

Case Report

One-stage surgery through posterior approach-for L5-S1 spondyloptosis

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Abstract

Grade 5 spondylolisthesis or spondyloptosis is a rare condition. Generally, the surgical management of spondyloptosis includes multi-staged procedures instead of one-staged procedures. One-stage treatment for spondyloptosis is very rare. A 15-year-old girl with L5-S1 spondyloptosis was admitted with severe low back pain. There was no history of trauma. The patient underwent L5 laminectomy, L5-S1 discectomy, resection of sacral dome, reduction, L3-L4-L5-S1 pedicular screw fixation, and interbody-posterolateral fusion through the posterior approach. The reduction was maintained with bilateral L5-S1 discectomy, resection of the sacral dome, and transpedicular instrumentation from L3 to S1. In this particular case, one-staged approach was adequate for the treatment of L5-S1 spondyloptosis. One-staged surgery using the posterior approach may be adequate for the treatment of L5-S1 spondyloptosis while avoiding the risks inherent in anterior approaches.

Key words: Internal reduction, pedicular fixation, spondylolisthesis, spondyloptosis

INTRODUCTION

Spondyloptosis is defined as a complete anterior dislocation of the L5 vertebral body from sacrum. Treatment of the spondyloptosis is challenging. The authors recommended nonoperative treatment for nonprogressive slips less than 50% in asymptomatic patients or surgical treatment is recommended for progressive slips greater than 50% or in symptomatic patients.^[1-3] Combined anterior and posterior fusion with reduction using instrumentation is usually recommended for the surgical treatment.^[4-6] However, the transabdominal procedure is technically difficult and there are risks of severe complications for neural and vascular structures.^[4,5]

We present a patient with L5-S1 spondyloptosis who underwent surgery with a simple-staged posterior surgical approach. In our patient, we referred a one-stage operation posterior approach operation. The posterior approach was used with success and without severe complications. Posterior decompression, posterior pedicular fixation, and reduction were found to be adequate for the treatment of L5-S1 spondyloptosis in our particular patient.

CASE REPORT

A 15-year-old girl was admitted with severe lower back pain for 1 year. There was no history of trauma. Neurological examination was normal. We observed obvious lumbar hyperlordosis and lumbosacral kyphosis. She had limited flexion of the lumbar spine. The patient had severe deformity in the sagittal plane, including lumbosacral kyphosis, lumbar hyperlordosis and pelvic rotation. Plain radiography showed pars defect, dysplasia of facets and a round sacrum with a slip angle of 75. Sagittal plane computed tomography (CT) scans demonstrated complete anterior descent of the L5 vertebra to the sacrum [Figure 1]. A lumbosacral magnetic resonance imaging (MRI) revealed severe

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compression of the thecal sac at the L5-S1 level and L5-S1 intervertebral disc degeneration [Figure 2].

A one-stage posterior approach was planned. In the prone position an inverted skin incision was made from L1 to the S2 using subperiosteal muscle stripping to the tip of the transverse process and sacral ala on each side. Decompressive L5 total laminectomy, bilateral L5, S1 foraminotomy, bilateral L5-S1 discectomy, resection of sacral dome, and L3, L4, L5, S1 pedicular screw fixation were performed. A bilateral posterolateral arthrodesis and interbody fusion at the L5-S1 level was performed. The reduction was maintained with bilateral L5-S1 discectomy, resection of the sacral dome, and transpedicular instrumentation from L3 to S1 and without L5 corpectomy. The slip reduced with the resection of sacral dome, and L5-S1 posterior discectomy. Reduction pedicle screws use for stabilization, in both L5 pedicles. As before we performed sacral dome resection and discectomy, we had not to apply considerable force to the screws. We needed not necessary

to pull the vertebral body up to a straight rod. Intraoperative neuromonitoring was performed. The stimulus-evoked monitoring was used to determine the response threshold of the L5 and S1 roots during the manipulations, particularly the distraction stages. The stimulus-evoked monitoring was also used during pedicle screw placement. The slipped angle of 75° was corrected to 30° using pedicle screws following laminectomies and resection of the sacral dome [Figure 3]. At the 25-months follow-up, she was fully active, with no neural deficit or pain. No loss of reduction, nonunions, loosening of the graft and breakage of screw were seen at radiological evaluation [Figures 4 a-d].

DISCUSSION

Spontaneous fusion of the fifth lumbar to the first sacral vertebra



Figure 1: Preoperative sagittal reconstructed CT scan demonstrating complete anterior descent of the L5 vertebra to the sacrum

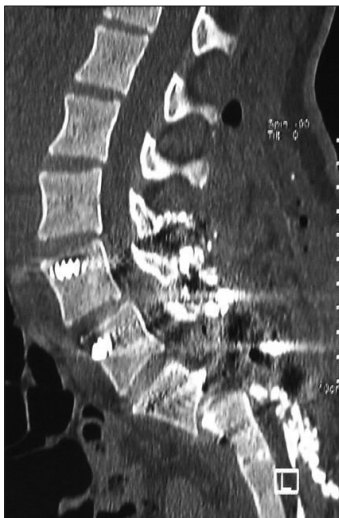


Figure 3: Sagittal reconstructed CT scan obtained early postoperative



Figure 2: Preoperative sagittal lumbosacral MRI revealing severe compression and narrowing of the thecal sac at L5-S1 level

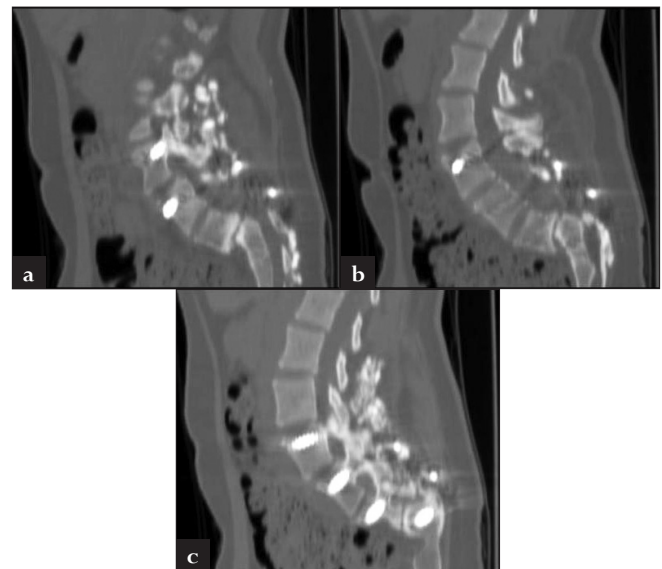


Figure 4: (a,b,c) Sagittal reconstructed CT scan obtained at 25 months. No loss of reduction, nonunions, loosening of the graft and breakage of screw were seen at radiological evaluation

occurs in approximately 50% of patients with spondyloptosis.^[6] However, progression of the deformity has been widely reported in younger patients (10-15 years old).^[5-7] The clinical indications for surgical treatment of spondyloptosis include lower back pain, radicular pain, progression of spinal deformity, and neurological abnormalities such as radiculopathy or cauda equina syndrome.^[1,2,8-10] The goals of surgical treatment are to relieve the pain to reduce neural deficit and to prevent progression of the deformity.

The suggested methods of surgical treatment for spondyloptosis include decompression, and fusion, with or without reduction [posterolateral and/or anterior, single or two staged]. In a two-staged approach, the first stage consists of anterior resection of the body of the fifth lumbar vertebra, and the an L4-L5 and L5-S1 anterior discectomy.^[5-7] The second stage consists of posterior resection of the posterior arch of the fifth lumbar vertebra, reduction, and fixation. The two-stage approach is recommended for young adults. In children and young adults, combined anterior and posterior arthrodesis can result in excellent correction.^[6,11] However, prior retroperitoneal surgery, severe peripheral vascular disease active disc space infection, neoplasm infrarenal aortic aneurysm, anomalous genitourinary system are relative contra-indication for anterior approach. After anterior lumbar approach, it is possible to develop a postoperative herniation, which may lead to bowel obstruction and possible bowel infarction. Iliac arteries or veins, the inferior vena cava, and the aorta occur in 2-4% of anterior approach.^[12-15] Retrograde ejaculation is a serious complication (0.5-2%) in males. Autonomic nerves at the L5-S1 level may be damaged and this can lead to autonomic dysfunction. There is no surgical management for this complication. Thrombosis of either venous or arterial structures may occur (1-11%).^[13-15] Neurological complications are quite rare and related to injuries to the nervous structures during operative procedure. Graft collapse occurs in 1-2% of all anterior approach. Graft dislodgment occurs in 1% of all anterior approach, and the treatment is reoperation using an anterior approach.^[15] Complications related to the bony fusion portion of the operation are the most common complication of anterior lumbar approach. It is the adequacy of the long term bony arthrodesis that provides long-term pain relief in patients undergoing anterior approach, and long-term results are promising.

Pedicular fixation systems alone make it possible to reduce and stabilize high-grade spondylolisthesis especially at L5-S1 level with a single-stage approach.^[10,14] However, authors have reported high nonunion and implant failure rates. The incidence of pseudoarthrosis after posterior spine arthrodesis has been reported to be as high as 25%.^[2] Pseudoarthrosis after spinal surgery for spondylolisthesis may present with a progression of deformity, radiological instability, pain, myelopathy or radiculopathy. Pseudoarthrosis is more commonly a problem in patients with spondylolisthesis, especially in those individuals with a higher grade of subluxation.^[3] Spondylolisthesis normal spinal biomechanics are altered so that large tensile forces are imposed on the graft site, limitary the capacity of fusion. There is no correlation between radiographic pseudoarthrosis rates and clinical outcome results.^[16] No treatment is required

for asymptomatic pseudoarthrosis, and the patient should be observed with serial radiographs.^[17]

Reduction remains a controversial treatment for spondyloptosis. The reported disadvantages of reduction are distraction of roots and cauda equina syndrome in patients with severe spondylolisthesis whereas, the reported advantages of reduction are neurological decompression by foraminotomy, correction of the lumbosacral kyphosis, and restoration of alignment in the sagittal plane.^[9,10,18,19] The degree of sagittal rotation is the primary determinant of the clinical deformity and reducing the amount of sagittal rotation can lessen the cosmetic deformity. Reduction can be performed internal and external. External spine fixation [using the Magerl technique], pelvic suspension, and halofemoral traction have been reported for closed reduction.^[1,9] Internal reduction with posterior instrumentation can result in an improvement. The plasticity of young patient' neural structures makes reduction by distraction possible without serious risks of root damage.^[12] All disc material must be excised before reduction. The reductive strains must be applied slowly and gently, allowing several minutes (10-15 minutes) between successive steps.^[12]

Pedicular fixation systems provide the opportunity to reduce and stabilize spondyloptosis by a single-stage posterior approach without the requirement of an additional anterior approach. Despite the need for a short segmental instrumentation, the reductive forces cannot be applied to short spinal segment.^[9] Resection of the sacral dome facilitates reduction and provides the best decompression of the fifth lumbar-nerve root.^[9]

We preferred not to fuse the patient *in situ*. Although this is a common method in the treatment spondyloptosis, progression of deformity is reported in younger patients.^[5,6] In this particular young patient, we think that the insitu fusion would not be the optimum way of treatment with lack of properly alignment and reduction. Our aim was to perform a relatively simpler approach instead of a more complex 360° spinal stabilization. We had an optimum clinical and radiological outcome with a well stabilized vertebral column and without morbidity, that might justify our surgical strategy.

CONCLUSIONS

In conclusion, surgical treatment of spondyloptosis is difficult and complex. As seen in our particular patient, a one-staged approach may be adequate in the treatment of the spondyloptosis, while avoiding multi-staged and complex approach, and their complications.

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