



Transfacetal Fusion for Low-grade Degenerative Spondylolisthesis of the Lumbar Spine

Results of a Prospective Single Center Study

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Study Design: Prospective, nonrandomised, single center.

Objective: To study the clinico-radiologic and functional outcome after transfacetal screw fixation and fusion for low-grade degenerative spondylolisthesis of the lumbar spine.

Summary of Background Data: Surgery for degenerative spondylolisthesis conventionally involves instrumented fusion using 3 column pedicle screw fixation systems. Recently transfacetal fusion techniques have been reported to produce good results without the surgical morbidity associated with posterolateral fusion and the neurologic complications associated with pedicle screw fixation.

Methods: 30 patients with low-grade degenerative spondylolisthesis of the lumbar and lumbosacral spine underwent transfacetal fusion using 2 cortical screws and local cancellous bone grafts.

Results: Clinical and radiologic evidence of fusion was obtained in 29 patients. One patient developed pseudoarthrosis and progression of slip was reoperated. Quadruple visual analog scores and Oswestry disability assessment showed a significant improvement at 1-year follow-up.

Conclusions: Degenerative spondylolisthesis with lower grade slips and normal anterior structures can represent an ideal indication for transfacetal fusion. This is a simple and useful technique for short segment fusions of the lumbar spine.

Key Words: spondylolisthesis, degenerative, transfacetal fusion, pedicle screws, instability

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The use of transfacetal fusion techniques dates back to 1944, when Don King¹ used short screws across the facet joint to achieve fusion. The technique has been used sparingly since then. Magerl² described his translaminar facet fusion technique in 1984 (Fig. 1). This revived the interest in transfacetal fusion techniques as several biomechanical studies subsequently validated the efficacy of the technique. Degenerative spondylolisthesis represents a good indication for facet fusion as the slip is low grade and the anterior structures are usually preserved which is a prerequisite for successful outcome after facet fusion.

The purpose of this prospective study is to determine the clinico-radiologic and functional outcome after transfacetal screw fixation for posterior fusion of the lumbar and lumbosacral spine in patients with low-grade degenerative spondylolisthesis.

PATIENTS AND METHODS (Table 1)

Thirty patients with low-grade degenerative spondylolisthesis (grades 1 and 2) of the lumbosacral spine underwent transfacetal fusion between 2004 and 2006 at our institute. Symptoms ranged from intractable low back pain (continuous or posture related) with or without radicular pain/claudeication. All patients were operated after lack of adequate pain relief with conservative management for a minimum of 3 months. Standing AP, lateral x-rays, dynamic flexion, and extension radiographs and a magnetic resonance imaging scan were taken as a part of preoperative evaluation. All patients demonstrated segmental instability on dynamic radiographs. The severity of pain preoperatively was evaluated using Quadruple visual analog scale (QVAS) and the quality of life was assessed using the Oswestry disability index.

Surgical Technique

The involved spinal segments were exposed through a standard posterior midline incision. The facet joints were then debrided of cartilage and prepared for fusion. Nucleotomy and additional bony decompression were carried out as per clinical and magnetic resonance imaging evaluation. Two 3.5mm stainless steel cortical screws were long enough to obtain purchase at the base of the transverse process were used as struts across the facets (Fig. 2). Gross facet asymmetry precluded the use of translaminar technique in some patients. Local cancellous bone obtained during the process of decompression was used for fusion.

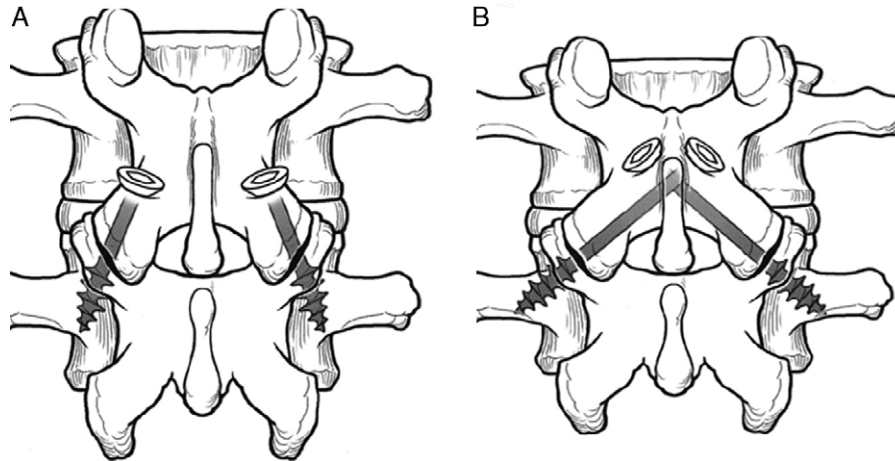


FIGURE 1. Illustration of the techniques described by (A) King D et al and (B) Magerl.

Patients wore a lumbosacral brace for 3 months postoperatively. Follow-up radiographs/dynamic films was performed at 6 weeks, 3 months, 6 months, and 1 year to assess the adequacy of fusion. All patients completed QVAS and Oswestry disability index questionnaires preoperatively and at a follow-up of 1 year.

RESULTS

There was no evidence of lamina perforation, neurologic injury or infections. Absence of pain, a

radiologically demonstrable fusion mass and no apparent motion on the flexion-extension x-rays in the fused segments was taken as definitive evidence of fusion. Radiologic evidence of fusion was in documented in 29 (96.6%) patients. Repeated surgery was needed in 1 patient owing to pseudoarthrosis. Patient underwent posterior lumbar interbody fusion with a good result.

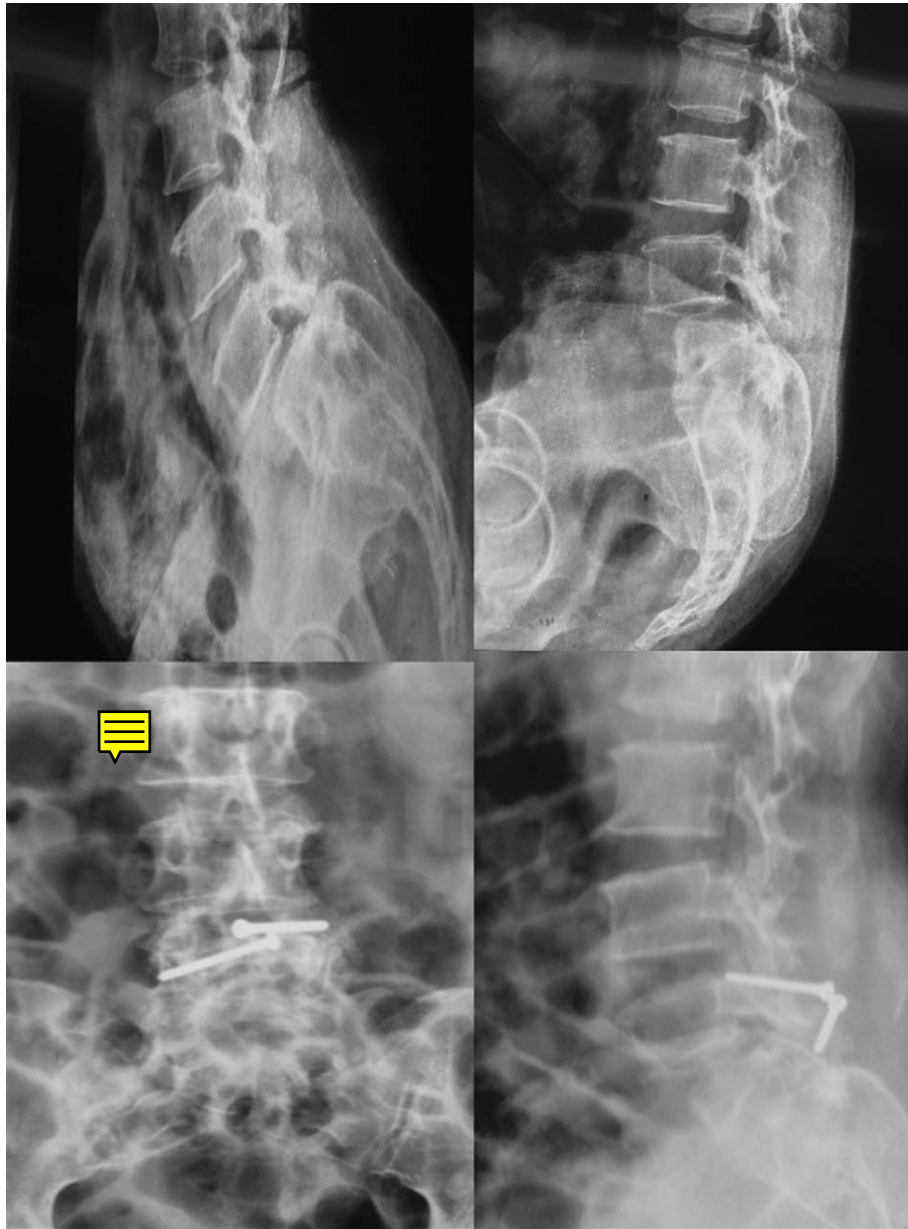
Twenty-nine patients had major pain relief and returned to their daily activities without major limitations. There were no incidences of screw loosening or broken screws. Statistical analysis was performed using

TABLE 1. Patient and Study Data

N: 30	Average Age: 44 y (31-60 y)		All Females
Standing x-rays (grade of slip Level:	Grade 1: 12 patients		Grade 2: 18 patients
L4-L5: 27 patients	L5-S1: 3 patients		
Exclusion criteria:			
High grade slip			
Advanced anterior segment degeneration			
Lysis			
Multilevel degeneration			
MRI			
Facet degeneration*:	Grade 1: 12 patients	Grade 2: 15 patients	Grade 3: 3 patients
Disc status: all patients had minimal evidence of disc degeneration with preserved disc height			
Neural foramen narrowing:	Unilateral: 19 patients		Bilateral: 11 patients
Surgery:			
Fixation technique:			
Translaminar route: 25 patients			
Direct transfacetal route: 5 patients			
One screw: 3 patients	2 screws: 2 patients		
Results:			
Surgical time: 62 min (50-90 min)			
Blood loss: 100 mL (50-200 mL)			
Radiologic fusion: 29 patients			
Pseudoarthrosis: 1 patient			
QVAS	Preoperative: 70.66 (SD: 7.34)	1 y: 20.77 (SD: 12.7)	P < 0.001
ODI	Preoperative: 64 (SD: 8.1)	1 y: 22.76 (SD: 11.7)	P < 0.001

*MRI grading of facet pathology.³

MRI indicates magnetic resonance imaging; ODI, oxygen desaturation index; QVAS, Quadruple Visual Analog Scale.



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AQ3 **FIGURE 2.** Dynamic x-rays of a grade 2 degenerative spondylolisthesis. Post operative x-rays after translamina facet screw fixation and fusion.

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47 the SPSS package (SPSS 16 for windows). There was a
49 significant improvement in the postoperative QVAS and
oxygen desaturation index scores at 1-year (Fig. 3).

51 **DISCUSSION**

53 The mainstay of surgical management in degenerative
55 spondylolisthesis is decompression and fusion. Transfacetal
57 screw fixation is a relatively simple fusion technique without
a significant learning curve compared with pedicle screw
59 fixation. Neurologic complications associated with transfacetal
screw fixation techniques have been shown to be minimal.⁴

With the use of transfacetal screws the fusion rates have been shown to be consistently higher by several authors⁴⁻⁶ (Humke et al: 94%, Jacobs et al : 91%, and Reich et al: 98.4%). We achieved fusion in 96.6% of the patients, which is comparable to existing literature. Addressing to the site of pathology directly, presence of large surface area of normal bone for fusion and less bulky implants may be the reasons behind high fusion rates with the transfacetal technique.

Fears of biomechanical incompetence with transfacetal fusion techniques have been put to rest by several in vitro and in vivo studies. Vanden Berghe et al⁷ found that pedicle screw fixation and facet fixation showed similar

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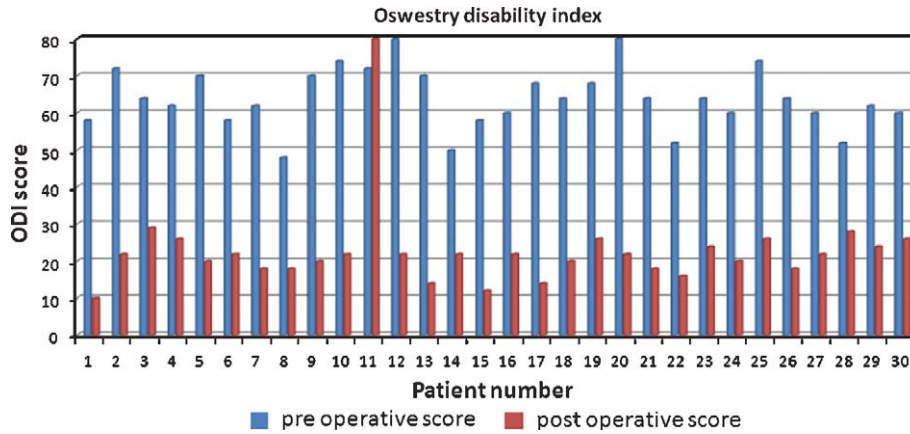


FIGURE 3. ■■■.

biomechanical characteristics. Similar results were reproduced by Deguchi et al⁸ and recently by Ferrara et al.⁹

The chief limitation for transfacetel fusion techniques is the need for intact anterior structures capable of resisting compressive forces. Degenerative spondylolisthesis presents an ideal condition for transfacetel fusion since the slips are usually low grade with normal anterior structures. Percutaneous fluoroscopy assisted transfacetel screw fixation technique has been recently described by Shim et al¹⁰ which will decrease the surgical morbidity associated with a circumferential fusion. To conclude, Transfacetel fixation is a simple and ideal fusion method for low grade degenerative spondylolisthesis of the lumbosacral spine. It may present a technically easy and cost effective procedure for short segment fusion in degenerative conditions of the lumbar spine

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