Tuberculous vertebral osteomyelitis

AKA tuberculous spondylitis, AKA Pott's disease.

Epidemiology

Tuberculosis of the central nervous system accounts for approximately 1% of all cases of tuberculosis and 50% of these involve the spine.

Spinal tuberculosis is more common in children and young adults. The incidence of spinal tuberculosis is increasing in developed nations. Genetic susceptibility to spinal tuberculosis has been demonstrated.

Vertebral granulomatous infections are found in 10–20% of TB cases in developed nations and upwards of 20–41% in undeveloped nations [1].

The most common levels involved are the lower thoracic and upper lumbar levels. Has a predilection for the vertebral body, sparing the posterior elements. Psoas abscess is common (the psoas major muscle attaches to the bodies and intervertebral discs from T12-L5). Sclerosis of the involved vertebral body may occur.

Etiology

M. tuberculosis is the most common etiology of vertebral granulomatous infection.

Immunocompromise has been found to increase the incidence of musculoskeletal lesions. While 3–5% of patients with pulmonary TB develop musculoskeletal lesions, this number substantially rises to nearly 60% in patients with HIV [2].

Clinical features

Characteristically, there is destruction of the intervertebral disk space and the adjacent vertebral bodies, collapse of the spinal elements, and anterior wedging leading to kyphosis and gibbus formation. The thoracic region of vertebral column is most frequently affected. Formation of a 'cold' abscess around the lesion is another characteristic feature. The incidence of multi-level noncontiguous vertebral tuberculosis occurs more frequently than previously recognized. Common clinical manifestations include constitutional symptoms, back pain, spinal tenderness, paraplegia, and spinal deformities.

Typically symptomatic for many months.

Neurologic deficit develops in 10–47% of patients [3] , and may be due to medullary and radicular artery inflammation in most cases. The infection itself rarely extends into the spinal canal [4] , however, epidural granulation tissue or fibrosis or a kyphotic bony deformity may cause cord

compression [5].

Diagnosis

For the diagnosis of spinal tuberculosis magnetic resonance imaging is more sensitive imaging technique than x-ray and more specific than computed tomography. Magnetic resonance imaging frequently demonstrates involvement of the vertebral bodies on either side of the disk, disk destruction, cold abscess, vertebral collapse, and presence of vertebral column deformities.

Neuroimaging-guided needle biopsy from the affected site in the center of the vertebral body is the gold standard technique for early histopathological diagnosis.

The available gadgetry of investigations, such as AFB smear, culture of Mycobacterium tuberculosis, and Uniplex PCR, suffers from a lack of adequate sensitivity and/or a lack of rapidity. Therefore, many times a diagnosis is made either very late in the disease process or sometimes empirical therapy has to be started because a definite diagnosis could not be made. All of these are not ideal situations for a clinician.

MPCR using IS6110, protein b, and MPB64 primers has a high sensitivity and specificity in rapid diagnosis of spinal tuberculosis. This is particularly useful for paucibacillary infections like spinal tuberculosis. However, further studies using large sample sizes are needed to confirm the practical applicability of this technique [6].

Treatment

Tuberculous vertebral osteomyelitis treatment.

Complications

Post-tubercular kyphosis.

Neurological complications (paraplegia or quadriplegia) and spinal deformity are the most dreaded complications of tuberculosis of spine [7]

Neurological complications develop in the active or healed stage of the disease. The sequelae of these two complications affect the quality and span of life. Almost all tuberculosis of spine, even if they are treated well, leave behind some amount of kyphosis in different segments of spine. Persistent spinal deformity affects the biomechanics of all segments of the spine. The life expectancy of human beings has increased globally. If deformity is moderate to severe, these patients report 10–20yrs later with the clinical problems related to persistent spinal deformity and paraplegia with the healed disease [8].

Outcome

Early diagnosis and prompt treatment is necessary to prevent permanent neurological disability and to minimize spinal deformity [9) 10)].

Case series

Fifty-nine adult patients with thoracic and thoracolumbar spinal tuberculosis underwent single-stage transpedicular debridement, posterior instrumentation and fusion. These patients were followed for a minimum of 5 years. Patients were assigned to one of two groups according to the infected anatomic segment. In the thoracic spinal tuberculosis group, there were 28 cases (17 males, 11 females) with a mean age of 38.9 years; in the thoracolumbar spinal tuberculosis group, there were 31 cases (19 males, 12 females) with a mean age of 40.3 years. All cases were evaluated clinically using the visual analog scale (VAS), Kirkaldy Willis criteria and the ASIA impairment scale (ASIA). Radiographs were performed for measuring the angle of kyphosis and scoliosis. Complications related to surgery were recorded.

All patients successfully resolved their infections, experienced one or more ASIA grades of improvement, and improved in their VAS pain scores at final follow-up. In both groups, patient-reported outcomes reached over 90% excellent or good results using Kirkaldy-Willis criteria. The loss of kyphotic angle correction was 2.6° in the thoracic spinal tuberculosis group and 3.2° in the thoracolumbar spinal tuberculosis group. No scoliosis was observed in either group. Fifty-eight (98.3%) cases achieved solid bony fusion. In the thoracolumbar spinal tuberculosis group, one patient experienced screw loosening, and another patient with nonunion and rod breakage underwent revision surgery.

The technique of single-stage transpedicular debridement, posterior instrumentation and fusion is an effective method for the treatment of thoracic and thoracolumbar spinal tuberculosis in adults. Long-term postoperative clinical and radiological outcomes were satisfactory [11)].

Kim et al., performed a retrospective review of the medical records of patients with culture negative pyogenic spondylitis (CNPS) and tuberculous spondylitis (TS). They compared the characteristics of 71 patients with CNPS with those of 94 patients with TS.

Patients with TS had more previous histories of tuberculosis (9.9 vs 22.3 %, $p = 0.034$), simultaneous tuberculosis other than of the spine (0 vs 47.9 %, $p < 0.001$), and positive results in the interferon-gamma release assay (27.6 vs 79.2 %, $p < 0.001$). Fever (15.5 vs. 31.8 %, $p = 0.018$), psoas abscesses (15.5 vs 33.0 %, $p = 0.011$), and paravertebral abscesses (49.3 vs. 74.5 %, $p = 0.011$) were also more prevalent in TS than CNPS.

Different from or contrary to the previous comparisons between CPPS and TS, fever, psoas abscesses, and paravertebral abscesses are more common in patients with TS than in those with CNPS [12)].

Many previous studies in Korea usually reported that tuberculous spondylitis is the predominant

infection. However, in the study of Jeong et al., the number of pyogenic infection was 3 times greater than that of tuberculous spinal disease. Etiological agents were identified in a half of all infectious spinal disease. For better outcomes, we should try to identify the causative microorganism before antibiotic therapy and make every effort to improve the result of culture and biopsy [13].

Case reports

Tuberculous vertebral osteomyelitis case reports

References

1)
Wu M, Su J, Yan F, Cai L, Deng Z. Skipped multifocal extensive spinal tuberculosis involving the whole spine: A case report and literature review. Medicine (Baltimore). 2018 Jan;97(3):e9692. doi: 10.1097/MD.0000000000009692. Review. PubMed PMID: 29505022; PubMed Central PMCID: PMC5779791.
2)
Rajasekaran S, Khandelwal G. Drug therapy in spinal tuberculosis. Eur Spine J. 2013 Jun;22 Suppl 4:587-93. doi: 10.1007/s00586-012-2337-5. Epub 2012 May 12. Review. PubMed PMID: 22581190; PubMed Central PMCID: PMC3691408.
3) , 5)
Rothman RH, Simeone FA. The Spine. Philadelphia
4)
Kinnier WSA. In: Tuberculosis of the Skull and Spine. Neurology. London: Edward Arnold; 1940:575–583
6)
Sharma K, Meena RK, Aggarwal A, Chhabra R. Multiplex PCR as a novel method in the diagnosis of spinal tuberculosis-a pilot study. Acta Neurochir (Wien). 2017 Jan 21. doi: 10.1007/s00701-016-3065-0. [Epub ahead of print] PubMed PMID: 28110400.
7)
Jain AK. Treatment of tuberculosis of the spine with neurologic complications. Clin Orthop Relat Res. 2002 May;(398):75-84. doi: 10.1097/00003086-200205000-00011. PMID: 11964634.
8)
Jain AK, Dhammi IK, Jain S, Mishra P. Kyphosis in spinal tuberculosis - Prevention and correction. Indian J Orthop. 2010;44(2):127-136. doi:10.4103/0019-5413.61893
9)
Jain AK. Tuberculosis of the spine: a fresh look at an old disease. J Bone Joint Surg Br 2010;92(7):905–13
10)
Jain AK, Dhammi IK. Tuberculosis of the spine: a review. Clin Orthop Relat Res 2007;460(July):39–49
11)
Zhang P, Peng W, Wang X, Luo C, Xu Z, Zeng H, Liu Z, Zhang Y, Ge L. Minimum 5-year follow-up outcomes for single-stage transpedicular debridement, posterior instrumentation and fusion in the management of thoracic and thoracolumbar spinal tuberculosis in adults. Br J Neurosurg. 2016 Jul 8:1-6. [Epub ahead of print] PubMed PMID: 27387195.
12)
Kim CJ, Kim EJ, Song KH, Choe PG, Park WB, Bang JH, Kim ES, Park SW, Kim HB, Oh MD, Kim NJ. Comparison of characteristics of culture-negative pyogenic spondylitis and tuberculous spondylitis: a retrospective study. BMC Infect Dis. 2016 Oct 12;16(1):560. PubMed PMID: 27733126.
13)

Jeong SJ, Choi SW, Youm JY, Kim HW, Ha HG, Yi JS. Microbiology and epidemiology of infectious spinal disease. J Korean Neurosurg Soc. 2014 Jul;56(1):21-7. doi: 10.3340/jkns.2014.56.1.21. Epub 2014 Jul 31. PubMed PMID: 25289121; PubMed Central PMCID: PMC4185315.