

## SURGICAL TREATMENT OF SYMPTOMATIC SPONDYLOLISTHESIS IN ADULTS

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### ABSTRACT:

Ten patients who had a painful spondylolisthesis (degenerative in 4, isthmic in 6) were treated surgically. Two patients were male and eight female. The mean age was 43.6 (range 26-61). The sites of spondylolisthesis were at L3-4 in one, at L4-5 in 5, at L5-S1 in 3, both L4-5 and L5-S1 in one. One level fusion was performed in 7 patients, two levels in 2 patients and three levels in one patient. Transpedicular screw fixations were used for nine patients. Six patients were treated with internal fixation and posterolateral fusion, 3 patients with internal fixation, posterolateral fusion an additional anterior interbody fusion and one patient with anterior interbody fusion alone. The period of follow-up observation was ranged from 8 months to 24 months with a mean of 13 months. Pseudoarthrosis rate was %20 and this correlated with failure.

**Key Words:** Spondylolisthesis, instrumentation, fusion.

Spondylolisthesis is described as the forward displacement of all or part of one vertebra on another (26). Persistent pain and progressive slippage may indicate surgical treatment. The operative procedures include removal of the loose posterior elements, decompression and posterior arthrodesis, osteosynthesis of the pars defect, anterior arthrodesis, reduction and posterolateral arthrodesis, in situ posterior arthrodesis and reduction by combined anterior and posterior procedures (3, 7, 9, 10, 11, 28).

Posterolateral fusion with internal fixation by transpedicular screws accomplishes fusion of segments in pathologic motion. Its advantages include: 1) restoring of segmental stability by addressing all three spinal columns, 2) allowing for neural decompression 3) providing the ability to translate the slips 4) having the high fusion rate.

In this study, we presented the short-term result of surgical treatment of spondylolisthesis in 10 patients.

### MATERIALS and METHODS

In this study, 10 adult patients with mild spondylolisthesis (Meyerding Grades I-II) who underwent surgical treatment were reviewed retrospectively. All patients had been complaining of low-back pain for more than 2 years. Besides persistent low-back pain, the indication for operation was a neurologic finding. All patients failed a trial of conservative therapy that included nonsteroidal antiinflammatory drugs, weight

reduction, activity limitation and bracing. There were 8 females and 2 males, with an average age is 43.6 years (range 26-61). The average follow-up was 13 months (range 8-24). By the Meyerding classification 4 patients were Grade I; and 6 patients, Grade II spondylolisthesis. None of patients had previous spinal surgery.

All patients were examined by AP, oblique and lateral radiographs in recumbent and standing positions. Flexion and extension radiographs were taken in the standing positions. A neurologic examination including manual muscle testing of all lower extremity muscle groups, deep tendon reflexes, sensory evaluation, straight leg raising sign were recorded (Table 1). Myelography, computed tomography and MRI were used to evaluate spinal stenosis and disc herniation.

In patients with radiculopathy, posterior decompression were done and the fibrocartilaginous tissue at the level of the defect excised. The fusion was posterolateral in 6 patients; in 3 patients an additional anterior interbody fusion was carried out. One patient was treated by anterior interbody fusion alone. Single level fusion was performed in 7 patients, 2 levels in 2 patients and 3 levels in one patient. Transpedicular screw fixation were used for stabilization in 9 patients. In 3 of these patients, Alici spinal instrumentation; in 4, CD instrumentation and in 2, Isola spinal instrumentation (with Galveston technique) were installed. No attempt was made to recude the spondylolisthesis, but attention was paid to achieve and adequate lumbar lordosis. The patients were allowed to walk on the second day after the operation. They used an external brace for 3 months. The mean period of

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Table 1.

&	Patient	Age	Sex	Complaint	Exam	Raidographic	Surgery	Outcome
1	R.Ç.	27	F	5 yr history of LBP, Neuro claudication	Decreased sensation dorsal aspect of bilate-ral foot	Isthmic, GII L5-S1, partial block on myelo.	L4-S1 inst, post decomp, postero-lat fusion	Fused
2	R.T.	39	F	3 yr history of LBP	Neg SLR, no motor and sensorial disorders	Isthmic, GI L4-5	L4-5 inst, posterolat fusion	Fused
3	M.O	61	F	5 yr history of LBP, progressive clau-dication,	Poz R SLR, decreased sensation dorsal R. foot	Degen, G1 L5-S1, spinal stenosis.	L4-S1 ins, post decomp., posterolat fusion Pseudoartrosis repair, L3-S1 fusion	Pseudo-artrosis Fused
4	MS	48	F	10 yr history of LBP, Neuro claudication,	Poz R SLR, R EHL 4/5, decreased sensa-tion dorsal R foot	Degen, GII L4-5, disc degeneration, spinal stenosis	L4-5 inst, post decomp posterolat fusion	Fused
5	G.T	26	F	2 yr history of LBP	Neg SLR, normal sensation	Isthmic, GII L4-5	L4-5 inst, posterolat fusion Anterior fusion	Fused artrosis Fused (incomplet)
6	MK	37	F	3 yr history of LBP, left leg pain	Poz L SLR, decreased sensation dorsal left foot	Isthmic, GII L4-5 disc herniation	L4-5 inst, post decomp, disc exci-sion, posterolat + anterior fusion	Fused
7	IK	33	M	2 yr history of LBP	Neg SLR, normal sen-sation	Isthmic, GI L4-5 and L5-S1	L4-S1 inst, poste-rolat fusion	Fused
8	F.C.	58	F	3 yr history of LBP, claudication of the left leg in the L5 distribution	Poz SLR on the left, decreased sensation left L5 dermatom	Degen, GII L5-S1 spinal stenosis	L5-S1 ins, post decomp, postero-lat fusion	Fused
9	N.M.	51	M	5 yr history of LBP, left leg pain	Poz SLR on the left, decreased sensation Left L5 dermatom	Isthmic, GI L3-4 partial block on myelo	L3-4 ant inter body fusion	Fused
10	Z.Ş.	56	F	10 yr history of LPB, bilat lower extremity claudication	Bilat SLR, fatiguable BHL bilat, with dec-reased sensation on on the right L5 S1 distribution	Degen, GII L4-5 L4-5 disc deg, spinal stenosis	L4-L5 inst, post decomp, posterolat fusion Anterior interbody fusion	Fused

postoperative observation was 13 months (range 8-24).

The results were classified as excellent, good, fair, or poor, as previously described by Henderson (14). *Excellent* - the patient experiences no pain, he is able to return to his former occupation with no restrictions and no need for external support. *Good* - the patients occasionally experiences pain, he is able to resume his

occupation, he does not use a belt or corset more than 30% of the time. *Fair* - the patients senses less pain than he did preoperatively, but pain is still a problem for him, he must either wear an external support at work or he is restricted to lighter work than before. *Poor* - the patient is no better than he was preoperatively, he is unable to work, and he continues to seek medical help for his pain.

## RESULTS

At follow-up, there were 20% (2 patients) excellent results, 60% (5 patients) good results, 10% (1 patient) fair result, and 10% (1 patient) poor result (Table 2). One of the five L4 to L5 and one of the three L4 to S1 fusions developed pseudoarthrosis. The one patient with a poor result at 10 months after posterolateral fusion underwent an anterior interbody fusion, but remained poor result at final follow-up. At 6 months after the anterior surgery fusion was seen to be incomplete. She was the unique smoker in this series. The other patient with a fair result was 61-year-old lady. She had a pseudoarthrosis. She was suffering the iliac pain because of loosed rod in the iliac wing (Galveston technique). These rods were removed and eye rod used by fixing to S1 and fusion level was extended to L3. At 10 months after the second operation posterolateral fusion developed. The finding of pseudoarthrosis was correlated with an unsatisfactory results.

Table 2.

	Number of patients	%
Excellent	2	20%
Good	6	60%
Fair	1	10%
Poor	1	10%

All ladies in this series were housewife. Of the patients, 5 had good, one had excellent results. They returned to daily activities in 4 months. The time of return to work after operations averaged 6 months (range 5 to 7 months) for male patients (one farmer, one hospital staff).

There was the correlation between the clinical result and radiological fusion. Of the two patients who had pseudoarthrosis were symptomatic. The radicular symptoms relieved in patient who underwent anterior interbody fusion alone without posterior decompression. He is rated an "excellent" result.

Complications were few as outlined in Table 3. There was one superficial infection that healed without problems. Two patients had painful bone graft donor sites. There were two kinds of device-related complication. These included on improper screw placement without neurological symptoms and six screw loosening in two patients.

Table 3.

Complications	Number of patients
Superficial infection	1
Painful bone graft donor sites	2
Incorrect position of a screw without neurological symptoms	1
Radiological loosening of screw	2

## DISCUSSION

Spondylolysis and isthmic spondylolisthesis causes the back pain and sciatica in adults. With conservative treatment the majority of patients will be free from pain. However, there are some patients who continue to complain, some with increasing pain. Persistent pain and progressing sliding may indicate surgical treatment. Many surgical solutions have been offered. These surgical techniques vary with the age of the patient and the degree of associated spondylolisthesis.

For a Grade I or less spondylolisthesis, a repair of pars defect may be considered. Buck (6) first published direct repair of pars defects in 1970. Many authors presented the surgical treatment of spondylolisthesis with the Buck method (21, 23, 25). Morsher et al. (18) described the hook screw technique in 1984. Winter and Jani (28) reported a successful result in children up to 16 years of age but unsatisfactory results in patients over 16 years of age with this technique. Nachemson (19) combined cancellous chip packing of the denuded pars defect with intertransverse process fusion.

Fibrocartilage tissue at the site of isthmic defect and bony stenosis of the intervertebral foramen may cause radicular pain. If decompression is performed without fusion there is probably increased risk of slip progression. Many authors believe that after having a solid fusion, the pathologic motion is eliminated and neurologic improvement occurs (4, 15, 17, 22, 27). We observed the same findings in our limited series. Radicular symptoms reduced after the fusion in all patients. One patient who had pseudoarthrosis, continued to have symptoms despite of the posterior decompression. Fusion seems to be solution of painful pathologic motion in the spine.

Pedicle implant systems have been used in an attempt to reduce and stabilize both degenerative and isthmic spondylolisthesis. The use of pedicle screw fixation ensures a good fusion rate and early mobiliza-

tion of the patients (1, 2, 8, 24). It is, however, associated with the possibility of many complications such as deep infections, neurologic complications, screw breakage, painful hardware, screw loosening or screw cut-out. We experienced one superficial infection that healed with medical therapy, 6 symptomatic screw loosening, one screw misplacement without neurologic symptoms.

Pseudoarthrosis is not uncommon complication. The incidence of pseudoarthrosis for posterolateral fusions ranges from 6% to 35% (12, 16, 20, 24). Smoking interferes with the healing of spinal fusion performed with cancellous bone graft and can lead to pseudoarthrosis. The incidence of pseudoarthrosis in patients after spinal fusion is four times higher in smokers as compared with non-smokers (5, 12). In our series, seven of nine (77.7%) patients treated with internal fixation achieved union. One of two patients who had pseudoarthrosis was smoker. While Harris and Weinstein (13) did not find that the presence of pseudoarthrosis affected the clinical outcome, our patients with pseudoarthrosis all did poorly.

Instrumented reduction offers major advantages in the treatment of spondylolisthesis. It restores anatomic alignment and permits full root decompression. But it carries the increased risk of neurologic injury. If there is no lumbosacral kyphosis, spondylolisthesis is not associated with deformity or significant loss of sagittal plane balance. In low grade spondylolisthesis, posterolateral fusion can be achieved without reduction. In the presented series, no special attempt was tried to reduce the spondylolisthesis.

As a conclusion, in surgical treatment of spondylolisthesis, posterolateral fusion leads to relieve symptoms. Pseudoarthrosis has a negative influence on clinical outcome. Transpedicular fixation enhances the rate of fusion and allows neural decompression and early mobilization of the patients with the additional cost and the possibility of complications.

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