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BOOK OF ABSTRACTS

RÉSUMÉS

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001

EPIDEMIOLOGICAL PROFILE AND THERAPEUTIC EFFICIENCY OF IODINE-131 IN THE MANAGEMENT OF HYPERTHYROIDISM: ABOUT 208 PATIENTS

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Statement on the purpose of the study: We report by this work the experience our department in the management of patients presenting hyperthyroidism and treated with iodine-131.
Method used: It was a retrospective study from August 2013 to May 2018 concerning a cohort of 208 patients who received radical treatment with iodine-131 for hyperthyroidism. Etiologic diagnosis was based on clinical examination, biological assessment, cervical ultrasound and thyroid scintigraphy. The main parameters collected in our study were as follows: age, sex, geographical origin, associated defects, the etiology of hyperthyroidism, previous treatments, Iodine 131 activity received, TSH and T4L on admission and then six weeks, three months, six months and twelve months after ira therapy
Summary of the results: In our study population, there were 175 women (84%) for 33 men (16%), an average age of 55 years with extremes ranging from 19 to 82 years. Patients came from five regions of northeastern Morocco (Fes-Meknes region, eastern region, Tangier-Tetouan-Al-Hoceima region, Kenifra region and Daraa Tafilalet region).
Associated diseases were high blood pressure (53.42%), followed by diabetes (27.4%) and heart disease (13.18%). A total of 185 (89%) were initially treated with carbimazole with or without thyroidectomy before receiving radical second- or third-line treatment. Graves' disease was the most common etiology (30%), followed by toxic adenoma (24%) and toxic multinodular goiter (21%). The therapeutic efficacy of the first cure evaluated after a follow-up of 03 months was 79% for Graves' disease, 100% for toxic adenoma and 93% for toxic multinodular goiter. No acute complications were observed during the study.
Conclusion: Iodine 131 therapy remains the gold standard of hyperthyroidisms for which a radical treatment is indicated.

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PROFIL ÉPIDÉMIOLOGIQUE ET EFFICACITÉ THÉRAPEUTIQUE DE L'IODE 131 DANS LA PRISE EN CHARGE DES HYPERTHYROÏDIES : A PROPOS DE 208 PATIENTS

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Introduction: *Nous rapportons par ce travail l'expérience du service de médecine nucléaire du CHU Hassan II de Fès dans la prise en charge des hyperthyroïdies traitées par l'iode 131.*
Matériel et méthode: *Il s'agit d'une étude rétrospective allant d'Aout 2013 à Mai 2018. Elle porte sur une cohorte de 208 patients qui ont bénéficié d'un traitement radical par l'iode 131 pour hyperthyroïdie. Le diagnostic étiologique était établi en fonction des données de l'examen clinique, du bilan biologique, de l'échographie cervicale et de la scintigraphie thyroïdienne. Les principaux paramètres recueillis dans notre étude étaient les suivants: l'âge, le sexe, l'origine*

géographique, les tares associées, l'étiologie de l'hyperthyroïdie, les traitements antérieurs, l'activité d'Iode 131 reçu, le bilan biologique à l'admission puis à six semaines, trois mois, six mois et douze mois après ira thérapie.

Résultats: *Dans notre population d'étude, on dénombrait un effectif de 175 femmes (84%) pour 33 hommes (16%), un âge moyen de 55 ans avec des extrêmes allant entre 19 ans à 82 ans. Les patients provenaient des cinq régions du nord-est du Maroc (région de Fès-Meknès, région de l'oriental, région de Tanger-Tétouan -Al-Hoceima, région de Kénifra et la région de Daraa Tafilalet).*

Les tares associées étaient l'hypertension artérielle (53,42%), suivie par le diabète (27,4%) et les cardiopathies (13,18%). Au total 185 (89%) ont été traités initialement par les ATS avec ou sans thyroïdectomie avant de bénéficier d'un traitement radical en deuxième ou troisième intension. La maladie de Basedow était l'étiologie la plus fréquente (30%), suivie de l'adénome toxique (24%) et du goitre multi nodulaire toxique (21%). L'efficacité thérapeutique de la première cure évaluée après un recul de 03 mois était de 79% pour la maladie de Basedow, 100% pour l'adénome toxique et de 93% pour le goitre multi nodulaire toxique. Aucune complication aigue n'a été observée au cours de l'étude.

Conclusion: *La radiothérapie métabolique par l'iode 131 reste le gold standard dans le traitement des hyperthyroïdies pour lesquelles un traitement radical est souhaitable.*

002

THYROID NODULES – THE DARK HORSE OF PARATHYROID IMAGING

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Background: Pre-operative localization of hyperfunctioning parathyroid lesions with dual phase ^{99m}Tc-Sestamibi imaging is a reliable and accurate method, with variable, but high reported sensitivity and specificity for single adenomas. The most common cause of a false positive finding is co-existent nodular thyroid disease. Other causes of false positive findings include the presence of thyroid carcinoma, parathyroid carcinoma, lymphadenopathy, sarcoidosis and other tumours. In order to plan the optimal surgical approach and minimize patient morbidity, it is of vital importance to minimize false positive reports.

Aim: To demonstrate the importance of combined ^{99m}Tc-Sestamibi and ^{99m}Tc-Pertechnetate thyroid imaging in the pre-operative localization of suspected parathyroid lesions.

Methodology: We present a female patient, aged 38 years, with primary hyperparathyroidism.

She was referred to the nuclear medicine department for pre-operative localization of parathyroid adenoma with ^{99m}Tc-Sestamibi scan**.**

Results: On the early images of the dual phase ^{99m}Tc-Sestamibi scan focal tracer accumulation was seen in the superior pole of the left thyroid lobe, which increased in intensity on the delayed images. SPECT reconstructed images confirmed the location within the left thyroid lobe.

Subsequent ^{99m}Tc-Pertechnetate thyroid images demonstrated a "hot" nodule in the superior pole of the left thyroid lobe; in the same location as seen on the ^{99m}Tc-Sestamibi scan.

The patient was referred for a thyroid ultrasound, which confirmed a benign spongiform nodule in the same location. No suspicious parathyroid lesions were seen on ultrasound. Thyroid function tests revealed subclinical hyperthyroidism.

Conclusion: Coexisting solid thyroid nodules may contribute to false positive localization of parathyroid lesion. Furthermore, the intensity of uptake in these thyroid nodules can potentially result in failure to visualize and locate the suspected hyperfunctioning parathyroid lesion. Dual tracer imaging with ^{99m}Tc-Sestamibi and ^{99m}Tc-Pertechnetate should always be considered in cases with apparent intrathyroidal tracer accumulation on ^{99m}Tc-Sestamibi scan to increase the specificity by minimizing false positive findings. The highest sensitivity and specificity for accurate parathyroid lesion localization will be achieved by the combination of dual tracer subtraction and thyroid ultrasound.

003

MISADMINISTRATION OF SN-117M COLLOID DURING RADIOSYNOVIORTHESIS PRESENTS NO SAFETY CONCERNS

CA Doerr, J Simon, K Frank, JC Lattimer, J Donecker, NR Stevenson, GR Gonzales

Objective: Demonstrate the safety of homogeneous Sn-117m colloid (HTC) when intentionally or unintentionally mis-administered.

Methods: 1)Twelve healthy male Sprague Dawley rats were separated into 3 groups of 4 rats each. Group 1 received a subcutaneous injection of HTC near the knee. Group 2 received an oral administration of HTC on the tongue. Group 3 received a cutaneous administration of HTC on a shaved area on the back. All doses were equivalent to 7.5mCi/277.5MBq in a 75kg human. Rats were monitored for up to 2 weeks and then sacrificed.

2) Twenty healthy Sprague Dawley rats were separated into 4 groups of 5 rats each, administered 25µCi of HTC IV, and sacrificed at 1 hour, 4 hours, 24 hours, and 14 days. Organs and tissues were harvested, weighed and counted for radioactivity.

3) A clinical trial using HTC for RSO in client-owned dogs was conducted in 42 dogs. One subject animal was randomized to receive a “high” weight-adjusted dose of HTC in the right elbow (equivalent to 7.5mCi/277.5MBq in a 75kg human) which was entirely inadvertently mis-administered outside the joint space.

Results: 1)Rat--Topical administration—no ill effects were observed, including no signs of radionecrosis.

2) Rat--IV administration—no ill effects were observed including in the major sites of accumulation on a % ID basis (liver, lung, muscle, bone) and a % ID/g basis (lung, spleen, liver). (Figures 1 and 2).

3)Dog--Based on scintigraphy, significant systemic translocation of the HTC did not occur after mis-administration (Figure 3). The subject did not exhibit any evidence of untoward reaction as detected by the clinical staff and confirmed by the owner following discharge. No medical intervention or specific follow up was warranted.

Conclusion: HTC is safe even in high dose, when intentionally or unintentionally mis-administered.

Figure 1 Percent injected dose for major sites of accumulation Greatest %ID accumulation was in the liver.

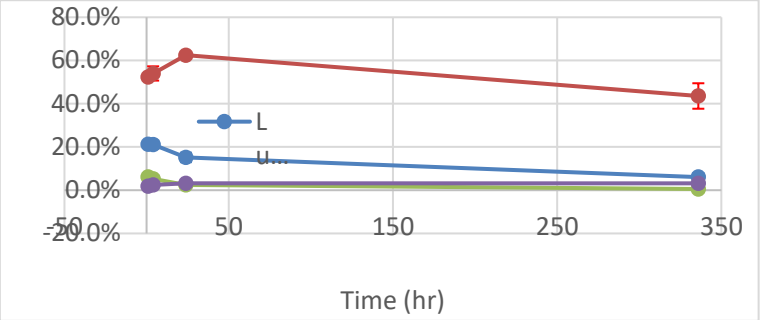


Figure 2 Percent injected dose per gram for lungs, liver and spleen After 24 hours, the % ID/gram for lungs liver and spleen was similar.

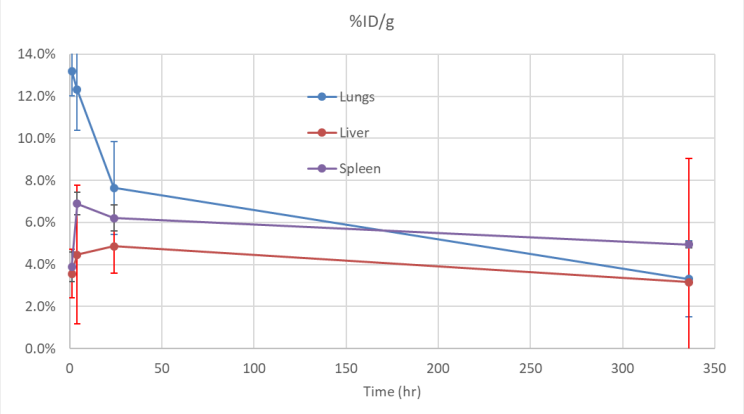
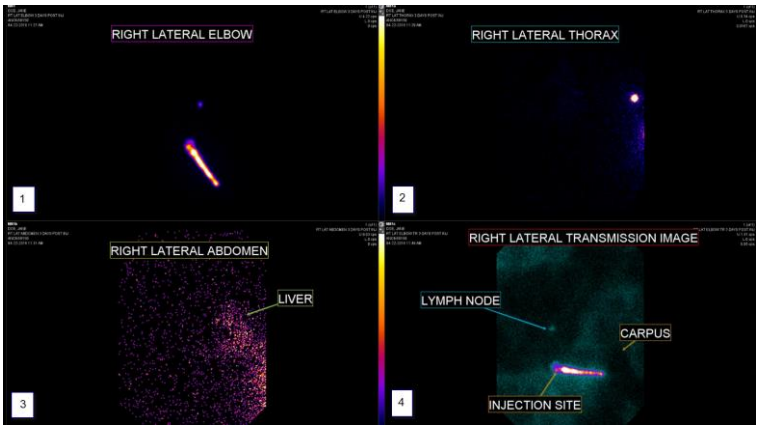


Figure 3 Scintigraphy (1) HTC localized within the antebrachium along fascial planes associated with the radium and ulna. (2) Bright lymph node identified in the lateral thorax. (3) Liver uptake <1/700th of the intensity of the uptake in the foreleg. (4) Very high intensity of uptake in the foreleg, and low level of intensity uptake in the regional lymph node.



004

FEASIBILITY OF PET-CT AT VICTORIA HOSPITAL " A NEED ASSESSMENT SURVEY"

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Purpose: The current PET-CT scanner at St. Joseph's Hospital has been serving Southwestern Ontario for more than 10 years. An increased the downtime of this device causes increased waiting time. The purpose of this survey is to assess the end user opinion on the need for, and desired features of a new device at Victoria Hospital.
Method: A standardized questionnaire was electronically delivered to a group of 100 specialists. Topics include the quality of the current PET-CT studies, level of satisfaction, the indications for PET-CT, the number of patients requiring imaging, and the software packages were considered important for inclusion within a new device. Survey results were compiled into tables and semiquantitative charts.
Results: 22 (22/100) completed the survey. All respondents (22/22) agreed that the number of patients needing PET-CT imaging and its indications will increase in the next 10 years. The majority (16/22) are satisfied with current image quality. A strong minority (10/22) are dissatisfied with current wait times. All respondents believe inpatient PET-CT requests should be completed in less than two weeks, and many (10/22) would like these requests done within 24 hours. Importantly, nearly all (21/22) agree that a new system will impact patient management, and research opportunities.
Currently, the biggest challenges, include long waiting time (15/22), non-contrast protocols (7/22), and concerns with sedation/general anesthesia (5/22). The most desired application and modules are radiation therapy planning (11/22), PET-CT with IV contrast capability (11/22), HD PET (10/22), respiratory gating (7/22), HD chest motion management (4/22), and finally pediatric dedicated software (3/22), and a larger borehole (3/22).
Conclusion: Given Southwestern Ontario's large geographic size and population, an increasing trend of PET-CT indications in cancer patient, and the impact of a new PET-CT with proper software on the patient management and research warrant a new PET-CT Scan at Victoria Hospital.

005

THE USE OF SPECT/CT BONE SCAN IMAGING IN OCCULT SCAPHOID INJURIES

Amar Suchak

For patients who have a suspected acute scaphoid fracture, negative plain film radiographs can have a false negative rate of up to 10%. There is currently no consensus for the imaging workup of these patients, and sequelae of a missed scaphoid fracture can be serious.
The primary objective of this pilot study is to determine if nuclear bone scan SPECT/CT àmaging can be used as a practical, sensitive and specific tool for scaphoid fracture detection.
Adult patients attending an urgent care centre with an isolated wrist injury and designated clinical factors for a scaphoid fracture and negative preliminary and/or 10-14 day post-injury radiographs were enrolled. At this point, a nuclear medicine bone scan SPECT/CT study was

performed, with five potential results created (ranging from a negative study to a scaphoid proximal pole fracture). A clinical management flow algorithm for each of these outcomes was followed, and clinical and radiographic follow-up at 6 weeks after the injury was performed for non-surgical patients.
Eighteen patients were enrolled in this pilot project. Three patients (16.7%) had bone scan findings positive for a scaphoid fracture, and nine patients (50%) discovered acute fractures in other (non-scaphoid) locations. This latter group included areas such as distal radial and triquetral fractures. Six patients had no fractures on any of the imaging modalities, and were also subsequently clinically improved at the 6 week follow-up clinical and radiographic visit.
In patients with a strong clinical concern for a scaphoid fracture, a bone scan SPECT/CT study can be helpful in detecting radiographically occult scaphoid or other wrist fractures in the appropriate clinical setting. The results of this project can now be applied to a larger cohort study in an effort to potentially optimize the clinical management of this common injury.

006

BOTULINUM TOXIN INTRAGLANDULAR INJECTION TO BLOCK PSMA SALIVARY GLAND UPTAKE

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Background: Prostate specific membrane antigen (PSMA) targeted alpha-radiotherapy has shown great potential for prostate cancer. Xerostomia has emerged as a potential dose-limiting side effect in the development and widespread use of this therapeutic modality. We aim to measure the effect of intraglandular salivary gland botulinum toxin injection on local PSMA uptake.
Material and Methods: Three female Sprague-Dawley rats received intraglandular submandibular salivary gland (SG) injection of 5 units of botulinum toxin A in 0.2 ml under direct visualization via neck skin incision. The contralateral gland was injected with the same volume of saline and used as control. One month later, a PSMA PET/CT was obtained 60 minutes after 18F-DCFPyL tail vein injection. Right and left submandibular gland relative uptake values were calculated using standardized regions of interest over the glands. As the pteryogopalatine ganglion (PG) was found to have similar high uptake in all rats, ratios of SG/PG were calculated to correct for potential decrease in both glands and compare rats to each other. Additionally, SG maximum standard uptake values (SUVmax) were measured for each side.
Results: The three rats showed near-complete decrease of bilateral salivary gland uptake as identified by low SG/PG ratios of 7%/2%, 3%/8%, 5%/5% (right/left SG, respectively) compared to saline injected glands in three other experimental rats: 45%, 27%, 36%. SUVmax for the three rats were (right/left): 0.2/0.2, 0.3/0.4, and 0.4/0.4. Additionally, the rats suffered dehydration and weight loss during the month, requiring manual feeds. Given that only one side received botulinum toxin, we hypothesized that it diffused in the nearby soft tissues and penetrated the contralateral glands.
Conclusion: Although technically challenging in rats, intraglandular botulinum toxin injection may lead to a decrease in salivary gland uptake on PSMA PET/CT. This may prove useful to diminish side effects of targeted alpha therapy for prostate cancer.

007

FDG-PET/CT IMAGING OF NONCUTANEOUS MALIGNANT MELANOMA

Charles Intenzo, MD, Adam Marc, BA, Ryan Weight, DO, Marlana Orloff, MD, Michael Mastrangelo, MD, Takami Sato, MD, Sung Kim, MD

Objectives: FDG-PET/CT has been proven to be an effective diagnostic tool in the management of patients with cutaneous melanomas. Increasingly, however, we have been performing FDG-PET/CT on patients referred to us with noncutaneous melanomas. This atlas presents the findings of various soft-tissue malignant melanomas in our practice.
Methods: Over a 10-year interval, a list of patients undergoing FDG-PET/CT for the evaluation of noncutaneous melanomas was obtained. Scan findings were correlated with histopathological results.
Results: PET/CT identified uveal, parotid, sinonasal, small bowel and urethral melanomas; none of these patients were found to have a primary cutaneous source. In all instances, follow-up PET imaging demonstrated either improvement or progression of disease, thereby influencing the course of therapy.
Conclusion: Although noncutaneous melanoma is an uncommon malignancy, FDG-PET/CT nonetheless plays a definite role in patient management, particularly in assessing therapeutic response.

008

MISMATCHED PERFUSION DEFECT ON VQ SCAN ASSOCIATED WITH FONTAN CIRCULATION

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Objectives: Present a case of mismatched perfusion defect on lung ventilation perfusion (VQ) scan in a patient with history of Fontan procedure. Review Fontan procedure and complications leading to perfusion defects. Review mismatched perfusion defects in patients with congenital heart disease.
Venous thromboembolism (VTE) affects roughly 1 in 1600 pregnancies. Accurate diagnosis of pulmonary embolism (PE) is important, as the patients frequently present with nonspecific symptoms.
The Fontan procedure is a palliative surgical procedure used in children with univentricular hearts, which results in the flow of systemic venous blood to the lungs without passing through a ventricle. Complications of Fontan circulation include pulmonary arteriovenous malformation, which could mimic a perfusion defect on V/Q.
The patient is a 33-year-old pregnant female at 23 weeks gestation. History is significant for complex congenital heart disease requiring a Fontan procedure at age five. She presented with a four-day history of left sided, pleuritic chest pain which had been steadily worsening over time. A V/Q scan was performed which showed a large mismatched perfusion defect involving the entire right upper lobe. Although the study was reported as unlikely for PE based on the patient's cardiac history and the discordance between the perfusion defect location (right)

and the chest pain (left), the referring physician was concerned and a CT angiography was performed 2 days following the V/Q scan.
The CT demonstrated narrowing of the right main pulmonary artery at anastomosis, with diminished right upper lobe pulmonary artery caliber and paucity of pulmonary vessels, which likely responsible for the observed right upper lobe perfusion defect. No Filling defects were identified to indicate pulmonary arterial embolism.
In this poster we will review and presented causes of mismatched perfusion defects in patients with congenital heart disease.

009

QUANTIFICATION OF I-131 UPTAKE IN WARTHIN'S TUMORS OF THE PAROTID GLAND ON SPECT/CT

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Objectives: Present a case of bilateral Warthin's tumors of the parotid glands in a patient with thyroid cancer. Present the first quantification of Warthin's tumors from I-131 SPECT/CT. 3. Review image characteristics of Warthin's tumor.
Warthin's tumor, also known as papillary cystadenoma lymphomatosum, is the second most common benign tumor of the parotid gland, comprising up to 20% of all parotid tumors. These tumors could be radioiodine avid, as presented in this abstract.
The patient is a 49-year-old male who initially presented with face and neck swelling. Ultrasound demonstrated a thyroid nodule which was biopsy proven to be papillary thyroid carcinoma. The patient subsequently underwent total thyroidectomy and radioiodine ablation with 131 mCi of I-131 NaI. There was incidental finding of bilateral parotid nodules on ultrasound, 1.8 x 1.8 x 1.3 cm on the right and 4.5 x 2.8 x 1.8 cm on the left, which were subsequently biopsy proven to be Warthin's tumors.
On post therapy I-131 scan, I-131 avid subcentimeter cervical lymph nodes and bilateral parotid lesions were identified. SPECT/CT of the neck was performed. The maximum SUV of normal parotid gland measured 4.7. The maximum SUV of the parotid lesions measured 86.0 on the right and 473.0 on the left, respectively. A left level III cervical lymph node measured 1.3 x 0.9 cm, with a maximum SUV of 50.0.
Benign parotid gland lesions could be highly radioiodine avid and could mimic metastatic thyroid cancer. In this poster, we will review the imaging findings of Warthin's tumors, including Tc-99m pertechnetate, I-131, FDG PET, ultrasound, CT and MRI. The differential diagnosis of salivary gland uptake on I-131 scan will also be reviewed.

010

RAPID RADIOIODINE TURNOVER IN TOXIC NODULE

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1. Schulich School of Medicine, Western University, London, Ontario 2. Division of nuclear medicine, the Ottawa Hospital, Ottawa, Ontario

Learning Objectives: Present a case of rapid iodine turnover in a toxic thyroid nodule. Present and discuss factors that affect rapid iodine turnover.

To determine the therapeutic dose for hyperthyroid patients, most centers perform thyroid uptake only at 24 hours. The radioiodine turnover rate (4-hour/24-hour uptake), which influences the treatment dose, is not routinely performed. Although rapid radioiodine turnover in Graves' disease is a well recognized phenomenon, data on toxic nodules is very limited, as presented in this abstract.

The patient is a 74-year-old referred for radioiodine therapy due to symptoms of hyperthyroidism. Her TSH was less than 0.01 mIU/L, free T3 was elevated at 7.2 mIU/L, and T4 was at the upper limited of normal at 17 mIU/L. Her ultrasound demonstrated a mass in the left lobe measuring 3.7 x 3.0 x 2.0 cm.

On the thyroid scan, there was intense uptake in the thyroid nodule with no visualization of the reminder thyroid gland. The 24-hour thyroid uptake was low normal at 8.9%, with no significant change on multiple repeat measurements. Due to the discordant findings between the thyroid scan and uptake, rapid iodine turnover was suspected, and confirmed by the repeat thyroid uptake of 37% at 5 hours. The turnover rate was 4.2 (>1.0 is defined as high turnover rate). The patient was subsequently treated effectively with 20 mCi of I-131 NaI.

The rapid iodine turnover of toxic nodules, as presented in the abstract, is rate. However, the cases could be under-detected due to the routine 24-hour uptake protocol. For trainees, rapid iodine turnover of the thyroid gland or nodules should be suspected if there is discordance between the 24-hour thyroid uptake, thyroid scan and clinical presentation. In this poster, factors affecting rapid iodine turnover in the thyroid gland or nodules will be discussed.

011

LOCALIZED SUBACUTE THYROIDITIS ON THYROID SCAN

Hassan Almubarak[1], Curtis Black[2], Zamzam Khalifa Sulaiman Al Bimani[1], and Wanzhen Zeng[1]
1. Division of Nuclear Medicine, University of Ottawa, Ottawa, Ontario, Canada 2. Dalhousie University, Halifax, Nova Scotia, Canada

Objectives: Present a case of localized subacute thyroiditis in a patient with 2-month history of neck swelling. Review presentation of localized subacute thyroiditis

Subacute thyroiditis is an inflammation of the thyroid gland which causes a disruption of thyroid follicles and release of stored thyroid hormone, resulting in transient hyperthyroidism followed by euthyroidism or transient/permanent hypothyroidism. Thyroid uptake and scan are routinely performed to differentiate subacute thyroiditis from other causes of hyperthyroidism. Subacute thyroiditis most common involves both thyroid lobes. Solitary transient cold nodule due to subacute thyroiditis has been reported. Subacute thyroiditis involving only one thyroid lobe is rare, as is the case here.

A 48-year-old female presented with a two-month history of a right sided neck swelling. Laboratory investigations demonstrated that the patient was euthyroid. The initial outside ultrasound prior to the thyroid scan showed a right lobe enlargement with a thyroid nodule measuring 2.9 x 1.4 x 1.1 cm.

The patient was referred for thyroid uptake and scan. On the thyroid scan, there was homogenous radiotracer uptake in the left lobe of the thyroid gland with no visualization of the entire right thyroid lobe. The 24-hour thyroid uptake was normal at 25.3%. On physical

exam, the thyroid gland was mildly enlarged at 30g with no palpable nodule in the right thyroid lobe. At 5 days after the thyroid scan, the patient had another follow-up ultrasound, which showed resolution of the right thyroid nodule, indicating that subacute thyroiditis could mimic nodules. Based on the thyroid scan, it is unclear if the left thyroid lobe was not involved throughout the clinical presentation or had resolved at the time of thyroid scan.
In this poster, clinical presentation and image findings of localized subacute thyroiditis will be reviewed.

012

UTILITY OF ^{111} IN-PENTETREOTIDE SCINTIGRAPHY FOR THE EVALUATION OF APPENDICEAL NEUROENDOCRINE TUMORS.

McIntosh, C, Abele, J.

Abstract

Objectives: ^{111}In-pentetreotide (Octreoscan™) scintigraphy is commonly used to assess neuroendocrine tumors (NETs). The aim of this retrospective study was to compare the utility of ^{111}In-pentetreotide SPECT/CT scintigraphy in the context of appendiceal gastrointestinal (GI) NETs versus non-appendiceal GI NETs.

Methods: A 6-year single institution retrospective chart review of 516 ^{111}In-pentetreotide SPECT/CT studies was performed. 97 scans involving patients with pathology-proven GI NET's were included in the analysis. The incidence of abnormal SPECT/CT scans in patients with GI NETs of appendiceal versus non-appendiceal origin were compared.

Results: 32 scans (1 pre-op, 31 post-op) were performed in patients with a GI NET of appendiceal origin, none of which were interpreted as abnormal (presence of an ^{111}In-pentetreotide avid primary or secondary lesion). 65 scans (36 pre-op, 29 post-op) were performed in patients with a GI NET of non-appendiceal origin, with 35/65 (53.8%) of scans interpreted as abnormal. Fisher's exact test demonstrates a significant difference between the two groups ($p < 0.05$).

Conclusion: ^{111}In-pentetreotide (Octreoscan™) with SPECT/CT is of no diagnostic benefit in the assessment of appendiceal NETs.

013

PET-CT GANTRY SHIELDING AND OCCUPATIONAL DOSE

Sutherland, Duncan EK, Stodilka, RZ, Romsa, JG

Objective: In developing a PET-CT suite, equipment positioning, and shielding are critical to minimize occupational radiation exposure. The self-shielding provided by the PET-CT scanner is often overlooked. In this study, we measured the effective shielding of a PET-CT gantry during clinical use, and provide an estimate of the reduction in occupational dose.

Methods: The study was conducted at the St. Joseph's Hospital, London, Ontario using a standard PET-CT protocol, where patients were administered 5 MBq/kg F-18 FDG. 21 patients were enrolled into this study. All measurements were taken 1.5 meter from the patient pre- and post-void, and throughout the PET-CT acquisition. The PET-CT took an average of 27.5

minutes per patient (3.5 minutes per bed position). These measurements were decay corrected.
Results: The average activity per patient was 405 MBq, and 10% of all activity was voided prior to PET-CT imaging. Without adjusting for the PET-CT ring, the dose would be 5.0 µSv/scan. Once the patient is positioned in the PET-CT ring, the dose is reduced to 0.8 µSv/scan, suggesting an average of 84% shielding. However, the dose rate was not uniform throughout the duration of the scan, and early pelvic images contribute disproportionately to radiation exposure.
Discussion: The PET-CT gantry reduces the external dose by 84%. 2700 PET-CT studies are performed each year at St. Joseph's Hospital and extrapolating this data, a dose reduction from 12.2 mSv/year (unshielded) to 1.9 mSv/year (shielded) is the result of the gantry alone. Including this significant shielding effect in PET-CT suite design should reduce the requirements for room shielding (lead in walls), and/or increase the flexibility in staff occupancy outside of the PET-CT suite.
Conclusion: A PET-CT gantry shields 84% of the radiation emitted from the patient. Future PET-CT suites should consider this shielding in designing PET-CT suites and considering where to place those suites in nuclear medicine departments.

014

PRIMARY BILATERAL ADRENAL GLAND LYMPHOMA WITH DUODENAL INVOLVEMENT ON FDG PET

Owais Kotibi, Wanzhen Zeng, Patrick Martineau

Objectives: Present a case of an incidentally discovered bilateral adrenal lymphoma with duodenal involvement. Present literature review of primary and secondary adrenal lymphoma Both primary and secondary adrenal lymphoma are rare. The most commonly seen histology is diffuse large B-cell lymphoma, which is highly FDG avid. We present a case of bilateral adrenal lymphoma which was incidentally discovered on FDG PET and review the literature on primary and secondary adrenal lymphoma.
A 60-year-old male with a history of cirrhosis underwent routine surveillance for duodenal varices by esophagogastroduodenoscopy. He was incidentally noted to have duodenal thickening which was subsequently biopsied. Pathology results revealed diffuse B cell lymphoma. CT chest, abdominal and pelvis was reported normal. The patient subsequently underwent staging with FDG PET/CT 3 weeks after CT, which revealed FDG avid lesions in the duodenum, a paraduodenal lymph node and bilateral adrenal glands. Bilateral small nodular adrenal lesions (1.4 cm on the right and 2.0 cm on the left) with a maximum SUV of 10.3 on the right and 22.5 on the left respectively were identified. The findings were interpreted as compatible with primary adrenal lymphoma with duodenal involvement, a presentation which has only been reported once before in the literature. A complete remission with R-CHOP chemotherapy was achieved, documented by a follow-up FDG PET.
Primary adrenal lymphoma is a relatively rare diagnosis. Secondary adrenal lymphoma from duodenal diffuse large B-cell lymphoma is also extremely rare. Adrenal lymphoma could be missed on CT, as presented. In this poster, we will review clinical presentation of primary and secondary adrenal lymphoma and image findings.

015

DISAPPEARANCE OF MYOCARDIAL PERFUSION DEFECTS ON PRONE SPECT IMAGING

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Objectives: Myocardial perfusion Imaging (MPI) traditionally images patients in supine position. The aim of this study was to assess the extent of perfusion defect improved by prone imaging and identify the subgroup of patients who might benefit the most from having prone images

Methods: Rest and stress supine and stress prone from 384 consecutive patients (age: 64.2±11.2, F:M=151:233) with suspected or known CAD were reviewed. Summed stress score (SSS) of the supine and prone and rest (SRS) of the inferior/inferolateral walls (5/17 segments) and the anterior wall (3/17 segments) was obtained on 4DM SPECT (INC). The difference in SSS between the supine and prone images (DSSS) was evaluated for correlation with sex and BMI using Student's t test.

Results: The mean summed score of the inferior/inferolateral walls was 3.7 ± 3.3, 3.5 ± 3.4 and 1.5 ± 2.5 for rest, stress supine and stress prone, respectively. The mean DSSS was 2.1±2.6 ($p<0.001$), with no statistical difference between sex ($p= 0.81$). There was no statistical difference of SSS in the anterior wall between supine (0.4 ± 1.1) and prone (0.2 ± 0.9, $p=0.10$). Of the 384 patients, 34 had larger, 98 had equal, and 252 had smaller perfusion defects in the inferior/inferolateral walls on prone compared to supine.

The median BMI was 27. The mean SSS in the inferior/inferolateral walls is numerically higher in patients with BMI≥27 (3.70±3.36) compared to BMI<27 (3.36± 3.09) in supine ($p=0.10$) and the difference is statistically significant in prone (1.75± 2.90 vs. 1.15± 1.94, $p=0.02$).

Conclusion: The addition of prone acquisition improves soft tissue attenuation artifact, as demonstrated by decreased perfusion defect score, in both male and female patients. The difference is most noticeably in the inferior and inferolateral walls, the typical location for diaphragmatic soft tissue attenuation. The prone images are more beneficial to patients with a higher BMI.

Eric Lepp Clinical Vignettes

EL-001

THE USEFULNESS OF COMPLEMENTARITY OF IMAGISTICS IN THE NET'S THERANOSTICS APPROACH

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Background: Peptide receptor radionuclide therapy (PRRT) is an effective method for treating neuroendocrine tumors (NETs). It is limited, however, in the prediction of individual tumor response and the precise and early identification of changes in tumor and metastasis size.
Aims: Our objective was to assess the performance of Lu-DOTATATE and Y- DOTATATE PRRT in metastatic gastroenteropancreatic NET (GEP-NET) and correlate it with primary tumor site, tumor proliferation index, and dual tracer imaging characteristics.
Material and methods: A 36-year-old man was admitted to Surgery Department because of the weight loss and fever. Computed tomography (CT) examination revealed nothing. Histopathological analysis of the tissues confirmed NET G2. A positive result (hepatic pathological uptake) of ^{99m}Tc-Tektrotyd scintigraphy (SRS) gave the possibility of PRRT. The patient was treated with the total dose of 8.3 GBq of ^{177}Lu-DOTATATE and 2.75 GBq of ^{90}Y-DOTATATE.
Results: After first cycle of PRRT, there was good symptomatic improvement, with a modest reduction in uptake on ^{177}Lu-DOTATATE PET/CT suggesting a favorable response. Hence, treatment with a second cycle was considered. After the second cycle, the patient declares intense fatigue and CT examination reveal multiple new hepatic lesions.
Conclusions: A high burden of disease represents an independent prognostic factor of response to PRRT in patients affected by GEP-NET. The metastatic lesions may signify varying tumor biology and heterogeneity among metastatic lesions in the same individual. Utilizing all modalities of response assessment seems to be important in judging the PRRT benefit and must be incorporated in response assessment tools.
Keywords: PRRT, neuroendocrine tumors, Lu-DOTATATE, Y- DOTATATE

EL-002

WBC SCINTIGRAPHY FOR IDENTIFYING INFECTED LIVER CYSTS
Chris McIntosh

A 55-year-old female with a history of autosomal dominant polycystic disease presented to hospital with acute right upper quadrant pain, abnormal liver function tests, and elevated C-reactive protein and white blood cell (WBC) count. Computed tomography (CT) demonstrated innumerable cysts replacing most of the liver. A few of the cysts were hyperdense and there was a small volume of perihepatic fluid, suspicious for recent cyst rupture. The patient was started on broad spectrum antibiotics, but her WBC count remained elevated. Blood cultures were negative. A nuclear medicine scan was requested to help with identifying an infected cyst to guide therapy.
An initial ^{99m}Tc sulfur colloid liver/spleen scan was acquired for mapping of the distribution of the hepatic parenchyma in relation to the hepatic cysts. A ^{99m}Tc-hexamethylpropyleneamine oxime (HMPAO) labelled WBC scan with 3 hour and 24 hour imaging was then acquired to identify an inflamed or infected cyst.
Photopenic defects on both scans corresponded to innumerable simple cysts through the liver. Discordant WBC accumulation was seen in a few scattered cysts within both lobes.

The cyst with the most intense WBC accumulation in segment 4A was targeted under ultrasound and cloudy fluid was aspirate. Culture of the cystic fluid grew Enterobacter cloacae and the antibiotics were adjusted based on susceptibility. The patient improved over the next several days and was discharged with a 6-week course of treatment.

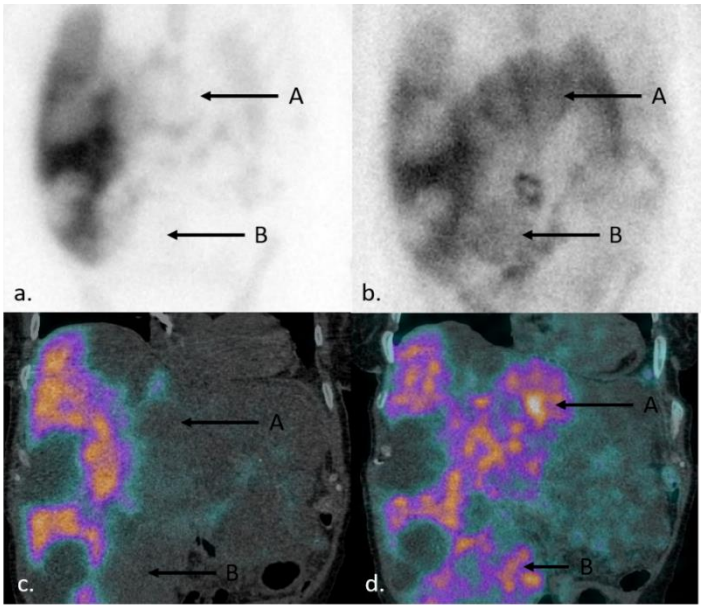

Figure 1. Injected hepatic cysts in a 55-year-old female. Anterior planar and coronal SPECT/CT of (a,c) ^{99m}Tc sulfur colloid for normal hepatic distribution and (b,d) 24 hour ^{99m}Tc HMPAO WBC showing abnormal leukocyte accumulation in multiple cysts, most notably in segment IVA (A) and V (B). Noninfected cysts remain photopenic on both studies.

WBC scintigraphy is a useful tool for identifying occult infectious and inflammatory processes. Due to physiologic uptake within the liver, the distinction between normal and pathologic WBC distribution can be challenging. Utilization of a second radiotracer such as sulfur colloid to localize normal hepatic parenchyma can aid in identify abnormal WBC distribution. As seen in this case, localizing of abnormal WBC uptake with liver cysts can guide further targeted diagnostic testing and treatment.

EL-003

ROLE OF NUCLEAR MEDICINE IN ACCESSORY OSSICLES

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Clinical Information: A 23-year-old male, right footed competitive soccer player, underwent a three-phase 99mTc methylene diphosphonate (MDP) bone scan for persistent right first metatarsophalangeal (MTP) joint pain. He had trauma in that region two years ago. In addition, starting two or three months ago, the patient has been suffering from persistent left midfoot pain at the level of the navicular bone from no apparent cause.

Imaging results: The three-phase bone scan included flow and blood pool studies of the feet and delayed planar images of the lower limbs and pelvis and tomographic images of the feet and ankles. No hyperemia was noted. Delayed images demonstrated minimally increased activity in the anterolateral aspect of the distal head of the right first metatarsal bone, corresponding to a bone spur, likely accounting for the right foot pain. Interestingly, mildly increased tracer activity was demonstrated at the junctions of bilateral navicular bones and their associated type II accessory navicular ossicles, left more than right, likely explaining the left foot pain.

Teaching point: Accessory bones are common, occurring in over 20% of the population and may occasionally cause pain due to trauma, impingement, entrapment and tenosynovitis, among other causes. ^{99m}Tc-MDP SPECT/CT is very sensitive in determining accessory bone remodeling. However, it lacks specificity for pain since asymptomatic accessory bones also can uptake tracer. Therefore, scanning with ^{99m}Tc-MDP is most useful when patients present with

pain. These accessory ossicles may easily be mistaken for other pathologies such as avulsion fractures. Therefore, thorough knowledge of the most common and most symptomatic accessory ossicles is essential in accurate diagnosis of accessory ossicle related pain.

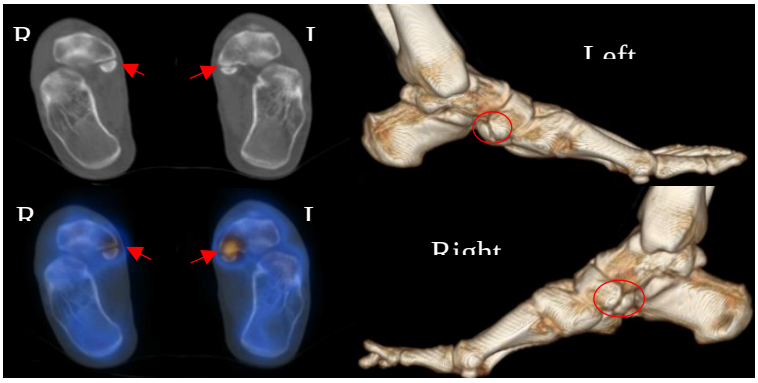

Figure 1: Low-dose CT axial plane, fusion axial plane and 3D reconstruction of bilateral feet. The red arrows point to the joint of the navicular bone and the accessory navicular ossicle. These are represented on the 3D modules circled in red.

Figure 1: Image axiale de CT de basse dose, image de fusion axiale et reconstruction 3D des pieds. Les flèches pointent vers les articulations d'os naviculaire et d'osselet accessoire naviculaire. Ceux-ci sont représentés dans les modèles 3D et encerclés en rouge.

Figure 2: Low-dose CT axial plane, fusion axial plane and 3D reconstruction of the right foot. The red arrows point to the bone spur of the distal head of the first metatarsal bone. It is represented on the 3D module circled in red.

Figure 1: Image axiale de CT de basse dose, image de fusion axiale et reconstruction 3D du pied droit. Les flèches pointent vers l'ostéophyte du premier os métatarsien. Il est redémontré dans le modèle 3D et encerclé en rouge.

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Résumé

RÔLE DE LA MÉDECINE NUCLÉAIRE DANS LES OSSELETS ACCESSOIRES

Information Clinique : *Un homme de 23 ans, droitier, joueur compétitif de soccer, passe une scintigraphie osseuse à trois phases au ^{99m}Tc méthylène diphosphonate (MDP) pour douleur chronique de la première articulation métatarso-phalangien droite. Il a un eu un trauma dans cette région il y a deux ans. De plus, depuis deux ou trois mois, il démontre une douleur persistante au niveau de l'os naviculaire du pied gauche sans cause apparente.*

Résultat d'imagerie : *La scintigraphie osseuse à trois phases comprenait des images de flow et immédiates des pieds et des images délais des membres inférieurs et du bassin ainsi que des images tomographiques des pieds et des chevilles. Aucune hyperémie n'a été démontrée. Un foyer minimalement intense au niveau antérolatéral de l'os métatarsien distal du premier orteil droit, correspondant à un ostéophyte, est démontré, et pourrait expliquer la douleur au pied droit. De plus, un foyer légèrement intense au niveau de l'articulation de chaque os naviculaire avec leur propre osselet naviculaire accessoire est démontré, plus intense au côté gauche, et pourrait expliquer la douleur au pied gauche.*

Point d'apprentissage : *Les osselets accessoires sont communs, retrouvés chez plus de 20% de la population et peuvent causer de la douleur occasionnellement par trauma et accrochage ligamentaire, entre autres. Le ^{99m}Tc-MDP SPECT/CT est très sensible pour détecter le remodelage osseux au niveau des osselets accessoires. Pourtant, le test a une basse spécificité pour la douleur, car ces osselets peuvent retenir du MDP lorsqu'asymptomatiques. Cela dit, le ^{99m}Tc-MDP est le plus utile lorsque le patient présente de la douleur. Ces osselets peuvent être faussement interprétés comme des fragments de fracture, entre autres. Donc, une connaissance approfondie des osselets accessoires les plus communs et les plus symptomatiques est essentielle pour bien diagnostiquer la douleur causée par ces osselets.*

EL-004

SEE IT TO BELIEVE IT: INCIDENTAL OCULAR IMPLANT UPTAKE ON BONE SCAN DONE FOR PROSTATE CANCER STAGING

Guillaume Chaussé, Stephan Probst

A 74-year-old man recently diagnosed with high risk prostate cancer with high serum prostate specific antigen (PSA) was referred to nuclear medicine for a 99mTc-MDP bone scan. As per institutional protocol, a whole-body blood pool images were acquired, which were unremarkable.
On delayed three-hour planar images, an unexpected round focus of intense uptake was found overlying the right orbit.
SPECT/CT showed intense uptake throughout a spherical osseous-like density in the right ocular orbit.
Review of the patient`s history revealed right eye evisceration 20 years prior, secondary to a complication of cataract surgery.
It became clear that this was a hydroxyapatite ocular prosthesis. The hydroxyapatite nature of the ocular implant can be recognized by its bone-like density on CT and its accumulation of bone scan agent.
Our case illustrates interesting but normal incidental ocular prosthetic uptake which is infrequently seen. Bone scan can be used to guide early implant management, as uptake correlates with vascularization of eye prosthesis, a prerequisite to drill the peg hole. However, this finding can be encountered 20 or more years after hydroxyapatite ocular implant insertion.

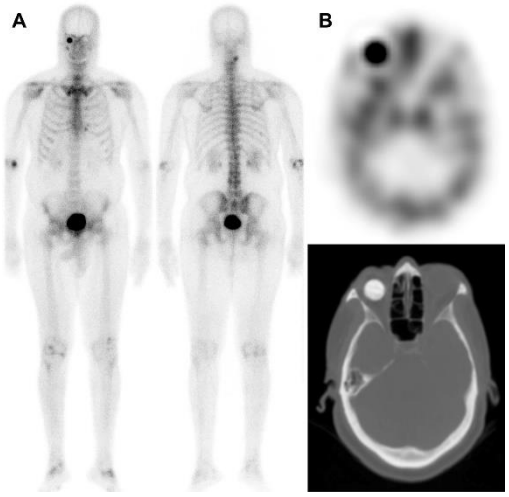

FIGURE 1.

ON DELAYED THREE-HOUR PLANAR IMAGES, AN UNEXPECTED ROUND FOCUS OF INTENSE UPTAKE WAS FOUND OVERLYING THE RIGHT ORBIT. ***B)*** *SELECTED AXIAL SLICE OF 99TC-MDP SPECT/CT SHOWING INTENSE UPTAKE THROUGHOUT A RIGHT HYDROXYAPATITE OCULAR PROSTHESIS.* ***)A***