

^{99m}Tc-Ethambutol Scintigraphy with Single-Photon Emission Computed Tomography/Computed Tomography in Vertebral Tuberculosis

Abstract

Vertebral tuberculosis (TB) is a common form of extrapulmonary TB. Here, the slow-growing *Mycobacterium bacillus* reaches the disc space through the hematogenous route and leads to various complications. Radiological imaging and histopathology have been the mainstay of diagnosis, but radionuclide imaging techniques using radiolabeled antitubercular drugs have rarely found space in the clinical domain. Here, we present a case of vertebral TB, where a technetium-labeled antitubercular drug, ethambutol, was synthesized and used for imaging the bacteria *in vivo*. Thus, we demonstrate a rarely used potentially specific agent for tuberculous-infection imaging, which can be produced in-house, and provides rapid results.

Keywords: ^{99m}Tc-ethambutol, single-photon emission computed tomography/computed tomography, vertebral tuberculosis

Introduction

Pott's disease or tubercular spondylodiscitis is a chronic infection with *Mycobacterium tuberculosis*, seen frequently in many developing countries. It gets lodged in the bone via a hematogenous spread. Primary or secondary involvement of the vertebrae along with paraspinal soft tissue can also be seen.^[1] Treatment for tuberculosis (TB) extends over a long period of 6–12 months.^[2] Very few imaging techniques can demonstrate the presence of *M. tuberculosis in vivo*. ^{99m}Tc-ethambutol (EMB) scintigraphy is one of them, although the literature on the utility of this technique is scarce.

Case Report

A 63-year-old male with no known comorbidities presented with fever and night sweats, and back pain which increased on bending forward and breathing deeply. Gradually, he developed tenderness over the mid-thoracic region. Radiograph of the spine revealed erosion in the D9–D10 area. A magnetic resonance imaging revealed the destruction of dorsal vertebrae with paraspinal abscesses extending from D8 to D11 with surrounding tissue edema. A differential of malignancy and infection was made. Bone marrow biopsy was negative for myeloma. The patient

was referred to the department of nuclear medicine for infection imaging before starting the treatment. ^{99m}Tc-EMB was synthesized in-house. 1 mCi of the tracer was injected intravenously, and serial planar whole-body anterior and posterior images were acquired periodically till 4 h. The anterior whole-body image showed radiotracer accumulation in the gallbladder, kidneys, and urinary bladder, depicting normal routes of excretion. Thyroid gland and gastric mucosa were not visualized, suggesting good labeling and no free pertechnetate in preparation. On the posterior images, focal radiotracer uptake was noted in the midline, in the lower dorsal region, corresponding to a lower thoracic vertebra. Single-photon emission computed tomography/computed tomography (SPECT/CT) was done at 1 h postinjection which showed a lytic lesion with increased tracer uptake involving the body of 9th and 10th dorsal vertebrae, including the right 10th dorsal vertebral pedicle and lamina with heterogeneously tracer avid bilateral anterior paravertebral soft-tissue thickening [Figure 1]. Erosion of the posterior end of bilateral 10th ribs was also noted. A provisional diagnosis of TB of the spine was made. The patient was started on antitubercular medication. On recent follow-up, after 6 weeks of Antitubercular treatment (ATT), the patient

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Received: 14-10-2021

Revised: 11-12-2021

Accepted: 14-12-2021

Published: 08-07-2022

Access this article online

Website: www.ijnm.in

DOI: 10.4103/ijnm.ijnm_162_21

Quick Response Code:



How to cite this article: Khurana A, Damle N, Kumar R, Ranjan P, Sikdar S, Arora G. ^{99m}Tc-ethambutol scintigraphy with single-photon emission computed tomography/computed tomography in vertebral tuberculosis. Indian J Nucl Med 2022;37:169-71.

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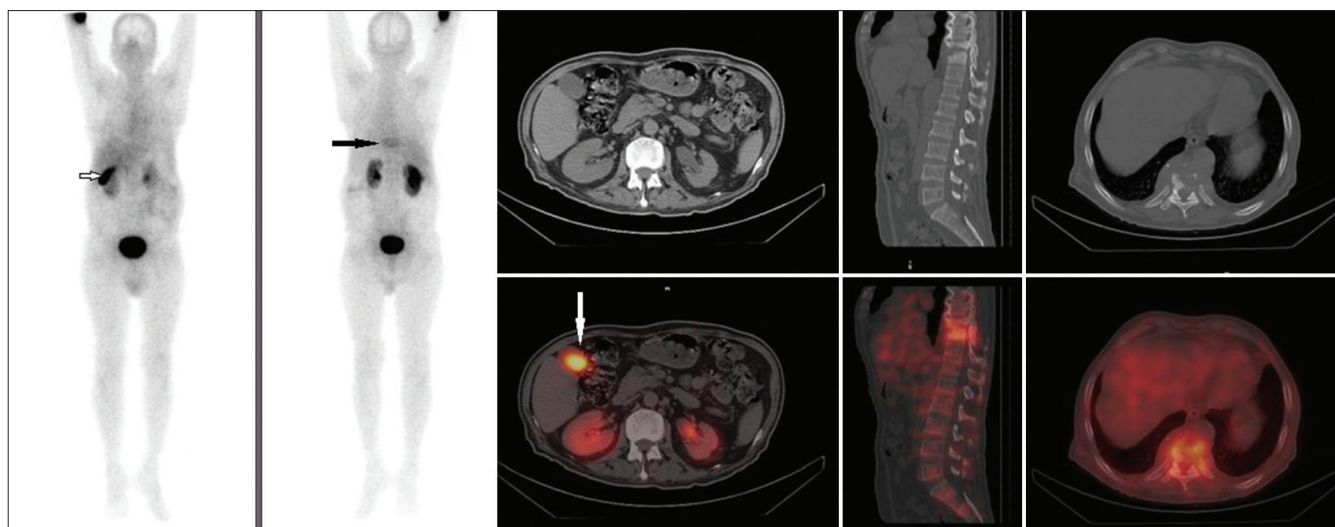


Figure 1: Anterior whole-body image showed radiotracer accumulation in the gallbladder (thin black arrow) and urinary bladder, depicting normal routes of excretion. Thyroid gland and gastric mucosa were not visualized, suggesting good labeling and no free pertechnetate in preparation. On the posterior images, focal radiotracer uptake was noted in the midline (thick black arrow), in the lower dorsal region, corresponding to lower thoracic vertebra. Both kidneys were visualized. Single-photon emission computed tomography/computed tomography was done at 1 h postinjection which showed gallbladder tracer accumulation (thin white arrow), a tracer avid lytic lesion involving body of 9th and 10th dorsal vertebrae, including the right 10th dorsal vertebral pedicle and lamina with heterogeneously tracer avid bilateral anterior paravertebral soft-tissue thickening. Erosion of posterior end of bilateral 10th ribs was also noted

is symptomatically better and is able to perform his daily activities.

Discussion

EMB is one of the four primary antitubercular drugs, is bacteriostatic, which acts on the mycolic acid cell wall synthesis of the culprit *M. tuberculosis*.^[3] It was tagged with ^{99m}technetium. A cross-sectional study done by Kartamihardja *et al.* included 168 subjects who were TB suspects, and they showed a sensitivity and specificity of 93.9% and 85.7% for pulmonary TB. For extrapulmonary TB, ^{99m}Tc-EMB was 95.5% sensitive and 77.8% specific.^[4] In 2010, a small study on 14 patients by Singh and Bhatnagar^[5] revealed true positive and true negative findings; however, the modality did not pick up well over the last decade in our country. Another retrospective study by Diah and Kartamihardja showed sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of ^{99m}Tc-EMB scintigraphy to be 90.91%, 71.43%, 93.75%, 62.5%, and 87.5%, respectively.^[6]

Literature on SPECT/CT with ^{99m}Tc-EMB scintigraphy is not available in India yet. TB is an important cause of mortality and morbidity in developing countries and needs to be addressed with disease-specific rapid investigations, which can affect the overall disease outcome. Although the causes of false positivity are yet to be established, the favorable property of its retention by the tubercular lesions can be harnessed for various indications such as multicentricity of lesions, response to therapy, and giving an approachable site to the clinician for biopsy.

Conclusion

^{99m}Tc-EMB appears to be a useful investigation for the diagnosis of spinal TB. Further studies are required to establish its role as a diagnostic modality for the same.

*This study was funded by an extramural grant from the ITR division, ICMR, New Delhi.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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