

## Spinal Tuberculosis a Great Mimicker

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### Abstract

Vertebral tuberculosis is the most common form of skeletal tuberculosis, constituting approximately 50% of all cases. As a disease per se tuberculosis is a great masquerader, and spinal tuberculosis is no exception to this rule. It is a destructive disease, and clinical manifestations, laboratory findings, and imaging abnormalities may not be distinct and specific enough to make its diagnosis and to distinguish it from its close mimics like pyogenic spondylitis, brucella spondylitis, spinal metastasis, spinal lymphoma, multiple myeloma, ependymoma, plasmacytoma, inflammatory and degenerative spine. Consequently, it may be misdiagnosed and hence can increase morbidity and mortality due to several complications. Over-diagnosing tuberculosis can erroneously subject the patient to unnecessary drugs, which have their own adverse effects. The purpose of this review article is to provide a comprehensive note of close mimics of tuberculosis and to highlight key clinical, radiological and microbiological features to differentiate spinal tuberculosis from its mimics. We hope that this article help to prevent incorrect diagnosis and mismanagement leading out of it.

**Keywords:** Potts spine; Spinal tuberculosis; clinical features; radiological features; differential diagnosis; mimicker.

### Introduction

Tuberculosis (TB) is one of the oldest disease described in almost all ancient civilisations and tuberculous bacilli has even been found in prehistoric skeletal remains [1]. It has serious medical, social and financial impacts, being an important public health issue, especially in developing countries.

Extra-pulmonary TB accounts for about 15–20% of TB cases [2]. Vertebral tuberculosis is the most common form of skeletal tuberculosis, constituting approximately 50% of all cases [3]. The lower thoracic and lumbar vertebrae are the most common sites followed by thoracolumbar, mid-thoracic and cervical vertebrae.[4] Percival Pott” first described spinal tuberculosis (TB) in 1779.[4]

Despite its common occurrence and the high frequency of long-term morbidity, spinal tuberculosis is sometimes difficult to diagnose because of the nonspecific findings and varied clinical presentations due to which diagnosis becomes difficult and hence increment in the risk of morbidity and mortality due to several complications. A combination of factors, namely, clinical presentation, radiological (X-Ray, CT, and MRI), microbiology (mycobacterium cultures) and histopathology in background of good clinical suspicion help in the correct diagnosis of spinal tuberculosis. Early diagnosis

and treatment is the key to avoiding this long-term disability [5].

As a disease per se tuberculosis is a great masquerader, and spinal tuberculosis is no exception to this rule. It is a destructive disease, and clinical manifestations, laboratory findings, and imaging abnormalities may not be distinct and specific enough to make its diagnosis and to distinguish it from its close mimics. Consequently, spinal tuberculosis may be misdiagnosed. Over-diagnosing tuberculosis can erroneously subject the patient to unnecessary drugs, which have their own adverse effects.

The purpose of this review article is to provide a comprehensive note of close mimics of tuberculosis and to highlight key clinical, radiological and microbiological features to differentiate spinal tuberculosis from its mimics. We hope that this article help to prevent incorrect diagnosis and mismanagement leading out of it.

### Pathogenesis

Spread of tuberculosis to skeletal system is most commonly through haematogenous dissemination. Spinal tuberculosis occurs secondary to the primary infection site, which is either a pulmonary lesion or an infection of the genitourinary system [6], and spreads either via the arterial or the venous route. In the subchondral region of each vertebra, an arterial arcade is derived from anterior and posterior spinal arteries and forms a rich vascular plexus which causes haematogenous spread of the infection in the paradiscal regions. In patients presenting with non-contiguous vertebral tuberculosis, the infection to multiple vertebrae is mainly through vertebral venous system (also known as Batson's plexus).

Three most common patterns of tuberculosis are para-discal, anterior, posterior and central lesions of which para-discal is

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the most common variety. In younger patients, the disk is primarily involved, because it is more vascularized. For older individuals, intervertebral disc is avascular and therefore the disk is relatively spared. Subligamentous dissection is an unusual presentation for spinal tuberculosis in which predominant feature is massive and extensive paraspinal abscess with relatively little osseous involvement. Subligamentous dissection of then infective focus occurs down the anterior longitudinal ligament.

#### 1. Paradiscal:

In this type, the spread of infection is facilitated by the posterior and anterior spinal arteries which form a rich local vascular plexus.[4] The disease is characterized by paradiscal destruction of a vertebral body leading to kyphosis with preservation of the disc until late in the disease process.

#### 2. Central:

This type occurs due to the spread of infection along Batson's plexus of veins and can lead to "skipped lesions" in the vertebral column. There is a collapse of the vertebral body with sparing of intervertebral disc, thereby leading to vertebra plana and if the infection progresses, the whole vertebral body collapses. This is commonly confused with malignancy. Infection can progress to the contiguous vertebra or to the paraspinal space.

#### 3. Anterior:

The infectious focus is located at the anterior surface of the vertebral body and spreads to the adjacent vertebrae underneath the anterior longitudinal ligament. A lack of proteolytic enzymes in mycobacterial infections (in comparison with pyogenic infections) has been suggested as the cause of the of the subligamentous spread of infection.[7,8,9] This mode of presentation is peculiar to tuberculosis and produces a shallow excavation on the anterior aspects of the involved vertebra.

#### 4. Posterior:

In addition, rarely the posterior elements of the spinal column, like the facets, vertebral spine etc. can also be involved alone or in conjunction with other types. In this radiological differentiation from metastasis becomes difficult, especially when disk space is preserved.

Pathologically, two types of osseous tuberculosis are recognized. Caseous exudative type is characterized by excessive destruction, exudation, and abscess formation. The granular type is less destructive, has dry lesions and rarely abscess formation. In patients however both types coexist, one predominating the other.

Normally osseous tuberculosis passes through the following stages:

1. Inflammatory edema and exudation stage
2. Necrosis and cavitation stage

#### 3. Destruction and deformation stage

#### 4. Healing and repair stage

### Clinical features

Spinal tuberculosis is insidious in onset and slowly progressing but acute presentation is not uncommon which may mimic a pyogenic spondylitis.

The characteristic clinical features of spinal tuberculosis include neck or back pain, local tenderness, stiffness and spasm of the muscles, a cold abscess, gibbus, and a prominent spinal deformity. Constitutional symptoms (malaise, loss of weight and appetite, night sweats, evening rise in temperature, generalized body aches, and fatigue) are present in approximately 20–30% of cases of osteoarticular tuberculosis. Back pain is the most frequent symptom of spinal tuberculosis. The intensity of pain varies from constant mild dull aching to severe disabling. It is typically localized to the site of involvement and is most common in the thoracic region. Neurologic deficits are common with involvement of thoracic and cervical regions. Left untreated, early neurologic involvement may progress to complete paraplegia or tetraplegia. Paraplegia may occur at any time and during any stage of the vertebral disease. The reported incidence of neurological deficit in spinal tuberculosis varies from 23 to 76%.[10] The level of spinal cord involvement determines the extent of neurological manifestations. In cervical spinal tuberculosis, patients manifest with symptoms of cord or root compression. The earliest signs are pain, weakness, and numbness of the upper and lower extremities, eventually progressing to tetraplegia. If the thoracic or lumbar spine is involved, upper extremity function remains normal while lower-extremity symptoms progress over time eventually leading to paraplegia.[11] Patients with cauda equina compression due to lumbar and sacral vertebral damage have weakness, numbness, and pain, but have decreased or absent reflexes among the affected muscle groups. This is in contrast to the hyperreflexia seen with spinal cord compression along with bladder involvement (cauda-equina syndrome). Formation of a cold abscess around the vertebral lesion is another characteristic feature of spinal tuberculosis and it can grow to a very large size. It is characterized by lack of pain and other signs of inflammation. The site of cold abscess depends on the region of the vertebral column affected. In the cervical region, the pus accumulates behind prevertebral fascia to form a retropharyngeal abscess. It may track down to the mediastinum to enter into the trachea, esophagus, or the pleural cavity. Retropharyngeal abscess can produce considerable pressure effects such as dysphagia, respiratory distress, or hoarseness of voice. In the thoracic spine, the cold abscess usually presents as a fusiform or bulbous paravertebral swellings and may produce posterior mediastinal lumps. The cold abscesses formed at lumbar vertebrae most commonly present as a swelling in the groin and thigh. [12,13] Spinal deformity is yet another hallmark feature of spinal tuberculosis. Type of spinal deformity depends on the location

of the tuberculous vertebral lesion. Kyphosis, the most common spinal deformity, occurs with lesions involving thoracic vertebrae. The severity of the kyphosis depends on the number of vertebrae involved. Atlanto-axial tuberculosis may present as torticollis.[4]

**Radiological features**

**Plain radiographs**

Early changes that can be appreciated on plain radiographs include rarefied bone, osteopenia and disc space narrowing. Late changes include soft tissue swellings, anterior wedge compressions, central body destruction, collapse, obliteration of disc space and gibbus formation.

On MRI, it shows as low signal on T1- weighted images in vertebral body marrow, high signal intensity of the disk on T2-weighted images and STIR (Short TI Inversion Recovery) sequences. This is due to the replacement of bone marrow by inflammatory exudates, cells, and hyperemia. With gadolinium, on post contrast T1 weighted sequence the infected disk shows enhancement, allowing differentiation of the non-affected part. This pattern can mimic many other inflammatory and infective pathologies on MR imaging.

Abscess and collections show low signal intensity on T1-weighted images with high signal intensity on T2-weighted sequences. However, soft tissue inflammatory or hyperemic phlegmonous response shows high signal T2-weighted images and enhances diffusely with contrast material on T1 weighted images. There is a thin peripheral rim enhancement in cases of abscess, whereas the phlegmon shows homogenous enhancement. MRI findings in the anterior pattern include the presence of a subligamentous abscess with contrast enhancement, preservation of the disks, and abnormal signal intensity involving multiple vertebral segments. In central pattern, shows hypointensity on T1-weighted images in a single vertebra and vertebral collapse with disk preservation.

In recent times, many neoplastic and non-neoplastic pathologies resemble TB spine radiologically with overlap of clinical manifestations ranging from back pain, fever, paraparesis, kyphosis, and sensory disturbances. These pathologies could also coexist with TB spine, making diagnosis difficult. As the management of many of these “TB spine mimics” is different, the goal of this review is to explore strategies to minimize over-diagnosis of TB spine on imaging by considering clinical correlation, imaging follow-up to identify the right diagnosis and thus limit unnecessary biopsy.

**Common Conditions mimicking spinal tuberculosis (Table 1)**

Table 1: Common Conditions mimicking spinal tuberculosis	
Pyogenic spondylitis	Brucella spondylitis
Spinal metastasis	Spinal lymphoma
Multiple myeloma and Plasmacytoma	Ependymoma
Inflammatory- RA/AS	Degenerative spine

**Infective Spondylitis:**

Spinal infections can be categorized as pyogenic, granulomatous, and parasitic.[14] Pyogenic response occurs due to infection from bacteria whereas mycobacteria, fungi, brucella and syphilis cause granulomatous reactions.[14] Pyogenic spondylitis and brucellosis are common infective pathologies with findings similar to TB spine (Table 2).

**Pyogenic spondylitis**

Differentiation between tuberculous and pyogenic spondylitis may sometimes be difficult clinically and radiographically. Pyogenic spondylitis occurs in relatively older population and onset of the disease is more acute with a marked systemic involvement. Tuberculous spondylitis usually occurs in first to third decade of life and has an insidious onset and chronic progression compared to pyogenic spondylitis but acute presentations are not uncommon. In pyogenic spondylitis, the lumbar spine is the most common area of infection, followed by thoracic and cervical spine whereas the thoracic spine followed by lumbar and thoracolumbar spine are most common areas of tuberculous infection.[15]

MRI has emerged as one of the important investigations in differentiating pyogenic spondylitis from a tubercular spondylitis. Pyogenic spondylitis most commonly involves the lumbar spine and one spinal segment consisting of two vertebral bodies and the intervening disk. Tuberculous spondylitis shows thin and smooth enhancement of the abscess wall and well-defined paraspinal abnormal signal, whereas thick and irregular enhancement of abscess wall and ill-defined paraspinal abnormal signal are suggestive of pyogenic spondylitis.[17] Relative preservation/minimal destruction of disc is noted in early stages of tubercular spondylitis due to the lack of proteolytic enzymes in mycobacterium as compared to pyogenic spondylitis, where there is moderate to complete disc destruction.[14] Whereas vertebral body is damaged more severely in tuberculous spondylitis than in pyogenic spondylitis. The presence of an intact anterior meningovertebral ligament had 83.3% sensitivity and 100% specificity for tuberculous spondylodiscitis, a 100% positive predictive value, and a 97.2%

Table 2: Comparing Clinical, radiological, microbiological and pathological findings of different types of spondylitis			
	TB spondylitis	Pyogenic Spondylitis	Brucellosis Spondylitis
Organism	Mycobacterium tuberculosis	Staphylococcus aureus(M.C.) streptococcus species Escherichia coli, proteus, Gram negative bacilli	Brucella species
Clinical Presentation	Insidious onset and chronic progression But may present acutely also	Onset of the disease is more acute with a marked systemic involvement	Insidious onset and chronic course
Pathogenesis	Relative preservation/minimal destruction of disc is noted in early stages of tubercular spondylitis due to the lack of proteolytic enzymes	The destruction of the intervertebral disk is more conspicuous than the destruction of the bone elements and there is usually no kyphotic deformity	
Most common site involved	Thoracic spinal vertebrae followed by lumbar and thoracolumbar spine	Lumbar followed by thoracic and cervical spine	Lumbar/sacral spine
Imaging	Thin and smooth enhancement of the abscess wall and well-defined paraspinal abnormal signal	Thick and irregular enhancement of abscess wall and ill-defined paraspinal abnormal signal	Osteophytes on anterior endplate, intact vertebral body with disc gas or discal vacuum on MRI with normal paraspinal soft tissue signal, thin and irregular abscess walls, facet joint involvement.
Histopathological examination[19]	Predominant lymphocyte infiltration Sequestrum, Langerhans giant cells, caseous necrosis,	Predominant neutrophil infiltration	Predominant lymphocyte infiltration, new bone formation, epithelioid granuloma,

negative predictive value.[18] Hence findings favouring tubercular spondylitis is a well defined paraspinal region with abnormal signal intensity, multiple vertebral or entire body involvement and subligamentous spread to three or more vertebral levels .Thus, contrast-enhanced MRI are essential in the differentiation of these two types of spondylitis. Clinical manifestations, radiological findings, blood and tissue cultures, and histopathological findings should be considered in combination for final diagnosis.(Table 2)

**Brucella spondylitis**

Brucellosis, a zoonotic infection that is caused by small Gram-negative bacilli from the genus Brucella .In humans transmission occurs by handling contaminated animal products or by consuming dairy products prepared from unpasteurized milk.[17] The musculoskeletal system is commonly affected, and the usual site of bone brucellosis is the spine(commonly lumbar spine). Spondylitic changes could occur in the form of lesions on the ventral sides of the vertebral bodies, osteophytes on an anterior endplate (Parrot beak spine), intact vertebral body with disc gas or discal vacuum on MRI with normal paraspinal soft tissue signal, thin and irregular abscess walls and facet joint involvement.[17] Osteoporotic lesions are frequently found in thoracic spine. The pedicles are normally spared but osteopenia occurs. Whereas in tubercular spondylitis, vertebral collapse with gibbus deformity and psoas abscess formation occurs but gas or air within the disc, vertebra or abscess is not its feature. These imaging findings with fever, malaise, weight loss and myelopathy favours the diagnosis of brucellar spondylitis over TB. (Table 2)

**2. Neoplastic**

**Lymphoma**

Lymphomas of the spine is an uncommon manifestation of lymphoma. They rarely involve vertebral column but when they do, vertebral body and epidural compartment are commonly affected. Intramedullary lymphoma can occur rarely. Peak prevalence is 5th–7th decades and occurs more commonly in males.[20] In spine, paraspinal,vertebral or epidural lesions can occur either in isolation or combination and vertebral lesions can have a sclerotic, lytic, or mixed appearance.[21,22] Contiguous vertebral involvement is also noted. Frequent occurrences of osteoporosis and bone destruction can make it difficult to differentiate lymphoma from Pott’s spine, which is common in our country.[23] Findings that favour tuberculosis of spine are involvement of intervertebral discs, presence of paravertebral abscesses/ collection and involvement of two contiguous vertebral bodies . In case of neoplastic involvement of spine, solid extraosseous soft tissue component may be associated if vertebral bodies are destroyed and disc spaces are usually spared and paravertebral abscesses are not seen. Skip or non consecutive multifocal involvement of spine is seen more commonly in neoplastic lesion. The ultimate answer to diagnostic dilemma lies in

Condition	Similar features	Distinguishing features	Remarks
Metastasis	Most common site: thoracic vertebrae Both spinal tuberculosis and metastases showed vertebral bone destruction and local mass on the imaging examination Skip lesions seen in both, but more in spinal metastases.	age: relatively old age In spinal metastases, disc affection is rare distant foci of involvement	DCE-MRI may provide additional information for differentiation between spinal TB and metastasis but Biopsy is the ultimate tool for the final diagnosis
Lymphoma	Since it has a nonspecific appearance on CT and MR imaging, it often mimics tubercular spondylitis	Lymphomas in spine usually occur as paraspinal masses with vertebral lesion but do not have extensive cortical bone destruction; discal height is usually preserved	CT perfusion technique has potential for differentiating inflammatory diseases like TB from neoplastic lesions affecting spine associated with paraspinal mass.
Plasmacytoma	Both involve thoracic spine Clinical features are sometimes misleading	radiograph findings of Expansile lytic lesion ,mini brain appearance and absence of sclerosis point towards plasmacytoma. single area of destruction due to clonal plasma cells  Commonly affects elderly male	diagnostic biopsy and mri appearance of sulci in brain
Multiple myeloma	symptoms like back pain, vertebrae fracture and spinal cord compression mimics spinal tb  Both may have multifocal involvement	MM- relatively old age Lab suggestive of hypercalcemia radiography findings include raindrop skull and endosteal scalloping	

histopathological examination. (Table 3)

**Metastases**

Breast, prostate and lung cancer are responsible for more than 80% of metastatic bone disease cases, and spine is the most common site of bone metastasis. Thoracic spine is affected most commonly with mean age of patients being 56 years. Findings that favour neoplastic infiltration is destructive bone lesion associated with a well-preserved disc space with sharp endplates or the involvement of only one vertebral body or posterior elements ,bone destruction and soft tissue mass, Skip lesions are seen more commonly in spinal metastasis, whereas a destructive bone lesion associated with a poorly defined vertebral body endplate, with or without loss of disc height, suggests infection.[24] Both spinal tuberculosis and metastases can show vertebral bone destruction and local mass on the imaging. TB lesion showing typical features,makes diagnosis relatively easy. However, if the patient who comes for examination has the lesion in a developmental stage when the tuberculous abscess has not yet formed or when the tuberculosis has not involved the intervertebral disk, the paraspinal lesion appears as a solid mass, or central Pott's disease, which shows vertebral involvement without associated discal changes and neural arch tuberculosis it will be very difficult to be distinguished from soft metastatic mass.Spinal metastasis characteristically spares the intervertebral disc space, as does the anterior and central type of tuberculosis. Postcontrast-MRI sequences will provide additional information for differentiation between spinal TB and metastasis but Biopsy is the ultimate tool for the final diagnosis[25]. (Table 3)

**Multiple Myeloma**

Patients with multifocal skeletal TB generally may mimic MM or secondary bone metastasis[26]. Multiple case reports have been reported in which atypical tuberculosis was initially misdiagnosed as multiple myeloma.[27]. In multiple myeloma(a cancer of plasma cells), plasma cells make an abnormal protein (antibody) known by

several different names, including monoclonal immunoglobulin, monoclonal protein (M-protein), M-spike, or paraprotein. Patient may present with clinical symptoms similar to TB spine like neck/back pain, vertebral compression fractures and myelopathy. But symptoms due to hypercalcemia like excessive thirst, frequent urination and/or pain in abdomen are present only in multiple myeloma.

Laboratory findings which can be used to differentiate it from TB spine are:

- reverse albumin/globulin ratio (i.e. low albumin, high globulin)
- monoclonal gammopathy (IgA and/or IgG peak)
- Bence Jones protein (Ig light chain) proteinuria
- hypercalcemia
- decreased or normal alkaline phosphatase (ALP) unless there is a pathological fracture due to impaired osteoblastic function

The typical findings favouring spinal tuberculosis are vertebral bone destruction, narrowing of intervertebral disk space and paraspinous abscess. (Table 3)

**Plasmacytoma**

Plasmocytoma represents solitary tumour of neoplastic monoclonal plasma cells either in bone or soft tissues. It usually manifests with a single collapsed vertebra [27,28]

Unlike multiple myeloma, in solitary plasmacytoma there is minimal or no systemic bone marrow involvement. Solitary plasmacytomas comprises <3% of all primary spinal neoplasms. [29] Commonly affects elderly male more than 50 years. They may involve any bone, but they have a predisposition for the red marrow-containing vertebral body with thoracic vertebrae most commonly involved like the spinal tuberculosis.

Physical findings are related to the site of involvement, presenting as a painful mass, pathologic fracture, or root or spinal cord compression syndrome which can be confused with spinal tuberculosis. Findings that favour solitary bone plasmacytoma are single area of destruction, bone marrow plasma cell infiltration <5% of all nucleated cells, absence of osteolytic bone lesions or other tissue involvement (i.e. no evidence of myeloma). In imaging plasmacytoma on plain radiograph appears as solitary expansile lytic lesion with thinning and destruction of the cortex, and bubbly/trabeculated appearance. Characteristically, the absence of sclerotic reaction is seen

Amin brain appearance has been described on MRI. It is seen as curvilinear low signal intensity areas within the lesion, giving an appearance of sulci in the brain. This appearance is characteristic for plasmacytoma. Findings that favour tuberculosis of spine are involvement of intervertebral discs, presence of paravertebral abscesses/ collection and involvement of two contiguous vertebral bodies. (Table 3)

**Ependymoma**

Ependymoma is a type of intramedullary tumor in spinal cord. Lesions tend to manifest in young adulthood predominance of sensory symptoms related to central location of these tumours that compress/interrupt the spinothalamic tract. It compresses the spinal cord rather than infiltrate it. Symmetric cord expansion is the rule. Children with ependymoma may experience headaches and seizures which are not seen in spinal TB. It that occurs in adults is more likely to form in the spinal cord and may cause weakness in the part of the body controlled by the nerves that are affected by the tumor and thus may mimic spinal TB. On imaging, the location and size of the tumor can be identified. It can occur in both the brain and spine, hence imaging tests should be used to create pictures of both areas when a diagnosis of ependymoma is suspected. Lumbar puncture can be done to look for tumor cells or other abnormalities.

**Ankylosing spondylitis**

Ankylosing spondylitis (AS) is a chronic inflammatory disease that primarily affects the spine and sacroiliac joint.[30] It is characterized by an insidious onset of low back pain and stiffness. The back pain is most commonly due to sacroiliitis. In early spondylitis small erosions at corner of vertebral bodies with reactive sclerosis (Romanus lesion/shiny corner sign) is noted. One of the complications in AS is the formation of localized vertebral or disco-vertebral lesions of the spine called Andersson's lesion/discitis, which on focal sagittal MRI sequences can easily mimic TB spondylodiscitis. Hence, it is important not to limit oneself to the finding of discitis and to look for other imaging findings like the "bamboo spine," facet arthropathy, stress fractures and syndesmophytes. When there is slightest suspicion of AS, it is necessary to screen the entire spine including SI joints. Identifying these findings become important as there is no indication for a diagnostic biopsy in these cases. (Table 4)

**Rheumatoid arthritis**

Rheumatoid arthritis (RA) is a systemic inflammatory disease with manifestations of a peripheral polyarthritis unlike spinal TB. Cervical spine involvement occurs commonly in rheumatoid arthritis whereas tuberculous spine involves thoracic vertebrae more commonly. Bone erosions and atlantoaxial subluxation on radiographs are important signs of cervical spine involvement in RA while in cervical spine TB

**Table 4: Comparison of characteristic findings of inflammatory diseases and tuberculosis of spine**

Condition	Similar features	Distinguishing features	Remarks
Ankylosing spondylitis	discitis seen on focal sagittal MRI sequences can easily mimic TB spondylodiscitis	other imaging findings like facet arthropathy, stress fractures, syndesmophytes and screen the SI joint Age-AL- middle-aged males [31,32]	always screen the whole spine and look for other clinical and radiological findings
Rheumatoid arthritis	Pannus can be fibrotic (low signal on T1, T2) or hypervascular (low on T1 and high on T2 sequences) which can be misdiagnosed as TB.	look out for other joint involvement	taking a proper clinical history with detailed clinical examination.

retropharyngeal abscess can be seen.[33] MRI can also show the level and the degree of narrowing of spinal canal caused by dislocation with or without extradural pannus tissue that can compress cord and mimic spinal tb like symptoms. Pannus is edematous thickened hyperplastic synovium infiltrated by lymphocyt, plasmocytes. Pannus can be fibrotic showing low signal on T1, T2 or hypervascular showing low on T1 and high on T2 sequences. It can be misdiagnosed as TB if MRI is interpreted without adequate clinical history and clinical examination details. (Table 4)

### Degenerative disc disease

Modic type 1 degeneration can cause paraspinal soft tissue changes, and these reactive bone changes related to disc degeneration can mimic findings noted in infection. Modic type 1 changes correspond to edema of vertebral endplates and subchondral bone, increased vascular density, increase in the number of nerve endings and in the levels of proinflammatory chemical mediators.[34] There can be presence of enhancement along with signal changes associated with degenerative disc disease, often misleading to infection.

Increased white blood cell count, ESR, and elevated body

temperature, may provide supportive but not confirmatory evidence of infectious spondylodiscitis. When infection cannot be excluded by clinical history, laboratory findings, and imaging, a biopsy should be performed.

### Conclusion

Spinal tuberculosis is a great mimicker both clinically and radiologically and often is misdiagnosed. Atypical spinal tuberculosis is not uncommon and often confused with other spinal pathologies, some of which has been discussed in this article. Additionally other spinal pathologies can be misdiagnosed as spinal tuberculosis initially and can cause significant delay in appropriate treatment of the patient. Hence awareness about the spinal conditions that mimic tuberculosis and their clinical, radiological, microbiological and histopathological aspect is of utmost importance for timely and appropriate management of these spinal conditions.

**Declaration of patient consent :** The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient's parents have given their consent for patient images and other clinical information to be reported in the journal. The patient's parents understand that his names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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