, the median TLG at baseline and post chemotherapy was significantly higher among patients who reported PMR as compared to the patients who reported CMR ($P<0.05$).

Conclusion: Based on the findings of the present study, significantly high MTV and TLG values were found at baseline and post chemotherapy in patients who reported PMR than those who reported CMR.

Diagnostic role of F-18 FDG PET/CT in differentiated thyroid cancer patients presenting with elevated thyroglobulin and negative radioactive iodine scan (TENIS syndrome)

Sufyan Hamid Muhammad[1]

[1]Gujranwala Institute of Nuclear Medicine, Pakistan

Background: This study aimed to assess the diagnostic role of F-18 FDG PET/CT in differentiated thyroid patients presenting with Elevated Thyroglobulin and Negative Radioactive Iodine Scan (TENIS Syndrome).

Materials and Methods: Twenty-one patients (16 females and 5 males, with mean age of 45 years, and age range of 25-80 years) suspected of having TENIS syndrome were included. The F-18 FDG with dose activity range of 5-10 mCi was injected intravenously. Mid-thigh to vertex acquisition was performed after 60 min of F-18 FDG injection along with low dosage of CT. The PET acquisition was carried out while patients were in supine position with arms above their heads.

Result: The PET/CT was positive for recurrent disease in 15 (71.4%) patients. The sensitivity, specificity, and diagnostic accuracy of PET/CT to predict the occurrence of recurrent disease at follow-up were 83.3, 66.7, and 77.8%, respectively. The sensitivity of PET/CT increased with increase in Tg levels.

Conclusion: The obtained results suggests that F-18 FDG PET/CT is a valuable tool in diagnosing recurrent disease in post-thyroidectomy DTC patients with a negative WBS and elevated Tg levels. The PET/CT positivity has been shown to be strongly and positively correlated with Tg levels in these patients' subsets.

Diagnostic performance of thallium-201 single photon emission computed tomography in Aids-related primary central nervous system lymphoma: A Systematic review and meta-analysis

John Kenneth V. Gacula[1], RN, Arnel E. Pauco[1]

[1]Division of Nuclear Medicine, Department of Medicine, University of the Philippines – Philippine General Hospital

Background: The present research aimed to determine the accuracy of the thallium-201 brain SPECT scan in diagnosing Primary Central Nervous System Lymphoma (PCNSL) and differentiating it from other causes of focal brain lesions in people living with HIV (PLWHA).

Materials and Methods: A systematic search for diagnostic studies that used thallium-201 brain SPECT in diagnosing and differentiating PCNSL in PLWHA was performed. The search, selection process, and data extraction were conducted independently by the two authors. A bivariate random-effects model was used to calculate pooled sensitivity and specificity, likelihood ratio, and the area under the receiver-operating characteristics curve (AUC). The Q statistic, Chi-square (x^2), inconsistency index (I^2) statistics, and Deek test were identified to assess heterogeneity, non-threshold effect, and publication bias, respectively.

Result: Fulfilling the inclusion criteria, 13 articles were included in the meta-analysis. A random-effects model estimated the pooled sensitivity and specificity, which were 0.92 (95%CI: 0.80-0.97) and 0.87 (95%CI: 0.78-0.92), respectively. The calculated AUC was 0.94 [0.92-0.96] with a slightly high heterogeneity (Q=6.379, P=0.021). The overall LR+ and LR- were 6.8 (95%CI: 4.0-11.6] and 0.10 (95%CI: 0.04-0.25). The pooled diagnostic odds ratio was 70 (95%CI: 20-244).

Conclusion: Thallium-201 brain SPECT imaging has high sensitivity and test accuracy in diagnosing PCNSL and differentiating it among other causes of focal brain lesions in PLWHA. It could answer the diagnostic dilemma brought upon by the similar characteristics of PCNSL in CT and MRI and low accuracy of MRS.

Sentinel lymph node localization in Filipino breast cancer patients using blue dye with or without lymphoscintigraphy - A single-center retrospective analysis

Lawrence Raymond Villaflor Mariano[1]

[1]Department of Nuclear Medicine, UST Hospital, Manila, Philippines

Background: Sentinel lymph node (SLN) localization has long been used in managing breast cancer patients who are to undergo surgical intervention. The use of blue dye alone or in combination with lymphoscintigraphy has been the subject of many studies aimed to establish the best possible standard of care for early management and prognostication of breast disease. The present study aimed to compare sensitivity, specificity, detection accuracy, and false negative rates of these two techniques.

Materials and Methods: Patient records from 2018-2022 were included in the study. Data from 350 female patients, of whom 167 underwent blue dye localization, and 183 underwent both blue dye and lymphoscintigraphy, were analyzed through a comparative Chi-square analysis.

Result: Analysis revealed a significantly higher detection accuracy, sensitivity, and lower false negative rates for the combination technique in all patients ($P<0.001$), as well as in patients with previous excision biopsy of the breast. Specificity of the two groups; however, were comparable and not statistically different ($P=0.93$). These results are concordant with previous literature in terms of sensitivity and false negative rates, and also provide novel data regarding higher detection accuracy.

Conclusion: The combination of lymphoscintigraphy and blue dye in the localization of SLNs may become the standard of care for early breast cancer patients in need of surgery, regardless of treatment history, as it showed significantly higher detection accuracy, sensitivity, and lower false negative rates than utilizing blue dye alone.

A retrospective study on the utility of semi-quantitative analysis in parathyroid scintigraphy

Dominic Alcantara[1], Nicole Patricia Hui[1], Eddie Lim[1]

[1]Nuclear Medicine and PET-CT Center, The Medical City, Ortigas, Philippines

Background: The lesion-to-background ratio (LBR) is the mathematical value of radiation counts of a lesion divided by the background counts, representing radioactive tracer retention in nuclear medicine scans. Parathyroid LBR thresholds have not been established yet in the Philippines, likely due to limited studies on preoperative parathyroid scintigraphy. To evaluate their utility, early and delayed LBRs were compared to surgical histopathology, parathyroid gland volume, ionized calcium, and intact parathyroid hormone (PTH).

Materials and Methods: A retrospective chart review was performed on hyperparathyroidism patients who underwent dual phase Technetium-99m sestamibi parathyroid scintigraphy with corresponding parathyroidectomy in the Medical City from January 2017 to June 2023, leading to analysis of 30 patient records.

Result: Surgical histopathology assessments were predominantly parathyroid adenoma (83.3%), two parathyroid hyperplasia (6.7%), one benign parathyroid (3.3%), and two nodular thyroid hyperplasia (6.7%). The dual-phase parathyroid scan is concordant with surgical histopathology, exhibiting a sensitivity of 96.3%, specificity of 66.7%, and positive predictive value (PPV) of 96.3%. Based on the area under the curve analysis, early LBR of 3.7 and delayed LBR of 2.2 showed similar PPV (94.4% and 95.5%). In addition, according to Spearman correlation analysis, early and delayed LBR had a moderate correlation with parathyroid gland volume (P= 0.68 and 0.64), as well as a fair correlation with ionized calcium (P= 0.31 and 0.50) and intact PTH (P= 0.45 and 0.48).

Conclusion: The results of this single-center retrospective study pointed to a significant relationship between LBR and hyperplastic parathyroid. The use of LBR may lead to marked improvements in diagnostic accuracy as an adjunct parameter in parathyroid scan interpretation.

A comparative study of two commercial software programs in measuring myocardial left ventricular perfusion and function among Filipino patients undergoing gated SPECT-MPI

Mary Amie Gelina E. Dumatol[1], Jerry M. Obaldo[1], Apolonio Alecksandr T. Molina[1]

[1]Nuclear Medicine Division, Philippine Heart Center, Philippines

Background: The present study aimed to compare Quantitative Gated SPECT (QPS/QGS) and 4DM in calculating perfusion and gated indices of SPECT-MPI among Filipino patients.

Materials and Methods: This study was conducted on adult patients who underwent dipyridamole-gated SPECT-MPI using technetium-99m sestamibi. The parameters of myocardial perfusion and left ventricular function, namely summed stress score (SSS), summed rest score (SRS), summed difference score (SDS), total stress defect extent (TDE), end-systolic volume (EDV), end-systolic volume (ESV), and ejection fraction (EF), were derived using the QPS/QGS and 4DM software. Statistical analysis was performed to examine the differences between the two.

Result: A total of 113 patients were included in this study. There were statistically significant differences between QPS and 4DM in terms of uncorrected SSS (median difference = 2), SDS (median difference = 3), and TDE (median difference = 3) ($P<0.001$), and attenuation-corrected SSS (median difference = 2) ($P<0.001$), SRS (median difference = 1) ($P= 0.008$), SDS (median difference = 2) ($P<0.001$), and TDE (median difference = 2) ($P= 0.029$). In a similar vein, statistically significant differences were observed between QGS and 4DM in terms of left ventricular EDV and EF ($P<0.001$). Perfusion and ventricular function measures produced by 4DM were higher than those of QPS/QGS.

Conclusion: As evidenced by the obtained results, 4DM-derived parameters of myocardial perfusion defects and left ventricular function in SPECT MPI were significantly higher than those derived through QPS/QGS. The MPI software should not be used interchangeably in conducting follow-up imaging studies.

Global research output of lutetium-177 PSMA in Prostate Cancer: A bibliometric study

Rakan Al-Rashdan[1], Akram Al-Ibraheem[1]

[1]Department of Nuclear Medicine and PET/CT, King Hussein Cancer Center (KHCC), Amman, Jordan

Background: The present study aimed to investigate the current research status in ^{177}Lu-PSMA and prostate cancer, identify the trends, country contributions, journals, institutions, and focus areas, and guide the future research direction.

Materials and Methods: We searched the Scopus database for articles that assessed the use of LU177 PSMA in prostate cancer. Using VOSviewer version 1.6.19 and Microsoft Excel, we analyzed annual trends, top-contributing countries and institutions, top-publishing journals, most occurred keywords, top-cited articles, and generated tables and figures.

Result: From 2015 to 2023, a total of 466 articles related to ^{177}Lu-PSMA therapy in prostate cancer were included in the analysis. The most cited articles primarily focused on metastatic castration-resistant prostate cancer and the safety and efficacy of ^{177}Lu-PSMA-617 therapy. In addition, research focused on the side effects of ^{177}Lu-PSMA treatment, such as xerostomia, thrombocytopenia, anemia, and fatigue. Germany emerged as the leading contributor, and the Journal of Nuclear Medicine had the highest number of publications (n=55).

Conclusion: The findings highlight the growing interest and advancements in the utilization of ^{177}Lu-PSMA therapy in prostate cancer and offer a comprehensive global perspective on the research productivity and critical focus areas within the field, providing valuable insights for researchers and guiding future research direction.

Beyond the thyroid: A multifaceted analysis of coexisting neoplasms

Akram Al-Ibraheem[1], Dhuha Al-Adhami[1], Ahmed Saad Abdlkadir[1], Nabeela Al-Hajaj[1]

[1]Department of Nuclear Medicine and PET/CT, King Hussein Cancer Center (KHCC), Amman, Jordan

Background: The incidence rates of thyroid cancer have shown a steady increase in the Middle East and other regions. While radiation exposure during childhood is a significant risk factor, the exact causes of this cancer remain unclear. Our retrospective study examined the types of cancers associated with thyroid cancer and compared the survival outcomes between patients with a single thyroid tumor and those with multiple neoplasms.

Materials and Methods: The analysis utilized the thyroid cohort from the King Hussein Cancer Center (KHCC). Our retrospective study divided the cohort into two groups: the first group consisted of 528 patients diagnosed with a single primary thyroid tumor, while the second group included patients with at least two primary neoplasms, one of which included a thyroid malignancy. Thyroid cancer was found to be linked to primary cancers affecting various organs.

Result: We consistently observed elevated risks for breast, prostate, gastrointestinal tract, and hematologic malignancies. In addition, there was coexisting evidence of other cancers in the parathyroid glands, ovaries, brain, head and neck, skin, gallbladder, and pancreas. A survival analysis was conducted using the Kaplan-Meier curve, revealing an overall 5-year survival rate of 81% for patients with multiple primary tumors.

Conclusion: The 5-year survival rate for patients with multiple primary neoplasms is significantly lower than that of patients with a single thyroid neoplasm, which was approximately 98% ($P < 0.01$).

Distinguishing benign from metastatic lymph nodes using PET/CT parameters in laryngeal squamous cell carcinoma

Akram Al-Ibraheem[1], Ahmed Saad Abdlkadir[1]

[1]Department of Nuclear Medicine and PET/CT, King Hussein Cancer Center (KHCC), Amman, Jordan

Background: Distinguishing between benign and metastatic lymph nodes (LN) in laryngeal squamous cell carcinoma (LSCC) continues to pose a formidable diagnostic challenge. This retrospective study aimed to assess the diagnostic efficacy of metabolic and morphologic LN parameters obtained through positron emission tomography/computed tomography (PET/CT) in the differentiation of benign and metastatic LN.

Materials and Methods: This study was conducted on 66 patients who had previously undergone ^{18}F-fluorodeoxyglucose (FDG) PET/CT before undergoing surgical intervention for LSCC. A range of metabolic and morphologic metrics for visualized LN were collected and compared against histopathological findings. Baseline ^{18}F-FDG PET/CT metrics, encompassing total lesion glycolysis (TLG), metabolic tumor volume (MTV), maximum standardized uptake value (SUV_{max}), and LN dimensions, were employed for logistic regression and receiver operating characteristic (ROC) analysis in relation to the histopathological outcomes. A statistical significance threshold of $P< 0.05$ was set.

Result: Within the included cohort, a total of 167 cervical LN were discerned utilizing ^{18}F-FDG PET/CT. Out of these, only 111 LN were verified as positive on the basis of histopathology. The ROC analysis revealed that LN MTV exhibited the highest area under the curve value (0.89; $P<0.01$), closely trailed by LN size (0.87; $P<0.01$). Using multivariate analysis, both MTV and LN size independently emerged as predictive factors for LN metastasis.

Conclusion: Our findings underscore that LN MTV and size hold promise as valuable discriminators between benign and metastatic LN in LSCC.

Positron emission tomography/computed tomography in Leukemia: Utilities and future directions

Sudqi Allouzi[1], Ahmed Saad Abdlkadir[1], Akram Al-Ibraheem[1]

[1]Department of Nuclear Medicine and PET/CT, King Hussein Cancer Center (KHCC), Amman, Jordan

Background: To explore the potential usages of positron emission tomography/computed tomography (PET/CT) in Leukemia patients.

Materials and Methods: Google Scholar, EMBASE, and PubMed were searched for all the papers on PET/CT in leukemia. The papers were later screened, and further resources were obtained from the referenced articles in each paper.

Result: The PET/CT is a non-invasive and accessible tool. The literature reviewed in this study suggested the promising potential of PET/CT in both leukemoid and myeloid leukemias. Several studies demonstrated the role of this tool in diagnosing leukemia, particularly in patients with atypical presentations, such as fever of unknown origin (FUO), and in increasing the accuracy of leukemia staging mainly due to its capability in the detection of extramedullary involvement. As patients undergo treatment, PET/CT could be deployed in both response assessment and follow-up for recurrence since it helps in detecting lesions that could be missed with conventional physical examination due to their size or location. Furthermore, in current clinical practice, PET/CT is widely used to detect suspected Richter transformation (RT) in chronic lymphoid leukemia (CLL) patients. Its probable role in detecting graft versus host disease in hematopoietic stem cell transplant (HSCT) recipients has been mentioned in several studies. Although limited, preliminary evidence suggested that PET/CT may have utility in other less common leukemias, such as hairy cell leukemia (HCL).

Conclusion: The PET/CT has budding viability in leukemia staging, re-staging, extramedullary involvement, Richter transformation detection, and follow-up. Nonetheless, its complete potential remains unexplored due to the limited number of studies in this area. However, since more research is being conducted and advancements in radiotracers are being made, we expect to solidify current utilities and uncover additional usages in this field while overcoming some limitations. Prognostication of PET/CT findings is also an area of great promise that requires further investigation.

Outcome of heavily pretreated mCRPC population treated with Lu-177 PSMA; preliminary data from King Hussein cancer center in Jordan

Deya' Aldeen Sweedat[1], Farah Anwer[1], Nabeela Al-Hajaj[1], Ali Mohammedkhair[1], Akram Al-Ibraheem[1]

[1]Department of Nuclear Medicine and PET/CT, King Hussein Cancer Center (KHCC), Amman, Jordan

Background: The present retrospective analysis aimed to evaluate the efficacy of ^{177}Lu-PSMA-617 in patients who received this radioligand therapy by analyzing the biochemical response at King Hussein Cancer Center (KHCC) in Jordan.

Materials and Methods: Those patients who received at least one cycle of PRLT were included. A total of 118 cycles of Lu-177 PSMA were given in 40 consecutive mCRPC patients who progressed after receiving the best available standard of care. The mean number of prior therapies was 4 (range: 2-6). All patients received prior abiraterone or enzalutamide, 28 received both, 9 received only abiraterone, 3 cases received only enzalutamide, 29 patients received one agent chemotherapy, 4 patients received two or more chemotherapy agents, while the other 7 patients did not receive chemotherapy. In addition, 29 patients received radiotherapy. All patients had undergone PSA tests before Lu-177 PSMA therapy. Patients were treated with a dose (4 - 7.4 GBq) of Lu-177 PSMA at 6-8 week intervals. Moreover, 1 patient received 9 cycles, 1 patient received 7 cycles, 2 patients received 5 cycles, 10 patients received 4 cycles, 8 patients received 3 cycles, 10 patients received 2 cycles, and 8 patients received one cycle. The PSA response was evaluated at least two weeks after every cycle. According to the Prostate Cancer Workgroup 3 Criteria, a PSA decline ≥ of 50% was considered a response.

Result: A decline in PSA of any amount was observed in 32 out of 40 cases, 80 (80%) patients after the first cycle. After the last cycle, a decline in PSA ≥50% and of any amount was observed in (40%) and (60%) of patients, respectively.

Conclusion: In heavily pretreated mCRPC, Lu-177 PSMA resulted in a significant biochemical response. The overall survival of those patients will be analyzed in the next stage of this project in light of the biochemical response.

Comparison of systemic distribution of Florbetaben and Pittsburgh B compound in cardiac amyloidosis

Prasetyo Nora Anggun[1,2]

[1]Department of Nuclear Medicine and Molecular Imaging, Dr. Hasan Sadikin General Hospital, Bandung, Indonesia
[2]Department of Nuclear Medicine and Molecular Imaging, Faculty of Medicine Universitas Padjadjaran, Bandung, Indonesia

Background: Cardiac amyloidosis (CA) is the cardiac manifestation of systemic amyloidosis, which can involve any organ in the body. Recently, amyloid positron emission tomography (PET) has been used for CA imaging. The present study aimed to evaluate the uptake of major organs using ^{18}F-Florbetaben (^{18}F-FBB) and ^{11}C-Pittsburgh B compound (^{11}C-PiB) PET in CA patients.

Materials and Methods: This retrospective study included 12 patients (M: F=5:7) who underwent ^{18}F-FBB PET/CT and 34 patients (M: F=16:18) who underwent ^{11}C-PiB PET/CT from 2012 to 2022. The uptake of major organs (lung, liver, kidney, and spleen) was assessed as the target-to-background ratio (TBR) of the mean standard uptake value (SUV_{mean}), with the blood pool as the reference tissue. Increased uptake in each organ was determined based on the uptake values of control patients.

Result: On ^{18}F-FBB PET/CT, increased uptake was observed in 7 (58%), 7 (58%), 7 (58%), and 6 (50%) patients in lung, liver, kidney, and spleen, respectively. When patients were assigned to three groups by the degree of myocardial uptake, no significant difference was observed in the overall TBR of assessed organs according to the TBR of heart on both ^{18}F-FBB ($P=0.054$ in heart, $P>0.05$ in other organs) and ^{11}C-PiB PET/CT ($P<0.001$ in heart, $P>0.05$ in other organs).

Conclusion: On amyloid PET of CA patients, the high uptake in other organs was variably observed in up to 50% of patients. The uptake in other organs did not differ according to the myocardial uptake. It is suggested that amyloid PET may show amyloid deposits in other organs and myocardium.

Effect of Iodine-131 on cell viability of MDA-MB231 breast cancer cell dan DU-145 prostate cancer cell

Aisyah Elliyanti[1], Katrin Monika[2], Yulia Kurniawati[1]

[1]Nuclear Medicine Division, Department of Radiology, Faculty of Medicine, Universitas Andalas, Padang, Indonesia/ Dr.M.Djamil Hospital, Padang, Indonesia
[2]Faculty of Medicine, Universitas Andalas, Padang, Indonesia

Background: Triple Negative Breast Cancer (TNBC) and non-responsive Androgen Receptor (AR) prostate cancer are difficult to treat, resistant to hormones, and have a poor prognosis; therefore, alternative therapies are needed. Iodine-131 (I-131) is effectively used in thyroid cancer therapy. The present study aimed to determine the effect of Iodine-131 on the viability of the MDA-MB231 breast cancer cell line and the DU-145 prostate cancer cell line.

Materials and Methods: This study used the MDA-MB231 breast cancer cell line, DU-145 prostate cancer cell line, and HaCaT cell line as control cells. MTT and clonogenic assay were used to identify IC50 and the cytotoxic effect. Iodine-131 doses were 7,8; 15,6; 31,3; 62,5; 125; 250; and 500 µCi in the MTT assay, as well as 1 µCi (low) and 10 µCi (high) in the clonogenic assay.

Result: The cytotoxic effect of 1 mCi of I-131 did not impact these cells. Viability cell decreased by 10 mCi of I-131 in MDA-MB231 cell (39,3%-20,5%), DU-145 cell (44,8%-21,7%), with P-values of 0,008 and 0,006, respectively, compared to HaCaT cell (44,3% and 31,6%). The IC50 values I-131 in the MDA-MB231, HaCaT, and DU-145 cell lines were 255,7 µCi, 267,8 µCi, and 281,8 µCi, respectively.

Conclusion: In high doses, I-131 reduces the viability of the MDA-MB231 and DU-145 cells. It has opportunities as an alternative therapy for breast and prostate cancer. Further studies are needed on such methods to deliver the radionuclide to the target and optimal doses.

Novel combination therapy between chidamide and ^{177}Lu-DOTAGA- rituximab for B-cell non-Hodgkin lymphoma

Hastono Ridwansyah[1,2], Arifudin Achmad[3,4,5], Hendris Wongso[4,6], Muhammad Hasan Bashari[5,7], Achmad Hussein Sundawa Kartamihardja[3,4], Neneng Elly Rosilawati[3,4,8], Jauharul Ardi[8], Bethy Suryawathy Hernowo[9]

[1]Doctoral Study Program, Faculty of Medicine, Universitas Padjadjaran, Bandung, Indonesia
[2]Department of Biomedicine, Faculty of Medicine, President University, Bekasi, Indonesia
[3]Department of Nuclear Medicine and Molecular Theranostic, Faculty of Medicine, Universitas Padjadjaran, Bandung, Indonesia
[4]Theranostic Research Collaboration Center, Universitas Padjadjaran, Bandung, Indonesia
[5]Oncology and Stem Cells Study Center, Faculty of Medicine, Universitas Padjadjaran, Bandung, Indonesia
[6]Research Center for Radioisotope, Radiopharmaceutical, and Biodosimetry Technology, Research Organization for Nuclear Energy, National Research and Innovation Agency, Puspiptek, Banten, Indonesia
[7]Department of Biomedical Sciences, Faculty of Medicine, Universitas Padjadjaran, Bandung, Indonesia
[8]Department of Nuclear Medicine and Molecular Imaging, Dr. Hasan Sadikin General Hospital, Bandung, Indonesia
[9]Department of Anatomical Pathology, Faculty of Medicine, Universitas Padjadjaran, Bandung, Indonesia

Background: Chidamide is a multi-class histone deacetylase inhibitor that can stimulate CD20 expression in diffuse large B-Cell lymphoma. We combined chidamide and a novel rituximab-based radioimmunoconjugate in a therapeutic study against a B-cell non-Hodgkin lymphoma cell line to optimize the antitumor effect of CD20-targeting radioimmunotherapy.

Materials and Methods: Rituximab was conjugated with DOTAGA anhydride (1:10 molar ratio) and subsequently radiolabeled with 17.4 and 155.4 MBq of ^{177}LuCl3. ^{177}Lu-DOTAGA- rituximab was purified using either 1) ultrafiltration with EDTA-quenching or 2) Sephadex G-25 size-exclusion chromatography (SEC). The radiochemical yield of ^{177}Lu- DOTAGA-rituximab was quantified using instant thin-layer chromatography. The ^{177}Lu- DOTAGA-rituximab stability was measured in human serum at 37°C and in PBS at room temperature up to 144 h. The stimulation of CD20 expression on the Raji B-cell non-Hodgkin lymphoma cell line was performed by adding chidamide (5 μM) for 24 h in their growth media. The CD20-stimulated expression was then measured using flow cytometry. The radioimmunotherapy was conducted by incubating these cells in their media with 666 kBq ^{177}Lu-DOTAGA-rituximab for 48 h. The cytotoxicity level was evaluated using Alamar blue assay.

Result: ^{177}Lu-DOTAGA-rituximab was obtained with a radiochemical yield of 43.07% and radiochemical purity of >98% and >99% after ultrafiltration and SEC purification, respectively. The ^{177}Lu-DOTAGA-rituximab obtained from both purification methods were stable up to 144 h, viz >96% and >99%. Although 24 h chidamide exposure failed to increase CD20 expression in Raji cells, the cytotoxicity of ^{177}Lu-DOTAGA-rituximab on chidamide-exposed Raji cells was significantly higher than those which did not exposed to chidamide (32.80% vs. 31.03%; $P<0.01$; 95% CI: 0.75% - 2.8%).

Conclusion: Chidamide may enhance the cytotoxic effect of ^{177}Lu-DOTAGA-rituximab on Raji cells. Further in vivo research is necessary to evaluate the role of chidamide in optimizing rituximab-based radioimmunotherapy.

Compatibility between coronary vascular area in myocardial perfusion imaging with coronary angiography to characterizing the severity of coronary artery stenosis

Hadi Marzuki[1], Erwin Affandi[1], Yulia Kurniawati[2]

[1]Department of Nuclear Medicine and Molecular Theranostics of Universitas Padjadjaran/ Dr. Hasan Sadikin Hospital
[2]Department of Nuclear Medicine and Molecular Theranostics of Universitas Andalas/Dr.M.Djamil Hospital

Background: The results of Myocardial Perfusion Imaging (MPI) have been able to report coronary blood vessels LAD, LCx, and RCA experiencing perfusion disorders through 17 segments of the myocard. Nonetheless, the specifics of the branching of the coronary arteries are still undetermined from the MPI. Therefore, the present study aimed to assess the compatibility between the coronary artery part in coronary angiography and the segment in MPI so that one can predict the anatomical location of the coronary arteries based on MPI.

Materials and Methods: The subjects of the study were patients who underwent a two-phase MPI (stress and rest test). Perfusion defects in MPI were compared, as well as areas of coronary artery stenosis on angiography. Assumptions of conformity were based on segments on MPI, which were basal segments representing proximal portions of the artery, medial segments representing medial portions of the artery, and apical segments representing distal portions of the artery. The statistical test used was the kappa test to observe the conformity between the two modalities, with the interpretation of criteria kappa values being very good, good, moderate, fair, and poor.

Result: The results of the conformity test between arterial stenosis in angiography with perfusion defects in MPI showed a value of $P<0.05$, with the highest suitability, namely the good criteria in RCA (kappa 0.672; P= 0.000), followed by LAD with moderate criteria (kappa 0.525; P=0.000) and LCx with fair criteria (kappa 0.357: P=0.008).

Conclusion: There is compatibility between MPI and coronary angiography in the coronary artery area of the miokard, especially in the RCA distribution. The results of MPI can provide more specific information, thereby helping determine the appropriate management of patients earlier.

Development of quality control phantom for Positron emission tomography–magnetic resonance imaging system

Yasuyuki Takahashi[1]

[1]Laboratory of Plant Molecular Genetics, Nara Institute of Science and Technology, 8916-5 Takayama, Ikoma, Nara 630-0101, Japan

Background: Positron emission tomography–magnetic resonance imaging (PET–MRI) systems have different signal detection principles between PET and MRI. As such, the performance test phantoms differ in size. NEMA phantoms for PET cannot be used in MR due to dielectric effects. In addition, convection effects must also be considered. In order to obtain stable images simultaneously with both devices, it is necessary to select a common phantom size and solution. The present study aimed to develop a performance test phantom that can be imaged simultaneously with the PET/MRI system.

Materials and Methods: The original phantoms are acrylic cylinders with diameters of 16 - 25 cm, and a depth of 14 cm, referring to NEMA standards for PET (NU 2-2001) and MRI (MS 1-2008), respectively. The solution consisted of water or gum syrup (60% sugar content) containing Gd proportional to the volume of the phantom. Gum syrup was assumed to be an MRI phantom solution that can be mixed with FDG water for glucose metabolic imaging. Image processing software Image J was used for image analysis. Measurements complied with NEMA standards, and uniformity (85% range) and area segment % were calculated.

Result: Uniformity decreased as the phantom diameter increased. For gum syrup, the difference was 5%-25% in area segment %. Moreover, when comparing water and gum syrup, the difference was 5%-15% at a diameter of 23 cm. Notably, the uniformity of the NEMA PET phantom was significantly reduced visually in the water image but improved in the gum syrup.

Conclusion: A uniform attenuation map suggested that even a large phantom could be handled by using a highly viscous solution. Nevertheless, the PET-NEMA standard requires sphere signal detectability, and it is difficult to enclose a highly viscous solution in the sphere. Therefore, we proposed and created a new application of the MRI-NEMA standard small column signal.

Iodine-131-MIBG scintigraphy in pediatric neuroblastoma: Correlation between the degree of radioisotope expression and tumor grade differentiation

Farah Anwer[1], Aysar N. Khalaf[1]

[1]Department of Nuclear Medicine, Warith International Cancer Institute, Karbala, Iraq

Background: This study aimed to determine whether there was a direct correlation between iodine-131-MIBG expression and the grade of neuroblastoma differentiation.

Materials and Methods: A retrospective review was performed of staging I-131-metaiodobenzylguanidine (MIBG) whole-body planar and selective regional single-photon emission computed tomography (SPECT/CT) scans of 69 patients between November 2021 and June 2023. The degree of MIBG expression, neuroblastic differentiation grades, and serial imaging time were investigated. At 24, 48, and 72 h after radioisotope administration, the intensity of MIBG uptake in the primary tumor or metastatic foci was visually evaluated and contrasted with liver uptake in planar and SPECT/CT modalities.

Result: In total, 69 patients with varying stages of neuroblastoma were included in the study, 23 of whom were female (33%) and 46 of whom were male (67%). The median age at diagnosis was 64.5 months. Among them, 24 (34%), 19 (28%), and 26 (38%) patients had differentiated, poorly differentiated, and undifferentiated grades, respectively. The degree of MIBG expression showed that 67% of patients with differentiated neuroblastoma revealed intense MIBG expression (>liver), 16.5% showed mild MIBG expression (≤liver), and 16.5% showed no expression. In contrast, 26% of patients with poorly differentiated neuroblastoma showed high MIBG expression (>liver), 11% showed mild expression within the lesions, and 63% had non-MIBG expression. Among patients with undifferentiated grades, only 7.7% showed MIBG expression (>liver), 27% showed mild expression, and 65.3% showed no MIBG expression, regardless of CT component findings. Serial images taken at 24, 48, and 72 h revealed a consistent result with a better tumor-to-background ratio within the delayed images.

Conclusion: I-131-MIBG image is reliable in detecting differentiated neuroblastoma, with marked expression observed (P<0.001). However, the expression was non-to-mild in both poorly differentiated and undifferentiated cases. The accuracy of the study was consistent over different time points.

Exploration of the capabilities and limitations of language models in nuclear medicine: A surrogate test with formative questions for medical students

Sira Vachatimanon[1], Kanaungnit Kingpetch[1]

[1]Division of Nuclear Medicine, Department of Radiology, Faculty of Medicine, Chulalongkorn University and King Chulalongkorn Memorial Hospital, Bangkok, Thailand

Background: Large Language models (LLMs) have demonstrated their ability to answer questions across various domains, including nuclear medicine. However, concerns have arisen about the potential for LLMs to produce false information, leading to misunderstandings in medical knowledge. This study aimed to assess the probability of two common large language models, ChatGPT and Bard, in generating false information related to nuclear medicine by using the formative questions for medical students as a surrogate test.

Materials and Methods: The formative questions comprised 20 multiple-choice questions in a single best-answer format. Each question was input separately into two LLMs: ChatGPT (GPT-3.5 model, version of July 20, 2023, from OpenAI laboratory, USA) and Bard (version of July 27, 2023, from Google LLC, USA). A board-certified nuclear medicine physician carefully evaluated the answers, along with explanations, provided by the LLMs.

Result: ChatGPT answered 17 out of 20 questions correctly, while Bard answered 18 out of 20 questions correctly. Incorrect responses of ChatGPT included misidentification of metastatic lung cancer as the more likely cause of a false negative fluorodeoxyglucose-positron emission tomography/computed tomography scan, confusing recent myocardial infarction as the clinical setting more suitable for using multi-gated acquisition instead of echocardiography, and inaccurately associating breast cancer with false negative bone scintigraphy rather than renal cell carcinoma. The errors of Bard included the misidentification of Tc-99m sulfur colloid as the tracer for Meckel's scan and the misinterpretation of the presence of Tc-99m DISIDA excretion into the bowel lumen as indicative of impaired liver function.

Conclusion: Although LLMs, including ChatGPT and Bard, exhibited the capability to provide correct answers to most questions, they cannot be considered entirely reliable sources of medical information. Therefore, any output from LLMs should undergo verification to identify misinformation and be utilized with caution.

Detection of prostate specific antigen density using radioimmunoassay method in prostate cancer diagnosis and its clinical significance

Nyamgerel. B[1], Oyunbold. L[1], Bujinlham. Sh[1], Enkhtuya. B[1], Sodgerel. B[2], Javkhlantugs. D[2], Munkhbaatar. D[3]

[1]First Central Hospital of Mongolia, Diagnostic Imaging Center, Ulaanbaatar, Mongolia
[2]First Central Hospital of Mongolia, Urology-Andrology Center, School of Medicine, Ulaanbaatar, Mongolia

Background: This study aimed to estimate prostate-specific antigen density (PSAD) and compare diagnostic sensitivity with other diagnostic methods.

Materials and Methods: This retrospective study was performed on 43 patients who had high PSA levels and transrectal ultrasound scan (TRUS) guided Biopsy analysis from May 2017 to November 2020. Based on the results of the biopsy analysis, the patients were divided into three groups according to the diagnosis of prostate cancer, atypical small acinar proliferation (ASAP), and benign prostate hyperplasia (BPH). The PSAd was calculated in each group and the sensitivity of the PSAd diagnosis was compared to the sensitivity of the PSA marker of the prostate cancer and the features of TRUS diagnosis. Statistical analysis was performed in SPSS software (version 22.0) and GraphPad Prism software (version 8.0).

Result: The average age of 43 patients in this study was 65±8. Moreover, 20 patients (46.5%) were diagnosed with prostate cancer, 9 (21%) with ASAP, and 14 (32.5%) with BPH. The PSA level was 32.8±20.48 ng/ml in the group with prostate cancer which was not statistically significant (P=0.13), compared to ASAP, and was significantly different compared to the group with BPH (P<0.01). The amounts of PSAD in the groups with cancer, ASAP, and BPH were determined at -1.59, -0.29, and -0.27, respectively. In addition, the group with prostate cancer was statistically significant, compared to other groups (P= 0.04, P=0.001). Besides, there was no statistical significance or obvious difference between the two groups without cancer. The sensitivity and specificity of PSA diagnosis are 90.9% and 75%, respectively, while the sensitivity and specificity of PSAD diagnosis are 78.6% and 70%, respectively.

Conclusion: Calculation of PSAD has more diagnostic value than PSA alone in the early diagnosis of prostate cancer.

Assessment of bone marrow infiltration with ^{18}F-Fluorodeoxyglucose positron emission tomography/computed tomography in initial staging of patients with newly diagnosed lymphoma

Betül ATALI[1], Tamer ÖZÜLKER[2]

[1]Department of Nuclear Medicine, Afyonkarahisar State Hospital, Afyon, Turkey
[2]Department of Nuclear Medicine, Prof. Dr. Cemil Tascioglu City Hospital, Istanbul, Turkey

Background: This study aimed to investigate the importance of fluorodeoxyglucose positron emission tomography/computed tomography (FDG PET/CT) in the evaluation of bone marrow involvement in lymphomas.

Materials and Methods: In total, 107 newly diagnosed lymphoma patients above 18 years old who underwent bone marrow biopsy were evaluated retrospectively. From PET/CT images, bone marrow maximum standard Uptake value (SUV_{max})-mean values and bone marrow/liver (BM/L) $SUV_{max\text{-}mean}$ values, BM involvement patterns (diffuse and focal), and bone marrow-independent stages according to PET/CT were recorded.

Result: When patients with a BM/L SUV_{max} ratio greater than 1 were evaluated as PET-positive bone marrow involvement and bone marrow biopsy was accepted as the gold standard method, the sensitivity, specificity, positive predictive value, and negative predictive value for general lymphomas were calculated at 58%, 54%, 41%, and 70%, respectively. The sensitivity of routine unilateral iliac bone biopsy was calculated at 33% in focal bone marrow involvement.

Conclusion: Sufficient sensitivity and specificity values that can be applied in daily practice cannot be achieved in general lymphomas and lymphoma subtypes when a BM/L SUV_{max} value greater than 1 is accepted as the cut-off for metastatic bone marrow involvement. In the receiver operating characteristic analysis, the most appropriate parameter in general lymphomas and all lymphoma subtypes was determined as the BM/L SUV_{max} value. It was shown that iliac crest biopsy would not contribute to the evaluation of BM in patients with focal bone marrow involvement.

Prognostic significance of transient ischemic dilatation with adenosine ^{99m}Tc-Sestamibi stress in diabetic patients with normal perfusion

Hammoudeh Rahma[1]

[1]Division of Nuclear Medicine, Department of Radiology and Nuclear Medicine, Jordan university Hospital, Amman, Jordan

Background: Previous studies have shown that transient ischemic dilatation (TID) does not predict adverse prognosis in patients with otherwise normal perfusion. However, data on diabetic patients is limited. The objective of this study was to investigate the prognostic significance of TID in diabetic patients with normal perfusion on adenosine stress/rest ^{99m}Tc-sestamibi imaging.

Materials and Methods: Abnormal TID was defined based on a prior study from our laboratory performed on a group of 70 patients with Framingham 10-year coronary heart disease risk of less than 10%. The mean TID (±SD) value was 1.05 ± 0.13. Three definitions of abnormal TID were used: TID > mean + 2SD (TID≥1.32), TID > mean + 1SD (TID≥1.19), and TID in the highest quartile of the group (TID≥1.15). The significance of TID at these thresholds was examined in 272 diabetic patients followed for cardiac events for 45 ± 9.7 months.

Result: Age, gender, family history of coronary artery disease (CAD), known CAD, smoking habits, hypertension, dyslipidemia, rest left ventricular ejection fraction (LVEF), post-stress LVEF, ΔLVEF, and ≥ 5% or 10% decrease in LVEF did not predict TID ≥ 1.32 and TID ≥ 1.15. However, TID ≥ 1.19 was predicted by rest LVEF, post-stress LVEF, and ΔLVEF ($P<0.01$ for all three parameters). Cardiac event-free survivals were similar in patients with a TID ≥ and < 1.32 ($P=0.52$), ≥ and < 1.19 ($P=0.68$), and ≥ and < 1.15 ($P=0.72$).

Conclusion: The TID does not confer adverse prognosis in diabetic patients with normal perfusion on adenosine stress/rest ^{99m}Tc-sestamibi irrespective of the threshold used for its definition.

^{68}Ga-PSMA-11 PET/CT and ^{18}F-Fluorocholine PET/CT in assessment and clinical decision making of recurrent prostate cancer: A crossover trial

Malihe Shahbazi[1,2], Marcus Hacker[3], Wolfgang Loidl[4], Werner Langsteger[3,5], Mohsen Beheshti[1]

[1]Division of Molecular Imaging and Theranostics, University Hospital Salzburg, Paracelsus Medical University, Salzburg, Austria
[2]Research Institute for Nuclear Medicine, Department of Nuclear Medicine, Tehran University of Medical Sciences, Tehran, Iran
[3]Division of Nuclear Medicine, Department of Biomedical Imaging and Image-Guided Therapy, Medical University of Vienna, Vienna, Austria
[4]Department of Urology, Ordensklinikum, Linz, Austria
[5]Department of Nuclear Medicine and Endocrinology, PET-CT Center LINZ, Ordensklinikum, Linz, Austria

Background: Although 68-Gallium labeled prostate-specific membrane antigen-11 (^{68}Ga-PSMA-11) positron emission tomography/computed-tomography (PET/CT) has proved its high diagnostic accuracy in the assessment of recurrent prostate cancer (PCa) patients, only a few prospective studies have addressed its role in clinical decision making comparing to ^{18}F-Fluorocholine (^{18}F-FCH) PET/CT as a prostate-specific PET-tracer. This study aimed to evaluate the impact of PET/CT using ^{68}Ga-PSMA-11 and ^{18}F-FCH in the clinical management of recurrent PCa and correlate imaging findings with clinical characteristics of the disease.

Materials and Methods: Forty-six PCa patients (mean age 68.3±6.3 years) with biochemical recurrence after treatment were enrolled in this prospective crossover trial. In 27 (59%) patients, no systemic treatment was performed after radical prostatectomy, while 19 (41%) patients received androgen deprivation therapy (ADT) and/or chemotherapy. Prostate-specific antigen (PSA) values were ≤ 1, > 1 ≤ 2, and > 2 ng/ml in 29 (63%), 5 (11%), and 12 (26%) of cases, respectively. All patients underwent both ^{68}Ga-PSMA-11 and ^{18}F-FCH PET/CT within a maximum interval of 15 days. A standard randomization tool randomized the sequence of PET/CT imaging. Clinical decision-making was done in an interdisciplinary meeting considering the PET/CT findings. PET/CT blinded readings were performed 3 months after imaging followed by a consensus meeting for the final interpretation of the detected lesions. Histopathology and/or clinical and imaging follow-ups were defined as reference standards.

Result: In the lesion-based analysis, 136 malignant lesions were detected by both imaging modalities. ^{68}Ga- PSMA-11 and ^{18}F-FCH PET/CT detected 130 and 65 lesions with a sensitivity of 96% and 48%, respectively (P<0.001). In addition to the higher detection rate of ^{68}Ga-PSMA-11, tumor-to-background and semi-quantitative PET parameters were significantly higher in 59 (43.4%) congruent lesions detected on both imaging modalities (mean SUV_{max} of 12.81±13.5 on ^{68}Ga-PSMA PET versus 6.35±4.89 on ^{18}F-FCH PET). Overall, 77 (56.6%) incongruent lesions were reported. ^{68}Ga-PSMA-11 PET/CT exclusively detected 71 (52.2%) lesions [Local recurrence: 2 (2.59%), regional lymph node: 17 (22%), distant metastases: 52 (67.5%)], while only 6 (4.4%) lesions were solely seen on ^{18}F-FCH PET/CT [regional lymph node: 4 (5.1%), distant metastasis: 2 (2.59%)]. In patient-based analysis, ^{68}Ga-PSMA-11 and ^{18}F-FCH PET/CT were positive in 35 and 26 patients, respectively. Both imaging modalities were negative in 10 patients. ^{68}Ga-PSMA-11 PET/CT changed the stage of the disease and treatment approach in 17 (37%) and 8 (17.4%) patients, respectively. However, PET/CT imaging led to major treatment changes in 4 (8.7%) patients, of which only in one patient ^{18}F-FCH PET/CT had a superior impact. ^{68}Ga-PSMA-11 PET/CT provides a superior impact on clinical decision-making and treatment approaches both in patients with and without prior or ongoing systemic treatment.

Conclusion: ^{68}Ga-PSMA-11 PET/CT revealed higher diagnostic performance than ^{18}F-FCH PET/CT in recurrent PCa patients, even in cases with very low PSA levels (i.e., ≤1 ng/ml). Moreover, it led to more accurate staging and clinical management of the disease. ^{18}F-FCH PET/CT may play a complementary role only in rare selected high-risk cases with negative ^{68}Ga-PSMA-11 PET/CT with ongoing ADT.

Author Index

N

O

P

R

S

T

U

W

Y