



Halo traction, single-segment circumferential fixation treating cervical tubercular spondylitis with kyphosis



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ABSTRACT

Objective: To evaluate the clinical efficacy and feasibility of twenty patients with cervical tubercular spondylitis with kyphosis (CTSK) treated by halo traction, single-segment circumferential instrumented fusion combined anterior debridement, decompression and bone grafting.

Methods: Retrospective review of data on twenty patients who suffered from CTSK admitted to our hospital between January 2007 and December 2012. All of them were performed by halo traction, single-segment circumferential instrumented fusion (anterior titanium plate and posterior pedicle or lateral mass fixation) combined anterior debridement, decompression and titanium mesh cage (TMC) filled with allograft bone particles. X-ray and computed tomographic (CT) images were used to determined sagittal balance and bone fusion. The clinical efficacy was evaluated using statistical analysis about the visual analogue scale (VAS) scores of pain, neurological status according to the Frankel classification and erythrocyte sedimentation rate (ESR), which were collected at certain time.

Results: The average follow-up period was 34.1 ± 7.0 months (24–48 months). In the 20 cases, no obvious postoperative complications related to instrumentation and bone grafting and neurologic function was improved in various degrees. The average pretreatment ESR was 46.4 ± 21.7 mm/h, which got normal within 3 months in all patients. The average VAS on admission was 6.7 ± 1.7 , which decreased to 1.6 ± 1.1 postoperatively. All patients got bony fusion within 3.4–5.5 months after surgery. The Cobb angle of $30.8 \pm 10.5^\circ$ on admission reduced to $2.9 \pm 3.9^\circ$ performed by preoperative halo traction, became to $-5.1 \pm 4.0^\circ$ after operation and remained at $-4.3 \pm 3.8^\circ$, with $0.9 \pm 0.7^\circ$ of correction loss.

Conclusions: Halo traction, single-segment circumferential instrumented fusion combined anterior debridement, decompression and TMC can be an effective and safe treatment method for the treatment of cervical tubercular spondylitis with kyphosis and the preoperative halo traction should be laid on much emphasis.

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1. Introduction

Tuberculosis (TB) is one of the most important issues of public health worldwide. About one third of the world population has been infected with *M. tuberculosis* (MTB), over 8.7 million new cases and 1.4 million deaths each year [1]. Tubercular spondylitis (TS) is the most frequent and serious form of skeletal tuberculosis, as a most common extra-pulmonary. TB of cervical spine is a rare disease, and only 4.2–12% of all the patients suffering from TS have involved the cervical spine [2–6].

MTB often invades the intervertebral disk and adjacent upper and lower vertebral bodies or several intervertebral spaces. Generally, TB is prone to invade the anterior and middle columns of the spine, while the posterior column is rarely involved. Therefore, combined with the weight of head, MTB readily causes cervical kyphosis. In some serious cases, this may lead to spinal cord compression and subsequent quadriplegia [7,8]. Moreover, another potential complication, particularly with large prevertebral abscesses, may be respiratory depression.

Various surgical approaches have been introduced in treatment of cervical tubercular spondylitis (CTS) [7,9–11]. However, CTSK performed by single-segment circumferential instrumented fusion has not been reported. Potent anti-TB drugs have made uncomplicated tuberculosis a medical disease, but when presented

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with neurologic compromise, significant vertebral body destruction with kyphosis associated with segmental instability, failure of medical treatment, and/or epidural/paravertebral abscess formation, surgical invention will be given priority [12,13]. Anterior debridement and fusion in traditional surgical surgery for CTS produce improved visualization, radical debridement, more extensive decompression and reconstruction of the anterior column, but also bring some complications, such as graft displacement, nonunion and pseudarthrosis [14]. Since Morscher et al. [15] in 1986 first reported locking plate applied in anterior surgery for cervical spine, it has been widely used in cervical spine disorders, including spondylosis, fracture, and even CTS, attributed to its effective improving the stability of fixed segments, being conducive to fusion, and good biocompatibility and safety. But when CTS was associated with kyphosis, stand-alone anterior long-segment fixation and bone grafting appears to afford inadequate stability in the early postoperative period and even lead to degeneration of the adjacent intervertebral disk during the long-term follow up [16,17]. Mao et al. [11] analyzed the long-term outcomes of one-stage anterior debridement, bone grafting, and internal fixation for the treatment of CTSK, they found there were 15 cases (71.4%) complicated by degeneration in adjacent intervertebral disk and 4 cases (19.0%) by mild absorption/subsidence of bone graft.

In this study, we aim to investigate the surgical effects of halo traction, the single-segment and 360° fusion/fixation approach combined with anterior debridement, decompression and TMC on the treatment of CTSK with mono-segmental damage only involving two adjacent vertebrae and the intervertebral disk.

2. Materials and methods

2.1. Ethical statement

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

2.2. Basic information

From January 2007 to December 2012, 52 patients with diagnosis of CTS underwent surgery at our spinal center, including 20 patients who suffered from CTSK: twelve of them were males, and eight were females, aged from 19 to 57 years (with an average age of 31.6 ± 10.3 years) and the time of symptoms before admission was average of 2.6 ± 1.4 months. Clinical details of surgical group are presented in Table 1. The diagnosis of tuberculosis of the CTSK guided by non-specific laboratory findings such as anemia, hypoproteinemia, and elevation of erythrocyte sedimentation rate (ESR) and by radiological findings including spinal X-ray films, computed tomography (CT), and magnetic resonance imaging (MRI). Patients were presented with constitutional symptoms including necks pain (100%), stiffness/nuchal rigidity/restricted neck activity/torticollis (100%), mild fever/perspiration (45%), anorexia/weight loss (70%), and cervical radiculopathy (5%) (Table 2). Although dysphagia/dyspnea by retropharyngeal abscess was present in 8 patients, symptomatic dysphagia occurred in only 4 cases. Nineteen (95%) patients were complicated by incomplete paraplegia. The classification of the American Spinal Injury Association (ASIA) (Table 3) was used to assess the neurological compromise function, 4 cases in grade B, 8 cases in C, 7 cases in D and 1 case in E (Table 3 and Fig. 1). The VAS scores of pain and ESR on admission ranged from 3 to 9, 18 to 78 mm/h, respectively, with an average of 6.7 ± 1.7 ,

Table 1
Clinical details of surgical group.

Average \pm SD	Age/sex	TSBA (mon)	Traction weight/time (kg/days)	Follow-up (mon)	Fusion time (mon)	VAS		ESR		
						OA	Preo*	Post ^{&}	FFU*	Pre
	31.6 ± 10.3	2.6 ± 1.4	$4.3 \pm 0.9/5.5 \pm 1.0$	34.1 ± 7.0	4.4 ± 0.7	6.7 ± 1.7	6.0 ± 1.6	1.6 ± 1.1	46.4 ± 21.7	7.9 ± 3.4

SD, standard deviation; TSBA, time of the symptoms before admission; OA, on admission; VAS, Visual Analogue Scale (VAS) scores of pain; ESR, Erythrocyte Sedimentation Rate; Pre, Post, FFU, preoperative, postoperative 3 months, final follow-up; mon, months; traction weight, the final traction weight.

* VAS, analyzed by paired t test, preoperative compare with on admission, $p = 0.158$.

& VAS, analyzed by paired t test, postoperative compare with preoperative, $p = 0.000$.

* VAS, analyzed by paired t test, final follow-up compare with preoperative and postoperative, $p = 0.000$.

ESR, analyzed by paired t test, postoperative 3 months compare with preoperative, $p = 0.000$.

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