

CASE REPORT

Posterior Vertebral Column Resection for Severe and Rigid Spinal Deformity Associated With Neurological Deficit After Implant Removal Following Posterior Instrumented Fusion

A Case Report and Literature Review

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Study Design. Case report.

Objective. To investigate the safety and efficacy of posterior vertebral column resection for severe and rigid spinal deformity associated with neurological deficit after implant removal following posterior instrumented fusion.

Summary of Background Data. Loss of correction after implant removal in patients with posterior instrumented fusion has been previously reported. However, to our knowledge, posterior vertebral column resection (PVCR) for severe and rigid spinal deformity associated with neurological deficit after implant removal following posterior instrumented fusion has not been reported.

Methods. An 18-year-old female with severe and rigid spinal deformity associated with neurological deficit was classified as Frankel C, according to the Frankel grading system. She underwent posterior spinal fusion with pedicle screw fixation at 16 years, and her implants were removed after 1 year due to back pain. Seven months after removal of the implants, she began to experience weakness in her lower limbs but did not seek any treatment. She was unable to stand and had to use a wheelchair. The patient successfully underwent PVCR and posterior reinstrumentation. Within 3 months, her neurological status improved to Frankel E.

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Results. The patient had no neurological deterioration and infections. There was no instrumentation failure and loosening correction at the 32 months follow-up.

Conclusion. Our results suggest that PVCR and pedicle screw fixation is a safe and efficacious option for severe and rigid spinal deformity associated with neurological deficit after implant removal following posterior instrumented fusion.

Key words: posterior vertebral column resection, spinal deformity, implant removal, neurological deficit.

Level of Evidence: N/A

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Occasionally an implant needs to be removed due to late surgical site pain or late-developing infection.^{1–5} Loss of coronal or sagittal plane correction after removal of spinal implants has been reported.^{6,7} However, to our knowledge, there are no case reports of severe and rigid spinal deformity associated with neurological deficit after implant removal following posterior instrumented fusion.

Herein, we discuss a patient with severe and rigid spinal deformity associated with neurological deficit after implant removal following posterior instrumented fusion, who was successfully treated with posterior vertebral column resection (PVCR).

MATERIALS AND METHODS

An 18-year-old female had undergone posterior spinal fusion with pedicle screw fixation at 16 years of age in another hospital. Her radiographs revealed that the coronal and thoracic kyphosis Cobb's angles were 75° and 80°, respectively, before removal of the implants (Figure 1). Her implants were removed after 1 year due to back pain, and then she began to experience weakness in her lower limbs. Seven months before admission to our hospital, the patient reported inability to stand or walk, and had to use a wheelchair in daily life (Figure 2).

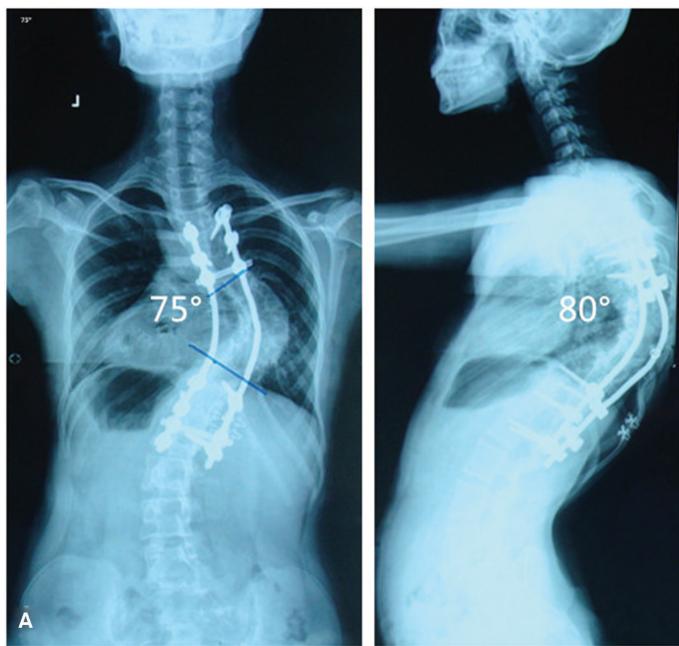


Figure 1. Long-standing scoliosis radiographs revealed that the coronal and thoracic kyphosis Cobb's angles were 75° and 80°, respectively, before implant removal.



Figure 2. The patient had to use a wheelchair in daily life.

Complete physical examination showed skin hypoesthesia below the umbilical plane, and lower limbs spasticity. The patient had weakness of the intrinsic musculature of lower limbs. Her Babinski sign was positive. Achilles and knee tendons showed hyper-reflexia.

The preoperative long-standing scoliosis radiographs revealed that the coronal and thoracic kyphosis Cobb's angles were 100° and 95°, respectively (Figure 3). The distance between the C7 plumb line and central sacral vertical line (Coronal Trunk Balance, CTB) was 28 mm; the distance between the posterior superior corner of S1 and C7 plumb line (Sagittal Trunk Balance, STB) was 34 mm. The whole spine 3-dimensional-computed tomography scans showed spinal fusion (Figure 4), and magnetic resonance imaging of the spinal canal revealed stenosis. Electrodiagnostic testing showed neurological deficit.

The pedicle screws were inserted using free-hand technique based on the reports by Kim *et al*⁸ and Yang *et al*.⁹ The patient underwent a VCR at T8, and posterior spinal fusion from T2 to L4 (Figure 5). Spinal cord monitoring, including motor evoked potentials (MEP), somatosensory evoked potential (SEP), and wake up test were performed to determine the intraoperative complications of spinal cord injury.

RESULTS

The surgery duration was 420 minutes, and the blood loss was 4000 mL. There were no changes in the signals of MEP and SEP, and wake up test was normal. Results postoperatively, the coronal main curve was corrected to 40° and sagittal kyphosis curve to 35° (Figure 6); the CTB and STB improved to 10 mm, 17 mm; and to 12 and

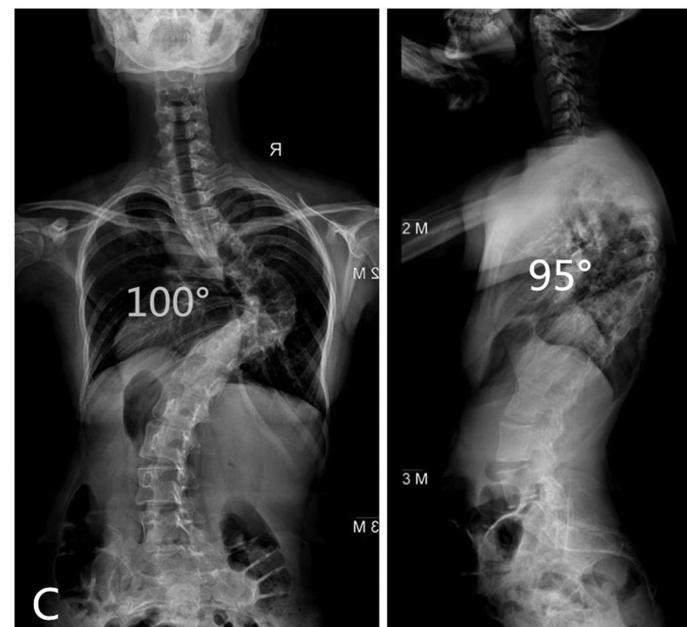


Figure 3. Long-standing scoliosis radiographs showed that the coronal and thoracic kyphosis Cobb's angles were 100° and 95°, respectively, one year after implant removal.

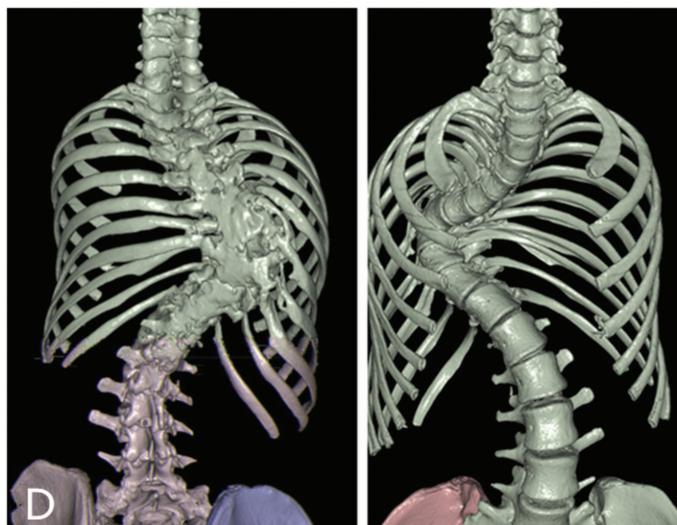


Figure 4. Three dimensional-computed tomography scans showed posterior spinal fusion.

18 mm at the last follow-up. Three months after PVCR, the patient's neurological status improved to Frankel E. At the 32 months of follow-up, there was no neurological status deterioration, instrumentation failure and loosening correction, and a solid fusion was radiologically evident (Figures 7 and 8).

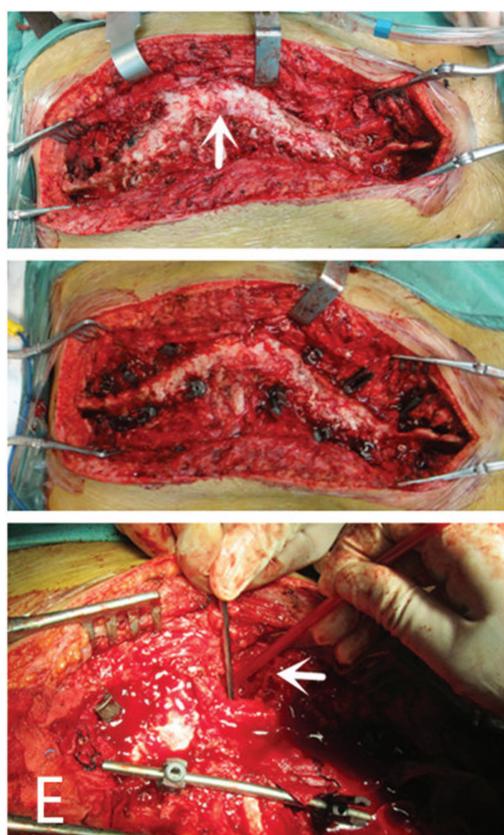


Figure 5. Intraoperative photograph showed spinal posterior fusion, which was treated with posterior vertebral column resection (T8) and pedicle screws fixation (T2–L4).

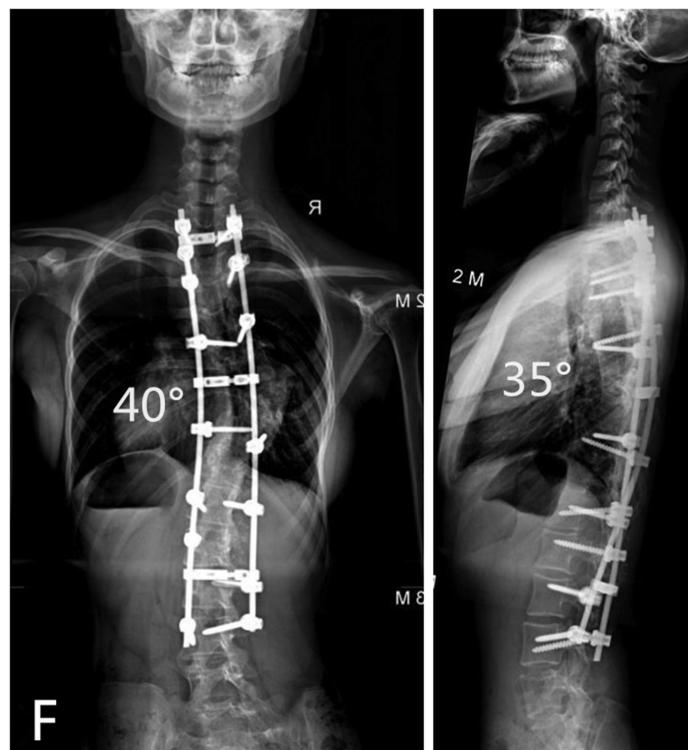


Figure 6. Postoperative long-standing scoliosis radiographs revealed good correction of severe and rigid spinal deformity, wherein the coronal main curve could be corrected to 40° and sagittal kyphosis curve to 35°.

DISCUSSION

Instrumented posterior spinal fusion is the most common surgical treatment for progressive scoliosis. Due to advancements in the pedicle screw rod technique and PVCR for spinal deformity, correction has improved.^{10–15} However, due to neurological deficit after spinal deformity, surgical treatment could be difficult.^{16,17} Some studies have described the need for implant removal due to infection and late surgical site pain.^{1–5} In 2014, Hilary *et al*¹⁸ reported that indications for removal of spinal implants include pain (57%), infection (28%), hardware failure (8%), and prominent hardware (7%). Rathjen *et al*¹⁹ reported removal of implants in patients due to infection and pain. However, neurological deficit was not reported after removal of spinal implant. Loss of correction in coronal and sagittal planes was obvious in our patient.

In this case, the patient successfully underwent PVCR and re-instrumentation. Postoperative long-standing scoliosis radiographs showed good correction. Within 3 months, the patient's neurological status returned to normal, and she was regularly attending college with a high degree of satisfaction. There was no instrumentation failure and loosening correction at the follow-up.

In summary, to the best of our knowledge, we present the first report on severe and rigid spinal deformity associated with neurological deficit in a patient after implant removal following posterior instrumented fusion. The patient's neurological status returned to normal after PVCR.

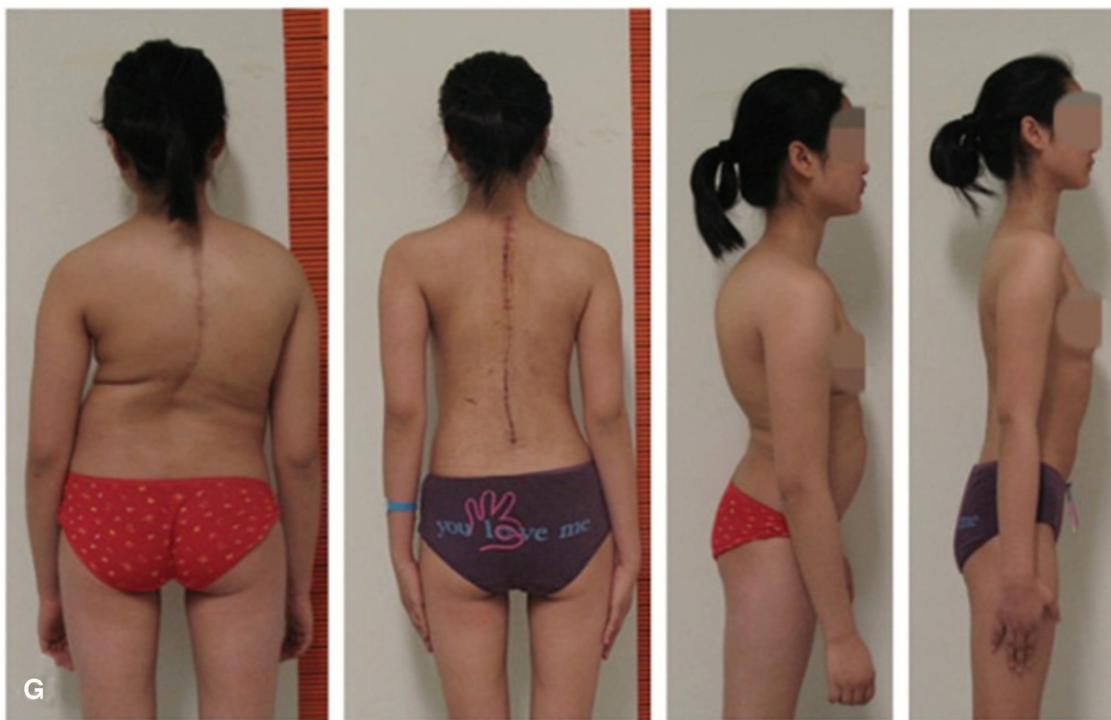


Figure 7. The patient had an obvious improvement as seen from her pre- and postoperative clinical photographs. The coronal and sagittal balance of the trunk had greatly improved. Also, her neurological status improved from Frankel C to E.

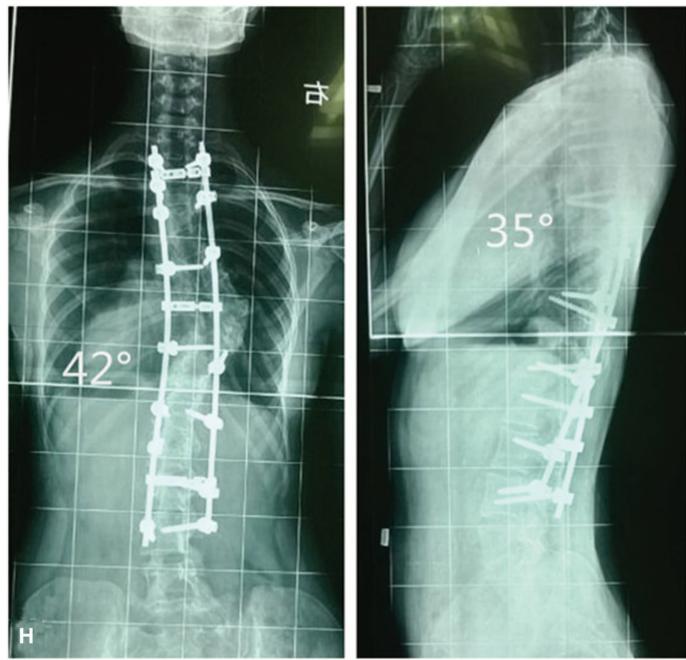


Figure 8. At the 32 months follow-up, the coronal main curve was 42° and sagittal kyphosis curve was 35°. There was no neurological status deterioration, instrumentation failure, and loosening correction.

CONCLUSION

Our study suggests that PVCR is a safe and efficacious option for severe and rigid spinal deformity associated with neurological deficit after implant removal following posterior instrumented fusion.

➤ Key Points

- There is a risk for neurological deficit after removal of an implant.
- This is the first case report of PVCR for severe and rigid spinal deformity associated with neurological deficit after implant removal following posterior instrumented fusion.
- The patient's neurological status successfully improved from Frankel C to E after PVCR.

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