

## **Case 14837**

### **Role of ethambutol scintigraphy in uncertain cases of tuberculous osteomyelitis**

RM Yogipranata, H Sukmaningtyas, Nopriwan

Radiology Department, Dr. Kariadi Hospital, Diponegoro University; Jl. Dr. Sutomo no. 16 50244 Semarang, Indonesia; Email:raniyogipranata@gmail.com

Dr. Kariadi Hospital

**Section:** Musculoskeletal System

**Published:** 2017, Aug. 3

**Patient:** 24 year(s), female

## **Clinical History**

---

A 24-year-old female patient was referred to our hospital with a right knee pain and movement difficulties after a fall one year before. The patient had no complaints of fever, dyspnea, or cough. In 2014 she was treated for lung tuberculosis, with a completed treatment during nine months.

## **Imaging Findings**

---

The patient had plain radiography, knee-MR, bone and ethambutol scintigraphy. Radiograph of the right lower limb shows lytic lesions in the epi-metaphyseal of the proximal right tibia, with ill-defined margin, wide zone transition, and no periosteal reaction, which was suspected as a primary bone tumour.

Knee-MR showed multiple hypointense lesion in T1-WI, hyperintense in T2-WI at the lateral condyle of the right tibia and right femur, also the proximal right fibula. They showed diffuse enhancement after contrast injection with some areas showed peripheral enhancement, which showed an abscess formation.

Bone scintigraphy using technetium-99m-labeled methylene diphosphonate (99m-Tc MDP) showed radioactivity uptake in the right tibia, which is not a likely site for bone metastases. Afterwards,

they patient had ethambutol scintigraphy using 99m-Tc Ethambutol which showed radioactivities uptake in a B2 segment of the right lung and lateral condyle of the right tibia. This shows an active tuberculous process.

## Discussion

---

Tuberculosis (TB) is still a global health problem despite the availability of various diagnostic modalities and effective antituberculous regiment [1, 2, 3, 5]. Therefore, a fast and accurate diagnosis becomes the key element in eliminating TB [5].

TB can involve pulmonary and extrapulmonary sites. Musculoskeletal system involvement shows only in 1-3% of cases, with extra-spinal manifestations being tuberculous arthritis, osteomyelitis and soft tissue TB. Femur, tibia and small bones of the hands and feet are the most likely sites for extra-spinal musculoskeletal TB and present usually as a solitary lesion [1, 3].

Bone involvement in TB usually results from hematogenous spread from a primary focus, usually the lung or the lymphatic system [2]. The mycobacterium would deposit in the metaphyses, and cause bone destruction, transphyseal spread and joint involvement [2, 3]. Early diagnosis and prompt treatment are critical to avoid bone destruction and joint deformity [3, 4]. However, clinical presentations and signs are often unspecific and insignificant, thus more difficult to diagnose.

Therefore, radiologist must be aware of the possibility since further investigations can be based on radiographic findings [1, 3].

In plain films, tuberculous osteomyelitis shows osteolytic foci with ill-defined borders in the metaphyses, with or without a cortical breakthrough and various amounts of sclerosis [1, 3]. CT scan can show early bone destruction and sequestrum formation [3, 4]. However, MR imaging is the modality of choice since it demonstrates intraosseous and soft tissue involvement (abscess, fistula and sinus tracts) [4]. Marrow changes appear as hypointense on T1-WI and hyperintense on T2-WI, with homogenous or heterogenous enhancement after contrast injection [3, 4]. An interosseous abscess can show peripheral enhancements [6].

Radionuclide emission-based nuclear medicine, using antitubercular drug Ethambutol (EMB) labelled with 99m-Technetium, is a non-invasive, sensitive and specific method to detect and locate tubercular lesion at an early stage of the disease in any anatomical site. It shows a high labelling efficiency (>85%) with in-vitro and in-vivo stability and shows a consistent biodistribution and pharmacokinetic parameters with the original drug, which suggested that 99Tc-EMB was safe for diagnostic purposes [5].

In this case, MR imaging has shown osteomyelitis of the right proximal tibia and distal femur. The bone biopsy did not show any malignancy but spur formation and exostosis. Since it failed to conclude the diagnosis, the patient was referred to nuclear imaging. A positive ethambutol scintigraphy, combined with increased ESR and positive Mantoux test, confirmed a tuberculous osteomyelitis. The patient was treated once again with tuberculosis regiment. In uncertain cases, ethambutol scintigraphy can aid to diagnose tuberculosis.

## Final Diagnosis

---

Tuberculous Osteomyelitis

## Differential Diagnosis List

---

Osteomyelitis caused by fungal or pyogenic infections , Primary bone tumour

## Figures

**Figure 1 Conventional X-ray**



Right cruris AP

© Department of Radiology, Dr. Kariadi Central Hospital, Semarang, Indonesia

Area of Interest: Musculoskeletal system;  
Imaging Technique: Conventional radiography;  
Procedure: Diagnostic procedure;  
Special Focus: Infection;



Right Cruris Lateral

© Department of Radiology, Dr. Kariadi Central Hospital, Semarang, Indonesia

Area of Interest: Musculoskeletal bone;  
Imaging Technique: Conventional radiography;  
Procedure: Diagnostic procedure;  
Special Focus: Infection;

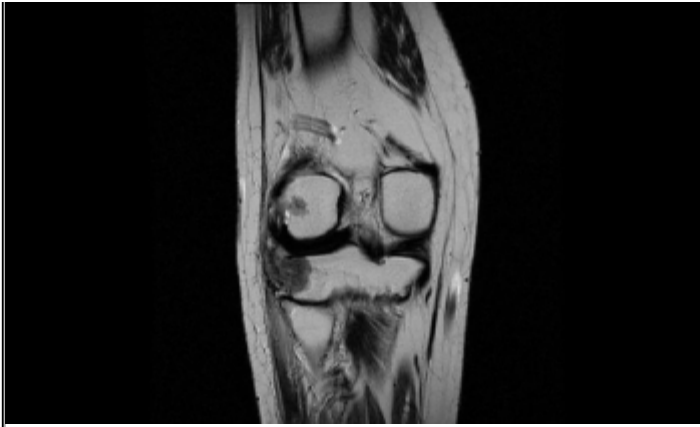
**Figure 2 MRI of the Knee**



Cor T1-WI

© Department of Radiology, Dr. Kariadi Central Hospital, Semarang, Indonesia

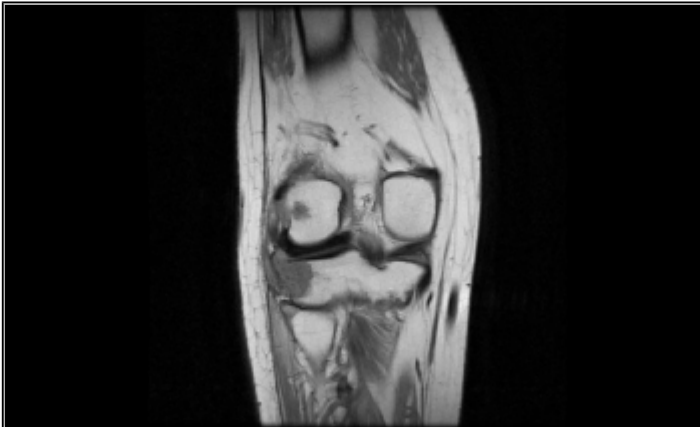
Area of Interest: Musculoskeletal bone;  
Imaging Technique: MR;  
Procedure: Diagnostic procedure;  
Special Focus: Infection;



Cor T2-WI

© Department of Radiology, Dr. Kariadi Central Hospital, Semarang, Indonesia

Area of Interest: Musculoskeletal bone;  
Imaging Technique: MR;  
Procedure: Diagnostic procedure;  
Special Focus: Infection;



Cor-PD

© Department of Radiology, Dr. Kariadi Central Hospital, Semarang, Indonesia

Area of Interest: Musculoskeletal bone;  
Imaging Technique: MR;  
Procedure: Diagnostic procedure;  
Special Focus: Infection;



Cor PD-FatSat

© Department of Radiology, Dr. Kariadi Central Hospital, Semarang, Indonesia

Area of Interest: Musculoskeletal bone;  
Imaging Technique: MR;  
Procedure: Diagnostic procedure;  
Special Focus: Infection;

**Figure 3 MRI of the Knee**



Sag T1+C

© Department of Radiology, Dr. Kariadi Central Hospital, Semarang, Indonesia

Area of Interest: Musculoskeletal bone;  
Imaging Technique: MR;  
Procedure: Diagnostic procedure;  
Special Focus: Infection;



Sag T2-GRE

© Department of Radiology, Dr. Kariadi Central Hospital, Semarang, Indonesia

Area of Interest: Musculoskeletal bone;  
Imaging Technique: MR;  
Procedure: Diagnostic procedure;  
Special Focus: Infection;



Sag PD

© Department of Radiology, Dr. Kariadi Central Hospital, Semarang, Indonesia

Area of Interest: Musculoskeletal bone;  
Imaging Technique: MR;  
Procedure: Diagnostic procedure;  
Special Focus: Infection;

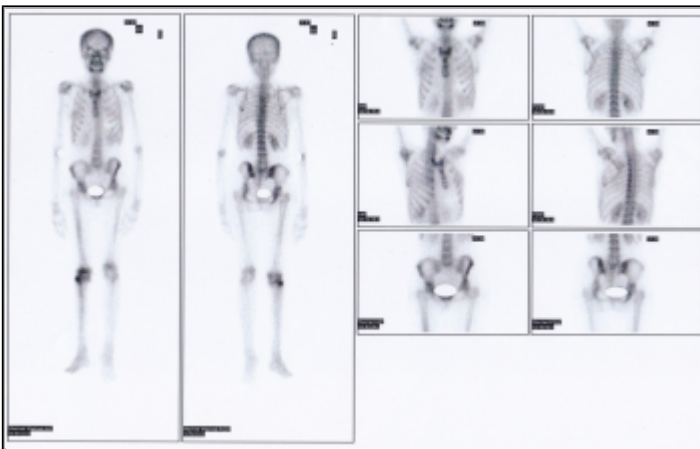


Sag PD-Fat Sat

© Department of Radiology, Dr. Kariadi Central Hospital, Semarang, Indonesia

Area of Interest: Musculoskeletal bone;  
Imaging Technique: MR;  
Procedure: Diagnostic procedure;  
Special Focus: Infection;

**Figure 4 Bone scan**

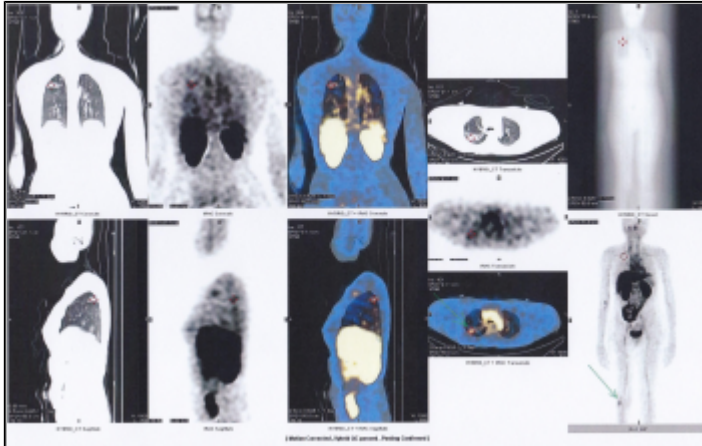


## Bone Scan

© Department of Radiology, Dr. Kariadi Central Hospital, Semarang, Indonesia

Area of Interest: Nuclear medicine;  
Imaging Technique: Nuclear medicine conventional;  
Procedure: Diagnostic procedure;  
Special Focus: Inflammation;

**Figure 5 Ethambutol scintigraphy**



## Ethambutol Scintigraphy

© Department of Radiology, Dr. Kariadi Central Hospital, Semarang, Indonesia

Area of Interest: Nuclear medicine;  
Imaging Technique: SPECT-CT;  
Procedure: Diagnostic procedure;  
Special Focus: Infection;

## References

- [1] Engin G, Acunas B, Acunas G, Tunaci M. (2000) Imaging of Extrapulmonary Tuberculosis RadioGraphics 20:471-488
- [2] MacLean KA, Becker AK, Chang SD, Harris AC (2013) Extrapulmonary Tuberculosis: Imaging Features Beyond the Chest Can Assoc Radiol J 64(4):319-24
- [3] Raut AA, Naphade PS, Ramakantan R. (2016) Imaging Spectrum of Extrathoracic Tuberculosis Radiol Clin N Am 54: 475-501
- [4] Vanhoenacker FM, Sanghvi DA, De Backer AI. (2009) Imaging features of extraaxial musculoskeletal tuberculosis Indian J Radiol Imaging 19(3): 176-186
- [5] Singh N, Bhatnagar A. (2010) Clinical Evaluation of Efficacy of <sup>99m</sup>Tc-Ethambutol in Tubercular Lesion Imaging Tuberculosis Research and Treatment p 1-9
- [6] Manaster BJ (2016) Diagnostic Imaging - Musculoskeletal Non-Traumatic disease 2nd edition. Philadelphia: Elsevier



## Citation

---

RM Yogipranata, H Sukmaningtyas, Nopriwan

Radiology Department, Dr. Kariadi Hospital, Diponegoro University; Jl. Dr. Sutomo no. 16 50244 Semarang, Indonesia; Email:raniyogipranata@gmail.com (2017, Aug. 3)

**Role of ethambutol scintigraphy in uncertain cases of tuberculous osteomyelitis {Online}**

URL: <http://www.eurorad.org/case.php?id=14837>