Dorsolumbar junction spinal tuberculosis in an infant

Case report

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The treatment of spinal tuberculosis is a challenging and controversial problem. The authors present the rare case of an 8-month-old infant with dorsolumbar junction tuberculosis. The child did not sit or stand and a hump was noted on his back. Radiological evaluations demonstrated destruction by a tuberculous abscess of the T-12 and L-1 vertebral bodies, extending into the psoas muscles and spinal canal. In addition to medical therapy, radical debridement and grafting were performed via an anterolateral approach. The follow-up period was 2 years. The difficulties in the management of spinal tuberculosis in infants are discussed.

KEY WORDS • spinal tuberculosis • dorsolumbar junction • infant • management • radical debridement • fibular graft • pediatric neurosurgery

Case Report

History and Examination. This 8-month-old boy was admitted to our service with a hump on his back, which was slowly increasing in volume. His mother reported that although he began to sit at 6 months of age, he had been refusing to sit for the past month. There was no history of fever, night sweats, or weight loss, and no known contact with sick individuals. The only known predisposing factor was the family’s low socioeconomic status, and the immunization history of the infant was not clear.

On physical examination, there was a tender mass at the dorsolumbar junction, with hyperemia on the overlying skin. The infant cried when supported to sit or stand. Neurological examination revealed normal motor and sensory findings.

Laboratory studies revealed a leukocyte count of 11,000/mm³ with 40% neutrophils and 60% lymphocytes and mild microcytic anemia. The erythrocyte sedimentation rate was elevated (54 mm/hour). A Mantoux tuberculin skin test confirmed the diagnosis of tuberculosis, and a 22-mm induration developed within 48 hours.

Plain radiographs of the spine revealed evidence of bone destruction, including the T-12 and L-1 VBs, and a prominent kyphosis with its apex at the dorsolumbar junction. Computerized tomography scanning of the dorsolumbar junction demonstrated destruction of T-12 and L-1 VBs by a cystic solid mass encasing the fragments of destroyed bone. The posterior vertebral elements were spared.

Magnetic resonance imaging of the spine demonstrated a solid, cystic, soft-tissue mass consisting of thick septations, which extended into the epidural space and compressed the spinal cord at the dorsolumbar junction and also extended into bilateral paravertebral muscles. Destruction of the T-12 and L-1 VBs was seen (Fig. 1).

Medical and Operative Treatments. The diagnosis was established based on the Mantoux test, radiological findings, and high prevalence of tuberculosis in Turkey. Empirical antituberculosis treatment with rifampin, isoniazid, ethambutol, and pyrazinamide was initiated 1 month before surgery to optimize the boy’s nutritional status, evaluate pul-

Abbreviations used in this paper: HIV = human immunodeficiency virus; MR = magnetic resonance; VB = vertebral body.
monary functions, and treat the mild anemia. The infant was placed in an external orthosis, and he did not suffer any neurological deficits. We decided to combine surgical therapy because progressive bone destruction was demonstrated on subsequent MR images of the dorsolumbar junction obtained before surgery.

We performed anterolateral radical debridement and grafting, as described by Hodgson and Stock. After making a lateral incision between the left 10th and 11th ribs, the diaphragm was divided along its posterior margin, the peritoneum was deflected downward, and the anterolateral surfaces of VBs were exposed. The abscess between VBs and in the psoas muscles, which included pus, cheesy material, and sequestered bone and disc material, was radically removed. After curettage of the involved discs, all avascular bone was removed with rongeurs and a high-speed drill. Healthy bleeding cancellous bone on the T-11 and L-2 VBs was exposed, and an allograft fibula was placed for anterior interbody grafting. Although cultures were negative for mycobacteria, histopathological studies of the surgical specimen demonstrated typical caseating necrosis. Microbiological studies showed acid-fast bacilli.

A shoulder–spine spica cast was placed to provide further stability for the first 6 months postoperatively. A custom-made plastic body jacket was used thereafter, which allowed the patient to walk (Fig. 2).

Although antituberculous treatment was continued postoperatively, an additional operation was performed for the right psoas abscess 7 months after the first operation. After the second surgery, cultures of the surgical specimen were positive for mycobacteria. The bacillus was found to be resistant to rifampin and streptomycin. We believed that this was a case of multidrug-resistant tuberculosis and decided to prescribe rifampin, isoniazid, ethambutal, cycloserine, and ethionamide for additional 12 months or more. The total follow-up period was 2 years.

**Discussion**

Articuloskeletal lesions occur in 3% of HIV-negative and 60% of HIV-positive patients with tuberculosis. Spinal lesions constitute at least 50% of osseous involvement. It is generally accepted that spinal tuberculosis...
Spinal tuberculosis in an infant

is the most dangerous pattern of osseous lesions because it can cause bone destruction, deformity, and paraplegia.\textsuperscript{7,10,17–20} Tuberculous infection gains access to the spine via the bloodstream. The paravertebral venous plexus of Batson provides the primary pathway for the dissemination of infection.\textsuperscript{16} The most common sites of spinal tuberculosis are the lower thoracic and upper lumbar vertebrae.\textsuperscript{8,10,20}

Chemotherapy is without doubt the mainstay in the management of spinal tuberculosis.\textsuperscript{17–19} The presence of kyphosis, however, especially of the multisegment-involved cases remains a major problem, and medical therapy does not necessarily arrest the progression of kyphosis.\textsuperscript{2,13,18} Moreover, medical therapy alone requires long-term immobilization, which can lead to many well-known complications. Therefore the benefits of nonsurgical treatment modalities are limited in spinal tuberculosis.\textsuperscript{11}

Failure of medical therapy, presence of abscess formation, spinal cord compression, and presence of neurological symptoms are widely accepted surgical indications. In neurologically intact cases, the presence of severe kyphosis and instability due to collapse of multiple VBs is other surgical indications.\textsuperscript{2,6,7,10,17–19} Classically, surgical management includes drainage of the abscess, curettage of involved discs and devitalized bone, and decompression of the spinal canal. Radical debridement and grafting have several advantages over classic debridement, such as a high percentage of bone fusion, correction of deformity, rapid neurological improvement, and early mobilization.\textsuperscript{10,17–19}

In childhood tuberculosis, more extensive disease, military spread is often found at the time of diagnosis.\textsuperscript{3,9,15} Children have a higher rate of spinal deformity at presentation and a greater tendency for spinal collapse during the active phase of disease, but have a relatively low incidence of paraparesis and paralysis compared with adults.\textsuperscript{20,23,24} Spinal tuberculosis is more destructive and disabling in younger children, and the selection of treatment modalities is more problematic in developing bodies.\textsuperscript{2,20}

Although extrapulmonary tuberculosis is more common in infants and children than in adults,\textsuperscript{3,9,15} spinal tuberculosis is very rare in infants. Among the pediatric spinal tuberculosis cases reported by Bailey, et al.\textsuperscript{2} (100 cases), Andronikou, et al.\textsuperscript{1} (53 cases), and Mushkin and Kovalenko\textsuperscript{20} (32 cases), there were no infants.

Here we have reported on an 8-month-old infant with spinal tuberculosis. The presenting symptom was unusual; the boy refused to sit or stand. The location of the lesion and radiological findings were matched with the previous reports in children and adults.\textsuperscript{1} Because tuberculosis is rapidly progressive in younger children and pretreatment had been recommended in some reports,\textsuperscript{2,3,9,15} we started empirical antituberculous chemotherapy soon after the diagnosis and 1 month before the surgery. There was prominent kyphosis due to the collapse of two vertebrae and prominent cord compression due to a large epidural extension of the abscess. We combined surgical treatment to avoid probable neurological deterioration and stop and correct the angulation because progressive bone destruction was seen in this 1-month period. Monitoring the neurological status of an infant was difficult until complete or prominent neurological deficit occurred. Anterior radical debridement and interbody fusion were the preferred treatments because good results have been reported when using this technique. The technique allowed early mobilization, which is very important for the locomotor development of infants. We preferred effective external orthosis to internal fixation to prevent disproportionate growth risk of the immature spine.

The main determining factors in the outcome of surgery and for graft fusion are the lesion level, the severity of bone destruction, and the length and type of graft used.\textsuperscript{13,23,24} Failure of fusion occurs more frequently in the dorsolumbar junction and in patients with destruction of two or more vertebrae.\textsuperscript{2,13,23,24} We used fibular allograft because it provides a large surface area of contact with healthy bone, improves stability, and increases osteogenic activity in children.\textsuperscript{20,21} Fibular allograft provides excellent structural integrity, but remodeling is slow due to its large area of cortical bone, often requiring several years to become fully incorporated.\textsuperscript{1,3,10,22}

In our case, we encountered two problems after surgery. First, the patient’s tuberculosis was multidrug resistant. An additional surgery had to be performed for paravertebral abscess while the infant was receiving medical therapy for 7 months. Radiological and laboratory studies showed evidence of active infection even after 12 months from the beginning of medical therapy. Second, postoperative radiological examinations demonstrated destruction of the T-11 VB because of active infection. There was no fusion between the upper end of fibular allograft and the T-11 VB. Because of hardness of the fibular allograft compared with the patient’s vertebrae, the graft penetrated all along the T-11 VB and some penetration of graft into the L-2 VB was seen as well (Figs. 3 and 4). Furthermore, the MR image of the spine obtained 2 years after surgery demonstrated additional penetration of the graft into the T-10 VB (Fig. 5). Al-

**Fig. 3.** Sagittal T2-weighted MR image obtained 1.5 years postoperatively, demonstrating a decompressed cord but some progression of kyphosis, probably due to penetration of fibular graft into the T-11 VB.
though correction of kyphosis was achieved soon after surgery, the angulation increased later due to the aforesaid problems.

The patient is still free from neurological deficit and maintains normal growth and locomotor development. He still receives medical therapy. After resolving the active infection by medical therapy, additional surgery may be performed for further correction of kyphosis, via anterior or posterior approaches.

Conclusions

Spinal tuberculosis is a challenging and controversial problem. In infants, spinal tuberculosis is very rare and is problematic from diagnosis to management. The preferred surgical treatment should allow normal growth of the immature spine and normal locomotor development. Medical treatment is the most important factor in the management spinal tuberculosis in that it also improves the success of future surgical treatment.

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Fig. 4. Sagittal CT reconstruction of the dorsolumbar junction (left) at 1.5 years postoperatively demonstrating fibular graft used for anterior interbody fusion and its relationship with the upper and lower VBs. Axial CT scans (right) demonstrating the T-11 VB and upper end of the fibular graft.

Fig. 5. Sagittal T2-weighted MR image obtained at the 2-year follow-up examination, demonstrating the penetration of fibular graft into the T-10 VB.
Spinal tuberculosis in an infant

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