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Lumbosacral Spondyloptosis Treated By Two-Staged Fusion in Situ Operation: A Case Report

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ABSTRACT

OBJECTIVE: Various operation techniques have been performed for treatment of lumbosacral spondyloptosis. However, there is not a standard treatment strategy because the disease is rare and the reported cases are in small series of other high-grade spondylolistheses.

METHOD: A 28-year-old lady with lumbosacral spondyloptosis was treated by a two-staged operation. A fibular allograft was first introduced into the L5 and S1 bodies by an anterior approach. Afterwards, posterior decompression, posterolateral fusion, and transpedicular screw fixation were performed.

RESULTS: Complaints of the patient gradually resolved in 6 months. She remained symptom-free at the 51-month follow-up and the deformity had not progressed.

CONCLUSION: The method performed in the patient presented here is a technically reliable and safe method providing adequate decompression, solid fusion and long-term stabilization in L5-S1 spondyloptosis.

KEY WORDS: spondyloptosis, spondylolisthesis, spinal fusion, spinal instrumentation

INTRODUCTION

Spondyloptosis, Grade V spondylolisthesis, is complete dislocation of the L5 vertebral body on the sacrum anteriorly. The natural history of untreated spondyloptosis is not clear because it is an unusual condition and most studies place it with lower grades of spondylolisthesis. The suggested methods of treatment for spondyloptosis except benign neglect have included fusion in situ (1,8,9,12,20), and reduction and fusion (2,5,9,10,15,17). Most authors agree that fusion in situ is a safe and reliable method for treatment of high-grade spondylolisthesis. However, others have suggested that reduction of severe anterior displacement and lumbosacral kyphosis may prevent persistent lumbosacral deformity (6,13,18).

We report a case of spondyloptosis treated with a fusion in situ method. A two-staged operation including anterior fusion and posterior decompression, posterolateral fusion and posterior stabilization were performed.

Case Report: A 28-year old female was admitted with complaints of low back pain for 14 years after falling, bilateral leg pain especially in the left leg and intermittent urinary incontinence for two years. On neurological examination, the straight leg raising test was positive at 45

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degrees on the left side, and 60 degrees on the right side. The anal sphincter tone was normal.

On lumbosacral radiographs, there was L5-S1 grade V spondylolisthesis. Lumbosacral computerized tomography (CT) sections showed bilateral prominent elongation of pars interarticularis, and CT sagittal reconstruction clearly showed the slip (Figure 1). On lumbosacral magnetic resonance imaging (MRI) examination, there was spinal canal stenosis at the L5-S1 level due to slip (Figure 2).

Anterior fusion was first performed. A fibular allograft was inserted into a tunnel prepared in the L5 and S1 bodies through an anterior suprapubic transperitoneal approach (Figure 3). Thereafter, posterior decompression, fusion and internal fixation were performed on same day. L5-S1 laminectomy and bilateral L5 foraminotomy were performed, the posterior part of S1 body was partially removed, and sacral roots were decompressed. Then, posterolateral fusion with autograft taken from spinous processes and laminae of L5 and S1, and L4 and S1 posterior internal fixation with a transpedicular screw-rod system were performed.

The patient was mobilized after two days with a lumbosacral corset. Postoperative radiographs (Figure 4) and CT examination showed the slip unchanged and the fibular allograft in the L5 and S1 bodies. The complaints of intermittent urinary incontinence and low back and leg pain gradually resolved in 6 months. There were no complaints, and the slip was same degree on sagittal CT reconstruction after 51 months (Figure 5).

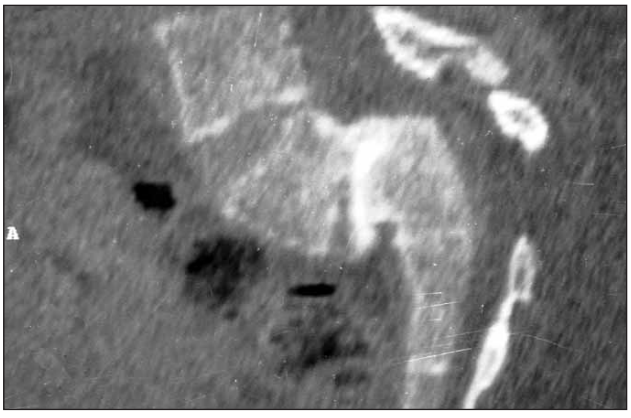

Figure 1- Sagittal lumbosacral CT reconstruction of the patient.

Figure 2- Sagittal T2-weighed lumbosacral MRI section of the patient. Note the anterior position of the L5 body compared to the S1 body and prominent spinal canal stenosis between the S1 body and L4 spinous process.

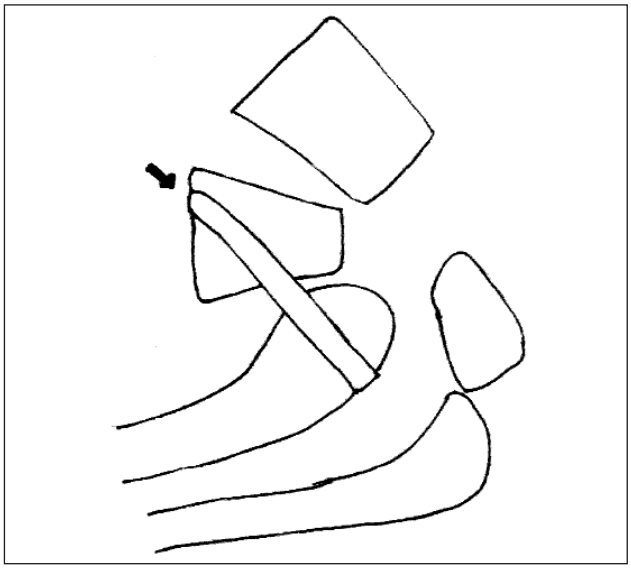

Figure 3- Schematic representation of insertion of the fibular graft through the L5 body to the S1 body by the anterior approach in the patient.

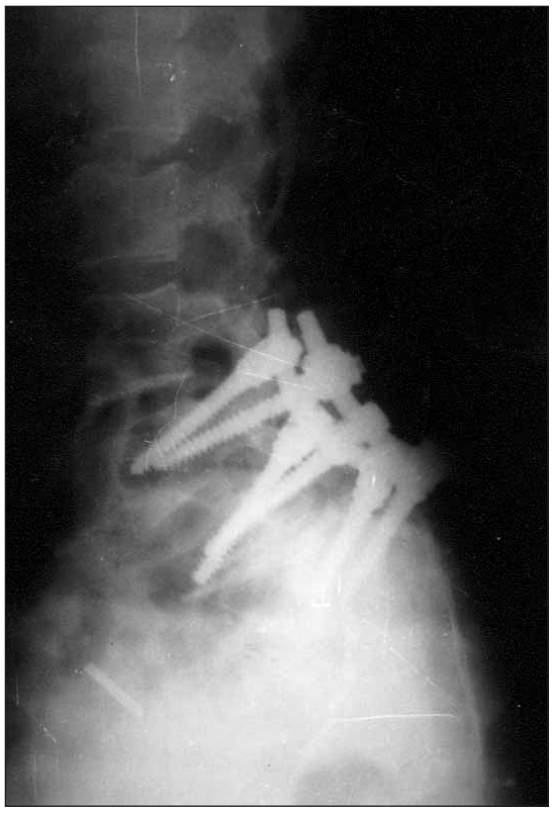

Figure 4- Postoperative lateral lumbosacral radiograph of the patient.

Figure 5- Follow-up sagittal CT reconstruction of the patient 51 months after surgery. The anterior fibular graft is clearly seen. There was no progression of the deformity compared to the preoperative examinations.

DISCUSSION

Spondyloptosis defines the condition where the L5 vertebral body has completely dislocated from the sacrum anteriorly, and descended into the pelvis (2). The etiopathogenesis of this disease is unclear. A few cases caused by traumatic acute spondylolysis have been reported in the literature (10,17). Developmental spondylolyses have some type of dysplasia in the posterior elements such as spina bifida of the S1 and S2 segments and frequently the L4 and L5 segments, unsegmented lumbosacral articular facets, hypoplastic L5-S1 facets and elongated isthmus (2). The presence of these dysplasias raises the question about whether these changes are congenital as described by Newman (17). In our case, there was isthmic elongation, and also a lumbar trauma history in childhood.

The natural history of untreated spondyloptosis is not clear because it is an unusual condition and most studies place it with high-grade (grades III and IV) spondylolisthesis. Patients with spondyloptosis have back pain, radicular pain, motor and sensory deficits in the lower extremities, and symptoms resembling intermittent claudication or a cauda equina syndrome (2,3,5,7,10,12,13,16,17,19). The physical examination may show flattening of the buttocks, loss of trunk height, tight hamstrings, and an associated structural scoliosis (2,3,5,7,10,12, 15,16,19, 20). Urinary incontinence has not been often reported in wide series of severe spondylolisthesis (3,13) except the series reported by Smith and Bohlman (11). Smith and Bohlman (20) reported that 4 of their 11 cases with severe spondylolisthesis had urinary incontinence, and there was evidence of return of function in all four patients six weeks to 2 years after surgery. In the patient presented here, the prominent symptom was urinary incontinence, and sphincter function was normal after 6 months of surgery.

Treatment of patients with spondyloptosis is a challenge. The goal of treatment is to relieve the pain and the neurological deficit, to prevent progression of deformity and to provide a long-term stabilization by solid fusion (3,12). The suggested methods of treatment for spondyloptosis except benign neglect have included fusion in situ with or without decompression (1,8,9,12,20), and reduction and fusion (posterolateral and/or anterior, single-, double- or triple-staged) (2,5,10, 15,17). Most authors

agree that fusion in situ methods are safe and reliable for treatment of high-grade spondylolisthesis. However, the deformity may progress after fusion in-situ (13,18). Reduction methods may yield better rates of fusion, of relief of pain, of correction of deformity, and of improved appearance than in situ arthrodesis, but they are lengthy, technically challenging, and have a considerable rate of complications (2,5,7). In addition, the deformity may also progress after reduction and fusion methods (8,15).

Various methods have been described for both in situ arthrodesis, and reduction and fusion in spondyloptosis. One of the popular reduction methods is the Gaines procedure. In this procedure, the anterior lumbosacral spine is approached and the body of L5 is first removed to the base of the pedicles;the loose neural arch and the pedicles of L5 are then removed, and the body of L4 is reduced onto S1 and stabilized by transpedicular instrumentation through a midline posterior approach (10,15). In the Lehmer series (15) using this method, 25% of the patients required reoperation because of delayed union of fusion or breakage of implant. In small series, good results were reported by various methods requiring long-term closed reduction, combined anterior and posterior approaches, and long term orthesis usage (2,9,14).

These sophisticated treatment methods for spondyloptosis incur the risk of neurological injury. The rate of neurological complication with reduction has been reported to be as high as 20-31% (2,5). These are multiple nerve root lesions, especially L5 root deficits, due to marked stretching of the cauda equina. The incidence of bowel, bladder, or sexual dysfunction is high (7). These procedures are actually lengthening procedures and the lumbosacral roots may be tethered by anatomically correcting the translational deformity6. In addition to the risk of neurological deficit, there may be some loss of correction by the end of the treatment in reduction methods (8,15).

Various methods have also been described for fusion in situ in spondyloptosis. Decompression may or may not be performed while anterior and/or posterior fusion may be performed. Grzegorzewski and Kumar (11) have reported 21 patients with grade III, IV and V spondylolisthesis treated by in situ posterolateral arthrodesis from L4 to S1 and immobilization in a pantoloon cast for four months. All patients had reported improvement after the operation. Radiographic findings showed progression of the slip in five patients, but progression was not associated with symptoms.

Bohlman and Cook (1) described a one-stage posterior approach applicable to the completely dislocated lumbosacral joint which includes posterior neural decompression, bilateral posterolateral fusion, and interbody fusion using a fibular strut. In this technique, after a wide fifth lumbar and first sacral, and if necessary, fourth lumbar laminectomy and a wide fifth lumbar and first sacral foraminotomy, the dura is gently freed from the postero-superior prominence of the first sacral vertebral body, and the sacral prominence is osteotomized to decompress the dura anteriorly. Next, a posterior interbody fusion is performed with bilateral fibular strut grafts inserted into bilateral holes drilled into the L5 and S1 bodies. In 1990, Smith and Bohlman (20) have reported 11 cases with Grade III-V spondylolisthesis treated by the same procedure, of which six were of spondyloptosis. They reported that a solid fusion was obtained in all patients, and all had major or complete neurological recovery in between two to twelve years of follow-up. None of their patients had complications or major changes in the position of the vertebrae, despite early mobilization two or three days after surgery, and osseous union was achieved in all of them. In 1938, Speed (21) reported on a case with severe spondylolisthesis that he treated successfully with an arthrodesis performed through a transabdominal approach using a single tibial bone strut that was placed in much the same position as the fibular graft that Bohlman et al inserted. Recently, Bozkus and Dickman (4) reported a similar technique with posterior interbody cage insertion and pedicle screw fixation and reduction of deformity for treatment of a case with high-grade spondylolisthesis.

Fusion in situ may be performed with or without decompression in spondyloptosis. Fusion in situ without decompression may cause postoperative neurological deficits, especially in the presence of preoperative deficits. L5 nerve root deficits are too frequent as in the reduction methods, presumably caused by intrathecal bleeding from decortication trauma or progression of the deformity during positioning (7,16,19). Extended L5 foraminotomy may be necessary to prevent this complication. The

sacral roots may be draped over a posterior prominence of the first sacral vertebra, and a laminectomy and resection of some bone from the posterior part of the first sacral vertebral body may be necessary to relieve the neural compression completely (20). Fusion in situ may be performed via only a posterior approach without anterior fusion in spondyloptosis. However, spondylolisthesis is a slip without angulation, but spondyloptosis is a more serious problem with a lumbosacral kyphosis superimposed on a slip which on its own would not be so serious, and it is generally accepted that a kyphosis in other parts of the spine requires an anterior fusion for a successful result (8).

We performed a two-stage operation with an anterior L5-S1 fusion with a fibular allograft, and then a posterior decompression, posterolateral fusion and internal fixation. This procedure resembles to the procedure described by Bohlman et al (1,20) except that we performed it in two stages, and we performed internal fixation with pedicle screw-rod system. In our opinion, application of an anterior strut graft is more reliable procedure compared to the posterior approach because there is need for some dural traction in order to insert the strut graft. We performed posterior transpedicular fixation in addition to anterior strut graft in this case to provide a stronger construction. Fusion was obtained, and the deformity had not progressed 44 months after the surgery. The low back pain, leg pain and urinary incontinence were totally resolved.

The method performed in the patient presented here may be a technically reliable and safe method providing adequate decompression, solid fusion and long-term stabilization in L5-S1 spondyloptosis.

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