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A retrospective controlled study of three different operative approaches for the treatment of thoracic and lumbar spinal tuberculosis: Three years of follow-up

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ABSTRACT

Objective: The purpose of this study was to determine the optimal operative approach for the treatment of spinal tuberculosis. We analyzed two types of pathological vertebrae (thoracic and lumbar) and three cardinal operative approaches for surgery.

Methods: Sixty patients with spinal tuberculosis were divided into thoracic ($n = 30$) and lumbar groups ($n = 30$) based on locations of the foci. These patients underwent anti-tuberculosis drug and surgical therapy. The operative approaches for the surgical treatments were the anterior approach (AA, $n = 20$), posterior approach (PA, $n = 20$), and combined anterior and posterior approach (CAPA, $n = 20$). All clinical data from the patients was collected and included surgical time, blood loss, correction of kyphosis, and vertebral body height reconstruction. Differences in the means between the groups were evaluated statistically with one-way analyses of variance (ANOVAs).

Results: The surgery time in the CAPA group was longer than that of AA group ($P < 0.05$), and there were no significant differences between the CAPA and PA groups or the AA and PA groups. The average vertebral body height reconstruction in the AA group was larger than that of the PA or CAPA groups, and there was no significant difference between the PA and CAPA groups ($P > 0.05$). There were no interactions between the location of the pathological vertebra and the type of surgical approach, with the exception of blood loss. The blood loss of the CAPA was greater than those of the AA and PA patients in the thoracic group ($P < 0.05$), and no significant difference was found in the lumbar group ($P > 0.05$).

Conclusions: AA was well-suited for serious vertebral collapse that required reconstruction of the height of the vertebrae. CAPA was unfit for patients with poor basic conditions due to the long surgical time, but the long surgery time of CAPA did not necessarily lead to greater blood loss compared to the other approaches.

1. Introduction

Tuberculosis (TB) is a potentially fatal contagious disease caused by *Mycobacterium tuberculosis*. Musculoskeletal involvement in TB has been reported in approximately 3–5% of human immunodeficiency virus (HIV) negative patients following pulmonary infection [1]. Although the incidence of TB is higher in some groups, the general incidence of TB is higher in developing countries due to population growth, poor socioeconomic conditions, and political instability. Recently, an increasing number of TB cases have been reported in the western world due to the HIV epidemic, immigration, and drug resistance.

The introduction of anti-TB drugs was a significant event in the treatment of TB. The majority of spinal TB cases can be cured with regular chemotherapy in clinics [2]. Reports have shown that anti-TB drugs cannot easily penetrate into the foci of spinal tuberculosis, especially when the foci are surrounded by a sclerotic wall [3,4]. Surgery is beneficial in such cases because the foci are directly resected. The removal of the sclerotic wall aid the penetration of the anti-TB drugs into the foci. This removal increases local drug concentrations, improve drug efficacy, and shorten the treatment of TB. A severely damaged and obviously unstable vertebral body can undergo an internal fixation via surgery to reconstruct the shape and stability of the spine.

The choice of surgical approach in TB is crucial. Generally, the prevalent methods of surgical treatments are divided into two

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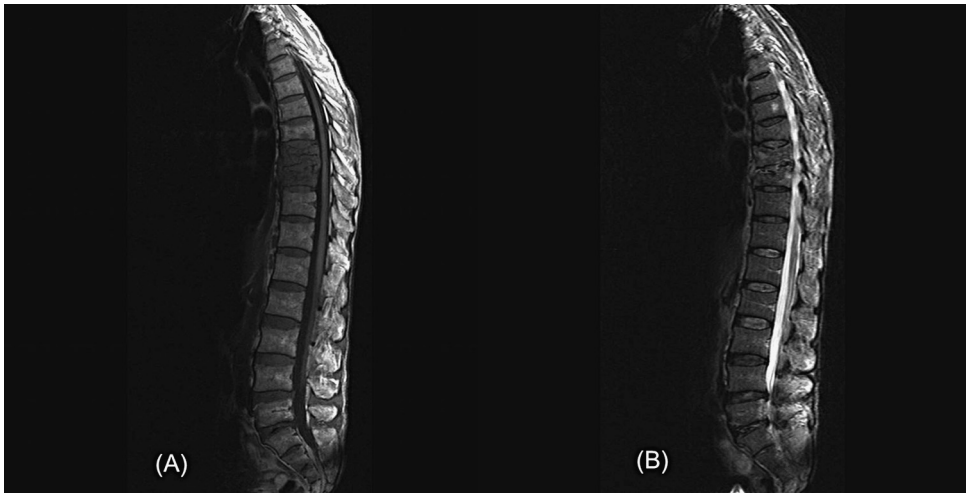

Fig. 1. MRI scan of one patient with thoracic spinal tuberculosis showing that the T_{9-10} vertebral bodies are irregularly destroyed. T1WI; the focus shows low signal (A). T2WI; the focus shows uneven high signal (B).

types: one-stage anterior approaches (AA) for debridement and spinal fusion [5,6], and one-stage posterior approaches (PA) for debridement and spinal fusion [7,8]. Some scholars have mentioned a third type of treatment; i.e., a combined anterior and posterior approach (CAPA) [9,10]. In this method, the vertebral body is fused in front of the spine, and a fixation is installed in the rear of the spine. CAPA is a combination and thus an improved version of the two former methods. However, despite these technological improvements, studies of the ideal surgical approach and comparisons between these spinal tuberculosis treatments have not been performed.

In this study, 60 adult patients with definitive spinal tuberculosis who underwent anti-TB drug and surgical therapies were observed to compare and analyze the three different modes of surgical approaches (AA, PA and CAPA) to treating two types of spinal tuberculosis (thoracic and lumbar). This study aimed to provide proposals regarding the best surgical approach for TB to clinicians.

2. Materials and methods

2.1. Patients

This study evaluated 60 patients (35 males and 25 females) with spinal tuberculosis. The patients underwent short-course chemotherapy in conjunction with partial excision of pathological vertebrae (the pathological vertebrae were defined by the tuberculosis destruction of the vertebral body and changes in radiological exams; Figs. 1 and 2) between January 2003 and June 2009. The ages of the patients ranged from 17 to 83 years with an average age of 44. The average patient weight was 53.5 kg. Spinal tuberculosis was found in the thoracic spine ($n = 30$) and the lumbar spine ($n = 30$). The operations were performed via AA ($n = 20$), PA ($n = 20$), and CAPA ($n = 20$) to treat thoracic and lumbar spinal tuberculosis. In the observed cases, nine patients had 1 pathological vertebra, forty-four patients have 2 pathological vertebrae, six patients had 3 pathological vertebrae, and one patient had more than 4 pathological vertebrae (Table 1). All patients were diagnosed with tuberculosis prior to surgery based on imaging studies (i.e., radiographs that revealed vertebral destruction, some osteoporosis of the surrounding bones, and paravertebral soft-tissue swelling), the clinical signs and symptoms of patients (i.e., examinations revealing kyphosis, local percussion pain, and paravertebral muscular spasms and the presence of fever, malaise, and thoracic dorsal aches or back pain), and laboratory findings (i.e., tests often revealed the presence of anemia and a normal or slightly increased white blood cell count). The sedimentation rates were high, and the tuberculosis skin tests were nearly always positive. The patients also had definite surgical indications that included spinal cord compressions or neurological

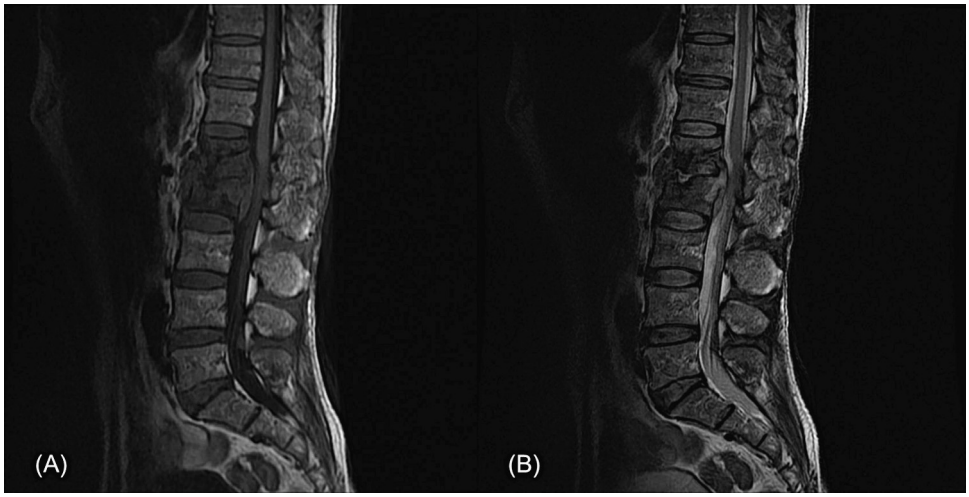

Fig. 2. MRI scan of one patient with lumbar spinal tuberculosis showing that the L_{1-2} vertebral bodies are irregularly destroyed and the dural sac is compressed. T1WI; the focus shows low signal (A). T2WI; the focus shows uneven high signal (B).