

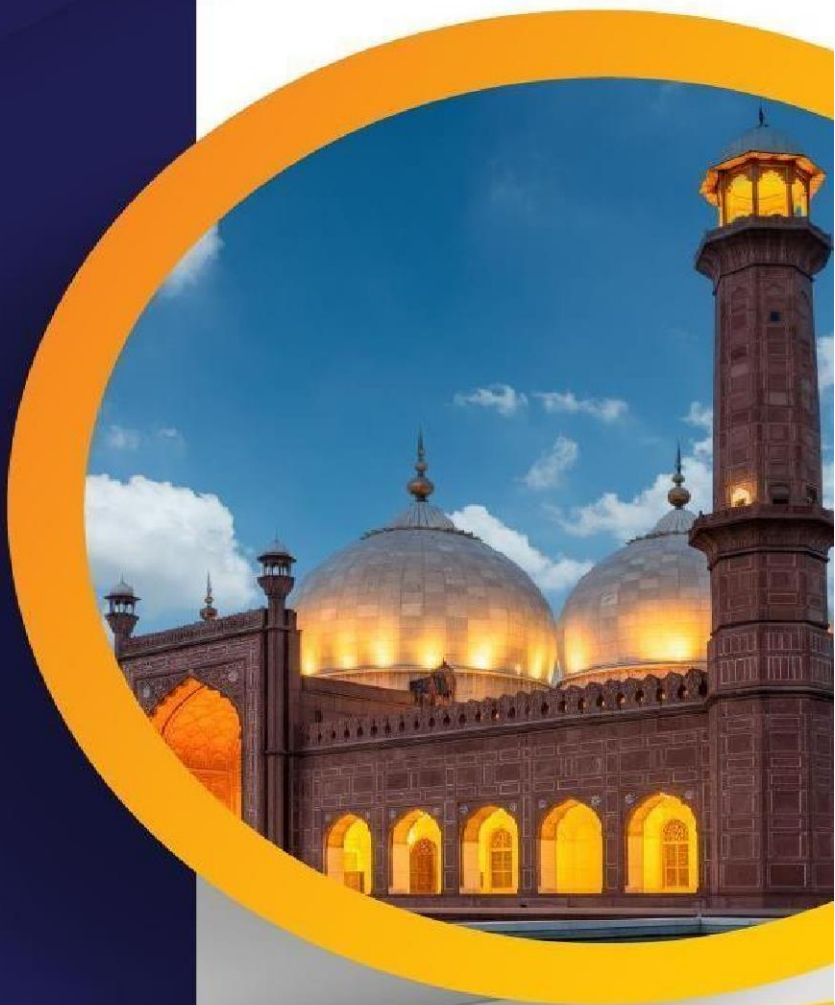


10th ANNUAL CONFERENCE
PAKISTAN SOCIETY OF NUCLEAR MEDICINE
31st October - 2nd November, 2025

NUCLEAR MEDICINE
IN PAKISTAN
FROM GAMMA TO BETA & BEYOND



ABSTRACT BOOK





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ORAL ABSTRACTS



Radiomics and AI in Predicting Chemotherapy Response in Lymphoma

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ABSTRACT

Background: Intratumoral heterogeneity has been increasingly recognized as a critical determinant of prognosis in various solid tumors. Advances in reproducible methodologies for textural analysis of medical images have catalyzed the emergence of radiomics—a data-driven approach that enables the extraction of high-dimensional quantitative features from routine imaging modalities. Radiomics facilitates objective characterization of tumor phenotype and heterogeneity, with select features now identified as potential assisted analytics further enhances the robustness, reproducibility, and clinical applicability of radiomic imaging biomarkers predictive of therapeutic outcomes. The integration of artificial intelligence (AI)-data.

Objective: To evaluate baseline PET-derived biomarkers, for their potential to predict early radiomic features, including texture-based therapy response in patients with Hodgkin's Disease (HD) and Non-Hodgkin's Lymphoma (NHL), utilizing AI-supported image analysis tools histologically confirmed lymphoma undergoing

Materials and Methods: Nin patients with chemotherapy were retrospectively analyzed. All patients underwent pre-treatment [18F]FDG PET/CT imaging. Patients were stratified into responders and non-responders based on disease status observed on interim PET scans following four cycles of chemotherapy. Primary tumor volumes were delineated manually on baseline PET images. Fifteen radiomic texture features were extracted per lesion using the Chang-Gung Image Texture Analysis (CGITA) software. AI algorithms embedded within the analysis platform facilitated automated feature computation and pattern recognition. The discriminative power of each feature was assessed via the area under the receiver operating characteristic curve (AUCROC).

Results: Our findings indicate that increased baseline tumor heterogeneity, as quantified by specific texture parameters, is associated with non-responsiveness to chemotherapy. Features demonstrating higher AUC values were more effective in distinguishing responders from non-responders, underscoring their potential utility as predictive imaging biomarkers.

Conclusion: Baseline FDG PET-derived radiomic features—particularly those reflecting tumor heterogeneity—may serve as valuable predictors of early treatment response in lymphoma. The incorporation of AI-enhanced radiomic analysis holds promise for advancing personalized treatment strategies and improving clinical decision-making in oncologic imaging.

Evaluating the role of F18-fluorodeoxyglucose Positron Emission Tomography-Computed Tomography in detection of carcinoma of unknown primary and its association with final diagnosis

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ABSTRACT

Background: Carcinoma of unknown primary (CUP) is a diverse group of metastatic cancers where the primary tumor remains undetected despite comprehensive diagnostic efforts. It accounts for 2-9% of global cancer cases, affecting men and women equally, with a median age of 59-66 years and poor survival rates of 11 weeks to 11 months.

Objective: To investigate the efficacy and reliability of 18FDG PET/CT imaging in detection and localization of CUP lesions and to correlate 18FDG PET/CT findings with final histopathological and conventional imaging diagnosis to access concordance.

Methodology: This was a prospective study in which patients with Carcinoma of unknown primary were referred to INMOL Hospital for FDG PET/CT. The chi square test and Fischer Exact test was used to find the association FDG PET/CT with final diagnosis.

Results: The study included 43 patients, (19 males and 24 females) and a mean age of 57.65 years. Histological confirmation of the primary site was positive in 79.1% of cases, with no significant gender difference. SUV max and SUV CATA values were significantly associated with positive histological findings ($p=0.001$ and $p<0.001$). Most patients (79.1%) had a single metastasis, and the most common primary sites identified were lung lesions (32.4%) and gastrointestinal cancers (20.6%). PET/CT showed high sensitivity (96.7%), moderate specificity (66.6%) and overall accuracy (88.3%)

Conclusion: The study determined that 18FDG PET/CT imaging demonstrated high efficacy and reliability in detecting and localizing CUP lesions, with significant concordance to final histopathological findings. The strong associations of SUV max and SUV CATA values with positive histological results highlights the diagnostic value of PET/CT in carcinoma of unknown primary.

Novelty: To correlate 18FDG PET/CT findings with final histopathological and conventional imaging diagnosis to access concordance.

Correlation between myocardial defects and contractility of left ventricle assessed on a gated post-nitrate myocardial viability imaging

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ABSTRACT

Purpose/Background: Gated Single Photon Emission Computerized Tomography (SPECT) is a helpful modality for the detection of viable left myocardium in a remote centre of Northern Pakistan, where cardiac PET-CT scan facility for viability assessment is not accessible. The purpose of this study was to correlate the perfusion defects in left ventricular myocardium with the regional wall motion abnormalities and ventricular dysfunction on Gated Post-nitrate Viability study.

Methods & Materials: A prospective study was done at our Nuclear Medicine Department, for the duration of two years, total 73 patients were included in the study. All patients underwent a one day Viability study after preparation by the Nuclear Physician on appointment as per the departmental protocol. On the day of the scan, the patients were given sublingual nitrate with monitoring blood pressure followed by Tc-99m MIBI (Methoxy Isobutyl Isonitrile) gated SPECT scan, where 20 mCi was injected intravenously and a fatty meal was given subsequently. The scan was done after 40 minutes post radiotracer injection on GE Infinia GP3 SPECT. Eight frames gating technique (variable fixed temporal resolution) of ECG was used to gate the cardiac cycle and whole acquisition was completed in 30 minutes. Later repeated study was also acquired in case of not adequate hepatic clearance. The scan was processed and reported by two Nuclear Physicians. By doing 20 segmental analyses, defects, viability of the myocardium was evaluated along with wall motion analysis.

Results: A total of 73 patients (68% males, 31.5% females) were analyzed across age groups 21–90 years, with most between 51–70 years. Typical chest pain was reported by 47 patients, atypical by 8, and 14 had no chest pain; 46 had dyspnea, and 53 had a history of myocardial infarction (MI). Coronary artery disease (CAD) was present in 54 patients, including TVCAD in 25, DVCAD in 18, and SVCAD in 11. Myocardial defects were most frequent in the apex (63 cases) and inferior (45 cases) walls, with 54 (74%) showing transmural MI and all showing partial thickness defects. Segment viability varied by artery territory, with highest in LAD (10/10 in 28 cases), RCA (4/4 in 50), and LCX (6/6 in 58). Dilated left ventricles were found in 36 (49%) cases, and post-nitrate ejection fraction $\leq 30\%$ in 33 patients. Correlation between defects and RWMA occurred in 62 (84.9%) cases, mainly showing hypokinesia (43 cases).

Conclusion: Significant correlation can be seen between myocardial defects and RWMA on Gated SPECT on a Viability Study.

Novelty: Novelty of this study lies in assessing the correlation between myocardial defects and left ventricular contractility or wall motion analysis on Gated Post-Nitrate Viability Study, potentially guiding the better therapeutic decisions in CAD management in a remote centre of Pakistan.

Clinical applications of musculoskeletal SPECT-CT in pediatric patients: A 10-year experience

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ABSTRACT

Introduction: Musculoskeletal disorders in children are quite common including various metabolic and neoplastic etiologies. Conventional planar bone scintigraphy is often an integral part of staging/restaging work up of many musculoskeletal tumors and other bone pathologies. However, in children scan interpretation using only planar imaging can be challenging. For instance, the normal epiphyseal growth plates activity can obscure or mimic osseous lesions. Similarly, there can be issues in delineating bladder activities from potential osseous lesion involving pelvic bones. These problems can be addressed by the introduction of hybrid imaging like SPECT-CT where fusion of functional and anatomical information can give a better picture. In this abstract, we present a 10 year data on the added value of SPECT/CT in evaluation of pediatric musculoskeletal disorders.

Materials and Methods: SPECT/CTs of 204 pediatric subjects aged < 18 years were retrospectively reviewed from August 2014 to August 2024. Results were sorted by mean age, gender, clinical indication for scan. Out of total 204 bone scans, 58 were performed on three phase bone scintigraphy protocol in which SPECT was part of standard protocol. In remaining 146 subjects, we did SPECT in order to confirm disease involvement.

Results: Mean age: 12.9 years. 66 female, 137 Male. Out of 204 total SPECTs, SPECT-CT ruled out disease involvement in areas with ambiguous uptake on planar bone imaging due to tracer contamination, urinary bladder activity and other non-specific findings 86/204 (42.2%), whilst 118/204 (57.8%) patients had significant findings on SPECT. Out of 58 patients who underwent 3 phase bone scans, SPECT answered queries in terms of osteomyelitis, avascular necrosis, shin splints, prosthetic loosening, condylar hyperplasia, heterotrophic ossification in 67.3% (37/58 cases). SPECT-CT provided crucial information towards diagnosis in 81 cases by confirming metastatic lytic sclerotic lesions in areas with suspicious uptake on planar imaging. SPECT-CT provided additional unsuspected information in 46 cases like incidental detection of pulmonary nodules, extra osseous calcification, enlarged nodes, pleural effusions & cord compression.

Novelty: Our study shows that SPECT/CT has significant added value in diagnosis of bone pathologies especially in pediatric population. It can improve diagnostic accuracy and influence clinical disease management. However, it is also important to consider the radiation exposure from CT in this age group, employing strategies such as using low X-ray tube voltages and other radiation physics parameters.

Prognostic impact of body mass index on coronary artery disease using gated myocardial perfusion imaging-Single Photon Computed Tomography

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ABSTRACT

Background / aim: Gated Myocardial Perfusion Imaging Single Photon Emission Computed Tomography (GMPI-SPECT) is a nuclear stress test; performed to observe perfusion of cardiac tissue and its related defects; to diagnose / stratifying risk in individuals either suspected or known cases of coronary artery disease (CAD). Body mass index (BMI) is used for screening of obesity. The objective of this study is to investigate the impact of BMI on the prognosis of intermediate-risk CAD patients, stratified by GMPI- SPECT results in both genders.

Methods: Ziauddin University Hospital was the setting of this cohort study, from March 2017 to December 2019 using non-probability purposive sampling. Non-obese and obese GMPI-SPECT patients (n=115) were divided into two major groups (male and female). Patients were interviewed after 18 months regarding cardiac events with/without interventional procedures. SPSS v.23 was used with $p < 0.05$ considered significant.

Results: In the study, 56.5% were male, 57.4% were obese; obese (6%) and male (4.5%) patient of an intermediate risk prognosis group have a more risk of minor cardiac events in 18-month follow-up. In post hoc analysis it was observed that samples with intermediate risk have significantly higher BMI as compared to high-risk samples ($p = 0.028$). Pearson Chi-Square test gives a significant association between GMPI-SPECT outcomes and 18-month intervals with a $p < 0.05$. One-way ANOVA gives a significant mean difference in BMI concerning GMPI-SPECT outcomes ($p < 0.05$).

Conclusion: Among an intermediate risk prognosis group (stratified by GMPI-SPECT), higher BMI and male gender with multiple risk determinants have more risk of experiencing minor cardiac incident within 18 months.

Clinical utility and diagnostic performance of FDG PET-CT in mantle cell lymphoma: A single center study

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ABSTRACT

Introduction: Fluorodeoxyglucose Positron Emission Tomography/Computed Tomography (FDG PETCT) is commonly used for staging and treatment assessment in lymphomas like diffuse large B-cell and Hodgkin lymphoma, but its role in mantle cell lymphoma (MCL) is less defined. Representing about 5% of lymphomas, MCL shows variable FDG uptake, and the prognostic value of PET-CT remains unclear. This retrospective study evaluated FDG PET-CT's role in MCL management by correlating baseline SUVmax with Ki-67 and LDH—key prognostic markers—and assessing its accuracy in detecting nodal, bone marrow, and gastrointestinal involvement using histopathology as the gold standard.

Materials and Methods: This retrospective analysis included 29 patients with histologically confirmed MCL who underwent FDG PET-CT between 2014 and July 2025. Baseline PET-CT scans were reviewed. All scans were performed under standardized conditions, including adequate fasting and a uniform uptake period. For each scan, SUVmax of the most metabolically active lesion on the baseline PET-CT was recorded and correlated with Ki-67 expression and LDH levels. Diagnostic accuracy of FDG PET-CT for nodal, bone marrow, and gastrointestinal tract sites was calculated using biopsy results as the gold standard. Sensitivity and specificity were derived for each organ system separately.

Results: SUVmax on baseline PET-CT demonstrated a positive correlation with both Ki-67 index and LDH levels. Higher SUVmax was associated with aggressive disease biology and served as a poor prognostic indicator. Nodal involvement: Nodal biopsies were available for 26 patients, all of whom demonstrated concordant positivity on both histopathology and PET-CT. This yielded a sensitivity and specificity of 100% for nodal disease detection. Bone marrow involvement: Among 12 patients who underwent bone marrow biopsy, four showed marrow infiltration. PET-CT detected marrow disease in three of these cases, resulting in a sensitivity of 75%, while all biopsy-negative cases were also negative on PET-CT, yielding a specificity of 100%. Gastrointestinal involvement: Gastrointestinal tract biopsies were available for six patients. Of these, five were positive and one was negative for MCL. PET-CT identified involvement in three of the five biopsy-positive cases, with two false-negative findings, corresponding to a sensitivity of 60% and specificity of 100%.

Conclusion: This study highlights the utility of FDG PET-CT in the evaluation and management of mantle cell lymphoma. Baseline SUVmax correlated with established prognostic markers (Ki-67 and LDH), suggesting a potential role in risk stratification. FDG PET-CT demonstrated excellent diagnostic accuracy for nodal involvement, with 100% sensitivity and specificity in this cohort. While specificity for bone marrow and gastrointestinal involvement remained high, sensitivity was comparatively lower. Given the limited sample size, larger multicenter studies are warranted to validate these findings and further define the role of FDG PET-CT in MCL.

Novelty: Our study aims to evaluate the diagnostic accuracy of FDG PET-CT in mantle cell lymphoma, which is a rarer subtype and shows variable FDG uptake.

Optimizing therapy in medullary thyroid cancer: The contribution of 68Ga-DOTATATE PET/CT

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ABSTRACT

Objective: Medullary thyroid cancer (MTC) is a rare type of thyroid cancer which arises from the neuroendocrine C cells of the thyroid gland. There is no single diagnostic imaging modality that can detect all MTC recurrences or metastases. 68Ga-DOTATATE PET/CT can be used in management of MTC with up trending tumor markers. Objective of this study is to reveal the clinical efficacy and impact of 68Ga-DOTATATE PET/CT on the management of MTC.

Method: A retrospective analysis was conducted on 27 patients with MTC patients who underwent ⁶⁸Ga-DOTATATE PET-CT scans. Data collected included demographics, scan indication, histopathology, prior treatments, tumor markers, SUV of primary and metastatic sites. Findings were correlated with the most recent conventional radiological imaging with no treatment in between. A consensus review was performed to assess the additional value of 68Ga-DOTATATE PET-CT, particularly in cases with discordant results. Where change in management of patients was made after reviewing scan and discussion in the MDT. We also looked at the histopathological parameters and their association with the rate of recurrence.

Results: The mean patient age was 42.1 years; 62% were male and 33% female. Restaging for rising tumor markers or suspected recurrence was the main indication. 68Ga-DOTATATE PET-CT outperformed conventional imaging in 18/27 (67%) cases, detecting additional disease—nodal metastases in 12, bone in 4, both in 2, and a benign hepatic lesion in 1. In 1 case (3.7%), DOTA excluded malignancy confirmed by FNAC, while 26% showed no added findings. Among 19 metastatic cases, extranodal extension (ENE) was most common (52.7%), followed by lymphatic and vascular invasion (each 10.5%); ENE appeared the key driver of distant spread. DOTA findings altered management in 16/27 (59%) patients, including ruling out recurrence, declaring disease unresectable, initiating follow-up, or changing therapy—radiation (50%), surgery (21%), TKI (7%), combination (14%), and palliation (7%).

Conclusion: 68 Ga-DOTATATE plays crucial part in work-up of medullary thyroid cancer, outperforming conventional imaging in (67%) patients and altered the clinical management (59%) patients. ENE was seen to be the main contributor to distant metastatic spread, suggesting it may have more impact than lymphatic or vascular invasion alone or in combination.

Novelty: A Novel imaging guided approach in improving therapy selection in MTC, it is a valuable and emerging area in endocrine oncology, especially for rare cancers like MTC.

Determination of the reference Mag -3 based ERPF values in healthy adults

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ABSTRACT

Objective: To determine age and gender specific MAG-3 based effective renal plasma flow (ERPF) values in healthy adults within our population.

Methodology: It is a Cross-sectional observational study conducted at Nuclear Medical Centre, Armed Forces Institute of pathology Rawalpindi from June 2022 to December 2023. A total of 300 healthy donors undergoing evaluation for kidney donation, referred to our centre for Tc-99m MAG-3 functional imaging, were included. MAG-3 clearance (ERPF) was calculated using a camera-based method.

Results: Of total 300 candidates, 167 (55.7%) were female while 133 (44.3%) were male with mean age of 32.60 ± 10.25 years and mean body surface area was 179 ± 0.19 m². The mean MAG-3 clearance (ERPF) was 305.52 ± 29.88 ml/min while relative uptake was 152.22 ± 22.24 ml/min ($49.80 \pm 5.75\%$) and 153.30 ± 21.58 ml/min ($50.20 \pm 5.75\%$) for right and left kidney respectively. The mean ERPF values were independent of age ($p=0.75$), gender (0.09) and side of kidney ($p=0.558$).

Conclusion: Our study, focusing on healthy kidney donors, offers valuable insights into normal population values, facilitating the establishment of gender-specific and kidney-specific ERPF means and ranges.

Keywords: Donors, ERPF, MAG-3, Renal transplant, Renography

Novelty: No / very limited research has been done as such on this topic in our centers

Extranodal extension in papillary thyroid carcinoma: Assessing its impact on recurrence and clinical outcomes

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ABSTRACT

Purpose: Papillary thyroid cancer (PTC) is most common type of thyroid cancer. Currently American Thyroid Association (ATA) guidelines are in use for risk stratification and management. Extranodal extension (ENE) is defined pathologically by tumor cells extending beyond the capsule into the perinodal fibroadipose tissue. However it is not currently included in ATA guidelines. ENE has association with increased risk of distant metastases, persistent disease and disease related mortality. The purpose of my study is to evaluate the risk of recurrence in PTC with extranodal extension.

Materials and Methods: Retrospective analysis of 97 patients with biopsy proven papillary thyroid carcinoma who underwent surgery and radioactive iodine therapy from January 2015 to December 2020 was done using HIS. Patients were divided into 2 groups; one with nodal disease (50 patients) without ENE and other with nodal disease with ENE (47 patients). Records were reviewed till last follow up for recurrence.

Results: Patients with nodal disease without ENE. Age range 15-62 years. 27 females, 23 males. 37 had ≤ 5 nodes, 10 had > 5 nodes. Average size of largest node 1.7cm. Median follow up 59.5 months. Recurrence occurred in 18/50 (36%) 2 with high risk features. 14 patients fall in ≤ 5 nodes & 3 in > 5 nodes, record not available in 1 patient. Excluding high risk patients with only nodal disease as risk factor 15/41(36.5%) had recurrence.

Patients with nodal disease and ENE. Age range 30-63 years. 29 females, 18 males. 21 patients had ≤ 5 nodes, 26 > 5 nodes. Average size of largest node 3.1cm. Median follow up 63.5 months. Recurrence occurred in 20/47 (42.5%) 6 with high risk features. 6 patients had ≤ 5 nodes & 14 > 5 nodes. Excluding high risk patients with only ENE as risk factor 11/21(52.3%) had recurrence.

Odds ratio suggest that odds of having recurrence are 31.7% higher for ENE positive group compared to those with ENE negative group.

Conclusion: Extranodal extension (ENE) should be considered a significant risk factor in papillary thyroid carcinoma when stratifying patients regarding appropriate treatment and risk of recurrence.

Novelty: This study highlights the significance of extranodal extension on recurrence in PTC which was not given significant importance in major thyroid cancer management guidelines.

Evaluation of attenuation pattern in SPECT myocardial perfusion imaging between Cadmium Zinc Telluride (CZT) digital and conventional gamma cameras

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Background: Cadmium-zinc-telluride (CZT) gamma cameras represent a technological advancement in myocardial perfusion imaging (MPI), offering improved image quality and faster acquisition through semiconductor detectors, pinhole collimation, and a stationary gantry. This study aims to compare the attenuation patterns between CZT and conventional NaI-based gamma cameras. The study also aims to compare image acquisition time and overall image quality between the two systems.

Methods: A total of 67 patients underwent MPI using a one-day stress-rest protocol. All patients were imaged in the supine position on a conventional gamma camera (Philips), followed by imaging on a CZT-based D-SPECT camera in both supine and upright positions. Patients were categorized into two groups:

Category A: Supine (Philips) vs. Supine (D-SPECT) Category B:

Supine (Philips) vs. Upright (D-SPECT)

Images were analyzed using the 17-segment model and interpreted based on Summed Stress Score (SSS). Subgroup analysis was performed to assess differences in defect size, severity, and distribution.

Results: Mean stress acquisition time was significantly lower with D-SPECT (7.17 min supine, 7.20 min upright) compared to Philips (12.00 min). Image quality was higher with D-SPECT (3.12 supine, 3.80 upright) versus Philips (2.64). In Category A, 76% of cases showed similar findings; 18% showed additional defects on Philips that improved on D-SPECT, and 7% showed the reverse. In Category B, 61% showed similar findings, while 30% had defects on Philips that resolved on upright D-SPECT, and 9% had additional findings on D-SPECT. Inferior wall defects were more frequent on Philips and in supine positions, while anterior wall defects were more observed on D-SPECT ($p < 0.05$). Regression analysis showed strong correlation in subcategories ($R^2 > 0.6$).

Conclusion: The CZT camera provides improved image quality in a shorter acquisition time, with slightly better efficiency in assessing inferior wall defects related to attenuation compared to the conventional gamma camera. However, no significant difference was observed in the evaluation of anterior wall defects between the two systems.

Novelty: This study evaluates the practical performance of cadmium-zinc-telluride (CZT) detector technology in myocardial perfusion imaging (MPI) in comparison to conventional scintillation gamma cameras. By directly comparing the two systems in a clinical setting, the study offers new insights into the diagnostic and operational advantages.

Targeting recurrent glioblastoma with AI-guided ^{211}At -Anti-PTK7 radioimmunotherapy: A new paradigm of alpha-particle dosimetry and clinical prospects

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ABSTRACT

Background: Recurrent glioblastoma (rGBM) indicate a poor prognosis with current therapies, offering minimal survival benefit. Targeted alpha-particle therapy (TAT) represents a paradigm shift in oncology, capable of delivering potent, focal radiation to eradicate treatment-resistant tumor cells while sparing the surrounding healthy brain parenchyma. The alpha-emitter astatine-211 (^{211}At) possesses ideal properties for treating micrometastatic rGBM. Concurrently, Protein Tyrosine Kinase 7 (PTK7) has emerged as a highly expressed and stable tumor-specific antigen on glioma stem cells, making it a desirable target for radioimmunotherapy.

Review Content: This comprehensive review synthesizes the multidisciplinary advancements enabling a novel therapeutic strategy: ^{211}At -labeled anti-PTK7 radioimmunotherapy. The ^{211}At -based anti-PTK7 radioimmunotherapy lies in its synergistic integration of three distinct technological advances to directly address the persistent difficulty of recurrent glioblastoma (rGBM). First, it targets PTK7, a novel biological target that is not only overexpressed on rGBM cells but is also a key marker on treatment-resistant cancer stem W2 cells. Second, it employs the potent alpha-particle emitter Astatine-211 (^{211}At), which offers a paradigm shift in cytotoxicity by delivering highly localized, irreversible DNA damage, a significant advantage over conventional beta-emitters or chemotherapy. Finally, the Artificial Intelligence (AI) for real-time, patient-specific alpha-dosimetry and treatment planning guidance system to ensuring optimal tumor dosing while managing toxicity. It is the specific target, payload, and intelligent delivery system that constitutes a truly novel and transformative therapeutic strategy.

Conclusion: The integration of a novel target (PTK7), a potent payload (^{211}At), and artificial intelligence represents the cutting edge of precision neuro-oncology. While significant challenges in production, dosimetry, and toxicity management remain the synergistic potential of these technologies is immense and the recent research underscores the potential of ^{211}At anti-PTK7 radioimmunotherapy as a viable treatment strategy for rGBM. The integration of AI-based dosimetry and improved targeting approaches represents a significant advancement in personalized alpha-particle therapy. While challenges remain in large-scale production and optimal combination strategies, current evidence supports continued clinical translation of this targeted approach for improving outcomes in recurrent glioblastoma patients. This review shows that AI-guided ^{211}At anti-PTK7 RIT is best and promising path forward to fundamentally alter the treatment strategies for recurrent glioblastoma.

Novelty: The paramount challenge in targeted alpha-particle therapy and AI-guided ^{211}At -Anti-PTK7 Radioimmunotherapy for the treatment of recurrent glioblastoma.

Multimodality assessment of thyroid nodules: Correlation of TI-RADS, FNAC, and thyroid scintigraphy

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ABSTRACT

Introduction: Thyroid nodules are a frequent clinical problem, and their precise evaluation is crucial for distinguishing benign from malignant lesions while avoiding unnecessary invasive investigations.

Methodology: This study evaluates the diagnostic correlation between three essential modalities—Thyroid Scintigraphy (using Tc-99m pertechnetate), TI-RADS ultrasound classification, and Fine Needle Aspiration Cytology (FNAC) interpreted via the Bethesda system—in evaluating patients presenting with nodular goiter. The primary goal is to enhance diagnostic accuracy and thereby reduce unnecessary invasive procedures. A retrospective study was conducted as cross-sectional analysis at NORI Hospital Islamabad from December 2024 to May 2025, the study examined 210 patients. All patients underwent both TI-RADS- based ultrasound and FNAC; a subset of 69 patients also received thyroid scintigraphy to assess functional status.

Results: The results provide strong evidence supporting the utility of the multimodal approach. All 8 hot nodules identified on scintigraphy were reliably benign (Bethesda 2) on cytology. Conversely, the 61 cold nodules demonstrated an 11% rate of malignancy or suspicion (Bethesda 4/5). A clear association was observed between higher TI-RADS scores and increased malignancy risk: the suspicion rate rose from 6.4% in TI-RADS 3 nodules to 9% in TI-RADS 4 and peaked at 22% in TI-RADS 5 lesions. FNAC analysis revealed a predominance of benign follicular and colloid nodules, with malignant cases primarily involving papillary carcinoma, Hurthle cell neoplasm, and follicular neoplasm. The study concludes that cold nodules on scintigraphy and higher TI-RADS scores (IV/V) are strongly associated with increased risk of malignancy, whereas hot nodules are reliably benign. This multimodal approach helps in risk stratification, supporting more targeted and efficient clinical decision-making and minimizing the need for unnecessary FNAC procedures.

Gastric and lung uptake of Tc-99m MDP on bone scintigraphy in a patient with multiple myeloma- A case report

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ABSTRACT

Introduction: On Tc-99m MDP bone scintigraphy, pulmonary and gastric uptake indicates metastatic calcification secondary to hypercalcemia. The lungs and stomach are usually affected since they have an alkaline environment that promotes precipitation of calcium phosphate. Most common causes of hypercalcemia are hyperparathyroidism, chronic renal failure, vitamin D intoxication, sarcoidosis and various malignancies including multiple myeloma, lymphoma and breast cancer.

Methodology: Here, we present a case of a patient with multiple myeloma showing concomitant lung and gastric uptake on bone scan. This case refers to a 57 years old patient who was referred to our department for a bone scan presenting with generalized bony aches for the last few months. Bone scan revealed multiple foci of increased tracer uptake involving sternum, bilateral anterior and posterior ribs, multiple thoracolumbar vertebrae, bilateral SI joints and acetabulae and skull bones. Extra-osseous soft tissue uptake was seen in bilateral lungs and stomach in keeping with soft tissue calcifications. Differentials for the findings were hyperparathyroidism, multiple myeloma and osseous metastases. Further lab investigations were advised. His urea and creatinine were within normal range. Serum calcium level (total) was raised 2.7mmol/L, PTH level was slightly raised (110pg/ml). Serum protein electrophoresis revealed M spike and B2 microglobulins were also elevated. Skeletal survey demonstrated generalized reduced bone density with multiple lytic lesions predominantly in the skull. This workup was consistent with diagnosis of multiple myeloma. Bone marrow biopsy was done which showed plasma cell dyscrasia consistent with multiple myeloma.

Results: The described case indicates that concomitant lung and gastric uptake on bone scan is a sign that underlying hypercalcemia needs prompt investigation and treatment. Successful treatment of underlying cause can lead to resolution of soft tissue uptake. Key words: MDP bone scan, hypercalcemia, metastatic calcification, multiple myeloma

Novelty: Metastatic Calcifications in soft tissue in hypercalcemia

Role of FDG PET/ CT in the management of primary central nervous system lymphoma

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ABSTRACT

Purpose: Primary central nervous system lymphoma (PCNSL) is a rare extranodal lymphoma affecting brain, eyes, spinal cord or leptomeninges with Diffuse Large B-Cell Lymphoma (DLBCL) being the most common variant. While MRI is typically used for diagnosis, atypical presentations can complicate assessment and response evaluation. We explore role of 18F-FDG PET/CT in management of PCNSL.

Materials and Methods: Retrospective analysis of 84 PET/CT scans of 48 patients, conducted between April 2010 and May 2025. Data collected included demographics, histopathology, Ki67, treatment, nodal/visceral involvement and SUVmax. Progression-free survival (PFS) and overall survival (OS) were calculated based on staging scans. Response to therapy was assessed using Deauville score on follow-up scans.

Results: Mean age of patients was 46.3 ± 17 years, with 42% female and 58% male. Majority (76%) were DLBCL, 8% Low-Grade B-Cell Lymphoma (LGBCL), 3% Non-Hodgkin Lymphoma and 2% Hodgkin Lymphoma. Histopathological details were unavailable for the rest. Among 40 patients with staging scans, 43% had no surgery. 57% had craniotomy of which 57% showed residual avid disease. Only 3 patients had distant nodal disease with CNS as primary site. 15 patients (38%) died, with estimated mean PFS of 79.7 ± 10.5 months (95% CI: 59.12-100.2 months). Estimated PFS was similar between patients with Ki67 > 70% (56.46 ± 17.4 months, CI: 22.3-90.6) and $\leq 70\%$ (68.79 ± 15.48 months, CI: 38.44-99.13) with no significant difference ($p = 0.846$). Similarly, PFS was comparable between males (54.20 ± 13.69 months, CI: 27.37-81.03) and females (65.76 ± 13.62 months, CI: 39.06-92.46), with no significant difference ($p = 0.338$). OS differences between these groups were also not statistically significant. Of the 44 patients who underwent restaging scans, 52% had complete metabolic response, 33% partial metabolic response and 15% had progressive disease (PD). In PD ($n = 7$), 1 developed osseous lesions, 2 nodal disease, 2 relapsed locally and 2 had disease in multiple regions. Additionally, 14 patients had serial scans and 1 patient transformed from LGBCL to DLBCL after 4 years.

Conclusion: 18F-FDG PET/CT is an important tool in both staging and restaging of Primary Central Nervous System Lymphoma (PCNSL). While not yet included in major guidelines, our study shows its potential in the comprehensive management of PCNSL, aiding in treatment response evaluation and detection of residual or progressive disease.

Novelty: This study demonstrates the utility of 18F-FDG PET/CT in PCNSL beyond conventional MRI, aiding in precise staging, response assessment, and detection of systemic involvement. Its integration could enhance clinical decision-making and long-term disease monitoring.

Prognostic role of SUVmax on Gallium-68 PSMA PET/CT and its association with clinicopathological features in prostate carcinoma

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ABSTRACT

Background: Prostate-specific membrane antigen (PSMA) is a 750 amino acid transmembrane specific antigen, expression of which is elevated in prostatic cancer cells, in comparison to the other benign conditions which do not show increased expression. 68Ga-PSMA PET/CT has emerged as a highly sensitive molecular imaging modality in prostate carcinoma, providing superior lesion detection and facilitating quantification compared to conventional imaging. The maximum standardized uptake value (SUVmax) mirrors tumor metabolic activity and may aid as a prognostic biomarker for disease aggressiveness and clinical outcomes.

Objective: The aim of this study was to assess the prognostic value of SUVmax on 68Ga-PSMA PET/CT in the initial staging of patients with biopsy proven prostate carcinoma and its correlation with clinicopathological features.

Methods: It was a retrospective cross sectional study conducted at PET/CT imaging facility of NORI AECH Pakistan. Between November 2024 and August 2025, a total of 50 patients with histologically confirmed prostate carcinoma, were enrolled in the study that were chemotherapy- and radiotherapy- naïve and underwent baseline 68Ga-PSMA PET/CT. SUVmax values of primary lesion in prostatic bed were recorded, their correlation with Gleason score and serum PSA levels was assessed. Pearson correlation coefficient was applied for normally distributed variables. Differences in SUVmax across metastatic burden groups were analyzed using a one way ANOVA test. A p-value of <0.05 was considered statistically significant.

Results: Higher SUVmax values demonstrate a significant association with adverse pathological features, including higher Gleason scores, elevated PSA levels and high metastatic burden.

Conclusion: Strong association between SUVmax values, Gleason score, PSA levels and metastatic disease burden suggest that SUVmax may offer useful prognostic insights in prostate carcinoma. Its integration into clinical practice may contribute to better risk stratification, guide treatment decisions, and improve patient management.

Keywords: SUVmax, 68Ga-PSMA PET/CT, prognostic biomarker, prostate carcinoma

Novelty: This study explores SUVmax on 68Ga-PSMA PET/CT as a reproducible imaging biomarker for prognosis in prostate carcinoma, evaluating its association with the key clinicopathological parameters to augment risk stratification.

Correlation between estimated GFR and measured GFR via DTPA scintigraphy in Pakistani population with chronic kidney disease

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ABSTRACT

Background: The study aimed to find the correlation between estimated GFR (eGFR) using serum creatinine and cystatin C-based CKD-EPI equations, and the measured GFR (mGFR) obtained via Tc-99 m DTPA scintigraphy in Pakistani population with chronic kidney disease (CKD).

Methods: This was an observational cross-sectional study conducted in Nuclear Medicine department of PINUM Cancer Hospital, Faisalabad, Pakistan, from July 2024 to January 2025. Patients with CKD were enrolled and the GFR was measured using Tc-99 m DTPA dynamic scintigraphy. Serum cystatin C and serum creatinine levels were analyzed to estimate GFR using CKD-EPI equations. Pearson's correlation test and Bland Altman analysis were employed to evaluate the relationship between eGFR and mGFR.

Results: A total of 97 patients (53 males and 44 females), with a mean age of 43.99 ± 12.04 years (Range: 18 to 66 years), were included in this study. Patients were subcategorized into two groups based on mGFR values. A strong positive correlation was observed between mGFR and eGFR in the overall population ($r > 0.8$, $p < 0.001$) and in Group 2 with $\text{GFR} < 60 \text{ ml/min/1.73m}^2$ ($r > 0.7$, $p < 0.001$). In Group 1 with $\text{GFR} \geq 60 \text{ ml/min/1.73m}^2$, a moderate positive correlation was noted ($r > 0.3$, $p < 0.05$). Bland–Altman analysis further demonstrated that eGFR_{cys} showed the best agreement with mGFR among the tested equations.

Conclusion: In the assessment of renal function using CKD-EPI equations, cystatin C-based formulas demonstrated superior correlation compared to creatinine-based equations in the Pakistani population with CKD.

Novelty: First study from Pakistan to assess the correlation between eGFR using serum creatinine and cystatin c based equations and mGFR using Tc-99 m DTPA scintigraphy in patients with chronic kidney disease

Knowledge of PET-CT (Positron Emission Tomography-Computed Tomography) imaging among undergraduate medical students of Rawalpindi Medical University: A cross-sectional study

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ABSTRACT

Background: Positron Emission Tomography-Computed Tomography (PET-CT) is an advanced imaging modality with rapidly expanding clinical applications. This study assessed the knowledge and understanding of PET-CT among undergraduate medical students at Rawalpindi Medical University (RMU), Pakistan.

Methods: A cross-sectional survey was conducted on 372 MBBS students at RMU between August 4th and September 5th, 2025, using convenience sampling. Data were analyzed using SPSS.

Results: High overall awareness was noted, with 91.6% (n=341) of students having heard of PET-CT, and 55% (n=204) having visualized a scan. However, significant gaps in fundamental knowledge were identified: 36.4% (n=135) incorrectly believed that the components of PET-CT do not both involve radiation. While 54.7% (n=203) correctly identified oncology as the most frequent application, only 38.8% (n=144) accurately knew that the number of operational scanners in Pakistan was greater than 10 (as of 2025). There was no significant correlation found between the student's year of study and their knowledge (p=0.170).

Conclusion: Despite high recognition, a significant variation and inadequacy exists in the core knowledge of PET-CT among RMU medical students. As the applications of PET-CT continue to expand in diverse specialties, these findings underscore the necessity for greater awareness and enhanced curriculum integration regarding established advanced medical imaging technologies for future physicians.

Diagnostic value of FDG PET-CT in predicting bone marrow involvement in multiple myeloma: Correlation with bone marrow biopsy findings

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ABSTRACT

Background: Multiple myeloma (MM) is a plasma cell dyscrasia primarily diagnosed through invasive Bone Marrow Biopsy (BMB), which assesses plasma cell infiltration (PCI). BMB is limited by site sampling error. 18F-FDG PET/CT offers a valuable non-invasive alternative for whole-body disease evaluation, but its precise correlation with histopathology and routine laboratory parameters in the local population remains under-investigated.

Objective: To evaluate the correlation of FDG PET-CT bone marrow uptake (SUVmax) with PCI on biopsy and with a spectrum of haematological and immunological markers in MM patients.

Methods: This retrospective study analyzed 44 histopathologically confirmed MM patients (27 males, 17 females; mean age 56.9 ± 11.2 years) who underwent FDG PET/CT at SIUT Karachi between January 2022 and December 2024. SUVmax was derived from the site of highest uptake. PCI on BMB served as the reference standard. Correlation with laboratory parameters (Hb, Ca, Cr, Alb, LDH, κ/λ ratio, immunofixation) was assessed using Pearson's coefficient.

Results: A significant positive correlation was found between SUVmax in the bone marrow and PCI ($r=0.002, p<0.05$). SUVmax showed a weak negative correlation with Hb ($r=0.276, p=0.084$), but no significant correlation was found with lytic lesions ($r=-0.29, p<0.05$) or any other tested laboratory/immunological parameter.

Conclusion: 18F-FDG PET/CT demonstrates significant correlation with bone marrow plasma cell infiltration, reinforcing its role as a powerful, non-invasive adjunct to BMB for evaluating marrow involvement in MM. However, the limited association with other markers emphasizes the critical need for a continued multimodal assessment approach in the diagnosis and monitoring of multiple myeloma.

Semi-Automated fusion technique to create PET-MRI like dataset, in a limited recourse setting

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ABSTRACT

Introduction: PET-CT is an established yet valuable imaging tool for staging prostate cancer. Its applications are extending beyond just staging and response evaluation of cancer. Its role in infection & inflammation is well established. Major challenge for PET-CT in pelvis and cardiac imaging is limited anatomic information, where growing demand of PET-MRI is being observed. But acquisition of PET- MRI is not a financially viable option due to its excessive capital & operational cost.

Objective: To evaluate the benefits of semi-automated fusion technique to generate PET-MRI like dataset in pelvic & cardiac PET-CT.

Methodology: This prospective study included 25 patients who underwent both CMR and PETCT scans for cardiac imaging (17), a PSMA PET-CT and routine pelvis MRI for prostate (08). Cardiac FDG PET- CT was predominantly performed to rule out cardiac Sarcoidosis, with an already available CMR, the delayed GAD axial T1 dataset was manually fused with TOF-AC PET. Similarly, a PSMA PET-CT was performed for staging of prostate cancer and an MRI performed during prior workup was utilized, and AX T2 dataset was manually fused with TOF-AC PSMA PET.

Results: By manually fusing MRI dataset with 18F-FDG cardiac PET & 18F-PSMA-1007 prostate PET, significant advantage was observed at lung myocardium interface & capsular/lymphatic anatomy respectively. Which otherwise pose a major challenge to rule out on PET-CT dataset.

Conclusion: In our patient pool we observed although PET-MRI has an added advantage of simultaneous acquisition as well as multiparametric MRI being a decider. But in a limited resource setting manual fusion technique can add value and PET-MRI like dataset gives a better insight of anatomy compared to a PET-CT

Novelty: PET-CT imaging in cardiac conditions & Ca-prostate are gaining much attention in current clinical practices, yet PET-CT due to lack of anatomic discrimination compared to MRI in these cases pose a challenge in most of the cases, thus we established a protocol to manually fuse already available MRI dataset with FDG PET-CT & 18F-PSMA for above mentioned conditions to counter these challenges.

Comparison of maximum permissible activity of I-131 determined by Benua and Leeper method and blood absorbed dose method in differentiated thyroid carcinoma patients

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ABSTRACT

Background: Iodine-131 NaI is the mainstay of treatment in patients with well differentiated carcinoma. Fixed versus dosimetrically determined doses for iodine therapy are long in debate. Objectives: In this study, two dosimetry methods for the calculation of maximum tolerable activity (MTA) of iodine-131 NaI for treatment of well-differentiated thyroid carcinoma patients were compared.

Materials & Methods: The methods included blood dosimetry method based on the Medical and Internal Radiation Dosimetry (MIRD) and 48-hour retention limit method based on modified Benua and Leeper method. For dosimetric analysis whole-body scans were obtained using pre-calibrated dual head SPECT/CT gamma camera for I-131 along with 1 ml blood samples at 2, 24, and 48 h post administration of I-131. Percent activity uptakes in whole body as well as blood samples were determined. MATLAB was used to generate time activity curves and to calculate cumulative activities for whole body and blood at all-time points. Using the published MIRD formalism radiation absorbed dose to blood was determined. For 48h retention limit method, percent whole body retention activities at 2, 24, and 48h were plotted against time to fit bi-exponential curve. MTA with blood dosimetry method was calculated by dividing 2 Gy absorbed dose limit to blood. MTA with 48h retention method was calculated by using 4.4 GBq retention limit at 48h in bi-exponential decay equation.

Results & Discussion: The MTA range with blood dosimetry method was found to be 395 mCi to 923 mCi as compared to 894.6 mCi to 4490 mCi with 48-hour retention method. Higher estimation of MTA is consequent to low retention of I-131 as none of the patients had any residual/metastatic disease.

Conclusions: For lower retentions at 48 hours (<5%), the MTA differed up to the factor of 5. However, for the retention of up to 10%, MTA differed by the factor of 3. Hence, 48-hour retention limit method was found to over-estimate the MTA as compared to blood dosimetry method.

Novelty: Iodine-131 NaI is the mainstay of treatment in patients with well differentiated carcinoma. Fixed versus dosimetrically determined doses for iodine therapy are long in debate. In this study, two dosimetry methods for the calculation of maximum tolerable activity (MTA) of iodine-131 NaI for treatment of well-differentiated thyroid carcinoma patients were compared.



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POSTER ABSTRACTS



Compatibility/comparison of bone scan, CT & PET-CT in detection of bone metastasis in breast cancers

Abdul Salam Abbasi

AECH-NORIN

ABSTRACT

Introduction: Skeletal Metastasis are very common in Breast Cancers and these can be osteolytic, osteoblastic, or mixed type. Traditionally, bone scan is prime & widely used modality used in our areas for detecting the bone metastasis esp: osteoblastic.

Methodology: Though the bone scan is highly sensitive, however specificity is much lower along with false positive rate ranging upto 40%.In that case, CECT is more sensitive than bone scan for detecting bone metastasis. Bone scan indicates that there is problem in the bone while CT-Scan shows the detailed 3D anatomical information about pathologies. The relative decreased sensitivity of PET scan to detect osteoblastic lesions is noted on previous study.

Conclusion: However this reduced sensitivity of PET-Scan in osteoblastic lesions can be overcome by fusion of PET with CT. So Hybrid Imaging like PET/CT & MRI has higher accuracy then the both CT & bone scans. In Piccardo et. prospective study: This shows comparison of PET scan with CT-Scan for bone metastasis. This study provides a comparison between two distinct imaging procedures and how they augment each other.

Progression of liver-NET to brain metastasis despite Lutetium-177 DOTA- TATE therapy

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ABSTRACT

Introduction: Neuroendocrine tumors (NETs) seldom metastasize the brain. However, when it occurs, the PRRT has poor prognosis. Due to their low incidence, NET with brain mets we found very few cases. Hence it is challenging to form a consensus to manage this clinical situation.

Methodology: A 77-years-old female, histopathology with synaptophysin and chromogranin positive with Ki-Index 5%, was diagnosed as poorly differentiated liver NET. Upon investigation with CT and MRI, pulmonary and renal lesions with primary lesions found in different segments of liver. Patient was resistant to chemotherapy, hence referral for PRRT was planned. Lu-177 of ITG-Germany, while DOTATATE precursor of ABX were used for the synthesis of therapeutic doses of PRRT. Clinical parameters as per international guidelines required for the therapeutic radio- pharmaceutical dose administration were maintained and patient received 02 cycles of lutetium-177 DOTA-TATE administered every 8-10 weeks over the course of 6 months were administered. Therapeutic response and dose localization was confirmed by the SPECT-CT and planer images as per protocol.

Results: The planar and SPECT-CT scans revealed the localization of the therapy dose at the avid lesions and, in comparison with the Ga-68 DOTA-TOC Scan, two separate large mass lesions anterosuperiorly and the other posteroinferiorly in liver were seen. After the administration of 3rd dose of 2nd cycle, new areas of uptake in brain parenchyma, larger ones in right occipital region and at least two small lesions in right frontal and parietal regions, were found which were later confirmed by MRI. Patient was sent to radiation oncologist for further treatment. It was concluded that the MRI Brain and GA-68 DOTATATE PET/CT before each cycle is mandatory, especially in poorly differentiated NET.

Conclusion: Fresh tumors markers and rescanning of SRRT avid receptors should be done. In our clinical setup due to financial constraints and long waiting ques of imaging modalities like PET/CT, SPECT/CT and MRI worsen the outcome of PRRT therapy. Up till now we have done a PRRT of more than 70 patients and found that this treatment is not an optimal treatment modality for poorly differentiated NET patients. Further studies are needed to validate its efficacy in this clinical scenario.

Novelty: Timely management with relevant imaging modalities of poorly differentiated NET with metastasis under going LU-177 therapy

Correlation of uptake of FDG in PET/CT in thyroid carcinomas with serum Thyroglobulin levels in iodine refractory patients: Our experience in AECH-NORI, Islamabad

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ABSTRACT

Background: Thyroid carcinomas are typically monitored using serum thyroglobulin (Tg) and iodine-131 whole-body scans. However, in iodine refractory patients (including but not limited to TENIS), FDG PET/CT is advised. Some of the patients present with increased Tg levels and negative iodine imaging indicating residual or recurrent structural disease depending on degree of de-differentiation. In literature FDG uptake in such scenarios has been described as inversely proportional to iodine avidity but not with Tg levels. In this regard, the role of FDG PET/CT remains of clinical interest and gives wide range of findings which can be used for prognostication and further therapy selection.

Objective: To analyze correlation between FDG uptake in lesions and serum Tg levels

Methods: Patients with histologically confirmed thyroid carcinomas with standard indication for FDG PET/CT were included. Standardized uptake values (SUV) of FDG in lesions were calculated and correlation with Tg levels was done.

Results: FDG PET/CT identified metabolically active lesions in patients despite serum Tg levels which could be low, normal or elevated and iodine scan findings were also documented. These findings suggest that FDG PET/CT can uncover disease not predicted by Tg levels alone. Further details will be shared in the upcoming PSNM conference.

Conclusions: FDG PET/CT demonstrates diagnostic and prognostic value in Thyroid carcinoma patients with iodine refractory disease independent of serum Tg levels and iodine-131 scans. The presence of FDG-avid disease in such patients indicates that FDG uptake reflects tumor aggressiveness independent of Tg secretion, supporting its use as a complementary imaging modality for risk stratification and treatment planning.

Novelty: To analyze correlation between FDG uptake in lesions and serum Tg levels

Advanced imaging in pyrexia of unknown origin: role of FDG PET/CT in identifying the underlying causes

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ABSTRACT

Background: Our study explores the role of F18 Flourodeoxyglucose Positron Emission Tomography/Computed Tomography (FDG PET/CT) in the management of patients with pyrexia of unknown origin (PUO) at a tertiary care cancer hospital in Pakistan.

Method: Retrospective study with 85 patients who underwent FDG PET/CT from January 2009 to October 2024. Patient with undiagnosed fever for at least 3 weeks were included in the study and clinical data was instituted through the Hospital based integrated information system. Findings of FDG PET/CT were compared with the clinical information, pathological and imaging work-up.

Results: PET scans of 30 female and 55 male patients were reviewed, and positive findings were seen in the 66 (77.6%). Out of these positive scans, infection was the underlying pathology in 36.3% cases, malignancy in 36.3% and inflammation in 27.3%. The rest of the scans were unremarkable. Infectious aetiology seen in 24 cases; granulomatous disease being the frequent - in nine, and one each with E. Coli bacteraemia, pseudomonas infection in transplant kidney, Brucellosis, fungal infection and Covid. Rest of the patients had non-specific infection related findings. The malignant category seen in 24 cases; out of which 16 cases were confirmed on histopathology, these included Lymphoma in nine, and one each of renal cell cancer, multiple myeloma, oncocytic thyroid cancer, adenocarcinoma liver, metastatic hepatic cancer, acute myeloid leukemia and reactive lymphoid hyperplasia while 8 were not confirmed. Rests of the cases were suspected to be due to malignant etiology. Inflammatory causes seen in 18 cases which included colitis in six, followed by joint diseases in two, and one each of autoimmune hepatitis, histiocytic granuloma, splenic abscess, lymphangioma, bowel ischemia, ARDS, Esophagitis/gastritis, sinusitis, thyroiditis and nonspecific inflammation. Out of 19 negative scans, five scans helped ruled out malignancy, two ruled out infection and one excluded vasculitis. PET/CT scan findings were consolidated by further workup including pathological and anatomical in 53% cases, rest of the cases did not have further confirmation after the scan.

Novelty: In our population FDG PET/CT played a pivotal role in identifying the cause of pyrexia of unknown origin in a large percentage of patients. Opting for FDG PET/CT during the initial course of disease can direct focused approach towards management and further workup, saving resources.

Thyroid gland incidentalomas on FDG PET/CT; Uncovering distinct patterns in various malignancies

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ABSTRACT

Objective: FDG PET/CT is a useful tool in staging, re-staging & response assessment of various malignancies. Characterization of different lesions using PET/CT involves fusion of low dose CT with PET which is a reflection of increased metabolic activity. Thyroid disorders are quite common and are concomitantly seen in various malignancies primarily due to hormonal or glandular architectural changes; later being more common post radiotherapy, a mainstay of oncological management. We aimed to see morphological as well as metabolic patterns of thyroid gland and establish its association with different cancers.

Method: Retrospective analysis of 294 FDG PET/CTs of biopsy proven breast, gynecological, esophageal, lymphoma, lung & nasopharyngeal cancers acquired between January 2023 to August 2023. Age, gender, chemoradiation and hormone receptor history was noted where relevant. CT and PET/CT lesions were analyzed and on the basis of this PET avid incidentalomas and their possible correlations were analyzed.

Results: Mean age 46y; 188 females, 105 males. Overall n=65 (22%) had thyroid lesions with FDG avidity in 45%. Breast cancer; 14% had PET avid lesions, of which 71% had prior radiation & all had positive hormone receptors. Gynecological malignancies; PET avid lesions in 11% (n=5) of which 80% had CT correlate. PET non-avid lesions in 13%. Esophageal cancer; diffuse uptake in 5% (n=1 post radiation; female) & non avid CT lesion in 12% (all received radiation). Lymphoma; 12% had uptake in thyroid gland of which 57% had radiation. 86% were females. Lung cancer; 2 (3%) had PET avid disease, both females, one with metastatic lesion on FNAC. CT only lesions in 24%. Nasopharyngeal cancers; 26% had PET avid lesions, all had radiation. 5% had CT only lesion with prior radiation.

Novelty: Metabolic activity in thyroid incidentalomas shows a notable trend: it's more common among women and those with a history of radiation exposure. This pattern underscores the importance of a thorough follow-up particularly in this subset of patients, starting with an ultrasound and thyroid function tests & where indicated, fine needle aspiration cytology to ensure precise diagnosis

Whole body scan and SPECT/CT imaging in hyperparathyroidism: A diagnostic approach

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ABSTRACT

Objective: Excessive PTH production by parathyroid gland is the most common cause of hyperparathyroidism known as primary hyperparathyroidism. The etiology of primary hyperthyroidism is the solitary functioning adenoma (90%). Accurate localization aids the surgeons for successful surgical resection and better outcomes. Studies have shown that 99mTc-sestamibi is imaging of choice for diagnosis of adenomas combined with whole body planar images and SPECT/CT also help in identification of ectopic parathyroid gland with a diagnostic accuracy of 90% for primary hyperparathyroidism. Further the addition of whole body scan increases the likelihood of brown tumor detection in Parathyroid scan.

Method: A retrospective analysis was conducted on parathyroid sestamibi scans performed for various indications during a period of January 2020 to August 2025. Patients scan was reviewed in Hospital Information system. Patient with the diagnosed thyroid disease were excluded from study. The standard protocol for the scan involve initial planar whole body scan acquired 20mins after intravenous administration of 800MBq Tcm99-Sestamibi followed by SPECT/CT at 1hour. Serial imaging carried out till 4hours to wait for the washout from the thyroid gland.

Result: A total of 144 patients were evaluated for parathyroid pathology. Among these 47 (32.6%) subjects were males and 97 patients (67.4%) female. Average age of population was 50 year. 79 patients (54.9%) were confirmed to have scintigraphic evidence of hyper functioning parathyroid. Out of the total cohort, 15 patients (10.8%) were diagnosed with Brown tumors, a skeletal manifestation of hyperparathyroidism. This comprises 18.9% of those who had positive parathyroid stamina scan. The PTH levels were above 300 in these subjects, suggestive of elevated PTH linked to metabolic bone disease. Ectopic parathyroid tissue located in the mediastinum was identified in 6 patients (4.2%). These cases were detected using SPECT/CT imaging, highlighting the utility of functional imaging in localizing ectopic glands. Intrathyroidal parathyroid glands were identified in 2 patients (1.4%). These cases represent a diagnostic challenge due to the unusual location and potential overlap with thyroid nodules.

Conclusion: Parathyroid sestamibi scan play an important role in localization of parathyroid adenoma and also aid in detection of unsuspected brown's tumor with addition of whole body scan.

Novelty: The parathyroid sestamibi scan not only aid in localization of parathyroid adenoma but also identifies those with brown tumor based on whole body scan skeletal uptake. This signifies the importance of parathyroid scan for functional and anatomical localization as well as skeletal changes resulting from elevated PTH

Discrepancy in lesion detection by PET-CT and radioiodine whole body scan in patient with metastatic follicular carcinoma of thyroid

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ABSTRACT

Introduction: Patient of 65 years has metastatic follicular carcinoma of thyroid. She had multiple surgeries for excision of metastatic foci and removal of thyroid. She has been given multiple doses of Radioiodine for therapy.

Methodology: She responded both clinically and reduction in size and number of metastatic lesions. However, her thyroglobulin level although reduces with the radioiodine therapy but was still remained relatively increased indicating active metastatic lesion. Patients again developed backache and MRI done which shows lesion at L5 and soft tissue mass compressing T11/T12 level. She underwent PETCT which revealed mild FDG avid lesion at T12 and L1 level.

Results: Radioiodine whole body scan showed multiple lesions not only in T12/L1 region but also in L5, iliac bone, chest and thyroid bed. The discrepancy in lesion detection is well known since FDG uptake is not appreciated in functioning metastasis from differentiated thyroid cancer. FDG avidity is increased when the lesions become more undifferentiated and do not concentrate radioiodine.

Conclusion: The case highlights the low value of FDG PET-CT in detecting radioiodine avid metastasis.

Utility of DMSA scan in detecting cortical scarring in paediatric group after recurrent UTIs

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ABSTRACT

Background: Urinary tract infection (UTI) is one of the most prevalent bacterial infections in children and, it can lead to permanent renal parenchymal damage in the form of cortical scarring if not detected early and treated properly. Due to the risk of long-term complications such as hypertension, proteinuria, and chronic kidney disease, renal scarring has a clinical significance therefore it is essential to detect scarring for risk stratification and appropriate follow-up. Among imaging modalities, ^{99m}Tc-dimercaptosuccinic acid (DMSA) scintigraphy is considered the gold standard for detecting acute pyelonephritis and chronic scarring. It provides high sensitivity and specificity in identifying focal cortical defects and assesses the differential renal function. In contrast, renal ultrasonography (US) is used as a first-line imaging tool because it is non-invasive, free of radiations and easily available.

Objective: To evaluate the diagnostic performance of ^{99m}Tc-DMSA for detecting renal cortical scarring in children ≥ 6 months after febrile UTI

Method: This retrospective study included pediatric patients (age range: 6 months–12 years) with a history of recurrent or febrile UTI. All patients underwent ^{99m}Tc-DMSA cortical scintigraphy 6 months after the acute infection phase.

Results: Scans were analyzed for cortical defects, differential renal function (DRF), and evidence of scarring. Findings were compared with ultrasonography and clinical outcomes.

Dual-tracer PET/CT in WHO grade III anaplastic meningioma: Correlation of FDG and Ga-68 uptake with histopathology

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ABSTRACT

Background: Parasagittal parietal lesions present a diagnostic challenge due to overlapping radiological features among dural-based and cortical pathologies. Integration of anatomical and functional imaging can aid in refining the differential diagnosis.

Case Presentation: We report the case of a 19 year old patient presenting with persistent headache. Contrast-enhanced magnetic resonance imaging (CE-MRI) revealed a heterogeneously enhancing parasagittal parietal lesion with associated mass effect. FDG PET/CT demonstrated marked metabolic uptake, while Gallium-68 PET/CT revealed concordant uptake, suggesting somatostatin receptor expression. The differential diagnosis included hemangiopericytoma, meningioma, parafalcine oligodendroglioma, cortical glioma, and dural metastases.

Conclusion: This case emphasizes the importance of a multimodality approach, combining MRI with both FDG and Ga-68 PET/CT, in characterizing complex intracranial lesions and narrowing the differential diagnosis prior to histopathological confirmation.

Novelty: Dual-tracer approach. FDG uptake reflects metabolic aggressiveness, while Ga-68 uptake reflects receptor density and therapeutic potential. In our case, concordant FDG and Ga-68 uptake suggested high-grade biology, later confirmed histopathologically. This dual-tracer correlation is rarely reported in anaplastic meningiomas and may represent an imaging biomarker for disease stratification. Our case underscores the synergistic role of dual-tracer PET/CT in both diagnosis and therapeutic planning of aggressive meningiomas.

Evaluation of CT-identified lytic and sclerotic bone metastases and their correspondence on 99mTc-MDP scintigraphy and SPECT/CT in breast cancer patients

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ABSTRACT

Background: Breast cancer remains the most frequently diagnosed malignancy among women worldwide and is a major contributor to cancer-related deaths. In advanced stages, the skeleton is the most common site of spread, with the spine, pelvis, ribs, and long bones being predominantly affected. On CT imaging, bone metastases can appear as either lytic or sclerotic, reflecting diverse pathological processes. Lytic lesions often indicate aggressive or progressive disease, whereas sclerotic lesions may correspond to indolent or previously treated disease. Although CT demonstrates detailed anatomical information, it lacks the ability to reliably assess lesion activity. Nuclear Medicine techniques such as 99mTc-MDP bone scintigraphy and hybrid SPECT/CT provide crucial functional data, aiding in the distinction between active and inactive disease.

Objective: To investigate the relationship between CT-detected lytic and sclerotic bone lesions and their corresponding uptake on 99mTc-MDP bone scintigraphy and SPECT/CT in patients with breast cancer.

Methods: Breast cancer patients referred for bone scintigraphy with hybrid SPECT/CT were retrospectively reviewed. CT-detected lytic and sclerotic lesions were analyzed for tracer uptake. Findings were classified as:

Concordant: CT-positive with corresponding tracer uptake

Discordant: CT-positive without tracer uptake

Patterns of uptake were compared between the two lesion types.

Correlation with clinical and biochemical follow-up was also considered where available.

Results: Preliminary evaluation demonstrated that most lytic lesions exhibited corresponding tracer uptake, suggestive of active disease. In contrast, a considerable proportion of sclerotic lesions revealed minimal or absent uptake, indicating inactive or treated metastases. A small number of lesions identified on CT but lacking uptake highlighted the importance of functional-anatomical correlation.

Conclusion: While CT is essential for anatomical localization of osseous metastases, it does not reliably determine disease activity. The addition of 99mTc-MDP bone scintigraphy and SPECT/CT improves diagnostic precision by characterizing lesion viability. This combined approach enhances staging, optimizes treatment planning, and ultimately contributes to improved management of breast cancer patients.

Diagnostic accuracy of SPECT-CT in sentinel lymphoscintigraphy for breast cancer patients

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ABSTRACT

Background: Sentinel lymph node (SLN) detection is crucial in the staging and management of breast cancer. While planar lymphoscintigraphy is widely used, hybrid SPECT-CT imaging may improve localization and detection rates.

Objective: To evaluate the diagnostic accuracy of SPECT-CT compared with planar lymphoscintigraphy in identifying sentinel lymph nodes in breast cancer patients.

Methods: This cross-sectional study was conducted at the Department of Nuclear Medicine, KIRAN Hospital, including 41 biopsy-proven breast cancer patients undergoing SLN mapping. All patients received periareolar injections of Tc-99m nanocolloid followed by planar imaging and subsequent SPECT-CT. The findings of both modalities were compared.

Results: Out of 41 patients, 32 (78%) were positive for SLNs on both planar and SPECT-CT imaging. Six patients (15%) were negative on planar but positive on SPECT-CT, while 3 patients (7%) were negative on both modalities. No patient was positive on planar but negative on SPECT-CT. SPECT-CT thus demonstrated superior detection capability, particularly in cases missed by planar imaging.

Conclusion: SPECT-CT provides added diagnostic value in sentinel lymph node detection compared to planar imaging alone, reducing false negatives and enhancing surgical planning in breast cancer patients.

Keywords: Breast cancer, Sentinel lymph node, Planar imaging, SPECT-CT, Diagnostic Accuracy.

Role of F-18 FDG PET/CT in treatment response assessment of lymphoma using Deauville criteria

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ABSTRACT

Background: Accurate response assessment in lymphoma is essential for guiding therapy and predicting outcomes. FDG PET/CT with the Deauville 5-point scale (5PS) provides a standardized and reproducible method for evaluating metabolic response and is the internationally accepted reference for both Hodgkin lymphoma (HL) and selected non-Hodgkin lymphomas (NHL).

Objective: To evaluate the role of FDG PET/CT in treatment response assessment of lymphoma patients using Deauville criteria at AECH-NORI, a tertiary care hospital.

Methods: We retrospectively reviewed [X] patients with histologically confirmed HL or NHL who underwent baseline and interim (after 2 cycles in HL, 2–4 cycles in NHL) and/or end-of-treatment (6–8 weeks post-chemotherapy) FDG PET/CT between [2022-2025]. Deauville scores were assigned for interim and end-of-treatment scans. Complete response (CR) was defined as scores 1–3, while scores 4–5 indicated partial, stable, or progressive disease depending on uptake trends and new lesions. PET/CT findings were correlated with clinical follow-up.

Results: A total of [X] patients (mean age XX years; M:F = X:Y) were included. Interim PET/CT demonstrated CR in [X%], PR/SD in [X%], and PD in [X%]. End-of-treatment PET/CT showed CR in [X%]. Patients with interim Deauville 1–3 had significantly higher rates of sustained remission, while those with Deauville 4–5 had increased relapse and progression ($p < 0.05$). PET/CT findings influenced treatment modification in selected cases.

Conclusion: F-18 FDG PET/CT using Deauville criteria is a reliable tool for assessing treatment response in lymphoma. Interim PET strongly predicts end-of-treatment and clinical outcomes, supporting its role in risk-adapted and individualized management strategies

Novelty: One of the few studies from Pakistan/South Asia to systematically apply Deauville scoring for both HL and NHL across baseline and follow-up PET. Reliable response assessment prevents both overtreatment and undertreatment.

Evaluating treatment response in breast cancer: a case report on static metastatic disease on bone scans

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ABSTRACT

Introduction: A 54-year-old woman with persistent backache was referred for further evaluation by a Tc99m MDP bone scan. Tc99mMDP bone scan showed wide-spread skeletal metastatic disease. Magnetic resonance imaging (MRI) showed extensive marrow disease involving the spine and iliac bones.

Methodology: A bone marrow biopsy revealed metastatic carcinoma with a tumor phenotype favoring breast primary. On further workup, the patient was diagnosed with invasive ductal carcinoma of the left breast and was treated with cyclin- dependent kinase 4 and 6 inhibitors along with hormone therapy and bisphosphonates, followed by radiation therapy for bone metastasis.

Results: The skeletal metastatic disease remains static on three consecutive Tc99m MDP bone scans, despite the clinical improvement and decreased tumor marker levels. The F-18- FDG-PET-CT scan done for monitoring treatment response revealed multiple non-avid sclerotic osseous lesions, favoring treatment response. The patient was continued with the same treatment, and a follow- up Tc99m MDP bone scan after 6 months revealed no interval change in the reported lesions compared to the initial scan. However, a synergistically performed F-18 FDG PET-CT scan again showed multiple non-avid sclerotic osseous lesions suggestive of treated metastasis.

Conclusion: This case highlights the importance of 18-F-FDG PET-CT in evaluating the treatment response, especially in patients with symptomatic improvement and falling tumor marker levels but with static disease on repeated Tc99m MDP bone scans.

TARE; Noval technique in irresectable HCC and hepatic metastases-institutional experience

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Introduction: Primary liver cancer (HCC) and liver metastases from colorectal cancer are frequently occurring tumors worldwide. 10-20% of such patients can be treated with curative intent. Radioembolization with Y-90 is a minimally invasive technique to treat liver cancer by injecting tiny radioactive particles directly into the hepatic artery. The techniques are alternative for inoperable tumors and shrink tumors for other treatments like liver transplant. Pre-treatment intra-arterial 99mTc- labeled albumin macroaggregated albumin (99mTc-MAA) scintigraphy is mandatory to quantify potential liverlung shunting and to exclude reflux to bowel, stomach or pancreas.

Objective: To evaluate the adequacy of the Y-90 therapy procedure and to see the response of therapy.

Methods: After initial assessment of patients and discussion in multidisciplinary team meeting (MDT), reviewing all factors like diagnosis, imaging findings, laboratory results, calculation of liver volume, percentage of lung shunting, patients are booked for the procedure.

Results: So far, we have treated five patients with Y-90 (Thera sphere). 04 patients were male and only one was female. The mean age of the patients was 61.8 years. All patients underwent a pretherapy 99mTc-MAA shunting scan. No significant post therapy complications were seen, and all patients followed up with a CT triphasic scan that showed good treatment response.

Conclusion: TARE provides significantly longer progression free survival than TACE although these two treatments do not significantly differ in terms of overall survival. TARE generally has a better side effects profile than TACE. Adequate response evaluation can be achieved with larger patient volume and longer period of follow up.

Correlation of SUV based parameters of F-18 FDG PET/CT with tumor grading and recurrence in sarcoma patients

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ABSTRACT

Background: For bone and soft tissue sarcomas, Positron Emission Tomography (PET) is useful in the evaluation of the primary lesion, staging of the disease, monitoring therapy and detection of recurrence and provides prognostic information.

Aims: This study evaluates the diagnostic accuracy of SUV-based parameters derived from F-18 FDG PET in order to optimize non-invasive prediction of bone and soft tissue sarcomas. Additional objective was to assess the effectiveness of 18F FDG PET/CT in staging patients at primary diagnosis and at recurrence.

Materials and Method: Forty patients of biopsy proven bone and soft tissue sarcoma (sarcoma group) were included in the study. Total lesions (both primary lesions as well as metastatic) in forty patients were ninety nine SUVmax, SUVmean, SUVmax/liver and SUVmean/liver were noted and correlated with 2 tier FNCLCC grading of the tumor i.e. either low grade or high grade. A threshold value of each of these parameters was selected using Youden index and sensitivity, specificity and statistical significance of each of them was determined using AUC-ROC.

Results: SUVmax of 3.7 predicted tumor grade with 66% sensitivity and 79% specificity. SUVmean of 2.1 predicted tumor grade with 73% sensitivity and 65% specificity. The highest sensitivity and specificity of 72% and 79% was achieved at an optimal threshold SUVmax/liver of 2.2. SUVmean/liver predicted tumor grade with 71% sensitivity and 79% specificity at an optimal threshold value of 1.6. F-18 FDG.

Conclusion: SUVmax/liver and SUVmean/liver ratios predict tumor grade with higher accuracy than absolute standardized uptake values.

Diagnostic accuracy of Cadmium Zinc Tellurite (CZT) detector based dynamic Single Photon Emission computed tomography (D-SPECT) myocardial perfusion imaging (MPI) in evaluation of coronary artery disease (CAD)

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ABSTRACT

Objective: To assess the diagnostic accuracy of CZT detector-based dynamic SPECT MPI for detecting coronary artery disease (CAD), using coronary angiography as the reference standard.

Study Design: Diagnostic accuracy study

Place & Duration: Department of Nuclear Cardiology, AFIC/NIHD Rawalpindi, from January to June 2024.

Methodology: A total of 198 patients, who underwent coronary angiography within three months of a D-SPECT MPI, were included. Dynamic SPECT MPI was performed using a CZT detector-based camera following 99mTc-Sestamibi injection during rest and stress phases. Stress imaging incorporated adenosine infusion. Myocardial blood flow (MBF) and myocardial flow reserve (MFR) values were calculated. An MFR value <2 indicated CAD. Coronary angiography, interpreted by two cardiologists

Results: Of 198 patients, 167 (84.3%) were males and 31 (15.7%) were females with a mean age of 56.03 ± 11.83 years. D-SPECT MPI diagnosed CAD in 70 (35.4%) patients, while the actual number of patients having CAD as diagnosed by coronary angiography was 74 (37.4%). The calculated sensitivity, specificity, PPV, NPV, and diagnostic accuracy of D-SPECT MPI, keeping coronary angiography as the gold standard, were 87.8%, 95.9%, 92.8%, 92.9%, and 92.9%, respectively.

Conclusion: This single-center study demonstrates that CZT-based dynamic SPECT MPI offers shorter imaging time, less radiation exposure, and cost-effectiveness, making it a valuable non-invasive diagnostic modality. The system's enhanced resolution and faster imaging acquisition contribute to its clinical utility.

Novelty: Despite advancements in cardiac imaging there is lack of comprehensive data addressing clinical utility of CZT detector based dynamic SPECT MPI in detecting CAD. This highlights the potential need for focused research to evaluate the potential technical advancements offered by this specific imaging technique. This study aims to assess whether Cadmium Zinc Telluride (CZT) detector based dynamic SPECT MPI can reliably and more efficiently detect coronary artery disease and help in high-risk patients' stratification, thereby improving diagnostic accuracy, patient care and clinical outcomes.

Focal, intense 18-F FDG uptake in lungs without structural pathology- An interpretation dilemma

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ABSTRACT

Background: Positron Emission Tomography/Computed Tomography (PET/CT) fusion imaging is a helpful technology that allows the correlation of findings from two imaging modalities. FDG-PET CT is mainly used in oncology for staging and therapy monitoring. Focal FDG uptake can be seen in benign as well as malignant conditions but a experienced nuclear physician mostly manages to differentiate malignant from non-malignant FDG uptake based on accurate interpretation of the PET data by correlating with the CT anatomic information to avoid false positive interpretation of an artifact, which may at times be misinterpreted as a pathology.

Objective: To evaluate focal, intense FDG uptake in lungs in F-18FDG PET CT imaging without any correlative CT pathology.

Materials and Methods: Total 2250 oncology patients underwent F-18 FDG PET CT from August 24 to June 25. Out of this PET/CT study, 07 patients revealed intense 18F-FDG focus in either lung without any perceptible corresponding CT lesion. A provisional diagnosis of an iatrogenic FDG microembolus was made and the patients were managed conservatively.

Results: All of these 07 patients underwent follow-up PET/CT after few months and complete resolution of abnormal FDG uptake on PET imaging was noted and it confirmed its benign etiology. An intense FDG focus is not entirely specific for malignancy. In general, CT is more sensitive than FDG-PET in the detection of pulmonary lesions. Therefore the absence of structural lesions on CT alarms the possibility that the focal FDG-PET intensity is not always related to pathology. In our study the 18F-FDG accumulation was assessed as an iatrogenic pulmonary microembolism

Conclusion: An intense 18 F-FDG-PET pulmonary abnormality without detectable lesion on the correlative CT study is highly suggestive of artifacts caused by FDG microembolus.

Novelty: This study emphasizes the importance of becoming familiar with the potential pitfalls of false-positive interpretations of PET.

Diagnostic accuracy of ^{99m}Tc -Methylene Diphosphonate (MDP) bone scintigraphy in detecting skeletal metastases in prostate cancer patients using ^{99m}Tc -PSMA scans as reference standard

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ABSTRACT

Background: Prostate cancer is the second most commonly diagnosed cancer and a leading cause of cancer-related deaths among men globally. Skeletal metastases are a major complication, significantly impacting morbidity and mortality. Accurate early detection is critical. While ^{99m}Tc -MDP bone scintigraphy is widely used due to its sensitivity and cost-effectiveness, it lacks specificity. ^{99m}Tc -PSMA imaging has emerged as a more accurate modality. This study evaluates the diagnostic accuracy of ^{99m}Tc -MDP bone scans using ^{99m}Tc -PSMA as the reference standard.

Objective: To determine the diagnostic accuracy of ^{99m}Tc -MDP bone scintigraphy in detecting skeletal metastases in prostate cancer patients, using ^{99m}Tc -PSMA imaging as the gold standard.

Methods: A cross-sectional study was conducted at the Nuclear Medicine Department, KIRAN Hospital, Karachi, over six months. A total of 120 male patients aged 50–80 years with histologically confirmed prostate cancer and suspected skeletal metastases were included. All patients underwent both ^{99m}Tc -MDP and ^{99m}Tc -PSMA scans. Diagnostic accuracy metrics including sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated using ^{99m}Tc -PSMA results as the reference.

Results: Based on prior evidence, ^{99m}Tc -MDP bone scintigraphy demonstrates sensitivity of approximately 72% and specificity of nearly 81% for detecting skeletal metastases. In this study, interim analysis suggests similar trends, with higher detection rates in patients presenting with elevated PSA and higher Gleason scores. Stratification by BMI indicates minimal impact on diagnostic performance, though final validation is ongoing.

Conclusion: The findings reinforce the utility of ^{99m}Tc -MDP bone scintigraphy as a sensitive but moderately specific tool in identifying skeletal metastases among prostate cancer patients. While ^{99m}Tc -PSMA imaging remains superior, MDP scintigraphy retains clinical value, particularly where PSMA availability is limited. These results may aid in developing tailored imaging algorithms to improve staging accuracy and patient management in diverse healthcare settings.

Novelty: This study addresses a critical gap in prostate cancer imaging by evaluating the diagnostic performance of ^{99m}Tc -MDP bone scintigraphy against ^{99m}Tc -PSMA scans, the emerging gold standard. Since MDP scintigraphy remains widely available, affordable, and commonly used in resource-limited settings, validating its accuracy in comparison to PSMA is essential. The findings will help optimize imaging choices, guide clinicians in staging and management, and ultimately improve patient outcomes while ensuring cost-effective care delivery.

Ectopic thyroid tissue in the superior mediastinum: A rare presentation

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ABSTRACT

Background: Ectopic thyroid tissue can occur anywhere along its embryological descent, most commonly at the tongue base and neck. While superior mediastinal occurrence is extremely rare such cases are usually asymptomatic and detected incidentally. Differentiating mediastinal ectopic thyroid from substernal, lymph nodes, or metastasis can be challenging with ultrasound, Computed Tomography or Magnetic Resonance Imaging alone. Thyroid scintigraphy provides valuable functional information for accurate diagnosis and management.

Case Presentations: In our 1st case a 24-years old female presented with complaint of swelling in the neck region. Thyroid function tests revealed her to be euthyroid. A thyroid scan with pertechnetate injection was performed which showed foci of abnormal increased uptake inferior to the normal thyroid gland, corresponding to soft tissue nodules in the superior mediastinum on correlative SPECT/CT. In our second case a 32-years old female presented with complaint of neck swelling. She was biochemically euthyroid. A focus of abnormal increased uptake was noted inferior to the thyroid gland on thyroid scan. Correlative SPECT/CT revealed the abnormal uptake to be a soft tissue nodule in the superior mediastinum; suggestive of ectopic thyroid tissue.

Conclusion: Ectopic thyroid tissue in the superior mediastinum, in the presence of a normally located thyroid gland and normal thyroid function tests is a very rare finding. The combined use of thyroid scintigraphy and SPECT/CT in such cases allows precise anatomical and functional characterization of the tissue, thereby guiding appropriate management and potentially avoiding unnecessary invasive procedures.

Added value of Gallium Dotatate PET/CT over conventional CT scan for neuroendocrine tumors

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ABSTRACT

Purpose: Neuroendocrine tumors are diverse group of neoplasms 25 percent of which are metastatic at diagnosis. NE cells are widely distributed in the body but gastrointestinal tract and lungs are the most common sites. Primarily staged on basis of MRI and CT. However, conventional imaging often cannot distinguish NENs from other differentials. 68Ga-DOTATATE PET/CT is the recommended functional imaging modality of choice in patients with NETs. The objective of the study aims to compare the value of DOTA PET CT over conventional CT scan for evaluation of neuroendocrine tumors.

Materials and Methods: 60 patients biopsy proven neuroendocrine tumors were retrospectively evaluated using HIS from January 2023 to March 2025. No treatment was taken between PET and CT scan. Out of the 60 patients 30 were females and 30 males. Age range 2-70 years.

Results: Classification based on primary tumor site; Gastric 10%, Small Bowel 17%, Liver 12%, Lung and bronchus 25%, Large bowel 10%, with other tumors being less than 10%. Histopathological grade; 1(72%), 2(22%), 3(2%) and 4% grade not available. Based on DOTA PET scan staging was changed in 7(12%) and in 2(3%) additional findings picked unrelated to tumor. Stage changed based metastasis in bones 3(5%), liver 3(5%) and 1(2%) both liver and bones. On follow up of thyroid uptake 1(2%) labelled as MEN syndrome, 1(2%) as subclinical hypothyroidism. Based on upstaging by DOTA PET scan 4(7%) switched to systemic therapy, 1(2%) kept on surveillance, 1(2%) received targeted radiotherapy and in 1(2%) surgery proceeded as solitary metastatic lesion.

Conclusion: In our cohort we established that DOTA PET scan has provided added role in staging and management of neuroendocrine tumors and changing stage and management. Moreover DOTA scan has also some role in detecting thyroid abnormalities.

Novelty It establishes how DOTATATE PET CT can help in upstaging patients of neuroendocrine tumors and thus alter their management. Additionally, it may help detect incidental findings like thyroid uptake which may lead towards detection of underlying thyroid diseases.

Tc99m Pertechnetate Meckel's scans from 2014 to 2025: A retrospective review of patients presenting in CENUM

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CENUM

ABSTRACT

Background: Meckel's scan is used worldwide for the detection of ectopic gastric mucosa related to Meckel's diverticulum. The main clinical indication includes unexplained gastrointestinal bleeding, especially in the pediatric population. However, its diagnostic accuracy mainly depends upon the patient preparation and scan protocols.

Objective: To review the clinical presentations and scan results of patients who underwent Tc-99m Meckel's scan at CENUM Lahore from January 2014 to August 2025.

Methods: This retrospective study analyzed data from all the patients who underwent Meckel's scans between January 2014 to August 2025 at CENUM. The scan was done with Tc-99m Pertechnetate. Dose in children was 0.05 mCi/kg (1.85 MBq/kg) and 5-10 mCi/kg (185-370 MBq/kg) in adults. Patient was placed supine under the camera with xiphoid to symphysis pubis in field of view. Patient demographic data, presenting complaints and interpretation of scan reports were reviewed. The rate of positive Vs negative scan findings was calculated, and clinical patterns were analyzed in relation to scan outcomes.

Results: A total number of 188 patients were included in the study, with 67 (35.64%) females and 121 (64.36%) males. The male: females ratio was 1.81:1. The patients range from 1-48 years with average age 11.63 +/- 6.05 years. Pediatric group (age < 18 years) included 164 patients (87.23%) while 24 patients (12.77%) were adults. Majority of the patients presented with complaints such as bleeding per rectum and abdominal pain. Tc-99m Meckel's scans were negative in 187 (99.47%) of the cases with 01 (0.53%) positive scans confirmed (5 years old male with pain abdomen and bleeding per rectum).

Conclusion: The extremely low positive rate of Tc-99m Meckel's scan in our study population may be due to inadequate patient preparation.

NOTE: In addition to developing stricter clinical guidelines, better patient preparation (like administer cimetidine/glucagon or penta gastrin prior to the scan, fasting 4-6 hours before the study, void before, during and after the study, avoid colonoscopy or laxatives prior to the study, avoid ethosuximide, no pre-treatment with potassium perchlorate) and making a more selective referral criterion, there is a need for additional imaging modalities like SPECT-CT or GI Bleed Study in case of strong clinical suspicion.

Novelty: The extremely low positive rate of Tc-99m Meckel's scan in our study population may be due to inadequate patient preparation.

Breaking ground in sarcoma imaging: The rise of FDG PET CT as a paradigm shift

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ABSTRACT

Purpose: Sarcoma is a relatively rare malignancy. Management is complex, and disease extent is the key factor in guiding appropriate therapy planning. Initial workup and follow up surveillance depends on type and suspected metastatic sites. NCCN guidelines recommend PET or CT for regional nodal metastases in a few types. FDG PET-CT is a non-invasive imaging modality based on glucose metabolism. Increased glucose metabolism shows correlation with high grade nature and poor survival in STSs. This study evaluates the role of PET-CT in staging/restaging of sarcomas and to find association of SUV with survival.

Materials and Methods: Retrospective analysis of 197 PETs of 145 patients acquired between February 2022 to December 2024. Histopathology, metastatic sites, SUVmax and last followup was evaluated. SPSS was used for data analysis and SUVmax of primary site at staging was compared with survival.

Results: Ewing sarcoma was most common followed by osteosarcoma and leiomyosarcoma. Age range 5- 75 years. 52% males, 48% females. 62 were staging of which 25 were post-surgery of primary tumor; 135 were restaging. Primary sites: abdomen/pelvis (33.7%) and lower limb (28.9%). PET-CT confirmed primary disease and residual/recurrent disease in 40.6% with SUVmax range 6.7-21. Mild uptake at primary site in 6.1% patients. No uptake in 53.3%. Metastases detected: nodal (30.5%), lung (22.9%), osseous/marrow (15.2%), other visceral (23.8%). PET-CT changed management in 15.2% and guided treatment/surveillance in others. Kaplan–Meier analysis showed significantly poorer survival in patients with SUV >10 at the primary site at staging compared to SUV ≤10 (log-rank $\chi^2=4.38$, $p=0.036$).

Conclusion: PET-CT plays a vital role in staging and restaging sarcomas, with significant impact on detecting primary and metastatic disease and altering management. High primary tumor SUV (>10) is associated with poorer survival, highlighting its prognostic value.

Novelty: This study is trying to evaluate the role of FDG PET-CT in all types of sarcomas.

The significance of patient preparedness in focused common bile duct ultrasonography for the diagnosis of choledocholithiasis

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ABSTRACT

Introduction: Choledocholithiasis, the presence of gallstones in the common bile duct, poses a diagnostic challenge due to its varied presentation. Focused common bile duct ultrasonography (FCBDUS) has emerged as a promising diagnostic tool. However, the significance of patient preparedness in fcbdus remains underexplored.

Objective: This research aims to elucidate the impact of patient preparedness (2-4 hours fasting and drinking atleast 2 glass of water before ultrasonography) on the accuracy and efficacy of FCBDUS in diagnosing choledocholithiasis.

Design: It is a cross sectional prospective study carried out in the radiology department of CMH Peshawar for a span of five months from January 2024 – May 2024. Setting: Radiology department of CMH Peshawar.

Study duration: 1st January 2024- 15th May 2024.

Methodology: In this study, a total of 100 patients with suspected choledocholithiasis were selected using non-probability purposive sampling. Out of 100 patients 50 were prepared before FCBDUS and 50 patients were scanned unprepared. Each patient underwent a thorough evaluation, including a medical history review and physical examination. Following this, ultrasounds were performed on each patient in both the supine and right semi-prone positions in both groups of prepared and unprepared patients. An experienced radiologist, with five years of post- specialization experience, assessed the quality of bile duct stone visualization.

Results: The visualization quality of bile duct stones was significantly higher in the right semi-prone position with well-prepared patients as compared to the supine position and unprepared patients before FCBD ultrasound.

Conclusion: In conclusion, our study demonstrates that the well-prepared patients (fasting of 2-4 hours and good hydration before scan) and in right semi-prone position provides better visualization of bile duct stones compared to the unprepared patients.

Keywords: Common bile duct (cbd), ultrasound, supine, right semi-oblique position, choledocholithiasis, focused common bile duct ultrasonography, patient preparedness, fasting, hydration

Determination of mandibular condylar uptake in asymptomatic population

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ABSTRACT

Objective: To determine mandibular condylar uptake values in normal population through quantitative analysis employing Tc-99m MDP SPECT/CT.

Study design: Prospective, cross sectional study.

Place and Duration of study: Nuclear Medical Centre, Armed Forces Institute of Pathology, Rawalpindi, Pakistan from July 2022 to July 2023.

Methodology: 129 subjects from both genders aged 10 to 40 years with no known skull pathology were included in the study. Quantitative analysis of Tc-99m MDP SPECT/CT bone scan of asymptomatic population was used to calculate mandibular condyle to clivus ratio. Percentage uptake difference less than or equal to 10 % between both mandibular condyles was considered acceptable.

Result: The study cohort comprised 129 subjects ($n=129$), with 72 (55.8%) males and 57 (44.1%) females. Age ranged from 12 to 40 years (mean $\pm$ SD = 25.70 ± 8.49). The mean mandibular condyle- to-clivus ratio on the right side was 0.97 ± 0.12 and on the left was 0.98 ± 0.13 , which showed low variability (CV ~12–13%). However, the mean percentage difference in condylar uptake on both sides was 4.13 ± 2.64 , which showed very high variability (CV = 63.92%). Gender-based comparison showed a significantly higher right condyle to clivus ratio in females (1.00 ± 0.10) compared to males (0.94 ± 0.12), with p-value of 0.005 and moderate effect size (Cohen's $d = -0.33$).

Conclusion: Determination of normal mandibular condylar uptake values in our population will contribute to enhanced diagnostic accuracy in maxillofacial applications of nuclear medicine, like condylar hyperplasia or Temporomandibular joint (TMJ) abnormalities.

Key words: Computed tomography, facial asymmetry, mandibular condylar hyperplasia,

Novelty: To determine ratio in Pakistani population

Comparison of Tc99m MDP bone scan, indigenously produced Tc99m HYNIC PSMA SPECT-CT and serum prostate specific agent (PSA) in patients with carcinoma prostate

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ABSTRACT

Introduction: This research evaluated the diagnostic utility of planar [^{99m}Tc]Tc-MDP bone scintigraphy, indigenously developed [^{99m}Tc]Tc-HYNIC-PSMA SPECT/CT, serum prostate-specific antigen (PSA), and Gleason score in patients with prostate carcinoma.

Material and Methods: Planar [^{99m}Tc]Tc-MDP bone scans and [^{99m}Tc]Tc-HYNIC-PSMA SPECT/CT images were compared for skeletal lesion detection. Serum PSA values were correlated with imaging outcomes, while Gleason scores were utilized to explore the relationship between tumor grade and PSMA-avid disease burden.

Results: The number of lesions identified with [^{99m}Tc]Tc-HYNIC-PSMA was consistently higher compared to [^{99m}Tc]Tc-MDP bone scans, demonstrating greater sensitivity for detecting metastases. Rising PSA levels were generally associated with a greater lesion count, though occasional deviations were observed. Gleason score correlations were weak overall

Conclusion: [^{99m}Tc]Tc-HYNIC-PSMA demonstrated superior sensitivity to conventional bone scintigraphy for skeletal metastasis detection and showed a stronger association with PSA, highlighting its higher biological specificity. Correlation with Gleason score remained weak.

Novelty: These findings suggest that [^{99m}Tc]Tc-HYNIC-PSMA can be a valuable imaging tool, especially in resource-constrained settings where PSMA PET is not readily accessible. Moreover it can also be helpful in selecting patients for Lu-177 therapy

Dual NETs, one patient: Pheochromocytoma with renal NET revealed by RAI-MIBG and Ga-68 DOTA-TOC scan- A case report

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ABSTRACT

Introduction: Neuroendocrine tumors (NETs) arise from different anatomical locations throughout the endocrine system with diverse clinical manifestations and arise sporadically. Treatment varies due to heterogeneous clinical presentation, with surgery as first line, medical therapy, chemo-radiation therapy, and, if resistant, treated with Lu-177-based PRRT. Pheochromocytomas are rare catecholamine-secreting tumors with malignant potential that arise from chromaffin cells of the adrenal medulla, usually managed with medicine, surgery, and therapeutic RAI-131-MIBG. In our hospital's nuclear medicine scanning data registry, we found a case of a patient diagnosed with two separate NETs: a renal neuroendocrine tumor and a pheochromocytoma. A 35-year-old male, with a known right adrenal tumor, paraganglioma, had surgical excision in 2011, left pyelolithotomy in 2012, status post chemotherapy, came for RAI-131 MIBG Scan for assessment of recurrent/residual mass. His CT scan revealed a right-sided suprarenal mass. Histopathology of the CT-guided biopsy of the renal lesion was found as positive for Synaptophysin and Chromogranin. MIBG imaging was done with a diagnostic dose purchased from Polatom/Poland. Acquisition was done as per protocol after 24, 48 and 72 hours. The images showed an MIBG avid lesion in the right suprarenal region.

Methodology: Later the patient was referred in July 2025 for Ga-68 -DOTA-TOC imaging for restaging and recurrence. Current CT scan showed partly necrotic mass, pheochromocytoma in the right supra renal region, deposits in the right psoas muscle with pleural and perifissural nodules. Current medications include Anti-hypertensives only. Ga-68 DOTA-TOC scan was done with Cyclotron-produced Ga-68, synthesized with ABX-DOTA-TOC precursor. PET-CT Imaging was done as per protocol. On scan significant Ga-68-DOTA-TOC Avid large right supra-renal lesion was detected along with pelvic nodal mass and kerner's score-4.

Conclusion: It is concluded that this patient was a case of NET and got treated in 2011-12, initially with surgery and then chemotherapy. He came in 2018 for MIBG Scan for reassessment and we found a renal mass at that time therapeutic MIBG was suggested. His surgery was done, recurrence occurred. Again a patient came in 2025 for NET avid scan and found positive at the same site. Reconfirmation with MIBG scan is needed if a tumor marker is raised. Management is Suggestive with PRRT. With two tumors the survival rate is high.

Novelty: This case highlights the rare coexistence of pheochromocytoma and renal NET, and underscores the diagnostic value of dual-tracer functional imaging (RAI-MIBG and Ga-68 DOTA-TOC) in identifying synchronous NETs and differentiating them from other renal neoplasms.

Tc-99m MDP SPECT-CT bone scintigraphy in the diagnosis of unilateral condylar hyperplasia

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ABSTRACT

Introduction: Condylar hyperplasia is a pathologic overgrowth of one or both mandibular condyles that can disrupt the mandible's neck, ramus, and body.

Methodology: The aim of this study was to assess the condylar growth by 99m Tc-MDP bone scan, through quantitative analysis of planar and SPECT images. The condyle to L4 vertebra ratio on planar and condyle to clivus ratio on summed SPECT images were measured.

Results: The mean condyle to clivus ratio and condyle to L4 vertebra ratio of active condyles is higher than the control group, ($p = <0.005$). The condylar ratios in the group decreases with increasing age. No statistically significant difference was found for the amount of mandibular deviation among the active and inactive cases.

Conclusion: This study highlights the diagnostic value of Tc-99m MDP SPECT-CT bone scintigraphy for unilateral condylar hyperplasia. By introducing quantitative condyle-to-L4 vertebra and condyle-to-clivus ratios, it distinguishes active from inactive condylar growth with higher accuracy than conventional assessments. The findings demonstrate that these ratios decline with age and are more reliable than mandibular deviation in identifying disease activity. This novel approach provides clinicians with an objective imaging tool to guide diagnosis and management of condylar hyperplasia.

Role of 18F FDG-PET/CT scan in the evaluation and staging of hepatocellular carcinoma

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ABSTRACT

Background& Aim: Fluorine-18 FDG-PET/CT scan has proven to be a valuable tool in the initial diagnosis, staging, and restaging of a variety of cancers. The potential use of F-18 FDG-PET/CT in the evaluation and management of hepatocellular carcinoma (HCC) continues to evolve. The purpose of this study was to investigate the effectiveness of F-18 FDG-PET/CT scan for the detection and staging of HCC by correlation of F-18 FDG-PET/CT uptake and SUV based semi-quantitative parameters of Tumor and metastatic lesions with tumor size, biochemical prognostic factor i.e alpha-feto protein level (AFP) and other tumor prognostic factors i.e Portal vein thrombosis and grade of cirrhosis.

Materials and Methods: Total of 30 patients of radiologically proven HCC i.e LI-RADS-V lesions (Liver Imaging Reporting and Data System) that underwent F-18 FDG-PET/CT were studied prospectively, during the span of six months. Results of the F-18 FDG-PET/CT scan were compared with other imaging studies i.e [Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Ultrasonography] for tumor size, local and peripheral metastases, number of metastatic lesions reported on these imaging modalities to establish the effectiveness of F-18 FDG-PET/CT in diagnosis and evaluation of HCC. Similarly other clinical, biochemical and prognostic parameters related to HCC i.e., AFP levels, portal vein thrombosis and cirrhosis grade were also compared with F FDG-PET/CT findings.

Results: Out of the 30 patients who underwent 18F-FDG PET/CT scan, increased FDG uptake then the surrounding normal liver parenchyma was noted in primary HCC lesions (Grade III) in 23 scans (77%), FDG uptake equal to or slightly greater than the surrounding normal liver parenchyma (Grade II) was observed in 2 scans (7 %) and FDG non-avid primary HCC lesions (Grade I) in 5 (16 %) scans. According to this data a total of 25 scans that is 83% of the patients, the primary HCC lesions showed F-18 FDG uptake and were categorized as F-18 FDG PET/CT positive. Similarly, 49 metastatic lesions were identified by PET-CT scan in 21 (70%) HCC patients who underwent F-18 PET-CT against 23 metastatic lesions identified in 11 patients by conventional imaging [CT, MRI, USG] out of total 30 patients .According to this data 10 patients were up-staged after FDG-PET scan and also some new lesions were identified in patient with known metastatic lesions.F-18 FDG-PET scan showed 100% Sensitivity for Primary HCC lesion > 30 mm in size while the sensitivity for Primary HCC lesion < 30 mm was 46%. In patients with AFP levels <100 ng/ml , FDG-PET scans were positive in 6/11 (54.5%) cases while in patients with levels >100 ng/ml, 17/19 FDG-PET scans (89.4%) were positive. Portal vein thrombosis and cirrhosis showed weak to very weak correlation with PET avidity and SUV based parameters.

Conclusion: F-18 FDG PET/CT can be helpful in evaluation of HCC with larger tumor size and elevated AFP levels when conventional imaging shows equivocal results. It is also a valuable addition to conventional imaging in staging of HCC as it can alter patient management due to the detection of new extrahepatic metastatic lesions.

Keywords: HCC: Hepatocellular carcinoma, FDG : Fluorodeoxyglucose,F-18 : Fluorine-18,AFP: Alpha feto protein

Novelty: It was the first of its kind study on this topic in Pakistan and was important because local data on this subject was missing.

Diagnostic accuracy of Tc-99m MIBI in thyroid cold nodules: comparative analysis with FNAC and histopathology

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ABSTRACT

Background: Thyroid nodules are common, with most being benign. Fine Needle Aspiration Cytology (FNAC) is the first-line diagnostic technique for evaluating these nodules. However, indeterminate cytology remains a major diagnostic challenge, often necessitating surgery. 99mTc-sestamibi (MIBI) scintigraphy has been proposed as a noninvasive adjunct for differentiating benign from malignant thyroid nodules, particularly in indeterminate cases.

Objective: To evaluate the diagnostic accuracy and correlation of 99mTc-MIBI scintigraphy in cold thyroid nodules compared with FNAC and histopathology.

Methodology: This cross-sectional study was conducted at the Department of Nuclear Medicine, AFIP, from August 2021 to January 2025. Thirty thyroid cold nodules identified on pertechnetate scans were included. All patients underwent FNAC, and a subset with suspicious or malignant cytology proceeded to surgery for histopathological confirmation. MIBI scans were visually scored on a 4-point scale (+1 to +4), with +3 or higher uptake considered positive for malignancy. Diagnostic indices including sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), accuracy, and Cohen's kappa (κ) were calculated using histopathology (for operated cases) and FNAC (for benign, non-operated cases) as reference standards.

Results: Among 30 thyroid nodules, 12 were malignant and 18 benign. FNAC was indeterminate in 4 nodules (1 malignant, 3 benign) and correctly identified 10/11 malignant and 13/15 benign nodules among the remaining 26. MIBI scintigraphy was positive (+3 uptake) in 9/11 malignant and 3/15 benign nodules. The sensitivity, specificity, PPV, NPV, and accuracy for FNAC were 90.9%, 86.7%, 83.3%, 92.9%, and 88.5%, respectively ($\kappa = 0.77$). For MIBI, the corresponding values were 81.8%, 80.0%, 75.0%, 85.7%, and 80.8% ($\kappa = 0.61$). Both FNAC and MIBI demonstrated substantial correlation with the reference standard, with higher agreement for FNAC.

Conclusion: 99mTc-MIBI scintigraphy shows substantial correlation with histopathology and offers supportive diagnostic value in differentiating benign from malignant thyroid nodules, particularly when FNAC results are indeterminate. FNAC remains the more sensitive modality; however, MIBI can serve as a useful complementary tool to improve diagnostic confidence and guide surgical decision-making.

Frequency of renal scarring in pediatric patients: Evaluation with 99mTechnetium-imercaptosuccinic acid (DMSA) scintigraphy

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ABSTRACT

Introduction: Renal scarring is a well-known, severe renal condition that can lead to life-threatening complications such as chronic renal failure and hypertension. Renal cortical scintigraphy is used to detect cortical abnormalities associated with acute & chronic pyelonephritis, vesicoureteric reflux, urinary tract infection and hydronephrosis. Cortical scintigraphy can detect twice as many abnormalities as ultrasound and four times as many as intravenous urography. The aim of this study is to determine the frequency of renal scarring using 99mTc-DMSA scintigraphy in pediatric patients visiting CENUM (Centre for Nuclear Medicine).

Material & Methods: Over the period of January 2024 to January 2025, 55 patients who were referred to Nuclear Medicine department of centre for Nuclear Medicine (CENUM) for documented DMSA renal scan were included in this cross-sectional (analytical) study. Patients of both gender lying in age group of 1-18 years (mean age = 7.36 with SD 3.61 years), diagnosed with vesicoureteric reflux, urinary tract infection or suspected renal scarring were included in this study. 99mTc-DMSA planar imaging of the abdomen was done 3 to 4 hours after intravenous injection of 1.5-1.9MBq/kg of the tracer and reviewed visually for the presence or absence of scarring (wedge shaped photon deficient area, apex towards medulla) with respect to kidney size, function and radiotracer uptake in both kidneys. The information was analyzed using Fischer exact test with a significance level of 0.05 (5%) and the results were expressed as frequencies and percentages.

Results: Out of 55 patients, 19 (34.5%) were female and 36 (65.4%) were male. Mean age of the patients was 7.36 with SD 3.61 years. We found that 32 (58.1%) patients were positive and 23 (41.8%) were negative for possible renal scarring. Of the positive cases, 16 (50%) patients had urinary tract infection, 11(34.40%) had vesicoureteric reflux and 5 (15.60%) had hydronephrosis. Among positive cases for renal scarring, 17 (53.2%) patients has Non-homogeneous uptake (chi-square statistic is 7.736, P value 0.02 at $p < 0.05$). 17 (53.1%) patients had normal size of kidney (chi-square statistic is 6.683, P value 0.030 at $p < 0.05$) and overall reduced split function in 18 (56.2%) patients (chi-square statistic is 10.44, P value 0.005 at $p < 0.05$).

Novelty: 99mTechnetium-DMSA scintigraphy offers the largest net advantage over other imaging modalities for detecting renal scarring since it can detect a higher percentage of cases of renal scarring and should be used for early detection of renal scarring. The study thus recommends that 99mTechnetium- DMSA scintigraphy be utilized as a diagnostic tool in routine practices.

The correlation of SUVmax and proliferation index in treatment naïve neuroendocrine tumors

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ABSTRACT

Objective: To evaluate whether the maximum standardized uptake value (SUVmax) of the primary lesion, as measured by Ga-68 DOTATATE PET/CT imaging, can serve as a predictor of histological grade and Ki-67 proliferation index in treatment-naïve neuroendocrine tumors (NETs).

Materials and Methods: This retrospective study included 136 patients diagnosed with NET who underwent Ga-68 DOTATATE PET/CT between January 2024 and April 2025. Patient data were collected, including age, histopathology, primary tumor location, Ki-67 proliferation index, histological grade, and SUVmax values of the same tumor lesion.

Results: The mean age was 47.5 ± 13 . The most common biopsy locations were the small intestine 53 % , stomach 20%, pancreas (8.5%), Large intestine 7% , Rectal 5% and 6.5% were unknown. Median Ki-67 proliferation index was 2(interquartile range: 4). Grade 1 tumours were present in 62 patients (62%), grade 2 tumors in 18 patients (13%) for the rest grade was not known. There was a weak but statistically significant negative correlation between SUV max and Ki-67 proliferation index ($r = -0.264$, $p = 0.002$), suggesting that higher Ki-67 levels were associated with slightly lower SUVmax values in this Study.

Conclusion: Initial Ga-68 DOTATATE PET/CT imaging in treatment-naïve NET patients revealed a significant inverse correlation between the SUVmax of the primary lesion and the Ki-67 proliferation index. This finding suggests that higher proliferative activity may be associated with lower somatostatin receptor expression, as reflected by decreased SUVmax, offering potential insight into tumor biology.

Novelty: This study demonstrates a novel inverse relationship between SUVmax on Ga-68 DOTATATE PET/CT and Ki-67 index in untreated NETs, suggesting imaging could serve as a surrogate marker for tumor grade. It underscores the potential role of functional imaging in non-invasively assessing tumor aggressiveness and guiding early clinical decisions.

Validity of 18F FDG-PET/CT in the detection of bone marrow disease in Hodgkin's and Non-Hodgkin's lymphoma

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ABSTRACT

Introduction: Positron Emission Tomography with 18F-Fluorodeoxyglucose (18F FDG-PET/CT) is useful for diagnosing lymphomas, including Hodgkin's and non-Hodgkin's. Its ability to detect bone marrow involvement is often compared to biopsy. Traditional bone marrow biopsy has been the gold standard for diagnosing lymphomas. On the other hand, 18F FDG-PET/CT provides functional and anatomical data without surgery.

Objective: To determine the validity of 18F FDG-PET/CT in the detection of bone marrow disease in Hodgkin's and non-Hodgkin's lymphoma taking bone marrow biopsy as gold standard.

Study Design & Duration: Cross Sectional Study. This study was conducted at the Department of Nuclear Medicine, KIRAN, Karachi, Pakistan. Six months after the approval of the synopsis from **January 31, 2023** to **July 30, 2023**.

Materials and Methods: Patients meeting the inclusion criteria at KIRAN, Karachi, were included after getting informed consent, which explained the study protocol, hazards, and benefits. Contrast-enhanced PET/CT and bilateral/unilateral iliac crest marrow aspirate with trephine biopsy were done. Marrow biopsy was followed by PET/CT within two weeks. Interpreting Hodgkin's lymphoma marrow infiltration. PET/CT scans with localized or diffuse tracer uptake in bone/bone marrow were positive. The offered proforma was used to electronically record research data.

Results: The mean $\pm$ standard deviation of age was 33.49 ± 14.45 years. In the gender distribution, 55 (63.2%) were classified as male while 32 (36.8%) were classified as female. Diagnostic accuracy of 18 F-FDG-PET findings was 80.46% in diagnosis of bone marrow disease with sensitivity 92.00%, specificity 75.81%, PPV 60.53% and NPV was found to be 95.92% by using bone marrow biopsy as gold standard.

Conclusion: It is to be concluded that 18F FDG-PET/CT holds potential for identifying bone marrow pathology in both Hodgkin's and non-Hodgkin's lymphoma. The results suggest that there is a promising ability to accurately detect patients with or without bone marrow involvement, which makes it a helpful method for assessing the condition and planning treatment without the need for intrusive procedures.

Keywords: Biopsy, Bone Marrow, CT, Hodgkin's Lymphoma, PET, Validity

Novelty: 18F FDG-PET/CT holds potential for identifying bone marrow pathology in both Hodgkin's and non-Hodgkin's lymphoma. The results suggest that there is a promising ability to accurately detect patients with or without bone marrow involvement, which makes it a helpful method for assessing the condition and planning treatment without the need for intrusive procedures.

Metastatic papillary thyroid microcarcinoma mimicking brachial cleft cyst- A case report

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ABSTRACT

Background: Papillary thyroid carcinoma (PTC) is the most common and well-differentiated type of thyroid cancer, with tumors ≤ 10 mm classified as papillary thyroid microcarcinoma (PTMC) by the World Health Organization. This case highlights a Brachial Cleft Cyst initially diagnosed as benign but later found to harbor metastatic PTC. It emphasizes the need for careful evaluation of atypical neck masses to avoid delayed diagnosis and treatment.

Case presentation: This case involves a 35-year-old woman with a three-year history of right-sided neck swelling and breathing difficulty, initially presumed to have a branchial cleft cyst (BCC) based on clinical findings and FNAC. Surgical removal of the cystic mass confirmed Papillary Thyroid Carcinoma. Further imaging and thyroid evaluation revealed a small nodule in thyroid gland. Total thyroidectomy followed by histopathology confirmed a unifocal papillary thyroid microcarcinoma (PTMC) in the right lobe. The case underscores the importance of considering hidden malignancy in seemingly benign lateral neck masses

Conclusion: Although PTMC typically follows an indolent course, cystic lymph node metastases may signal aggressive behavior. Misdiagnosis as benign neck cysts can delay appropriate treatment. This case emphasizes the need for thorough evaluation of adult-onset lateral neck masses and supports early surgical intervention for accurate diagnosis and optimal management.

F-18 FDG PET-CT in MALT lymphoma: A single center experience

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ABSTRACT

Introduction: Mucosa-associated lymphoid tissue (MALT) lymphoma can potentially arise from any mucosal site, with gastric mucosa as the most common primary site. Except for a few rare cases, MALT lymphoma is rarely an aggressive disease having good prognosis. Keeping in view this scenario, the main objective of our study is to analyze the data of MALT lymphoma affected patients whose F¹⁸FDG PET-CT scans acquired at our center.

Material and Methods: In this study 18 histopathologically confirmed patients were retrospectively evaluated who had F¹⁸FDG PET-CT scan from 1st Jan, 2009 to 18th June, 2025. 15 patients were males and 3 were females with mean age of 52.5 yrs. PET-CT scans were evaluated both visually and semi- quantitatively by measuring standardized uptake value (SUV_{max}).

Results: Out of eighteen patients, largest number were of gastrointestinal tumors (71%) while remaining (29%) were of different origin as shown in diagram. Out of 18, 8 patients had both regional and distant nodal involvement, among which 3 had gastric origin disease with nodal disease on both sides of diaphragm (*Ann Arbor stage IV*). Out of 18 patients, interim scan was done only in 9 (50.2%) patients, utilizing the Deauville criteria, 5 patients had complete metabolic response (CMR) on interim scan, while 4 had partial response (PR) on interim scan. Those who had CMR on interim scan, 3 had CMR on follow up scans, 1 had CMR then relapse and eventually died while follow up scan was not done in 1 patient. Those who had partial response on interim scan, 2 had CMR on follow up scan. 1 had partial response then relapse after 2 years while 1 had progressive disease with second primary of gastric adenocarcinoma.

Conclusion: Our limited institutional experience with F¹⁸-FDG PET-CT in MALT lymphoma is in keeping with the established usefulness of F¹⁸-FDG PET-CT in NHL. Further large volume, prospective multicenter studies are required to validate the role.

Radiosynoviorthesis, QC and clinical applications of Lutetium-177 Hydroxyapatite for radiosynoviorthesis.

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ABSTRACT

Background: The attractive nuclear characteristics and friendly chemistry of Lutetium-177 (^{177}Lu) has opened new vistas in the field of theranostic Nuclear Medicine. The therapeutic potentials of ^{177}Lu can be well explored by labeling it with Hydroxyapatite. The effects of the radiolabeling yields on incubation time, temperature, pH and centrifugation was examined.

Aims: The aim of this study was to formulate and evaluate ^{177}Lu HA locally for radiosynoviorthesis applications.

Material and Method: Formulation of HA with ^{177}Lu was carried out in basic media under aseptic conditions. Radiochemical purity of the labeled product was performed by paper Chromatography techniques. The stability of ^{177}Lu HA was observed at room temperature for upto 24 hrs in saline, in blood serum and synovial fluid for up to 48hrs. The radiopharmaceutical was then injected into the knee joints of patients. The bio distribution images were acquired at 1hr, 24hrs and 48hrs post injection using GE NM/CT Gamma Camera.

Results: The labeling efficiency of ^{177}Lu HA was (98.6 plus/minus 0.5)% at the conditions of HA 7.5mg. 0.1ml of 0.5M NaHCO_3 , Ascorbic acid 10mg at pH 8.5. After centrifugation, the radiochemical purity (RCP) was (99.5 plus/minus 0.2)% The biodistribution images showed no leakage of the tracer into the surrounding tissues or regional lymph node.

Conclusion: Higher labeling efficiency, long time stability and simple procedure make ^{177}Lu HA, a suitable candidate for the treatment of chronic inflammatory, Hemophilia and other intra-cavitary therapy applications.

Internal dosimetry of Lutetium-177 Hydroxyapatite for personalized activity to radio synovectomy patients

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ABSTRACT

Introduction: Radiosynovectomy (RSV) with Lu-177 hydroxyapatite (Lu-177 HA) offers favorable beta emission and post-therapy imaging.

Methodology: In a retrospective study of eight patients (mean age 21.8 years) with refractory knee synovitis treated from January 2023 to March 2024, we evaluated dosimetry outcomes and tested a volume-based pre-treatment activity formula. SPECT/CT was performed at 1, 4, and 24 hours post-injection; the inflamed synovium was CT-segmented and MIRD dosimetry was applied assuming uniform activity distribution. Mean administered activity was 5.35 ± 0.74 mCi with 86.4% injection efficiency. Synovial absorbed doses ranged 60–94 Gy (77 ± 11 Gy), with six of eight joints in the 70– 100 Gy therapeutic range.

Results: The pre-treatment formula strongly correlated with delivered doses (mean difference 1.68 ± 0.52 mCi; $r = 0.87$; $p = 0.03$). Dose uncertainty was 13–15% due to syringe residuals, segmentation variability, and calibration factors. Clinically, short-term symptom improvement occurred with no adverse events.

Conclusion: The study supports feasibility of volume-based, personalized activity planning for Lu-177 HA RSV using SPECT/CT dosimetry, though larger prospective studies are needed for validation.

Establishing a state-of-the-art radiopharmacy at PKLI & RC Lahore: Challenges and opportunities in Pakistan

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ABSTRACT

Introduction: Radiopharmacy underpins modern nuclear medicine by ensuring the safe, reliable supply of radiopharmaceuticals. In Pakistan, limited infrastructure has constrained Positron Emission Tomography (PET) scan availability. To overcome this, a GMP-compliant radiopharmacy was established at the Pakistan Kidney and Liver Institute & Research Center Lahore, offering both clinical and research opportunities

Aims & objective: To share the experience of developing a state-of-the-art radiopharmacy at PKLI & RC Lahore, highlighting the challenges encountered and opportunities created for nuclear medicine in Pakistan.

Methodology: A facility was developed with an ABT (Dose-on-Demand Cyclotron) and TRASIS (All-IN- One Synthesizer), and fully equipped cleanrooms.

A stepwise approach was taken, installation and validation of equipment, SOP development compliant with PNRA regulations, staff training in GMP and aseptic practices and implementation of quality control testing for batch release.

Discussion: The radiopharmacy achieved reliable F-18 FDG production with >95% radiochemical purity. Key challenges included developing local expertise, ensuring strict compliance with GMP standards, and managing tracer logistics. International collaborations and vendor support helped mitigate these barriers. The experience also underscored the importance of sustainable supply chains and regulatory alignment in Pakistan.

Conclusion: PKLI's radiopharmacy demonstrates that advanced Nuclear Medicine infrastructure can be successfully developed in Pakistan. The project not only provides sustainable F-18 FDG supply for clinical Positron Emission Tomography (PET) scan but also serves as a model for future facilities, tracer diversification and radiopharmacy training initiatives.

Initial experience of F-18 FDG production using ABT (dose-on-demand cyclotron) and trasis (all-in-one synthesizer) at PKLI & RC Lahore

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ABSTRACT

Introduction: The local production of F-18 FDG is vital for Positron Emission Tomography (PET) imaging, ensuring timely availability and reducing reliance on external supply chains. Establishing a GMP-compliant radiopharmacy facility in Pakistan requires careful validation of equipment, processes, and staff training.

Aims & objective: To report the initial production experience, quality outcomes, and technical challenges of F-18 FDG synthesis at PKLI.

Methodology: F-18 was produced via the ABT (Dose-on-Demand Cyclotron) and labelled into F-18 FDG with the TRASIS (All-in-One-Synthesizer) under GMP-compliant conditions. Each production run (n = 100) was subjected to routine QC testing according to European Pharmacopoeia specifications. Environmental monitoring and complete GMP documentation were maintained for all runs.

Results & discussion: Initial runs produced F-18 FDG with radiochemical purity >95% and radionuclidic purity >99%. Endotoxin testing met acceptance criteria. Challenges included cyclotron target maintenance, cleanroom workflow optimisation and staff training in automated synthesis. Continuous optimisation and technical support allowed rapid resolution of issues.

Conclusion: Our initial experience with the ABT (Dose-on-Demand Cyclotron) and TRASIS (All-in-One Synthesizer) has shown that GMP-compliant F-18 FDG production is feasible, safe, and reliable in Pakistan. The achievement of 100 successful productions strengthens confidence in local radiopharmaceutical supply and provides a model for further expansion of nuclear medicine services in the region.

Mapping the first node: Clinical insights from sentinel lymph node scintigraphy at IRNUM

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ABSTRACT

Introduction: Sentinel lymph node scintigraphy is an established tool in breast cancer management, enabling targeted lymphatic mapping and minimizing extensive axillary surgery. It represents a growing advancement in nuclear medicine practice

Objective: To report the IRNUM experience of sentinel lymph node scintigraphy and assess its visualization outcomes in breast cancer patients.

Method: Eleven breast cancer patients underwent sentinel lymph node scintigraphy. Tc-99m radiocolloid was injected periareolarly in all cases, followed by static imaging. Injection and imaging times were documented, and nodal visualization patterns were evaluated.

Results: Sentinel nodes were successfully visualized in 9 of 11 patients (82%). Two patients (18%) showed no nodal uptake. The majority of visualized nodes were located in axillary regions, while draining lymphatic channels were also noted. Injection-to-imaging intervals varied between 25 and 30 minutes.

Conclusion: Sentinel lymph node scintigraphy provides reliable guidance for breast cancer surgery and reflects the advancing role of nuclear medicine in clinical practice at IRNUM.

Assessment of renal toxicity in Lu-177 DOTATATE therapy using DTPA scans

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ABSTRACT

Introduction: Peptide Receptor Radionuclide Therapy (PRRT) with Lu-177 DOTATATE has emerged as a targeted and effective treatment modality for patients with inoperable or metastatic neuroendocrine tumors (NETs). However, the renal excretion pathway of radiolabeled somatostatin analogs and their affinity to reabsorption in proximal tubules, the renal toxicity has a significant concern. This study aimed to quantitatively assess renal toxicity in patients undergoing Lu-177 DOTATATE therapy by measuring the Glomerular Filtration Rate (GFR) using 99mTc-DTPA dynamic renal scintigraphy before and after the therapy.

Methodology: This observational study design was implemented at the nuclear medicine department of IRNUM, Peshawar. A total of 12 patients were included with the renal function monitoring using same protocols for hydration, administration of radiopharmaceutical (5mCi of 99mTc-DTPA), and gamma camera imaging using Discovery NM/660 Pro with integrated Xeleris software. Pre-therapy and posttherapy GFR values were obtained, and statistical analysis was conducted using a paired t-test to determine the significance of renal function changes.

Results: The results demonstrated a statistically significant reduction in GFR post therapy, with the degree of decline correlating moderately with the number of PRRT cycle administered. Patient receiving 4 cycles of therapy exhibited the most pronounced reduction in renal function. Importantly, no patient develops severe nephrotoxicity, indicating that PRRT can be safe with proper renal monitoring.

Radiation levels of isolation rooms used by radio-iodine ablation patients during hospitalization at NORIN Nawabshah, Pakistan

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ABSTRACT

Background: The use of RAI-131 in thyroid carcinoma patients presents a special concern on the environmental radiation safety for those who come in contact with the patients especially after discharge from the facility because of excretion of I131 through perspiration, salivation, breathing and urination.

Methods & Materials: The present study was conducted at Nuclear Medicine Oncology and Radiotherapy Institute Nawabshah (NORIN) Sindh from 2017 to 2021 with the objective to evaluate contamination hazards by excretion made by thyroid cancer patients received iodine therapy stayed in isolation room with doses ranging from 80–200 mCi. The areas included corridor, sink, patient bed, and toilet bowl of isolation rooms before admission and after discharge using LAMSE RM-1001 survey meter.

Results & Discussion: The minimum background radiation level measured before patient stay in isolation room was 0.07 $\mu\text{Sv/h}$ while the maximum was 0.40 $\mu\text{Sv/h}$ and the mean background reading was $0.18 \pm 0.072 \mu\text{Sv/h}$. The maximum dose rate after discharge was observed at toilet bowl with mean of $9.69 \pm 1.98 \mu\text{Sv/hr}$ and minimum of 5.0 $\mu\text{Sv/hr}$ and maximum value 13.77 $\mu\text{Sv/hr}$. The readings recorded for the sink were: 2.0 $\mu\text{Sv/h}$ minimum, 20.0 $\mu\text{Sv/h}$ maximum with a mean of $5.55 \pm 1.57 \mu\text{Sv/h}$ while those for the patient bed 0.41 $\mu\text{Sv/h}$ minimum, 6.92 $\mu\text{Sv/h}$ maximum and a mean of 2.83 $\mu\text{Sv/h}$. the least dose rate was found in isolation room corridor ($1.53 \pm 0.78 \mu\text{Sv/h}$) with maximum and minimum values 0.28 & 3.20 $\mu\text{Sv/h}$ respectively.

Conclusion: Radiation is harmful; safety measures must be ensured to minimize radiation exposure to the family members as well as community either during hospitalization or after discharge of RAI-131 patients. The radiation levels from toilet bowls, beds, sinks, and corridor of isolation rooms were well within the acceptable limits and hence, do not pose significant hazard to the public.

Novelty: Radiation is harmful; safety measures must be ensured to minimize radiation exposure to the family members as well as community either during hospitalization or after discharge of RAI-131 patients. The radiation levels from toilet bowls, beds, sinks, and corridor of isolation rooms were well within the acceptable limits and hence, do not pose significant hazard to the public.

Dose calibrator constancy testing in Nuclear Medicine – Seasonal humidity as a hidden variable

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ABSTRACT

Background: Dose calibrators based on well-type ionization chambers are essential for accurate radionuclide activity measurement in nuclear medicine. While corrections for temperature and pressure are routinely applied, the effect of ambient humidity remains underexplored in quality assurance guidelines.

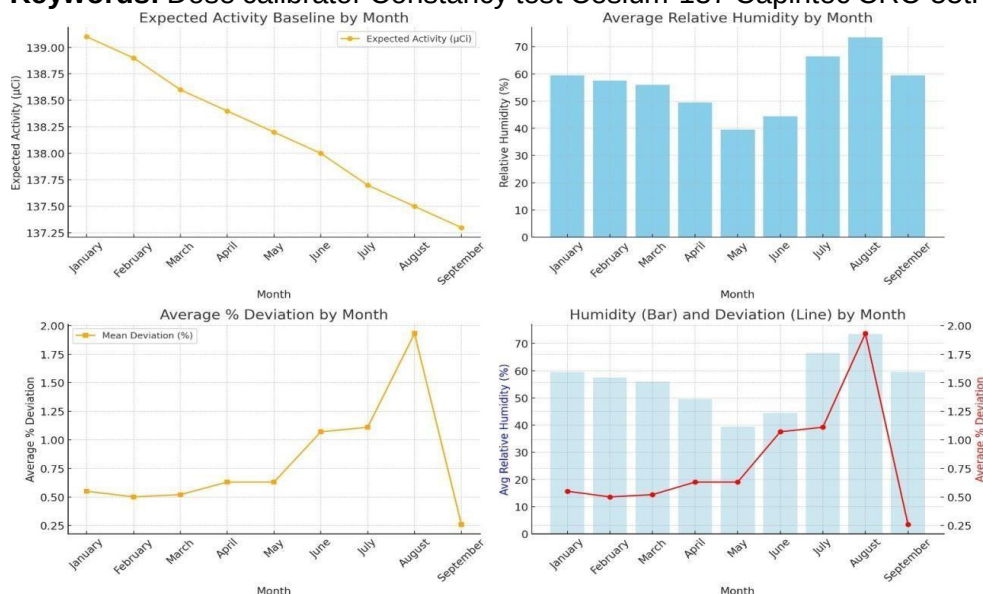
Objective: To evaluate the effect of seasonal humidity on dose calibrator constancy.

Methods: Daily constancy checks using a sealed Cesium-137 reference source (Eckert & Ziegler Isotope Products; ID 1218-91-13) were performed at the Nuclear Medical Centre, (AFIP), Rawalpindi, from January to Sept 2025. Expected activity was decay-corrected to 139.2 μCi (Jan 2025 baseline). Mean relative humidity data were obtained from the Pakistan Meteorological Department and Weather Spark. Statistical analysis utilized Pearson correlation and linear regression to assess the relationship b/w humidity and percentage deviation in measured activity.

Results: Across 176 test days, mean deviations were 0.50–0.63% during dry months (January– May). With the onset of the monsoon, deviations increased to 1.07% in June and peaked at 1.93% in August, coinciding with 76% relative humidity. The highest daily deviation (3.2%) occurred on 11 August. As humidity decreased in Sept, deviations normalized to 0.26%. A strong positive correlation was found between humidity and activity deviation ($r = 0.693$, $p < 0.0001$), with a 0.047% deviation increase per 1% rise in humidity.

Conclusion: Seasonal humidity significantly influences dose calibrator constancy. Although deviations remained within $\pm 5\%$ limits, humidity control and monitoring should be integrated into QA protocols to enhance calibration stability and ensure accurate patient dosing.

Keywords: Dose calibrator Constancy test Cesium-137 Capintec CRC-55tR Humidity Nuclear medicine QA



Impact of socioeconomic status and literacy, alongside technical and biological determinants, on the quality and utility of PET/CT imaging in LMICs.

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ABSTRACT

Introduction: Positron Emission Tomography-Computed Tomography (PET/CT) has become an indispensable tool in oncology for diagnosis, staging, and treatment response evaluation. While technical limitations (e.g., scanner resolution, timing accuracy) and biological factors (e.g., tumor biology, radiotracer uptake) directly influence image quality and interpretation, in low- and middle-income countries (LMICs) additional socioeconomic and literacy-related factors play a significant role in determining the overall effectiveness of PET/CT services.

Objective: To highlight the impact of socioeconomic status and literacy, alongside technical and biological determinants, on the quality and utility of PET/CT imaging in LMICs.

Materials and Methods: A narrative review and contextual analysis were performed, examining patient-related barriers such as literacy, financial constraints, compliance with preparation protocols.

Results: Socioeconomic disparities and limited health literacy were found to substantially affect patient preparation and adherence to PET/CT protocols. Inadequate understanding of fasting requirements, medication restrictions, and the importance of minimizing muscular activity prior to imaging often led to suboptimal studies. Financial limitations resulted in delayed access or refusal of imaging. These non-technical factors frequently had an equal or greater impact on image quality and clinical decision-making compared to biological and technical variables.

Conclusion: In LMICs, socioeconomic and literacy-related challenges significantly influence PET/CT imaging outcomes, often surpassing technical and biological limitations in their effect. Addressing these through patient education, culturally sensitive communication, subsidized imaging programs, and training of technologists can improve compliance, optimize image quality, and enhance the clinical impact of PET/CT in resource-constrained settings.

Keywords: PET/CT; Socioeconomic factors; Health literacy; LMICs; Imaging quality; Oncology

Novelty: Mostly technical and biological factors have been considered as the impactful determinants on PET/CT imaging but as a developing nation we observed few more factors having an indirect influence on the earlier.

Optimizing thyroid blockade in I-131 MIBG imaging for pheochromocytoma and related neuroendocrine tumors

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ABSTRACT

Background: Thyroid blocking agents play a vital role in protecting the thyroid gland during the scintigraphic distribution of I-131 MIBG. The chemicals that block the uptake of radioactive iodine (RAI) by the thyroid gland include potassium iodide (KI), Lugol's iodine drops, or potassium chlorate (KClO₃) in varying concentrations.

Aims: The aim of this presentation is to familiarize nuclear medicine–associated radiochemists, radiopharmacists, and technologists with the dose, type, and timing of these agents prior to MIBG injection.

Materials and Methods: Different doses of saturated solution of potassium iodide (SSKI) or Lugol's solution were prepared for children and adults depending upon body weight, gender, and duration of administration. Patients were advised to start the dose as per the institutional protocol. Those who were allergic to iodine were given potassium chlorate (KClO₃) as an alternative.

Results: For adults, 400 mg of KI were dissolved in 10 mL of water and divided into three equal doses, or 10 drops of Lugol's iodine solution, administered three times per day (minimum 1 hour to maximum 24 hours) prior to ¹³¹I-MIBG injection, and continued for a further 3 days.

For children, 60 mg of KI in 2 mL of water, three times a day, or 4–5 drops of Lugol's solution per day, was administered. Patients allergic to KI were given KClO₃ in equivalent concentrations instead of KI.

Conclusion: The procedure is simple and convenient. The dose can be taken in the form of an oral solution, syrup, or uncoated tablet. Insufficient thyroid blockade may lead to increased uptake in the thyroid gland, potentially compromising image quality. Adequate thyroid blockade ensures patient safety and improves scan quality.

Stimuli-responsive liposomes for targeted radiopharmaceutical delivery

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ABSTRACT

Introduction: Stimuli-responsive liposomes are revolutionizing radiopharmaceutical delivery by precisely releasing radiation in difficult-to-access tumors, advancing precision medicine. These nanocarriers respond to tumor microenvironment triggers, such as pH, hypoxia, or temperature, to provide targeted therapy for resistant cancers like pancreatic and hepatocellular carcinomas. By reducing damage to healthy tissues, they offer significant potential for enhancing theranostic applications.

Objectives: This review aims to assess recent developments in stimuli-responsive liposomes for radiopharmaceutical delivery, emphasizing their design, targeting precision, and clinical relevance for hard-to-reach tumors. It integrates findings from studies published between 2020 and 2025 to underscore their impact on personalized cancer care.

Methods: A thorough literature review was performed using PubMed, Scopus, and Web of Science, with search terms including —stimuli-responsive liposomes, —radiopharmaceutical delivery, and —tumor microenvironment. Studies focusing on pH-, hypoxia-, or temperature-responsive liposomes encapsulating radionuclides (e.g., ^{177}Lu , ^{90}Y) were selected. Data on liposome structure, release mechanisms, tumor targeting, and clinical outcomes were evaluated.

Results: Research indicates that pH-responsive liposomes, leveraging the acidic tumor environment (pH~6.5), achieve up to 85% radionuclide release, significantly improving tumor reduction in pancreatic cancer models. Hypoxia-sensitive liposomes enhance radiation delivery by 35–45% in oxygen-deprived liver tumors compared to standard systems. Temperature-activated liposomes, triggered by localized hyperthermia, enable precise radiation release in deep tumors, minimizing systemic toxicity. Surface-modified liposomes with ligands like folate improve targeting accuracy in metastatic cancers, with early clinical studies demonstrating favorable biodistribution and therapeutic efficacy.

Conclusion: Stimuli-responsive liposomes represent a major leap forward in radiopharmaceutical delivery, enabling accurate targeting of hard-to-reach tumors with reduced side effects. By harnessing tumor-specific triggers, they lay the foundation for tailored cancer therapies. Ongoing clinical research will further establish their transformative role in precision oncology.

Novelty: Stimuli-responsive liposomes revolutionize precision oncology by delivering radionuclides to resistant tumors with up to 85% release and 35–45% enhanced efficacy using tumor-specific pH, hypoxia, or thermal triggers.

Keywords: Radiopharmaceutical delivery, theranostic nano medicine, tumor-targeted radionuclide therapy, Stimuli -responsive systems

Nuclear Medicine and AI: Opportunities, challenges and best practices

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ABSTRACT

Background: Artificial Intelligence (AI) is increasingly applied in nuclear medicine, offering potential to enhance image acquisition, interpretation, and patient management. This study/review explores opportunities, challenges, and best practices in the integration of AI into nuclear medicine.

Methods: Literature and case studies were reviewed to evaluate AI applications in PET, SPECT, and radionuclide therapy workflows. Focus areas included image reconstruction, lesion detection, quantification, radiomics, and clinical decision support systems. Barriers and enabling factors for implementation were also analyzed.

Results: AI-driven reconstruction methods demonstrated up to 40–50% improvement in image quality with reduced noise and lower radiotracer doses. Automated segmentation tools improved workflow efficiency and consistency across PET/CT and SPECT datasets. Radiomics-based models showed promise in predicting treatment response and patient outcomes in oncology. However, challenges included limited large-scale, standardized datasets, algorithm bias from heterogeneous training data, and regulatory uncertainty. Clinical adoption was most successful when AI tools were integrated gradually, supported by multidisciplinary teams, and validated across diverse patient populations.

Conclusion: AI offers transformative opportunities for nuclear medicine by enhancing diagnostic accuracy, reducing radiation dose, and supporting personalized theranostics. Yet, the field must overcome challenges related to data standardization, ethical concerns, and regulatory frameworks. Best practices include rigorous validation, transparent algorithm development, clinician training, and maintaining a hybrid decision-making model where AI augments, but does not replace, human expertise. Strategic adoption of AI will strengthen nuclear medicine's role in precision medicine and improve patient outcomes.

Incidence of thyroid cancer in South-West Asia (2020–2024)

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ABSTRACT

Background: Thyroid cancer, a malignancy with globally and regionally rising incidence, requires evaluation of its demographic and geographic patterns for effective disease management and prevention.

Methods: A retrospective analysis was conducted on 205 patients diagnosed with thyroid cancer between 2020 and 2024, utilizing hospital records across Southwest Asia. Variables assessed included gender, age group, region (urban/rural), and histological subtype.

Results: A marked female predominance was confirmed, with 146 patients (71.2%) being female versus 59 (28.8%) male. The 30–49 year age group accounted for the largest proportion of cases at 42%, followed by the 50–69 year group (33%). Urban residents represented 60% of cases, indicating urban clustering compared to 40% in rural areas. Papillary carcinoma remained the dominant histological subtype, accounting for 152 cases (74%), followed by follicular (14%), medullary (7%), and anaplastic carcinoma (5%).

Conclusion: The incidence of thyroid cancer in Southwest Asia showed a steady increase from 2020 to 2024, characterized by a clear female predominance, highest occurrence in the 30–49 year age group, and urban clustering. These findings provide a necessary regional 5-year dataset and underscore the urgent need for targeted screening programs and focused public health strategies aimed at high-risk demographics and geographic hotspots.

Diagnostic dilemma in a patient with ACS and prior left main PCI: Coronary angiography or MPS? A case report

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ABSTRACT

Background: Coronary artery disease (CAD) is the leading cause of morbidity and mortality worldwide. Both invasive and noninvasive modalities are valuable for diagnosis and risk stratification. Myocardial perfusion scintigraphy (MPS) is widely used to assess ischemic burden and viability, while coronary angiography remains the gold standard, especially in patients with recurrent symptoms after percutaneous coronary intervention (PCI). In such high-risk cases, timely invasive evaluation is essential to avoid delays in definitive management.

Case presentation: 77-year-old male with diabetes, hypertension, and a prior PCI of Left main and LAD arteries presented with persistent chest pain and dyspnea on exertion. His High-sensitivity troponin I was elevated at 282 pg/mL (normal ≤ 34.2 pg/mL), confirming NSTEMI. As the patient initially declined invasive angiography, he was referred for MPS. On arrival to our hospital, rest part of MPS was performed first due to reduced ejection fraction ($<45\%$). Immediately post-imaging, he developed acute pulmonary edema requiring stabilization. While in the emergency room, subsequent troponin levels showed a rise from 24.7 pg/mL initially to 97 pg/mL after 3 hours. MPS revealed extensive multivessel ischemia with viable LAD territory and non-viable RCA segments. Urgent coronary angiography was planned.

Conclusion: This case illustrates that in post-PCI patients with recurrent ischemic symptoms, invasive coronary angiography should be prioritized over noninvasive testing. Awareness of atypical presentations and close monitoring during adjunctive therapies, such as nitrates, is essential to prevent adverse outcomes.

Novelty: This case is novel as it highlights recurrent ACS in a patient with prior left main PCI, where myocardial perfusion scintigraphy (MPS) revealed extensive high-risk ischemia. Such presentations are rarely reported and emphasize the need for greater awareness and clearer guidance on the choice between invasive and noninvasive testing in this high-risk group.

Postprandial symptoms as an unusual presentation of coronary artery disease: A case report with myocardial perfusion scan findings

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ABSTRACT

Background: Postprandial symptoms are often attributed to gastrointestinal causes, yet they may occasionally be the primary manifestation of significant coronary artery disease (CAD).

Case Presentation: We report the case of a 66-year-old male with diabetes and hypertension who presented with postprandial discomfort initially perceived as gastric pain by patient. Subsequent evaluation with Myocardial Perfusion Scan (MPS), and Coronary Angiogram revealed severe left main and triple vessel CAD with reduced left ventricular function.

Conclusion: This case highlights the importance of recognizing postprandial symptoms as a potential marker of underlying coronary artery disease in high-risk patients. It underscores the role of MPS in diagnosis and the need for greater awareness of such atypical presentations to enable timely management.

Novelty: This case is unique because the patient's heart disease presented mainly as post-meal symptoms, which are usually mistaken for gastrointestinal problems rather than a cardiac issue. This made the diagnosis challenging and could have led to delays in treatment. Another important aspect is that during the stress test, the radiotracer was injected even before the patient reached peak heart rate, since ischemic changes had already begun to appear. The myocardial perfusion scan ultimately revealed the underlying cause, highlighting the crucial role of nuclear imaging when heart disease presents in unexpected ways.