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Case Report

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Upper Thoracic Spondyloptosis due to Pott Disease: One-Stage Surgical Reduction of Spondyloptosis via Posterior Approach

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ABSTRACT

AIM: To describe a rare case of spondyloptosis caused by spinal tuberculosis in the upper thoracic region.

CASE PRESENTATION: A 22-year-old female patient suddenly fell down because of lower extremity weakness. Spondyloptosis was observed, which developed following melting of the spine caused by tuberculosis. Successful reduction, spinal alignment, and stabilization of the spine were achieved following instrumentation with a long-segment screw and rod in a single-stage surgery.

CONCLUSION: To the best of our knowledge, this is the first case of spondyloptosis secondary to tuberculosis. This case report highlights the treatment of spinal tuberculosis and surgical deformity correction in a single-stage surgery.

KEYWORDS: Thoracic spondyloptosis, Spinal tuberculosis, Thoracic stabilization, Posterior corpectomy, Vertebral column resection

INTRODUCTION

Upper and mid-thoracic spondyloptosis is a rare condition in the thoracic rib cage and is caused by the stabilizing effect of the sternum. Surgery often requires fusion and reduction of the deformity. Generally, this condition was seen after a high-speed trauma (4,7). Trauma and infection may also cause spondyloptosis.

Spinal tuberculosis is the most debilitating form of extrapulmonary tuberculosis. Classically, progressive kyphosis and neurologic deterioration occur following the involvement of the disc space, adjacent vertebrae, and posterior column of the spine. This condition was described by Sir Percival Pott in 1779; thus, it is also known as Pott's spine (8). Spinal tuberculosis is more common in teens and children and is labeled as a "disease of poverty" given its prevalence in low-income and poorly developed countries (5). Extrapulmonary tuberculosis occurs in 10% of cases, in which half of them involve the musculoskeletal system. The spine is the most common musculoskeletal region involved, which accounts for 1%–2% of cases (6).

Herein, we described a rare case of spondyloptosis caused by spinal tuberculosis in the upper thoracic region of a 22-year-old female patient. Especially, in the upper thoracic region, surgical treatment is challenging. Successful reduction in a single step, providing spinal alignment and stabilization techniques, were also discussed. To the best of our knowledge, this is the first case of spondyloptosis secondary to tuberculosis.

CASE REPORT

Approximately 1.5 years ago, the patient (female, 22 years old) suddenly fell due to lower extremity weakness, which resulted in a thoracic fracture. Laboratory findings showed increased C-reactive protein (CRP) level and sedimentation rate, and the QuantiFERON test was positive. Medical anti-tbc treatment was considered for 9 months. Later, the patient was admitted to our clinic with lower extremity weakness and back

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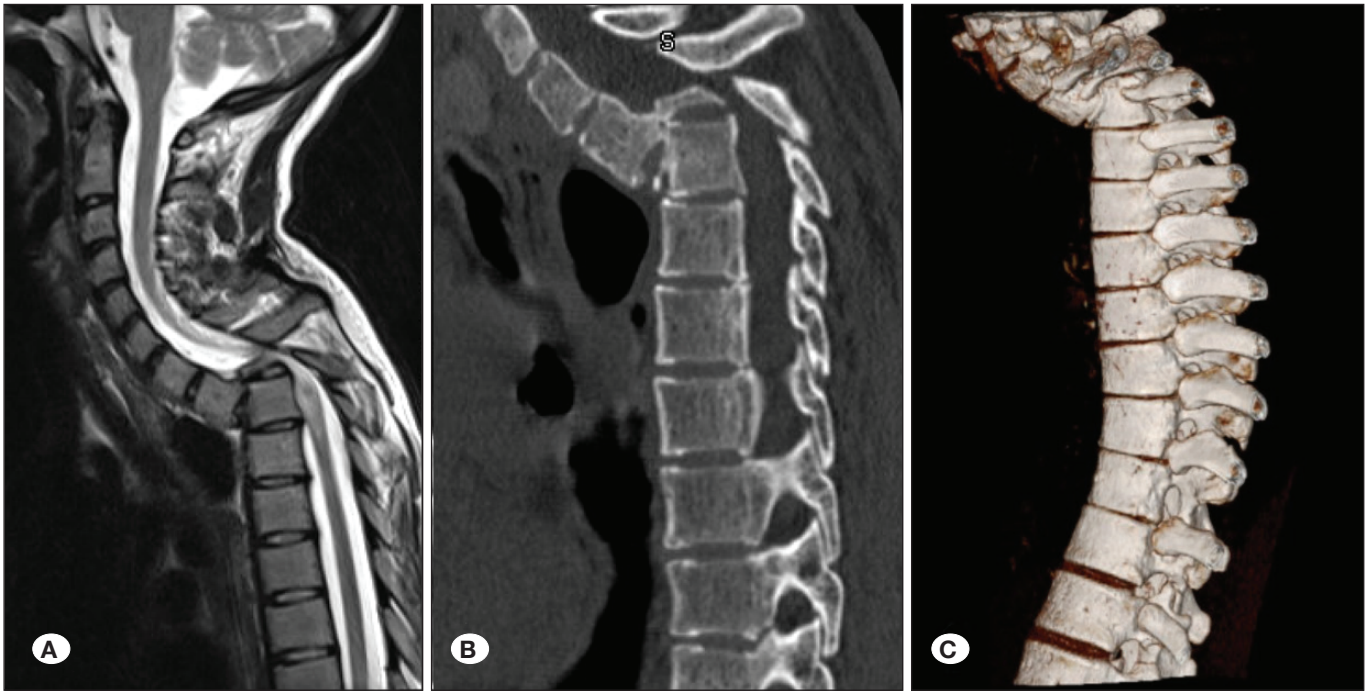

Figure 1: Preoperative radiological images. **A)** T2-sequence magnetic resonance image showing signs of myelopathy and slippage of the thoracic vertebra due to lysis of the adjacent vertebra. **B)** Sagittal computed tomography reconstruction showing Th2 lysis and Th1–3 spondyloptosis. **C)** 3D reconstruction showing severe kyphosis due to spondyloptosis following tuberculosis.

pain. Magnetic resonance imaging (MRI) revealed Th2 lytic changes, Th2 compressing the spinal cord anterolaterally, and Th1–3 spondyloptosis due to Th2 spondylolysis (Figure 1). Her neurological condition progressively deteriorated in 1.5 years. At the first time the patient suddenly fell, she could not walk and then could not move her extremity. Neurological examination revealed motor weakness 1–2/5 motor power ratio (mpr) on the right side and 0/5 mpr on the left side, hypoesthesia under Th3, preserved gait control, bilaterally positive Babinski sign, hyperactive right patella and Achilles reflex, and decreased left patella and Achilles reflex. Laboratory findings showed CRP of 0.1 and white blood cell count of 4.4. Results of the chest X-ray imaging were normal.

Informed consent was obtained from the patient for the publication of the case and images.

As the patient had incomplete spinal cord damage and deformity, planned surgery was decided; one-stage surgery was performed. Under general anesthesia, the patient was placed in the Concorde position with a DORO head holder system and applied traction. After stripping of the muscles from C5 to Th6, three levels up and three levels down were instrumented bilaterally and screws were placed bicortically. Transpedicular screws were implanted in C6 and C7 for strength stabilization. After posterior decompression, bilateral facetectomy was performed. As the spinal cord was compressed from the anterolateral right side, corpectomy of the Th2 vertebral body was performed. Intraoperative cultures and pathological specimens were taken to confirm the treatment of infection. A corpectomy cage was placed from the posterior side. Temporary rods were assembled bilaterally. Finally, after decompressing the spinal cord by 360°, simultaneously under head traction using a head holder, gentle distraction was applied to stabilize vertebral reduction; thereafter, temporary rods were removed on one side and then on the other. Consequently, permanent rods were inserted. To prevent cage displacement, Th1–3 were compressed (Figure 2). Postoperative computed tomography (CT) revealed a successful reduction of Th1–3 (Figure 3). Sagittal alignment was restored, and the spinal canal was decompressed. Involuntary movements on the lower extremity began on postoperative day 3. The patient was discharged on day 7. The pathological report revealed normal results; there were no findings of infection. Physiotherapy and follow-up control were considered on month 2. On the follow-up control at 3 years, neurological examination revealed improvements. Preoperatively, motor weakness was 1–2/5 mpr on the right side and 0/5 mpr on the left side, which increased to 3/5 mpr and 2/5 mpr, respectively, at the 3-year follow-up.

DISCUSSION

The stability of the thoracic spine is provided by the rib cage, anterior longitudinal ligament, posterior longitudinal ligament, facet joints, and ligamentum flavum (4,7). Thus, in this region, significant force is needed to cause spondyloptosis. Motor vehicle accidents and substantial falls, with their capability to induce considerable shear forces, are the most frequent causes of traumatic spondyloptosis. The most frequent cause of spondyloptosis is traumatic. In most cases, due to motor vehicle accidents, forceful falls can induce substantial shear force, which results in spondyloptosis (7). In our case, spondyloptosis was caused by Pott's disease.

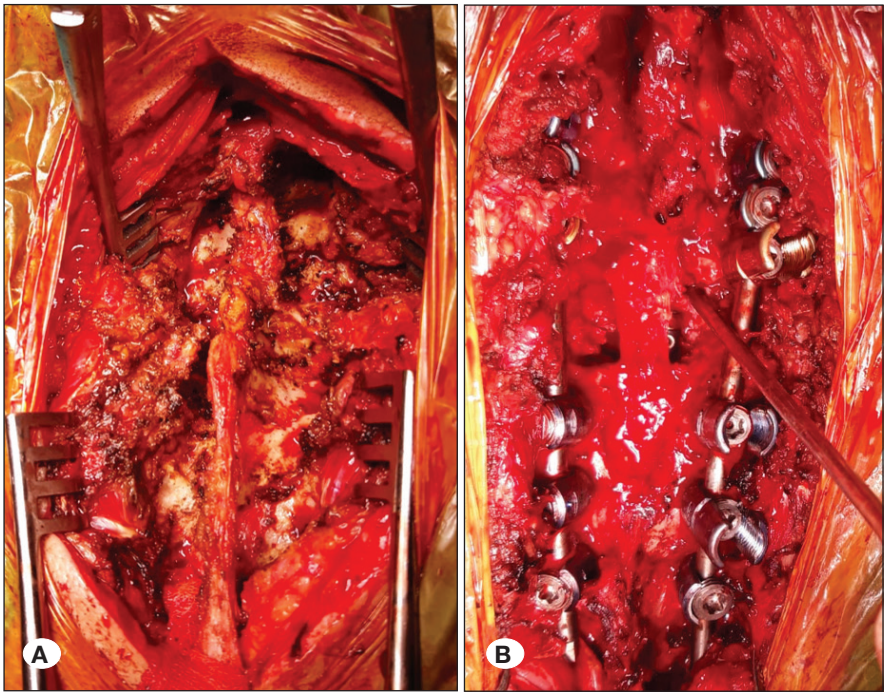

Figure 2: Intraoperative images.
A) Before instrumentation.
B) After instrumentation and restoring alignment.

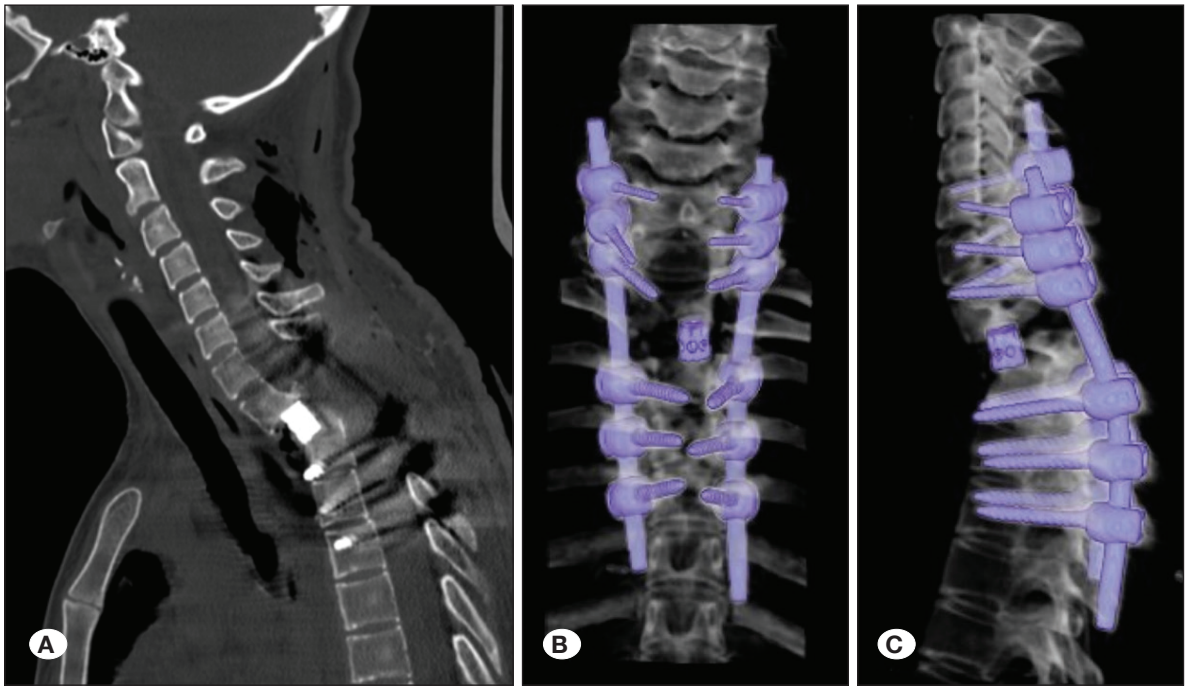

Figure 3: Postoperative images. **A)** Postoperative computed tomography (CT) images showing the cage in place. **B)** Postoperative 3D CT showing the cage and implanted screws on anteroposterior images. **C)** Postoperative 3D CT showing the cage and implanted screws on lateral images.

Spinal tuberculosis affects 1%–2% of all cases of tuberculosis and is most commonly manifested in the musculoskeletal system (3). Given the higher incidence in poorly developed countries and lower-income households, spinal tuberculosis is known as “a disease of poverty” (5). Moreover, it is commonly seen in children and young adults.

The hematogenous spread (via arterial or venous routes) of *Mycobacterium tuberculosis* into the cancellous bone of the spine from the primary lesion (lungs or genitourinary system) results in vertebral body involvement. In this disease, the classically seen paradiscal destruction of the vertebra leads to kyphosis. Additionally, the disc space is preserved until the late stage of spinal tuberculosis.

Tuberculosis has varied clinical manifestations. The most constitutional feature is weight loss, pyrexia, and night sweats. Generally, spinal tuberculosis presents with axial pain of varied types, ranging from a dull pain to dreadful pain (2). Usually, the anterior column collapsed due to kyphosis, which clinically presents with spinal prominence and a gibbus deformity. In the thoracic spine, fusiform paravertebral abscesses, which are rarely clinically evident, are most frequently seen (3). In our case, spondyloptosis, gibbus deformity, and kyphosis occurred in the thoracic region.

The narrowed spinal canal, tenuous blood supply to the thoracic spinal cord, and high-energy trauma result in an irreversible neurological deficit in most cases. In our case, the patient had severe paraparesis (1–2/5 mpr on the right side and 0/5 mpr on the left side) preoperatively.

All cases of spondyloptosis were of traumatic etiology (11). To our knowledge, this is the first case of spondyloptosis due to tuberculosis. In the present case, we restored alignment and performed a corpectomy in a single-stage. The presented case is unique, as it is related to spinal infection. This information could have value for spinal infection management, as this is the first case of Pott's disease complicated with complete (grade 5) spondylolisthesis. Despite the chronic process, a single-stage surgery was performed, which led to neurological improvements. In the literature, no cases caused by infection and no cases in which surgery was performed late were reported (there was only one case in which surgery was performed after 3 months) (1,4,7,9,11). In the reviewed literature (1,4,7,9-11), most of the cases occurred in the mid- and lower thoracic spine, whereas upper thoracic spondyloptosis is rare. In all the cases reported, neurological improvements were not noted. In our patient, despite the late surgery, neurological improvements were observed, which could be explained by the chronic compensatory reaction of chronic spinal cord compression due to vertebral tuberculosis.

In spondyloptosis, axial CT images show the double-vertebra sign and fractures of the posterior elements of the spine. MRI in spondyloptosis shows spinal cord myelomalacia and discoligamentous injury related to trauma. In our case, MRI revealed Th2 lytic changes, Th2 compressing the spinal cord anterolaterally, and Th1–3 spondyloptosis due to Th2 spondylolysis.

The principles of dislocation management require reduction with traction or intraoperatively following stabilization. In the case of spinal infection, draining the abscess and taking biopsy are necessary. The main goal of surgery is restoration of alignment, decompression of neural elements, as well as removal of spinal infection. In patients with spondyloptosis who have a complete neurological deficit, the most important goal is stabilization following reduction and alignment. Surgical interventions should allow the rehabilitation of paraplegic patients with a wheelchair.

Surgical management of spondyloptosis is classified as reducible and irreducible. In reducible cases, for the severe ligamentous disruption, reduction could be doubtlessly achieved through a posterior approach with surgical distraction (1). In irreducible cases, distraction could be ineffective; in these cases, corpectomy of the collapsed vertebra is recommended. Following corpectomy, due to the approximation of the vertebral bodies of the adjacent vertebrae and succeeding spinal shortening, restoration of sagittal alignment could be possible (1). Nevertheless, for subsequent instability, we recommend extended instrumentation including at least three vertebrae above and below the affected vertebrae (10). Li et al. described a case of posterolateral grade 3–4 spondylolisthesis, which was openly reduced using horizontally oriented temporary rods facilitating under control, sequential sagittal unlocking and distraction, inversion of the anteroposterior shear, and restoration of alignment (9). In our case, the patient had grade 5 anterior spondyloptosis, and because of the irreducible vertebrae, we performed corpectomy of the affected vertebra and instrumentation encompassed three vertebrae above and below the corpectomy level.

CONCLUSION

Pott's disease may cause lytic changes on the vertebrae, and treatments depend on the stage of infection. In our case, surgery was performed for the upper thoracic spondyloptosis. To our knowledge, this is the first case of spondyloptosis caused by Pott's disease. Despite anatomical challenges in this region, spondyloptosis was successfully treated with a single-stage surgery via the posterior approach.

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AUTHORSHIP CONTRIBUTION

Study conception and design: OM
Data collection: OM, SC
Analysis and interpretation of results: OM, SC
Draft manuscript preparation: OM
Critical revision of the article: OM
All authors (OM, SC) reviewed the results and approved the final version of the manuscript.

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