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CASE REPORT

Treatment of Extreme Tuberculous Kyphosis Using Spinal Osteotomy and Halo-Pelvic Traction

A Case Report

Bin Yu, MD*, Ke Zhu, MD*, Deng Zhao, MD, Fei Wang, MD, and Yijian Liang, MD, PhD

Study Design. A case report of treatment of extreme tuberculous kyphosis using spinal osteotomy and halopelvic traction.

Objective. The aim of this study was to describe the process and outcome of treatment of a case with extreme tuberculous kyphosis using spine osteotomy and halo-pelvic traction.

Summary of Background Data. Spinal tuberculosis causes destruction, deformity, and paraplegia. Long-standing kyphosis may progress with growth in children, and produces respiratory insufficiency, and neurologic deficit. Surgery may help to prevent or reverse the neurological deterioration, while improving pulmonary function in cases with significant spinal deformity.

Methods. Review of records and radiographs.

Results. A 24-year-old female with tuberculous angular kyphosis presented with bilateral lower extremities paresis and dyspnea. The vertebral bodies from T3 to T9 were severely destructed, with a Cobb's angle of 180°on radiographs. The total duration of distraction using halopelvic apparatus kept 10 months. During the duration of traction, the patient underwent a posterior release surgery because flexibility of the kyphosis was not sufficient. Pedicle subtraction osteotomy and pedicle screw fixation were performed to achieve final correction when the Cobb's angle decreased to about 80°. After the whole treatment of halopelvic traction and spine ostetomy, the patient's height increased nearly 30 cm, whereas the angular kyphosis was corrected to a Cobb's angle of 30°. The patient had no complication and neurological deterioration during the treatment. Correction angle and good sagittal balance were well maintained in the duration of 2 years' follow-up.

Conclusion. The halo-pelvic apparatus produces high corrective forces applied over a long period, and it provides a slow and safe correction of deformity. In cases of extreme kyphotic deformity, halopelvic traction is an appropriate technique, while avoiding many serious complications from a rapid, one-stage correction.

Key words: halo-pelvic traction, osteotomy, tuberculous kyphosis.

Level of Evidence: N/A

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Kyphosis develops regularly in spine tuberculosis. Deformity correction and stabilization for surgical treatment of severe kyphosis remain challenge. Halopelvic provides an assistance for the treatment of

Figure 1. The kyphosis was obvious on the preoperative photo.

From the Orthopaedic Department, The Third People's Hospital of Chengdu/The Second Affiliated Hospital of Chengdu, Chongqing Medical University, Chengdu, China

*These Authors equally contributed to the work.

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Address correspondence and reprint requests to Yijian Liang, MD, PhD, Orthopaedic Department, The Third People's Hospital of Chengdu/The Second Affiliated Hospital of Chengdu, Chongqing Medical University, 82 Qinglong Street, Chengdu, Sichuan 610031, China; E-mail: yijiancq@163.com

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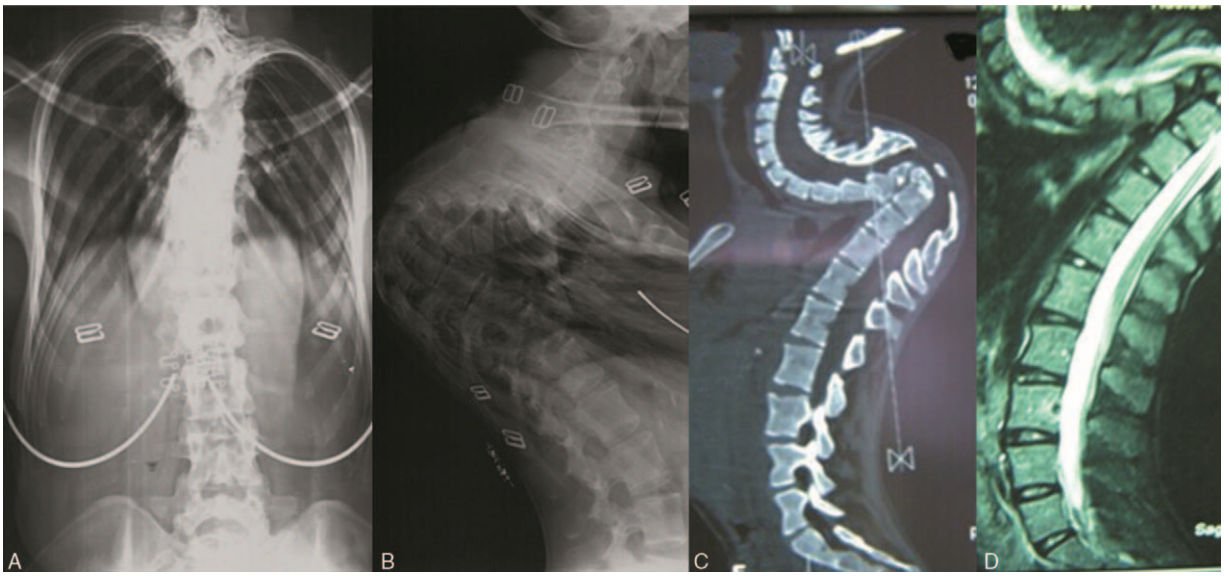

Figure 2. Anteroposterior (A) and lateral (B) radiographs, sagittal CT image (C), and MRI image (D) demonstrated the extreme thoracic kyphosis.

Figure 3. The halopelvic apparatus was fit onto the patient.

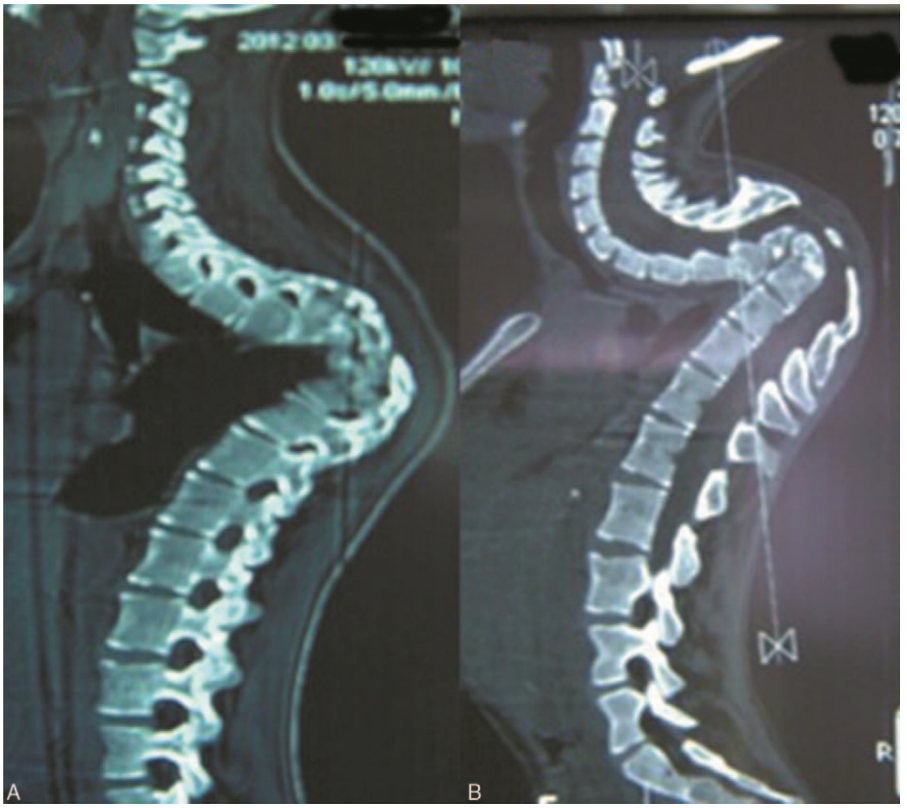

Figure 4. Posttraction sagittal CT image (A) showed obvious correction of Cobb's angle was achieved in contrast to the pretraction (B).

severe spine deformities such as kyphosis and scoliosis since first described in 1971.[1] It has excellent clinical effect even though these procedure have not been popular recently.[2]

In this report, we presented a case in which the authors had treated a patient with tuberculous kyphosis about 22 years and had followed this patient for 2 years after correction.

CASE

A 24-year-old female with tuberculous angular kyphosis presented with bilateral lower extremities paresis and obvious humpback (Figure 1).

Tuberculosis of thoracic vertebra was diagnosed due to dorsal part pain and prolonged low-grade fever 22 years ago. She only took anti-tuberculosis medications for treatment. The patient underwent lesion clearance, posterior

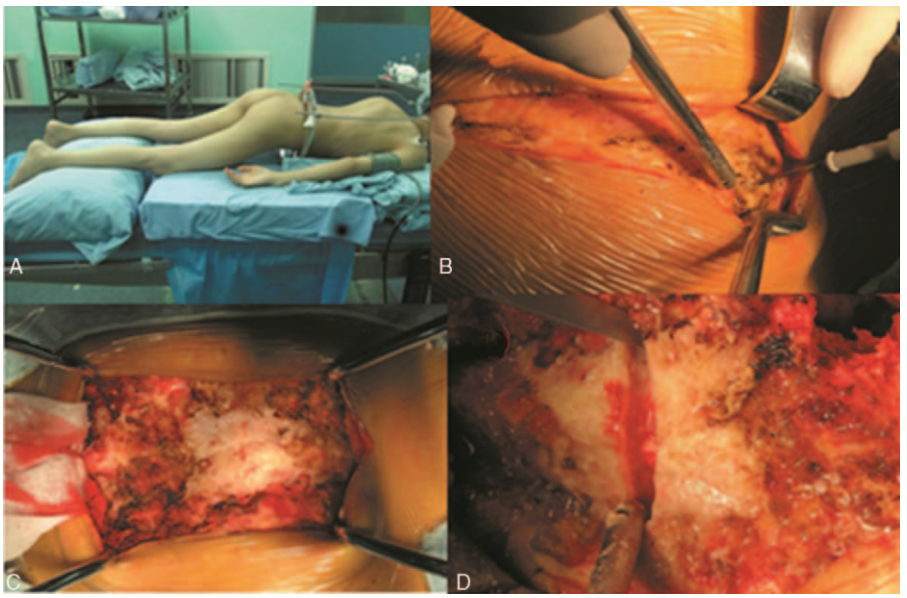

Figure 5. The patient underwent posterior release (A, B) included both soft tissue and fused vertebral lamina. A rectangle bone groove with 0.5 cm wide and 2/3 depth of the lamina (D) was made on every two fused vertebral lamina (C) using a high -speed drill.

fusion, and plaster-of-Paris jacket because of mobility limitation and gatism 15 years ago.

On admission, preoperative radiographs demonstrated the thoracic kyphosis with Cobb's angle of 180° (Figure 2 A, B: radiographs, C: CT image, and D: MRI image). We fit a halopelvic apparatus onto the patient (Figure 3). Although she adapted to it and developed confidence with her breathing, distraction was begun. We carefully monitored whether the neurological deficit got worsening.

After distraction for half a year, the Cobb's angle decreased to nearly 120° (Figure 4. A: post-traction CT image, and B: pre-traction CT image), and the patient had no neurologic deterioration. The patient underwent surgical release because flexibility of the kyphosis was not sufficient. A rectangle bone groove with 0.5 cm wide and 2/3 depth of the lamina was made on every two fused vertebral lamina using a high-speed drill (Figure 5, intraoperative pictures A, B, C, D). After surgery, halopelvic traction was keeping on for another 4 months, until the Cobb's angle decreased to about 80° (Figure 6). Pedicle subtraction osteotomy, pedicle screw fixation, and autologous bone grafting were performed to achieve final correction. The angular kyphosis was corrected to a Cobb's angle of 30° from T1 to T12 (Figure 7). The patient's height increased approximately 30 cm. The whole treatment process was graphic as Figure 8.

There was no specific complication related to the halopelvic distraction during the treatment. The bilateral lower extremities paresis recovered gradually. The patient had been followed for 2 years after treatment. Correction angle and good sagittal balance were well maintained. Hunchback was not viewable (Figure 9).

Figure 6. The Cobb's angle was corrected to nearly 80°after another 4 months of halopelvic traction after posterior release.

DISCUSSION

Spinal tuberculosis causes destruction, deformity, and paraplegia.[3] Long-standing kyphosis may progress with growth in children, and produces neurologic deficit.[4,5] Treatment of spine tuberculosis has evolved in the past years from healing of the lesion with residual deformity to healing of the lesion with minimal or no spinal deformity.[6] Surgical correction of severe kyphosis, along with decompression of the cord and debridement of the tuberculosis-destroyed vertebral bodies, is best to avoid late-onset paraplegia.[7] Several different surgical procedures were available for treating spinal deformities.[8–10] These techniques take a one-stage correction for spine deformity, and undoubtedly increase surgical-related complications, such as large-vessel injuries, neurological injuries (cord, roots, nerves), dural tears, and stabilization failure.[11]

Halopelvic traction corrects spinal deformities successfully, since be demonstrated.[1] But it is not popular recently for its shortcoming. Patients need endurance to wear a big and burdensome apparatus for several months. It would restrain patients much, and bring challenges in appearance, and daily life. Despite these shortcomings, the halopelvic apparatus has advantages over other recently methods, in which angular correction is achieved rapidly and suddenly while the spinal cord has poor tolerance while the kyphosis is very rigid and angled acutely.[12,13]

Figure 7. A physiological curvature of the thoracic vertebrae was achieved after the whole treatment.

Figure 8. Process graph of treatment.

The halopelvic apparatus produces high corrective forces applied over a long period, and it provides a slow and safe correction of deformity.[2] In this case, halopelvic traction combined with surgical release, especially the release of fused vertebral lamina, provided a slow and safe correction of rigid deformity, and achieved optimal correction of deformity in the case presented. Forty degree of correction by osteotomy can avoid excessive shortening of spine, which may result in buckling of the dura and spinal cord, and keep the balance between the amount of anterior column height restoration and posterior column shortening without any implant, such as cage, titanium mesh. So correction to a Cobb's angle of 70°or 80°was the aim of distraction. Then we can correct the Cobb's angle to the range of normal curvature. Osteotomy and pedicle screw fixation were performed to achieve final correction and maintain the effect, and halopelvic apparatus was removed. Halopelvic traction was ideal for the treatment of severe and rigid spinal deformities such as healed tuberculous kyphosis. The strong fixation allowed osteotomies of the rigid deformity to be staged and distraction forces to be gradually applied between stages of surgery without fear of instability or spinal cord compression.

Figure 9. Hunchback was not in viewable 2 years after the operation.

➢ Key Points

- ❑ The patients presented with extreme tuberculous kyphosis with a Cobb's angle of 180°.
- ❑ For treatment, we took four steps, halopelvic traction, posterior release surgery when flexibility of the kyphosis was not sufficient, halopelvic traction, and at last pedicle subtraction osteotomy and pedicle screw fixation.
- ❑ The angular kyphosis was corrected to a Cobb's angle of 30°while the patient had no complication and neurological deterioration during the treatment. Correction angle and good sagittal balance were well maintained in the duration of 2 years' follow-up.
- ❑ In cases of extreme kyphotic deformity, halopelvic traction is an appropriate technique, while avoiding many serious complications from a rapid, one-stage correction.

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