Mother's iliac bone graft for severe collapsed lumbar tuberculosis: A case report

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Abstract

Early diagnosis of spinal tuberculosis in young children is difficult due to atypical clinical features. We report a case of lumbar tuberculosis with abscess of the psoas major muscle in a 4-year-old child. Spinal reconstruction was challenging due to the involvement of multiple vertebral levels. The child complained of lumbar and back pain. Preoperative magnetic resonance imaging (MRI) revealed bone destruction of the L1–L3 vertebral body and abscess formation of the psoas major muscle. The child underwent excision of the vertebral lesions and a fresh iliac bone graft from his mother through an anterior approach and posterior fixation with T12–L1 and L4–L5 pedicle screws. At the 15-month follow-up, the patient had good clinico-radiologic outcomes with evidence of bony fusion. No functional impairment of lumbar movements was found through physical examination during the follow-up period. The report highlights the diagnostic dilemma of early childhood spinal tuberculosis due to lesions seen both on radiology and during surgery and discusses challenges in management of the disease and the relevant literature. The mother's iliac bone graft we describe can be a viable option in very young children with severe vertebral bone destruction requiring reconstruction by surgical procedure.

KEYWORDS
abscess of the psoas major muscle, lumbar spine, surgery, tuberculous spondylitis

1 | INTRODUCTION

Extrapulmonary tuberculosis occurs in one-third of the world's population, especially in developing countries, and the spine is invaded in 50% of cases of bone and joint tuberculosis. Flexion collapse of the spine is a common manifestation of spinal tuberculosis in children with lumbar kyphosis, and once advanced, it is extremely challenging to treat. Despite clear guidelines by the WHO for the medical management of tuberculosis, the surgical treatment of spinal tuberculosis in infants and children with severe bone destruction and abscess formation is controversial. Especially in poor and underdeveloped countries, there is still a lack of direct and effective guidance for diagnosis and management of spinal tuberculosis. Early diagnosis and prompt treatment are necessary to prevent lasting neurological deficits and minimize spinal deformities. The use of fresh iliac bone grafts from the child's mother to reconstruct the vertebral body sequence and provide stability has rarely been reported. We admitted a child with severe destruction of lumbar spine tuberculosis leading to vertebral body collapse. Anterior lumbar lesion removal and decompression with iliac bone transfer from the child's mother was performed with the assistance of posterior pedicle screw internal fixation. Combined antituberculosis treatment was also administered, and the results were satisfactory at 14 months of postoperative follow-up. This case is reported below.
CASE PRESENTATION

Our patient was a 4-year-old boy who presented with intermittent low-back pain with no apparent cause over a year. One year before, the child underwent a lumbar spine X-ray at the local hospital, which showed no significant destruction or abnormalities of the lumbar spine (Figure 1A), so no special treatment was undertaken. The child now had recurrent low-back pain and visited our hospital for magnetic resonance imaging (MRI) examination (Figure 1B). MRI showed the signs of tuberculosis from L1 to L3 vertebra with peripheral and intracanal abscess formation and secondary to spinal stenosis. The child showed no symptoms of tuberculosis, such as afternoon low fever, loss of appetite, night sweats, and weight loss.

Clinical examination revealed mild lumbar kyphosis, along with obvious tenderness or pain while percussing the L2–L3 spinous process. There are restrictions during a prone hyperextension maneuver. Bilateral lower limb muscle tone, power, and reflexes were normal. Further examination after admission, radiographs (Figure 1C) and CT three-dimensional (3D) reconstruction (Figure 2) showed severe destruction of L1, L2, and L3, with only partial remnants of the body being spared, consistent with signs of tuberculosis. Routine hematological and biochemical tests, including human immunodeficiency virus (HIV) and antibodies IgG and IgM, were normal, except erythrocyte sedimentation rate (ESR, 60.0 mm/h), which was higher than the reference value.

All patients involved in this study provided informed consent documents and voluntarily agreed to participate in this research. This study was approved by the Medical Ethics Committee of 926th Hospital of Joint Logistic Support Force.

SURGICAL PROCEDURE

Considering the serious collapse of the L2 vertebral body, the instability of the spine, and the presence of a paravertebral abscess, after discussion with the child’s parents, surgery was scheduled to completely remove the lesion and rebuild the stability of the spine. After 2 weeks of oral antituberculosis treatment (rifampin 0.15 g/day, pyrazinamide 0.25 g/day, isoniazid 0.15 g/day), the patient underwent surgery on May 14, 2017. First, the child was placed in the prone position, and pedicle screws were inserted into the bilateral pedicles of T12–L1 and L4–L5 for sufficient hemostasis. Next, the lesion was debrided by the anterolateral approach, and the spine was rebuilt.

FIGURE 1 (A) Anteroposter and lateral radiographs demonstrated no lesion was seen in April 2016. (B) Preoperative sagittal MRI showed inflammatory tissue at L1–L3 with vertebral body erosion and prevertebral abscess in May 2017. (C) Preoperative lumbar radiograph demonstrated L1–L3 vertebral bodies collapse and bone resorption

FIGURE 2 Preoperative axial CT scan and reconstruction showed disappeared pedicle on the left from L3 and loss of L2 vertebra body
During surgery, it was seen that the surface of the right psoas major muscle showed pathological changes of hyperplasia. Upon incising it, pale yellow cheese-like purulent fluid flowed from the lesion. The L1–L3 vertebrae were severely damaged, especially the L2 vertebrae, with partial dead bone formation and caseous necrotic material. Streptomycin powder was added to the lesion areas after the L1–L3 vertebral lesions were fully removed successfully. An allogeneic bone graft from the mother’s iliac bone was then fashioned to bridge the bony defect and fixed with absorbable sutures. The excised necrotic tissue was examined by pathological methods.

4 | RESULTS

The child had normal sensory movements of both lower extremities after surgery. The wound dressing was dry, and there was no obvious inflammation or swelling around the skin. A postoperative radiograph re-examination showed a good position of the grafted iliac bone block and good alignment of the internal fixation device (Figure 3A). Pathological examination confirmed granulomatous inflammation with necrosis, lesion morphology consistent with tuberculosis, and positive antacid staining (Figure 3B). The child continued oral antituberculosis medication after discharge from the hospital and wore an orthopedic brace for 3 months. A repeat radiograph 12 months after surgery showed complete fusion of the graft bone block with no significant deformity (Figure 3C). On review 14 months after removal of the internal fixation, the child had a normal vertebral body sequence and physiological curvature, excellent lumbar fusion, and good lumbar mobility (Figure 3D), and antituberculosis treatment was discontinued.

There were no significant abnormalities in routine blood tests, ESR or liver, and kidney function at the same time in each postoperative stage. By the time of the last follow-up, the child had increased in height by 12 cm. His height and activities did not differ from his peers. The results of the follow-up showed significant clinical efficacy. Figure 4 shows the whole consultation process from the onset of the disease to 3 years after healing. Although three vertebrae were fused, the patient retained normal lumbar mobility due to the extreme compensatory capacity of the other intervertebral discs and muscle activity as well as the strong growth potential of the child. However, due to the young age of the child, the development of the spine after lumbar fusion needs to be further followed up.

5 | DISCUSSION

Approximately 1.4 million new cases of tuberculosis are diagnosed each year in China. Pediatric spinal tuberculosis is also on the rise, especially in remote and underdeveloped areas. The progression of spinal tuberculosis is slow and insidious. The overall destruction of the disease varies from a few months to several years, with the average time to destruction ranging from 4 to 11 months; in our case, the timeline was exactly 12 months. Commonly, patients are often only
given advice before the onset of severe pain, significant deformities, or neurological symptoms. For example, in our case, there was no intervention due to delayed diagnosis. Unlike adults with spinal tuberculosis, children face skeletal growth and development, and if patients are diagnosed early and treated appropriately, they have the promise of an excellent recovery.
In the early stages of disease activity, as in the case of this child we admitted, diagnosis of spinal tuberculosis is difficult due to the lack of typical signs and local signals. The typical symptoms of spinal tuberculosis are weakness, loss of appetite and weight, and night sweats caused by the toxic reaction of Mycobacterium tuberculosis. The vertebral body at the site of the lesion is stiff and painful to move, and cold abscesses and sinus tracts may also develop. Cold abscess formation around the vertebral body is a feature of spinal tuberculosis and can occur without pain and other inflammatory signals (MRI images). However, not all of these symptoms and signs are necessarily present in the early stages of the disease.

Back pain is often the most common symptom of spinal tuberculosis. Chronic back pain can be the only symptom and occurs in 61% of patients with spinal tuberculosis.9,10 In addition, spinal deformity is the hallmark feature of spinal tuberculosis, but by the time spinal deformity occurs, it is too late for optimal conservative treatment. Especially in immunosuppressed patients, clinical presentation and diagnosis are delayed due to the lack of obvious inflammation and pain production.11 Therefore, in the pediatric population, delays in clinical presentation and diagnosis are a common phenomenon in the treatment of spinal infections due to the underdeveloped immune system. In our case, the patient was in such a situation, thus missing the best time for conservative treatment.

The goal of treatment for spinal tuberculosis is to destroy the infection, provide stability to the invaded spine, and prevent or treat paralysis by supportive care, chemotherapy, and surgery. Antituberculosis chemotherapy should be started as early as possible, and an empirical antituberculosis treatment program is required before the etiologic diagnosis is established.12,13 In contrast, surgical treatment of tuberculosis has long been controversial. The usual indications for surgical intervention are progressive neurological deficits, ineffective conservative treatment, spinal instability, deformities, drug resistance to drain the abscess and willingness to accept abscess incision and drainage, as well as in cases of diagnostic suspicion where the tumor cannot be excluded.14,15

The surgical approach often varies from person to person depending on the extent of lesion destruction. When performing anterior bone grafting, posterior, and anterior fixation procedures should be combined to increase the stability of the spine and prevent coronal deformities of the spine in later stages due to medical factors.14 The stabilizing effect of posterior fixation offers several advantages, including early prevention of disease progression and early fusion, correction of deformity and maintenance of a corrected vertebral body sequence. In pediatric patients, radical lesion removal using the anterior approach can also destroy the growing epiphyseal plate of the child.11,16 If the growing epiphyseal plate is preserved, the deformity can be corrected spontaneously, as the preserved growing epiphyseal plate can induce bone remodeling. Thus, the growing epiphyseal plate is a particularly important factor in children due to the ability to allow bone remodeling of damaged vertebrae.17 When performing anterior lesion removal on pediatric patients, care should be taken not to damage the epiphyseal plate, while combined posterior fusion and fixation is recommended to stop and correct the kyphosis deformity.11,17,18

The application of autogenous bone grafts, such as iliac, rib or fibula grafts, is considered the gold standard for bone defects caused by nodular destruction, but there are some disadvantages, such as pseudarthrosis formation and graft loosening. Especially for young children who are growing and developing, taking bones from the patients themselves increases the trauma and affects the normal development of the bone extraction area, which leads to nerve injury and persistent pain,19 warping and hypertrophic chest scarring.20 If a direct posterior osteotomy is performed, the risk of paraplegia will be high, and the child’s later spinal development might be seriously affected, resulting in short stature or other deformities. In this case, the application of allogeneic bone grafts is a better option than autologous bone grafts and can achieve comparable results.21 However, conventional allograft bone in adults mostly serves a supportive role and fuses more slowly, with signs of fusion usually starting to be observed 2 years postoperatively.22 Therefore, considering that the pediatric patient has the opportunity to grow normally while being fused, it is ideal to reconstruct the sequence and stability of the lumbar spine with an allogeneic bone graft using fresh iliac bone from the patient’s mother after relevant blood and tissue matching.

6 | CONCLUSION

In summary, spinal tuberculosis is rare in children, with an insidious onset and atypical clinical symptoms, and its early diagnosis is difficult. Internal antitubercular therapy remains the basis of spinal tuberculosis treatment, especially in infants and children. Surgical treatment is required in patients with significant bone destruction, abscess formation, or paraplegia. When autologous bone grafting is not possible, a fresh iliac bone graft from the child’s mother is an alternative method.

AUTHOR CONTRIBUTIONS

Yonggang You wrote the article. Suli Chen prepared Figures 1–4 and contributed equally to this work and should be considered co-first authors. Wenpeng Qiu provided pathological image. All authors reviewed the article and have read and approved the study.

CONFLICT OF INTEREST

The authors declare no potential conflicts of interest.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article, and further inquiries can be directed to the corresponding author/s.

ETHICAL STATEMENT

This study was approved by the Medical Ethics Committee of 926th Hospital of Joint Logistic Support Force.
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How to cite this article: You Y, Chen S, Li Z, Zhang Y, Qiu W. Mother’s iliac bone graft for severe collapsed lumbar tuberculosis: A case report. Precision Medical Sciences. 2022;11(3):111-116. doi:10.1002/prm2.12076