

Scintigraphic Pattern of Multifocal Spinal TB

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ABSTRACT

In the evaluation of inflammatory bone disease, trauma, metabolic bone disease, and benign or malignant tumors, bone scintigraphy has an important role among the diagnostic armamentarium. In the majority of cases, the scintigraphs demonstrate unifocal or multifocal increases in tracer uptake in the affected region. However, it is well known that bone scintigraphy is nonspecific and other conditions capable of producing osteoblastic response and/or increased blood flow and also osteolytic response. These may be differentiated from each other by their characteristic scintigraphic patterns and changes on skeletal radiographs. Neoplastic metastatic disease is characterized by multifocal lesions, cold lesions (central photopenic areas), affecting most frequently the central skeleton, the ribs, the vertebrae, and the pelvis. Two cases are reported in this context, where spinal tuberculosis (Pott's disease) mimic the typical metastatic patterns of bone scan.

Keywords: Tc-99m MDP, Pott's disease, Multifocal bony pathology, Spinal tuberculosis.

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INTRODUCTION

Spinal tuberculosis (Pott's disease) is an infection involving one or more of the components of the spine, namely the vertebral body, intervertebral discs and ligaments, paravertebral soft tissues, and the epidural space. It is a potentially fatal contagious disease, with a wide spectrum of clinical manifestations and radiological features that can affect almost any part of the body. Most infections are pulmonary, but approximately 20% of tuberculous infections are extrapulmonary. Pott's disease comprises 50% of skeletal tuberculous infections. The spine is involved in 3% to 5% of all cases of tuberculosis (1). According to a recent study, the thoracic spine is most commonly involved (48.5%), followed by the lumbar (39.4%) and cervical vertebrae (12.1%) (2). Spinal tuberculosis can be presented with unifocal or multifocal bony involvement, where multifocal bony involvement accounting for only 10% of all

skeletal cases approximately, even in tuberculosis endemic areas (3,4). Hematogenous spread from any primary focus, such as the lungs, cervical lymph nodes, tonsils, or gastrointestinal tracts, may be the cause of multifocal skeletal lesions. Tuberculosis with multiple bony involvements is extremely rare in immunocompetent patients (5, 6). As patients with multifocal spinal tuberculosis may have atypical presentations, it is difficult for the physicians to diagnose this condition, and treatment is delayed in the majority of cases.

A ^{99m}Tc MDP bone scintigraphy is one of the most sensitive methods to detect metastatic focal lesions of the skeletal system. This imaging technique can also detect physicochemical changes secondary to any infection or inflammation, which makes this technique sensitive for early detection of such pathological conditions (7).

Here, we report two cases where we faced a dilemma in the diagnosis of multifocal skeletal tuberculosis, mimicking multiple metastases on ^{99m}Tc MDP bone scintigraphy.

CASE 1

A 70-year-old male was admitted to the hospital with the history of fever, night sweats, weight loss, and severe low back pain. Positive findings on physical examination include a rise in temperature, tenderness over the thoraco-lumbar spine, and tenderness over the right shoulder joint.

Patients QuantiFERON-TB Gold (blood) test was found to be positive. Chest radiograph reported an old fracture at the posterior shaft of the left 5th & 6th ribs. MRI findings were infiltrative changes in multiple vertebrae, ribs, & both hemipelvis. Compression collapse in C5, C6, D6, L1 & L2 vertebrae. Then FNAC from the C5 vertebra was performed, and the findings were compatible with tuberculosis, which confirmed the diagnosis. After confirming tuberculosis, anti-TB drugs were started on the patient.

Due to constant severe low back pain, the patient was referred to the Nuclear Medicine department for bone scintigraphy. Tc-99m MDP bone scan revealed, multifocal lesions- increased radiotracer concentrations were seen in manubrium sterni and body of sternum. Multiple ribs on both sides, left sacroiliac joints. Multiple vertebrae—Increased radiotracer concentrations were seen in the L1, L2, L3, D6, and D7 vertebrae, which were confused with the osteoblastic lesions of malignant metastasis. Another finding of D12 vertebra showed a cold/osteolytic lesion (central photopenic area with peripheral rim of activity), which confused with the metastatic osteolytic lesion. Scattered radiotracer concentrations were seen in the L4 and L5 vertebrae. (Figure: 1)

In this case, plain radiography failed to detect the spinal lesion, but correlation between MRI and Tc-99m MDP bone scintigraphy detect the spinal lesion and confirm Pott's disease.

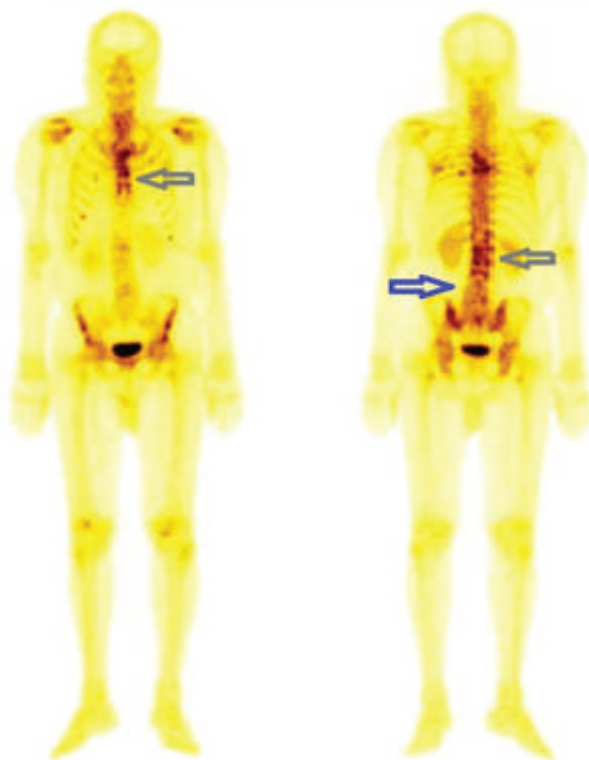


Figure 1: ^{99m}Tc-MDP Bone Scan image showing Increased Radiotracer concentration seen in sternum and L1, L2 & L3 vertebrae (gray head arrow) with scattered radiotracer concentration seen in L4 & L5 vertebrae (blue head arrow).

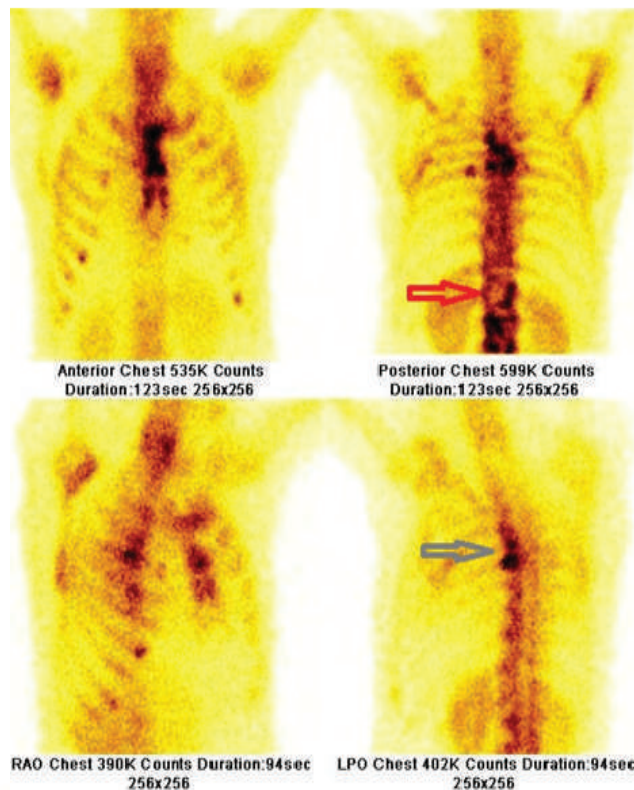


Figure 2: ^{99m}Tc-MDP Bone Scan image showing central photopenic area with peripheral rim of activity seen in D12 vertebra (red head arrow) and increased radiotracer concentration seen in D6 & D7 vertebrae (gray head arrow).

CASE 2

A 55-year-old female, previously diagnosed as a case of SLE with Potts disease, had a history of low-grade fever and severe low back pain. Patient was advised by her physician to have an MRI of the thoraco-lumbar spine. MRI revealed a compression fracture in the L2 and L3 vertebral bodies.

Patient had done CT-guided FNAC, which revealed an osteolytic lesion in the L2 vertebra, which is a non-specific inflammatory lesion, negative for any malignant cells.

Then the patient referred to NINMAS for Tc-99m MDP bone scintigraphy. It revealed multiple focal areas of osteolytic lesions (central photopenic area with peripheral rim) in D12 and L1-L4 vertebrae. Scattered radiotracer concentration seen in L5 vertebra, which mimics the typical bone scan pattern of metastatic bone disease. (Figure 3)

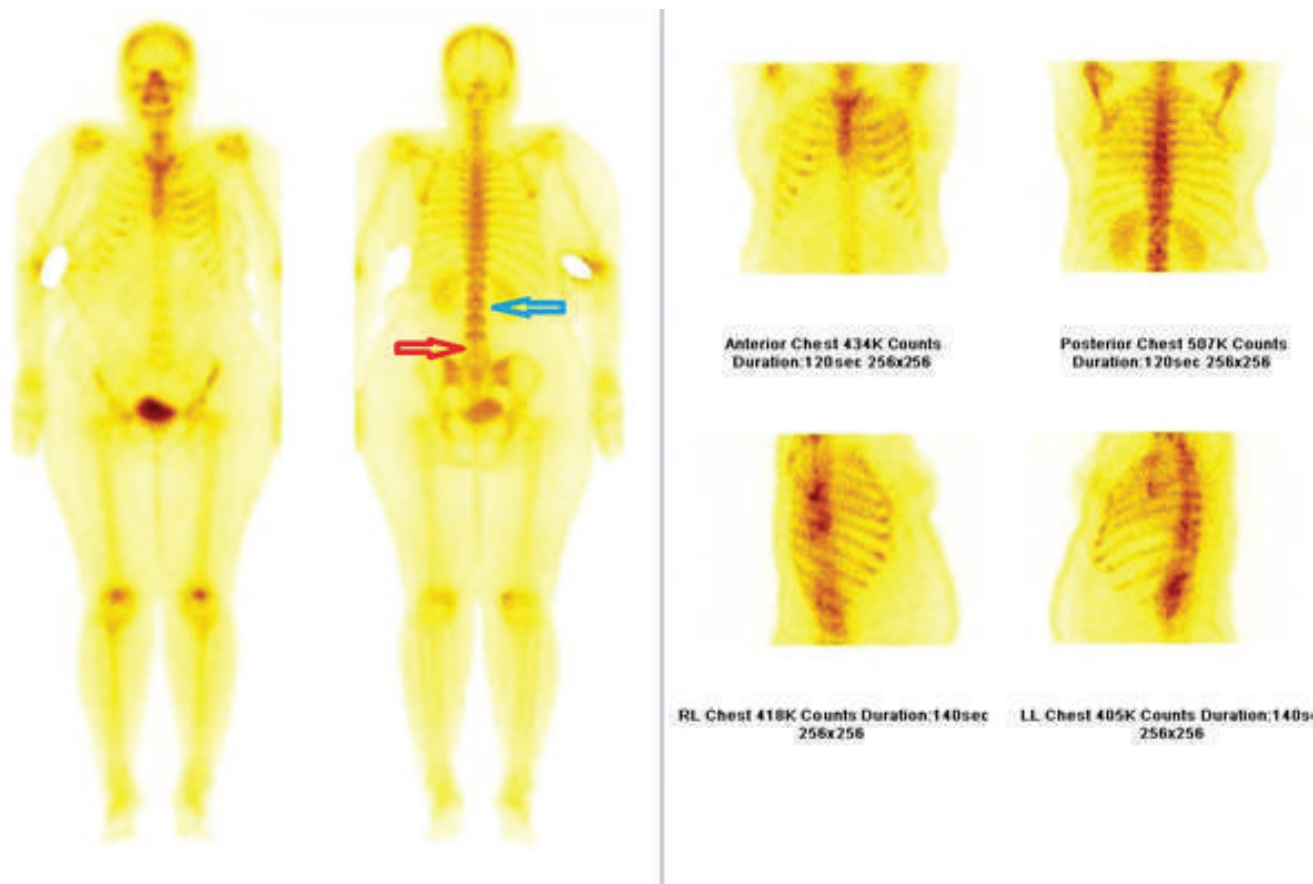


Figure 3: ^{99m}Tc -MDP Bone Scan image showing scattered radiotracer concentration seen in L5 vertebra (red head arrow) with osteolytic lesion (central photopenic area with peripheral rim of activity) seen in D12, L1, L2, L3 & L4 vertebrae (blue head arrow).

DISCUSSION

Spinal tuberculosis (Pott's disease) is an uncommon complication of mycobacterium tuberculosis that may have serious consequences if the diagnosis is missed or delayed. Delay in diagnosis and management may cause serious complications such as spinal cord compression, spinal deformity, and paraplegia.

Modern imaging methods improve the diagnostic accuracy for detecting spinal tuberculosis. The classic radiographic picture of two diseased vertebrae with the destruction of the intervertebral disk is easily recognized and readily treated, but its atypical forms are often misdiagnosed and mistreated. In addition, plain radiography may fail to show any abnormality. Computed tomography (CT) is useful because it may reveal abnormalities earlier than plain radiography, provides

detailed images of bone, and shows the extent of soft tissue involvement (8). Magnetic resonance imaging (MRI) is also a useful diagnostic imaging method in spinal tuberculosis because it is sensitive enough to detect bone destruction in an early phase (9–12).

Ahmadi et al. (13) reported that neither clinical examination nor magnetic resonance findings may be reliable in helping differentiate spinal infections from one another or from neoplasm; the latter method is preferred and is also useful in the detection of Pott's disease because it is sensitive enough to detect bone destruction in its early phase (9–12). Tc-99m MDP bone scintigraphy can be a useful tool in the diagnosis and management of spinal tuberculosis. According to Lin et al. (14), the sensitivity of Tc-99m MDP bone scintigraphy for detecting spinal tuberculosis is 75%. Pandit et al. (15)

found that Tc-99m MDP bone scintigraphy has advantages and limitations in spinal tuberculosis.

Multifocal skeletal tuberculosis has a similar imaging appearance to metastatic bone disease in radiology. So, imaging examinations are not always sensitive for the differentiation of multiple bone metastases and multifocal skeletal tuberculosis. They may even appear normal in the early stage of bony tuberculosis. MRI is a more sensitive test for musculoskeletal tuberculosis, but its imaging appearance can also be misjudged in cases of multiple foci or non-contiguous vertebral involvement (16). Nuclear medicine techniques, such as Tc-99m MDP bone scintigraphy and FDG-PET, on the other hand, are very effective in the early detection of chronic infections when radiology is negative and non-specific symptoms of bone involvement are present. Though non-specific tests, they can provide early detection of pathological sites and thereby guide further diagnostic tools such as biopsy, FNAC, etc. (17). FNAC and bone or soft tissue biopsy play an important role in making a definite diagnosis. In the case of skeletal tuberculosis, the possibility of detecting mycobacterium may be less than 50% due to the low bacterial load to the site of the lesion (18). For this reason, few researchers suggest multiple biopsies to be performed (19). Since Tc-99m MDP bone scintigraphy is easily available, less expensive, and has fewer radiation hazards, it can be considered a valuable diagnostic procedure for the evaluation of multifocal bone tuberculosis.

Antitubercular chemotherapy is the choice of treatment for skeletal tuberculosis. Even therapeutic response to antitubercular treatment has been widely accepted as a modality of diagnosis of tuberculosis (17). Surgery is needed only if any neurological deficit or spinal instability (6).

CONCLUSION

Multifocal spinal TB, often challenging to diagnose due to non-specific clinical picture and confusing imaging, should be a crucial differential diagnosis, requiring clinical, biochemical, and histopathological correlation.

REFERENCES

1. Pertuiset E, Beaudreuil J, Liote F: Spinal tuberculosis in adults. *Medicine* 78:309, 1999.

2. Narlawar RS, Shas JR, Pimple MK, et al: Isolated tuberculosis of posterior element of spine: magnetic resonance imaging findings in 33 patients. *Spine* 27:275, 2002.
3. Tuli SM. Tuberculous osteomyelitis: Tuli SM, editor. *Tuberculosis of the Skeletal System*. 2nd ed., chapter 1, New Delhi: Jaypee Brothers, 2000.
4. Moore SL, Rafii M. Imaging of musculoskeletal and spinal tuberculosis. *Radiol Clin North Am*. 2001; 39: 329-42. doi:10.1016/S0033-8389(05)70280-3.
5. Gosal GS, Boparai A, Chowdhary G, Kour R. Multifocal skeletal tuberculosis involving the lumbar spine and iliac bone, mimicking a malignant bone tumour: a case report. *Malaysian Orthopaedic Journal* 2012; 6 (3): 51-53. doi: 10.5704/MOJ.1207.019
6. Marudanayagam A, Gnanadoss JJ. Multifocal skeletal tuberculosis: a report of three cases. *The Iowa Orthopaedic Journal* 2006;26: 151-53.
7. Merrick MV. Bone scanning (Review). *Brit J Radiol* 1975;48:327-51. doi:10.1259/0007-1285-48-569-32.
8. Ridley N, Shaikh MJ, Remedios D: Radiology of skeletal tuberculosis. *Orthopedics* 21:1213, 1998 <https://doi.org/10.3928/0147-7447-19981101-12>
9. al-Mulhim FA, Ibrahim EM, el-Hassan AY, et al: Magnetic resonance imaging in tuberculous spondylitis. *Spine* 20:2287, 1995.
10. Shanley DJ: Tuberculosis of the spine: imaging features. *AJR Am J Roentgenol* 164:659, 1995. <https://doi.org/10.2214/ajr.164.3.7863889>
11. Desai SS: Early diagnosis of spinal tuberculosis by MRI. *J Bone Joint Surg Br* 76:863, 1994. <https://doi.org/10.1302/0301-620X.76B6.7983108>
12. Kim NH, Lee HM, Suh JS: Magnetic resonance imaging for the diagnosis of tuberculous spondylitis. *Spine* 19:2451, 1994.
13. Ahmadi J, Bajaj A, Destian S, et al: Spinal tuberculosis: atypical observations at MR imaging. *Radiology* 189:489, 1993. <https://doi.org/10.1148/radiology.189.2.8210378>
14. Lin WY, Wang SJ, Cheng KY, et al: Diagnostic value of bone and Ga-67 imaging in skeletal tuberculosis. *Clin Nucl Med* 23:743, 1998.
15. Pandit HG, Sonsale PD, Shikare SS, et al: Bone scintigraphy in tuberculous spondylodiscitis. *Eur Spine J* 8:205, 1998. <https://doi.org/10.1007/s005860050159>
16. Hofmeyr A, Lau WE, Slavin MA. Mycobacterium tuberculosis infection in patients with cancer, the role of 18-fluorodeoxyglucose positron emission tomography for diagnosis and monitoring treatment response. *Tuberculosis*. 2007; 87(5): 459–63. doi:10.1016/j.tube.2007.05.013
17. Sood R, Padhy AK. Multifocal tuberculosis mimicking metastatic disease on bone scintigraphy. *JIACM* 2003;4(2): 103-6. <https://doi.org/10.3329/bjnm.v2i2.40363>
18. Luk KD. Tuberculosis of the spine in the new millennium. *Eur Spine J*. 1999;8(5):338–45. <https://doi.org/10.1007/s005860050185>
19. Ye M, Huang J, Wang J, Ren J, Tu J, You W & Zhu T. Multifocal musculoskeletal tuberculosis mimicking multiple bone metastasis: a case report. *BMC Infectious Disease* 2016;16:34 doi:10.1186/s12879-016-1376-7.