



Treatment of thoracic or lumbar spinal tuberculosis complicated by resultant listhesis at the involved segment



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ABSTRACT

Purpose: The purpose of this study was to present a singular pathological process of thoracic or lumbar spinal tuberculosis contributing to listhesis at the involved site, with special focus on clinical features and management of this disorder.

Methods: We retrospectively reviewed the medical records of 14 patients (5 males and 9 females, including 2 boys) admitted to our institution from April 2007 to March 2010 and were subsequently diagnosed with thoracic or lumbar spinal tuberculosis with resultant listhesis at the involved level. All patients underwent posterior instrumentation and reduction combined with single-stage anterior radical debridement and interbody fusion. Patients were followed-up clinically and radiographically.

Results: The average follow-up duration was 54.6 months. All patients had a successful fusion. Complete reduction was achieved in 10 cases. Preoperative neurological injury was observed in six patients and all recovered after surgery. The average postoperative Frankel grade improvement was 1.2. The preoperative median value of the extent of listhesis was 26.2%, which fell to zero at the final follow-up ($Z = -3.296, P = 0.001$). Pre- and postoperative median spinal stenosis rates were 45.9% and 8.4%, respectively ($Z = -3.296, P = 0.001$). The preoperative neurologic level was positively correlated with the listhesis distance before surgery ($r_s = 0.770, P = 0.001$). Postoperatively, the spinal stenosis rate was positively correlated with listhesis distance ($r_s = 0.691, P = 0.006$). The correlation between neurologic level and age or spinal stenosis rate was not significant. The standardized coefficient of listhesis distance was greater than that of spinal stenosis rate in our multiple linear regression analysis model. No implant failure or recurrence of tuberculosis occurred.

Conclusion: Treatment of this rare pathology aims to restore good spinal alignment, radical debridement, and permanent stability. A reasonable surgical strategy may be the combination of posterior reduction, anterior debridement, and supportive graft fusion. This strategy can safely and effectively achieve all of the therapeutic goals in one step.

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1. Introduction

Tuberculosis is commonly acknowledged as a scourge of humanity that affects hundreds of thousands of people worldwide each year. According to the latest global tuberculosis report by the World Health Organization, an estimated 8.6 million people developed TB and 1.3 million died from this disease in 2012 alone. While tuberculosis typically affects the lungs, it can affect the spine in 3–5% of people [1], which is also known as Pott's disease. Many studies have examined kyphotic deformity, costopelvic impingement, and neurological deficit resulting from active spinal

tuberculosis. Clinically, vertebral listhesis is mostly caused by degenerative diseases or trauma and occurs via the shifting of one vertebra in relation to adjacent vertebra. The shift is anterior in the majority of cases. To the best of our knowledge, previous reports on active Pott's disease contributing to vertebral displacement at the same location have been frequently associated with the superior portion of the cervical spine or the craniovertebral junction [2–16]. Nevertheless, active thoracic or lumbar spinal tuberculosis complicated by resultant listhesis at the involved site has rarely been reported, except for several case presentations [17–19]. Therefore, the treatment experience and long-term results about this entity are scant. In this paper, we present our investigation of 14 patients who suffered from active thoracic or lumbar spinal tuberculosis and consequent listhesis at the involved level. Their clinical and radiographic data and treatment outcomes were presented with a minimum of 40-month follow-up.

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2. Materials and methods

2.1. Ethics statement

The study protocol was approved by our Institutional Review Board (IRB) at the Second Xiangya Hospital of Central South University, Hunan, PR China and Written informed consent was obtained from the patient for publication of this Study and any accompanying images.

2.2. Patient population

The medical records of 14 patients who were treated surgically at our institution from April 2007 to March 2010 were respectively reviewed. All patients were diagnosed with active spinal tuberculosis of the thoracic or lumbar spine with resulting listhesis at the same site. No patients had gross kyphotic deformity. Diagnosis of active spinal tuberculosis was predicated on the basis of clinico-radiological evidence and laboratory findings, as described by Wang et al. [20]. No patients had concomitant active pulmonary tuberculosis. Needle-guided biopsy was not routinely performed because of its invasiveness and potential complications. Routine PPD test was not used owing to its relatively low diagnostic value. The patients enrolled in this study included 12 adults and 2 children; there were 6 males and 11 females aged from 3 to 67 years (mean, 37.1 years). Apart from typical symptoms, such as mild fever, weight loss, night sweats, or fatigue, all patients presented with back pain, significant local tenderness, and restricted range of spinal movement.

Before surgery, all patients received a systematic antituberculous regimen of four drugs for two to four weeks, including isoniazid (300 mg/day), rifampicin (450 mg/day), pyrazinamide (1500 mg/day), and ethambutol (750 mg/day), after establishment of the clinico-radiological diagnosis of spinal tuberculosis. In 8 cases, the neurological status at hospital admission was normal (Frankel Grade E). Six patients had a neurological compromise of varying degrees of severity and of them, three presented with a partial loss of motor function (Frankel Grade C), and three had a mild defect of motor function (Frankel Grade D). Medication did not result in marked neurologic improvement in any case.

All patients (with or without neurologic deficits) received surgical treatment after adequate preoperative assessment because of indications, such as neurological deterioration, osseous instability, progressive low back pain, or an expanding cold abscess [21]. All patients underwent posterior instrumentation and reduction, combined with anterior radical debridement and circumferential fusion in a single stage procedure. Postoperatively, all patients continued their adjuvant chemotherapy for an average duration of 15.9 months (range, 12–18 months) and had no severe complications associated with the prescribed medications. After surgery, all patients received bracing of the spine to stabilize the spinal structures and allow for earlier ambulation.

Follow-ups were conducted by telephone up to July 2013. Data on clinical and radiographic outcomes were available for all 14 patients. During the follow-up, patients were specifically asked about spinal pain and examined for persisting neural deficits and symptoms of recurrent infection or implant failure. Patient data are summarized in Table 1.

2.3. Radiological assessment

The distance of listhesis was measured on radiographs according to the method described by Meyerding [22]. Computed tomography (CT) scans were conducted to confirm vertebral listhesis. Loss of the vertebral body was assessed according to the method by Rajasekaran and Shanmugasundaram [23]. The spinal stenosis rate

Table 1
Main clinical and demographic data of the patients.

Case	Gender	Age (y)	TB site	Associated lesion	Listhesis (%)		Vertebrae involved (n)		Vertebral body loss		Spinal stenosis rate (%)		Neurologic level ^a	
					Pre-surgery	Final follow-up	Pre-surgery	Final follow-up	Pre-surgery	Final follow-up	Pre-surgery	Final follow-up		
1	F	43	L3–L4	L3 lateral translation	58.0	0.0	2	1.4	45.9	9.6	C	E		
2	F	67	L4–L5	L4 retrolisthesis	50.0	42.0	2	0.6	31.5	20.1	D	D		
3	F	39	L3–L5	L3 retrolisthesis	19.7	15.7	3	1.3	22.0	8.7	E	E		
4	M	3	L2–L3	L2 retrolisthesis	38.1	0.0	2	1.4	37.0	3.6	E	E		
5	F	24	L3–L4	L3 lateral translation	18.8	0.0	2	1.0	55.7	2.4	E	E		
6	F	30	T12–L1	T12 lateral translation	49.0	0.0	2	0.5	90.9	6.0	C	D		
7	F	28	L2–L3	L2 lateral translation	57.0	0.0	2	0.4	84.2	7.5	C	D		
8	M	50	T12–L1	T12 retrolisthesis	27.5	0.0	2	0.9	49.8	2.0	D	E		
9	F	24	L2–L3	L2 retrolisthesis	19.0	0.0	2	0.6	19.4	8.9	E	E		
10	M	53	L1–L2	L1 retrolisthesis	15.0	0.0	2	0.4	53.5	8.1	E	E		
11	F	58	T11–T12	T11 retrolisthesis	21.2	0.0	2	0.6	43.9	17.2	D	E		
12	F	38	L5–S1	L5 retrolisthesis	27.3	0.0	2	0.3	20.0	4.8	E	E		
13	M	55	L3–L4	L3 retrolisthesis	20.0	17.8	2	0.3	58.6	50.6	E	E		
14	M	8	L2–L3	L2 retrolisthesis	25.2	20.1	2	0.9	45.8	18.6	E	E		

^a According to the Frankel grade.

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