

## <sup>99m</sup>Tc-Ethambutol Scan with SPECT/CT in Knee Joint Tuberculosis

### Abstract

Modalities for *in vivo* imaging of *Mycobacterium tuberculosis* are limited and inadequately studied. One such modality is <sup>99m</sup>Tc-ethambutol scintigraphy which has shown promising results for diagnosis of tuberculosis (TB). Ethambutol, one of the primary antitubercular drugs, is bacteriostatic which acts on the mycolic acid cell wall synthesis of the *M. tuberculosis*. However, literature on its utility is scarce. The few studies that exist have reported its sensitivity and specificity between 90%–95% and 71%–85%. We present here a case demonstrating the role of <sup>99m</sup>Tc-ethambutol scan in knee joint TB.

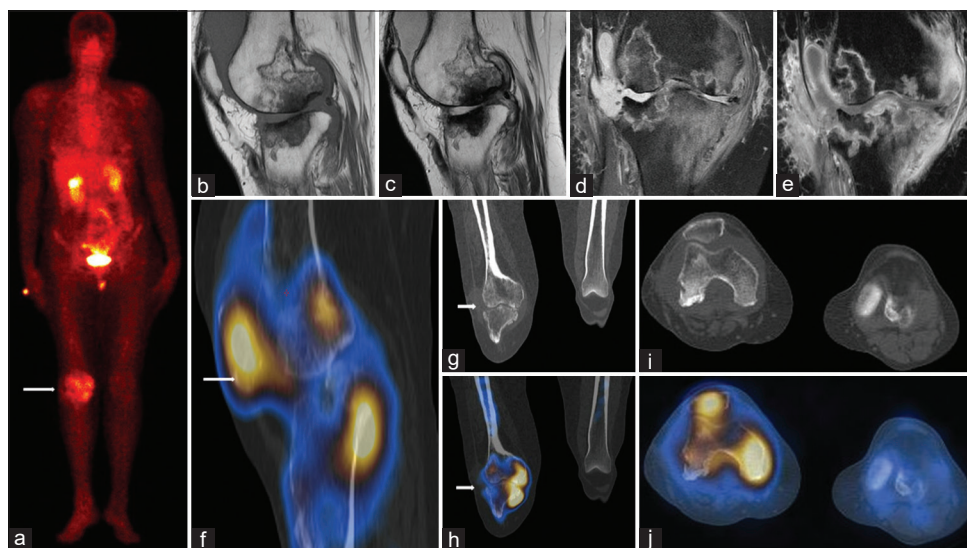
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Modalities for *in vivo* imaging of *Mycobacterium tuberculosis* are limited and inadequately studied. One such modality is <sup>99m</sup>Tc ethambutol scintigraphy which has shown promising results for diagnosis of tuberculosis (TB). Ethambutol, one of the primary antitubercular drugs, is bacteriostatic which acts on the mycolic acid cell wall synthesis of the *M. tuberculosis*. However, literature on its utility is scarce.

The few studies that exist have reported its sensitivity and specificity between 90%–95% and 71%–85%.<sup>[1-6]</sup> A 48-year-old female with no known comorbidities presented with pain, swelling, and restricted motion of the right knee joint for the past 4 years associated with weight loss and loss of appetite. CRP and ESR were toward higher side. She was treated on analgesics and empirical antibiotics and recommended

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**Figure 1:** Maximum intensity projection (a) image of PET revealed increased metabolic activity in the right knee joint. Sagittal T1-weighted (b) and T2-weighted (c) magnetic resonance images showing geographic areas of altered signal intensity in the lateral femoral and tibial condyles, bound by hypointense serpiginous lines, suggestive of epiphyseal bone infarcts. Effusion noted in suprapatellar recess. Coronal STIR (d) and postcontrast T1-weighted (e) images depicting joint effusion, synovial thickening, marked periartthritis, and soft-tissue inflammation consistent with active tuberculosis. Sagittal section of the right knee SPECT/CT (f) showing diffuse increased tracer uptake in the ends of tibia and femur and suprapatellar region. Coronal and axial CT images (g and i) and SPECT/CT (h and j) showing lytic sclerotic changes in the lower end of right femur and upper end of the right tibia with increased uptake

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physiotherapy, all to no avail. The pain gradually increased in intensity, and she was taken to a health facility where magnetic resonance imaging (MRI) was conducted. On MRI scan, a complicated cyst was seen over the lateral aspect of the right knee joint with lateral meniscus tear and degenerative changes. An arthroscopic debridement along with the excision of the cyst was done, and intra-articular viscous supplement was injected. The patient improved, but the symptoms reappeared after 2 months. The patient was referred to our institution where MRI was repeated, and based on radiological findings, diagnosis of knee joint skeletal tuberculosis (TB) was made. The patient was then referred to the nuclear medicine department for further evaluation with <sup>99m</sup>Tc-ethambutol scintigraphy. <sup>99m</sup>Tc-Ethambutol was synthesized in-house with radiochemical purity 95%. Dose of 10 mCi <sup>99m</sup>Tc-ethambutol was injected intravenously, and serial planar whole-body anterior and posterior images were acquired at 15–30-min intervals up to 2 h and at 4 h postinjection. Anterior whole-body image showed radiotracer accumulation in the gallbladder and urinary bladder, depicting normal routes of excretion. No significant (mild) thyroid or splenic uptake was seen, suggesting good radiolabeling. Both kidneys were visualized as shown in Figure 1.

Based on our diagnosis of TB knee, the patient was put on anti-tubercular therapy (ATT) by the treating physician. After 3 months of ATT, the patient was symptomatically better and was able to perform her daily activities.

#### **Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that

her name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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#### **Conflicts of interest**

There are no conflicts of interest.

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