A modified minimally invasive surgery for thoracic pyogenic spondylitis: percutaneous pedicle screw fixation in combination with a vertebral debridement in a separate posterolateral approach – a case report.

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Abstract

We report a modified minimally invasive surgery for thoracic pyogenic spondylitis by single-stage posterior fixation with curettage of the spinal anterior segments and autogenous iliac bone grafting using a separate posterolateral approach. This surgical method avoids contamination of spinal implants by maintaining a muscular barrier from the curettage/grafting site.

1. INTRODUCTION

Since infectious spondylitis usually affects the vertebral bodies and intervertebral disc(s), curettage of those lesions and anterior spinal fusion have been the treatment of choice.[1] In the thoracic spine, thoracotomy is the standard approach for this surgical purpose; however, the procedure may exert considerable stress on lung function. Anterior debridement through a posterolateral approach was first described by Capener as "lateral rhachotomy" for tuberculous spondylitis in 1954.[2] We also reported good surgical outcomes following a single-stage combination of lateral rhachotomy and posterior spinal fusion using a compression hook system for tuberculous spondylitis.[3]

Recently, a percutaneous pedicle screw (PPS) system has enabled a minimally invasive but rigid posterior spinal fusion for infectious spondylitis outside the infected lesion.[4] PPSs can be inserted in a separate tract from the curettage site of lateral rhachotomy, preventing contamination of the implants. Here, we report a case of thoracic pyogenic spondylitis that was successfully treated with single-stage posterior fixation using PPSs in combination with curettage and autogenous iliac bone grafting of the vertebral bodies with bilateral, separated posterolateral approaches.

2. CASE PRESENTATION

A 72-year-old man was diagnosed with pyogenic spondylitis, low back pain, and fever. After unsuccessful control of the inflammation with the use of antibacterial medication for more than 12 months, the patient was referred to our department. At the first visit to our department, the patient had no fever, low back pain, or abnormal neurological deficits.

Plain radiographs showed spinal ankylosis from T4 to T11 and from T12 to L1. Sagittal MRI demonstrated that the T11–12 vertebral bodies showed heterogeneously high signal intensity on both T1-weighted images (WI) and T2WI. The intervertebral disc at T11–12 was clearly enhanced on gadolinium (Gd)-enhanced T1WI (Figure 1). Sagittal reconstructed computed tomograms (CT) showed diffuse idiopathic skeletal hyperostosis between T9 and L3 without obvious vertebral destruction (Figure 2). T11 and T12 vertebral bodies indicated osteosclerosis. A chronic pyothorax was also found on a chest CT scan but was not indicated

for therapeutic intervention by a respiratory physician. CT-guided biopsy of the T11–12 intervertebral disc revealed a negative culture study with a histopathological diagnosis of chronic inflammation. The antibiotic medication was discontinued because the patient was asymptomatic, and the patient's serum C-reactive protein (CRP) value ranged between 1 and 2 mg/dL.

One year later, the patient was admitted to the Department of Respiratory Medicine with rapidly deteriorating pyothorax and pneumonia. Thoracic drainage was performed, and *Pseudomonas aeruginosa* was detected. CT showed marked destruction of the T11–12 vertebral bodies, which indicated "rim enhancement" on Gd-enhanced T1WI MRI (Figure 3). We diagnosed the patient with progressive pyogenic spondylitis and planned surgical treatment after improvement of pyothorax and pneumonia.

3. TREATMENT

Single-stage lateral rhachotomy and posterior spinal fusion with PPS were performed. First, the PPS was inserted from T8–10 to L1–3 (Figure 4). The skin incisions for PPS installation were placed medial to the common insertion point to avoid violating the posterolateral approach for curettage. Each PPS was inserted perpendicularly to the body surface. Posterolateral approaches to the T11–12 vertebral bodies were performed bilaterally. An 8 cm longitudinal skin incision was made at the center of the T12 transverse process, which was confirmed by fluoroscopy. After costotransversectomy of T12, the lateral cortex of the T12 vertebral body was exposed. Then, the cortex was drilled away by a high-speed burr, and the infected lesion was curetted. The outside was hard sclerotic bone, and the inside was scar tissue. The T11 vertebral body and T11–12 intervertebral disc were also curetted. Finally, autologous iliac bones were transplanted into the curetted area (Figure 5). A 5.5-mm-diameter titanium-alloy rod was percutaneously connected to the PPS.

4. OUTCOME AND FOLLOW-UP

Six months after surgery, plain radiography and CT revealed bony union between T11 and 12 (Figure 6). Antibacterial medication was terminated as the inflammatory reaction and C-reactive protein turned negative. The patient had no symptoms or recurrence of inflammation at 3 years post-operation.

5. DISCUSSION

The principle of surgical treatment for pyogenic spondylitis is curettage of the infected lesions with spinal fusion.[5]Anterior curettage and bone grafting combined with posterior instrumented fixation have demonstrated good results in maintaining local spinal alignment.[6] However, a combined anterior and posterior approach is highly invasive. Thoracotomy has been reported to be strongly associated with respiratory complications,[7] particularly in older patients. Because the patient in the present case was elderly and had a long history of pyothorax, the patient's pleura and vessels were expected to be severely adhered to the vertebrae using the transthoracic approach, thereby increasing the difficulty and risk of surgery. Therefore, single-stage posterior fixation with PPS in combination with curettage of the vertebral bodies using the separated posterolateral approach was selected for treatment.

We previously reported a lateral rhachotomy and posterior spinal fusion with compression hooks for thoracic tuberculous spondylitis.[3] The drawbacks of this method were relatively weak fixation compared to pedicle screw systems.[8] PPS fixation is more rigid than the hook system. In addition, PPS is assumed to reduce the risk of instrument contamination compared to the hook system, which requires conventional spinal exposure. In an analysis of 10 reports of pyogenic spondylitis treated with single-stage debridement and spinal instrumentation using an open, identical approach, Przybylski et al.[9]reported that 7 out of 106 cases demonstrated recurrent infection. In the present case, spinal fixation with PPS and curettage were independent approaches. The PPS was placed closer than usual to the midline so that screw heads and rods were isolated from the infected lesion. A thick muscular septum between the posterior instruments and infected vertebral lesion is expected to prevent the instruments from bacterial contamination.

6. CONCLUSION

For cases of thoracic infectious spondylitis that require debridement and bone grafting of the vertebral lesions, our surgical method, one-staged posterior instrumentation using PPS combined with debridement via a separate posterolateral approach, could be a novel and favorable option for minimally invasive surgery.

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CONFLICT OF INTEREST

None.

AUTHOR CONTRIBUTIONS

YS, KH, MM, YO, HK, KT, and TO were involved in study conception, data collection, data interpretation, and manuscript writing. NY, YM, DC, and MK interpreted the data and revised the manuscript accordingly. TA edited and finalized the manuscript.

CONSENT

The authors confirm that informed consent was obtained from the patient for the publication of this case report.

DATA AVAILABILITY STATEMENT

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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