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BOOK OF ABSTRACTS

RÉSUMÉS

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001

ROSAI-DORFMAN DISEASE - TYPICAL AND ATYPICAL FDG-PET/CT FINDINGS.

P Martineau MD/PhD, M Pelletier-Galarneau MD, Msc, E Leung, MD, FRCPC

Learning Objectives: 1 .To review the epidemiology, pathology, and clinical presentation of Rosai-Dorfman disease 2. To review the typical FDG-PET/CT findings through the use of a pathology confirmed case

Rosai-Dorfman disease, also known as sinus histiocytosis with massive lymphadenopathy, is a rare, poorly understood, histiocytic disorder. Since it was first reported in 1969, fewer than 1000 cases have been reported wordwide. The most common manifestation is painless, massive cervical lymphadenopathy but extranodal disease has been described in nearly half of patients with the most commonly affected sites being the skin, upper respiratory and digestive tract, and bone. We summarize the current standard of care and the typical imaging findings of Rosai-Dorfman disease. The advantages of using FDG-PET/CT over conventional CT in assessing disease involvement are discussed. We then present the case of a middle aged male patient who presented with a single enlarged cervical lymph node and was initially diagnosed with lymphoma. Subsequent imaging with FDG-PET/CT revealed diffuse involvement of the pleura, mesentery, and testicles. Testicular biopsy and immunohistochemical staining confirmed the diagnosis of Rosai-Dorfman disease.

002

THE IMAGING FINDINGS OF ERDHEIM-CHESTER DISEASE: A MULTIMODALITY APPROACH

P Martineau MD PhD, M Pelletier-Galarneau MD Msc, W Zeng, MD PhD FRSCP

Learning Objectives: 1. To review the epidemiology, pathology, and clinical presentation of Erdheim-Chester disease. 2. To review the typical bone scan, FDG-PET, and MRI findings. 3. To review the role of nuclear medicine in the diagnosis and management of Erdheim-Chester disease.

Erdheim-Chester disease is a rare, non-Langerhans histiocytic disorder with fewer than 500 cases described in the literature. The most common manifestation is polyostotic sclerotic lesions. The majority of cases also demonstrate soft-tissue involvement typically affecting the maxillary sinus, large vessels, heart, lungs, CNS and retroperitoneum. Due to the nature of the disease, nuclear medicine can play an important role in assessing the extent of the disease with bone scintigraphy used to detect sclerotic bone lesions and PET scan able to detect and caracterize soft tissue involvement, in addition to osseous lesions. We present the case of a middle-aged female who initially complained of tooth pain. Dental assessment suggested the presence of a mandibular lesion. The patient subsequently underwent imaging, including bone scan and FDG-PET/CT, which showed characteristic boney involvement. Biopsy results confirmed the diagnosis of Erdheim-Chester disease. We review and compare the results of the bone scan, FDG-PET, and MRI. As well, we summarize the current standard of care.

003

COMMON RUNNING INJURIES OF THE FOOT AND ANKLE: CLINICAL PRESENTATION AND SPECT-CT IMAGING PATTERNS

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Humans have been running long distances for millions of years. Over time, many features of energetics, strength, stabilization and thermoregulation have evolved, allowing humans to perform remarkably well at endurance running. Nevertheless, incidence of injury has been reported to be as high as 30-80% per year among endurance runners, with foot and ankle injuries representing approximately a quarter of these injuries. Bone scintigraphy is a sensitive diagnostic tool for both acute and chronic sports injuries, with radiotracer uptake determined by local blood flow and the rate of bone turn over. This allows detection of pathology at a very early stage, often before structural changes can be detected on conventional anatomical imaging modalities such as x-ray and computed tomography (CT). Furthermore, the addition of single photon emission computed tomography (SPECT) and SPECT-CT allows for better localization and characterization of bone pathology, with resultant increase in diagnostic accuracy. We review imaging patterns and clinical presentations of common running injuries of the foot and ankle including stress fracture, plantar fasciitis, Achilles tendon injury, tibialis posterior injury, sesamoid bone injury, peroneal tendonitis, ankle inversion injury, and posterior ankle impingement syndrome.

004

THE ACCURACY OF SPECT/CT ARTHROGRAPHY IN EVALUATING ASEPTIC LOOSENING OF HIP AND KNEE PROSTHESES

Abele JT, Swami V, Russell G, Masson E, Flemming J

To evaluate the accuracy of nuclear medicine arthrography with SPECT/CT in the evaluation of aseptic prosthetic hip and knee joint loosening.
Methods: A retrospective evaluation of nuclear medicine arthrography with SPECT/CT in 38 patients (21 hip, 17 knee). Our standard protocol includes injection of 37 MBq of ^{99m}Tc sulfur colloid in 2 mL of sterile saline into the joint space using fluoroscopic-guidance. After ambulating for 30 minutes, planar and SPECT/CT images of the area of interest are obtained. Imaging results were compared with reference standards of surgical evaluation or a minimum 1 year clinical and radiographic follow-up.
Results: Our study demonstrated a sensitivity of 100%, specificity of 96.0%, PPV of 92.9%, NPV of 100%, and accuracy of 97.4% for nuclear medicine arthrography with SPECT/CT in the evaluation of aseptic prosthetic loosening.

Conclusion: Nuclear medicine arthrography with SPECT/CT demonstrates very high accuracy in the evaluation of clinically suspected aseptic hip and knee prosthetic loosening. This is an effective imaging modality in determining the need for revision arthroplasty in these patients.

005

UTILIZATION OF SPECT-CT AND ITS ADDED VALUE IN BREAST CANCER BONE SCINTIGRAPHY; OUR INITIAL EXPERIENCE

Ahmed Al-Zahrani, Hasan Al-Wadaani, Ahmed Al-Dhafiri, Husain Ahmed, Asif Moin

Objectives: Hybrid imaging is now becoming an integral part of molecular imaging. This comes with its pros and cons. On one hand it can do functional and anatomical imaging in single setting while on the other side there are concerns for access radiation exposure. Here we evaluate the utilization of Single Photon Emission Computed Tomography- Computed Tomography (SPECT-CT) and its added value in routine bone scintigraphy (BS) for breast cancer patients.
Methods: The study was approved by institutional review board. We did retrospective analysis of the reports of BS that was performed at our institute during Dec 1st 2010 till November 30th 2012. Images (34 patients) were also reviewed for inconclusive reports.
Results: 471 BS were performed on patients with breast cancer. Additional imaging with SPECT CT was done on 159 (33%) patients. Ages ranged between 30-89 years. There were 158 females and 1 male. SPECT CT was positive for osseous metastases in 57 (35.8%), degenerative changes in 70 (44%), traumatic lesions in 10 (6.3%), normal variant in 7 (4.4%), inconclusive in 7 (4.4%) and miscellaneous including 3 hemangiomas, 2 too small to be characterized, 1 osteoid osteoma, 1 infection and 1 enostosis (5.1%).
Conclusion: Selective use of SPECT CT improved the diagnostic accuracy of BS in osseous disease detection for 35.8% of breast cancer patients at our institution.

006

MULTIFOCAL HAEMANGIOMATOSIS INCLUDING A GIANT HEPATIC HAEMANGIOMA WITH CAPSULAR RETRACTION AND KASABACH MERITT'S SYNDROME

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Background: Haemangiomas are the most common benign lesions of liver with female gender preponderance. Multifocality and capsular retraction on computerized tomography are rare features. We are presenting a case of multifocal haemangiomatosis with a giant hepatic lesion showing capsular retraction on CT images raised a possible suspicion of a malignant lesion which is confirmed by Tc-99m Tagged RBC imaging.

Case History: This is a 40 year old hypertensive male presented with short history of upper abdominal pain and vomiting with past history of an episode of abdominal pain with thrombocytopenia. His recent laboratory tests were within limits. An upper abdomen ultrasound revealed a large echogenic lesion in the right hepatic lobe suggestive of a mass lesion. On subsequent contrast enhanced CT examination showed a vascular lesion 13/6 x 10.5 cm involving VI and VII hepatic segments with mild capsular retraction. In addition, high density lesions were also found in spleen (1.1 cm) and T8 and T9 bodies. Findings were highly suggestive of multifocal haemangiomas with a giant one in liver. But the mild capsular retraction raised a possible suspicion of a malignant lesion. A planar Technetoum-99m tagged RBC scan (20 mCi) was performed and dynamic images showed relatively reduced perfusion over segment VI of liver in early dynamic frames. Blood pool images revealed a large area of progressive enhancement of blood pool activity involving segment VI of liver. Splenic and vertebral lesions seen on CT were not outlined most likely due to limitation of camera to resolve small sized lesions. All these findings were consistent with multi focal haemangiomas with a giant one involving the liver. On the basis of these evidences biopsy was considered unjustified. Patient was referred to vascular surgeon for resection of the lesion.

007

CORTICAL PLASTICITY DURING AMBULATION IN POST-STROKE PATIENTS ASSESSED WITH 18F-FDG PET IMAGING.

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A frequent and morbid consequence of stroke is alterations of gait. This results in a higher incidence of falls in stroke victims than in the general population, especially when turning or performing wait transfer, and is a major source of injury in a generally older and frailer population. However, brain imaging during prolonged, large-scale motion in humans is technically difficult, as it cannot be performed inside a scanner. There is therefore limited information of cerebral activity patterns during ambulation both in normal subjects and in stroke patients. Here, we have assessed whether 18F-FDG PET imaging was capable of showing changes in cerebral activity linked to different ambulatory conditions in post-stroke patients as compared to normal controls.
Four post-stroke subjects (all with lower limb involvement on the Chedoke-McMaster Scale; average time post-stroke: 25,8 months) and four matched controls were submitted on different days to 2 different locomotion tasks, one involving long segments of walking in a straight line with 180° turns in-between segments, and the other with an irregular pattern involving multiple turns around circulation cones. Subjects received an IV injection of on average 185 MBq of 18F-FDG at initiation of ambulation, and then walked for 40 minutes (allowing full uptake of the tracer). Within 10 minutes, they were imaged (20 minute emission scan followed by a 10 minutes transmission scan) on a Siemens HR+ PET system. Straightwalking activity was subtracted from that in the multiple-turns task to generate Z-score maps.
Patterns of activation were much more asymmetrical in stroke subjects than in controls in the superior parietal lobules and somato-motor cortices, with more activity changes between the 2 conditions on the side of the stroke in those with a better functional outcome, and contralateral to the lesion in those with

more functional limitations. Also, whereas controls showed increased activity in the vermis during the turning task, stroke subjects showed increased activity in cerebellar hemispheres.
It is therefore possible to study cerebral activation during sustained and complex motor sequences using 18F-FDG PET imaging, and to use this approach to evaluate normal and impaired gait. Our results show differences in the way stroke patients handle complex ambulatory patterns as compared to controls. Such information might be helpful in designing appropriate rehabilitation programs for this category of patients.

008

PNEUMOTHORAX DETECTED IN THE NUCLEAR MEDICINE SUITE: AN UP-TO-DATE REVIEW OF DIAGNOSIS, CLASSIFICATION AND APPROPRIATE TRIAGE OF THIS CRITICAL FINDING

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Objectives: Two relatively recent technologies which have impacted work-up and staging of lung cancer are transthoracic needle biopsy (TNB) and FDG-PET/CT scanning. In the effort to provide timely work-up, FDG-PET/CT may closely follow TNB leading to a demonstrable incidence of unexpected pneumothorax (PTX) in these relatively asymptomatic out-patients. The purpose of this educational poster is therefore to update nuclear medicine staff regarding the detection, classification and optimal management of PTX when incidentally detected during the course of FDG-PET/CT.
Methods: A panel of cases of small, medium and large PTX detected on FDG-PET/CT at our hospital was identified based on review of the picture archiving and communication system and voice recognition databases. Images and management strategy of representative patients with PTX are presented in a case-based manner incorporating current literature-based recommendations.
Conclusions: This review will educate technologists and nuclear medicine physicians regarding the appearance and management of pneumothorax as detected in the nuclear medicine suite.

009

MULTICENTER VALIDATION OF THE BONTA PROTOCOL FOR SHORTENING GASTRIC-EMPTYING STUDIES

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Objectives: Gastric emptying scintigraphy is considered the gold standard for detection of gastroparesis and other disorders of motility; SNMMI guidelines are predicated upon 4-hr imaging, inconvenient for patients and staff. Bonta et al. introduced 2-hr criteria (emptying <35% abnormal, >55% normal, otherwise proceed to complete exam) which serve to shorten the protocol in most patients with negligible loss of accuracy, as

validated in their single-center cohort of 158 patients. We have evaluated these criteria in a larger multicenter trial.

Methods: Data from 3 academic medical centers were retrospectively aggregated. Standard 4-hr solid gastric emptying, performed according to current SNMMI guidelines, served as the gold standard. 331 patients were included, 249 (75%) of whom were normal with 4-hr emptying ≥ 90%. Sensitivity, specificity, accuracy and resource savings for the Bonta method were calculated.

Results: At 2 hrs, 203 of 331 patients (61.3%) had gastric emptying > 55%, 54 (16.3%) had gastric emptying < 35%, and 74 (22.4%) had intermediate values requiring imaging through 4 hrs. The Bonta criteria yielded 7 (2.1%) false negative and 10 (3.0%) false positive studies, resulting in sensitivity, specificity and accuracy of 91.5%, 96.0%, and 94.9%, significantly superior to any possible 2- or 3-hr cut-off. Of the 7 false negative studies, all but 1 had near-normal 4-hr emptying of questionable clinical significance (89% x 3; 88% x 2; 86% x 1 and 76% x 1). According to Bonta, 77.6% of studies could be terminated by 2 hrs, decreasing total camera usage from 1,412 to 1,127 images and average study duration from 3.3 to 2.4 hrs.

Conclusions: We demonstrate that in a multicenter cohort, use of the Bonta criteria shortened studies in 77.6% of patients, resulting in an effective compromise between reduced camera usage (by 19.2%), shortened average study duration (by 27.3%) and preserved accuracy (of 94.9%).

010

PHASE ANALYSIS OF GATED BLOOD POOL SPECT FOR MULTIPLE STRESS TESTING ASSESSMENTS OF VENTRICULAR MECHANICAL DYSSYNCHRONY IN A DILATED CARDIOMYOPATHY CANINE MODEL

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Objectives: Ventricular Mechanical dyssynchrony seems to be present in almost all chronic heart failure (HF) patients, even patients with a narrow QRS complex. While this parameter could change during the stress condition, no comprehensive analysis has been made to see the range of difference in ventricular dyssynchroy between rest and levels of stress. Our objective was to investigate the range of difference in inter- and intraventricular dyssynchrony parameters between rest and levels of dobutamine stress in a non-ischemic dilated cardiomyopathy (DCM) canine model with normal QRS complex using gated-blood pool SPECT (GBPS).

Methods: Stress was induced by dobutamine infusion in 10 dogs with DCM. Hemodynamic and ventricular (dys)synchrony data were analyzed by left ventricular (LV) pressure measurements and GBPS. Count-based indices were extracted for assessing intra and interventricular mechanical (dys)synchrony. A comparison was performed between DCM and 8 healthy dogs.

Results: LV ejection fraction increased from 22.6±6.0% in baseline versus 48.1±5.8% in 20µg/kg/min; (p<0.0001). Ventricular performance (dP/dt_{max}) increased from 949.5±238 to 3020.8±568.9 at 20µg/kg/min; (p<0.0001). Contraction homogeneity index (CHI) showed a significant increase in synchronism from baseline to the stress levels of 5, 10, 20µg/kg/min dobutamine (p<0.05). Similar results were found for entropy and phase SD. While, no profound difference was found between baseline and

levels of stress for interventricular delay, introduction of stress was coincided with improved synchrony in 90% of dogs with negative delay.

Conclusions: Intermediate levels of dobutamine significantly reduced the intraventricular dyssynchrony. There was a remarkable inter-animal variability in interventricular dyssynchrony pattern by different levels of dobutamine stress. However, introduction of stress significantly improved the synchrony of contraction in 90% of DCM subjects with negative delay. Further investigation is needed to assess whether lower mechanical dyssynchrony indices from stress GBPS in DCM patients with normal QRS have the ability to predict response to cardiac resynchronization therapy.

011

IMPROVING THE EVIDENCE FOR I-131 ABLATION THERAPY: CONSIDERATIONS REGARDING RANDOMIZED CONTROLLED TRIALS (RCTS) AND THE ROAD AHEAD

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Objectives: On July 20 2005, Cancer Care Ontario published a comprehensive evidence summary report on long term usefulness of I-131 remnant ablation in terms of lowering disease-related mortality, loco-regional recurrence in the neck or distant metastases in patients with papillary or follicular thyroid carcinoma. Unfortunately, the lack of sufficient high quality evidence, such as long-term RCTs, precluded recommendations. The report, which included a total of 13 observational studies, suggested conducting prospective trials, preferably RCTs. We wish to discuss the possible challenges and considerations associated with RCTs in I-131 ablation therapy. We will also consider newly emerging study designs that can be utilized to achieve high-quality evidence.

Methods: Computerized database searches (PubMed and EMBASE) were performed to identify articles on methodological aspect of RCTs and observational studies published within 2007-2012. Papers retained for inclusion were subjected to content analysis and synthesis. We have summarized the body of evidence applicable to conduct of RCTs on patients treated with radioactive iodine therapy.

Results: When a RCTs regarding I-131 is conducted we must consider: 1) Generalizability/External Validity including strict inclusion criteria, recruiting of sufficient participants and heterogeneity, 2) Sources of bias such as overestimation of treatment effect size, small sample size, patient withdrawal, patient preference/crossover phenomenon, failing to randomize for etiologic factors, and spin/specific reporting and 3) Ethical issues such as inclusion of randomization process in consent forms and the risk of exposure to ionizing radiation. Four new hybrid research designs are introduced where positive aspect of RCTs and observational methods are merged.

Conclusions: Ablation therapy, introduced 70 year ago, has been subject to very few controlled studies. While widely regarded as effective, multiple factors limit the conduct of RCTs. RCTs conducted on radioactive iodine treatment may be challenged regarding generalizability/external validity, sources of bias and concerns over ethical matters. The road ahead may rely on new hybrid designs which are more practical yet provide high-quality evidence.

References:
1) https://www.cancercare.on.ca/common/pages/UserFile.aspx?fileId=34805
2) http:// www.ncbi.nlm.nih.gov/pubmed/25388015

012

POSTERIOR BLADDER LAYERING OF EXCRETED RADIOURINE ON WHITE BLOOD CELL SCAN DIAGNOSED BY SPECT/CT

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Objectives: Present a case of unusual findings of posterior layering of radiourine on white blood cell scan (WBC) diagnosed by SPECT/CT. Review literature on altered bladder activity (anterior and posterior layering of excreted radiourine) on FDG pet. Review indications and performance of SPECT/CT WBC scan.
Body of Abstract: An 82 year old male with chronic coccygeal ulcer was referred to nuclear medicine for a Tc-99m HMPAO white blood cell (WBC) scan to rule out osteomyelitis. The past medical history is significant for benign prostate hyperplasia and urinary retention. The patient also has atrial fibrillation and hypertension. About 2 months prior to the study the patient had suffered a right-sided cerebral hemorrhage which gradually resolved over time.
The planar images of the WBC scan showed heterogeneously increased activity within the urinary bladder despite the patient being catheterized. The distal sacrum and the coccyx are obscured by the bladder activity. On SPECT/CT, the bladder is greatly distended with radiourine localized to the posterior third of the entire bladder. There is WBC accumulation in the soft tissue and the abscess packing without involvement of the bone on SPECT/CT.
Posterior bladder layering of excreted radiourine has been observed in 4% of FDG PET/CT scans in a study. It has never been observed on WBC scans probably because the images are usually performed 4 hours post radiotracer administration. The heterogeneity of radiourine observed on the planar images may be mistaken for urinary pathology. The possible causes of the observation will be discussed. Literature describing both anterior and posterior layering of radiotracer in the bladder on FDG PET/CT scans will be reviewed. It is important for trainees to be aware the clinical significance of altered bladder activity and important additional findings on WBC SPECT/CT images.

013

GASTRIC MIXED ADENONEUROENDOCRINE CARCINOMA: FDG PET/CT, OCTREOTIDE AND CT FINDINGS

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Objectives: Present a rare case of Mixed AdenoNeuroEndocrine Carcinoma (MANEC) of the stomach in an elderly male. Describe findings of FDG PET, Octreotide scan, CT and endoscopy. Review clinical presentation, pathology and images of MANEC. Review updated neuroendocrine tumor classification.

Body of abstract: A 68 year old male presented in July 2013 with increasing dysphagia and mild odynophagia. An upper endoscopy from Sept 2013 showed an ulcerative mass encasing the gastric cardia and extending to the gastroesophageal (GE) junction, with the biopsy positive for adenoneuroendocrine carcinoma (MANEC) at a 50-50 mix. A CT scan from Oct 2013 identified a 4 X 3 cm mass in the GE junction and gastric cardia with invasion of the diaphragm and crus, and a celiac axis lymph node. A follow-up FDG PET scan showed that the gastric/GE junction mass and the celiac axis lymph node are highly hypermetabolic, with a maximum SUV of 15.1 and 11.6, respectively. There is no distal metastasis. An Octreotide scan performed in Nov 2013 was negative.
Chemotherapy with Eepirubicin, Cisplatin and Fluorouracil was started. The case was discussed at the Tumor Board rounds and the plan was to treat the patient with three cycles of chemotherapy pre-operatively, surgery, and then three cycles after.
MANEC is a very rare poorly differentiated tumor, characterised by an intimate mixture of neuroendocrine carcinoma and adenocarcinoma. It was reclassified as a type IV gastric neuroendocrine tumor by WHO in 2010. The observation of the negative Octreotide scan in this case is likely due to the dedifferentiation of the tumor and the loss of somatostatin receptor overexpression. It is important for trainees to familiarize with the updated neuroendocrine tumor classification and the effect of tumor grade on FDG PET and Octreotide activity and prognosis.

014

BONE SCAN VERSUS PET-CT SCAN FOR DETECTION OF OSSEOUS METASTASES: CLINICAL EXPERIENCE AT THE QEII HEALTH SCIENCES CENTRE

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Objective: To assess and compare PET-CT scans and bone scans for detection of osseous metastases.
Method: The QEII HSC Diagnostic Imaging database was queried for patients who received a bone scan (BS) and a PET-CT within three months of each other from June 2008 to June 2014. Scan reports were reviewed and classified as positive, negative, or equivocal. Patients with at least one positive or equivocal report were selected for further review including number of osseous metastases and intensity of uptake on both scans, presence of non-osseous metastases on PET-CT scan, and presence of metastases on BS that were outside the field of view of PET-CT. Patients with discordant reports on PET-CT and BS were further reviewed by the nuclear radiologist and a clinical oncologist to judge presence of true osseous disease based on imaging and clinical follow-up.
Results: 156 patients met the inclusion criteria. 133 patients (85%) had concordant findings, either both tests positive (37 patients) or negative (96 patients), while 23 patients had discordant findings (15%). In cases of concordant positive imaging, PET-CT often identified more osseous lesions (9 patients) than BS (4 patients) and also often exhibited tracer uptake of greater intensity. Of these 23 discordant cases, 8 patients had true bony disease and PET-CT correctly identified 5 of these cases as positive while BS was positive in 3 of the 8. Of the 23 discordant cases, 12 patients had no bony disease on follow-up. PET-CT was negative in 8/12 cases while BS was negative in 2/12. Of the 23, PET-CT was equivocal in 5 cases whereas BS was

equivocal in 9 cases.
Conclusions: Overall PET-CT and BS showed high concordance (85%) for the presence or absence of osseous metastases. Sensitivity was similar, though PET-CT demonstrated fewer false positives, fewer equivocal scans, and more lesions.

015

INCIDENTAL FINDINGS IN BONE MINERAL DENSITOMETRY:

P. Martineau, S. Bazarjani, L.S. Zuckier

Bone mineral densitometry (BMD) using dual-energy x-ray absorptiometry (DEXA) is the gold standard for assessing bone density. While not intended to be a primary imaging modality, artifacts and incidental findings are frequently encountered and these must be recognized and identified by the reporting physician. We present a collection of incidental findings encountered on BMD, collected at several practice sites over a decade of imaging. While some of these findings remain mere curiosities, others can change the overall interpretation of the exam by affecting the bone density reading or revealing significant co morbidities. Being cognizant of these unexpected abnormalities, and understanding their etiology, will prepare the reader to more readily appreciate their significance when encountered in clinical practice.

016

DIFFUSE LUNG UPTAKE ON BONE SCINTIGRAPHY: PRINCIPLES AND PATTERNS: SPECT AND SPECT-CT FINDINGS

P. Martineau, M. Galarneau, L.S. Zuckier

Bone scintigraphy represents the second most frequently performed nuclear medicine procedure, preceded only by cardiac perfusion imaging. While extra-osseous uptake on bone scintigraphy is frequently observed, diffuse uptake in lung parenchyma is distinctly uncommon. A relatively small number of pathologies, both systemic and pulmonary, are associated with this finding; correlating the particular pattern seen on scintigraphy with anatomical imaging often allows for an accurate diagnosis. We review imaging findings and uptake mechanism for several etiologies of lung uptake on bone scintigraphy. Imaging finds will be updated by inclusion of tomographic SPECT and SPECT-CT images wherever possible. Entities discussed include hyperparathyroidism, pulmonary ossification, pulmonary microlithiasis, and radiopharmaceutical contaminants. Being cognizant of these unexpected abnormalities, and understanding their etiology, will prepare the reader to more readily appreciate their significance when encountered in clinical practice.

Eric Lepp Clinical Vignettes

EL-001

INTERESTING DISCOVERY OF ANTERIOR MEDIASTINAL MASS

Émilie Vallée R2, Sylvain Prévost MD, Marc-André Levasseur MD, James Patrick Buteau R3, Éric Turcotte MD

Thirty one years old patient known for a prior superior vena cava syndrome that had evolved over two years, with thoraco-abdominal telangiectasia, fascial flushing, hypotension and progressive dyspnea. A chest X-ray had raised suspicion of an anterior mediastinal mass. The investigation was followed with a chest CT scan and 18F-FDG PET/CT. Quickly thereafter, a mediastinal biopsy was performed and confirmed the presence of a type B2 or B3 thymoma.
Several imaging modalities can be used for investigation of a thymic mass. Not only does chest X-ray allows the fortuitous discovery of mediastinal masses, but it may help the clinician with rapid detection of mediastinal disease explaining patient's symptoms. Chest CT scan evaluates the localization, orients the diagnosis, and defines extension more precisely.
What is the role of the PET/CT? It is almost always used for staging after strong diagnostic suspicion; PET/CT also brings interesting information: Standard Uptake Value (SUV). World Health Organization (WHO) histological *classification and the clinicopathological Masaoka classification are complementary, providing prognostic value and orienting therapeutic approach. Therefore, correlation between SUV max and WHO histological classification could help the clinician by offering prognostic value and by orienting therapeutic approach.*
Many studies in the past years have shown the existence of a correlation between SUV max on 18F-FDG PET/CT and the degree of malignancy of epithelial thymic tumors according to WHO histological classification (low risk thymoma, high risk thymoma and thymic carcinoma).
Indeed, a review of the literature showed that for SUV max values greater than 4.3, prognosis drops rapidly. In those cases, early and aggressive treatment should be considered.

EL-002

A TALE OF TWO ARTIFACTS: SURGICAL COMPLICATIONS OF RENAL TRANSPLANT WITH MAG3 AND DTPA

James Curtis, Jonathan Abele

CD is a 31 year old woman who received a cadaveric renal transplant for end stage renal disease.
Initial routine renal MAG3 scintigraphy on post-op day 1 was unremarkable, but on day 3, a small area of pooling of activity was identified surrounding the superior pole of the right iliac fossa transplant kidney, raising the possibility of a urinary leak.
The etiology of this collection was uncertain however, as MAG3 is known to demonstrate vicarious biliary excretion, and the pooling of activity was in a location that could also be consistent with activity in the patient's gallbladder. In such equivocal cases SPECT-CT would often be used at our institution to provide anatomic correlation, however this was unavailable at the time.

Instead, renal scintigraphy was repeated with DTPA, as DTPA is excreted exclusively by glomerular filtration, and does not demonstrate any biliary excretion. DTPA renal scintigraphy did not demonstrate any similar pooling of activity in this region, excluding a leak around the superior pole of the transplant. DTPA does have its own limitations however, as there is a lower extraction efficiency, and more blood pool accumulation of radiotracer.
In this case, the DTPA study showed an additional equivocal area of increased pooling of radiotracer activity overlying the right groin region in close proximity to the site of the patients surgical incision. In isolation, this may have been attributed to a site of leakage, however as there was no concordant area of abnormality on the MAG3 study, the activity was attributed to the hyperemia at the site of the patients surgical incision. Only using the results of both studies together, and a firm understanding of the biodistribution of both tracers could it be confidently said that no leak was present in either location.

EL-003

URINARY LEAK AFTER RENAL TRANSPLANTATION DIAGNOSED BY SPECT/CT IMAGING AT MAG3 RENAL SCINTIGRAPHY

F. Mechken

Abstract: A 23 year-old-female patient with a history of renal transplantation at the left iliac fossa 12 years ago underwent a recent renal transplantation to the right side, one month prior to our evaluation. The graft is carrying an ureteropelvic duplication with 2 ureterovesical anastomosis described by pelvic ultrasound. In the early postoperative course, a technetium-99m mercaptoacetylglycine-3 (Tc-99m MAG3) renal scan demonstrated a normal transplant kidney perfusion without complication.The follow up ultrasound showed a new mild hydronephrosis, 10 days after surgery and stent removal, predominant at the superior pole of the graft with dilatation of the upper ureter down to the level of the ureterovesical anastomosis. It also demonstrated a stable fluid collection inferiorly to the graft attributed to a residual hematoma.
Because of the progression of hydronephrosis and the deterioration of the renal function, a Tc-99m MAG3 renal scan with Lasix is performed to rule out an obstruction. The graft was well perfused and functional. There was a mild stasis at the superior collecting system but also gradual accumulation of tracer adjacent to the lower part of the graft, near the distal anastomosis. A urinary leak is suspected then confirmed by SPECT/CT imaging which showed tracer accumulation in a pelvic collection, lateral to and distinct from the right aspect of the bladder, close to the anastomotic site.
The follow up ultrasound demonstrated a dilatation of the superior collecting system and a hypoechoic fluid collection laterally to the bladder. Percutaneous nephrostomies were installed for the two collecting systems. A leak from the ureterovesical anastomosis of the superior system was demonstrated.
This case report underlines the usefulness of renal scintigraphy in the early evaluation of renal transplants with SPECT/CT imaging to accurately depict and characterize a leak at the ureteral anastomosis.

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A BREATHTAKING EXTRAOSSEOUS UPTAKE OF TC99M-MDP

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There are many known causes of extraosseous accumulation of technetium-99m methylene diphosphonate (Tc99m-MDP). Lung uptake is most commonly seen in the presence of pleural effusions, primary lung malignancies, metastases, infections and radiation therapy.
An 80-year-old woman with a voluminous bladder mass was referred to our centre for a cancer staging assessment. Initial pathology identified a high-grade urothelial carcinoma.
A Tc99m-MDP bone scan, performed in search of bone metastasis, didn't reveal any suspicious sites of skeletal uptake. However, there was a wedge-shaped soft tissue accumulation of the tracer in the upper half of the right lung, which was confirmed with SPECT/CT imaging. Furthermore, the lung uptake was triangular in shape and peripherally based, corresponding to the anterior segment of the right upper lobe. There were no abnormalities of the underlying pulmonary parenchyma, nor any hilar lesions on the low-dose CT scan.
The treating physician was immediately contacted and informed of our findings. We strongly suggested pursuing the investigation with a pulmonary ventilation/perfusion (V/Q) scan. The following day, the V/Q scan confirmed the presence of a pulmonary embolism in the anterior segment of the right upper lobe, as well as two other subsegmental emboli in the left upper lobe.
The primary interest of this unexpected case is to include the possibility of an underlying pulmonary embolism in the differential diagnosis of Tc99m-MDP lung uptake. Although very rare, the investigation with a V/Q scan confirmed our suspicion of a pulmonary embolism without underlying necrosis on the CT scan.