



TREATMENT OF L5-S1 SPONDYLOPTOSIS: CASE REPORT

L5-S1 SPONDİLOPİTOZİSİN TEDAVİSİ: OLGU SUNUMU

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SUMMARY:

Spondyloptosis or grade 5 spondylolisthesis is defined as the forward slippage of the entire L5 vertebral body of S1. Reduction of severe spondylolisthesis continues to be a subject of debate; most authors agree that fusion insitu is a safe and reliable procedure for treatment of high grade spondylolisthesis. Reduction and fixation of L5 on to S1 as described before is a treatment option but it has been noted that the rate of major complications is an acceptably high after reduction or even non reduction procedures. L5 reduction procedures appear to have a distinct instance of L5 root deficits. A method described by Gaines including L5 vertebrectomy, reduction and fusion of L4 on to S1 seems to be more logical because it shortens the spinal canal and nerve roots and peripheral nerves can be re aligned avoiding neurologic deficit. In this case report, two cases of spondyloptosis treated by Gaines procedure were presented with follow-up six years and twelve years.

Key words: Spondylolisthesis, spondyloptosis, surgical treatment, Gaines procedure.

Level of evidence: Case report, Level IV.

ÖZET:

Spondiloptozis veya grade 5 spondilolistezis ise L5 vertebra cisminin S1 üzerinde ileri derecede kayması sonrası oluşur. İleri derece spondilolisteziste redukiyon hala tartışılırken füzyonun daha güvenilir bir tedavi yöntemi olduğu üzerinde görüş birliği vardır. Başlangıç korreksiyonu idame ettirebilmek için posterior füzyona anterior füzyonun da eklenmesi önerilmektedir. L5 in S1 üzerinde redüksiyonu ve L5-S1 füzyonu tedavi şekli olarak kabul görse de majör komplikasyonların redüksiyon yapılsın veya yapılmasın görülebileceği unutulmamalıdır. Gaines' in tariflediği metod da ise L5 vertebrektomi, redüksiyonun sağlanması ve L4-S1 füzyonunu içermesi ile spinal kanalı kısaltılır, sinir kökleri ve periferal sinirlerin doğrultusu sağlanmış olur ve buda nörolojik hasar oluşumunu azaltır. Bu olgu sunumunda ise iki spondilopitozisli vakanın Gaines prosedürü ile tedavi edilmesi ve sonrasında 6 ve 12 yıllık takipleri sunulmuştur.

Anahtar Kelimeler: Spondilolistezis, spondilopitozis, cerrahi tedavi, Gaines işlemi

Kanıt Düzeyi: Olgu Sunumu, Düzey IV.

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INTRODUCTION:

Spondylolysis is a unilateral or bilateral defect of pars interarticularis which, in combination with other factor may permit forward slippage of one vertebra on the below producing a spondylolisthesis. Wiltse and Winter classified spondylolisthesis in five categories based on the cause of listhesis ⁽¹⁾.

Spondyloptosis or grade 5 spondylolisthesis is defined as the forward slippage of the entire L5 vertebral body of S1. Reduction of severe spondylolisthesis continues to be a subject of debate; most authors agree that fusion insitu is a safe and reliable procedure for treatment of high grade spondylolisthesis ⁽¹⁾. However, others have suggested that reduction of severe anterior displacement and lumbosacral kyphosis may prevent some of the reported complications of fusion insitu including non union, bending of fusion mass, and persistent lumbosacral deformity ^(3,5,7-9,11). Because loss of initial correction is not uncommon some investigators advocate a combined anterior and posterior fusion in conjunction with instrumentation, the reason for anterior fusion being that it provides a mechanical support against additional slippage and maintains correction ⁽¹⁰⁾.

Reduction and fixation of L5 on to S1 as described before is a treatment option but it has been noted that the rate of major complications is an acceptably high after reduction or even non reduction procedures. L5 reduction procedures appear to have a distinct instance of L5 root deficits. A method described by Gaines including L5 vertebrectomy, reduction and fusion of L4 on to S1 seems to be more logical because it shortens the spinal canal and nerve roots and peripheral nerves can be re aligned avoiding neurologic deficit ^(2,4,6). In this case report, two cases of spondyloptosis treated by

Gaines procedure were presented with follow-up six years and twelve years.

CASE REPORT:

One of the patients was 18 year old girl who was operated in 1995 and the other patient was 17 year old boy whom we operated in March 2003 by Gaines procedure. Both of them attended our clinic with the complaints of low back pain tightness and weakness in legs, which progressively increased by time. Preoperative evaluation of the patients showed severe deformity of their postures, there was hamstring tightness and positive straight leg rising test in both patients. One of them showed hypoesthesia in L5 dermatome.

The boy had a bilateral pes equino varus deformity and Sprengel's deformity pointing a congenital malformation. Preoperative radiographic evaluation included standard A-P, lateral and oblique graphics, MRI and CT of the region. Radiographic measurements taken were pre and post operative sagittal rotation (slip angle); lomber lordosis using three measurements; preoperative L1-L5 angle, pre and postoperative L1-L4 angle and L5-S1 angle; sacral inclination and L4-S1 percent of slip postoperatively (Table-1).

The first patient underwent a single operation and the second underwent two operations, Gaines procedure, which is a two stage operation. In the first stage the patient was positioned supine and an anterior transperitoneal midline incision was used to expose anterior lumbosacral spine. Care was taken to prevent injury to aorta and iliac veins. The retro peritoneum was incised from the third and fourth lumbar vertebra, avoiding injury to the midsacral nerve and artery and to sympathetic ganglia. The body of L5 to the bases of pedicles and the upper and lower

Table-1. Radiographic measurements of the two patients pre and postoperatively.

	Preop	Postop 6 months	Postop 6 year	Postop 12 years
Slip angle	42/ 25	0/0	8/0	6
L1-L5 lordosis	32/ 50	-	-	-
L1-L4 lordosis	26/ 20	32/ 9	30/ 9	40
L1-S1 lordosis	28/ 26	38/ 4	40/ 4	36
L4-S1% slip	100/ 100	24/ 25	38/ 25	40
Sacral Inclination	24/32	26/ 34	24/ 34	30

* values are given in degrees, first values belong to first patient and the second values belong to second patient, which are separated by slash.

discs are removed. The opposing end plates of S1 and L4 was decorticated for fusion and iliac crest grafting was performed. Epidural bleeding was controlled with gel foam. After the first stage was completed, the first patient underwent the second stage at the same time and the other five days later.

The second stage was performed the patient positioned prone and through a midline posterior approach. The pedicles and loose neural arc is removed, reduction and fusion of L4 onto S1 is performed. Bilateral posterolateral fusion was performed and this created a reconstructed L4-S1 foramen. For the first patient ISOLA and for the second USS posterior instrumentation system was used.

For the first patient the operation time was 8.5 hours and blood loss was 2250 ml, the second patients total operation time was 8 hours and total blood loss was 2000 ml. Both patients stayed two days at the intensive care unit and ambulation could be initiated five days post operation. Radiographs were obtained six days after operation and every six weeks to see the maintenance of reduction.

A lumbosacral orthosis was used 16 weeks. The first patient had a transient L5-S1 neuropraxia which resolved 3 weeks later and the other had a hypoesthesia in his left L5

dermatome which resolved 6 weeks later. At six and twelve years follow up both patients were active no complaints were recorded. Slip angle which assesses the lumbosacral kyphosis has changed greatly from pre operation to post operation. During follow up a slight increase in slip angle was recorded that we assume was due to late formation of solid fusion mass.

DISCUSSION:

The need to treat symptomatic spondylolisthesis surgically is universally accepted, but the choice of surgical procedure for patients who have severe spondylolisthesis with more than 50 % slippage remains controversial⁹. Surgical options for high grade slips include posterior in situ fusion, anterior and posterior fusion with or without reduction, L5 vertebra resection with reduction of L4 onto sacrum for spondyloptosis, and posterior interbody fusion with or without trans-sacral fixation. Although excellent results of in situ fusion for high grade spondylolisthesis have been published, some reports have shown pseudoarthrosis rates as high as % 45. Furthermore, with high grade spondylolisthesis, bending of fusion mass, slip progression, residual gait abnormality, and clinical deformity are common. Even without

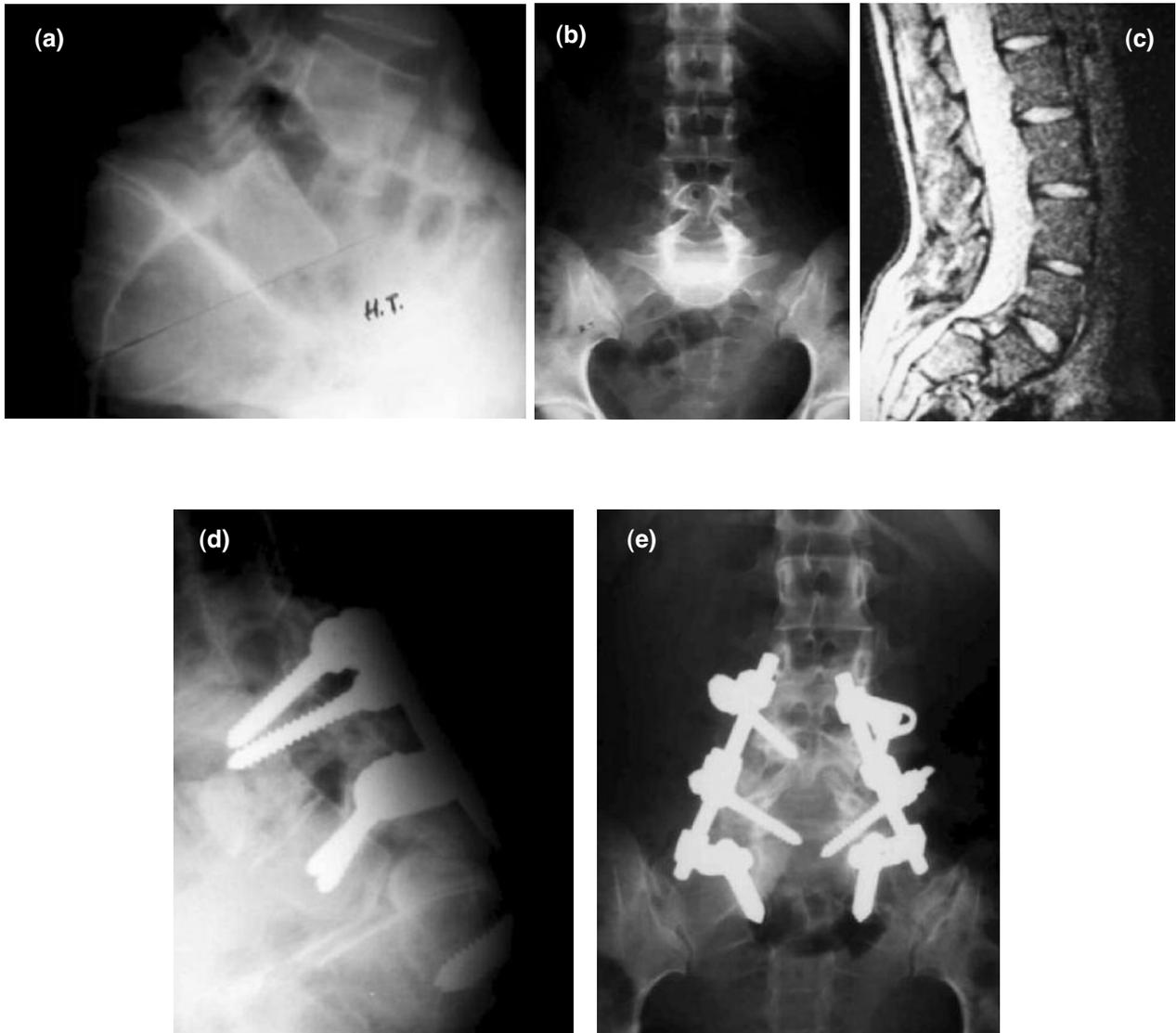


Figure-1. Preoperative lateral (a), posteroanterior (b) graphics and axial MRI section (c), and postoperative lateral (d) and posteroanterior (e) graphics of the first patient.

reduction postoperative neurologic dysfunction has been reported after fusion in situ. To prevent deformity progression and pseudoarthrosis combined anterior and posterior arthrodesis with or without vertebra resection has been recommended⁽⁶⁾.

The aim of the surgery for high grade spondylolisthesis is to relieve pain, resolve

neurologic dysfunction, obtain a solid arthrodesis, and restore sagittal plane balance and appearance. According to Bradford⁽¹⁾ and Boachie-Adjei reduction provides several major advantages. Reduction improves the lumbosacral orientation and thereby facilitates arthrodesis and allows direct decompression of neural elements. Correction of lumbosacral

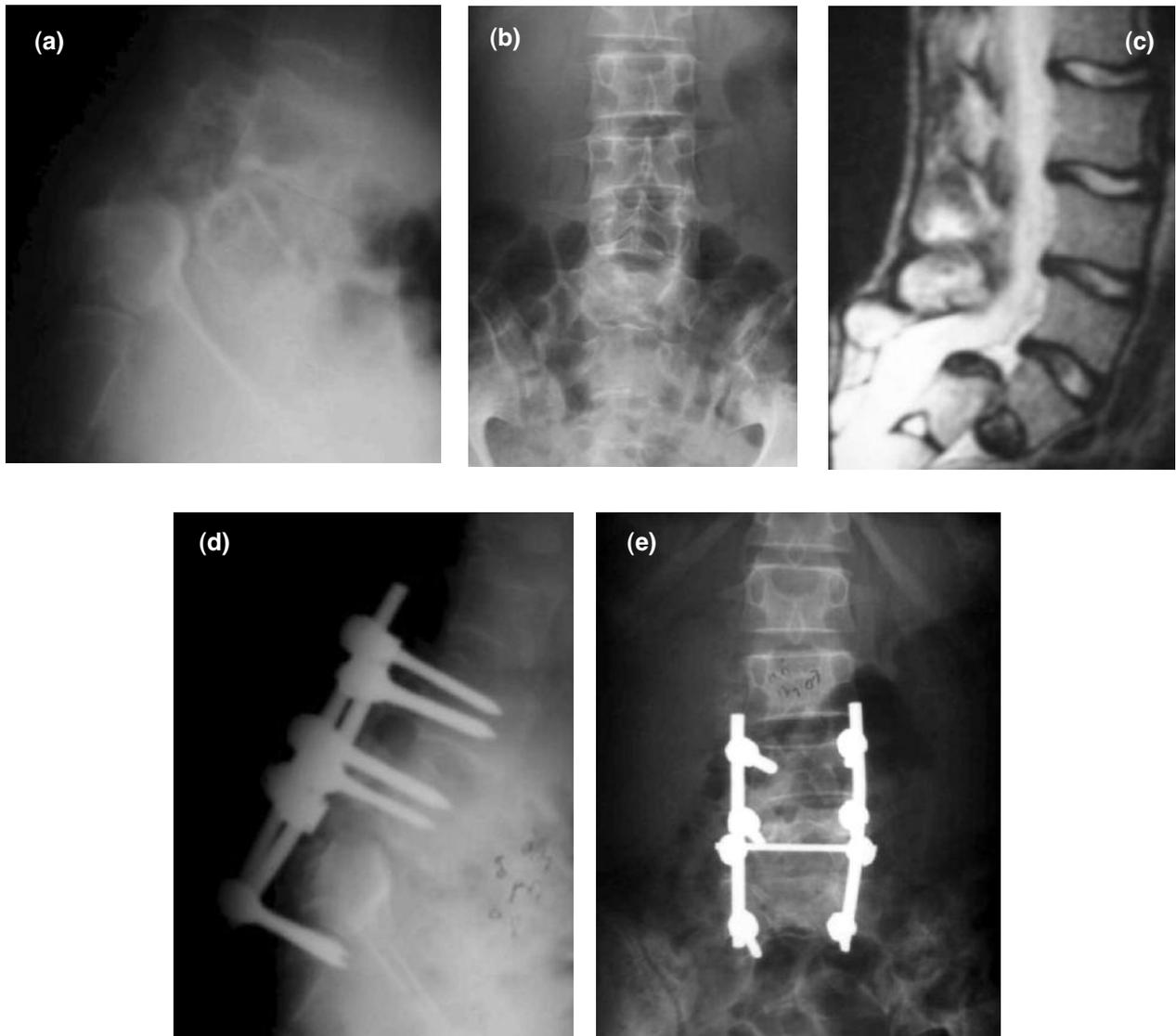


Figure-2. Preoperative lateral (a), posteroanterior (b) graphics and axial MRI section (c), and postoperative lateral (d) and posteroanterior (e) graphics of the second patient.

kyphosis results in spontaneous correction of thoracic lordosis and lumbar hyperlordosis. The restoration of alignment in the sagittal plane allows the patient to stand fully upright with the knees and hips extended. Thus several authors advocate reduction of severe spondylolisthesis; different techniques have been proposed⁽¹²⁾.

The rate of neurologic complication associated with reduction of severe spondylolisthesis has been reported to be as high as % 314. Furthermore in such a severe problem like spondyloptosis, any technique that attempts to reduce L5 onto sacrum must elongate the spinal column and thereby apply tension to the spinal cord and

lumbar roots causing neurologic deficits. The procedure described by Gaines prevents elongation of the spinal column by resection of L5 and give access to realign nerve roots and peripheral nerves therefore avoids iatrogenic cauda-equina syndrome ^(2,4).

In conclusion Gaines procedure is a major spinal reconstruction consisting of two stages. In our experience in such cases like spondyloptosis this procedure indicated because of high incidence of neurologic deficits by direct reduction of L5 onto sacrum and without reduction it is difficult to achieve solid fusion⁽²⁾. In literature there is not a large data reporting long-term outcomes of this procedure therefore it should be performed for severe cases like spondyloptosis and by experienced surgeons.

REFERENCES:

1. Bradford DS. Treatment of severe spondylolisthesis: A combined approach for reduction and stabilization. *Spine* 1979; 5: 423-429.
2. Dinçer D, Erdemli B. Treatment of a case with L1-L5 spondyloptosis by the Gaines procedure. *J Musculoskeletal Res* 1999; 3(4): 317-324.
3. Freeman III BL, Donati NL. Spinal arthrodesis for severe spondylolisthesis in children and adolescents. A long-term follow up study. *J Bone Joint Surg* 1989; 71-A: 594-598
4. Gaines RW, Nichols WK. Treatment of spondyloptosis by two stage L5 vertebrectomy and reduction of L4 onto S1. *Spine* 1985; 10: 680-686.
5. Hensinger RN, Lang JR, MacEwen GD. Surgical management of spondylolisthesis in children and adolescents. *Spine* 1976; 1: 207-216.
6. Matthiass HH, Heine J. The surgical reduction of spondylolisthesis. *Clin Orthop* 1986; 203: 34-44.
7. Norbert B, Dante M. Treatment of severe spondylolisthesis by reduction and pedicular fixation. *Spine* 1993; 18 (12): 1655-1661.
8. Schöllner D. One stage-reduction and fusion for spondylolisthesis. *Int Orthop* 1990; 14: 145-150.
9. Sebai M, Khawashki A. Spondyloptosis and multiple-level spondylolysis. *Eur Spine J* 1999; 8 :75-77.
10. Smith MD, Bohlman HH. Spondylolisthesis treated by a single stage operation combining decompression with in situ posterolateral and anterior fusion. *J Bone Joint Surg* 1990; 72-A: 415-421.
11. Smith JS, Hu SS. Management of spondylolysis and spondylolisthesis in pediatric and adolescent population. *Orthop Clin of North Am* 1999; 30 (3): 487-499.
12. Smith JA, Deviren V, Berven S, Kleinstveck F, Bradford DS. Clinical outcome of trans-sacral interbody fusion after partial reduction for high-grade L5-S1 spondylolystesis. *Spine* 2001; 26: 2227-2234.