Prognostic Factors for Recovery of Patients After Surgery for Thoracic Spinal Tuberculosis

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■ BACKGROUND: **Thoracic spinal tuberculosis (TST) is a dangerous disease. Besides antituberculosis chemotherapy, surgery is also necessary for treating TST. To date, no study has focused on the prognostic factors for recovery of patients after surgery for TST.**

■ METHODS: **From 2001–2016, 237 patients who underwent surgery for TST in our department were included in this study. Japanese Orthopedic Association score was used to assess recovery after surgery. Kaplan-Meier method and Cox regression analysis were employed to identify the significant prognostic factors.**

■ RESULTS: **Univariate analysis demonstrated that diabetes, paralysis, kyphosis, duration of symptoms (≥3/<3 months), and number of involved vertebrae (>2/≤2) were identified as potential prognostic factors responsible for recovery after surgery for TST. Multivariate analysis suggested that paralysis, duration of symptoms (≥3/<3 months), and number of involved vertebrae (>2/≤2) were identified as the significant prognostic factors responsible for recovery after surgery for TST.**

■ CONCLUSIONS: **This study supports the previously published evidence that nonparalysis, shorter duration of symptoms, and fewer involved vertebrae are favorable prognostic factors for recovery after surgery for TST. For a better recovery effect, the key points for treating TST were timely diagnosis and treatment. It is urgent for government to arouse attention and popularize the knowledge of spinal tuberculosis.**

INTRODUCTION

Tuberculosis (TB) has imposed serious influence on human health worldwide.[1,2] The World Health Organization reported that there were 1.4 million new cases of TB in China and 1.81 million deaths resulting from TB in Asia annually.[3] The most commonly involved site of TB is lung, and the incidence of spinal involvement is around 1% of all cases with TB.[4] Thoracic spinal tuberculosis (TST) accounts for the largest proportion (30.3%–55.8%) of spinal tuberculosis cases.[5-7] Although the incidence of TST is relatively low, it is dangerous. The spinal cord compression caused by TST may lead to local pain, paralysis, kyphosis, and even death.[7-10] Antituberculosis chemotherapy remains to be the mainstay for treating TST. Surgery is also necessary for decompression, spinal stability maintenance, and kyphosis correction.[11] To date, no study has focused on the prognostic factors for recovery of patients after surgery for TST. Thus we performed a study in which the patients who underwent surgery for TST were regarded as a separate group, seeking to provide some helpful insights into the prognostic factors for recovery postoperatively.

MATERIAL AND METHODS

Patients

This study was approved by the Medical Ethics Committee of Xinqiao Hospital, Third Military Medical University, which was performed in accordance with the ethical standards of the 1964 Declaration of Helsinki as revised in 2000. The patients received a thorough explanation of this study, and their oral and written informed consent was obtained in this study.

From 2001–2016, 242 patients experienced surgery for TST in our department. Five out of the 242 patients had postoperative incision infection from TB for nonadherence to surgeons' advice

Key words
- Postoperative recovery
- Prognostic factor
- Thoracic spine
- Tuberculosis

Abbreviations and Acronyms
CRP: C-reactive protein
ESR: Erythrocyte sedimentation rate
JOA: Japanese Orthopedic Association
TB: Tuberculosis
TST: Thoracic spinal tuberculosis

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about postoperative anti-TB chemotherapy. Thus they were excluded from this study. The other 237 patients who could follow the surgeons' advice were included in this study. The diagnosis of TST was based on symptoms, physical signs, radiologic examination, hematologic examination (C-reactive protein [CRP] and erythrocyte sedimentation rate [ESR]), and pathologic examination. Empirical anti-TB chemotherapy was employed when it was difficult to get a definite diagnosis. All the included patients had obtained a definite diagnosis by postoperative pathologic examination.

The indications for surgery for TST were as follows: 1) unbearable pain that cannot be relieved by conservative treatment, 2) severe or progressive neurologic defect, 3) progressive kyphosis, or 4) deterioration of spinal stability.

Procedures

All patients were treated with standard HERZ chemotherapy (isoniazid, rifampicin, ethambutol, and pyrazinamide) for 2–4 weeks before surgery. Kidney function and liver function were monitored during chemotherapy. The purposes of surgery were decompression, spinal stability maintenance, and kyphosis correction. All the included patients experienced debridement, bone grafting, and instrumentation (if necessary) from either an anterior and/or a posterior approach. Patients continued the anti-TB chemotherapy for 12–18 months postoperatively. The advice of regular reexamination with a 3-month interval was provided. Off-bed activities were permitted under the protection of waist support 2–4 weeks after surgery. Non-weight-bearing activities were permitted to be performed until there was radiographic evidence of fusion.

Data Extraction and Follow-Up

Preoperative data of the enrolled patients included 1) demographic data including gender, age, urban/rural source; 2) clinical data, such as chronic disease history (diabetes, hypertension, and osteoporosis), symptoms (night sweat, low-grade fever, weight loss, weakness, local pain, limited activity, radicular pain, and numbness), physical signs (touch feeling, paralysis, tenderness, kyphosis, reflex, mass, and sinus), radiologic features (number of involved vertebrae) and laboratory tests (CRP and ESR); and 3) surgical methods (approach, instrumentation).

Each included participant was asked to complete a questionnaire to get the Japanese Orthopedic Association (JOA) score (0–11) for thoracic spine[12] preoperatively and at each time point during the follow-up visits to assess recovery after surgery. Follow-up visits were conducted every 3 months for the first year after surgery and every 6 months for the second year after surgery. The patients received and completed the JOA questionnaire at return-visit to the outpatient department, through telephone contact, or e-mail.

Statistical Analysis

The recovery time was calculated from the date of operation to the date on which patients achieved 11 scores of JOA. Univariate analysis was used to identify the potential prognostic factors of recovery using the Kaplan-Meier method and log-rank test. The potential prognostic factors with P values <0.10 were then subjected to a multivariate analysis with a Cox proportional hazards model to identify the significant prognostic factors for recovery postoperatively. Significance was set at $P < 0.05$. All the data analysis were performed with SPSS version 16.0 (SPSS, Inc., Chicago, Illinois, USA).

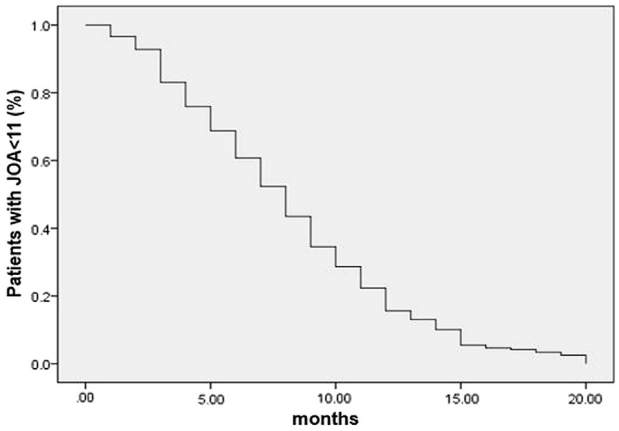

Figure 1. Kaplan-Meier curve for the overall rate of all patients with a Japanese Orthopedic Association score <11.

RESULTS

The survival analysis included 237 patients, 129 men (54.4%) and 108 women (45.6%). The mean age was 42.7 (range: 7–79). The median recovery time (MRT) was 8 months (range: 1–20 months). The Kaplan-Meier curve for the overall rate for all patients with JOA scores <11 is shown in Figure 1.

Univariate Analysis of Prognostic Factors for Recovery After Surgery

The results of the univariate analysis demonstrated that diabetes ($P = 0.095$), paralysis ($P = 0.001$), kyphosis ($P = 0.001$), duration of symptoms (≥3/<3 months, $P = 0.002$), and number of involved vertebrae (>2/≤2, $P = 0.002$) were identified as the potential prognostic factors ($P < 0.10$) responsible for recovery after surgery. This univariate analysis showed no significant association between the postoperative recovery and other prognostic factors (age, gender, source, hypertension history, osteoporosis history, extraspine TB, low-grade fever, night sweat, weight loss, weakness, local pain, limited activity, radicular pain, numbness, touch feeling, tenderness, reflex, mass, sinus, CRP, ESR, surgical approach, and instrumentation) (Table 1).

Multivariate Analysis of Prognostic Factors for Recovery After Surgery

Data on potential prognostic factors (diabetes, paralysis, kyphosis, symptom duration, and number of involved vertebrae) were then subjected to a multivariate analysis using Cox proportional hazards model (Table 2). In this study, the patients with shorter MRT (see Table 1) were regarded as those who achieved better postoperative recovery. Patients without paralysis (MRT = 7.0)