Multifocal Skeletal Tuberculosis involving the Calvarium and Posterior Spinal Elements in an Immunocompetent Patient

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ABSTRACT
Tubercular osteomyelitis, a form of extrapulmonary tuberculosis (TB), represents less than 2% of all TB cases and about 10% of all cases of extrapulmonary TB. Isolated involvement of the posterior elements of the spine and calvarial TB are rare manifestations of extrapulmonary TB, especially in immunocompetent patients. We, hereby, present a case of a 12-year-old female patient with the mentioned multifocal skeletal involvement presenting with spastic paraparesis. Magnetic resonance imaging (MRI) of the cervicodorsal spine was suggestive of lesion involving the posterior elements of the spine from C7 to D3 vertebra with marrow edema and without involvement of the vertebral bodies and intervertebral discs. The MRI of the brain was suggestive of a lenticular-shaped extra-axial lesion in the right frontal region arising from inner table of calvaria. The patient was first operated for the lesion in the cervicodorsal spine due to acute-onset paraparesis followed by complete excision of frontal lobe lesion, which was done after 2 weeks of removing the spinal lesion. Histopathological examinations of both the lesions were suggestive of TB. Majority of patients with multifocal skeletal TB have nonspecific generalized somatic symptoms and signs at presentation and inconclusive radiological findings. All these factors can lead to a delay in diagnosis in such cases. Hence, a high index of suspicion for TB is necessary for patients presenting with multiple somatic symptoms and multiple destructive skeletal lesions, particularly in areas where TB is endemic.

Keywords: Calvarial tuberculosis, Immunocompetent patient, Isolated posterior involvement, Multifocal tuberculosis, Skeletal tuberculosis.


Source of support: Nil
Conflict of interest: None

INTRODUCTION
Tubercular osteomyelitis, a form of extrapulmonary TB, represents less than 2% of all TB cases and about 10% of all cases of extrapulmonary TB. Spinal TB accounts for about 50% of skeletal TB cases.1,2 In spinal TB, the usual mode of infection begins in the vertebral body and spreads to the adjacent vertebral body by extending beneath the anterior longitudinal ligament. Isolated involvement of the posterior elements of the spine is very rare, incidence being 2 to 3% of patients with spinal TB.3 Calvarial TB is one of the rare manifestations of TB with an estimated incidence of 1% of all skeletal TB.2

Multifocal skeletal involvement constitutes less than 5% of all bony TB even in countries where TB is endemic, and is rare in immunocompetent patients and in those with normal pulmonary findings.4 These patients usually present with nonspecific symptoms and the disease usually presents with an indolent and atypical clinical course, usually leading to a delayed diagnosis along with significant bone and joint destruction.5 The clinical and radiological manifestations in such cases may mimic other destructive bony lesions including malignancy.1,6 This diagnostic dilemma and low suspicion can lead to a delay in diagnosis and treatment, resulting in devastating deformities and functional deficits.6

The involvement of posterior elements of the cervicodorsal spine by TB along with the calvarium in patients not immunocompromised prompted us to report this case.

CASE REPORT
A 12-year-old female patient presented with complaints of weakness in both lower limbs of 1-week duration. She also had long-standing history of headache and giddiness for which she had taken conservative treatment. She had no history of trauma, back pain, weight loss, fatigue, anorexia, fever, night sweats, seizures, or features of raised intracranial pressure. She denied any bladder or bowel complaints and also any history of chest pain, cough, or hemoptyis or any family history of TB.

On examination, the patient had spastic paraparesis without any sensory involvement. Rest of the neurological examination was normal and systemic examination was also uneventful.
Chest X-ray was normal. The CT scan of the cervicodorsal spine showed destruction of the spinous process and lamina of C7 to D3 vertebrae. The MRI of the spine revealed signal abnormality involving the spinous process of C7 to D3 vertebra along with the adjacent laminae with posterior paraspinal soft tissue component extending to the posterior epidural space and through the neural foramina bilaterally at D1 to D3 levels, compressing the nerve root at these levels. Marrow edema was also seen from D1 to D3 levels. Vertebral bodies and intervertebral discs at the above-said levels appeared unremarkable. The lesion appeared isointense on T2-weighted image and showed intense homogeneous enhancement on postcontrast. There was enhancement of posterior dura from C6 to D5 vertebrae, which may represent spread along dura (Fig. 1).

The MRI of the brain showed a lenticular-shaped extra-axial lesion in the right frontal region, arising from the inner table of calvaria, which was seen to buckle the right frontal lobe in the region of superior and middle frontal gyri on the right side. It was causing a mass effect of brain parenchyma with effacement of adjacent gyri and sulcal spaces. On postcontrast study, the lesion showed involvement of diploic space and involving dura, which appeared to be thickened and showed homogeneous enhancement. The brain parenchymal lesion did not show any postcontrast enhancement (Fig. 2).

The patient was first operated for the lesion in the cervicodorsal spine due to acute-onset paraparesis. Laminectomy from C7 to D3 levels was done and near total excision of the mass was achieved (Fig. 3). Craniotomy and complete excision of frontal lobe lesion were done after 2 weeks of removing the spinal lesion (Fig. 4).

Histopathological examinations of both the lesions showed chronic granulomatous inflammation composed of epitheloid histocytes, lymphocytes, plasma cells, and Langhans giant cells with focal caseous necrosis. Histopathological examination of the frontal lobe lesion also showed areas of active fibrosis and inflammation of the bone tissue. All these findings were suggestive of TB. The patient was started on anti-Koch’s treatment as per directly observed therapy short course category II and was discharged. At 3 months follow-up, the patient had complete recovery of power without any residual spasticity and with no other neurological deficit. Follow-up MRI of the spine and brain showed no residual lesion (Figs 5 and 6).

DISCUSSION

The TB is a common infectious disease and among the greatest health problems in developing countries. It has an enormous social and economic impact and might be a cause of mortality and morbidity, if left untreated.7 Extrapulmonary TB is more common in immunocompromised patients especially in human immunodeficiency
Figs 3A and B: Intraoperative images: (A) Lesion involving the posterior elements of the spine; and (B) postdecompression view with decompressed cord.

Figs 4A to C: Intraoperative images: (A) Calvarial involvement of the right frontal bone; (B) involvement of the dura after craniotomy; and (C) removal of the involved dura.

Figs 5A to C: Postoperative images: (A) Sagittal T1 MRI of the cervicodorsal spine; (B) sagittal T2 MRI of the cervicodorsal spine; and (C) axial T2 MRI at the level of D1 spinous process.
virus-infected, hemodialysis patients and patients who are on immunosuppressive therapy and is uncommon in patients with normal pulmonary findings. We report a case of multifocal TB in a patient without an underlying disorder.

Vertebral TB is caused by hematogenous spread of Mycobacterium tuberculosis into the dense vasculature of cancellous bone of the vertebral bodies. The primary focus is either a pulmonary lesion or an infection of the genitourinary system. Spread occurs either via the arterial or venous route. It is initially apparent in the anterior inferior portion of the vertebral body and later spreads into the central part of the body or the disc. The three common types of vertebral involvement are paradiskal, anterior, and central.

The TB that involves the posterior elements of the spine, particularly in isolation, is considered rare. According to literature, two hypotheses exist explaining this atypical presentation: (1) increased pressure in the body cavities leading to retrograde flow of blood and mycobacterium from a primary focus through the valveless Batson venous plexus located in the epidural space to the vertebral venous plexi. The posterior external venous plexi, which anastomose freely with the other vertebral venous plexi, could be a source of seeding of the mycobacterium to the posterior veins and posterior spinal structures by this mechanism and (2) infection of immunocompromised patients. Lymphatic spread and multidrug-resistant TB are less widely accepted theories for atypical spinal TB.

Extrapulmonary TB involving calvarium is also rare even in areas where TB is endemic. About 50% of patients affected are younger than 10 years and 70 to 90% are younger than 20 years. The common sites of involvement are frontal and parietal followed by occipital and sphenoid bones, which is probably due to greater amount of cancellous bone with diploic channels at these sites. Primary calvarial TB is rare and occurs secondary to a primary focus elsewhere. According to literature, various hypotheses have been mentioned for the pathogenesis of calvarial TB including trauma, hematogenous seeding of the bacilli to the diploe, and lymphatic dissemination. Depending on the virulence of the organism and immune response of the host, radiological findings include lytic, diffuse, or circumscribed sclerotic lesions.

About 50% of patients with bone and spine TB have negative findings on chest X-ray. Majority of patients with multifocal skeletal TB have nonspecific generalized somatic symptoms and signs at presentation and inconclusive radiological findings. Clinically and radiologically, it may also mimic other pathological conditions like brucellosis, hydatid disease, or tumors. All these factors can lead to a delay in diagnosis in such cases. Hence, a high index of suspicion for TB is necessary for patients presenting with multiple somatic symptoms and multiple destructive skeletal lesions, particularly in areas where TB is endemic.

The mainstay of treatment of spinal TB is conservative management with bracing and antituberculous drugs. Surgery is indicated in cases with neurological deficit or spinal instability. Our patient presented with acute-onset paraparesis and, hence, surgical intervention was the treatment of choice in our case. Spinal decompression was done first and after a diagnosis of TB was made, the frontal lesion was dealt with. Due to timely intervention, the patient had complete neurological recovery at follow-up.

CONCLUSION

The incidence of multifocal skeletal TB is very uncommon, but should be considered as a differential diagnosis in patients who present with multiple destructive osseous lesions. Diagnosis of this condition may be delayed as clinical and radiological findings may not be distinguishable from various other pathological conditions. A high index of suspicion is essential to prevent delayed diagnosis, and timely intervention may prevent subsequent complications. Early surgical management in certain patients can help prevent permanent neurological deficit.

REFERENCES