Commentary

Spinal tuberculosis (TB) is the most common and the most serious form of TB lesions in the skeleton. Spinal involvement may be the first manifestation of TB for which a patient may seek medical care. Spinal TB, often called Pott's disease, is an advanced disease by definition in itself, requiring meticulous assessment and aggressive systemic therapy.[1] It is a destructive form of extrapulmonary TB and neurological involvement may complicate the scenario. It accounts for approximately half of all cases of musculoskeletal TB.[2] Antituberculous

treatment remains the cornerstone of treatment. Surgery may be required in selected cases, e.g., large abscess formation, severe kyphosis, an evolving neurological deficit, or lack of response to medical treatment.[2]

Conventional radiographs give a good overview; computed tomography (CT) visualizes the disco-vertebral lesions and paravertebral abscesses, while magnetic resonance imaging (MRI) is quite useful in determining the spread of the disease to the soft tissues and to determine the extent of spinal cord involvement bringing more objectivity.[3] Radiological appearance in plain radiograph in TB may be quite useful, but as a diagnostic modality it is nonconfirmatory or may be even misleading at times, particularly in posterior lesions and atypical cases.MRI is a noninvasive imaging modality that can readily provide valuable information about the physicochemical properties of tissues, e.g. water content, fat content, etc., using its T1 and T2 weighted images which profoundly enhanced diagnostic ability in spinal lesions.

MRI plays an important role in the diagnosis of spinal TB with a high specificity and sensitivity (100% and 88.2%, respectively) for the diagnosis of spinal TB.[4,5] It allows demonstration of bony, soft tissue and neural pathology; however, the clinical correlation is not yet clear.[4] Three important findings of spinal TB on MRI are endplate disruption, paravertebral soft tissue abscess, and the presence of increased signal intensity of intervertebral disc on T2W images.[6] Characteristic MRI pathomorphology of Pott's spine is nonhomogenous destruction of the intervertebral disc and adjacent vertebral bodies (spondylodiscitis), collapse of the spinal elements, and anterior wedging leading to kyphosis or gibbus formation and formation of a "cold" abscess around the lesion.[2] Spondylodiscitis in the context of endemic areas is a well-recognized MRI finding of Potts spine familiar to most physicians. The other major advantages of MRI are the earlier detection of spinal TB as suggested by an increased intensity of the bone marrow and allowing for overview of the whole vertebral column to diagnose noncontiguous lesions.[6] In addition, MRI can identify other abscesses including extension into the psoas muscle and epidural space, posterior element involvement, and spinal cord compression. The paravertebral soft-tissue shadow tends to be bilateral in infective lesions, whereas such shadows tend to be unilateral in neoplastic lesions. MRI can clearly demonstrate combinations of anterior and posterior TB lesions as well as pedicular involvement that often signify a more ominous pathology and higher risk of segmental instability or risk of progressive deformity. Neoplastic lesions usually spare the intervertebral disc and tend to destroy the pedicle instead. Preoperative MRI findings in spinal TB may identify features that correlate with the neurologic status but not with the treatment outcome. Multilevel noncontiguous spinal TB is an atypical form of spinal TB that is being increasingly reported that affects two noncontiguous vertebrae without destruction of the adjacent vertebral bodies and intervertebral disks.[2]

HIV-negative patients with Pott's spine demonstrate greater tuberculous destruction in terms of total percentage body collapse and resultant kyphosis.[6] HIV-positive patients show a tendency for greater epidural abscess volume when spondylitic abscess extends to epidural space.[6] For the diagnosis of spinal TB MRI is more sensitive imaging technique than x-ray and more specific than CT.[2] Neuroimaging guided needle biopsy from the affected site in the center of the vertebral body is the gold standard technique for early histopathological diagnosis.[2] MRI is the investigation of choice in diagnosing spondylodiscitis, especially in very early stages of the disease when other investigations still yield negative results.[7] In chronic stages, MRI also allows tubercular spondylodiscitis to be distinguished from cases of different etiology.

A classification system based on objective findings can be a potential guide in selecting the treatment method for spinal TB. There has been no widely accepted classification so far; but Oguz *et al*., aimed to select the best-treatment method depending on objective criteria.[8] Delay in diagnosis and surgery can cause degenerative pathologies, deformities, and complete paraplegia, especially in cases with incomplete neurological deficit.[1] These types of patients should be immediately immobilized, admitted to hospital, and early surgical treatment should be performed selectively. GATA classification system proposed by Oguz *et al*., was based on seven clinical and radiological criteria (abscess formation, disc degeneration, vertebral collapse, kyphosis, sagittal index, instability, and neurological problems) and recommends specific techniques for each type. This classification divided TB of the spine into three types by using these seven criteria. Interobserver reproducibility and intraobserver reliability may be important issues.

Several original works from India are now available in the literature about classification of Pott's spine.[9-11] Bhojraj and Mehta proposed a classification system, using information provided by MRI, to help to plan the appropriate surgical treatment for patients with thoracic spinal TB.[9] They describe a series of 47 patients, divided into four groups, based on the

surgical protocol used in the management. Their classification appears to be more comprehensive than GATA classification, because posterior lesions are included in their classification. Rajasekaran[10] found that facet joint dislocation spells disaster in childhood Pott's spine. He describes four radiological "spine at risk" signs: (i) facetal dislocation, (ii) retropulsion sign, (iii) lateral translation, and (iv) "topplling over sign". These radiological signs offer reliable prediction of progression of the deformity and are of inestimable assistance for identifying "children at risk" of severe deformity. The risk factors for severe increase of deformity are: (i) patients less than 10 years of age at the onset of the disease, (ii) an initial kyphosis angle of more than 30°, (iii) vertebral body loss of greater than 1.5, (iv) involvement of more than three vertebral bodies, (v) presence of "spine at risk" signs in radiographs, global involvement of the vertebrae, and (vi) children who have partial or no fusion during adolescent growth spurt. Chandrasekhar *et al.*,[11] have very recently proposed a novel classification on pragmatic MRI-based criteria[11] Their eight point MRI criteria of the vertebral lesions are likely to enhance the diagnostic ability of tuberculous (and also differentiation from nontuberculous pathologies), thereby reducing the dependency on histopathologic diagnosis or invasive method for early initiation of therapy.

While tissue diagnosis is the gold standard for diagnosis of neoplastic lesions, identification of the organism is the confirmatory evidence in cases of infective lesions. But both of these methods may require invasive step to obtain a sample. A definitive diagnosis can only be made when acid fast tuberculous bacilli are cultured from pus or biopsy material. While the acidfast bacilli stain may show the organisms in some clinical specimen, these may not be present in many cases since skeletal TB is of paucibacillary nature. Tuberculous bacilli grow slowly in culture, and confirmation may take 6 to 8 weeks. Tubercular granuloma with necrosis in microscopy is highly suggestive, but not confirmatory of active tubercular disease. Polymerase chain reaction testing is exquisitely specific for tuberculous bacillus, and provides rapid confirmation of a positive culture; but it is so specific that it may overlook other species of Mycobacteria and is only approved for use with pulmonary specimens so far.[12]

Posterior spinal element, specially the pedicle, is not uncommonly involved in spinal TB. Pedicle involvement is a part of the disease process and usually associated with relatively severe vertebral body and disc destruction, wider paravertebral abscess, and severe kyphosis. Pedicle involvement can be detected early from MRI and need to be documented as it may influence the treatment strategy. Features most strongly indicative of a diagnosis of spinal TB are relative sparing of the disc space, large paraspinous abscesses, a thick rim of enhancement around the paraspinous and intraosseous abscesses, calcifications within the paraspinous collections, and a fragmentary pattern of osseous destruction.[13,14] MRI demonstrating the relative sparing of the disc space and involvement of the vertebral bodies on either side of the disc is a rare finding in malignant disease. Dissection of the anterior soft tissues, with abscess formation and collection and expansion of granulation tissue adjacent to the vertebral body, is highly suggestive of TB. Complications like epidural abscesses, compression of the nerve root, or compression of the spinal cord are also best demonstrated with MRI studies.

But spinal lesion with accompanying backache may be a final common expression of a group of heterogeneous diseases that needs accurate diagnosis not only for timely and optimum treatment, but also for better prognostication and costeffective management. Until noninvasive and three dimensional imaging like CT scan and MRI were widely available, open biopsy was almost always required for obtaining a representative tissue sample or a biopsy to make even a provisional diagnosis. CT scan with the added advantage of contrast studies (when required) has reduced the clinicians' difficulties to some extent. MRI and contrast MRI have further reduced this dilemma with much more confidence due to its superior ability to discreetly assess pathological changes in the soft tissues and neural elements with ease and confidence.

Timely diagnosis of spinal TB may potentially reduce preventable complications or need for extensive spinal surgery because TB can be effectively treated conservatively with curative intent, while a spinal metastasis from a radioresistant tumor in an elderly with low Karnofsky's performance score may be treated less intensively, except for pain. Combined with specific patterns of bony and soft tissue lesions, extent of abscess formation, types of image intensity and three dimensional extent of the lesion visible in MRI, it is both desirable and potentially possible to diagnose tubercular lesion of the spine with confidence. Moreover, MRI provides invaluable information about the spinal cord and the nerve roots in such cases. A classification system based on objective MRI findings can be a guide not only in making a near-histological diagnosis but also in selecting the appropriate treatment method for spinal

TB. Such classification can evolve from high-quality multicentric studies from the large volume centres of the TB-affected countries like India.

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