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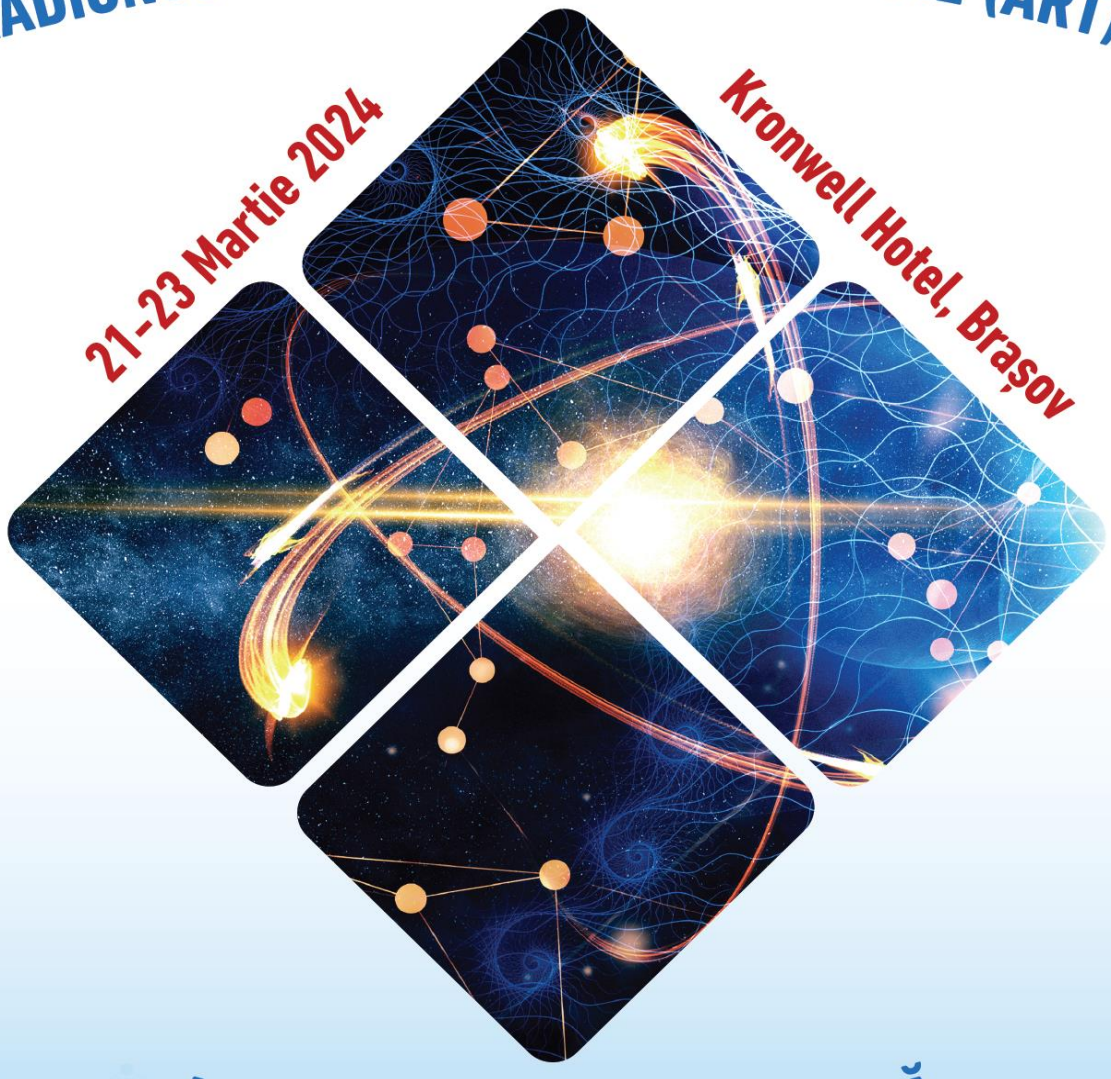

A 6-A CONFERINȚĂ NAȚIONALĂ DE MEDICINĂ NUCLEARĂ

ABSTRACTS E-BOOK

A 2-a Ediție a Conferinței Internaționale a Radionuclizilor Aplicați în Terapie (ART)

&

A 6-a Conferință Națională de Medicină Nucleară

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ORAL PRESENTATIONS

1. FDG-PET/CT in Extraskeletal Ewing Sarcoma: Imaging Insights and Clinical Implications....7
Antohie Mihaela Carmen, Agrigoroaie Laurentiu, RuxandraTibu, Desiree Deandreis....7

2. Factors affecting accuracy in SUV measurements....9
Cecan Maria-Iulia....9

3. Case review of Breast Implant Associated with Anaplastic Large Cell Lymphoma....11
Dumitru Craciun, Stefan Solomon, Ciprian Tutui, Teodora Mititelu, Catalin Mazilu, Raluca Mititelu....11

4. Distinguishing between lymphoma and other pathologies on 18F FDG PET-CT – a practical approach....13
Dr. Diana Ene....13

5. There's More On Bone Scintigraphy That Metastatic Lesions: Non-Metastatic Findings On Bone Scan In Our Departament....15
Polixenia-Laura Grecu-Bodnariuc, Ruxandra Țibu, M.Guțu....15

6. Diagnostic Accuracy of 68Ga-PSMA-11 PET/CT and Conventional Imaging for initial staging of Intermediate and High-risk Prostate cancer patients....16
Rakesh Kumar, Jagrati Chaudhary, Sanjay Kumar, Anil Kumar Pandey....16

7. 131I-SPECT/CT and 18FDG-PET/CT – a complementary imaging approach in ectopic differentiated thyroid carcinoma....18
Claudiu Pește an....18

8. An 18F-FDG PET/CT Puzzlement. Adrenal Oncocytoma: A Case Report....22
Miruna Matei, Stefan Solomon, Lenuta Manoli, Catalin Mazilu, Raluca Mititelu....22

9. 18F-FDG PET/CT in diagnosing HCC associated portal vein tumor thrombosis....25
Alexandru Mitoi, Sandica Bucurica, Mirel Alexa, Simona Mazilu, Teodora Mititelu, Catalin Mazilu, Raluca Mititelu....25

10. Quantitative vs. Qualitative SPECT-CT in Bone Lesion Evaluation....27
Mario-Demian Mutuleanu, Conf. Dr.Mirela Gherghe....27

11. Extracardiac uptake of 99mTc-HMDP in ATTR amyloidosis....29
Claudiu Stan, Cristina Chirion, Dan Stanescu, Robert Adam, Gabriela Neculae, Sorina Badelita, Andreea Jercan, Daniel Coriu, Mirela Draghici, Camelia Dobrea, Razvan Capșa, Sebastian Onciul, Ruxandra Jurcuț....29

12. Perspectives on Targeted Therapies in the Management of Neuroendocrine Tumors: Possibilities, Limitations, Challenges....31
Stolniceanu Cati Raluca, Grierosu Irena, Statescu Ana Maria, Jalloul Wael, Ionescu Teodor, Vlad Ghizdovat, Volovat Constantin, Oana Olariu, Angela Oarza, Stefanescu Cipriana....31

13. Sentinel Lymph Node Biopsy in Breast Cancer Patients with Axillary Conversion after Neoadjuvant Chemotherapy—A Tertiary Centre Experience....32
Tatiana Lucia Șuta, Alexandra Maria Lazar, Mario-Demian Mutuleanu, Paula Monica Spiridon, Mirela Gherghe....32

14. Challenges in SPECT-CT imaging of parathyroid glands....34
Taciuc Alexandru, Țupea Claudiu, Ioana Ion-Alexandru, Gherghe Mirela....34

15. 177Lu-DOTATATE - The Rise and Downfall of a Multimetastatic Teratoma....36
Ruxandra Tibu, Laurentiu Agrigoroaie, Carmen Mihaela Antohie, Polixenia-Laura Grecu-Bodnariuc, Camilo Garcia....36

POSTERS

16. The importance of Multiphasic Bone Scintigraphy in the evaluation of bone pathologies..... 38
Andreea Baban, Diana Romedea, Ana- Maria Statescu, Vlad Ghizdovat 38

17. Optimization steps for image reconstruction using PET-CT equipment for small animals..... 40
Simona I. Băruță, Ilie A. Necșoiu, Livia E. Chilug, Dana Niculae 40

18. 99mTc-EDDA/HYNIC-TOC's role in detecting ACTH-secretant pituitary adenomas – a case report..... 41
Alexandru Ioan Bajenaru, Raluca Mihaela Mititelu 41

19. Comparative evaluation of SUVmax and aBSI in monitoring patients with metastatic prostate cancer..... 43
Nona-Alexandra Chelaru, Bianca-Simona Stoica, Mario-Demian Mutuleanu, Mirela Gherghe 43

20. The false negative aspect of the SPECT-CT and PET-CT examinations in a 20-year-old patient with metastatic triple-negative breast cancer. 45
Chirca Elena-Corina, Tatiana Lucia Șuta, Jamal Rabah, Mirela Gherghe 45

21. ^{64}Cu and ^{89}Zr – emerging radioisotopes produced at Radiopharmaceutical Research Centre @IFIN-HH 47
Diana Cocioabă, Radu Leonte, Roxana Cornoiu, Bogdan Burghelea, Radu Șerban, Dragoș-Andrei Niculae, Simona Băruță, Andrei Necșoiu, Dana Niculae 47

22. Peculiar uptake in malignant ascites in bone scintigraphy: A Case Report 49
Bianca Constantinescu, Miruna Matei, Catalin Mazilu, Raluca Mititelu 49

23. Importance of 18F-FDG PET/CT in radioiodine-refractory thyroid carcinoma 51
Dumitru Craciun, Mirel Alexa, Adina Mazilu, Mirela Oancea, Andrei Goldstein, Letitia Mititelu, Gabriela Voicu, Diana Neagu, Catalin Mazilu 51

24. Molecular imaging assessment in the management of a patient with recurrent multiple paragangliomas 52
Renato-Flavius Drobotă, Jamal Rabah, Tatiana Lucia Șuta, Mario Mutuleanu, Mirela Gherghe 52

25. Decoding the Silent Code: MPI Unveils Ischemia in Young Adult with RCA Hypoplasia..... 54
Iona Hrapșa, Diana Iancu, Letitia Mititelu, Catalin Mazilu, Raluca Mititelu, S. Stanciu 54

26. Nuclear medicine imaging - semiquantitative analysis in transthyretin cardiac amyloidosis: static vs spect 55
Ionescu Teodor Marian, Stolniceanu Cati Raluca, Jalloul Wael, Grierosu Irena, Țibu Ruxandra, Iacob Roxana, Ciocoiu Manuela, Lupușoru Raoul Vasile, Clement Alexandra, Sascău Radu-Andy, Petriș Octavian Antoniu, Ștefănescu Cipriana 55

27. The value of ^{18}F-FDG PET/CT in the management of a rare case of Erdheim-Chester Disease..... 56
Adriana Marcuseanu, D. Vasile, M. Budau, M.Gherghe 56

28. The assistance of 18F-FDG PET/CT in Prostate Cancer: A Case Report 58
Miruna Matei, Alin Mitoi, Alexandru Militaru, Claudiu. Patriche, Catalin Mazilu, Raluca Mititelu 58

29. Pericardial Malignancies Unveiled by 18F-FDG PET-CT: A Case Series..... 60
Miruna Matei, Iona Hrapșa, Catalin Mazilu, Dragos Cuzino, Raluca Mititelu 60

30. Typical Pulmonary Carcinoid with Atypical Metastasis: A Case Report 63
Miruna Matei, Bianca Constantinescu, Andreea Rosca, Catalin Mazilu, Raluca Mititelu 63

31. Pathological association of pulmonary amyloidosis and lung metastasis in a patient with colo-rectal adenocarcinoma 65
Micu Liliana, Mutuleanu Mario-Demian, Gherghe Mirela 65

32. Precision in Diagnosis: Unveiling Infective Endocarditis with 18F-FDG PET/CT Imaging ***69***
Alexandru Militaru, Diana Florentina Minea, Alexandru Mitoi, Letitia Mititelu, Simona Mazilu, Catalin Mazilu *69*

33. PET/CT dosimetry differences of oncological patients ***71***
Diana C. Neagu, G. Stanciu, O. Popa, I.M. Grosu, M. Bestelei, C. Chinde, A. Gutea, B.M. Cirstea, T. Ciprut, I.A. Chiriac *71*

34. Importance of decontamination protocols of the differentiated thyroid cancer patient admitted for ^{131}I therapy ***73***
Diana C. Neagu, A.L. Goldstein, I.A. Chiriac, M. Purice, F. Alexiu, G. Voicu, O.G. Duliu *73*

35. Production, characterization and translation of radioisotopes of medical interest at the Radiopharmaceuticals Research Center (IFIN-HH, CCR) ***75***
Ilie Andrei Necșoiu, Silvia Diana Cocioabă, Simona Ionela Băruță, Maria Roxana Tudoroiu-Cornoiu, Radu Anton Leonte, Dana Niculae *75*

36. Beyond the pixel: Unmasking artifacts in pediatric 99mtc-dtpa scans ***76***
Georgiana Prisacariu, Laura Bejinariu, Irena Cristina Grierosu, Ruxandra ,Țibu, Ana Maria Stătescu, Magdalena Stârcea, Cipriana Ștefănescu *76*

37. 99mTc-Tektrotyd Scintigraphy Shining upon Neuroendocrine Tumors ***78***
Angela Oarza, Cati-Raluca Stolniceanu, Alexandru Florescu, Irena Cristina Grierosu, Oana Olariu, Rares Stamate, Cipriana Stefanescu *78*

38. The role of 99mtc-edda/hynic-toc scintigraphy in the management of a bilateral glomus tumor ***79***
Jamal Rabah, Renato-Flavius Drobotă, Tatiana Lucia Șuta, Mirela Gherghe *79*

39. Hiding in Plain Sight: Atypical Presentation of Giant Ureteral Lithiasis in a Child ***81***
Iulia O. Roată, I.C. Grierosu, A.M. Stătescu, M.I. Stârcea, C. Ștefănescu *81*

40. Congenital hypothyroidism, risk factor for autism spectrum disorder ***82***
Paula Spiridon, Diana Neagu, Gabriela Voicu, Andrei Liviu Goldstein, Iuliana Gherlan *82*

41. The Utility of PET-CT in Prognostic Evaluation of Ovarian Cancer ***84***
Paula Monica Spiridon, Cătălin Mazilu, Dragoș Cuzino, Raluca Mititelu *84*

42. Extraosseous liver uptake of 99mTc-HDP in breast cancer patient- clinical case ***85***
Bianca-Simona Stoica, Nona-Alexandra Chelaru, Mirela Gherghe *85*

ORAL PRESENTATIONS

1. FDG-PET/CT in Extraskeletal Ewing Sarcoma: Imaging Insights and Clinical Implications

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Introduction

Extraskeletal Ewing Sarcoma (EES) is a rare and aggressive soft tissue malignancy posing diagnostic challenges due to its diverse clinical presentations and histopathological similarities to other tumors. Conventionnal imaging has an essential role in the diagnostic work-up for primary lesion characterisation, but its negative predictive value for regional and distant metastasis is insufficient, a lack filled by the addition of FDG-PET/CT.

This clinical case aims at presenting the clinical role of FDG-PET/CT at initial work-up, after neoadjuvant chemotherapy, and in follow-up after surgery of a primary pelvic EES.

Case presentation

A 27 years female patient presents with a 2 year history of mictional troubles in aggravation with standard imaging work-up showing a large pelvic mass. Biopsy proves the sarcomatous origin of the lesion, with FISH technique positive for Ewing sarcoma. Complementary work-up with FDG-PET/CT visualised the primary lesion with favourable metabolic phenotype, without additional sites of disease detected.

Discussion

After initial staging, a therapeutic strategy for locally advanced Ewing sarcoma was chosen. Neoadjuvant chemotherapy with FDG-PET/CT for therapeutic evaluation showed an excellent partial response and histological exam of the postsurgical specimen found almost complete necrosis of the tumor. Follow-up FDG-PET/CT was reassuring, without any sign of relapse.

Conclusion

As showcased by this clinical case, the integration of FDG-PET/CT into multimodal treatment algorithms for EES contributes in optimizing therapeutic strategies and in delivering important prognostic data.

FDG-PET/CT în Sarcomul Ewing Extrascheletal: Perspective Imagistice și Implicații Clinice

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Introducere

Sarcomul Ewing extrascheletal (EES) este o malignitate rară și agresivă a țesuturilor moi, care prezintă provocări de diagnostic datorită prezentărilor sale clinice diverse și asemănărilor histopatologice cu alte tumori. Imagistica convențională are un rol esențial în evaluarea diagnosticului pentru caracterizarea leziunii primare, dar valoarea sa predictivă scaută pentru metastazele regionale și la distanță este insuficientă, o lipsă completată prin adăugarea FDG-PET/CT.

Acest caz clinic își propune să prezinte rolul clinic al FDG-PET/CT la controlul inițial, după chimioterapie neoadjuvantă și în urmărirea după intervenția chirurgicală a unui EES pelvin primar.

Prezentarea cazului

O pacientă de 27 de ani prezintă un istoric de 2 ani de tulburări micționale în agravare cu examen imagistic standard care arată o masă pelvină mare. Biopsia dovedește originea sarcomatoasă a leziunii, cu tehnica FISH pozitivă pentru sarcomul Ewing. Examenul complementar cu FDG-PET/CT a vizualizat leziunea primară cu fenotip metabolic favorabil, fără alte locuri de boală detectate.

Discuţii

După stadializarea inițială, a fost aleasă o strategie terapeutică pentru sarcomul Ewing local avansat. Chimioterapia neoadjuvantă împreună cu FDG-PET/CT pentru evaluarea terapeutică a arătat un răspuns parțial excelent și examenul histologic al specimenului postchirurgical a constatat necroza aproape completă a tumorii. Urmărirea FDG-PET/CT a fost liniștitoare, fără niciun semn de recidivă.

Concluzie

După observarea acestui caz clinic, integrarea FDG-PET/CT în algoritmi de tratament multimodal pentru EES contribuie la optimizarea strategiilor terapeutice și la furnizarea de date importante de prognostic.

2. Factors affecting accuracy in SUV measurements

Cecan Maria-Iulia

Prof. Dr. Ion Chiricuță Institute of Oncology, Department of Nuclear Medicine, Cluj-Napoca
CT Clinic – Affidea, PET/CT Department, Cluj-Napoca

The most common parameter used to measure the uptake of various radiopharmaceuticals, mainly F18-FDG, in PET/CT studies, is SUV (standardized uptake value) (1).

Generally, less differentiated tumors are associated with higher levels of F18-FDG accumulation and a poor prognosis, while well-differentiated and benign lesions are associated with lower uptake. In order to evaluate the response to treatment, from a metabolic point of view, especially in borderline lesions, it is important to understand and assume that many variables can affect and influence the SUV value. There are biological factors which can affect the F18-FDG distribution in the body such as body size measurement, blood glucose level and uptake time; technical factors such as image acquisition and reconstruction parameters, scanner variability, quality control procedures or region of interest (ROI) method, can make a difference in F18-FDG quantification (2).

Another important aspect for an accurately measuring of SUV is the F18-FDG administration; the net administrated F18-FDG dose should be known exactly. The residual radioactivity in medical materials such as serum line tubes, catheters, syringes, needles used during intravenous injection can affect SUV measurement. In order to minimize this activity, proper administration procedures should be implemented. Automatic dose dispenser and administering system can assure that the tracer is injected and the residual activity is minimal or must be measured so that it can be accounted. Also, when using low dose of activity, as in the case of pediatric patients, incorrect values of net injected dose can lead to incorrect SUV quantification (3). Due to the fact that PET/CT is widely used for treatment response evaluation and therapeutic decision factor, confident measurements are needed.

Keywords: SUV quantification, residual activity, F18-FDG

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Erori în cuantificarea SUV

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SUV (standardized uptake value) reprezinta concentrația radiofarmaceuticului injectat într-un anumit punct de interes, în principal F18-FDG, în evaluarea PET/CT (1).

În general, tumorile slab diferențiate sunt asociate cu niveluri crescute de F18-FDG și cu un prognostic nefavorabil, iar cele bine diferențiate respectiv leziunile benigne, sunt asociate cu o captare mai scazuta. Pentru evaluarea raspunsului la tratament, din punct de vedere metabolic, în special în leziunile borderline, este important să înțelegem și să asumam faptul că multe variabile pot afecta și influența valoarea SUV. Există o categorie de factori biologici care pot afecta distribuția F18-FDG în organism, cum ar fi greutatea pacientului, nivelul glicemiei și perioada de uptake. Factorii tehnici, precum parametrii de achiziție și reconstrucție a imaginii, variabilitatea scanerului, procedurile de control al calității sau metoda prin care se stabilește regiunea de interes (ROI), pot face diferența în cuantificarea F18-FDG (2).

Un alt aspect important pentru o evaluare precisă a valorii SUV este administrarea F18-FDG; trebuie cunoscută cu exactitate doza de F18-FDG administrată. Radioactivitatea reziduală din materialele medicale, cum ar fi catetere, perfuzoare, seringi sau ace utilizate în timpul injectării intravenoase poate afecta măsurarea SUV. Pentru a minimiza această activitate reziduală, trebuie implementate proceduri de administrare adecvate. Dispenserul automat de doze și sistemul de injectare automat, pot asigura ca trasorul să fie injectat cu precizie iar activitatea reziduală este una minimă sau necesită o calibrare astfel încât să poată fi contabilizată. De asemenea, atunci când se utilizează doze mici de activitate, ca și în cazul pacienților pediatrici, valorile incorecte ale dozei injectate pot duce la cuantificarea eronată a SUV (3). Datorită faptului că examinarea PET/CT este des utilizată pentru evaluarea răspunsului la tratament și este considerată ca fiind factor decizional în conduita terapeutică, este necesara cuantificarea cu acuratețe a valorii SUV.

Cuvinte cheie: cuantificarea SUV, activitate reziduală, F18-FDG

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3. Gülaldi NCM, Cagdas B, Görtan FA. Optimization of SUV with Changing the Dose Amount in F18-FDG PET/CT of Pediatric Lymphoma Patients. Curr Radiopharm. 2022;16(2)

3. Case review of Breast Implant Associated with Anaplastic Large Cell Lymphoma

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Aim/Introduction

PET/CT with ^{18}F-Fluorodeoxyglucose (^{18}F-FDG) is a well-established method for staging hemato-oncological disease and restaging by assessing a patient's response to therapy. The purpose of this case review is to present a rare case of Breast Implant Associated with Anaplastic Large Cell Lymphoma (BIA-ALCL) which is a subtype of non-Hodgkin's lymphoma. In addition to BIA-ALCL, the patient exhibited a unique autoimmune response, presenting in a manner that resembled Systemic Lupus Erythematosus (SLE).

Materials and Methods

A 45-year-old woman presents with inflammation, redness and purulent discharge on the incision scar, SLE and a diagnosis of BIA-ALCL for the right breast. The immunohistochemistry biopsy was CD30 positive and ALK negative which sustained the diagnosis of BIA-ALCL. The imaging examinations that she had done prior to PET/CT were ultrasound and MRI with a score of BIRADS of 4c. The patient fasted for 6 hours and the acquisition of images was made using a PET/CT dedicated scanner.

Results

PET/CT with ^{18}F-FDG showed bilateral retropectoral, axillary and internal mammary adenopathies FDG avid. The right breast had periprosthetic fluid accumulation and high metabolic activity especially in the prepectoral region with invasion into the thoracic wall. Also a small lesion was seen on the left side of the breast at the exterior margin. Following bilateral mammary capsulectomy and three cycles of chemotherapy with immunotherapy (Brentuximab vedotin), the follow-up PET/CT scan revealed a notable absence of metabolic activity in the breast. Moreover, the previous-affected axillary lymph nodes showed no metabolic activity. The post-surgery biopsy findings indicated solely inflammatory activity, with no evidence of disease extension from the primary site of origin.

Discussions

Studies indicated that textured implants have a higher risk of developing BIA-ALCL and it is estimated that the incidence is 1 per 4000 cases [1]. Without precise data related to the incidence of complications associated with breast implants poses a difficulty in accurately tracking these metrics. Additionally, immune involvement such as SLE can also appear as an independent factor that may manifest after breast augmentation [2]. In the context of this case, it appears that immune-related complications have surfaced concurrently with BIA-ALCL. Therefore respecting the recommended

guidelines and performing PET/CT examinations before and after treatment every 3 to 6 months has allowed physicians to choose and adapt the best therapy

Conclusion

The utilization of PET/CT with ^{18}F-FDG in staging this rare and emerging disease is being shown as the right method according to recent updates in guidelines. This coordinated approach enables a thorough assessment of disease progression, showcasing successful outcomes in this case.

Keywords: Breast Implant Associated with Anaplastic Large Cell Lymphoma, PET/CT, ^{18}F-FDG

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4. Distinguishing between lymphoma and other pathologies on 18F FDG PET-CT – a practical approach

Dr. Diana Ene
Belgium

F18 FDG PET-CT is nowadays paramount in the various phases of management of lymphoma.
In the initial diagnosis of enlarged lymph nodules or of a lesion of unknown etiology or of a fever of unknown origin (FUO), often the lymphoma arises as one of the possible differential diagnosis.
The initial diagnosis of lymphoma on PET-CT images remains challenging because of the frequent overlapping between metabolic features in with various infectious or inflammatory diseases. Other types of cancer may exhibit similar presentation on the PET-CT images.

Location, distribution and morphology of active lesions and the intensity of the uptake can give clous to differentiate between lymphoma and other pathologies with quite similar metabolic presentation.

Morphologic imaging and clinical history are also very helpful.

Some tips and tricks will be discussed, allowing to do an educated guess in complicates cases.

Keywords: FDG PET CT, lymphoma, differential diagnosis

Diagnosticul diferential intre limfom si alte tipuri de patologie pe imaginile F18 FDG PET CT

Dr. Diana Ene
Belgium

F18 FDG PET CT este in zilele nostre de neinlocuit in toate fazele managementului limfomului. Limfomul apare frecvent ca unul dintre diagnosticele diferentiale in bilantul initial al adenopatiilor generalizate, al anumitor leziuni a caror etiologie nu este cunoscuta sau in diagnosticul initial al febrei de origine neprecizata.

Diagnosticul initial al limfomului pe imaginile FDG PET CT ramane dificil datorita suprapunerii frecvente cu aspectul metabolic al anumitor bolilor infectioase sau inflamatorii. Alte tipuri de cancer pot avea prezentari metabolice asemanatoare.

Localizarea, distributia si morfologia leziunilor active precum si intensitatea captarii pot da indicatii pentru a putea diferentia intre un limfom si alte patologii cu prezentare metabolica asemanatoare.

Imagistica morfologica si contextul clinic sunt deasemena deoebit de utile.

Anumite caracteristici imagistice tipice vor fi discutate care permit orientarea diagnosticului de catre medicul nuclearist.

Cuvinte cheie: limfom, FDG PET CT, diagnostic diferential

5. There's More On Bone Scintigraphy That Metastatic Lesions: Non-Metastatic Findings On Bone Scan In Our Departament

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Introduction

Bone scintigraphy is a diagnostic imaging technique widely used for both neoplastic and non-neoplastic bone diseases, that sometimes leads to incidental discoveries of benign lesions in oncologic patients. Nowadays, it is freely available and has whole-body capability and high-contrast resolution given by the computed tomography component. When coupled with single-photon emission computed tomography/computed tomography (SPECT/CT), it can be utilized to provide precise anatomical localization, attenuation correction, therefore offering a better lesion localization: the main advantage of SPECT/CT over planar and/or stand-alone SPECT.

Methods and Results

We present our experience gained between 2020 and 2024 related to benign lesions identified on bone scans in the Nuclear Medicine Laboratory of Suceava County Hospital where out of a total of about 1500 bone scans, 98 identified benign bone pathology; all images are acquired on a General Electric NM680 SPECT/CT.

Conclusions

There are many known types of bone tumors, more or less common, most of them being benign. However, they can cause problems by structurally weakening the bones, interfering with joint movement, or destroying nearby healthy tissue. They are usually not life-threatening but can resemble a cancerous tumor or a metastatic lesion on planar images, in this cases SPECT/CT should be a routine imaging technique, fully integrated into the clinical decision-making process for an accurate diagnosis.

Keywords: Scintigraphy, bone, SPECT/CT

6. Diagnostic Accuracy of 68Ga-PSMA-11 PET/CT and Conventional Imaging for initial staging of Intermediate and High-risk Prostate cancer patients

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Introduction

Transrectal-ultrasound (TRUS)-guided prostate biopsy has been the standard diagnostic approach with high sensitivity and specificity for prostate cancer (PCa), however, multi-parametric MRI (mpMRI) has shown optimistic results in diagnosis, localization, and staging of clinically significant PCa patients. Bone scan is recommended for both the staging and therapy response assessment of skeletal metastases from prostate cancer. However, it has limited sensitivity and specificity for detection of bone metastasis.

Prostate-specific Membrane Antigen (PSMA) is expressed in prostate tissue and often shows a substantial overexpression on PCa cells. Thus, PET/CT using the PSMA inhibitorradiotracer ^{68}Ga-HBED-CC (^{68}Ga-PSMA-11) has the potential to improve the sensitivity and specificity for preoperative lymph node (LN) staging. However, the relative worth of pelvic mpMRI and ^{68}Ga-PSMA-11 PET/CT for the LN staging of PCa is still unknown. Therefore, the present study is aimed to assess the diagnostic accuracy of ^{68}Ga-PSMA-11 PET/CT and conventional Imaging (mpMRI & bone scan) for initial staging of intermediate and high-risk PCa patients.

Materials and methods

Histopathologically proven PCa patients were included in this study, those underwent both conventional imaging (mpMRI & bone scan) and ^{68}Ga-PSMA PET/CT scan. Bone scan was performed to know the presence of skeletal metastasis in PCa patients.

Acquired radiological (mpMRI) and nuclear images (bone scan & PET/CT) were visually analysed by experienced radiologists and nuclear medicine physicians, respectively. Serum Prostatic specific antigen (PSA) level and Gleason score were used for risk stratification (intermediate and high risk) of PCa patients as per latest guidelines of European Association of Urology (EAU).

Results

Forty (40) patients with the mean age of 65.4±8.05 years were prospectively included in this study. Median serum PSA level was found to be 18.19 ng/ml (range 3.65-170). As per latest EAU guidelines, on the basis of serum PSA level and Gleason score, 18/40 (45%) patients had intermediate risk and remaining, 22/40 (55%) patients had high risk PCa. Of 40 patient, 27 (67.5%) patients showed concordance and 13 (32.5%) patients showed discordance for detection of LN involvement on both mpMRI and 68Ga-PSMA-11 PET/CT.

Of 27 concordant patients, 4 (15%) patients showed LN involvement and remaining 23 (85%) patients had no LN involvement on both mpMRI and PET/CT. Of 13 discordance patients, 9 (69%) patients had LN involvement on PET/CT, and remaining 4 (31%) patients showed LN involvement

on mpMRI. Of 40 patient, 33 (82.5%) patients showed concordance and 7 (17.5%) patients showed discordance for detection of seminal vesicles involvement on both mpMRI and 68Ga-PSMA-11 PET/CT. Of 33 concordant patients, 5 (~15%) patients showed seminal vesicles involvement and remaining 28 (~85%) patients had no seminal vesicles involvement on both mpMRI and PET/CT. Of 7 discordance patients, 2 (28.6%) patients had seminal vesicles involvement on PET/CT, and remaining 5 (71.4%) patients showed seminal vesicles involvement on mpMRI. Of 40 patients, only 6 (15%) patients showed skeletal metastasis on bone scan.

Conclusion

^{68}Ga-PSMA-11 PET/CT scan can replace conventional imaging (mpMRI and Bone scan) for the initial staging of lymph node (N) and distant metastasis (M)for intermediate and high-risk PCa patients. For T staging mpMRI is better than ^{68}Ga-PSMA-11 PET/CT scan, especially for seminal vesicle in these patients.

7. 131I-SPECT/CT and 18FDG-PET/CT – a complementary imaging approach in ectopic differentiated thyroid carcinoma

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Differentiated thyroid carcinoma (DTC) usually is a slow growing neoplasm, the most common type being the papillary form, corresponding to more than 80% of cases (1). Some clinical and pathological aspects may predict an aggressive tumor behavior. These features are the patient age, tumor size and presence of tumor invasion, distant metastases, and dedifferentiation of the tumor (2). It has been noticed that some recurrences have been reported without having these clinico-pathological findings (1). Thus, The American Thyroid Association recommends that the one management approach should be based on the initial risk stratification and tailored during follow-up as additional data accumulate as a response to therapy.

The initial risk dictates the extent of surgery, the indication for radioiodine ablation, the need for external beam therapy or other systemic therapies (3), but during the monitoring process, the risk reassessment should be performed in order to adapt the follow-up strategy and create the most suitable diagnostic and therapeutic steps for the best clinical response.

Radioiodine whole-body scan is an essential diagnostic tool in DTC management, but in cases of equivocal uptake, the ^{131}I-SPECT/CT could bring additional information about non-iodine-avid lesions and can provide structural information about equivocal lesions (3). In 24-35% from cases radioiodine SPECT-CT may change the treatment strategy (3).

Ectopic thyroid tissue (ETT) is a rare developmental abnormality of the thyroid. Papillary thyroid carcinoma (PTC) is the most common malignant transformation in this case, a particularity where ^{131}I-SPECT/CT could add information able to reveal new therapeutic needs.

^{18}FDG-PET/CT is primarily considered in high-risk DTC patients with elevated serum Thyroglobulin with negative whole-body scan. The sensitivity of ^{18}FDG-PET/CT was 83% and the specificity was 84% in non–^{131}I-avid DTC(4).

In ETT, ^{131}I-SPECT/CT and ^{18}FDG-PET/CT are imaging tools leading to useful information about equivoque situations and tumor aggressiveness, tools that should be considered when the clinical presentation requests.

We highlight the aspects of a study case of patient with DTC in which the hybrid nuclear imaging tests ^{131}I-SPECT/CT and ^{18}FDG-PET/CT were essential for the right therapeutic strategy.

Keywords: ectopic thyroid tumor, ^{18}FDG-PET/CT, ^{131}I-SPECT/CT

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131I-SPECT/CT și 18FDG-PET/CT – o abordare imagistică complementară în carcinomul tiroidian diferentiat ectopic

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Carcinomul tiroidian diferențiat (CTD) este de obicei un neoplasm cu creștere lentă, cel mai frecvent tip fiind cel papilar, corespunzând la peste 80% din cazuri (1). Unele aspecte clinice și patologice pot prezice un comportament tumoral agresiv. Aceste caracteristici sunt: vârsta pacientului, dimensiunea tumorii și prezența invaziei tumorale, a metastazelor la distanță și dediferențierea tumorii (2). S-a observat că unele cazuri de recidivă au fost raportate fără a exista aceste aspecte clinico-patologice (1).

Astfel, American Thyroid Association recomandă ca stategia de management a bolii să se bazeze pe evaluarea inițială a riscului și să fie adaptată pe măsură ce apar noi date suplimentare ca răspuns la terapie. Riscul inițial dictează amploarea intervenției chirurgicale, indicația pentru ablația cu iod radioactiv, necesitatea radioterapiei externe sau a altor terapii sistemice (3), dar în timpul procesului de monitorizare trebuie efectuată reevaluarea riscului pentru a adapta strategia de follow-up și a stabili cei mai potriviti pași diagnostici și terapeutici pentru cel mai bun răspuns clinic.

Scanarea de corp întreg cu iod radioactiv este un instrument de diagnostic esențial în managementul CTD, dar în cazurile de captare echivocă, ^{131}I-SPECT/CT ar putea aduce informații suplimentare despre leziunile nefixante și poate oferi informații structurale despre leziunile echivoce (3). În 24-35% din cazuri, ^{131}I-SPECT/CT poate modifica strategia de tratament (3). Țesutul tiroidian ectopic (ETT) este o anomalie rară de dezvoltare a tiroidei.

Carcinomul papilar tiroidian (PTC) este cea mai frecventă transformare malignă in acest caz, o particularitate în care ^{131}I-SPECT/CT ar putea adăuga informații capabile să identifice noi nevoi terapeutice.

^{18}FDG-PET/CT intră în dicuție în primul rând la pacienții cu CTD cu risc crescut cu valoarea crescută a tiroglobulinei serice, cu scanare de corp întreg negativă. Sensibilitatea ^{18}FDG-PET/CT este de 83% și specificitatea este de 84% în CTD cu leziuni enfixante (4).

În ETT, ^{131}I-SPECT/CT și ^{18}FDG-PET/CT sunt instrumente imagistice care conduc la informații utile despre situațiile echivoce și agresivitatea tumorii, instrumente care ar trebui luate în considerare atunci când prezentarea clinică o solicită.

Vom prezenta aspectele unui studiu de caz al unui pacient cu CTD în care examinările de imagistică nucleară hibridă ^{131}I-SPECT/CT și ^{18}FDG-PET/CT au fost esențiale pentru strategia terapeutică corectă.

Cuvinte cheie: tumoră tiroidiană ectopică, ^{18}FDG-PET/CT, ^{131}I-SPECT/CT

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8. An 18F-FDG PET/CT Puzzlement. Adrenal Oncocytoma: A Case Report

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Introduction

Adrenal oncocytomas are a rare entity, more commonly diagnosed in female patients. [1] Other sites where oncocytoma may arise include the kidney, thyroid and salivary glands.[2] The aim of this report is to underline the importance of ^{18}F-FDG PET/CT in evaluating the metabolic activity of an adrenal incidentaloma and, as well, its utility as a follow-up method.

Case Description

We present a case of a 65-year-old male patient, a former smoker, known with a history of a pulmonary neuroendocrine carcinoma with large cells (LCNEC). The pulmonary tumor had a diameter of 26/20/20 mm and was located in the superior segment of the right inferior lobe. An inferior right lobectomy associated with a mediastinal lymphadenectomy were performed in 2022, which were followed by histopathological studies and immunohistochemical staining showing a poorly differentiated (G3), CD56+, C-Kit+, Syn-, CGA- with a variable expression of PD-L1 in 69% of the cells, with lymph node extension (interlobar).

A Contrast Enhanced Computed Tomography (CECT) scan was performed in order to assess the disease extension, on which an enhanced, well-defined solid nodule measuring 18/20 mm was discovered in the medial limb of the left adrenal gland, thus raising the suspicion of an adrenal metastasis.

The patient underwent a PET/CT scan with ^{18}F-FDG two months after surgery, which revealed moderate uptake of the radiotracer in the right inferior paratracheal and subcarinal nodes and high metabolic activity of the left adrenal nodule with a SULmax of 7.53.

Due to the aggressive nature of the pulmonary tumor, which presented high anaplastic features and the radiological and molecular imaging studies were highly suggestive of a distant metastasis, the patient underwent a left adrenalectomy. The histopathological report and immunohistochemical staining results were compatible with the diagnosis of adrenal oncocytoma (CROMO-, S100-, Ki67 2%).

Two additional ^{18}F-FDG PET/CT scans were performed as follow-up, both examinations showed no metabolic activity suggestive of regional or distant recurrence of the disease.

Discussion

Oncocytomas are tumors consisting of epithelial cells (oncocytes) which have a highly granular and eosinophilic cytoplasm and an abnormal accumulation of mitochondria.[1] Adrenal oncocytomas are

usually benign findings and non-functioning, there have been cases described in the literature of borderline, malignant and functioning tumors. They have a ranging size of 3 to 15 cm [3].

Radiologic differential diagnosis can be difficult in some cases of adrenal tumors, especially in the case of adrenal oncocytoma as they can display features often present in other tumors, such as carcinoma.[4] In these situations, molecular imaging studies may be recommended. A study made by Yun et al. [5] showed that the PET/CT scan managed to characterize adrenal lesions detected on CT or MRI with a sensitivity of 100%, specificity of 94% and accuracy of 96%. Other studies reported the incidental discovery of the adrenal lesion in an asymptomatic patient.[6]

In our case, due to the history of the patient, presenting with an aggressive pulmonary tumor (LCNEC with high anaplastic signs - synaptophysin and chromogranin negative), a left adrenal tumor with high avidity for ^{18}F-FDG, with a diameter less than 3 and no symptoms suggestive of Cushing's syndrome or pheochromocytoma - the suspicion of an adrenal metastasis was highly likely.

There have been other studies where PET/CT scan was not capable of distinguishing between a malignant and benign tumor [7], with Acar et al [8] reporting a lesion with a high uptake value that proved to be benign and Gilardi et al [9] reporting a benign lesion that grew in size and changed its uptake value, thus mimicking a malignant behavior.

In a study made by Son et al [10], they presented a case with an oncocytoma which was determined to be borderline that recurred four years after the surgery, thus presenting the importance of PET/CT follow-ups in adrenal lesions.

Conclusion

While benign adrenal lesions usually don't display high avidity for ^{18}F-FDG, oncocytomas may demonstrate a variable uptake. Thus, adrenal oncocytomas should be considered in the differential diagnosis of adrenal tumors. In such cases, the PET/CT scan is a powerful tool as a follow-up protocol.

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9. 18F-FDG PET/CT in diagnosing HCC associated portal vein tumor thrombosis

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Introduction

Hepatocellular carcinoma (HCC) ranks fourth in terms of overall cancer incidence, making it one of the most prevalent forms of cancer. Discovering that most HCC patients are in advanced stages misses the opportunity for aggressive therapy and results in a worse outlook.

The invasion of the portal veins, in particular, is associated with a significant adverse prognostic risk for hepatocellular carcinomas, which occur in 20% to 70% of cases[1].

Materials and methods

This review focused on using 18F-FDG PET-CT to detect portal venous tumor thrombosis (PVTT) in hepatocellular carcinoma. We evaluated PET-CT in this scenario, specifically looking at SUVmax as a biomarker for distinguishing thrombosis

Studies have focused on the relationship between SUVmax and HCC histological grade, PVTT FDG absorption patterns, and the effects of curative treatments. This project aims to improve the detection and treatment of HCC with PVTT.

Discussion

18F-FDG PET/CT is essential for HCC diagnosis, staging, and therapeutic efficacy. Poorly differentiated carcinomas in HCC exhibit increased FDG uptake, while well-differentiated variations demonstrate reduced uptake, reflecting the influence of the tumor's histological grade on tumor glucose metabolism.

PET/CT is effective at detecting HCC relapses after treatment and recognizing PVTT.

Because of their distinct approaches, benign and malignant thrombus must be distinguished.

Patients with liver tumor lesions that exhibited strong metabolic activity had a significantly higher incidence of malignant thrombosis. Malignant thrombosis was more common in liver tumor lesions with high metabolic activity.

The 18F-FDG uptake patterns, either diffuse, linear, or localized, matched those of a tumor thrombus. SUVmax values exceeded 3.35, which is above benign thrombi thresholds in the literature.

Hu, Xu-Guang et al.[2] helped determine the prognostic value of 18F-FDG uptake in PVTT for advanced HCC, their data show that SUVmax values exceeding 4.65 predict inferior progression-free survival (PFS) and overall survival (OS). Also FDG uptake in portal vein tumor is an independent predictive factor for PFS and OS.

Conclusion

PET/CT is crucial in distinguishing between malignant and benign portal vein tumor thrombosis, with higher SUVmax values indicating aggressive tumor behavior and a worse prognosis.

It also helps identify recurrence post-treatment, offering vital data for treatment planning and improving HCC management, particularly in patients with portal vein tumor thrombosis.

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10.Quantitative vs. Qualitative SPECT-CT in Bone Lesion Evaluation

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Introduction
Recognizing the growing significance of quantitative molecular imaging and the demand for objective and reproducible image analysis, we aim to underscore the advantages of conducting a quantitative interpretation of single photon emission computed tomography-computed tomography (SPECT-CT) studies in comparison to qualitative methods when evaluating bone lesions.

Materials and methods
Prospective monocentric study was conducted on 70 female patients who underwent SPECT-CT bone scans using technetium- hydroxydiphosphonate [^{99m}Tc–HDP] that identified the presence of metastatic bone lesions and degenerative lesions in each patient. The highest one to five SUVmax values for both metastatic and degenerative bone lesions were identified in each patient and the data were then statistically analyzed. The results of the study were compared to the data published in the literature to correlate and better understand the capabilities of quantitative SPECT-CT in bone lesion evaluation

Results
Numerous studies have explored the diagnostic accuracy of quantitative and qualitative SPECT-CT in distinguishing between benign and metastatic bone lesions. We first compiled sensitivity and specificity values between our results 91.5% and 93.3% respectively, and the ones from the literature. Further analysis of the data were performed between the two methods used for image interpretation revealing a range of 74–92% and 81–93% for quantitative bone SPECT-CT and 60–100% and 41–100% for qualitative bone SPECT-CT, showing how much the results depend on the reviewer's experience when the qualitative method is used. We also consider that one of the possible explanations for obtaining the 100% "perfect" results can be found in the subjectiveness of the characterization criteria used by each group for lesion evaluation.

Conclusions
Both qualitative and quantitative SPECT-CT demonstrate enhanced potential in effectively discerning between benign and metastatic bone lesions. However, quantitative SPECT-CT provides additional objective information, contributing to heightened diagnostic accuracy and facilitating the evaluation of treatment response through precise measurements.

Keywords: quantitative analysis; SPECT-CT; metastatic bone disease.

Avantajele analizei cantitative vs. calitativa prin imagistica hibrida SPECT-CT in evaluarea leziunilor osoase la pacientii oncologici

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Introducere

Recunoscând importanța in crestere a imagisticii moleculare cantitative și necesitatea unei analize obiective și reproductibile a imaginilor, ne propunem să evidențiem avantajele efectuării unei interpretări cantitative a studiilor de tomografie cu monoemisie de fotoni-computer tomografie (SPECT-CT) în comparație cu metodele calitative în evaluarea leziunilor osoase la pacientii oncologici.

Materiale și metode

Am realizat un studiu prospectiv pe un lot format din 70 de paciente de sex feminin care au efectuat scintigrafii osoase SPECT-CT cu radiotrasor osteotrop tehnetiu-hidroxidifosfonat [^{99m}Tc]–HDP, in urma carora au fost identificate atat leziuni osoase metastatice cat și leziuni degenerative la fiecare pacienta. Au fost masurate valorile SUVmax de la una la maxim cinci leziuni atat in cazul leziunilor osoase metastatice cat și pentru cele degenerative, datele fiind mai apoi analizate din punct de vedere statistic. Rezultatele studiului au fost comparate cu datele publicate în literatură pentru a corela și a înțelege mai bine capacitățile analizei cantitative SPECT-CT în evaluarea leziunilor osoase.

Rezultate

Mai multe studii au evaluat performanta diagnostică a imagisticii de tip SPECT-CT cantitative și calitative în diferențierea între leziunile osoase benigne și metastatice. Intr-o prima etapa a studiului au fost determinate valorile de sensibilitate și specificitate obtinute in urma analizei datelor proprii acestea fiind de 91,5% și respectiv 93,3%, comparandu-le apoi cu cele din literature. In a doua etapa au fost comparate valorile sensibilității și specificității obtinute prin cele doua metode de interpretare a imaginilor si anume cantitativa si calitativa; s-au obtinut valori ale sensibilitatii intre 74–92% si specificitatii 81–93% pentru analiza SPECT-CT cantitativa, respectiv 60–100% și 41–100% pentru cea calitativa, aratând astfel influența experienței medicului asupra interpretării datelor imagistice atunci când este utilizată metoda calitativă. De asemenea, luăm în considerare că una dintre explicațiile posibile pentru obținerea rezultatelor „perfecte” de 100% poate fi găsită în subiectivitatea criteriilor de caracterizare folosite de fiecare pentru evaluarea leziunilor.

Concluzii

Atât analiza SPECT-CT calitativa, cât și cea cantitativă, demonstrează un potențial crescut în diferentierea eficientă între leziunile osoase benigne și metastatice. Cu toate acestea, analiza SPECT-CT cantitativa furnizează informații obiective suplimentare, contribuind cresterea acurateței de diagnostic facilitând evaluarea mai exacta a răspunsului la tratament.

Cuvinte-cheie: analiză cantitativă; SPECT-CT; leziuni osoase

11.Extracardiac uptake of 99mTc-HMDP in ATTR amyloidosis

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Preamble

Amyloidosis is a heterogeneous group of diseases caused by extracellular deposition of insoluble fibrils. Among the 9 types of fibrillar proteins that lead to restrictive cardiomyopathy, 98% are represented by AL and ATTR. The study of extracardiac uptake (ECU) of radiotracers has been less studied, and the evaluation of multisystem localization would have diagnostic and prognostic value.

Objective

We aimed to retrospectively evaluate all consecutive symptomatic cases of ATTR amyloidosis, hereditary with several variants of the TTR mutation (ATTRv) or degenerative, wild-type (ATTRwt) amyloidosis. We re-evaluated all SPECT and WB acquisitions to detect if there was extracardiac uptake in the soft tissues.

Findings

In the period 01.2017 – 12. 2023, we studied all the 260 referred patients, for the screening or confirmation of cardiac amyloidosis. G2 or G3 Perugini score was found in 18 patients with ATTRv amyloidosis of which: 16 with ATTRGlu54Gln, one with ATTRIle127Val and one with ATTRGlu89Val. We also studied 8 patients with ATTRwt amyloidosis. We performed whole body and static acquisitions for all patients. Of the 26 patients with positive scintigraphy, 24 performed SPECT, 2 patients could not maintain long-term clinostatism, and one of them could not perform abduction of the upper limbs above the head.We did not discover the extracardiac accumulation of the radiotracer in any symptomatic patient with CA-ATTR variant or wild type.

We detected in one patient (NG) a diffuse uptake at the level of the descending colon, but this was also found in patients with an oncological indication for bone scintigraphy, being probably related to an irritable colon or rectocolitis. We did not detect pleuro-pulmonary or renal uptake in any patient examined scintigraphically. We discovered both in ATTRv and wt amyloidosis patients, an uptake at the level of the free wall of the right ventricle, of course of lower intensity than that at the level of the left ventricle, probably due to the different thickness of the walls.

Conclusion

The absence of extracardiac uptake in scintigraphically evaluated patients may be a characteristic of the TTR gene mutation variant, 88.8% of the investigated patients having the ATTRGlu54Gln mutation or it was not detected due to the small study group. Although in WT amyloidosis, cardiac localization is always present, the cases of extracardiac amyloidosis have not been extensively studied by biopsy. Of the 8 patients with WT cardiac amyloidosis, none showed extracardiac uptake.

12. Perspectives on Targeted Therapies in the Management of Neuroendocrine Tumors: Possibilities, Limitations, Challenges

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Background

Peptide receptor radionuclide therapy (PRRT) is a recognized treatment in advanced neuroendocrine tumors (NETs), where somatostatin receptors scintigraphy (SRS) reveals the overexpression of somatostatin receptors (SR). PRRT is new targeted option against NETs, carrying radiation directly to tumour cells.

Material and method

A 37-year-old female patient without any relevant medical history, was evaluated for intense pelvic pain without any symptoms suggesting carcinoid syndrome. The initial laboratory test did not present biochemical or hematological abnormalities. A CT was performed, showing a cephalic interduodeno-pancreatic expansive tumour, and the biopsy revealed a G2 NET. The patient underwent surgery (cephalic duodenopancreatectomy en block with right hemicolectomy) in January 2022. The histology confirmed a G2 NET and a proliferation index Kinett 67 of 35 - 40%. Chemotherapy with Cisplatin was initiated. In July 2023, post-chemotherapy CT demonstrated no tumour evidence. In February 2023, MRI scan showed four new hepatic metastases. A SRS demonstrated radiotracer uptake in that level. In July 2023, the patient started PRRT. Every four doses ^{177}Lu-DOTATATE every eight weeks. The treatment was completed in January 2024.

Result

The treatment was completed with a clinical and radiological benefit observed in the SRS. No adverse events related to ^{177}Lu-DOTATATE were observed.

Conclusion

In conclusion, our patient is a good example of treatment with PRRT reaching partial response without significant toxicity. ^{177}Lu-DOTATATE is an effective therapy in NETs with an excellent safety profile Currently, ^{177}Lu-DOTATATE is an established therapeutic option for the treatment of metastatic NETs. Recently, published studies have shown that re-treatment with PRRT has efficacy and acceptable tolerance. In the unfortunately case of a future possible resistance to β-emitter ^{177}Lu-DOTATATE, we consider that targeted α therapy with ^{225}Ac-DOTATATE can be potentially beneficial.

13.Sentinel Lymph Node Biopsy in Breast Cancer Patients with Axillary Conversion after Neoadjuvant Chemotherapy—A Tertiary Centre Experience

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Introduction

Breast cancer (BC) is the leading cause of cancer-related deaths among women with more than 500,000 deaths annually. Sentinel lymph node biopsy (SLNB) is recommended in T1/T2cN0 stages for patients with indications for neoadjuvant chemotherapy (NAC), while its role in cN1/2 stages remains controversial. The study conducted in our department aims to investigate the role of SLNB in cN1/2 patients with axillary conversion after NAC.

Materials and methods

The retrospective study includes 102 patients with breast cancer at stage II-III, out of which were 47 cN0, respectively 55 cN1-N2 patients, who responded favorably to NAC before the scintigraphy assessment of the sentinel lymph node, in preparation for conservative surgical intervention. Each patient was administered a dose of 18–37 MBq 99mTc-albumin nanocolloid via peritumoral injection under ultrasound guidance. In patients with complete tumoral remission after NAC, the colloid was injected around the intratumorally inserted metallic clip at the time of the core biopsy. SLN mapping was performed 18–20 hours before surgery, using multiple-incidents planar scans acquired 30 minutes up to 2 hours after colloid administration; in special cases of non-axillary or multiple sites drainage, a SPECT/CT examination was performed for accurate localization of the lymph nodes.

Results

The lymphoscintigraphy performed after the administration of NAC presented an identification rate (IR) of 93.13%. The IR for SLNB was 94.11%, with a false-negative rate (FNR) of 7.4%. After a median follow-up of 31.3 months, we obtained a distant disease-free survival rate of 98%. Results reported in literature were similar to those of our study, presenting IR in the range 80.8–96.8%, with FNR varying from 0 to 22%.

Conclusions

SLNB proves to be a valuable and reliable procedure in advanced stages of breast cancer patients treated with NAC, providing a low FNR, and has a prognostic value similar to the classic recommendation, with a low recurrence rate in our study population.

Keywords: lymphoscintigraphy; sentinel lymph node biopsy; breast cancer; neoadjuvant chemotherapy

Biopsia ganglionului santinelă în cancerul mamar la pacienții cu conversie axilară după chimioterapie neoadjuvantă – experiența unui centru terțiar

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Introducere

Cancerul de sân (BC) este principala cauză de deces prin cancer în rândul femeilor, cu peste 500.000 de decese înregistrate anual. Biopsia ganglionului santinelă (SLNB) este recomandată în stadiile cT1/T2N0 la pacientele cu indicație de chimioterapie neoadjuvantă, însă rolul său în cazul stadiilor cN1/2 rămâne controversat. Studiul desfășurat în departamentul nostru si-a propus să investigheze rolul SLNB la pacientele stadializate cN1/2 la diagnostic, cu conversie axilară după administrarea NAC.

Materiale și metode

Studiul retrospectiv a inclus 102 paciente cu cancer mamar stadiile II-III, dintre care cN0 47, respectiv cN1-N2 55 paciente, care au avut răspuns favorabil la NAC înainte de evaluarea scintigrafică a ganglionului santinelă, în vederea intervenției chirurgicale conservatoare. Fiecărei paciente i s-a administrat o doză de 99mTc-albumină umană nanocoloidală de 18–37 MBq prin injectare peritumorală, sub ghidaj ecografic. În caz de remisiune completă, injectarea s-a practicat în jurul clipului metalic intratumoral inserat la momentul biopsiei. Limfoscintigrafia s-a efectuat cu 18-20 ore anterior intervenției chirurgicale prin scanarea planară în incidențe multiple la 30 minute până la 2 ore postinjectare; în cazuri speciale, de drenaj non-axilar sau multiplu, s-a efectuat examen SPECT/CT pentru localizarea exacta a ganglionilor.

Rezultate

Limfoscintigrafia efectuată după administrarea NAC a prezentat o rată de identificare (IR) de 93,13%. IR pentru SLNB a fost de 94,11%, cu o rată fals-negativă (RFN) de 7,4%. După o medie de urmărire de 31,3 luni, se constată o rată de supraviețuire fără progresia bolii de 98%. Rezultatele raportate în literatură au fost similare cu cele ale studiului nostru, prezentând IR în intervalul 80,8–96,8%, cu RFN variind de la 0 la 22%.

Concluzii

SLNB se dovedește a fi o procedură valoroasă și fiabilă pentru evaluarea pacientelor cu cancer mamar local avansat tratate prin chimioterapie neoadjuvantă, cu o rată fals-negativă scăzută și valoare prognostică similară indicației clasice, avand rată de recurență redusă pentru cazurile incluse în studiu.

Cuvinte cheie: limfoscintigrafie; biopsie de ganglion limfatic santinelă; cancer de sân; chimioterapie neoadjuvantă.

14.Challenges in SPECT-CT imaging of parathyroid glands

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Introduction

Primary hyperparathyroidism represents the leading cause of hypercalcemia in outpatients. From a pathogenic point of view, it is the result of the autonomous and excessive secretion of parathyroid hormone (PTH) from one or more parathyroid glands. The only curative treatment is surgery, a minimally invasive procedure being possible with an adequate preoperative localization. Currently, the most commonly used localization studies are: cervical ultrasound, cervico-mediastinal CT scan and scintigraphy with ^{99m}Tc-Sestamibi (ideally completed by SPECT-CT examination). Of these, molecular imaging has the advantage of not only locating the lesion, but also confirming the parathyroid origin of the tissue.

Methodology

We selected a number of nine patients with hyperparathyroidism (7 women and 3 men, average age of 60.3 years) investigated in our clinic during 2023, most of them being referred for a second opinion evaluation, with previous negative or ambiguous localization studies. The examination protocol included parathyroid scintigraphy, static acquisition (anterior incidence) at 20 and 120 minutes and SPECT-CT at 120 minutes after ^{99m}Tc-Sestamibi injection.

Results

The selected cases included: three mediastinal tumors, a paratracheal tumor in a patient with multiple surgeries for PHP and several previous negative evaluations, a negative scan in the case of a cystic adenoma, parathyroid hyperplasia in a patient with chronic kidney disease and transplant indication, a false-positive study in a patient with a cytologically confirmed follicular lesion of the thyroid, a possible pericardial location of the PTH-secreting tumor, a parathyroid adenoma with the same uptake as the thyroid and an adenoma with a particular ultrasound morphology.

Conclusions

^{99m}Tc-Sestamibi parathyroid scintigraphy with SPECT/CT represents a key element in the arsenal of localization studies in primary hyperparathyroidism. Especially when the tumor occurs in an ectopic parathyroid, the SPECT-CT examination proves essential. At the same time, knowing the limits of the method, as well as the patient's history, the severity of the biochemical changes and the result of the other localization studies are all very important for an optimal interpretation.

Key words: hyperparathyroidism, scintigraphy, sestamibi

Provocări în imagistica SPECT-CT a glandelor paratiroide

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Introducere
Hiperparatiroidismul primar reprezintă principala cauză de hipercalcemie la pacienții din ambulatoriu. Din punct de vedere patogenic, este rezultatul secretiei autonome si excesive de parathormon (PTH) de la nivelul uneia sau mai multor glande paratiroide. Singurul tratament curativ este cel chirugical, o interventie minim invaziva fiind posibila cu o localizare adecvata preoperator. Studiile de localizare utilizate in mod curent sunt: ecografia cervicala, examenul CT si scintigrafia cu ^{99m}Tc-sestamibi (ideal completata cu examen SPECT-CT). Dintre acestea, imagistica moleculara are avantajul nu doar al localizarii leziunii, ci si al confirmarii substratului paratiroidian.

Metodologie
Am selectat un numar de noua pacienti cu hiperparatiroidism (7 femei si 3 barbati, varsta medie 60.3 ani) investigati in clinica noastra in cursul anului 2023, cei mai multi fiind indrumati pentru o evaluare de a doua opinie, studiile imagistice anterioare de localizare având rezultate negative sau echivoce. Protocolul de examinare a inclus scintigrafie paratiroidiana cu achizitie statica (incidenta anterioara) la 20 si 120 minute si SPECT-CT la 120 de minute de la injectarea de ^{99m}Tc-sestamibi.

Rezultate
În cazurile selectate s-au identificat: trei tumori situate mediastinal, o tumora paratraheala la un pacient multiplu operat cu evaluari anterioare negative, un adenom chistic necaptant, o hiperplazie paratiroidiana la o pacienta cu boala renala cronica si indicatie de transplant, un studiu fals-pozitiv pe fondul unei leziuni foliculare tiroidiene, posibila localizare a tumorii la nivel pericardic, un adenom cu captare tardiva similara cu a tiroidei si un adenom cu morfologie ecografica particulara.

Concluzii
Scintigrafia cu ^{99m}Tc-sestamibi, completată de examen SPECT/CT, reprezinta un element cheie in arsenalul studiilor de localizare din hiperparatiroidismul primar. În special în cazul tumorilor dezvoltate la nivelul unei paratiroide ectopice, examenul SPECT-CT se dovedeste esențial. In acelasi timp, cunoasterea limitelor metodei, precum si a istoricului pacientului, severitatii modificărilor biochimice și rezultatul celorlalte studii de localizare sunt foarte importante pentru o interpretare optimă.

Cuvinte cheie: hiperparatiroidism, scintigrafie, sestamibi

15.177Lu-DOTATATE - The Rise and Downfall of a Multimetastatic Teratoma

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Introduction

Neuroendocrine tumors (NET) are a heterogenous group of somatostatin receptor expressing tumors, most commonly found in the gastrointestinal or bronchopulmonary tracts. In contrast, mature teratomas are generally benign germ cell tumors, but on very rare occasions a NET can develop within. ^{177}Lu-DOTATATE, a somatostatin analogue labeled with a low energy beta-emitting radionuclide, has proven to be an effective treatment option, with lower adverse effects compared to other therapeutic options.

Case Presentation

We present the case of a 47 years old female patient, diagnosed by MRI and molecular imaging (Octreoscan) with a multimetastatic mature presacral teratoma nesting a neuroendocrine tumor within. Disseminated lesions are found in multiple visceral, bone and lymphatic sites. Initially, the patient underwent a surgical reduction of the tumor burden: a cerebral frontal lesion resection, a right ovariectomy, retroperitoneal lymph node resections, followed by external radiotherapy of two hepatic lesions. Afterwards, ^{177}Lu-DOTATATE was administered in four doses aiming to further reduce the remaining tumor burden.

Discussions

The first dose of ^{177}Lu-DOTATATE confirms a proper tumor targeting, in accord with the pretreatment ^{68}Ga-PET/CT scan. This was further proven by the global regression of ^{177}Lu-DOTATATE uptake after the second dose in most known metastases, while a minority became completely non-avid. This more than satisfactory first response was consolidated by another round of two ^{177}Lu-DOTATATE doses, which achieved the disparition of most metastatic lesions and significant downgrade of the rest (from Krenning score 4 to 2). Leukopenia was the only adverse effect. Follow-up for the next two years was reassuring without any sign of relapse.

Conclusion

As this case exemplifies, even uncommon NETs such as those originating within teratomas could benefit from targeted internal radiotherapy. Given the often high metastatic burden of NETs, efficient treatment options with minimum adverse effects, improved overall survival and quality of life are scarce, but ^{177}Lu-DOTATATE proved its therapeutic benefits.

Key words: ^{177}Lu-DOTATATE, neuroendocrine tumors, teratoma.

POSTERS

16.The importance of Multiphasic Bone Scintigraphy in the evaluation of bone pathologies

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Purpose

Evaluation of inflammatory and infectious processes of bones and periosteal tissues, using multiphase scintigraphic examination.

Materials and methods

^{99m} Technetium labeled with diphosphonates is the most commonly used radiopharmaceutical for bone scintigraphy. They predominantly concentrate in the mineral phase of the bone, in hydroxyapatite and amorphous calcium phosphate crystals. After injection iv. accumulation depends on blood flow and osteoblastic activity. Multiphasic bone scintigraphy involves obtaining dynamic images of 1-3 seconds, for one minute, in the first phase (radionuclide angiography), which will reflect the vascularization in the area of interest. In the tissue diffusion phase, which evaluates the degree of hyperemia of the soft tissues and the adjacent bone, static planar images are recorded, obtained within 3-5 to 10 minutes. The final phase records images at 2-4 hours up to 24 hours, highlighting the presence or absence of osteoblastic activity. The multiphasic bone scan has significant sensitivity, with an important negative predictive value and represents a first step in the diagnostic algorithm of several non-infectious and infectious pathologies (eg neuroalgodistrophic syndrome, osteomyelitis, evaluation of prostheses and periprosthetic complications, etc.). Using the three-phase bone technique presented above and completed with the acquisition of whole body images of the tissue and bone phase, we analyzed 3 cases from our clinic.
In one case, a SPECT tomoscintigraphic examination was performed. A GE Infinia dual head gamma camera was used. The patients addressed for various infectious and non-infectious pathologies. Multiphasic bone scintigraphy highlighted local changes in soft and bone tissue, contributing to the subsequent management of the patient.

Conclusions

The utility of multiphasic scintigraphy is given by its significant negative predictive value, a negative triphasic bone study excluding bone pathology. Multiphasic bone scintigraphy is a readily available, relatively inexpensive screening test that can also be performed on patients with medical devices or those from whom CT/MRI is contraindicated.

Key words: Multiphasic Scintigraphy, Nuclear Medicine, SPECT

Importanta Scintigrafiei Osoase Multifazice in evaluarea patologiilor osoase

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Scopul
Evaluarea proceselor inflamatorii si infectioase ale oaselor si tesuturilor periosoase, utilizand examinarea scintigrafica multifazica.

Materiale si metode
^{99m}Tehnetiu marcat cu difosfonati reprezinta radiofarmaceuticele cele mai utilizate pentru scintigrafia osoasa. Acestea se concentreaza predominant in faza minerala a osului, in cristalele de hidroxiapatita si calciu fosfat amorf. După injectarea iv. acumularea depinde de fluxul sanguin și de activitatea osteoblastică. Scintigrafia osoasă multifazică presupune obtinerea de imagini dinamice de 1-3 secunde, timp de un minut, in prima faza (angiografie radionuclidica), ce vor reflecta vascularizatia in zona de interes. In faza de difuzie tisulara, care evalueaza gradul de hiperemie în țesuturile moi și osul adiacent, se inregistreaza imagini plane statice, obtinute în decurs de 3-5 pana la 10 minute. Ultima faza inregistreaza imagini la 2-4 ore pana la 24 de ore, si evidentiaza sau nu, prezenta reactiei osteoblastice. Scanarea osoasă multifazica are sensibilitate semnificativa, cu valoare predictiva negativa importanta si reprezinta un prim pas in algoritmul diagnostic al mai multor patologii neinfectioase si infectioase (ex sindromul neuroalgodistrofic, osteomielita, evaluarea protezelor si a complicațiilor periprotetice etc). Utilizand tehnica os trei faze prezentata mai sus si completata cu inregistrarea de imagini whole body de faza tisulara si osoasa, am analizat 3 cazuri din clinica noastra. Intr-un caz s-a efectuat si examinare tomoscintigrafica SPECT. S-a utilizat o gamma camera dual head GE Infinia. Pacientii s-au adresat pentru patologie diversa, infectioasa si neinfectioasa. Scintigrafia osoasa multifazica a pus in evidenta modificari locale la nivelul tesuturilor moi si osos, contribuind la managementul ulterior al pacientului.

Concluzii
Utilitatea scintigrafiei multifazice este data de valoarea sa predictiva negativa semnificativa, un studiu osos trifazic negativ excluzand patologia osoasa. Scintigrafia osoasa multifazica este un test de screening usor disponibil, relativ ieftin si care se poate efectua si la pacientii cu dispozitive medicale sau la care este contraindicat CT/IRM.

Cuvinte cheie: Scintigrafie Multifazica, Medicina Nucleara, SPECT

17.Optimization steps for image reconstruction using PET-CT equipment for small animals

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Abstract

Currently, Positron Emission Tomography (PET) is a clinically validated medical imaging technique that is used to diagnose diseases and track therapy outcomes. Modern scanners that integrate Computer Tomography (CT) and PET offer a combination of the two imaging modalities. The spatial distribution of the injected radiotracer can be reconstructed from PET/CT acquired data using several mathematical approaches. During the last years have seen a great deal of work focused on developing analytic and iterative PET image reconstruction techniques to improve the final results.

Current challenges in PET image reconstruction include more accurate quantitation, system modeling, motion correction and dynamic reconstruction.
Advances in these aspects could enhance the use of PET/CT imaging in the preclinical and clinical research involving therapeutic interventions.

The MicroPET-CT (MILabs – The Netherlands) system installed at the Radiopharmaceutical Research Centre (CCR, IFIN-HH, Romania) is designed for small animals imaging being able to provide resolutions up to 0.03 mm (PET 0.45-0.5 mm and CT 0.03 mm, respectively).

This work provides information about the optimization steps to obtain better reconstruction images by using MicroPET-CT scanner installed at CCR involving the use of ^{18}F, ^{68}Ga, ^{89}Zr, ^{64}Cu positron emission radioisotopes.

18.99mTc-EDDA/HYNIC-TOC's role in detecting ACTH-secretant pituitary adenomas – a case report

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Introduction

Recently, 99mTc-labelled peptides have emerged as an option in scintigraphic imaging of neuroendocrine tumors in clinical practice, demonstrating advantages over 111In-pentetreotide, including improved imaging quality on gamma cameras and lower radiation exposure for patients, thus allowing for higher radiotracer doses[1].

Case Report

The patient is a 54 years old female with a medical history of HBV infection, obesity and hypertension. She was diagnosed with Cushing's disease in February 2022 following an endocrinological checkup after clinical symptoms and features of hypercortisolism. An IRM examination confirmed the presence of a pituitary adenoma (PA), likely responsible for the patient's symptoms. Therefore, in April 2022 she underwent transsphenoidal neurosurgery to remove the adenoma, and it was histopathologically confirmed to be an ACTH-secreting PA. A spike in ACTH value in August 2022 prompted another IRM examination, which revealed the presence of a remnant PA extended to the cavernous sinus and retrosellar to the right side. The following indication was to perform a somatostatin receptor scintigraphy which was done in our clinic using 99mTc-EDDA/HYNIC-TOC (Tektrotyd). The result was residual activity in the sella and diffuse uptake in the adrenal glands, possibly due to prolonged exposure to high levels of ACTH secretion.

Discussion

Most neuroendocrine tumors express somatostatin receptors, thus allowing their scintigraphic visualization after intravenous injection of a radiolabelled somatostatin analogue. Although some previous studies state that ACTH-secreting PA's do not express somatostatin receptors, other studies demonstrate their presence in these tumors[2-4]. 99mTc-EDDA/HYNIC-TOC's sensitivity in detecting PA's reported by studies ranges up to 90.91%[5]. We were able to confirm the uptake of Tektrotyd in the remnant PA of our patient, therefore demonstrating the existence of SSTR at this level. Also, we did not find any other abnormal uptake in the rest of the body, so we ruled out the possibility of ectopic ACTH secretion.

Conclusion

99mTc-EDDA/HYNIC-TOC can be used in investigations of well-differentiated PA for assessing the uptake in the sellar region as well as excluding an ectopic lesion.

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19.Comparative evaluation of SUVmax and aBSI in monitoring patients with metastatic prostate cancer

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Introduction
Bone scan index (BSI) assesses bone tumor burden, monitors treatment response and is considered an imaging biomarker for the disease progression.

Materials and methods
The retrospective study included 30 patients with prostate cancer, who underwent at least 2 planar bone scans and SPECT/CT using Tc99m-HDP, at intervals of 6-12 months. Measurements of the maximum standardized uptake value (SUVmax) of the most intense 5 lesions in patients with multiple metastases were obtained for both time points T0 and T1, and for patients with less than 5 lesions, the values of all lesions were included. Automatic BSI (aBSI) values were obtained using EXINI aBSI 3.4 software, with manual corrections made for benign foci considered malignant (degenerative lesions, known traumas, and urinary catheters). Therefore, 60 bone studies were analyzed, comparing the summed SUVmax values for T0 and T1, and aBSI, for each patient. Correlations between SUVmax and aBSI obtained from these imaging evaluation methods were statistically analyzed using the Spearman correlation coefficient.

Results
The median values of SUVmax at T0 were 26.70±20.68 and at T1 23.70±23.02, while for aBSI at T0 it was 0.45±2.05 and at T1 0.35±2.09. The correlation between ΔBSI and ΔsumSUVmax presented a strong positive coefficient ($r=0.828$, $p<0.01$). In the study group, 4 patients classified as having less than 5 lesions presented BSI values equal to 0.0 on all scans, because the metastatic lesions were localized adjacent to organs with physiological radiotracer uptake, while the minimum SUVmax value encountered was 8.82, and the maximum 47.90.

Discussion
Multiple studies which included more than 100 patients have demonstrated that aBSI is an independent prognostic indicator of overall survival in prostate cancer patients with bone metastasis. Furthermore, it represents an emerging imaging biomarker that can be used in a prognostic model for risk stratification of prostate cancer patients.

Conclusions
This study highlights a strong correlation between the two parameters, however SPECT-CT reduces false positive results and minimizes errors through morphological correlations.

Kew words: BSI, SUVmax, prostate cancer

Evaluarea comparativă a SUVmax și aBSI în urmărirea pacienților cu cancer de prostată metastatic

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Introducere

Bone scan index (BSI) este utilizat pentru evaluarea extensiei tumorale la nivelul țesutului osos și monitorizarea răspunsului la tratament fiind considerat un biomarker imagistic pentru progresia bolii.

Materiale și metode

Studiul retrospectiv a inclus 30 pacienți cu cancer de prostată, care au efectuat cel puțin 2 scintigrafii osoase whole-body și SPECT/CT utilizând Tc99m-HDP, la interval de 6-12 luni. Au fost obținute măsurătorile maximum standardized uptake value (SUVmax) ale celor mai intense 5 leziuni în cazul pacienților cu multiple metastaze, pentru ambele momente T0 și T1, iar în cazul pacienților cu mai puțin de 5 au fost introduse valorile tuturor leziunilor.

Valorile BSI (aBSI) au fost obținute prin conturare automată cu ajutorul software-ului EXINI aBSI 3.4, fiind efectuate corecții manuale în cazul focarelor benigne considerate maligne (leziuni degenerative, traumatisme cunoscute și catetere urinare). Astfel, au fost analizate 60 studii osoase în care au fost comparate valorile SUVmax sumate pentru T0 și T1, respectiv aBSI, în cazul fiecărui pacient. Corelațiile SUVmax și aBSI obținute între cele metode de evaluare imagistică au fost analizate statistic utilizând coeficientul de corelație Spearman.

Rezultate

Mediana valorilor SUVmax la T0 a fost 26.70±20.68 și la T1 23.70±23.02, iar în cazul aBSI la T0 0.45±2.05 și la T1 0.35±2.09. Corelația între ΔBSI și ΔsumSUVmax a prezentat un coeficient puternic pozitiv ($r=0.828$, $p<0.01$). Din lotul analizat 4 pacienți încadrați în categoria celor cu mai puțin de 5 leziuni au prezentat valori BSI egale cu 0.0 în ambele evaluări din motive precum localizarea leziunilor metastatice în adicența organelor de acumulări fiziologice a radiotrasorului, în timp ce valoarea minimă întâlnită a SUVmax a fost 8.82, iar valoarea maximă 47.90.

Discuții

Studii publicate pe loturi de peste 100 de pacienți au arătat că aBSI reprezintă un indicator prognostic independent al supraviețuirii globale în cazul pacienților cu cancer de prostată și metastaze osoase. De asemenea acesta reprezintă un biomarker de imagine care poate fi utilizat într-un model prognostic pentru stratificarea riscului pacienților cu cancer de prostată.

Concluzii

Acest studiu evidențiază o corelație puternică între cele două variabile, dar SPECT-CT este superior, deoarece reduce rezultatele fals pozitive și minimizează erorile prin intermediul corelațiilor morfologice.

Cuvinte cheie: BSI, SUVmax, cancer prostată

20.The false negative aspect of the SPECT-CT and PET-CT examinations in a 20-year-old patient with metastatic triple-negative breast cancer.

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Introduction

Triple-negative breast cancer (TNBC) is defined by the absence of estrogen receptors, progesterone receptors and the lack of human epidermal growth factor receptor 2 expression. The incidence of breast cancer in women aged 20-24 is 2.3 per 100,000 individuals at risk, according to the Globocan in 2022.

Case Presentation

A 20-year-old patient, with heredo-collateral antecendece of breast and ovarian neoplasms, was diagnosed with triple-negative breast cancer (TNBC) in August 2022. Ultrasound and CT examinations revealed a tumoral mass infiltrating the entire volume of the left breast and axillary metastatic lymph nodes (stations I, II, and III), without distant lesions. Genetic testing identified the BRCA1 mutation. The patient underwent 8 cycles of neoadjuvant chemotherapy using two different schemes. Post-chemotherapy CT evaluation showed a significant dimensional regression of the tumor and axillary metastatic lymph nodes, but multiple osteosclerotic lesions were detected. "Whole-body" scintigraphy and SPECT/CT highlighted multiple osteoblastic lesions, with none or minimal uptake of the bone-seeking radiotracer. Following the onset of neurological symptoms, a brain MRI was performed, revealing a secondary leptomeningeal lesion. Intrathecal chemotherapy was administered with a progressive improvement in neurological symptoms. PET/CT reevaluation with 18F-FDG showed progression of the breast tumor (dimensions of 70/62 mm and SUVlbm=13 g/ml) and multiple metabolically active supradiaphragmatic lymph nodes. Due to the unfavorable evolution, a decision was made to change the treatment line to immunotherapy.

Conclusions

TNBC in young patients diagnosed at an advanced clinical stage has a very poor prognosis. The particularity of the case was that, despite the aggressiveness and high tumor grade of TNBC in a very young patient, the osteoblastic bone metastases did not show any uptake of the radiotracer in both SPECT-CT and PET-CT scans.

Aspect fals negativ al examinarilor SPECT-CT si PET-CT la o pacienta de 20 de ani cu cancer de san metastatic triplu negativ

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Introducere

Cancerul de sân triplu negativ (TNBC) este definit prin absența receptorilor de estrogen, receptorilor de progesteron și de lipsa expresiei factorului de creștere epidermic uman 2. Incindenta cancerului de san la femeile cu varsta cuprinsa intre 20-24 ani, este de 2,3 la 100.000 de indivizi la risc, conform Globocan (2022).

Prezentare de caz

Pacienta în vârstă de 20 de ani, cu antecedente heredo-colaterale de neoplasm mamar si ovarian, diagnosticată în august 2022 cu TNBC, in urma examinarilor ecografica și CT, se vizualizeaza o masa tumorala infiltrativa la nivelul glandei mamare stângi si adenopatii axilare (statiile I, II si III), fără leziuni secundare la distanta. Testarea genetica a identificat mutația BRCA1. Pacienta a urmat 8 cicluri de chimioterapie neoadjuvanta cu doua scheme diferite. Evaluarea CT postchimioterapie arată o regresie semnificativă dimensională a tumorii, cât și a adenopatiilor axilare, dar se deceleaza multiple leziuni osteocondensante. Examinarea scintigrafica "whole-body" si SPECT/CT, a evidențiat leziuni osteoblastice multiple, minim captante sau necaptante pentru radiotrasorul osteotrop. In urma aparitiei de simptome neurologice, se efectuează examen IRM cerebral, care evidențiaza o leziune leptomeningeală cu caracter secundar. Se administreaza chimioterapie intratecala cu o îmbunătățire progresivă a simptomelor neurologice. Reevaluarea PET/CT cu 18F-FDG arată progresia tumorii mamare (dimensiuni de 70/62 mm si SUVlbm=13 g/ml) si multiple adenopatii supradiafragmatice active metabolic. Datorită evoluției nefavorabile, se decide schimbarea liniei de tratament cu imunoterapie.

Concluzii

TNBC la pacientele tinere, diagnosticate intr-un stadiu clinic avansat, are un prognostic foarte rezervat. Particularitatea cazului a fost că, în ciuda agresivității și gradului tumoral ridicat al TNBC la o pacienta foarte tanara, metastazele osteoblastice nu au prezentat fixare a radiotrasorului atat la scanarea SPECT-CT cat si PET-CT.

21. ^{64}Cu and ^{89}Zr – emerging radioisotopes produced at Radiopharmaceutical Research Centre @IFIN-HH

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The development of radiopharmaceuticals and medical radioisotopes, which are used to obtain quantitative images, has been accelerated by the advancement of nuclear medicine. These make it possible to determine the precise amounts of radioactive material required to safely and effectively provide treatment or diagnostic to patients.

^{64}Cu is used as a radioisotope for imaging and/or therapeutic purposes in the treatment of multiple cancer types, as well as disorders such as Alzheimer's disease and arteriosclerosis. Its "triple" emissions of β^+ (17.86%), β^- (39.03%), and Auger electrons make it of special interest. Its 12.7 hours half-time allows a good uptake and distribution of 64CuCl2 to obtain qualitative images and high contrast, also enough to trigger a therapeutic effect during its intracellular residency.
Radiopharmaceuticals based on ^{89}Zr-labeled antibodies are intended for use in the early detection, screening, and monitoring of malignant tumours, such as breast, prostate, ovarian, and intestinal cancer. The disintegration mechanism of ^{89}Zr shows 22.3% positron emission and 76.6% electron uptake, and its half-life of 78 hours matches the longer distribution and uptake time required by monoclonal antibodies use in molecular imaging.

The procedures involve irradiating ^{nat}Y foils and electrodeposited ^{64}Ni targets with protons, via the nuclear reactions ^{89}Y(p,n)^{89}Zr and ^{64}Ni(p,n)^{64}Cu, respectively.

Irradiations were conducted on a fully automated solid target irradiation system, performed at TR-19 cyclotron installed at Radiopharmaceutical Research Centre (IFIN-HH). The final product was obtained by processing the irradiation targets, which included a dissolving and a purification step.

14–17 GBq of purified [^{64}Cu]$CuCl_2$ were obtained after 6 hours of radiation, whereas 2-3 GBq of purified ^{89}Zr-oxalate were obtained after 4 hours, values decay-corrected to the end of bombardment.

As determined by radio-TLC, radio-HPLC, and gamma spectrometry, the radiochemical and radionuclide purities of the ^{64}Cu and ^{89}Zr solutions were higher than 99.99% following purification, matching pharmaceutical requirements. In preclinical research, the resulting solution's activity is utilized for PET scanning of small animals, with the processes being scaled up for clinical use.

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Keywords: medical radioisotopes, cyclotron, nuclear reactions

22.Peculiar uptake in malignant ascites in bone scintigraphy: A Case Report

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Introduction

Bone scintigraphy is a widely used imagistic technique for oncological patients in order to assess the disease extension to the bones. Extra-osseous uptake of the 99mTc-diphosphonate can be observed in various cases, the accumulation of the radiotracer in ascites is uncommon.

Case Description

We present a case of a 68-year-old male recently diagnosed through a superior endoscopy with a gastric tumor of approximately 33 mm in diameter, situated at the eso-gastric junction circumferential, protrusive and constrictive in nature in the distal esophagus, respectively circumferential in the lesser curvature of the stomach, with extension to the cardia and approximately 50% of the antrum's diameter. Biopsies were taken and histopathological studies showed a moderately differentiated (G2) adenocarcinoma.

The patient underwent a Contrast Enhanced Computed Tomography (CECT) scan to assess the disease extension. The tumor with the same characteristics described at the endoscopy was visualized. Adenopathies, up to 29 mm in diameter were reported located in the following regions: inferior periesophageal, on the lesser curvature of the stomach, celiac and hepatic. Further, confluent peritoneal nodules suggestive of peritoneal carcinomatosis situated in the greater omentum, were noted with presence of fluid accumulation in a considerable amount in the peritoneum and a small right reactive pleural effusion with minimal ventilatory disturbances. Multiple thoracic vertebral lesions, up to 10 mm in diameter, have been identified and the suspicion of bone metastases was raised, a bone scintigraphy being consequently recommended.

A "whole-body" bone scintigraphy with ^{99m}Tc-HDP was performed in order to assess the possible bone metastases. Results showed minimal heterogeneous uptake located in several thoracic vertebrae, disproving the suspicion of bone metastases. Particularly, a diffuse extra-osseous uptake of the radiotracer was observed in the abdominal and pelvic region, due to the high level of peritoneal fluid accumulation.

The patient was diagnosed with stage four gastric adenocarcinoma with lymph nodes and peritoneal metastases.

Discussion

Stomach cancer remains a widely spread neoplasm worldwide. Based on the GLOBOSCAN 2022 reports, stomach cancer remains the 5th most common form of cancer and the 5th form of neoplasm with a high deadly rate. Typically, the greatest number of cases consist of adenocarcinomas.[1]

Peritoneal carcinomatosis is the most frequent form of neoplasm in the peritoneum. Primary neoplasms located in the gastrointestinal tract, breasts or ovaries often metastasize in the peritoneum in forms of nodules or fluid accumulation. The physiopathology mechanisms behind the formation

of ascites are part of a complex, multifactorial process [2]: lymphatic obstruction due to mass growth and compression and/or tumor cells spreading, immunosuppression and increasing of the vascular permeability due to activation of local vascular factors, thus a greater fluid influx in the peritoneal space.

The ^{99m}Tc-HDP is a radiopharmaceutical with high affinity for bone structures. Occasionally, extra-osseous and extra-urinary uptakes are reported. In comparison with pleural or pericardial effusions, peritoneal effusion uptakes are less cited throughout the literature. In a case report by Wong. D[3], a small percentage of patients with malignant ascites had a diffuse ^{99m}Tc-HDP uptake in the peritoneal region. In the presence of intra-fluid calcifications or an elevated mineral concentration, ^{99m}Tc-HDP uptake might be expected, but in the case of ascites, those mentioned do not apply. Due to its malignancy, the ascites fluid has a higher protein concentration, which consequently affects the vascular permeability, which is thought to explain the uncommon uptake of the radiopharmaceutical. Similarly, Chakraborty et. al.[4] reported a case of ^{99m}Tc-HDP uptake in pleural and peritoneal effusions, in the absence of bone metastases in a prostate carcinoma. Their findings raised the possibility of the scintigraphy, widely used, to detect extra-osseous metastases.

Conclusion

This case highlights the capability and impact of bone scintigraphy in indicating other extra-osseous malignant sites, while used routinely for identifying possible bone metastases. While the sensitivity of the ^{99m}Tc-HDP is low for peritoneal effusions, the specificity is high when a radiotracer uptake is present. Thus, malignancy should be taken into consideration in these occurrences.

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23.Importance of 18F-FDG PET/CT in radioiodine-refractory thyroid carcinoma

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Introduction

Among all thyroid tumors, the predominant occurrence is attributed to differentiated thyroid carcinoma. Positron emission tomography combined with computer tomography (PET/CT) with [18F]Fluoro-2-deoxy-d-glucose (18F-FDG) plays an important role in detecting local recurrences and distant metastases in patients with negative iodine-131 post-therapy "whole body" scintigraphy and increased levels of thyroglobulin. The purpose of this study is to assess the sensitivity of this diagnostic method.

Material and method

We performed a retrospective analysis of a total of 29 patients (23 women and 6 men) with an established diagnosis of differentiated thyroid carcinoma and persistent morphological and/or biochemical presence of disease. All patients performed 18F-FDG PET/CT in the Nuclear Medicine Department of the Military Emergency University Hospital "Carol Davila" Bucharest after thyroidectomy, and at least one cycle of 131-Iodine therapy. Images were evaluated visually and semiquantitatively using the maximum value of the radiotracer uptake, corrected for body mass without adipose tissue and injected activity (SULmax).

Results

Out of the 29 patients 23 were women and 6 men, with a median age of 60 years, the average dose of I-131 that was administered to the patients was 358 mCi. Upon reviewing the patient's thyroglobulin levels, it was observed that 7 of them exhibited levels exceeding more than twice the upper limit. The histopathological type most predominant is represented by 83% for papillary thyroid carcinoma (n=24) and 17% for follicular thyroid carcinoma (n=5). PET/CT detected active metabolic lesions suggestive of local disease recurrence and/or lymph node metastases or other organ in 69% of cases (n=20, 5 pulmonary metastases, 15 lymph node metastases and/or local recurrences, 2 bone metastases), showcasing the high sensitivity of the method. The values of thyroglobulin correlated with the PET-CT findings and SULmax values, with few exceptions.

Conclusions

This small patient sample has the sensitivity of the PET/CT exam aligning with the results described in the literature. Therefore it is valuable to use PET/CT for monitoring recurrent disease and metastases in patients with negative results on scintigraphy post-therapy with I-131 and increased levels of thyroglobulin.

24.Molecular imaging assessment in the management of a patient with recurrent multiple paragangliomas

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Introduction

Paragangliomas (PGLs), defined as tumors of extra-adrenal chromaffin cells, are rarely localized in the retroperitoneum. The symptoms are similar to pheochromocytoma and mainly depend on the secretory nature of the tumor. Positive diagnosis is based on serum hormone testing and radiological and molecular imaging evaluation, which are essential before surgery. The only curative therapeutic strategy is surgical, with increased attention in preventing the frequently reported perioperative hemodynamic and cardiovascular complications.

Case report

We present the case of a 44-year-old patient diagnosed in 2006 with retroperitoneal PGL with locoregional invasion, who underwent surgical intervention. In 2016, the patient presented with abdominal pain, imaging investigations revealing invasive retroperitoneal relapse involving the urinary bladder, as well as bone and lymph node metastases.Total cystectomy was performed en bloc with right prostatovesiculectomy. Serological marker levels decreased following surgery, but at 6 weeks post-operation, they showed a significant increase. Following genetic testing, a mutation in the SDHB gene was identified (hereditary paraganglioma syndrome type 4). In 2017, a scintigraphy with I-123 MIBG was performed, which detected vertebral metastases (T9, T10, L1, L2), osteolytic with reduced uptake for radiopharmaceutical, followed by an F18-FDG PET-CT examination which highlighted metabolically active adenopathies, localized in the following regions: left para-aortic (at the level of vertebrae L3-L4), right external iliac with SUVlbm 12.19 g/ml and left internal iliac with SUVlbm 15.4 g/ml. Following the 2019 PET-CT investigation, a regression in nodular dimensions is observed, but there is an increase in metabolic activity at the level of the para-aortic nodes and both metabolic and dimensional progression of the right external iliac node (SUVlbm 25.83 g/ml currently compared to SUVlbm 12.19 g/ml). The patient was treated with cyclophosphamide, vincristine, dacarbazine (CVD), and zoledronic acid. In 2020, the patient is reevaluated by scintigraphy with radiolabeled somatostatin analog [99mTc]-HYNIC-TOC, which reveals minimal metabolic and dimensional progression of lymph node involvement, while metastatic bone lesions remain stable.

Conclusions

Molecular imaging in the management of patients with PGL is essential for defining the extent of the disease and the expression of SSTR receptors or highlighting norepinephrine transporters for targeted therapies (PRRT or I-131 MIBG).

Keywords: paraganglioma; I-123 MIBG; somatostatin receptor scintigraphy

Evaluarea imagisticii moleculare in managementul unui pacient cu paragangliom multiplu recidivat

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Introducere

Paraganglioamele (PGLs-uri), definite ca tumori cu celule cromafine extra-adrenale, sunt rareori localizate în retroperitoneu. Simptomatologia este similară feocromocitomului și depinde în principal de caracterul secretor al tumorii. Diagnosticul pozitiv se bazează pe dozarea hormonilor plasmatici și efectuarea explorărilor radiologice și izotopice, esențiale înainte de tratamentul chirurgical. Singura strategie terapeutică curativă este cea chirurgicală, acordând o atenție sporită prevenirii tulburărilor hemodinamice și cardiovasculare frecvent raportate perioperator.

Prezentare de caz

Pacient în vârstă de 44 ani diagnosticat în 2006, cu PGL retroperitoneal cu invazie locoregională, pentru care s-a efectuat intervenție chirurgicală. În 2016 pacientul se prezintă cu dureri abdominale, investigațiile imagistice dezvăluind recidivă retroperitoneală invazivă în vezica urinară cu determinări secundare osoase și limfoganglionare. Se practică cistectomie totală în bloc cu prostatoveziculectomie dreapta. Valorile markerilor serologici scad postoperator, dar la 6 săptămâni de la intervenție acestea înregistrează o creștere semnificativă. În urma testării genetice s-a identificat mutația genei SDHB (sindromul paragangliomului ereditar tip 4). În 2017 efectuează scintigrafie cu I-123 MIBG care detectează determinări secundare vertebrale (T9, T10, L1, L2), osteolitice, hipocaptante pentru radiotrasor, urmată de un examen PET-CT F18-FDG care evidențiază adenopatii active metabolic, două situate paraaortic stâng (în planul vertebrelor L3– L4), iliac extern drept cu SUVlbm 12.19 g/ml și iliac intern stâng cu SUVlbm 15.4 g/ml. În urma investigației PET-CT din 2019, se constată o regresie a dimensiunilor nodulare, însă o creștere a activității metabolice la nivelul nodulilor paraaortici și o progresie atât metabolică cât și dimensională a nodulului iliac extern drept (SUVlbm 25.83 g/ml actual comparativ cu SUVlbm 12.19 g/ml). Pacientul a fost tratat cu ciclofosfamidă, vincristină, dacarbazină (CVD) și acid zoledronic. În 2020 pacientul este reevaluat prin scintigrafie cu analog de somatostatină radiomarcat [99mTc]-HYNIC-TOC care evidențiază minimă progresie metabolică și dimensională adenopatică, iar leziunile metastatice osoase rămân stabile.

Concluzii

Imagistica moleculară în managementul pacientului cu PGL este esențială în definirea extensiei bolii și a expresiei receptorilor SSTR sau evidențierii transportorilor de norepinefrină în vederea terapiilor țintite (PRRT sau I-131 MIBG).

Cuvinte cheie: paragangliom; I-123 MIBG; scintigrafie cu receptori somatostatina

25.Decoding the Silent Code: MPI Unveils Ischemia in Young Adult with RCA Hypoplasia

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Introduction

Coronary artery anomalies (CAAs) are congenital malformations with potential for serious consequences. Right coronary artery hypoplasia (RCAH), a specific type, can present with diverse symptoms or remain silent. Tragically, undiagnosed CAAs have been linked to sudden cardiac death in young athletes, highlighting the need for early detection. Noninvasive imaging, like SPECT perfusion, aids in diagnosis and severity assessment.

Case Presentation & Observations

A 22-year-old male with incomplete right bundle branch block (iRBBB) underwent further investigation after normal vitals. Angio-CT confirmed RCAH with superdominant left coronary artery (LCA). Despite no symptoms, myocardial perfusion imaging (MPI) stress testing revealed moderate ischemia in the RCA territory, in accordance with the anatomical anomaly. The ischemic deficit was 9% of the left ventricle, with 6% attributed to the RCA territory. Gated stress images showed impaired thickening and slight hypokinesis in the same region. Notably, despite normal resting and peak left ventricular ejection fraction (LVEF), the lack of LVEF increase with stress suggested inducible myocardial ischemia, further emphasizing his risk profile.

Conclusions & Importance

Despite his young age and lack of overt symptoms, SPECT MPI identified moderate ischemia in this patient with RCAH. This finding, combined with the anatomical anomaly, underscores the importance of early diagnosis and risk stratification in individuals with CAAs, particularly young athletes or individuals pursuing careers involving physical activity. Noninvasive imaging like MPI can uncover hidden ischemia before symptoms arise, potentially preventing adverse events. Tailored management based on individual risk profiles, incorporating medication, lifestyle adjustments, or interventions as needed, is crucial for optimizing long-term outcomes in this population.

Keywords: Right coronary artery hypoplasia, Asymptomatic ischemia, Myocardial perfusion imaging, SPECT-CT

26.Nuclear medicine imaging - semiquantitative analysis in transthyretin cardiac amyloidosis: static vs spect

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Introduction

Transthyretin cardiac amyloidosis (ATTR-ca) is a protein deposition disease characterized by progressive thickening of both ventricles, inter-atrial-ventricular septum and atrioventricular valves. Bone scintigraphy (BS) has proven to be the corner stone in diagnosing ATTR-ca. However, diagnosing only by visual scoring can prove difficult. Therefore, a semiquantitative analysis is necessary. The aim of this paper is to compare the semiquantitative results of static and SPECT images of ATTR patients that cannot undergo both imaging techniques.

Material and Method

75 patients suspected of ATTR-ca underwent BS using a Siemens Diacam Dual-Head Gamma Camera. Acquisition protocol included whole-body images (at 10 minutes and 2 ½ hours), static and SPECT centered on thorax at 2 ½ hours. Regions of interest were made on the heart (H), contralateral side (Cl) and rib (R): H/R (static images), H/Cl (static and SPECT images). Semiquantitative results were compared only on the patients that underwent both static and SPECT imaging.

Results and Discussion

In total, 12 patients with static and SPECT images were diagnosed with ATTR-ca. Ratio results varied between the two image types, however, they were over the threshold. Semiquatitative analysis can improve visual scoring. The guidelines recommend heart to rib uptake comparison and SPECT images. By comparing the ratio result obtained in static and in SPECT images, we were able to determine that in ATTR-ca patients the ratio results were over the threshold. If SPECT cannot be performed, static images could be enough. Nevertheless, static ratio results were lower compared to SPECT. This may be a result of the overlay the static images present.

Conclusion

Visual scoring and semiquantitative methods made on static and SPECT thorax images, can accurately diagnose ATTR-ca. If the patient cannot undergo SPECT, static images should be considered as the bare minimum for a precise diagnosis.

Keywords: ATTR-ca, static images, SPECT

27.The value of ^{18}F-FDG PET/CT in the management of a rare case of Erdheim-Chester Disease

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Introduction

Erdheim-Chester disease (ECD), a rare and potentially life-threatening non-Langerhans cell histiocytosis, is characterized by abnormal histiocyte accumulation in various body tissues. Predominantly affecting adults, ECD manifests with diverse clinical symptoms, including skeletal pain, cardiovascular complications, and central nervous system involvement.

Materials and Methods

We present the case of a 53-year-old male patient who is HIV-positive, exhibiting progressive pericardial effusion and diagnosed with Erdheim-Chester disease in 2023. On admission, he reported a history of severe weight loss and bilateral exophthalmos since 2021. Initial diagnostic investigations, including computed tomography (CT), identified significant pericardial effusion and abdominal fat stranding. Subsequent blood tests were conducted, and a follow-up CT scan a year later revealed bilateral orbital masses in addition to the previously identified findings. The bone biopsy confirmed non-Langerhans histiocytosis. Given the complexity of the case, an ^{18}F-Fluorodeoxyglucose (^{18}F-FDG) PET/CT was recommended to comprehensively assess disease extent and guide treatment planning.

Results

Analysis of the ^{18}F-FDG PET/CT scan revealed bilateral hypermetabolic intraorbital masses (SUVmax 6.63 g/ml in the right eye and 6.78 g/ml in the left eye), along with circumferential pericardial thickening with high metabolic activity, hypermetabolic infiltrative mass tissue in the retroperitoneal and perirenal fat (SUVmax 4.58g/ml), invading vascular, renal, muscular and appendicular structures. These metabolic patterns were superimposed with the previous CT scans. Furthermore, 99mTc-HDP whole-body bone scintigraphy highlighted increased symmetrical radiotracer uptake in all long bones, confirming the frequent bone involvement associated with Erdheim-Chester disease. In the light of the comprehensive diagnostic findings, treatment with Cladribine was initiated.

In summary, our case outlines the diagnostic value of FDG PET/CT in Erdheim-Chester disease. The imaging findings, combined with bone scintigraphy, provide a comprehensive foundation for accurate diagnosis and guide therapeutic decisions in complex cases.

Importanța 18F-FDG PET/CT în managementul unui caz rar de boală Erdheim-Chester

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Introducere

Boala Erdheim-Chester (ECD) este o histiocitoză non-Langerhans rară și potențial amenințătoare de viață, caracterizată prin acumularea anormală a histiocitelor în diverse țesuturi si organe ale corpului ce afecteaza predominant adulții. ECD se manifestă prin simptome clinice variate, precum afectare osoasa, complicații cardiovasculare și implicare a sistemului nervos central.

Materiale și Metode

Prezentăm cazul unui pacient HIV pozitiv de sex masculin în vârstă de 53 de ani, diagnosticat cu boala Erdheim-Chester în 2023, care s-a prezentat cu efuziune pericardică progresivă. La internare, relatează un istoric de pierdere semnificativă în greutate și exoftalmie bilaterală care au debutat în 2021. Investigațiile diagnostice inițiale, incluzând tomografia computerizată (CT), au identificat efuziune pericardică semnificativă și densificarea grăsimii abdominale. Au fost efectuate teste biochimice, iar CT-ul de urmărire, realizat un an mai târziu, a relevat mase orbitare bilaterale nou apărute față de investigațiile anterioare. Rezultatele histologice au fost afirmative pentru histiocitoza non-Langerhans. Având în vedere complexitatea cazului, s-a recomandat realizarea unei tomografii cu emisie de pozitroni/tomografii computerizate cu fluorodeoxiglucoză (^{18}F-FDG PET/CT) pentru a evalua în mod cuprinzător extinderea bolii și a ghida planul terapeutic.

Rezultate

Investigația ^{18}F-FDG PET/CT a evidențiat mase intraorbitare bilaterale cu metabolism crescut (SUVmax 6,63 g/ml în ochiul drept și 6,78 g/ml în ochiul stâng), îngroșarea circumferențială a pericardului cu activitate metabolică crescută, infiltrarea semnificativă a grăsimii retroperitoneale și perirenale ce asociază hipercaptarea radiotrasorului (SUVmax 4,58 g/ml), invazia structurilor vasculare, renale, musculare și de asemenea afectare apendiculară. Aceste modificări metabolice au fost în concordanță cu caracteristicile morfologice observate anterior la scanările CT. În completarea examinării PET/CT, scintigrafia osoasă whole-body cu 99mTc-HDP a evidențiat o creștere simetrică a captării radiotrasorului în oasele lungi, confirmând afectarea frecventă a scheletului osos asociată cu boala Erdheim-Chester. Luând în considerare evaluările imagistice și confirmarea bioptică, s-a inițiat tratamentul cu Cladribină.

Concluzie

Cazul nostru subliniază valoarea diagnostică a FDG PET/CT în evidențierea manifestărilor complexe ale bolii Erdheim-Chester. Constatările imagistice furnizează informații esențiale pentru un diagnostic precis și orientează decizia terapeutică.

28.The assistance of 18F-FDG PET/CT in Prostate Cancer: A Case Report

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Introduction

The utility of positron emission tomography (PET) with 18F-fluorodeoxyglucose (18F-FDG) in prostate cancer depends on the stage of the disease and the natural history of this malignancy, which is common in men. While FDG uptake can generally overlap significantly in normal benign and malignant tissue, aggressive primary tumors with a Gleason score greater than 7 usually have high 18F-FDG uptake.

The aim of this case report is to showcase the utility of 18F-FDG PET/CT in the era of ^{68}Ga-PSMA PET/CT, particularly in patients presenting with synchronous malignancies. Synchronous primary prostate and lung cancer is rare.

Case description

We present the case of a 76-year-old man diagnosed with advanced prostate adenocarcinoma with a Gleason score of 8(4+4) with multiple adenopathic conglomerates supra- and infradiaphragmatic and multiple bone metastases, for which he received chemotherapy. A biopsy of the left supraclavicular lymph nodes was obtained, which confirmed the extensive involvement of the lymphatic system.

The last follow-up contrast-enhanced computed tomography (CECT) scan revealed a new pulmonary nodule measuring 14 mm with spiculated margins extending to the visceral pleura in the basal segment of the right lower lung, with apparent involvement of the lymph nodes in the right hillum

A PET/CT scan with ^{18}F-FDG was performed, which showed increased uptake of ^{18}F-FDG of the lung nodule with a SULmax of 4.18 and adjacent lymph nodes with a SULmax of 4.08; the prostate, adenopathic conglomerates, and bone lesions showed minimal to no uptake of FDG, thus raising the suspicion of a new primary lung tumor.

Discussion

Nowadays, the diagnosis of synchronous and metachronous malignancies is increasing due to longer life expectancy and advances in cancer diagnosis and therapy. When multiple primary tumors are detected simultaneously, treatment priority is based on the severity of each tumor. Synchronous primary prostate and lung cancer is rare.

18F-FDG is the most commonly used tracer for oncologic imaging, but has limitations in detecting early-stage prostate cancer. 68Ga-PSMA is a new tracer that has high specificity and sensitivity in detecting local and metastatic tumors. However, as prostate cancer progresses, the increased glucose metabolism in advancing prostate cancer provides an opportunity for 18F-FDG.

Incidental high FDG uptake in the prostate, while rare, should prompt further investigation, including at least measurement of serum levels of prostate specific antigen (PSA). All patients with incidentally detected 18F-FDG-avid prostate lesions must be carefully evaluated for clinically significant malignancy. Clinical correlation can be established by a thorough genitourinary history that includes lower urinary tract symptoms, infections, previous surgery, and a known history of prostate cancer.

Conclusion

While the PET/CT with 68Ga-PSMA is the preferred molecular imaging for staging and monitoring prostate cancer, the PET/CT with 18F-FDG can help to assess the primary or secondary origin of a new tumor in a patient presenting with prostate adenocarcinoma with low to no avidity to 18F-FDG.

29.Pericardial Malignancies Unveiled by 18F-FDG PET-CT: A Case Series

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Introduction

Pericardial masses, though uncommon, typically arise from other underlying conditions. While tissue sampling and biopsy remain the definitive diagnostic tools, difficulties like accessing the area or obtaining sufficient fluid can pose obstacles. This is further complicated by the fact that pericardial disease is usually just the "tip of the iceberg", highlighting the need for a comprehensive approach (1). This is where molecular imaging shines, offering a systemic view that effectively aids in diagnosing both inflammatory and malignant cases within the pericardium and surrounding tissues.

Case Series Description

In this case series report we present three cases with metabolically active pericardial lesions, highly suggestive of a secondary origin diagnosed by ^{18}F-FDG PET/CT that would've been otherwise missed by other imaging methods.

The first case is a 56-year-old male diagnosed with stage three lung adenocarcinoma for which he received chemotherapy. The patient underwent an ^{18}F-FDG PET/CT scan to evaluate the response to therapy and determine the further management of the case. The scan showed an expansive, heterogeneous right pulmonary tumor presenting with central intratumoral necrosis, pleural and pericardial invasion, with high metabolic activity having a maximum standardized uptake value normalized by lean body mass (SULmax) of 13.56. There was a diffuse and high uptake of the radiotracer in the percardium that surrounds both atriums, the left ventricle and at the roots of the great vessels with a SULmax up to 8.59.

The second case is a 73-year-old male diagnosed with stage four squamous-cell lung carcinoma with mediastinal tumor invasion, who was referred for an ^{18}F-FDG PET/CT to evaluate the extent of the disease. The prior Contrast Enhanced Computed Tomography (CECT) examinations showed no pericardial involvement. The ^{18}F-FDG PET/CT scan displayed the left pulmonary tumor with a diameter of 73/61/80 mm, which fused with the hilum structures and was in contact with the mediastinal pleura and the pericardium; (high uptake of the radiotracer with a SULmax of 14.35). The scan showed a pericardial effusion (max. 12 mm) with two focal uptakes of the radiotracer with a SULmax up to 10.23.

The third case is a 44-year-old female with a history of squamous cell cervical carcinoma, for which she underwent a total hysterectomy with regional lymphadenectomy, chemo- and radiotherapy four years ago. In the last month, she developed symptoms of constrictive heart failure, confirmed at the last CECT and cardiac ultrasonography. The ^{18}F-FDG PET/CT scan showed solid thickening of the pericardium in the vicinity of the left cardiac chambers, pleuro-pericardial and between the superior vena cava and the descending aorta presenting with a high uptake of the radiotracer, with a SULmax up to 16.56 (pleuro-pericardial).

Discussion

This case series highlights the potential of ^{18}F-FDG PET/CT in diagnosing metabolically active pericardial lesions, particularly those of secondary origin. While traditional imaging modalities like CECT and ultrasound may miss subtle pericardial involvement, F-FDG PET/CT offers a unique combination of anatomical and functional information, aiding in early detection and accurate characterization of these lesions.

All three cases presented with metabolically active pericardial lesions suggestive of malignancy, despite limited or no findings on prior CECT scans. Furthermore, ^{18}F-FDG PET/CT accurately identified the extent of pericardial involvement, including pericardial effusion and focal lesions. This information proved crucial for guiding further management and potentially impacted treatment decisions.

Clinical implications:

^{18}F-FDG PET/CT should be considered in patients with suspected secondary pericardial involvement, especially when other modalities are inconclusive. That's because early detection and characterization of pericardial lesions can lead to timely intervention and improved patient outcomes.
The ability of ^{18}F-FDG PET/CT to assess metabolic activity adds valuable information beyond anatomical detail, aiding in ruling out malignancy.

Limitations and future directions:

To establish the role of ^{18}F-FDG PET/CT in routine clinical practice, we must acknowledge some of its limitations. Despite strict patient preparation, there's not enough control over the unwanted but physiologic uptake of FDG in myocytes or brown fat adjacent to pericardium. It is also a real challenge to differentiate benign from malignant lesions, although quantitative parameters like standardized uptake value (SUV) can aid in adding to the probability of malignancy (2). Other aspects like cost-effectiveness, availability and technique complexity should not be overseen either. Finally, the specific role of PET/CT compared to other modalities like PET with different tracers or advanced MRI techniques needs further investigation.

Conclusion

This case series underscores the valuable role of 18F-FDG PET/CT in identifying metabolically active pericardial lesions, particularly in cases where conventional imaging modalities fall short. By revealing occult lesions and guiding biopsy procedures, PET/CT can facilitate earlier diagnosis and inform tailored treatment strategies for patients with suspected secondary malignancies.

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30.Typical Pulmonary Carcinoid with Atypical Metastasis: A Case Report

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Introduction

Pulmonary carcinoids account for less than 30% of all carcinoid tumors and only 1-2% of all pulmonary malignancies. Histologically, they are classified as typical carcinoid, atypical carcinoid, small cell lung carcinoma and large cell neuroendocrine carcinoma.

With the rise of 68Ga-DOTA-labeled somatostatin analogs PET/CT for the management of neuroendocrine tumors (NETs), our aim is to showcase the value of ^{18}F-FDG PET/CT in the follow-up care of pulmonary carcinoids.

Case Description

We present a case of a 56-year-old female with a history of a pulmonary carcinoid tumor with a diameter of 4 cm with extension to the regional pleura, located in the left superior pulmonary lobe. A left superior pulmonary lobectomy with lymphadenectomy was performed in 2017 and histopathological studies showed a well-differentiated (G1) typical pulmonary carcinoid with no lymph extension.

After five disease-free years, the patient presented with a left posterior thoracic wall mass, originating from the ninth left rib. A biopsy was taken from the mass, histopathological studies and immunohistochemical staining were performed, indicating an atypical pulmonary carcinoid metastasis with a positive expression of the ki67 protein of 10% and high expression of ROS1 gene. A bone “whole-body” scintigraphy with 99mTc-HDP was performed to assess the bone extension, and revealed extensive osteogenic focal uptake located in several thoracic vertebrae, bilaterally on the rib cage and in the pelvic bones, suggestive of bone metastases.

The patient underwent a PET/CT scan with ^{18}F-FDG to further assess the disease extension, which revealed multiple metabolic active lesions located in the thyroid, pancreas, liver and bone. The thyroid was enlarged, presenting with multiple heterogeneous, hypodense lesions avid for ^{18}F-FDG with a SULmax of 5.83 in the right lobe. In the liver there were several hypodense lesions, the biggest and the most metabolically active located at the intersection of the second and third hepatic segment, with a SULmax of 4.82 and diameter of 23/25 mm. In the pancreas there was an expansive solid mass, located at the conjunction of the istm and pancreatic body with a diameter of 13/12 mm, that showed a moderate uptake of FDG with a SULmax of 2.01. The numerous bone metastases previously described, showed a high avidity for the radiotracer, the most active lesion was present in the left iliac wing with a SULmax of 7.85.

Biopsies were taken from the thyroid and pancreas lesions, the histopathological and immunochemical examinations of the thyroid lesion were highly suggestive of a pulmonary well-differentiated carcinoid metastasis (Ki67 2%, Chromogranin A and Synaptophysin positive). The pancreatic biopsy was negative for a NET metastasis. The patient is now undergoing chemotherapy.

Discussion

While primary sites of neuroendocrine tumors in the thyroid gland were fairly cited throughout the years, metastases from other primary sources, especially the lung, are uncommon. Disotuar et al.[1] reported a total of ten cases of bronchial carcinoids with thyroid metastases, four of which having as a primary site a typical carcinoid.

Generally, ^{18}F-FDG has a high rate of accuracy in cases of poorly-differentiated carcinoids, with a higher number of mitoses and thus, a higher metabolic rate. However, in the case of our patient, with a well-differentiated G1 typical bronchial carcinoid, the ^{18}F-FDG uptake was high.
Studies [2,3] suggest a correlation between the proliferative index (Ki67) and the accuracy of the PET/CT scan. In the case of our patient, results of the thyroid biopsy showed a 2% expression of the Ki67 protein, and in spite of having a smaller percentage of the cellular proliferation marker, it showed a high avidity for ^{18}F-FDG.

68Ga-somatostatin peptides PET/CT scans are recognized as the gold standard in the initial staging and management of well differentiated pulmonary NETs, because of the high expression of somatostatin receptors. But, it may not be the best molecular imaging tool for the follow-up care, as it may not identify small distant metastases, including bone, liver and lymph node lesions[4].

Conclusion

This case showcases the importance of ^{18}F-FDG PET/CT scan in the long-term management of typical pulmonary carcinoid, identifying various metastases even in peculiar regions, thus changing the therapeutic approach.

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31.Pathological association of pulmonary amyloidosis and lung metastasis in a patient with colo-rectal adenocarcinoma

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Introduction

Systemic amyloidosis is a group of diseases caused by the deposition of insoluble fibrils, known as amyloid fibrils, in the extracellular spaces of tissues. Primary amyloidosis (AL) associated with monoclonal gammopathy is most involved in pulmonary localization and presents three forms: nodular, diffuse alveolo-septal or tracheobronchial.

Case presentation

We present the case of an 83-year-old patient, smoker, with COPD, HTN, DM type II, PCI with stent on the left subclavian artery, operated for colo-rectal adenocarcinoma (ADK mucinous G1 pT2N0, M0), followed periodically by CT imaging for an LSD lung nodule with uncertain substrate (bronchoscopy and cytological examination negative).

Progression of the known pulmonary nodule (44 mm vs. 36 mm) and detection of a new contralateral nodule required an 18-FDG PET-CT examination. Both nodules were metabolically active (SUVlbm=3.59g/ml LSD and SUVlbm=1.92g/ml LSS), suggesting suspicion of neoplasia.

Atypical LSD lobectomy was performed, with histopathological examination and IHC confirming nodular pulmonary amyloidosis.

The cardiological exam and echocardiography was performed in order to rule out cardiac amyloidosis.

The results places the patient in the gray area (equivocal), and the pyrophosphate scintigraphy identified a Perugini score of 1.

Serum protein electrophoresis with immunofixation had diffuse band migration in IgG and kappa areas. For this, the quantitative determination of light chains is necessary.

The PET-CT evaluation at 1 year and 6 months postsurgery showed residual node progression (26/14mm vs. 14/12mm and SUVlbm=9.65g/ml vs. 2.74g/ml).

The patient was reoperated, the HP exam identified non-microcellular carcinomatous tumor proliferation, moderate inflammatory reaction and the presence of rare amyloid deposits. The morphological aspect suggests lung metastasis.

Disscusion

The diagnosis of pulmonary amyloidosis is made after surgical resection of suspicious pulmonary nodules.

PET-CT studies with 18-FGD in patients with nodular pulmonary amyloidosis indicated a heterogeneous metabolic activity, from non-uptake to moderately-intensely uptake forms. At the same time, it is concluded that an SUVlbm >3 g/ml suggests neoplasia (adenocarcinoma /MALT/ plasmocytoma).

Despite the increased prevalence of cardiac disease in AL amyloidosis (75%), the patient is cardiac compensated, with equivocal arguments that overlap with secondary HTN changes and senescence.

Pyrophosphate scintigraphy excluded the ATTR/hybrid form, and the immunoelectrophoresis result requires a complete hematological diagnostic approach.
The incidence of AL amyloidosis ranges from 9,7 to 14.0 cases per million person- years (APC, 3%; P=.114), with no statistically significat increase. Involvement of the lung is relatively common, but rarely diagnosticated.
Hybrid imaging has an important role in the follow-up of patients with amyloidosis, being frequent cases in which neoplasia and pulmonary amyloidosis coexist. In the case of the current patient, the IHC examination will clarify the type of neoplasia.

Conclusion
18-FDG PET-CT examination in pulmonary amyloidosis is insufficiently studied. Often this method gives false-positive results for neoplasia, but remains a key investigation, providing information related to the potential hematologic disease, synchronous neoplasia and associated inflammatory-infectious complications.

Key words: pulmonary amyloidosis, PET-CT 18-FDG, neoplasia

Asociere patologică de amiloidoză pulmonară si determinări secundare la o pacientă cu neoplasm colo-rectal

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Introducere

Amiloidoza este o patologie sistemică caracterizată prin depunerea extracelulară a fibrilelor insolubile de amiloid.

Amiloidoza primară (AL) asociată gamapatiilor monoclonale este cel mai frecvent implicată în localizările pulmonare și se poate prezenta sub trei forme: forma nodulară, difuză alveolo-septală sau traheobronșică.

Prezentare de caz

Prezentăm cazul unei paciente in vârsta de 83 ani, fostă fumătoare, cunoscută cu BPOC, HTA, DZ tip II, implant de stent pe artera subclavie stangă, operată pentru neoplasm de colo-rectal (ADK mucinos G1 pT2N0, M0), urmarită periodic prin imagistica CT pentru un nodul pulmonar LSD cu substrat incert (bronhoscopia si examen citologic negative).

Progresia nodulului pulmonar cunoscut (44 mm vs. 36 mm) și decelarea unui nodul nou apărut la nivelul LSS au impus efectuarea unui examen PET-CT cu 18-FDG. Ambii noduli au fost activi metabolic (SUVlbm=3,59g/ml LSD și SUVlbm=1.92g/ml LSS), ridicând suspiciunea pentru neoplazie.

S-a intervenit chirurgical prin rezecție pulmonară atipică LSD, cu examen histopatologic si IHC de amiloidoză pulmonară nodulară.

Consultul cardiologic plasează pacienta în zona gri (echivocă) de afectare cardiacă, iar scintigrafia cu pirofosfat a obiectivat un scor Perugini 1.

EPS cu imunofixare a identificat migrația în benzi difuze în zonele Ig G si kappa, necesitatând dozări cantitative pentru lanțuri ușoare.

Evaluarea PET-CT la 1 an și 6 luni postoperator a obiectivat progresia nodului din LSS (26/14mm vs. 14/12mm și SUVlbm=9,65g/ml vs. 2,74g/ml).

Pacienta a fost reoperată, examenul HP relevând proliferare tumorală carcinomatoasă non-microcelulară, reacție inflamatorie moderată cu prezența de rari corpi amilacei. Aspectul morfologic pledând mai degrabă pentru determinare secundară.

Discuții

Diagnosticul amiloidozei pulmonare se face adesea după rezecția chirugicală a nodulilor pulmonari suspecți .

Studiile PET-CT cu 18-FGD publicate au raportat o activitatate metabolică cu aspect heterogen in cazul amiloidozei pulmonare, variind de la forma necaptantă până la forme moderat-intens captante, specificând că un SUVlbm >3 g/ml pledează pentru neoplazie asociată (adenocarcinom/MALT/plasmocitom).

Contrar prevalenței crescute pentru afectarea cardiacă in cadrul amiloidozei AL (75%), pacienta este compensată cardiac, cu argumente echivoce ce se suprapun peste modificarile date de HTA și senescența. Scintigrafia cu pirofosfat a exclus forma ATTR/ hibridă, iar rezultatul imunoelectroforezei impune un demers diagnostic hematologic complet.

Incidența amiloidozei AL variază de la 9,7 la 14,0 cazuri la 1 milion de persoane/an (APC, 3%; P=.114), fără o creștere semnificativă statistic. Afectarea pulmonară în cadrul formei AL este relativ comună însă rareori diagnosticată.
Imagistica hibridă joacă un rol important în urmărirea pacienților cu amiloidoză ținând cont de numeroase raportări în care neoplazia si amiloidoza pulmonară coexistă. În cazul pacientei prezentate examenul IHC urmând să certifice tipul neoplaziei.

Concluzii
Examinarea PET-CT cu 18-FDG în amiloidoza pulmonară este insuficient studiată în prezent. Adesea oferă rezultate fals pozitive pentru neoplazie, însă rămâne o investigație cheie, oferind informații legate de boala hematologică implicată/ neoplazii sincrone, extensia acestora și complicații inflamator-infecțioase asociate.

Cuvinte cheie: amiloidoza pulmonară, PET-CT 18-FDG, neoplazie

32.Precision in Diagnosis: Unveiling Infective Endocarditis with 18F-FDG PET/CT Imaging

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Introduction

Infective endocarditis (IE) is a rare but impactful condition, with a prevalence of 3 to 10 cases per 100,000 individuals annually. [1]

Despite efforts for earlier diagnosis, the 1-year mortality rate has not improved. IE has evolved over time. In the pre-antibiotic era, it affected young or middle-aged adults with heart diseases. Antibiotics and medical advancements shifted risk factors to prosthetic valves, hemodialysis, catheters, immunosuppression, and IV drug use. The average patient is now older with more comorbidities, and staphylococci have replaced streptococci as the main causative organism. IE symptoms vary, affecting 3-10 individuals per 100,000 annually, with fevers, night sweats, fatigue, and weight loss. Early diagnosis is crucial for those with risk factors, heart murmurs, and associated symptoms. Positron emission tomography (PET) using 18F-fluorodeoxyglucose (18F-FDG) is promising for detecting infections due to increased metabolic activity in inflammatory cells. [2]

Materials and methods

We share the cases of three patients who underwent 18F-FDG PET scans to detect active infective endocarditis, offering concise insights into the diagnostic process and findings.

Before the investigation, the patients follow a 48-hour low-carb, high-fat diet followed by a 16-hour fast. The administered activity consisted 2.5–3 MBq/kg of 18F-FDG, followed by a wholebody investigation after 55–65 minutes and a delayed imaging technique centered on the thorax after about 80 minutes.

A 27-year-old female, with a ventricular septal defect since age four, currently has pulmonary hypertension (PAPs=27mmHG) and no history of drug addiction. Surgery was not recommended. Two months before a PET scan, she experienced a week-long episode of high fever, chills, sweats, and nausea. Echocardiography reveals tricuspid insufficiency and a dysplastic valve, increasing the risk of infective endocarditis (IE). Despite ten days of Ceftriaxone and Gentamicin, inflammatory markers did not improve. Switching to vancomycin resulted in a positive response. Infectious disease specialists suggest an 18F-FDG PET/CT scan to assess IE activity and determine if surgery to repair the septal defect, with or without replacing the tricuspid valve, is feasible considering the unchanged appearance of the dysplastic tricuspid valve on echocardiography.

We identify a hypermetabolic foci at the tricuspid valve level on the 18F-FDG PET/CT scan images, with a SULmax of 2.47, indicating an active infective endocarditis.

In the second case, a 67-year-old male patient with a history of atrial fibrillation, an infected prosthetic mitral valve, and a left cerebellar ischemic stroke underwent transoesophageal echocardiography. Atypical filaments were observed on the prosthetic valve, but a conclusive diagnosis of infective endocarditis could not be established due to insufficient information. Considering these findings, it is recommended to perform a supplementary 18F-FDG PET/CT scan to further assess the situation.

We identify hypermetabolic diffuse activity close to the prosthetic valve without specific foci on the 18F-FDG PET/CT scan, with a SULmax of up to 4.73.
The third case is an 82-year-old woman who has a history of congestive heart failure with significant tricuspid insufficiency, diabetes mellitus, and a pacemaker—a cardiovascular implanted electronic device. A hyperechoic abnormal growth on the lead of CIED is assessed by the specialist on the transesophageal echocardiography images. Vancomicin and Ceftriaxone were recommended by the infectious diseases specialist, along with the potential advantage of a PET-CT scan to distinguish between lead fibrosis and active infective endocarditis.
We detect a hypermetabolic activity next to the pacemaker lead on the PET/CT scan images, which is most likely the vegetation detected by transesophageal echocardiography. Interestingly, we find hypermetabolic foci in the left pulmonary hilum and right lower lobe of the lung.

Discusion
In all three cases, inconclusive echocardiography results prompted further investigation through an 18F-FDG PET/CT scan. Literature suggests individuals with strong clinical suspicion of prosthetic valve endocarditis (PVE) and nondiagnostic echocardiograms should undergo [18F]FDG PET/CT. Major criteria for this include intense, focal/multifocal, or heterogeneous patterns observed at least three months post-prosthetic valve surgery. Abnormal FDG uptake on Cardiac Implantable Electronic Device leads is also considered a major criterion. The ISCVID has added aesthetically aberrant uptake on native valves as a minor criterion.[2]
Duval X et al[3] evaluated the diagnostic and patient management modifications induced by systematic whole body 18F-FDG-PET/CT in patients with high suspicion of IE. The study found that a significant proportion of PVIE and NVIE patients benefited from 18F-FDG-PET/CT.

Conclusion
It has been shown that 18F-FDG PET/CT is a useful diagnostic modality for patients with suspected IE, and inconclusive results in other diagnostic assets. Through the use of this method, infectious endocarditis mortality and morbidity can be decreased, and an earlier diagnosis can lead to a better prognosis.

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33.PET/CT dosimetry differences of oncological patients

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The PET/CT examination plays an essential role in modern medical diagnosis and monitoring of various conditions such as cancer, neurological diseases and cardiac pathologies.
A major concern in the use of this hybrid imaging technique is patient dosimetry. Proper management of radiation doses administered to patients are essential to minimise the risks associated with exposure to ionising radiation through medical procedures.
One of the factors that can influence patient dosimetry is the positioning of the patient during the procedure.

The standard protocol for patient positioning in PET/CT scans is supine with both arms raised. Due to comorbidities, one or both arms may be lowered along the torso and the patient may have variations of the supine position during scan time. Each position has distinct advantages and challenges in terms of image quality, lesions detection and ensuring patient comfort.

We performed a retrospective study on 378 oncology patients who underwent F-18 FDG PET/CT at our clinic between March and July 2023. Fluorine 18-FDG PET/CT studies were obtained by using one of two PET-CT protocols: the standard whole-body, head to mid-thigh, and extended whole-body, head to toe. The both groups of patients were divided into those scanned in the arm-raised position and both arms lowered position. Height and weight were recorded and patients were further divided into 5 body-mass index subgroups (underweight, normal weight, overweight, obese, and morbidly obese). The administered dose of F-18 FDG was adjusted to the patients weight in accordance with the EANM guidelines. Individual effective radiation dose was calculated from the effective tube current–time product per exposed section.

The administered dose of F-18 FDG could significantly be reduced using BMI instead of patient weight, without diminishing image quality. Omitting arm elevation results in lower but acceptable PET-CT image quality and a higher effective irradiation dose.

The results highlight the importance of personalised dosimetry in PET-CT imaging taking into account both individual patient characteristics and positioning.

Keywords: dosimetry, PET-CT, optimization

Diferente ale dozimetriei pacientilor oncologici in examinarea PET-CT

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Investigația PET-CT joacă un rol esențial în diagnosticul medical modern și monitorizarea diverselor afecțiuni, precum cancerul, bolile neurologice și patologiile cardiace.
O preocupare majoră în utilizarea acestei tehnici imagistice hibride o reprezintă dozimetria pacientului. Gestionarea adecvată a dozelor de radiații administrate pacienților sunt esențiale pentru minimizarea riscurilor asociate expunerii la radiații ionizante prin proceduri medicale.
Unul din factorii care pot influența dozimetria pacientului îl reprezintă poziționarea acestuia pe masa de scanare a aparatului.

Protocolul standard de poziționare al pacienților în scanarile PET-CT este în decubit dorsal cu brațele ridicate. Datorită unor comorbidități, unul sau ambele brațe pot fi coborâte pe lângă trunchi, iar pacientul poate fi poziționat în decubit dorsal cu variații de înclinare ale trunchiului. Fiecare poziție prezintă avantaje și provocări distincte în ceea ce privește calitatea imaginii, detectarea leziunilor și asigurarea confortului pacientului.

Am efectuat un studiu retrospectiv pe 378 pacienți oncologici care au efectuat investigații ^{18}F-FDG PET/CT la clinica noastră între 01.03-31.07.2023. Achizițiile au fost obținute utilizând unul dintre cele două protocoale de scanare PET-CT: standard whole-body (vertex→jumătatea coapsei) sau extended whole-body (vertex→călcâi). Ambele grupuri de pacienți au fost împărțite ulterior în cei scanați cu poziția brațelor deasupra capului sau pe lângă trunchi. Înălțimea și greutatea au fost înregistrate și pacienții au fost împărțiți în continuare în 5 subgrupe IMC: subpondere, normopondere, supraponderalitate, obezitate și obezitate morbidă. Doza de ^{18}F-FDG administrată a fost ajustată la greutatea pacienților în conformitate cu ghidurile EANM. Doza efectivă de iradiere individuală la CT a fost calculată din produsul curent-timp al tubului CT per secțiune expusă.

Doza administrată de ^{18}F-FDG ar putea fi mult redusă folosind IMC în loc de greutatea pacientului, fără a diminua calitatea imaginii. Omiterea ridicării brațelor are ca rezultat o calitate mai scăzută, dar acceptabilă a imaginii PET-CT și o doză efectivă de iradiere mai mare.
Rezultatele subliniază importanța dozimetriei personalizate în invesțigatiile PET-CT luând în considerare atât caracteristicile individuale ale pacientului cât și poziționarea.

Cuvinte cheie: dozimetrie, PET-CT, optimizare

34.Importance of decontamination protocols of the differentiated thyroid cancer patient admitted for ^{131}I therapy

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Differentiated thyroid cancer is the most common endocrine malignancy, with an increasing incidence, predominantly affecting females.

After thyroidectomy, the administration of radioactive iodine (RAI) is an effective treatment, as ^{131}I uptake by the thyroid cells is similar to anorganic iodine. The beta radiation emitted by ^{131}I produces significant physico-metabolic changes at the cellular level, including apoptosis.
^{131}I therapy requires strict precaution because of the patient's radioactivity. National regulations require containment protocols to minimise exposure radiation to other people and to limit contamination of the environment.

The study was conducted on a sample of 67 patients classified by age group, according to tumor recurrence risk staging guidelines of the American Joint Committee on Cancer (AJCC). Effective dose rates (EDRs) were measured periodically at 1 meter distance. EDRs values were correlated with factors such as: presence of thyroid remnants at the cervical level, distant metastases, weight calculation groups according to body mass index (BMI), fluid intake during hospitalization and number of showers taken during hospitalization.

We considered daily mean EDRs, in all patients with therapeutic doses of 30mCi ^{131}I and 50mCi ^{131}I, regardless of BMI group, these were below the national regulations limit of 40μSv/h at 24h after therapeutic dose administration. The most significant decrease in EDRs was in a female patient with BMI=28.6 kg/m2 who received a dose of 100mCi ^{131}I and had a EDR=130μSv/h at 24h, with a decrease of 92.4% at 96h (EDR =7.5 μSv/h). In this sample, regardless of the number of days of hospitalization, the average water consumption/patient/day, was 1.2liters/day, although the recommendation received was a minimum of 2liters/day.
By analysing all the data we have identified that patient hydration is the main external factor influencing the decrease in EDR.

Keywords: effective dose rate, radioprotection, radioiodine therapy

Importanța protocoalelor de decontaminare ale pacientului cu cancer tiroidian diferențiat internat pentru terapia cu ^{131}I

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Cancerul tiroidian diferențiat este cea mai frecventă afecțiune malignă endocrină, cu o incidență în creștere, mai evident în cazul femeilor.

Administrarea de iod radioactiv (^{131}I) este cel mai eficient tratament pentru cancerul tiroidian diferentiat. Procesul de captare al ^{131}I de către celulele tiroidiene este similar iodului anorganic, insa acesta emite radiații beta producând modificări metabolice semnificative la nivel celular, inclusiv apoptoza.

Terapia cu ^{131}I necesită precauții stricte din cauza radioactivității pacientului. Reglementările naționale (CNCAN) impun protocoale de izolare pentru a minimiza expunerea persoanelor din anturaj la radiații și limitarea contaminării obiectelor din mediul inconjurator.
Studiul a fost efectuat pe un eșantion de 67 pacient clasificați pe grupe de vârstă, conform ghidului de stadializare al riscului de recidivă tumorală al Comitetului American pentru Cancer (AJCC). Debitele de doză efectivă (DDE) au fost măsurate periodic la o distață de 1metru. Valorile DDE au fost corelate cu factori precum: prezența de resturi tiroidiene la nivel cervical, a metastazelor la distanță, grupe de calculare a greutății conform indicelui de masă corporală (IMC), consumul de lichide pe perioada internării și numărul de dușuri efectuate pe perioada internării.

Am luat în considerare mediile zilnice ale DDE, la toți pacienții cu doze terapeutice de 30mCi ^{131}I și 50mCi ^{131}I, indiferent de grupa IMC, acestea s-au încadrat sub limita CNCAN de 40μSv/h la 24h de la administrarea dozei terapeutice. Cea mai importantă scadere a DDE s-a înregistrat la o pacientă de sex feminin, cu IMC=28.6 kg/m^2, care a primit o doză de 100mCi ^{131}I și a avut un DDE=130μSv/h la 24h, cu o scădere a acestuia de 92,4% la 96h (DDE=7.5 μSv/h). La acest eșantion, indiferent de numărul de zile de spitalizare, consumul mediu de apă/ pacient/zi, a fost de 1.2litrii/zi, deși recomandarea primită a fost de minim 2litrii/zi.

Analizând toate datele acumulate am identificat că principalul factor extern care influențează scăderea DDE este aportul de lichide.

Cuvinte cheie: radioprotecție, radioiodoterapie, debit de doză efectivă

35. Production, characterization and translation of radioisotopes of medical interest at the Radiopharmaceuticals Research Center (IFIN-HH, CCR)

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A TR-19 cyclotron (Advanced Cyclotron Systems Inc., Canada), a multifunctional, fully automated and computer controlled device, serves as the central component of RCC. It has the possibility of simultaneous double irradiation with independently varying intensities, up to a total beam current of more than 300 μA. This cyclotron has a variable energy of 14-19 MeV resulting in a wide range of radioisotopes for PET imaging: ^{18}F, ^{64}Cu, ^{61}Cu, ^{89}Zr, ^{166}Ho, ^{11}C, ^{13}N, ^{15}O, ^{68}Ga.

High specific activity is required for radioisotope applications in nuclear medicine, and this can be obtained employing nuclear reactions initiated by highly accelerated protons. In order to perform either diagnostic or therapeutic medical imaging, radioisotope production is essential. PET imaging with ^{89}Zr and ^{64}Cu-based agents has been a dynamic field of research. The production processes involve the nuclear reactions ^{89}Y(p,n)^{89}Zr and ^{64}Ni(p,n)^{64}Cu to irradiate ^{nat}Y foils and electrodeposited ^{64}Ni targets, respectively. A completely automated solid target irradiation system (Alceo-Comecer, Italy) was used to carry out the irradiations. The post-irradiation process involves the dissolution and purification of the irradiated targets to obtain pharmaceutical grade products.

For pharmacology, radiobiology, and radiopharmacy research, the microPET-CT imaging equipment for small animals (mice and rats) located within the RCC is employed. The radiopharmaceuticals used for preclinical studies are obtained by labeling the molecules of interest with positron-emitting radioisotopes produced at the TR-19 cyclotron.

Keywords: medical radioisotopes, PET-CT, cyclotron, radiopharmaceuticals

36.Beyond the pixel: Unmasking artifacts in pediatric 99mtc-dtpa scans

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Aim and introduction

Recognition and understanding of artifacts are imperative for discerning abnormal findings in pediatric 99mTc-DTPA scans, facilitating precise interpretation and error prevention. Our research aims to share our 20-year experience of collaboration within the Nuclear Medicine and Pediatric Nephrology Departments, thereby enriching discourse in this field.

Material and Methods

This retrospective study was conducted between 2004 and 2023 at the Nuclear Medicine Department of the Emergency Clinical Hospital "Sf. Spiridon" Iaşi. Aimed to identify artifacts encountered in Pediatric 99mTc-DTPA Scans, the study utilized a dual head Siemens gamma camera for image acquisition. Our investigation stemmed from the analysis of 1732 99mTc-DTPA Scans, with 1291 involving pediatric patients, and our primary objective was to discern and analyse artifacts manifested within the imaging data. The most frequent artifacts encountered are related to the position and motion of the patient, the moment of diuretic administration and the choice of region of interest (ROI) background subtraction method.

Results and Discussions

From 1291 Pediatric 99mTc-DTPA scans only 6,66% presented artefact due to motion. Our artifact correction methods are tailored to effectively manage identified issues and contribute to the patient's clinical journey. The efficacy of our proposed artifact correction methods merits further investigation, with potential refinement for broader applicability across pediatric nuclear medicine studies. Collaboration within the field is essential for advancing artifact management strategies and optimizing diagnostic precision in paediatric imaging.

Conclusions

The acquisition and interpretation of Pediatric 99mTc-DTPA scans present a continuous challenge, emphasizing the importance of meticulous scrutiny in detecting and addressing potential artifacts to ensure accurate diagnostic inference.

Keywords: 99mTc DTPA, pediatrics, artifacts

Dincolo de pixeli: dezvăluirea artefactelor în nefrograma cu 99mtc-dtpa la pacienții pediatrici

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Scop și introducere
Recunoașterea artefactelor este esențială pentru interpretarea imaginilor scintigrafice obținute prin nefrogramă cu 99mTc-DTPA la pacienții pediatrici, facilitând astfel interpretarea precisă și prevenirea erorilor. Scopul studiului de față este de a împărtăși experiența acumulată pe parcursul a 20 de ani de colaborare între Departamentul de Medicină Nucleară și cel de Nefrologie Pediatrică.

Material și metode
Acest studiu retrospectiv (2004-2023), realizat în cadrul Departamentului de Medicină Nucleară al Spitalului Clinic de Urgență "Sf. Spiridon" Iași, a avut ca scop identificarea artefactelor în imaginile scintigrafice obținute prin nefrogramă cu 99mTc-DTPA la pacienții pediatrici. Pentru achiziție a fost utilizată gamma camera Siemens cu două capete. În cadrul acestui studiu au fost analizate 1732 de nefrograme cu 99mTc-DTPA, dintre care 1291 au fost realizate la pacienți pediatrici. Obiectivul nostru a fost identificarea și analiza potențialelor artefacte. Cele mai frecvente artefacte întâlnite sunt legate de poziționarea și mișcarea pacientului, momentul administrării diureticului și alegerea metodei de selecție a fundalului regiunii de interes (region of interest - ROI).

Rezultate și discuții
Din 1291 de nefrograme cu 99mTc-DTPA la pacienți pediatrici, doar 6,66% au prezentat artefacte cauzate de mișcăre. Eficacitatea metodelor propuse de corecție a artefactelor pot fi completate de investigații suplimentare, în vederea aplicabilității pe scară largă. Colaborarea interdisciplinară este esențială pentru îmbunătățirea strategiilor de gestionare a artefactelor și optimizarea preciziei diagnostice.

Concluzii
Achiziționarea și interpretarea nefrogramelor cu 99mTc DTPA la pacienții pediatrici reprezintă o continuă provocare, subliniind necesitatea examinării meticuloase pentru detectarea și abordarea potențialelor artefacte.

Cuvinte cheie: 99mTc DTPA, pediatrie, artefacte

37.99mTc-Tektrotyd Scintigraphy Shining upon Neuroendocrine Tumors

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Introduction

Somatostatin receptor scintigraphy (SRS) has an essential role in guiding targeted therapeutic methods for neuroendocrine tumors (NETs). Our aim is to highlight the significance of SRS in the therapeutic approach and of NETs, particularly in assessing somatostatin receptors (SSTR) status and guiding for targeted therapy, with exemplification of a particular case.

Material & method

We herein describe a 73-year-old patient with a small intestine NET G_2, Ki67=3-4% pT3NxMx, with elevated NET markers (serotonin: 920ng/ml, Cg A: 411,3ng/ml; 5-HIAA: 139mg/24h). Several structural images (CT/MRI) revealed multiple metastatic dissemination. To evaluate SSTR status, the patient underwent two times ^{99m}Tc-Tektrotyde SRS in evolution (before and after therapy). Image acquisition was performed with a dual detector gamma camera Siemens-Diacam: 10 minutes static, followed by whole body and SPECT images acquired at 2 and 4 hours. Regions of interest were defined for each hot pathological area and the uptake was quantified to assess quantitatively SRS images.

Results & discussion

First SRS revealed multiple areas of focal pathological uptake (Krenning grade 2-4), localized in left latero-cervical area, mediastinum, half superior of left hemithorax and epigastrium/mesogastrus, with extensive Tumor budding score. The results underline the fact that all metastatic sites described in the structural images have SSTR. Considering the age of the patient and the associated comorbidities, the interdisciplinary medical committee recommended somatostatin analogues therapy (Sumatolin) initiation, instead of PRRT. After 6 months of therapy, the patient's life quality was significantly improved with visible amelioration of clinical symptoms. The follow-up scintigraphy has proven a partial response, indicating the utility of SRS in monitoring therapy.

Conclusion

This case highlights the key role of ^{99m}Tc-Tektrotyd scintigraphy in management of NETs. By describing SSTR expression, SRS facilitates personalized treatment strategies, optimizing patient management and outcomes in the era of precision medicine.

Keywords: ^{99m}Tc Tektrotyde scintigraphy, NETs, targeted therapy

38.The role of 99mtc-edda/hynic-toc scintigraphy in the management of a bilateral glomus tumor

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Introduction

Glomus tumors are mesenchymal neoplasms with slow progression, that account for less than 2% of soft tissue tumors.

Case presentation

A 37-year-old patient who, in 2021, sought evaluation in the ENT department for the investigation of palpable painless lateral cervical formations. Initially, a cervical CT scan was performed, revealing two iodophilic, non-homogeneous lesions located at the carotid glomus, measuring 33/21/34 mm with Shamblin class II on the right side and 24/25/38 mm with Shamblin class I on the left side.

In August 2021, an Angio-MRI examination detected nodular tissue patches with non-homogeneous T2 hyperintensity, without diffusion restriction and without visible vascular involvement on arterial sequence (TOF). A reevaluation MRI performed in March 2023, showed no change in dimensions. Further investigation with 99mTc-Tektrotyd scintigraphy (SRS), "whole-body" acquisition and SPECT-CT was recommended. The nodular formations were identified, with stable dimensions and an increased expression of somatostatin receptors, with SUVlbm=39.8 g/ml on the left side and SUVlbm=55.4 g/ml on the contralateral side. Considering the high expression of somatostatin receptors and the high surgical risk, treatment with a somatostatin analog was initiated. Throughout the conducted investigations, the patient remained asymptomatic.

Discussions

Head and neck paragangliomas (HNP) are rare vascular neuroendocrine tumors, originating from neuroendocrine cells of the neural crest, affecting both sexes equally. The majority are diagnosed between 40 and 60 years of age and in 10% of cases they are reported as multiple or bilateral tumors. Molecular imaging investigations used for the evaluation of paragangliomas include: I123 MIBG scintigraphy, 99mTc-HYNIC-TOC, PET-CT with 18F-flubrobenguane, 18F-FDOPA, 18F-FDG, 68Ga-DOTATOC, or 68Ga-DOTATATE.

Conclusions

Paragangliomas can be challenging to diagnose and may remain completely asymptomatic. SRS has demonstrated high sensitivity in detecting HNP and has had a significant impact on the management of patients with increased surgical risk, allowing the initiation of SSA therapy.

Key words: Somatostatin receptor scintigraphy; paraganglioma; neuroendocrine tumor.

Rolul scintigrafiei 99mtc-edda/hynic-toc în managementul unei tumori glomice bilaterale

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Introducere
Tumorile glomice sunt neoplasme mezenchimale ce însumează mai puțin de 2% din tumorile țesuturilor moi, având o evoluție lentă.

Prezentare caz
Pacient în vârstă de 37 de ani care în anul 2021 se prezintă în serviciul ORL pentru investigarea unor formațiuni laterocervicale palpabile nedureroase. De primă intenție se efectuează examen CT regiune cervicală care evidențiază două leziuni tisulare neomogene iodofile, placate la nivelul glomusurilor carotidiene, cu dimensiuni de 33/21/34 mm și clasă Shamblin II de partea dreaptă, respectiv 24/25/38 mm, clasă Shamblin I de partea stângă. În 08.2021, examenul Angio-IRM decelează plaje nodulare tisulare în hipersemnal neomogen T2, fără restricție pe difuzie, fără afectare de calibru vascular vizibilă pe secvență arterială (TOF). Reevaluarea IRM din martie 2023 evidențiază aspectul nemodificat dimensional. Se recomandă completarea investigației cu examen scintigrafic tip 99mTc-Tektrotyd, achiziție "whole-body" și SPECT-CT unde se regăsesc formațiunile nodulare, stabile dimensional, cu expresie crescută a receptorilor de somatostatină, cu SUVlbm= 39,8 g/ml de partea stângă, respectiv SUVlbm= 55,4 g/ml contralateral. Având în vedere expresia crescută a receptorilor de somatostatină și riscul chirurgical mare, se inițiază tratamentul cu analog de somatostatină (SSA).
Pe toată perioada investigațiilor efectuate, pacientul s-a menținut asimptomatic.

Discuții
Paraganglioamele capului și gâtului (HNP) sunt tumori neuroendocrine vasculare rare, dezvoltate din celulele neuroendocrine ale crestei neurale, ce afectează în mod egal ambele sexe; majoritatea sunt diagnosticate între 40 și 60 de ani, iar în 10% din cazuri sunt descrise ca tumori multiple sau bilaterale. Investigațiile de imagistica moleculara au un rol esential in diagnosticarea si evaluarea paraganglioamelor, cele mai utilizate fiind: scintigrafia cu I123 MIBG, 99mTc-HYNIC-TOC, PET-CT cu 18F-flubrobenguane, 18F-FDOPA si 68Ga-DOTA

Concluzii
Paraganglioamele pot fi dificil de diagnosticat și complet asimptomatice. SRS a demonstrat o sensibilitate foarte mare în detectarea HNP și a avut un impact major în managementul acestui pacient cu risc chirurgical crescut, permițând inițierea terapiei cu SSA.

Cuvinte cheie: scintigrafie cu receptori de somatostatină; paragangliom; tumori neuroendocrine.

39.Hiding in Plain Sight: Atypical Presentation of Giant Ureteral Lithiasis in a Child

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Introduction
Urolithiasis is a pathology caused by the presence and formation of mineral deposits in the urinary tract.
The prevalence of urolithiasis in pediatric population has increased dramatically over the last two decades, the complex underlaying etiologies are yet to be established.

Material and methods
A 9-year-old patient, coming from a particular regional socio-economical context, was admitted to the Pediatric Nephrology Clinic for recurrent urinary tract infections. The ultrasound images taken three months apart describe a progressive hydronephrosis, up to grade III. Sterile pyuria, nephritic-grade proteinuria, hematuria, hemoglobinuria with renal function within normal ranges persisted during the check-up appointments. Radioisotope nephrogram was performed and subsequently an Uro-CT investigation.

Results and discussions
99mTc-DTPA nephrogram with 1st minute diuretic test was suggestive for an incomplete obstruction on the right kidney curve. Split function was 56.9% for the right kidney and 43.1% for the left kidney. Scintigraphic estimated glomerular filtration rate (eGFR) was 130 ml/min.
Urinary lithiasis affects 1% of the pediatric population. Exceptional ureteral localization is accompanied by noisy symptomatology. Dimensions over 4 cm account for giant stones and infectious etiology determine formation of struvite stones.
Case particularity: Incomplete obstruction with slow radiopharmaceutical elimination in the presence of a giant ureteral calculus. Quasi-asymptomatic ureteral lithiasis development with no documentation of any renal colic episodes.

Conclusions
Dynamic renal scintigraphy maintains a well-defined place in the management of obstructive renal pathologies. Despite atypical presentation of our case, 99mTc-DTPA nephrogram can accurately establish the presence, level and nature of an obstructive process, guiding further clinical diagnosis and treatment plan.

Keywords: ureteral lithiasis, giant stone, 99mTc-DTPA

40.Congenital hypothyroidism, risk factor for autism spectrum disorder

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Congenital hypothyroidism (CH) is characterized by hormone deficiency present at birth. The majority of CH is due to a defect in thyroid gland development (80%) which encompasses a variety of defects including agenesis, ectopic or hypoplastic gland.

Ectopic thyroid tissue is an uncommon entity that may be found anywhere along the line of the obliterated thyroglossal duct, usually from the tongue to the diaphragm. Sublingual thyroid is a rare type of ectopic thyroid tissue resulting from failure of the embryonic development and migration of the thyroid gland to its normal pre-laryngeal site. In most cases, patients develop subclinical hypothyroidism due to inadequate hormone production. Untreated, this condition puts them at risk of developing irreversible neurological deficits.

We present a case of a 6-year-old male patient who was referred to our clinic after incidental finding of a mass located in the tongue root. The patient did not describe any pressure symptoms. The physical examination revealed a swelling at the base of the tongue and did not identify any palpable thyroid gland in the pre-tracheal region.

The cervical CT and US examinations showed the absence of the thyroid tissue in its normal location and found a mass in sublingual region. The thyroid scan with Tc-99m pertechnetate confirmed the presence of sublingual thyroid tissue.

Hormonal profile diagnosed primary hypothyroidism based on high levels of TSH, with normal values of FT4 and T3. Substitution treatment with levothyroxine was initiated and adjusted based on TSH levels. After a 6-year follow-up, the patient reported symptoms of insomnia, shyness, and introversion and after a psychiatric evaluation was diagnosed with autism spectrum disorder.
This presentation aims to present the case of a 6-year-old male patient and highlight the correlation between CH resulting from thyroid dysgenesis and autism spectrum disorder, both conditions being characterized by a decrease in parvalbumin expression.

Keywords: ectopic thyroid gland, congenital hypothyroidism, autism spectrum disorder

Hipotiroidismul congenital, factor de risc pentru tulburarea de spectru autist

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Hipotiroidismul congenital este caracterizat prin prezenta unui deficit al hormonilor tiroidieni la nastere. Majoritatea cazurilor de hipotiroidism congenital sunt datorate anomaliilor aparute in dezvoltarea glandei tiroide (80%) ce cuprind o varietate de defecte inclusiv agenezia, tiroida ectopica sau hipoplazica.

Tesutul tiroidian ectopic reprezinta o entitate ce poate fi intalnita oriunde de-a lungul ductului tireoglos, de la baza limbii pana la nivelul diafragmei. Tiroida sublinguala este un tip rar de tesut tiroidian ectopic rezultat in urma unui defect aparut in dezvoltarea si migrarea glandei tiroide. In cele mai multe cazuri pacientii dezvolta hipotiroidism subclinic datorita productiei inadecvate a hormonilor tiroidieni. Netratata, aceasta afectiune expune pacientii riscului de a dezvolta defecte neurologice ireversibile.

Prezentam cazul unui pacient in varsta de 6 ani ce s-a prezentat in clinica dupa descoperirea incidentala, in cursul unui consult ORL, a unei mase localizate la baza limbii. Pacientul nu acuza simptome de presiune sau discomfort in regiunea cervicala. Examenului clinic a constatat prezenta unei tumefactii localizate la baza limbii si nu a identificat tesut tiroidian palpabil in regiunea pretraheala. In urma ecografiei si a examenului CT cervical s-a constatat prezenta unei mase in regiunea sublinguala precum si absenta tesutului tiroidian. Ulterior, examenul scintigrafic tiroidian cu Tc-99m pertechnetat a confirmat prezenta tesutului tiroidian in regiunea sublinguala.

Profilul hormonal a diagnosticat hipotiroidismul primar pe baza nivelurilor ridicate ale TSH, cu valori normale ale FT4 si T3. Tratamentul de substituție cu levotiroxină a fost inițiat și ajustat pe baza nivelurilor TSH. După un follow-up de 6 ani, pacientul a raportat simptome de insomnie, timiditate și introversie și după o evaluare psihiatrică a fost diagnosticat cu tulburare de spectru autist.

Scopul acestei lucrari este de a prezenta cazul unui pacient in varsta de 6 ani diagnosticat cu hipotiroidism congenital si tulburare de spectru autist si de a evidentia legatura dintre aceste afectiuni, stiind ca in ambele cazuri este prezenta scaderea expresiei parvalbuminei.

Cuvinte cheie: tiroida ectopica, hipotiroidism congenital, tulburare de spectru autist

41. The Utility of PET-CT in Prognostic Evaluation of Ovarian Cancer

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Introduction

Ovarian cancer (OC) stands out as the most lethal gynecological malignancy, often diagnosed in advanced stages and accompanied by significant morbidity and mortality rates. This study aimed to explore the connection between tumor differentiation and glucose metabolism among patients diagnosed with histopathological confirmed OC.

Materials and Method

We conducted a retrospective review of 36 consecutive patients (ages 44-76) with histopathological confirmed OC who underwent PET-CT in our department between January 2021 and January 2023. Quantitative data on glucose metabolism were collected using the maximum standardized uptake value normalized by lean body mass (SULmax). The PET-CT examination was conducted using specialized equipment, with patients instructed to fast for a minimum of 6 hours prior to the procedure and follow a low-carbohydrate diet for 24 hours beforehand. PET-CT images were reviewed for primary tumors, locoregional spread, and distant organ metastases.

Results

We examined a total of 36 patients with a mean age of 60±8 years (median 63.5). Among these patients, 4 had well-differentiated cancer, 2 had moderately differentiated cancer, and the remaining 30 had poorly differentiated cancer. The mean SULmax value of all lesions in the entire group was 7.47±5.27. Specifically, the mean SULmax value was 6.42±64.73 in well-differentiated cancer, 5.50±1.94 in moderately differentiated cancer, and 7.79±5.29 in poorly differentiated cancer. These findings suggest higher glucose metabolism in poorly differentiated tumors compared to well and moderately differentiated cancers. When we analyzed the age of the patients alongside the SULmax values, we observed that in patients younger than 60 years old, the mean SULmax value was 7.12±4.45, while in patients older than 60 years, it was 7.49±5.40.

Conclusions

This study revealed that glucose metabolism in OC does not correlate linearly with the degree of tumor differentiation. Instead, it shows higher values in patients with poorly differentiated cancer, followed by those with well-differentiated and moderately differentiated cancer. Additionally, glucose metabolism correlates with age, exhibiting elevated levels in patients over 60 years old diagnosed with OC. Given the association between tumor aggressiveness and glucose consumption, this finding could contribute to the prognostic evaluation of patients with malignant ovarian cancer.

Keywords: Ovarian cancer, tumor differentiation, glucose metabolism

42.Extraosseous liver uptake of 99mTc-HDP in breast cancer patient-clinical case

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Introduction

Extraosseous uptake of radiotracers can occur in processes involving infarction or tissue calcification. Soft tissue tumors that frequently show calcified foci are mucinous ones, such as breast, ovarian or gastrointestinal tract cancer.

Case presentation

78-year-old patient known to have invasive ductal carcinoma of common and mucinous type, stage IIIA (T2N2M0), subtype ER+/PR+/Her 2-, diagnosed in 2017, who, following the administration of neoadjuvant chemotherapy, converted to T1N0M0, performed lymphoscintigraphy with 99mTc-Nanocoll, to identify the sentinel lymph node; intraoperatively, he showed tumor invasion, which is why a radical mastectomy with right axillary lymphadenectomy was performed, followed by chemotherapy and hormone therapy. As part of the imaging monitoring, in 2023 the patient performs a whole-body bone scintigraphic examination with 99mTc-HDP which does not reveal the presence of bone metastases, but reveals areas of extraosseous fixation of the radiotracer of uncertain cause, at the liver level, later being confirmed as metastases liver on CT examination with contrast substance.

Discussions

The most common metastatic sites of breast cancer are located in the bone system brain or liver. A cause for radiotracer uptake may be intra-tumoral infarction. Initially, the necrotic metastatic liver mass causes congestion and enlargement of the organ, and then the developing infarct damages the cellular integrity leading to precipitation of calcium at the mitochondrial level, resulting in deposition of calcium and hemosiderin, for which bisphosphonates have an increased affinity.

Conclusion

The presented case reveals the importance of extraosseous uptakes on whole-body scintigraphy used for monitoring patients with breast cancer, because secondary lesions that were not diagnosed using other imaging modalities can be identified resulting in significant changes in patient management.

Keywords: bone scintigraphy, liver metastases, breast cancer

Fixarea extraosoasă la nivel hepatic a 99mTc-HDP la o pacientă cu neoplasm mamar- caz clinic

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Introducere
Fixarea extraosoasă a radiotrasorilor poate sa apară în procesele ce implică infarctizarea sau calcificarea țesuturilor. Tumorile de țesuturi moi care prezintă frecvent focare calcificate sunt cele mucinoase, precum cancerul de sân, ovarian sau de tract gastrointestinal.

Prezentare de caz
Pacienta în vârstă de 78 de ani cunoscută cu carcinom ductal invaziv de tip comun si mucinous, stadiul IIIA (T2N2M0), subtip ER+/PR+/Her 2-, diagnosticat în anul 2017, care în urma administrării chimioterapiei neoadjuvante, s-a convertit la T1N0M0, a efectuat limfoscintigrafie cu 99mTc- Nanocoll, pentru identificarea ganglionul santinelă; intraoperator acesta a prezentat invazie tumorală, motiv pentru care s-a efectuat mastectomie radicală cu limfadenectomie axilară dreaptă, urmată de chimioterapie și hormonoterapie. În cadrul monitorizarii imagistice, pacienta efectuează în anul 2023 o examinare scintigrafică osoasă whole-body cu 99mTc-HDP ce nu evidențiază prezența de metastaze osoase, dar relevă zone de fixare extraosoasă a radiotrasorului de cauză incertă, la nivel hepatic, ulterior fiind confirmate ca metastaze hepatice la examinarea CT cu substanță de contrast.

Discutii
Cele mai frecvente sedii de metastazare ale cancerului de sân sunt localizate la nivelul sistemului osos, cerebral sau hepatic. În ceea ce privește fixarea extraosoasă a radiotrasorului aceasta poate fi cauzată de infarctizarea intra-tumorală. Inițial, masa metastatică necrotică hepatică provoacă congestie și mărirea de volum a organului, iar apoi infarctul în curs de dezvoltare, prin afectarea integrității celulare, duce la precipitarea calciului la nivel mitocondrial determinând depunerea de calciu și hemosiderină, pentru care bifosfonații au o afinitate crescută.

Concluzie
Cazul prezentat relevă importanța pe care trebuie să o acordăm captărilor extraosoase apărute la scintigrafiile whole-body efectuate pentru monitorizarea pacientelor cu cancer mamar, deoarece pot fi identificate leziuni secundare necunoscute până la momentul investigației și care au impact semnificativ în managementul ulterior al pacientului.

Cuvinte cheie: scintigrafie osoasă, metastaze hepatice, cancer de sân