

THE SURGICAL TREATMENT OF DEGENERATIVE SPONDYLOLISTHESIS

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ABSTRACT

Thirty patients with severe lumbar degenerative spondylolisthesis were treated surgically between August 1991 and December 1995 in Orthopaedics and Traumatology Department of Ege University Medical Faculty. 21 of the patients were female, and 9 were male; the mean age was 42 (29-62) years. The low back and leg pain was moderate in 8 patients and severe in 22; seventeen patients had varying degrees of neurologic deficit.

The mean value of slippage was 36.06% (25-55%) and the mean slipping angle was 3.02° (-18°-+15°).

Posterolateral segmental fusion combined with external fixation by pedicular screw and rod system was applied in all cases. Autolog cancellous bone obtained from the iliac crest in 18 cases and dehydrated spongiosa chips allograft was used in 12 cases. The mean follow-up time was 25 (18-39) months. The low back pain was diminished in 26 patients (87%); neurologic deficit was reduced in fifteen patients (50%). Solid fusion was obtained in 24 patients (80%).

In conclusion, pedicular fixation with posterolateral segmental fusion by allograft or autogenous graft is a preferable method for the surgical treatment of degenerative spondylolisthesis.

Key words: Degenerative spondylolisthesis, Surgical treatment.

ÖZET

DEJENERATİF SPONDİLOLİSTEZİS'İN CERRAHİ TEDAVİSİ

Ege Üniversitesi Tıp Fakültesi Ortopedi ve Travmatoloji kliniğinde Ağustos 1991 ile Aralık 1995 tarihleri arasında 30 lomber dejeneratif spondilolistezis olgusu opere edildi. Hastaların 21'i kadın, 9'u erkek olup, yaş ortalamaları 42 (29-62) idi. 8 hastada orta şiddette, 22 hastada ise şiddetli bel ve bacak ağrısı vardı; bunlardan 17'sinde ise çeşitli oranlarda nörolojik defisit mevcuttu.

Ortalama kayma %36.06 (%25-%55) olup, kayma açısı ortalama 3.02° (-18°-+15°) idi. Tüm olgularda pediküler vida ve rod sistemleri ile internal fiksasyon ve posterolateral segmental füzyon uygulandı. 18 olguda iliak kemikten alınan otolog spongiöz kemik grefti, 12 olguda ise dehidrate spongiöz çips allogreft kullanıldı. Ortalama takip süresi 25 ay (18-39 ay) idi. 26 (%87) olguda, bel ağrısı şikayetlerinin ortadan kalktığı görüldü. 15 olguda (%50) nörolojik defisit azaldı. Radyolojik değerlendirmede 24 hastada (%80) solid füzyon elde edildi.

Sonuç olarak; dejeneratif spondilolistezisin cerrahi tedavisinde, pediküler fiksasyon ve allogreft veya otogreft ile posterolateral füzyon tercih edilebilecek bir tedavi yöntemidir.

Anahtar sözcükler: Dejeneratif spondilolistezis, Cerrahi Tedavi.

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INTRODUCTION

Degenerative spondylolisthesis is the progressive anterior translation of a superior vertebra on its inferior neighbour due to degenerative causes, in cases where there is no defect in the neural arch (4,11). Recently, several kinds of stable and rigid lumbar posterior instrumentation of transpedicular screw system have been reported (9,16,17,20,24).

Internal fixation of the spine has been widely used to facilitate postoperative care and perhaps to enhance the fusion rate (22). The aim of this study is to present the results of the surgical treatment of degenerative spondylolisthesis in our clinic.

PATIENTS AND METHODS

Thirty patients with severe lumbar degenerative spondylolisthesis were treated surgically between August 1991 and December 1995 in Orthopaedics and Traumatology Department of Ege University Medical Faculty. There were twenty-one women (70%) and nine men (30%). The mean age of the patients was 42 years (29-62). No patient was responsive to conservative treatment preoperatively. The pain was moderate in eight patients and severe in twenty-two patients. Seventeen patients had some neurologic deficits. Clinical symptoms are shown in Table 1.

Table 1. Clinical symptoms of the patients

Clinical Symptoms	Patient No.	Percentage (%)
Low-back pain	30	100
Sciatica or Leg Pain	24	80
Neurologic Intermittent Claudication	18	60
Neurologic Deficits	17	57
Loss of Motor Function	10	33
Loss of Sensory Function	13	43
Loss of Decreased Achilles' Reflex	13	43
Loss of Decreased Patella Reflex	2	7
Neurogenic Bladder	1	3

The preoperative radiological evaluation consisted of standard anteroposterior, lateral, oblique and flexion-extension radiograms. (Figure 1a, b).

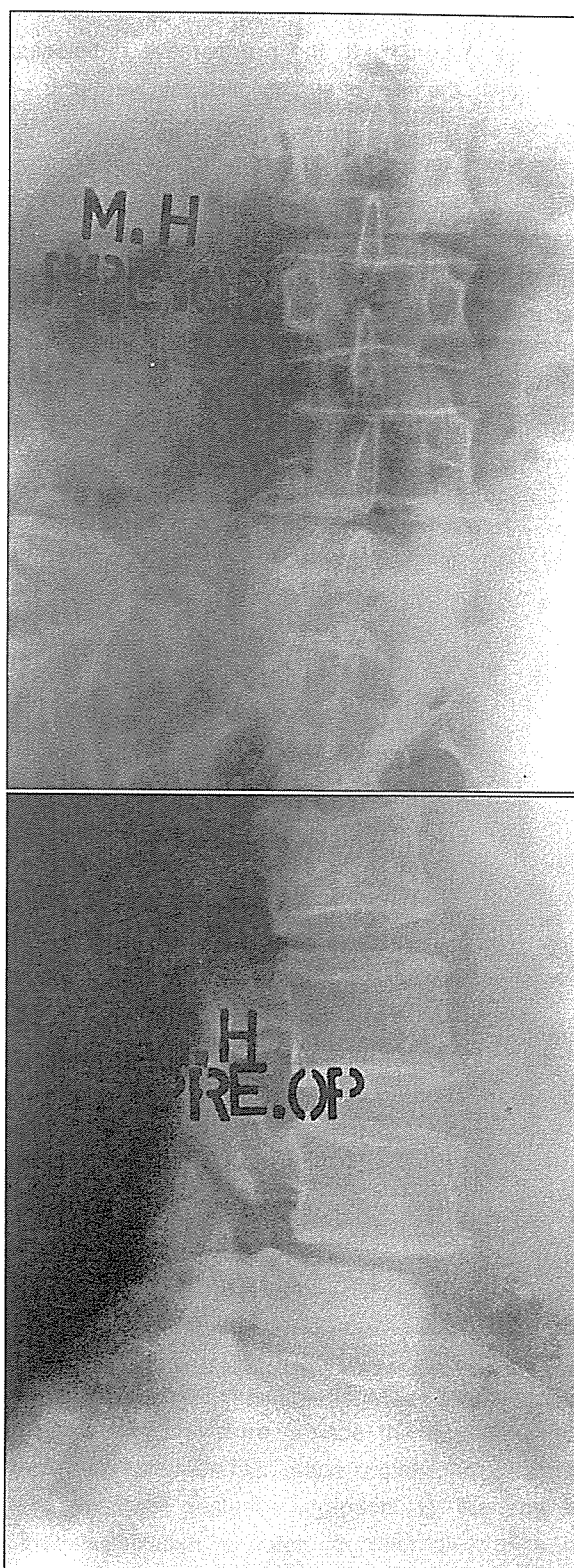


Figure 1a, b. Preoperative anteroposterior and lateral radiograms of a patient with L4-5 spondylolisthesis.

Computerized Tomography Scan was performed in all patients. According to the preoperative radiological evaluation, the sites of spondylolisthesis were at L 4-5 in 86% (26 patients) and L 3-4 in 14% (4 patients). All spondylolistheses showed segmental instability on the lateral flexion-extension radiographs according to Nachemson's criteria (18). Percentage of slippage and the slippage angles were measured by established techniques (25). The mean value of slippage was 36.06% (25%-55%), mean slipping angle was 3.02° (-18° - $+15^\circ$). The posterolateral segmental fusion combined with internal fixation by pedicular screw and rod system was applied in all cases (Figure 2a,b).

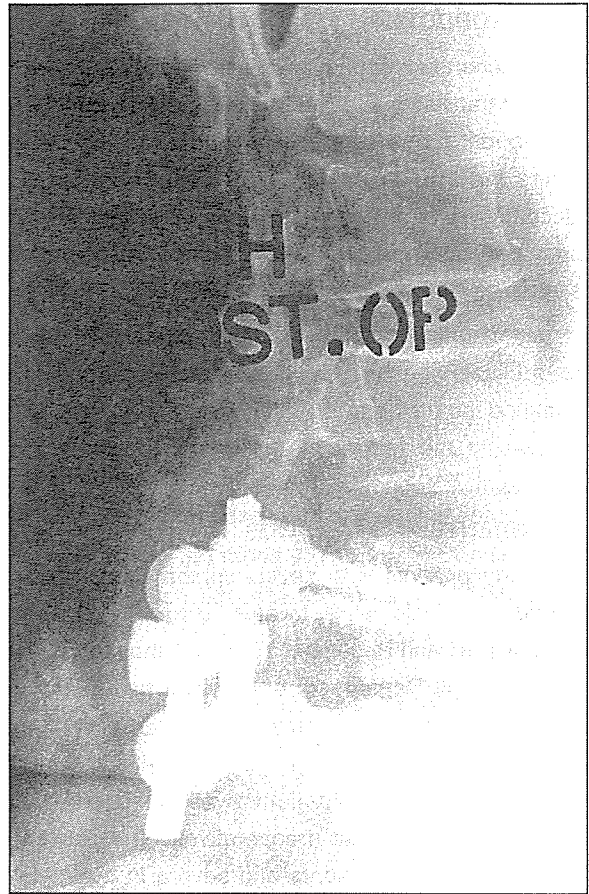
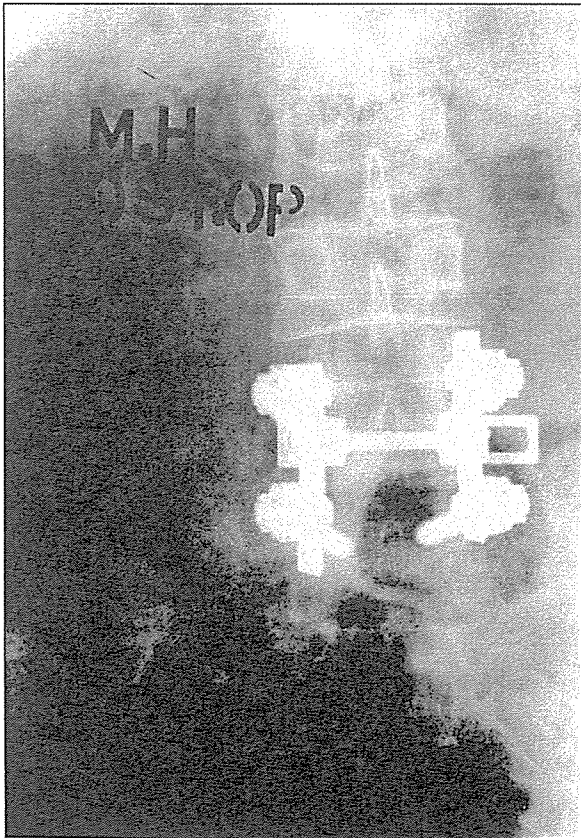


Figure 2a, b. Postoperative anteroposterior and lateral radiographs of the same patient.

The systems of internal fixation are shown in Table 2.

Table 2. Spinal Instruments

Spinal Instrument	Case No.
MSS Instrument (Hipokrat Co. İzmir, TURKEY).....	22
TSRH System (Danek Group Inc. Tennessee, USA)	6
ISOLA Spinal System (Acromed. Cleveland - Ohio, USA)	2
Total.....	30

Decompression by partial laminectomy was performed in seventeen cases who had neurologic deficits. No special attempt was made to reduce the slippage, but attention was paid to achieve or maintain an adequate lumbar lordosis. A moderate distraction was used in every case. The slippage was reduced spontaneously while the rods were distracted, because of segmental instability. The autolog cancellous bone was obtained from the iliac crest and

transplanted to the decorticated areas in eighteen cases. The dehydrated spongiosa chips allograft (Tutoplast, Biodynamics Int. GmbH, Erlangen, Germany) was applied on twelve cases. The levels of fusion are shown in Table 3.

Table 3. Level of Fusion

Level of Fusion	Patient No.
L3 - L4	2
L4 - L5	23
L3 - L4 - L5.....	5
Total.....	30

The patients were mobilized at the third week postoperatively by using a low-profile, custom made, total contact polyethylene thoracolumbosacral orthosis. The patients used the orthoses for three months.

RESULTS

The follow-up period after surgery was 25 months (18-39 months) in average. All patients were included in the follow-up. Clinical evaluation of the patients was made according to Kaneda's criteria (15). There were eighteen excellent, seven good, two fair and three poor results. None of the patients worsened at the follow-up period. The low back pain was reduced in all patients and was diminished in twenty-six (87%) patients. Neurologic deficit was reduced in fifteen patients (50%). At the radiological evaluation, the solid fusion was achieved in twenty-four patients (80%). The other ones had not enough follow up. No significant difference has been found between autogenous iliac crest graft group and freeze dried allograft group. The ratio of slippage and the slipping angles are represented in Table 4.

Table 4. Radiological Assessment

Radiological Assessment	Preop.	Postop.	Follow-up
Slipping Angle (Average).....	-3.02	+7.2	+6.3
Ratio of Slippage (Average).....	37.1%	8.75%	9.85%

There was loosening between screws and rods in one case in the MSS instrument group. This implant

was removed eight months after the first operation. The solid fusion was obtained between L4 and L5 vertebrae after the second operation. One of the screws had broken one year postoperatively in TSRH group. The solid fusion was also seen in this patient. The wound infection was seen in a patient, then was treated with adequate antibiotherapy.

DISCUSSION

The indications for fusion in the presence of a degenerative spondylolisthesis include pain unresponsive to conservative treatment, significant neurologic symptoms or deficits and progression of slip (7,14). On the contrary, some of the literature has been unclear with respect to the role of the spinal fusion, when a decompressive laminectomy is performed for spinal stenosis associated with degenerative lumbar spondylolisthesis (12,13, 19,24). We agree with Boos et al. (1) about major indications for surgery, which are persistent severe low-back and leg pain unresponsive to conservative treatment at least three months, gait abnormality (due to tight hamstrings), symptomatic slip progression and progressive neurologic deficits.

The reduction of severe spondylolisthesis continues to be a subject of debate. Most authors agree that, only fusion in-situ is a safe and reliable procedure for the treatment of the high grade spondylolisthesis (1,21). The rate of neurologic complications associated with reduction of severe spondylolisthesis has been reported as high as 31% (3). However, others suggested that reduction of severe anterior displacement and lumbosacral kyphosis may prevent some of the reported complications of fusion insitu, including nonunion, bending of the fusion mass and persistent lumbosacral deformity (2,10). Modern pedicular fixation systems allow rigid and stable fixation (5,6,23). These fixation systems may therefore provide the opportunity to reduce and stabilize high grade spondylolisthesis with a single stage posterior approach (1). We applied pedicular fixation systems for internal fixation of slipped vertebrae since it supplies the reduction and

the stable fixation in the short vertebral segment.

According to Friedlaender (8), freeze dried allografts have reduced immunogenicity, but in addition they undergo changes in mechanical properties (8). This is no consequence in our cases, because graft has been adequately protected by rigid internal fixation. We transplanted dehydrated human cancellous spongiosa chips allografts (Tutoplast, Biodynamics Int. GmbH, Erlangen, Germany) to eleven patients, because of its advantages of availability without morbidity at the donor site, shortened operation time and reduced blood loss. We have not seen any delayed union or pseudoarthrosis in all cases that we transplanted allografts.

In conclusion, pedicular fixation with posterolateral segmental fusion by allograft or autogenous graft is a preferable method for the surgical treatment of degenerative spondylolisthesis, because the use of internal transpedicular fixation ensures a good fusion rate and early mobilization of the patients.

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