Second Annual
BIR SPECT/CT
Symposium

London, UK

NMD: Al-Jahra Hospital

25/02/2013

NMD: Al-Jahra Hospital

Muhammad Umar Khan, FCPS

Al-Jahra Hospital; PET/CT Suite: Kuwait Cancer Control Center

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25/02/2012

SPECT/CT in Imaging Infection

NMD: Al-Jahra Hospital Kuwait

25/02/2013

Learning Objectives

- To refresh our understanding about the use of SPECT/CT in imaging certain infectious processes
- To revise recent literature regarding the role of SPECT/CT in infection imaging
- To try making our reports more informative, descriptive and conclusive after the addition of SPECT/CT acquisition to conventional radionuclide infection imaging procedures

- Disclosures: None

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Introduction

- SPECT/CT is showing great promise to improve the specificity of planar imaging and SPECT alone.
- New era of multi-modality imaging with hybrid technology is broadening the scope of Nuclear Medicine.
- Advent of Hybrid Imaging Systems (SPECT/CT) has resulted in fusion of functional and anatomical data.

- Ultimate Goal: Improved patient management

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* Gnanasegaran et al. Semin Nucl Med 2009;39:431-42

Introduction

- Radionuclide imaging has been used to detect and localize infectious and inflammatory diseases for over five decades.
- Many infection seeking agents are available but none of them is "ideal".
- Advent of Hybrid Imaging Systems whether PET/CT or SPECT/CT have resulted in increased sensitivity and specificity of detecting and localizing an infectious process.
- SPECT/CT has incremented the diagnostic capability of conventional scintigraphic infection imaging procedures.

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Khan MU, Usmani MS. 2011: Radionuclide Infection Imaging: Conventional to Hybrid; Chapter 4: 73-96. 12 Chapters in Nuclear Medicine, Intech.

Infection seeking agents

- ✓ Gallium 67 citrate
- ✓ Tc-99m MDP
- ✓ Radio-labelled Leukocytes
  - ✓ Tc-99m HMPAO
  - ✓ In-111 oxine
- ✓ Radio-labelled Anti-granulocyte Antibody
  - ✓ Tc-99m Sulesomab
- ✓ F-18 FDG
- ✓ Novel agents

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Gallium 67

- ✓ Gallium 67 has demonstrated high sensitivity for both acute and chronic infectious processes as well as non-infectious inflammation.
- ✓ Tracer activity parallels acute inflammation returning to normal as the disease process resolves.
- ✓ Clinical scenarios:
  - ✓ Fever of Unknown Origin (FUO)
  - ✓ Sarcoidosis
  - ✓ Pulmonary Infections (PCP)
  - ✓ Pulmonary toxicity (Bleomycin or Amiodarone)
  - ✓ Malignant Otitis Externa

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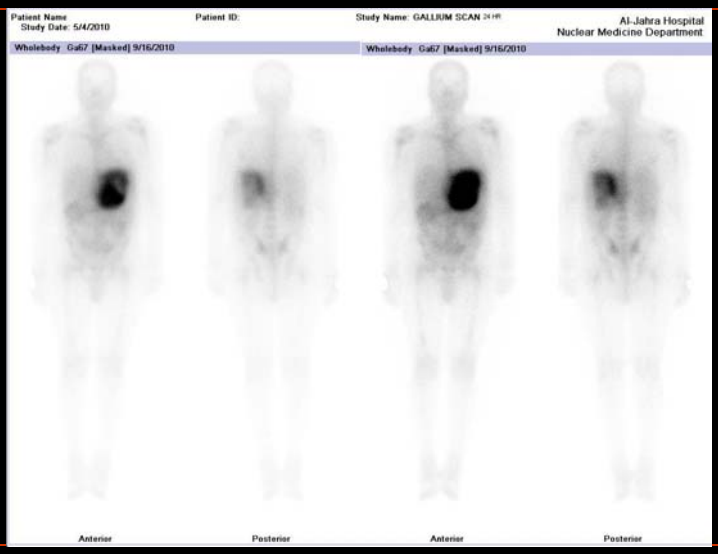

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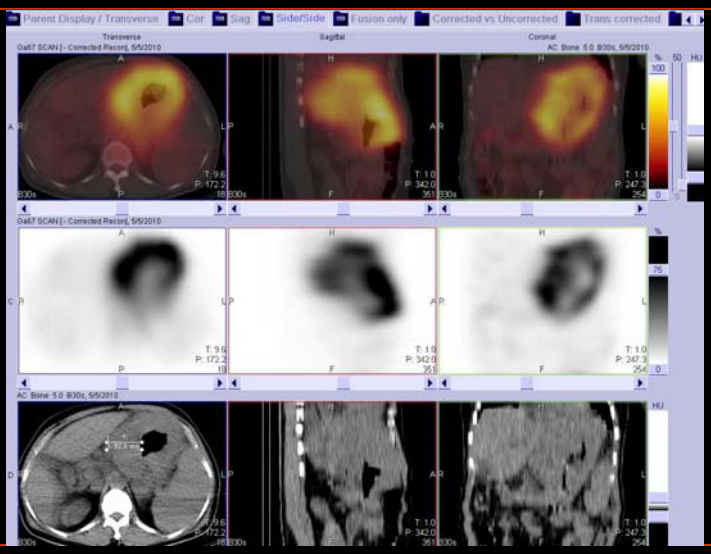

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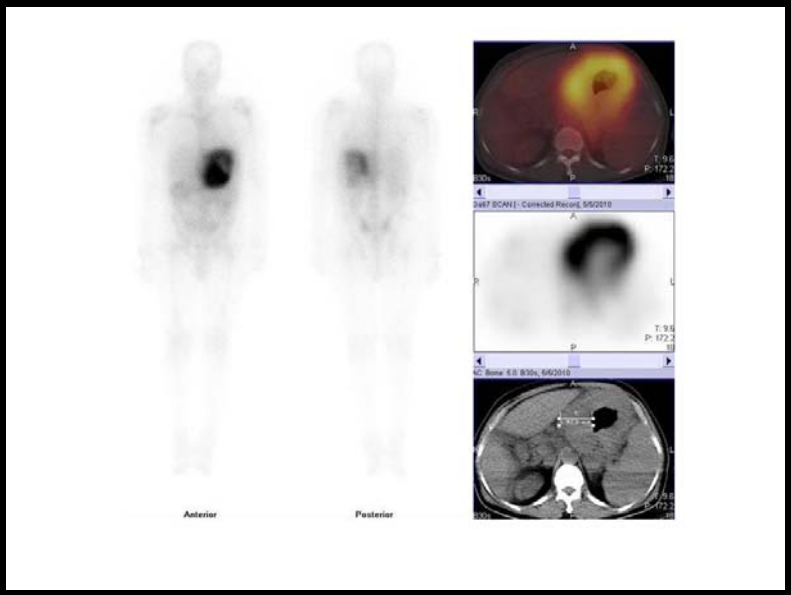

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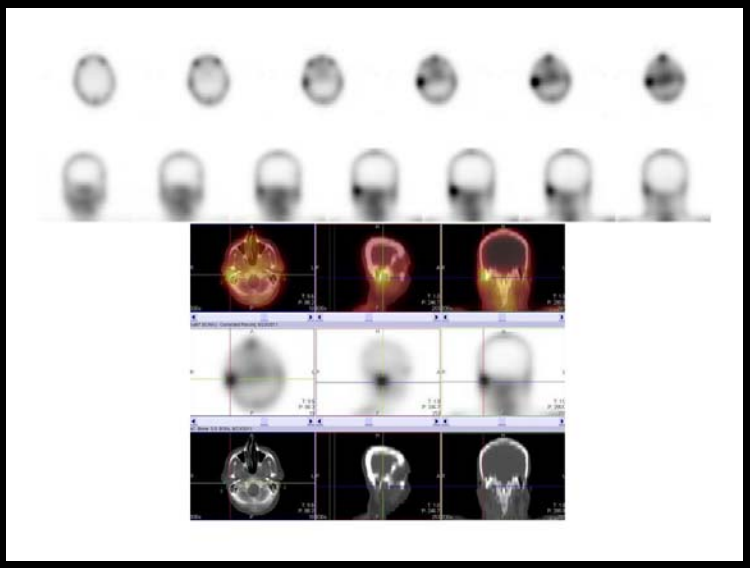

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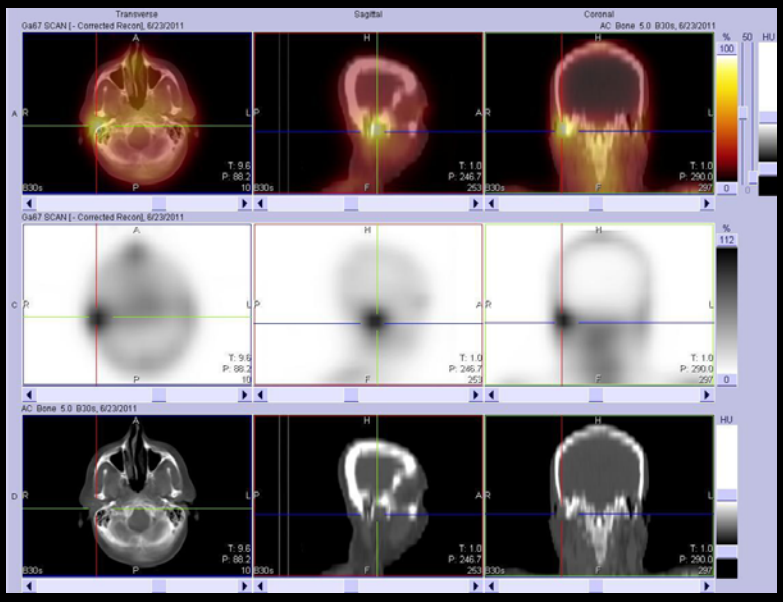

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Gallium 67 SPECT/CT

- ✓ Gallium 67 scintigraphy is primarily characterized by poor spatial resolution and low specificity due to paucity of anatomical and morphological information.
- ✓ Bar-Shalom et al studied patients with multiple infectious conditions including FUO.
- ✓ They concluded that SPECT/CT was found to be beneficial in determining the precise anatomical sites of infection in 85% of the discordant studies.
- ✓ It was found particularly useful in the chest and abdomen.

Bar-Shalom RB et al: 2006; J Nucl Med 587-594

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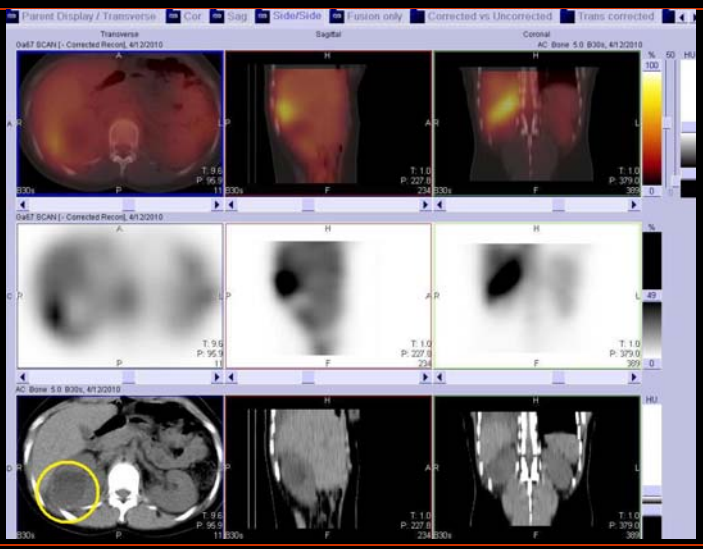

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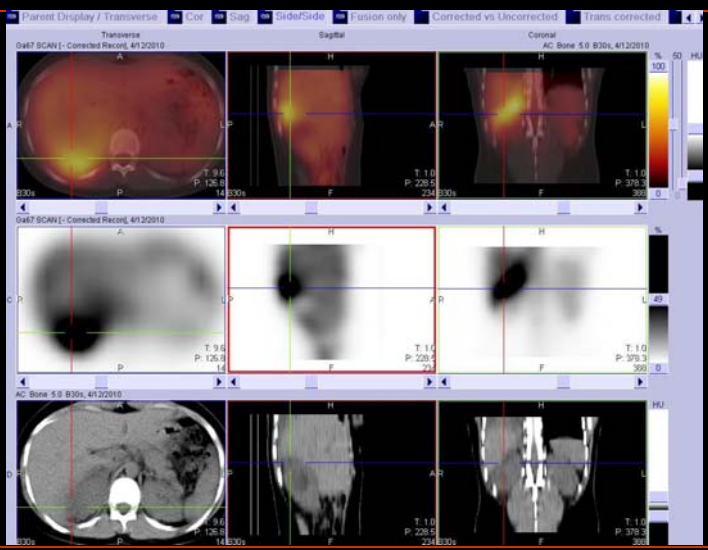

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Rev Esp Med Nucl Imagen Mol. 2012 Jan-Feb;31(1):34-9. doi: 10.1016/j.remn.2011.04.006. Epub 2011 Jun 11.

SPECT-CT with 67Ga-citrate in the management of spondylodiscitis.

[Article in English, Spanish]

Domínguez ML, Lorente R, Rayo JI, Serrano J, Sánchez R, Infante JR, García L, Durán C.

Servicio de Medicina Nuclear, Hospital Universitario Infanta Cristina, Badajoz, España. mluzovi@yahoo.es

Abstract

Spondylodiscitis affects a small proportion of all patients with locomotor system infections, however its early diagnosis is important due to its potential morbidity. Magnetic resonance imaging is the diagnostic method of choice. Nonetheless, it has certain limitations and is not suitable for all patients. The conventional scintigraphic studies for evaluating spondylodiscitis are those performed with (99m)Tc-HDP and (67)Ga-citrate. However, their poor image resolution is a disadvantage of these techniques. The use of hybrid Single Photon Emission Computed Tomography-Computed Tomography (SPECT-CT) improves detection of the disease by combining functional and anatomical images. We present 9 patients with suspicion of spondylodiscitis who underwent sequential bone scintigraphy with (99m)Tc-HDP and SPECT-CT with (67)Ga-citrate, with positive findings confirmed by clinical monitoring for at least 6 months.

PMID: 21658818 [PubMed - indexed for MEDLINE]

NMD: Al-Jahra Hospital Kuwait

Courtesy: Pubmed-Medline

Clin Nucl Med. 2012 Sep;37(9):827-32. doi: 10.1097/RLU.0b013e318262ae6c.

A prospective study comparing whole-body FDG PET/CT to combined planar bone scan with 67Ga SPECT/CT in the Diagnosis of Spondylodiskitis.

Fuster D, Solà O, Soriano A, Monegal A, Setoain X, Tomás X, Garcia S, Mensa J, Rubello D, Pons F.

Nuclear Medicine Department, Hospital Clínic, Villarroel, 170, 08036 Barcelona, Spain. dfuster@clinic.ub.es

Abstract

PURPOSE: This study aimed to prospectively evaluate the usefulness of PET/CT using F-FDG in comparison to bone scan and Ga in the diagnosis of spondylodiskitis.

MATERIAL AND METHODS: This prospective study included 34 patients (15 women and 19 men) aged 59 (18) years with clinical symptoms of spondylodiskitis. Whole-body PET/CT and bone scan combined with planar and SPECT/CT Ga was performed in all patients. Diagnosis of spondylodiskitis was made by microbiology and/or on the basis of clinical and laboratory findings and imaging follow-up.

RESULTS: Spondylodiskitis was confirmed in 18 of 34 patients. In the other 16 patients, spondylodiskitis was finally excluded, and the most frequent findings observed were degenerative spondyloarthropathy (n = 7), vertebral fracture (n = 3), endocarditis (n = 2), and other processes (n = 4). The sensitivity and specificity of combined bone scan and Ga were 78% and 81%, with a positive predictive value of 82%, a negative predictive value of 76%, and an overall accuracy of 79%. SPECT/CT with Ga helped identify soft tissue involvement in 10 of 18 patients. The sensitivity and specificity of PET/CT were 89% and 88%, with a positive predictive value of 89%, a negative predictive value of 87%, and an overall accuracy of 88%. Concordance between Ga and PET/CT was good (κ = 0.71; 95% confidence interval, 0.48-0.94). PET/CT was able to detect soft tissue involvement in 12 of 18 patients. In 2 patients, a multifocality was found, which was only diagnosed by PET/CT.

CONCLUSIONS: PET/CT is useful in the diagnosis of spondylodiskitis, with more accurate results than combined bone scan and Ga. SPECT/CT with Ga is recommended, especially when planar bone scan and Ga pattern is suggestive of spondylodiskitis.

PMID: 22889769 [PubMed - indexed for MEDLINE]

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Courtesy: Pubmed-Medline

Tc-99m MDP

- ✓ Three phase scintigraphy with Tc-99m MDP has been extensively used in evaluation of osteomyelitis.
- ✓ Radionuclide procedure of choice for diagnosing osteomyelitis in non-violated bone i.e. bone that is not affected by underlying conditions.
- ✓ Detects the process 7-14 days before radiological changes occur.
- ✓ Reported Sensitivity 90-100%.
- ✓ Reported Specificity 70-95%.
- ✓ In adults a negative bone scan essentially rules out infection.
- ✓ A 4th phase at 24 hours post injection can be done to increase specificity in some cases.
- ✓ Overall accuracy of bone scan/Ga-67 is approximately 65-80%.

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Khan MU, Usmani MS. 2011: Radionuclide Infection Imaging: Conventional to Hybrid; Chapter 4: 73-96. 12 Chapters in Nuclear Medicine, Intech.

Tc-99m MDP SPECT/CT

- ✓ Three phase bone scintigraphy and MRI are considered the modalities of choice for diagnosing osteomyelitis. MR imaging assesses the associated soft tissue complications (Overall sensitivity 92-100% & specificity 89-100%).
- ✓ MRI has limitations:
  - ✓ Replacement of marrow fat with edema and exudate results in:
    - ✓ Decreased signal on T1 and increased signal on T2 weighted images
  - ✓ Non-Specific: Acute infarction, fracture or even tumour
- ✓ CT is more sensitive to detect cortical destruction.

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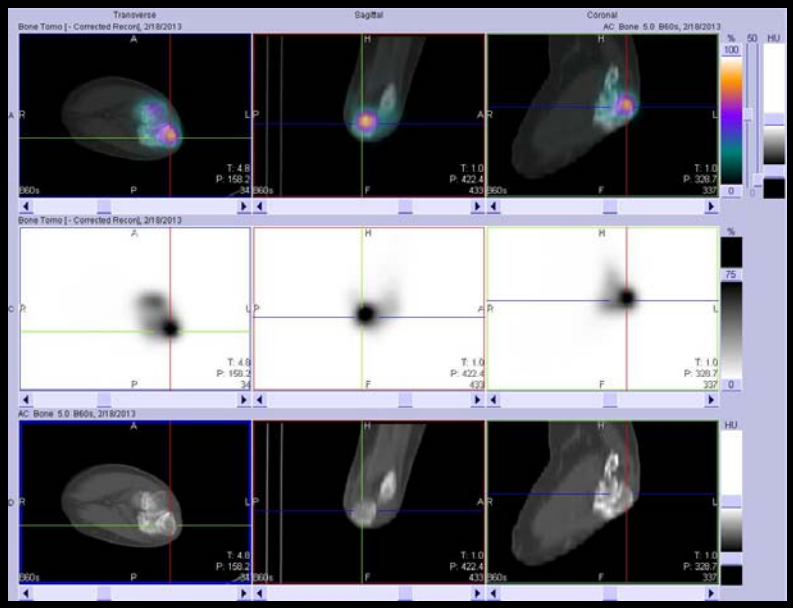

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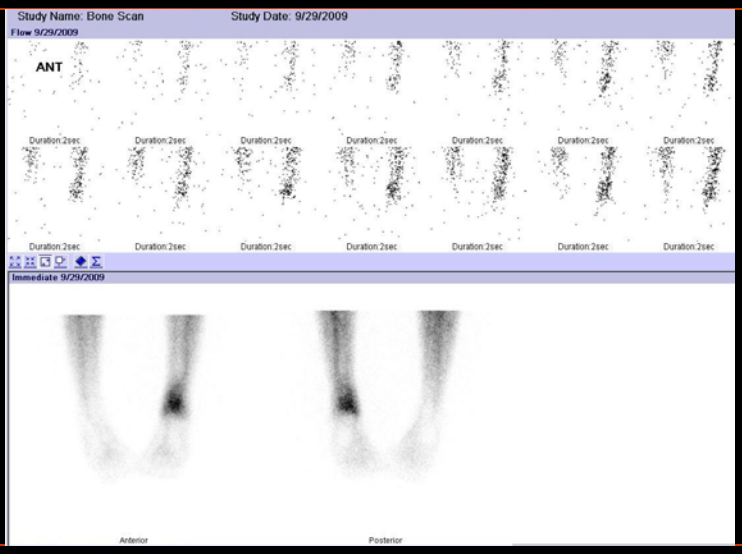

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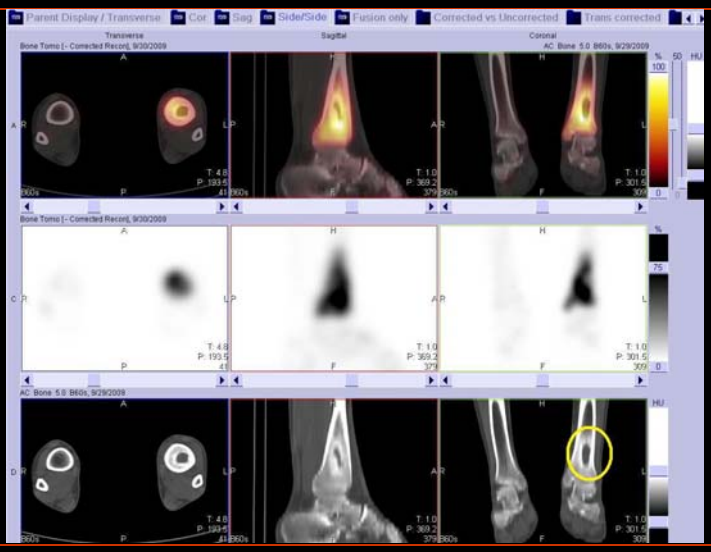

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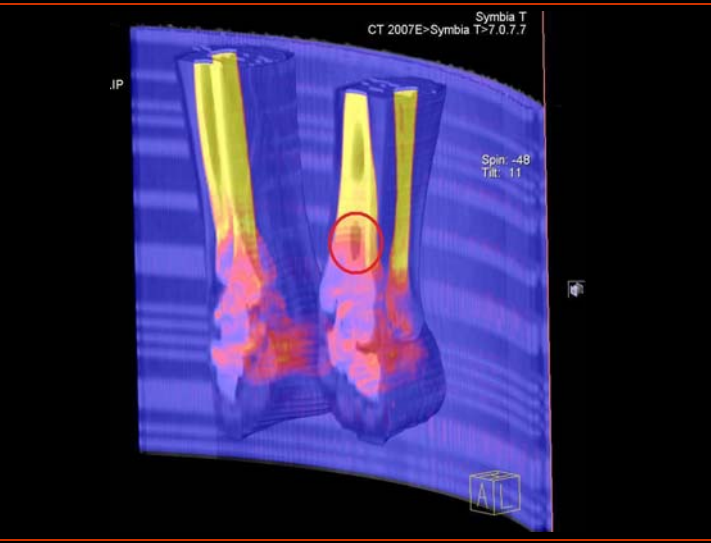

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Brodie abscess

From Wikipedia, the free encyclopedia

A **Brodie abscess** is a subacute osteomyelitis which may persist for years before converting to a frank osteomyelitis. Classically, this may present after conversion as a draining abscess extending from the tibia out through the shin.

Most frequent causative organism is Staphylococcus aureus.

Brodie abscess

Classification and external resources

ICD-10	M86.6
ICD-9	730.1
eMedicine	article/1248682

Contents [hide]

1 Clinical Presentation
- 1.1 Most Frequent Sites
- 1.2 Radiographic Features
- 1.3 History

Clinical Presentation [edit]

Localized pain, often nocturnal, alleviated by aspirin. Often mimics the symptoms of Osteoid osteoma, which is typically < 1cm diameter.

Most Frequent Sites [edit]

Usually occurs at the metaphysis of long bones. Distal tibia, proximal tibia, distal femur, proximal or distal fibula, and distal radius.

Radiographic Features [edit]

Oval elliptical or serpiginous radiolucency usually >1cm surrounded by a heavily reactive sclerosis, granulation tissue, and a Nidus often less than 1cm. The margins often appear scalloped on radiograph. Brodie's abscess is best visualized using Computed tomography (CT) scan. Associated atrophy of soft tissue near the site of infection and shortening of the affected bone. Osteoblastoma may be a classic sign for Brodie's Abscess.

History [edit]

Brodie abscess is named after Sir Benjamin Collins Brodie, 1st Baronet

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Courtesy: Wikipedia

JBR-BTR. 2010 Mar-Apr;93(2):81-6.

Brodie's abscess revisited.

Kornaat PR, Camerlinck M, Vanhoenacker FM, De Praeter G, Kroon HM.

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Abstract

Radiology plays an important role in the diagnosis of a Brodie's abscess, as can be difficult for a clinician to identify the disease using clinical information alone. A Brodie's abscess is clinically difficult to diagnose because patients typically have mild local symptoms, few or no constitutional symptoms, and near normal laboratory values. Furthermore, a Brodie's abscess may mimic various benign and malignant conditions, resulting in delayed diagnosis and treatment. The most frequently made incorrect diagnosis is that of a primary bone tumor. The present pictorial review summarizes imaging clues to the diagnosis of a Brodie's abscess, such as the serpentine sign on conventional radiographs and the penumbra sign seen on Magnetic Resonance (MR) images. A Brodie's abscess is difficult to diagnose, however, once diagnosed, it is a curable disease with a 100% cure rate.

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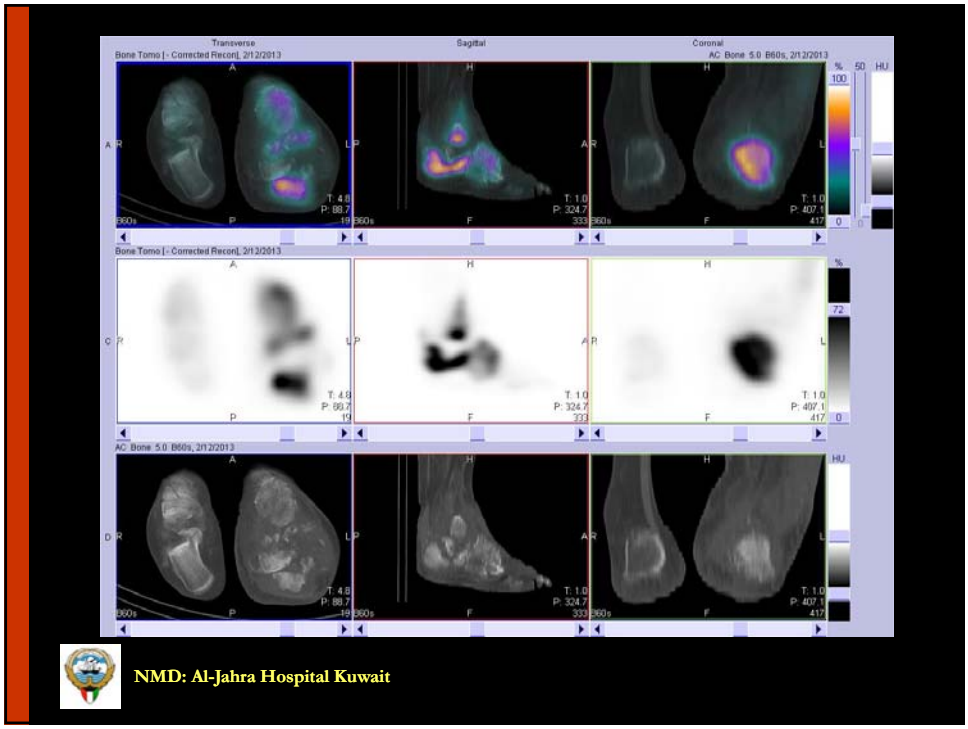
Courtesy: Pubmed-Medline



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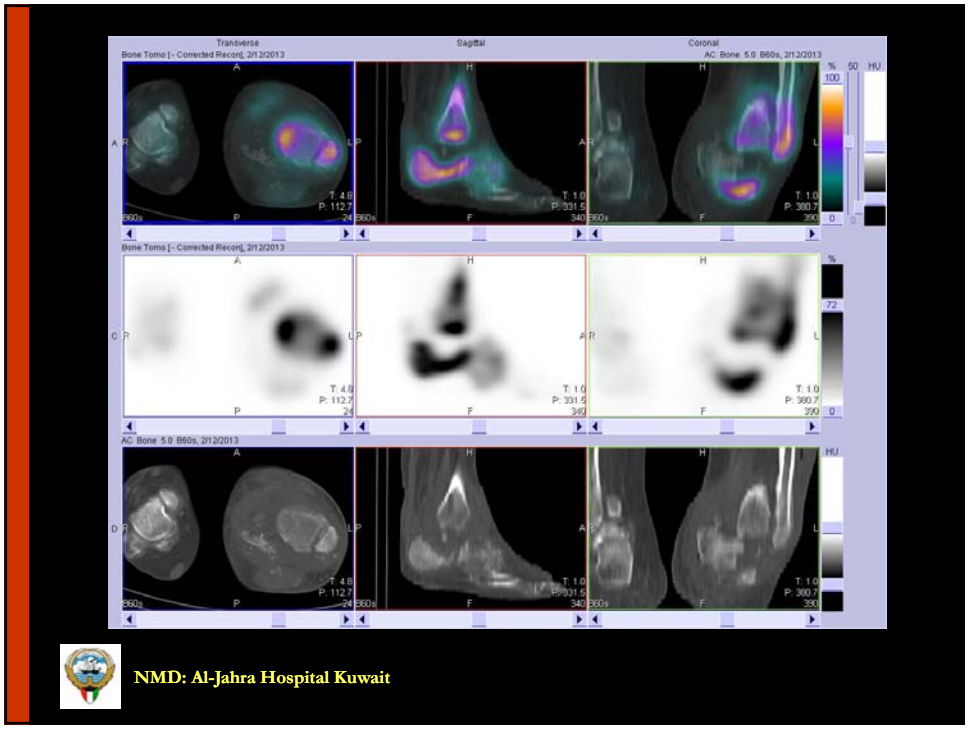

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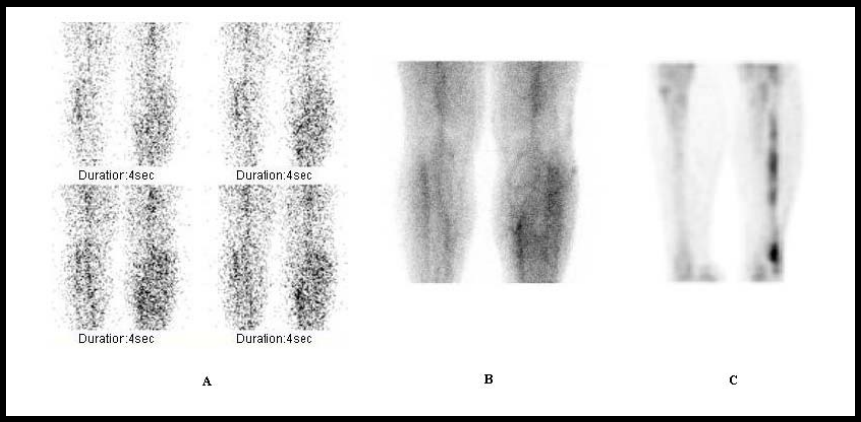

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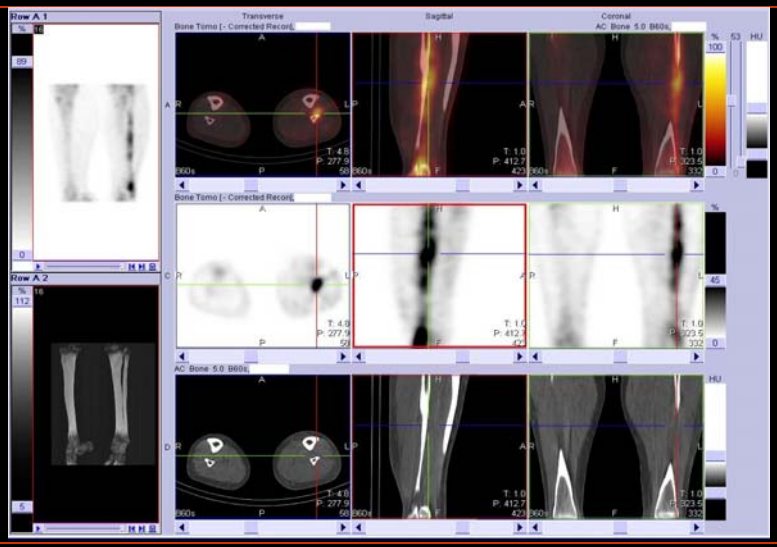

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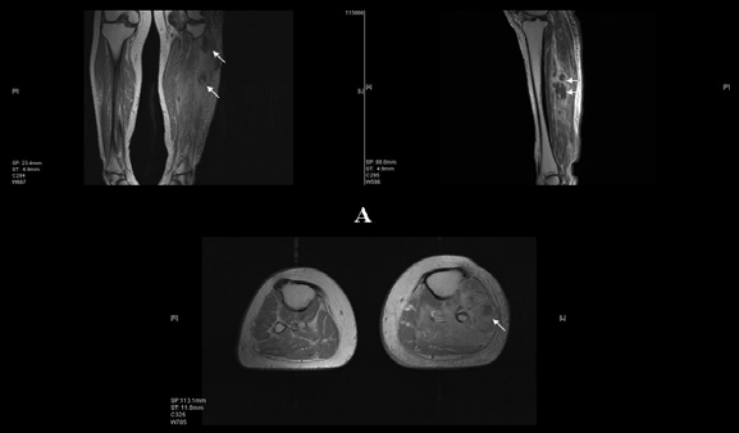

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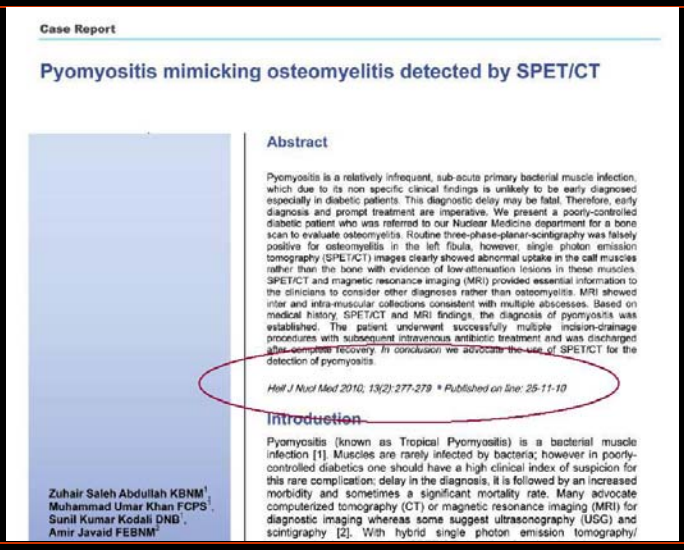

Case Report

Pyomyositis mimicking osteomyelitis detected by SPET/CT

Zuhair Saleh Abdullah KBNM[1],
Muhammad Umar Khan FCPS[1],
Sunil Kumar Kodali DNB[1],
Amir Javaid FEBNM[1]

Abstract

Pyomyositis is a relatively infrequent, sub-acute primary bacterial muscle infection, which due to its non specific clinical findings is unlikely to be early diagnosed especially in diabetic patients. This diagnostic delay may be fatal. Therefore, early diagnosis and prompt treatment are imperative. We present a poorly-controlled diabetic patient who was referred to our Nuclear Medicine department for a bone scan to evaluate osteomyelitis. Routine three-phase-planar-scintigraphy was falsely positive for osteomyelitis in the left fibula, however, single photon emission tomography (SPET/CT) images clearly showed abnormal uptake in the calf muscles rather than the bone with evidence of low-attenuation lesions in these muscles. SPET/CT and magnetic resonance imaging (MRI) provided essential information to the clinicians to consider other diagnoses rather than osteomyelitis. MRI showed inter and intra-muscular collections consistent with multiple abscesses. Based on medical history, SPET/CT and MRI findings, the diagnosis of pyomyositis was established. The patient underwent successfully multiple incision-drainage procedures with subsequent intravenous antibiotic treatment and was discharged after complete recovery. *In conclusion* we advocate the use of SPET/CT for the detection of pyomyositis.

*Hell J Nucl Med 2010; 13(2):277-279 * Published on line: 25-11-10*

Introduction

Pyomyositis (known as Tropical Pyomyositis) is a bacterial muscle infection [1]. Muscles are rarely infected by bacteria; however in poorly-controlled diabetics one should have a high clinical index of suspicion for this rare complication: delay in the diagnosis, it is followed by an increased morbidity and sometimes a significant mortality rate. Many advocate computerized tomography (CT) or magnetic resonance imaging (MRI) for diagnostic imaging whereas some suggest ultrasonography (USG) and scintigraphy [2]. With hybrid single photon emission tomography/

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- Horger et al assessed that SPECT/CT correctly classified 85% of indeterminate scintigraphic bone lesions compared to 36% using SPECT alone*.
- Romer et al also showed that SPECT/CT classified 92% of indeterminate lesions on SPECT**.
- Result: You reach a definitive diagnostic conclusion

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* AJR Am J Roentgenol 2004;183:655-661

**J Nuc Med 2006;47:1102-1106

Tc-99m labelled WBC's

- ✓ Used for diagnosis of complicated osteomyelitis after fractures and surgery i.e. in violated bone, vascular graft infections and various soft tissue insults.
- ✓ The overall sensitivity and specificity of Tc-99m HMPAO labelled leukocytes is 88% and 91% respectively for osteomyelitis in previously violated bone.
- ✓ Performed only after a positive three phase bone scintigraphy.
- ✓ Labelled leukocytes imaging is the procedure of choice for evaluation of patients with diabetic foot.
- ✓ Tc-99m HMPAO: Sensitivity 90% & 93%; Specificity 86% & 100%.
- ✓ In-111: Sensitivity between 72-100%; Specificity between 67-100%.
- ✓ Tc-99m HMPAO/Three phase Bone: 92.6% & 97.6%. Useful for Charcot Osteoarthropathy.
- ✓ Useful for soft tissue infective foci.

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Khan MU, Usmani MS. 2011: Radionuclide Infection Imaging: Conventional to Hybrid; Chapter 4: 73-96. 12 Chapters in Nuclear Medicine, Intech.

Tc-99m labelled Anti-granulocyte Antibodies

- ✓ Most commonly used is practice is Sulesomab (Leukoscan).
- ✓ Indicated as an adjunct in diagnostic imaging of infection/inflammation, in suspected osteomyelitis, including patients with diabetic foot ulcers.
- ✓ Tc-99m MDP bone scan has a low specificity. Follow up Tc-99m Sulesomab reduces the false positive rate of Tc-99m MDP bone imaging.
- ✓ Overall sensitivity & specificity for diagnosing infection is 86% and 72% respectively.
- ✓ In diabetic foot ulcers the diagnostic accuracy when compared to In-111 & Tc-99m HMPAO labelled leukocytes was observed not to significantly different (81% & 75% respectively).

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Khan MU, Usmani MS. 2011: Radionuclide Infection Imaging: Conventional to Hybrid; Chapter 4: 73-96. 12 Chapters in Nuclear Medicine, Intech.

Tc-99m labelled Anti-granulocyte Antibodies

- ✓ Horger et al (2003) showed that SPECT/CT changed the interpretation of radio-immuno-scintigraphy in 28% of suggestive foci evaluated in 27 patients with relapsing post traumatic osteomyelitis.
- ✓ Graute V et al (2010) concluded that SPECT/CT substantially improves the utility of Tc-99m labelled anti-granulocyte antibodies for diagnosis and localization of joint infections and provide information on the extent of the infection.

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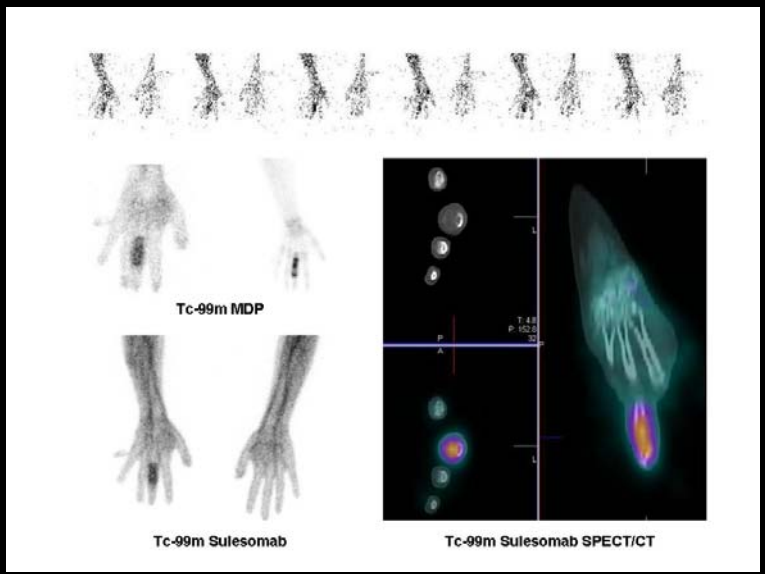
Horger M et al: 2003; Eur J Nucl Med Mol Imaging 1665-1673
Graute V et al: 2010; Eur J Nucl Med Mol Imaging 1751-1759



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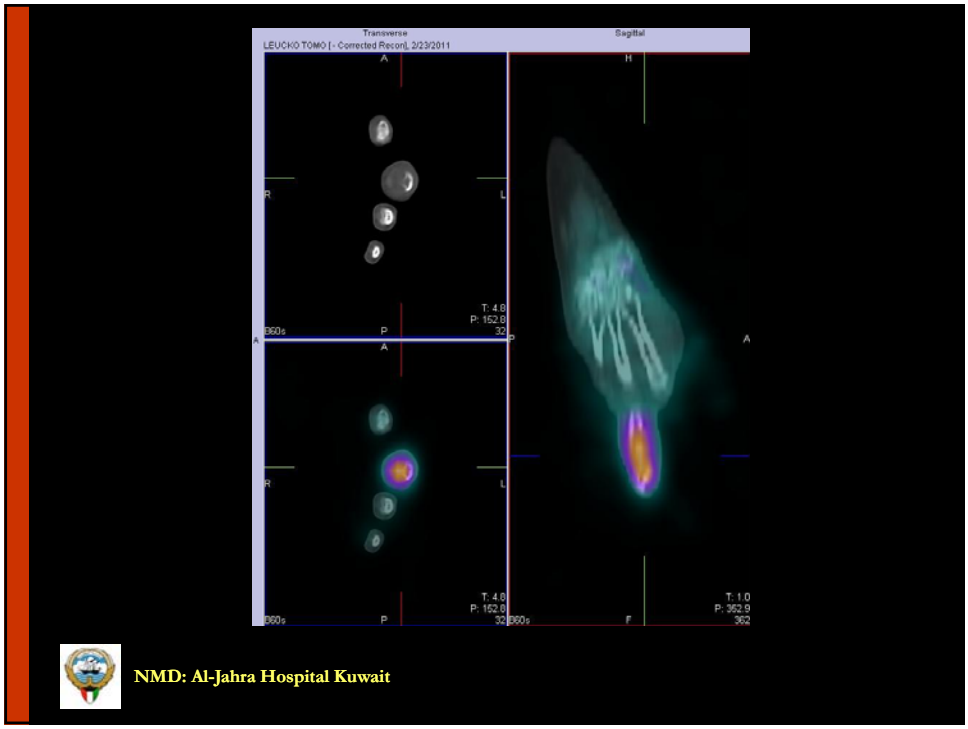

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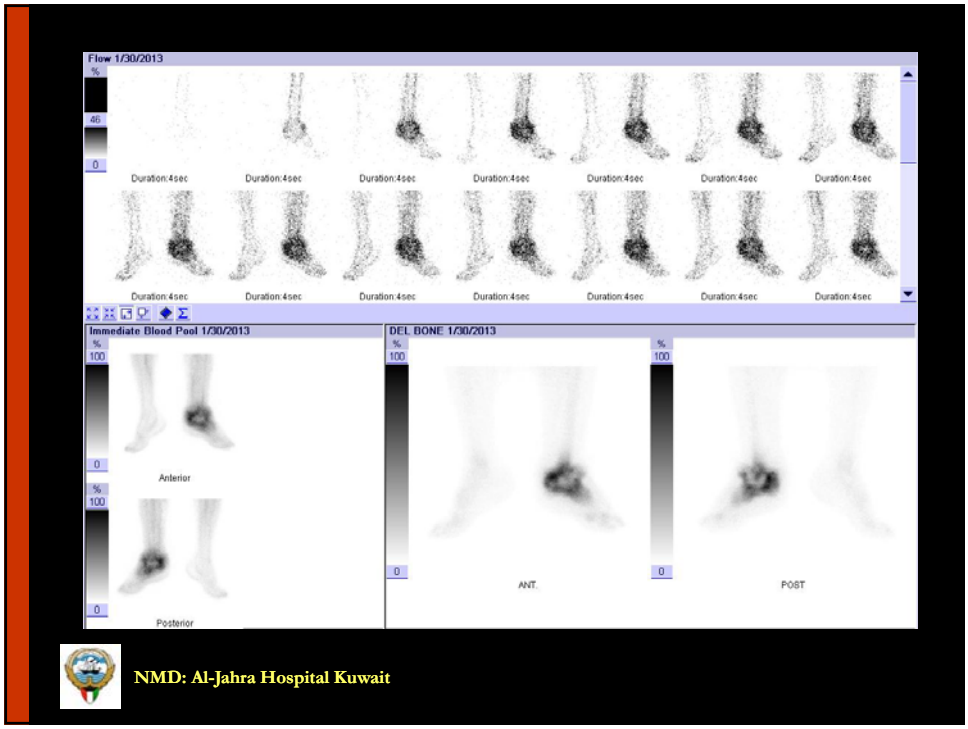

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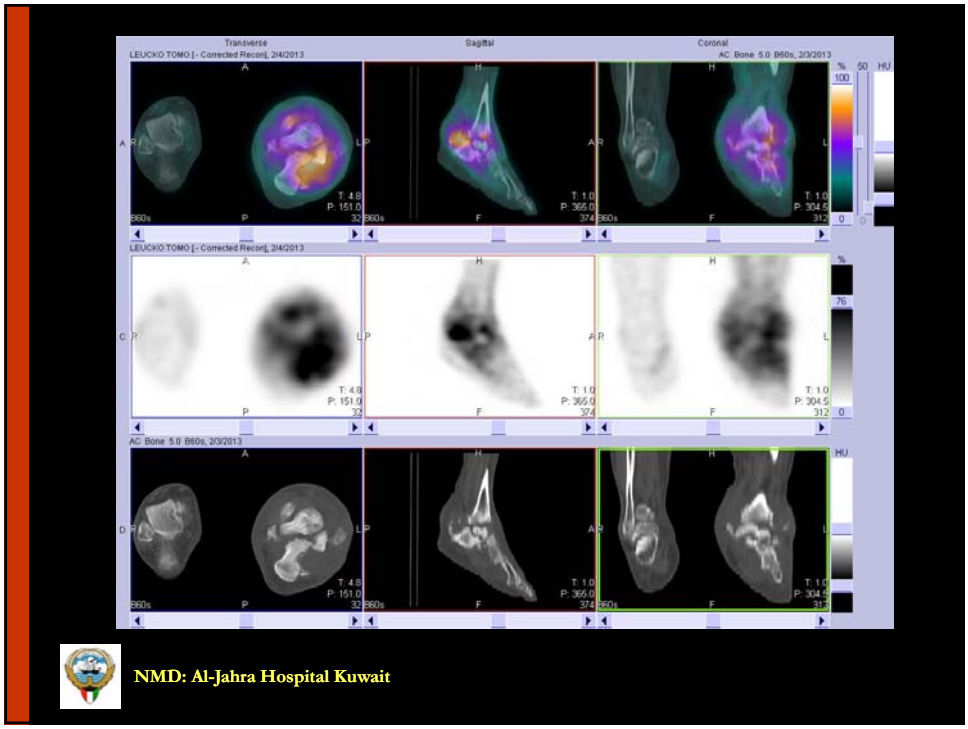

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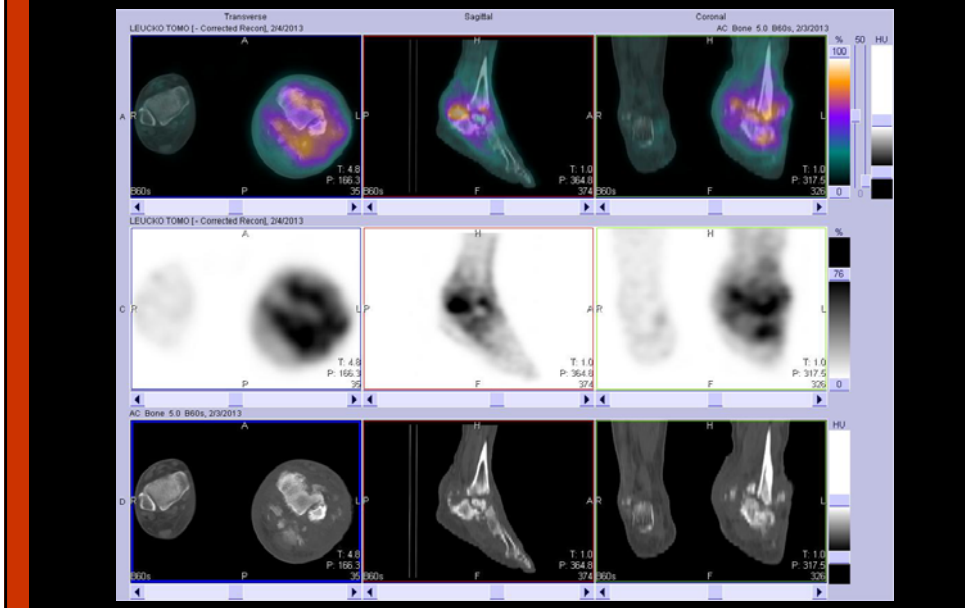

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J Nucl Med. 2009 Jul;50(7):1042-6. doi: 10.2967/jnumed.108.059493. Epub 2009 Jun 12.

Diabetic foot infection: usefulness of SPECT/CT for 99mTc-HMPAO-labeled leukocyte imaging.

Filippi L, Uccioli L, Giurato L, Schillaci O.
Section of Nuclear Medicine, Ospedale Maggiore, Trieste, Italy.

Abstract

Our aim was to evaluate the role of SPECT/CT for the diagnosis of diabetic foot infection by labeled leukocytes.

METHODS: Seventeen patients with 19 clinically suspected sites of infection were included. After leukocyte labeling and administration, planar scans were acquired at 30 min, 4 h, and 24 h for 18 consecutive patients. SPECT/CT was obtained at 6 h. The final diagnosis was established by clinical follow-up (24 mo) in all cases and by bone biopsy for 14 sites.

RESULTS: Leukocyte scanning was positive in 16 of 19 lesions and negative in 3. SPECT/CT changed the interpretation of the planar and SPECT images for 10 of 19 suspected sites (52.6%): it excluded osteomyelitis in 6 cases, revealed bone infection in 1 case, and revealed both bone and soft-tissue infection in 3 cases. The hybrid device did not significantly contribute to the evaluation of patients with negative scan results.

CONCLUSION: SPECT/CT can be useful for a more accurate diagnosis of diabetic foot infection by labeled leukocyte imaging.

PMID: 19525471 [PubMed - indexed for MEDLINE] Free full text

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Courtesy: Pubmed-Medline

J Foot Ankle Surg. 2010 Nov-Dec;49(6):529-36. doi: 10.1053/j.jfas.2010.07.010. Epub 2010 Sep 18.

The optimized evaluation of diabetic foot infection by dual isotope SPECT/CT imaging protocol.

Heiba SI, Kolker D, Mocherla B, Kapoor K, Jiang M, Son H, Rangaswamy B, Kostakoglu L, Savitch I, DaCosta M, Machac J.
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Abstract

Sequential Tc-99m hydroxymethylene-diphosphonate (HDP) 3-phase bone (BS) and In-111 leukocyte scanning (WBCS) have been frequently used to evaluate the diabetic foot, as nonosteomyelitis BS uptake is repeatedly observed and osteomyelitis (OM) in WBCS is often uncertain without BS correlation. Additionally, both modalities are limited in lesion localization because of low resolution and lack of anatomic details. We investigated a method that combined BS/WBCS, and if needed, WBCS/bone marrow scanning (BMS) using SPECT/CT to accurately diagnose/localize infection in a practical protocol. Blood flow/pool images were obtained followed by WBC reinjection and next day dual isotope (DI) BS/WBCS planar and SPECT/CT. BMS/WBCS SPECT/CT (step 2 DI) was obtained on the following day when images were suspicious for mid/hindfoot OM. Diagnosis accuracy and confidence were judged for the various imaging combinations. Diagnosis was classified as OM, soft tissue infection (STI), both OM/STI, and other/no bony pathology by microbiology/pathology or follow-up. Distinction between various diagnostic categories and overall OM diagnostic accuracy in 213 patients were higher for DI than WBCS or BS alone, and for DI SPECT/CT than DI planar or SPECT only. Diagnostic confidence/lesion site was significantly higher for DI SPECT/CT than other comparative imaging methods. In a group of 97 patients with confirmed microbiologic/pathologic diagnosis, similar results were attained. Step 2 DI SPECT/CT performed in 67 patients further improved diagnostic accuracy/confidence. DI SPECT/CT is a highly accurate modality that considerably improves detection and discrimination of STI and OM while providing precise anatomic localization in the diabetic foot. This combined imaging technique promises to beneficially impact diabetic patient care.

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NMD: Al-Jahra Hospital Kuwait

Courtesy: Pubmed-Medline

Diabetes Care. 2012 Sep;35(9):1826-31. doi: 10.2337/dc11-2425. Epub 2012 Jun 20.

Indexing severity of diabetic foot infection with 99mTc-WBC SPECT/CT hybrid imaging.

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Abstract

OBJECTIVE: Management of diabetic foot infection (DFI) has been hampered by limited means of accurately classifying disease severity. New hybrid nuclear/computed tomography (CT) imaging techniques elucidate a combination of wound infection parameters not previously evaluated as outcome prognosticators. Our aim is to determine if a novel standardized hybrid image-based scoring system, Composite Severity Index (CSI), has prognostic value in DFI.

RESEARCH DESIGN AND METHODS: Masked retrospective (99m)Tc-white blood cell (WBC) single photon emission CT (SPECT)/CT image interpretation and independent chart review of 77 patients (101 feet) suspected of DFI-associated osteomyelitis at a large municipal hospital between January 2007 and July 2009. CSI scores were correlated with probability of favorable outcome (no subsequent amputation/readmission after therapeutic intervention) during median 342-day follow-up.

RESULTS: CSI ranged from 0-13. Receiver operating characteristic accuracy for predicting favorable outcome was 0.79 (optimal cutoff CSI, ≤2; odds ratio of therapeutic failure for CSI >2, 15.1 [95% CI 4.4-51.5]). CSI of 0 had a 92% chance of favorable outcome, which fell progressively to 25% as indices rose to ≥7. Image-based osteomyelitis versus no osteomyelitis assessment was less accurate than CSI at predicting outcome (P = 0.016). In patients with intermediate severity (CSI 3-6), treatment failure decreased from 68 to 36% when antibiotic duration was extended to ≥42 days (P = 0.026).

CONCLUSIONS: (99m)Tc-WBC SPECT/CT hybrid image-derived wound infection parameters incorporated into a standardized scoring system, CSI, has prognostic value in DFI.

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NMD: Al-Jahra Hospital Kuwait

Courtesy: Pubmed-Medline

Novel Agents & Future trends

- ✓ Leukocytes labelled in-vitro by F-18 FDG
- ✓ Leukocytes labelled with Cu-64
- ✓ Tc-99m Ciprofloxacin
- ✓ Tc-99m labelled anti-microbial peptides
- ✓ Tc-99m labelled recombinant human beta-defensin-3
- ✓ Tc-99m ubiquicidin (UBI29-41)
- ✓ Radiolabelled fluconazole and I-123 labelled chitin targeting agents
- ✓ Tc-99m labelled lactoferrin (hLF-11)
- ✓ N-formyl products (fMLF or fMLP)
- ✓ Tc-99m labelled Interleukin-8 (IL-8)

NMD: Al-Jahra Hospital

Khan MU, Usmani MS. 2011: Radionuclide Infection Imaging: Conventional to Hybrid; Chapter 4: 73-96. 12 Chapters in Nuclear Medicine, Intech.

Clin Nucl Med. 2006 Dec;31(12):801-2.

Fused SPECT/CT imaging of Peri-iliopsoas infection using Indium-111-labeled leukocytes.

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Abstract

Nuclear imaging with In-111-labeled leukocytes has become an instrumental tool in localizing sites of infection and is superior to Ga-67 in localizing abdominal and pelvic abscesses resulting from absence of a normal bowel excretory pathway. Labeled white blood cells (WBCs) localize at sites of infection through diapedesis, chemotaxis, and enhanced vascular permeability and can thus be used to identify infection. The accuracy of this functional imaging modality can be enhanced by fusing SPECT images of labeled WBC with CT images that provide anatomic detail to facilitate reading as illustrated in the case described.

PMID: 17117077 [PubMed - indexed for MEDLINE]

Braz J Infect Dis. 2008 Dec;12(6):558-60.

Usefulness of hybrid SPECT/CT for the 99mTc-HMPAO-labeled leukocyte scintigraphy in a case of cranial osteomyelitis.

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Abstract

Cranial osteomyelitis is a potentially fatal lesion. White blood cell scanning (WBC) with 99mTc-hexamethylpropylene amine oxime (HMPAO) has proven highly sensitive and specific in the diagnosis and follow-up of patients with suspected osteomyelitis. In this report we show the usefulness of SPECT and transmission CT performed simultaneously using a hybrid imaging device for the functional anatomic mapping of soft tissue and cranial bone infections. 99mTc-HMPAO-labeled leukocytes scintigraphy was performed on an elderly diabetic man with an intracranial mass lesion and with suspected temporal bone infection. Planar scans were acquired 30 min, 4 h, and 24 h after injection. SPECT/CT was obtained 6 h after tracer injection, using a dual-head camera coupled with a low-power X-ray tube. The scintigraphic results were matched with the results of surgery and of clinical follow-up. The planar images alone were true-positives for abscess in this patient. SPECT/CT improves the accuracy of99mTc-HMPAO scintigraphy especially in discriminating between soft-tissue and bone involvement. In fact, SPECT/CT also showed temporal bone osteomyelitis. This result indicates that SPECT/CT performed using a hybrid device can improve imaging with 99mTc-HMPAO-labeled leukocytes in patients with suspected osteomyelitis by providing accurate anatomic localization and precise definition of the extent of infection.

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NMD: Al-Jahra Hospital Kuwait

Courtesy: Pubmed-Medline

Clin Nucl Med. 2008 May;33(5):333-4. doi: 10.1097/RLU.0b013e31816a7931.

SPECT/CT of axillofemoral graft infection.

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Abstract

A 73-year-old woman was admitted to the hospital via the emergency room with increasing pain and tenderness in the right axilla and high fevers. She had a long history of peripheral vascular disease with multiple graft failures and recent insertion of a right axillofemoral graft. A computed tomography study of the chest obtained at admission confirmed graft patency and a small fluid collection around the graft at the level below the right axilla. It also confirmed a saccular aneurysm of the aortic arch. A SPECT/CT study of the chest at 3 hours after reinjection of autologous leukocytes labeled with Tc-99m showed intense labeled leukocyte uptake around the vascular graft in the lateral chest wall. Culture of the infected tissue around the excised graft grew Staphylococcus aureus sensitive to all tested antibiotics. Vascular graft infections are rare, with few reported cases of axillofemoral graft infections utilizing Ga-67. Labeled leukocytes have been used successfully in the setting together with CT scanning. This is a rare case of labeled leukocyte uptake in an infected axillofemoral graft by SPECT/CT.

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Clin Nucl Med. 2008 Nov;33(11):813-5. doi: 10.1097/RLU.0b013e318187ef1f.

Diagnosis of acute bacterial prostatitis by Ga-67 scintigraphy and SPECT-CT.

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Publication Types, MeSH Terms, Substances

NMD: Al-Jahra Hospital Kuwait

Courtesy: Pubmed-Medline

Clin Nucl Med. 2010 Jan;35(1):12-7. doi: 10.1097/RLU.0b013e3181c36173.

Clinical impact of SPECT/CT with In-111 biotin on the management of patients with suspected spine infection.

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Abstract

PURPOSE: Early identification and localization of spine infection is necessary for adequate therapeutic strategy. To localize the precise site of infection we evaluated In-111 Biotin SPECT/CT versus planar and SPECT imaging.

METHODS: Seventy-two consecutive patients were enrolled and underwent SPECT/CT and planar imaging 2 to 4 hours post i.v. injection of In-111 Biotin. Final diagnosis was based on bacterial cultures and/or clinical/imaging follow-up for at least 1 year. We evaluated the diagnostic performance of planar, SPECT, and SPECT/CT In-111 Biotin scintigraphy.

RESULTS: In-111 Biotin SPECT/CT and SPECT showed similar values of sensitivity (93.5% vs. 92.1%) and the same specificity (92.3%), planar imaging showed 80.4% of sensitivity and 69.2% of specificity. In 16 patients SPECT/CT correctly localized the infection site (bone, soft tissue, or both bone and soft tissue).

CONCLUSIONS: SPECT/CT enhances the impact of In-111 Biotin scintigraphy on the clinical management of patients, allowing the exact site of infection to be localized to select the appropriate therapy.

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Courtesy: Pubmed-Medline

J Nucl Med. 2012 Aug;53(8):1235-43. doi: 10.2967/jnumed.111.099424. Epub 2012 Jul 11.

Added value of 99mTc-HMPAO-labeled leukocyte SPECT/CT in the characterization and management of patients with infectious endocarditis.

Erba PA, Conti U, Lazzeri E, Sollini M, Doria R, De Tommasi SM, Bandera F, Tascini C, Menichetti F, Dierckx RA, Signore A, Mariani G.
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Abstract

The clinical performance of the Duke Endocarditis Service criteria to establish the diagnosis of infectious endocarditis (IE) can be improved through functional imaging procedures such as radiolabeled leukocytes ((99m)Tc-hexamethylpropyleneamine oxime [HMPAO]-labeled white blood cells [WBC]).

METHODS: We assessed the value of (99m)Tc-HMPAO-WBC scintigraphy including SPECT/CT acquisitions in a series of 131 consecutive patients with suspected IE. Patients with permanent cardiac devices were excluded. (99m)Tc-HMPAO-WBC scintigraphy results were correlated with transthoracic or transesophageal echocardiography, blood cultures, and the Duke criteria.

RESULTS: Scintigraphy was true-positive in 46 of 51 and false-negative in 5 of 51 cases (90% sensitivity, 94% negative predictive value, and 100% specificity and positive predictive value). No false-positive results were found, even in patients with early IE evaluated within the first 2 mo from the surgical procedure. In 24 of 51 patients with IE, we also found extracardiac uptake, indicating septic embolism in 21 of 24. Despite the fact that septic embolism was found in 11 of 18 cases of Duke-definite IE, most of the added value from the (99m)Tc-HMPAO-WBC scan for decision making was seen in patients in whom the Duke criteria yielded possible IE. The scan was particularly valuable in patients with negative or difficult-to-interpret echocardiographic findings because it correctly classified 11 of 88 of these patients as having IE. Furthermore, 3 patients were falsely positive at echocardiography but correctly negative at (99m)Tc-HMPAO-WBC scintigraphy: these patients had marantic vegetations.

CONCLUSION: Our results demonstrate the ability of (99m)Tc-HMPAO-WBC scintigraphy to reduce the rate of misdiagnosed cases of IE when combined with standard diagnostic tests in several situations: when clinical suspicion is high but echocardiographic findings are inconclusive; when there is a need for differential diagnosis between septic and sterile vegetations detected at echocardiography; when echocardiographic, laboratory, and clinical data are contradictory; and when valve involvement (especially of a prosthetic valve) needs to be excluded during febrile episodes, sepsis, or postsurgical infections.

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NMD: Al-Jahra Hospital Kuwait

Courtesy: Pubmed-Medline

Conclusion

- SPECT/CT improves diagnostic accuracy:
  - Better anatomical localization
  - Better characterization of indeterminate/equivocal lesions
- SPECT/CT improves confidence in interpretation of the scans.
- Make the reports of the conventional nuclear medicine infection imaging procedures “new” and “clear”…….

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Take Home Message

- SPECT/CT may potentially lead to*:
  - Reduced use of additional imaging such as MRI
  - Reduce the time required for diagnosis/staging
  - Reduce stress for the patients
  - Reduce additional costs
- Result: Prompt patient management

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* Gnanasegaran et al. Semin Nucl Med 2009;39:431-42

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"One pain is cured by another. Catch some new infection in your eye and the poison of the old one would die."

William Shakespeare, *Romeo and Juliet*

THANK YOU