ABSTRACT

INTRODUCTION: Various operation techniques are performed for treatment of lumbosacral spondyloptosis. Gaines procedure is one of such procedures. In which there is circumferential excision of L5. With L4-L5-S1 root decompression, with L4-S1 reduction fixation & fusion. MATERIALS and METHODS: A 25-year-old lady with lumbosacral spondyloptosis with incapacitating low back pain & neurological claudication, was treated by the Gaines procedure in 2 stages: In 1st stage in supine, the anterior lumbosacral spine was approached through transperitoneal approach and the body of L5 was first removed to the base of the pedicles; L4-L5 & L5-S1 partial Dissectomy done; In 2nd stage in prone, after 7 days, residual pedicles, discs & complete neural arch of L5 removed; L4 & S1 partial laminectomy done, L4-L5-S1 & sacral nerve roots decompression done, and the body of L4 was reduced onto S1 with pedicle screw fixation and intervening 10 mm height TLIF cage & banked autologous cancellous bone grafts from excised body all around (360 degree), further stabilized by transverse connector, all through a midline posterior approach, without complication. Initially rest for 6 wks, followed by gradual rehabilitation with LS brace done. RESULTS: Complaints of the patient have relieved completely after 3 months & now independent in ADL at 6 months. Anterior plus posterior fusion is progressive on sequential x-rays. Satisfactory back ROM is achieved & full function is expected at 1 year CONCLUSION: Though Gaines procedure is technically demanding & time consuming procedure, in experienced hands, it definitely fulfills all requirements of curative surgery & yields good outcome for difficult problem of lumbosacral spondyloptosis in young patients.

INTRODUCTION

Spondyloptosis, Grade V spondylolisthesis, is complete dislocation of the L5 vertebral body on the sacrum anteriorly. Spondyloptosis is a combination of lumbosacral spondylolisthesis and lumbosacral kyphosis. Originally described by Neugebauer as a complete tilting of the body of the 5th Lumbar vertebra over the sacrum.1 Typical clinical symptoms are low back pain and stiffness with hamstring shortening. There is also lumbar hyperlordosis, flexed-hip and-knee walking and toe gait. Radicular pain to the buttocks and thighs is not always present since nerves adapt to tension or compression. Radiation of the pain below the knees or cauda equina syndrome is suggestive of high-grade spondyloptosis.2

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.3-7 and reduction and fusion.8,9,10,11,12 Most authors agree that fusion in situ is a safe and reliable method for treatment of high-grade spondyloptosis. However, others have suggested that reduction of severe anterior displacement and lumbosacral kyphosis may prevent persistent lumbosacral deformity.13,14,15

We report a case of spondyloptosis treated by us using L5 vertebrectomy and L4 onto S1 reduction, fixation, fusion and decompression in 2 stages (Gaines procedure).

Case report: A 25-year-old lady with lumbosacral spondyloptosis with incapacitating low back pain & neurological claudication & so bedridden for 4 months. On examination there was no sensory or motor deficit, reflexes were normal & root tension sign was positive with tight hamstring. No bladder bowel involvement.

On imaging Grade 5 anterior lysthesis of L5 over S1 was present with instability on lateral flexion-extension views (Figure 1), with cauda equina compression on MRI (Figure 2). Aortic-vena cava tree angiography is must for pre operative planning (Figure 3)
The Surgical procedure was performed in two stages by two separate anesthetic procedures. In the first stage under general anesthesia, supine position with head low, via transperitoneal approach L4 –S1 anterior spine was exposed taking care of the bifurcation of the aorta & vena cava at that level with its branches. Then the body of L5 was incompletely excised to the base of the pedicles followed by L4-L5 & L5-S1 partial dissection and removal of caudal cartilage end plate of the L4 vertebra (Figure 4).

Haemostasis was achieved using bone wax & abgel. After the completion of the procedure lumbosacral corset was applied to the patient. Blood loss during the procedure was 1 unit. Duration of general anaesthesia was 3 hours and that of the surgery was 2 hours.

The second stage of this procedure was performed 7 days after the first stage. Under general anaesthesia, in prone position on bolster via midline posterior approach L4 & S1 pedicle screw inserted & fixed one side using temporary rod. Complete removal of residual pedicles of L5 and complete neural arch of L5 & L4-L5 & L5-S1 disc removed. L4 & S1 vertebre partial laminectomy and bilateral L4-L5-S1 & sacral nerve roots decompression was done. The body of L4 was gradually reduced onto S1 with pedicle screw fixation and intervening 10 mm height lordotic TLIF cage. The removed bone & banked autologous cancellous bone grafts from excised body packed for anterior & postero-lateral fusion all around (360 degrees) between L4 & S1. The construct was further stabilized by transverse connector. Thorough haemostasis achieved by using bipolar & abgel. (Figure 5) Blood loss during this procedure was 1 unit and duration of general anaesthesia was 3 hours and that of surgery was 2 hours.

After the surgery post operative protection with lumbosacral corset for 6 wks was given with bed rest and followed by gradual range of motion exercises of back. Patient noticed temporary meralgia on left side during post operative period which was brief. Complaints of severe back pain & claudication were completely relieved after 3 months and patient is now independent in activities of daily living at 5 months. Anterior plus posterior fusion is progressive on sequential x-rays (Figure 6) and full function is expected at 1 year.

Satisfactory back range of motion has been achieved after 6 months of follow up.
DISCUSSION

Spondyloptosis defines the condition where the L5 vertebral body has completely dislocated from the sacrum anteriorly, and descended into the pelvis. The etiopathogenesis of this disease is unclear. A few cases caused by traumatic acute spondyloysis have been reported in the literature. 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. The presence of these dysplasias raises the question about whether these changes are congenital as described by Newman. In our case it appears to be dysplastic type.

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) spondylothesis. 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. The physical examination may show flattening of the buttocks, loss of trunk height, tight hamstrings, and an associated structural scoliosis.

Urinary incontinence has not been often reported in wide series of severe spondyloptosis except the series reported by Smith and Bohlman. Smith and Bohlman reported that 4 of their 17 cases with severe spondyloptosis had urinary incontinence, and there was evidence of return of function in all four patients six weeks to two 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. The suggested methods of treatment for spondyloptosis except benign neglect have included fusion in situ with or without decompression, and reduction and fusion (posterolateral and/or anterior, single-, double- or triple-staged). Most authors agree that fusion in situ methods are safe and reliable for treatment of high-grade spondyloptosis. However, the deformity may progress after fusion in-situ. 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.

In addition, the deformity may also progress after reduction and fusion methods. 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. In the Lehmer series 11 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 orthosis usage.

These sophisticated treatment methods for spondyloptosis help in reducing the tension on sacral roots, correction of slip angle greatly reduces the bending moment and tensile stresses that work against the postero-lateral graft. When the normal biomechanics are restored by the correction of the deformity, it may be possible to fuse fewer lumbosacral segments and reduce adjacent segment degeneration and also correct the overall appearance of the spine in adolescents.

The rate of neurological complication with reduction has been reported to be as high as 20-31% in 8-9. 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. These procedures are actually lengthening procedures and the lumbosacral roots may be tethered by anatomically correcting the translational deformity. In addition to the risk of neurological deficit, there may be some loss of correction by the end of the treatment in reduction methods. 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 have reported patients with grade III, IV and V spondylothesis treated by in situ postero-lateral arthrodesis from L4 to S1 and immobilization in a pantonil 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 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 reported cases with Grade III-V spondylothesis treated by the same procedure, of which six were of spondyloptosis. They reported that a result of surgery in this series was obtained here, the prominent symptom was urinary incontinence, and sphincter function was normal after 6 months of surgery.

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REFERENCE