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Successful Congenital Kyphoscoliosis (with Severe Truncal Shift) Correction Associated with Syrinx and Diastematomylia without Prior Neurosurgical Intervention: A Case Report and Brief Review of Literature

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Abstract

Introduction and Importance: The use of halo-femoral traction to ease correction in patients with scoliosis with multiple intraspinal pathologies is an evolving technique that is not yet fully understood. This report aimed to demonstrate the efficiency of using this technique to achieve maximum deformity correction along with decreasing complication rates. **Case Presentation**: Congenital scoliosis with two intraspinal pathologies was corrected in a 17-year-old male with severe truncal shift, who was easily fatigued due to respiratory symptoms, utilizing the traction method with no neurosurgical intervention. The patient had consulted many hospitals locally and internationally, and was told that surgery poses a great risk of neurological deficit. He needed neurosurgical release of the cord prior to any deformity correction. **Management and Outcome**: The patient did not undergo any neurosurgical intervention, but rather posterior spinal correction and instrumented fusion preceded by halo-femoral traction. He was followed up for 5 years and showed complete recovery without any short-term or long-term complications. The patient was able to return to full activity and resolution of respiratory symptoms, and a good alignment on follow-up radiography was observed. **Discussion**: Not all patients with scoliosis associated with intraspinal pathology need treatment before spinal correction. Perioperative halo-femoral traction seems to be safe and effective in maximizing deformity correction and decreasing the risk of complications.

Keywords

Scoliosis, Syrinx, Diastematomylia, Traction, Halo-Femoral Fixation

1. Introduction

Congenital scoliosis is a malalignment of the spine that might cause both coronal and sagittal imbalance, ranging from mild to severe, flexible or rigid, progressive or stable, and might be associated with intradural pathology. Multiple approaches have been described in the literature to treat congenital scoliosis with intraspinal pathology, with the standard approach being referring the patient to neurosurgery for cord release and repair of cord malformations prior to attempting to correct the deformity [1] [2].

The use of halo-femoral traction in scoliosis correction has been described previously in the literature, where a patient with spinal pathology was first treated by spinal cord release; then, traction was applied for a couple of days. Each day, additional weight was added to the traction, and the patient eventually underwent final spinal correction and fusion [3]. Another method described that halo-femoral traction could facilitate the reduction and increase the correction rate if used intraoperatively as one stage surgery [4]. Overall, the traction method was found to be effective in correcting axial deformity, including pelvic obliquity decreasing the Cobb angle, and precluded the need for anterior surgical release in most patients.

To the best of our knowledge, halo-femoral traction utilization in scoliosis correction is limited to deformities with no intraspinal pathologies, or in combination with cord release as a staged procedure prior to final correction.

This case report describes the use of halo-femoral traction without surgical release in congenital scoliosis with two spinal cord pathologies for 3 days before the final posterior fusion.

2. Case Presentation

The patient was a 17 year-old obese male (body mass index, 33.02 kg/m^2) with clear medical background. According to the medical history, the problems started when the patient was 11 years old. The mother noticed a back hump and severe truncal shift; the patient consulted multiple centers locally and internationally and was advised to undergo spinal cord release before final fixation and correction of the scoliosis and truncal shift. Fixing the deformity without cord release poses a significant risk of paralysis and neurological complications.

Eventually, the patient presented to our center, which is a tertiary hospital, where the patient was admitted and underwent radiography (**Figure 1**), whole spine CT (**Figure 2**), MRI (**Figure 3**), bone mineral density (BMD), and pulmonary function tests (PFT), in addition to routine blood workups and imaging. The results showed moderate dorsalkyphoscoliosis centered mainly at the

Figure 1. Long film scoliosis X-ray.

Figure 2. Whole spine CT scan 3D construct.

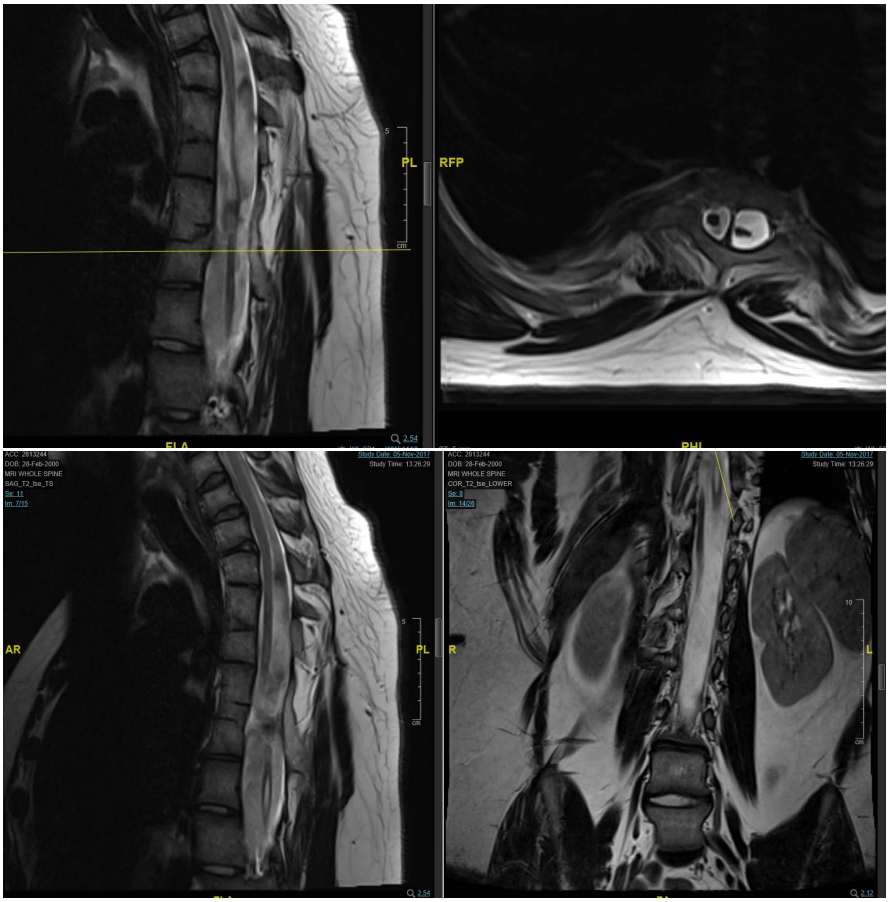

Figure 3. MRI spine shows diastematomylia and syrinx of the cord.

mid-thoracic spine with convexity toward the left with severe truncal shift. Cobb angle was estimated at 40˚ and hemivertebrae from T2 to T7 and loss of height in T8-T9. There was also an abnormal fusion from T1 to T8, as well as rib fusion bilaterally. Finally, a split spinal cord (diastematomylia) was observed with a fibrous band starting at T2 and bony bar at T8/T9, with two hemi cords and a small syrinx in the left hemi cord at T10/T11. BMD was within the expected range for patient's age. On the other hand, PFT showed severe airway flow obstruction, consistent with small airway disease.

3. Management and Outcome

Following a thorough study of the patient's case, the decision was made to operate on him in two stages—stage 1 was to apply a weighted halo-femoral traction until corrections were achieved with continuous monitoring of any neurological manifestations, and stage 2 was to perform posterior spinal fusion and fixation if the patient had no neurological manifestations.

Parents of the patient were informed of the high risk of the procedure, and that if any neurological symptoms developed, traction would be aborted and the patient referred to a neurosurgery service for intervention. The patient was placed in the operating room, and halo-femoral traction was applied without weight.

Once the patient was fully awake, weight was gradually added—while the patient was in the supine position—over days under X-rays shown in Figure 4; continuous monitoring and neurological examination were performed until almost full correction and good body alignment were achieved in 3 days without any neurological deficit. The initial weight was 6 kg on each side, with 1 kg further added daily. Thereafter, the patient was again taken to the operating room for the removal of the halo-femoral traction, C7 to the ilium posterior spinal fusion, and instrumentation with iliac fixation using three rods, as illustrated in Figure 5, due to significant BMI, and therefore the risk of implant failure.

The patient tolerated the procedure well, and a detailed postoperative neurological examination was performed and found to be intact. On postoperative day

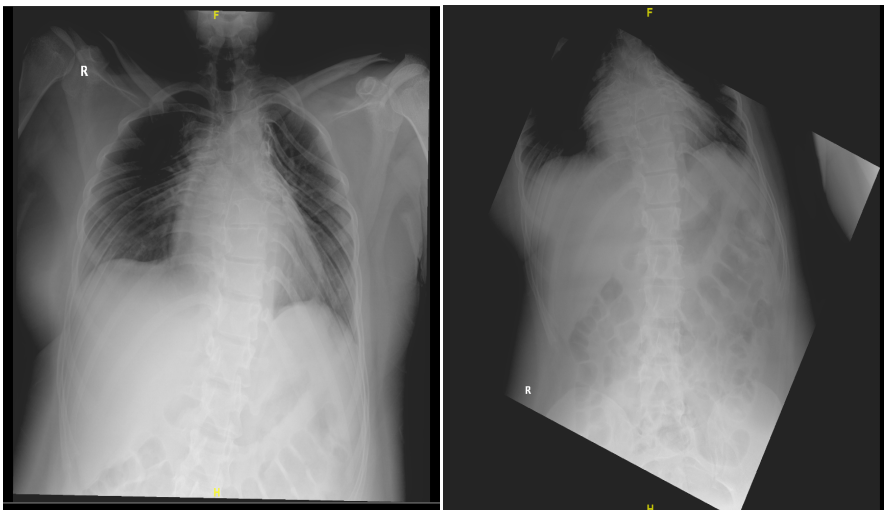

Figure 4. Correction post traction application.

Figure 5. Post removal of traction and final posterior spinal correction and instrumented fusion.

2, pain was controlled, the patient ambulated out of bed independently, and stayed in the hospital for a total of 5 days for rehabilitation and pain control. Before discharge, a long film was obtained that showed full correction and good alignment. Upon follow-up, the patient reported complete resolution of his respiratory symptoms. Examination revealed a healed wound with no complications, good body balance, and intact neurological examination. Over 5 years, the patient was followed up in the clinic with annual radiography and examination, and the patient achieved full recovery without any short-term or long-term morbidity.

4. Discussion

Although several authors do not prefer to use halo-femoral traction for correction of severe spinal deformity [5], others agree upon the benefits of halo-femoral traction [3] [4] because the prolonged use of traction on soft tissue will eventually correct the deformity. In nine studies, a 24% improvement in the coronal plane was reported [5]-[11]; in four studies the improvement in the sagittal plane was 19.3% [5] [6] [7] [10], and the need for osteotomy and surgical release were also reduced. In another study, intraoperative time (420 min in the traction group, 490 min in the control group) and blood loss (1195 mL in the traction group vs. 1305 mL in the control group) were also decreased [12]. According to Mehlman *et al.* [3], the traction method is useful; however, surgical release is required prior to traction, after which patients were sent to the ward and gradual weight was used. After full correction of the spine, patients were taken back to the operating room for final spinal fusion. Looking back at our patient, where traction was placed in the operating room under general anesthesia, no other invasive surgical procedure was performed. The patient stayed in the ward for 3 days under traction in the supine position, and the weight was increased daily with close neurological and radiological observation. Once the patient achieved full correction without neurological complications, a final posterior spinal fusion was performed and traction was removed.

In addition, a couple of studies were conducted to compare the effect of traction on respiratory function [5] [13] and showed that a significant improvement in respiratory function was noted in the traction group during follow-up. As was also observed in our case, during the pre-traction investigation, the pulmonary function test showed severely restricted pulmonary disease. During the traction period, the patient's condition continued to improve postoperatively. The patient reported complete resolution of his repository symptoms during the follow-up.

Traction related complication [6] [7] [8] [9] [11] [12] [14] [15] [16] were reported in nearly ten articles, with the majority of the complications being related to pin sites, some other complaints included headache, neck pain, visual complaints, and some neurological deficits, including numbness and physical examination findings such as hyperreflexia [14]. However, all symptoms were re-

lieved after decreasing the traction weight. One author reported that his patient developed a palatal (roof of the mouth) paresthesia, therefore, he had to abort the traction [14], another study mentioned that a traction was used on a patient with pre-existing neurological deficit and with the traction, the patient developed spastic paraplegia [7]. In our patient, traction underwent smoothly without any complications.

5. Conclusion

Spinal deformity cases associated with intraspinal pathology can be treated successfully without the treatment of intraspinal pathology if the fixation of the spine is preceded by a period of halo-femoral traction that can achieve spinal correction uneventfully.

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Provenance and Peer Review

External peer review.

Patient Informed Consent

Informed consent was obtained from the patient.

Declaration of Competing Interest

No conflict of interest is reported by any of the authors in relation to this study.

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