



Two approaches for treating upper thoracic spinal tuberculosis with neurological deficits in the elderly: A retrospective case-control study



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ABSTRACT

Objective: The current study compared clinical outcomes of two diverse therapeutic strategies for upper thoracic (T1–4) spinal tuberculosis with neurological deficits in elderly patients.

Methods: A retrospective analysis was performed on 18 cases undergoing single-stage posterior transpedicular decompression, debridement, interbody fusion, and instrumentation (Group A). Sixteen cases underwent single- or two-stage anterior debridement, bone grafting, and posterior instrumentation (Group B). The clinical and radiographic results for these patients were analyzed and compared.

Results: Patients were followed up for an average of 40.9 ± 4.0 months (range 36–48 months). Results demonstrated that the average operative duration, blood loss, hospital stays, and operative complication rate were lesser for Group A than for Group B. The average fusion time was 8.1 ± 1.5 months and 7.8 ± 2.9 months in Groups A and B, respectively ($p > 0.05$). Cobb's angles were significantly corrected after surgical management, but loss of correction occurred in both groups. All patients had significant postoperative neurological improvement.

Conclusions: Single-stage posterior transpedicular debridement, decompression, interbody fusion and instrumentation might be a better surgical treatment compared with combined posterior and anterior approaches. Such techniques may result in fewer complications and a better quality of life for elderly patients.

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1. Introduction

Spinal tuberculosis (TB) is the most common form of extrapulmonary TB, accounting for almost half of the cases of bone and joint TB [1]. Spinal TB is a severe spinal disease that frequently causes kyphotic deformity, neurological deficits, and paralysis [2]. With an increasingly aging population in China and an increase in spinal TB incidence, spinal TB in the elderly can be a significant threaten to general health and societal well-being [3]. Medical workers have made several efforts to control and treat spinal TB. Traditionally, conservative antituberculous chemotherapy is fundamental for the treatment of spinal TB. However, outcomes of such conservative methods have been generally unsatisfactory, especially in elderly patients receiving long-term external fixation and

anti-TB chemotherapy treatments [4]. Thus, surgery is frequently inevitable.

Different surgical methods have been reported for treating upper thoracic (T1–4) spinal TB. The main surgical objective is to drastically clear the focus, reconstruct spinal stability, and improve neurological status. These problems have been addressed in previous studies, including those on the use of an anterior approach [5–7], a combined one- or two-stage anterior-posterior approach [8–12], and a posterior-only approach [13,14]. Based on a literature review, some surgeons report that a sole posterior approach could obtain equally adequate results compared with anterior debridement and bone grafting [15]. To our knowledge, there are few studies comparing therapeutic efficacy between sole posterior and combined posterior and anterior approaches for upper thoracic TB with neurological deficits in an elderly sample. Therefore, the present study compared clinical outcomes derived from these two approaches in a group of elderly patients having upper thoracic TB with neurological deficits.

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Table 1
Patient clinical data.

	Group A (N = 18)	Group B (N = 16)	p-Value
Gender			
Male	10	10	<i>p</i> > 0.05
Female	8	6	<i>p</i> > 0.05
Age (years)	69.9 ± 4.6	69.6 ± 4.2	<i>p</i> > 0.05
Involved vertebrae (T1–T4)			
1	3	2	<i>p</i> > 0.05
2	13	13	<i>p</i> > 0.05
3	2	1	<i>p</i> > 0.05
Comorbidities			
COPD	4	3	<i>p</i> > 0.05
Hepatitis	6	7	<i>p</i> > 0.05
Diabetes mellitus	4	5	<i>p</i> > 0.05
Cardiovascular diseases	7	1	<i>p</i> < 0.05
None of the above diseases	1	2	<i>p</i> > 0.05
Preoperative data			
Cobb's angle (°)	41.9 ± 6.5	43.4 ± 7.6	<i>p</i> > 0.05
ESR	76.9 ± 11.1	75.9 ± 12.2	<i>p</i> > 0.05
VAS	7.4 ± 0.8	7.3 ± 0.9	<i>p</i> > 0.05

Abbreviation: COPD (chronic obstructive pulmonary disease).

2. Materials and methods

2.1. Patient clinical characteristics

From January 2006 to December 2010, 34 upper thoracic spinal TB patients with neurological deficits were enrolled in this study. The ethics committee of Xiangya Hospital of Central-South University approved this study. Informed consent was also obtained from all participants. Patients included 20 males and 14 females with a mean age (according to the Chinese standard) of 69.8 ± 4.3 years at the time of surgery (range = 62–78 years; Table 1).

All patients experienced constitutional symptoms, including back pain, weakness, sweats, moderate fever, weight loss, and neurological dysfunction; the mean symptom duration was six months. None of the patients were HIV positive or had active lung TB. TB diagnosis was based on clinical presentation, laboratory examinations, and imaging results, including plain radiographs, computed tomography (CT), and magnetic resonance imaging (MRI) [16]. In the 34 patients, the involved vertebrae are from T1 to T4 (9 cases in T1, 18 in T2, 23 in T3, 16 in T4). American Spinal Injury Association (ASIA) impairment scale was applied to evaluate neurological status. Five patients were grade B, 20 were grade C, and 9 were grade D. Initial and preoperative pain, including thoracic back pain, was assessed based on a visual analog scale (VAS). The Cobb's angle for all cases was evaluated. Most patients had multiple comorbidities, such as cardiovascular diseases, diabetes mellitus, hepatitis B, and chronic obstructive pulmonary diseases (COPD) (Table 1).

Inclusion criteria were as follows: (1) patients aged >60 years, (2) patients had neurological deficits and bone destruction of various degrees with limited paravertebral abscess, (3) lesions confined to a mono-segment or two adjacent segments, (4) the absence of an extensive TB abscess, (5) insensitive to conservative treatment (anti-TB drugs and ambulation). Patients who satisfied inclusion criteria were divided into two groups: 18 cases underwent surgical management using single-stage transpedicular debridement, decompression, interbody bone fusion, and instrumentation via the posterior-only approach (Group A). Another 16 cases that underwent anterior debridement, bone grafting, and posterior instrumentation in a single- or two-stage procedure served as the control group (Group B). The same team reviewed all surgical indications and performed the operations. What needs to be stressed is that cases in Group B (combined anterior and posterior approach)

were collected earlier, but cases in Group A (posterior-only) were collected in recent years.

2.2. Preoperative procedure

A mean time of 15.7 ± 1.9 days (14–21 days) prior to the surgery, patients were administered standard antituberculosis chemotherapy with isoniazid (5 mg/kg/d), rifampicin (10 mg/kg/d), ethambutol (15 mg/kg/d), and pyrazinamide (25 mg/kg/d). Concurrent diseases were routinely controlled. However, the patients' pain and neurologic status had no obvious improvement during the oral anti-TB drugs. When anemia and hypoproteinemia were completely rectified, the surgery was carried out.

2.3. Operative procedure

In Group A, only the posterior approach was performed. The procedure was as follows. With the assistance of C-arm fluoroscopy, pedicle screws were placed two levels superior and inferior to the level of the affected vertebrae. If the upper part of the vertebral body was not destroyed, screws were also placed in the diseased vertebrae. A pre-bent rod on the mildly affected side temporarily connected the screws to avoid instability and spinal cord injury during decompression and focal debridement. Decompression was completed by an expanded hemi-laminectomy on the more severely affected side of the lesion segment. Different curette sizes and angles were applied to remove the lesion through the healthy, bleeding bone using the posterolateral approach. The insides of the pedicles were reserved for safety. The ribs, intercostal arteries, and thoracic nerve roots on the focal level were sacrificed for better exposure, if necessary. The temporary rod was switched to the other side, and the same decompression and debridement were performed if the bilateral vertebral body were severely affected. Pus and necrotic tissue were eliminated by pressurized washing and negative pressure suction. Rectification of the deformity was achieved with the help of the compression and stretch of the internal fixation instrument. To promote bone fusion, block-sized allogeneic bone with an appropriate shape was imbedded in the interbody; autogenous or allogeneic particulate bone was implanted in the posterolateral vertebral body.

In Group B, posterior instrumentation without fusion was performed first, followed by anterior debridement and allografting in a single- or two-stage procedure. The procedure of anterior surgery was as follows. The patients were placed in a lateral decubitus positions, leaving the severely involved side upward, and an incision parallel with posterior midline, 6–7 cm lateral to spinous process, was made according to the tuberculosis lesion segment. After routine extrapleural exposure, the posterior part of the rib articulated with the involved vertebrae body and the involved transverse process were removed. Then, the tuberculous focus, including collapsed vertebrae, in-between intervertebral disc and cold abscess, was completely removed through to healthy bleeding bone for spinal cord decompression. Expanding the 2 immediate healthy vertebrae, 2 suitable autologous rib strut grafts (from above removed rib) were harvested between them to complete interbody fusion.

Streptomycin (1 g) and isoniazid (0.3 g) were locally placed in the surgical area and drainage was performed after the previously described procedures. The intraoperative biopsy was obtained, and debrided material was sent for mycobacterial culture and histopathological examination.

2.4. Postoperative procedure

Typically, the drainage tube was removed when drainage flow was less than 30 ml per 24 h. Intravenous antibiotics

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