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Case Report

Spinal Tuberculosis in Children

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ABSTRACT

Spinal tuberculosis is the result of infection with Mycobacterium tuberculosis. It is a secondary infection, the primary lesion of which is in the lungs, genitourinary system, or gastrointestinal tract and can be active or latent. Involvement of the vertebral segment is the result of hematogenous spread of infection along the arterial pathway or Batson's vein plexus, lymphatic spread, or direct invasion from adjacent internal organs.

Epidemiology

Tuberculosis continues to be the leading cause of morbidity and mortality, with an estimated annual incidence of 10.4 million worldwide.

It has been estimated that 10% of patients with extrapulmonary tuberculosis have musculoskeletal involvement, with the spine being the most common.

Spinal tuberculosis (TB) accounts for 50% of cases of musculoskeletal tuberculosis. (1)

Pathogenesis

Spinal tuberculosis is the result of infection with Mycobacterium tuberculosis. It is a secondary infection, the primary lesion of which is in the lungs, genitourinary system, or gastrointestinal tract and can be active or latent. Involvement of the vertebral segment is the result of hematogenous spread of infection along the arterial pathway or Batson's vein plexus, lymphatic spread, or direct invasion from adjacent internal organs. There are three tuberculous lesions: paradiscal, central and anterior. Paradiscal pattern is the most common lesion and has a higher incidence in adults than in children. Paradiscal infection spreads through the epiphyseal arteries.The progression of the disease causes further destruction of the vertebral body, which leads to late deformity and neurological deficits. The central lesion extends along the Batson vein plexus and results in destruction of the vertebral body with disc involvement. Central lesions are more common in children. Anterior destruction of the vertebral body under the anterior longitudinal ligament occurs as a result of the tearing of the periosteum and the anterior longitudinal ligament in combination with a significant accumulation of abscess.

Involvement of the posterior elements is rare, but is associated with late diagnosis and neurological deficits. Computed tomography (CT) and magnetic resonance imaging (MRI) allow early detection of spinal lesions. (2), (3)

The most common part of spinal tuberculosis is the lumbosacral articulation and the adjacent segment with local kyphosis. Failure of more than one segment is not uncommon. Asymmetric destruction of bones contributes to scoliotic deformity, and with extended anterior destruction, dislocation of the facet joint can develop, which can lead to complete translocation of the spine and complex deformity (4).

Diagnostics

Computed tomography (CT) is better suited for assessing the extent of the lesion when contrast is used to enhance granulomatous tissues and abscesses, but exposes the patient to high radiation.(5) Magnetic resonance imaging (MRI) can detect changes that occur in the early stages of the disease. The destruction of bones in the vertebral bodies leads to a decrease in intensity on T1-weighted images and an increase in intensity on T2-weighted images, since the bone marrow is replaced by inflammatory cells.5 MRI scans are more sensitive than x-ray and more specific than computed tomography for diagnosing spinal tuberculosis. (5) Due to its superiority in soft tissue imaging, MRI is effective in detecting extension into bone anatomy and the spinal canal. It is also useful for differential diagnostics5,6. In tuberculosis, MRI provides the most information for the reasons stated above and should be the first line test if ST is suspected. When MRI is not available, computed tomography should be done. If computed tomography is unavailable, x-ray can be an alternative. Computed tomography is better for evaluating bone anatomy. X-ray is more common for initial diagnosis and often done in emergency department or family clinic. A definitive diagnosis of ST can only be confirmed by culture of a sample obtained by biopsy or aspiration. This method is recommended by the National Institute for the Advancement of Health and Medical Care (NICA) in the United Kingdom (7). Biopsy using computed tomography is the preferred method for obtaining a sample of the lesion. Laboratory methods that can aid in diagnosis include detection of metabolic products such as interferon-G and M. tuberculosis polymerase chain reaction, which detects bacterial DNA if present in a serum sample (6), (8).

WHO has suggested that any extrapulmonary tuberculosis should require sputum examination and chest x-ray, as there is a high risk of pulmonary infection (9).

Thus, computed tomography (CT) and magnetic resonance imaging (MRI) are the main modalities for detecting tuberculous spondylitis.

Patient and Observation

2 years old male, with lower paraparesis (muscle strength 2-3 grade) and inability to walk. The child stopped walking on his own 3 months before coming to our clinic. Received drug therapy from an orthopedist, without a positive effect. After neurosurgeons consultation, whole spine MRI was done. MRI found kyphotic deformity of the thoracic spine, compression of the spinal cord by a huge vertebral mass, Th3-Th4 vertebral bodies destroyed by the mass. CT reveals absence of bone signals from the VTh3 body and 1/3 of the VTh4 body (Figure 1)

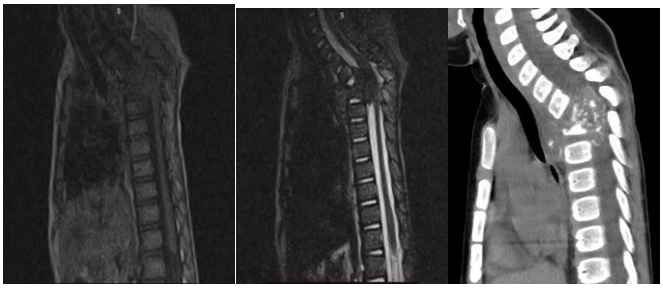

Figure: 1. Preoperative MRI and CT images (spinal cord compression).

Surgery: Under general anesthesia in the position of the child lying on the left side, a linear 10 cm long incision was made between the anterior and posterior axillary lines in 3-4 intercostal space. Access to the tumor of VTh3 and VTh4 bodies was made. Branches of Azygos vein that penetrate the tumor were ligated. The tumor was completely removed with an ultrasonic destructor and microsurgical instrumentation. In some parts it has clear boundaries and a capsule, in other parts it grows into the surrounding soft tissues. Tumor grew into the spinal canal at the level VTh2 and VTh5. VTh3 and VTh4 bodies were replaced by tumor mass. The tumor is separated from the dura, a weak pulsation of the spinal cord has appeared. Fragments of the mass were taken for pathohistological examination. An interbody titanium cylindrical implant 0.8 cm in diameter and 2.5 cm in length was placed between the VTh2 and VTh5 bodies. A lateral plate was fixed with screws 2 cm long into the VTh2 and VTh6 bodies. The wound was sutured hermetically. An active drainage left in the pleural space. Cosmetic intradermal suture on the skin. Aseptic dressing.

Post-op: The postoperative period was uneventful. Received 4 courses of rehabilitation. Complete regression of paresis of the lower extremities 2 months after surgery. The child began to walk on his own 3 months after the surgery.

Postoperative CT images show the restoration of physiological kyphosis of the cervicothoracic spine. No mass compressing the spinal cord (Figure. 2).

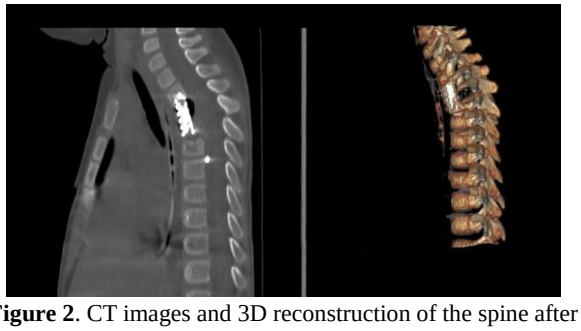

Figure 2. CT images and 3D reconstruction of the spine after surgery

Post-op CT image: the screw has passed through the spinal body into the spinal canal, which does not compress the spinal cord and is acceptable for this patient (10) (Figure. 3).

Figure 3. The image shows the intracanal screw

Pathohistological examination of the tumor cells revealed a malignant giant cell tumor. Neither on MRI, nor on CT, as well as macroscopically, the lesion did not have similar features for this type of tumor. Therefore, the revision of the histological material was done. The revision of the pathological cells gave a picture of tuberculous spondylitis. To exclude an active tuberculous process, follow up CT and sputum examination were performed. The results were negative. The patient received a course of adjuvant anti-tuberculosis therapy.

Discussion

Tuberculous spondylitis in childhood is relatively rare, but it is a very important cause of spinal column deformity and neurological deficits (11).

ST can be difficult to diagnose, evaluate, and treat. Its widespread and non-specific manifestation can lead to a delay in diagnosis, increasing the risk of disability and mortality. A favorable prognosis can be ensured through early diagnosis and treatment. MRI provides the most information for ST diagnosing, however CT and x-ray can be used in resource-limited regions. These techniques are not as sensitive as MRI for early diagnosis of ST.

Medical therapy and surgery is the most effective approach for tuberculous spondylitis. Surgical treatment is indicated for patients who do not respond to drug therapy or who have progression of the disease or neurological deficits. Eradication of tuberculosis is the only method to prevent TB, which requires the development of a more effective vaccine than BCG(1).

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