

BILATERAL LUMBAR FACET
SCREW FIXATION AND POSTERIOR
LUMBAR INTERBODY FUSION
IN LUMBAR DISC PROLAPSE

Bilateral Lumbar Facet Screw Fixation and Posterior Lumbar Interbody Fusion in Lumbar Disc Prolapse

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Abstract

Background Data: Lumbar disc prolapse is a common neurosurgical diagnosis. A trial of medical treatment, bed rest and physiotherapy is tried at first. Surgical treatment is resorted to if conservative treatment fails. However, postoperative complications including recurrent lumbar disc prolapse, postlaminectomy spondylolisthesis and failed back syndrome can occur. This is usually caused by instability at the discectomy level. In a trial to reduce these complications, we will use posterior lumbar interbody fusion together with bilateral facet screw fixation implanted during discectomy to reduce postoperative instability.

Purpose: To study the effect of posterior lumbar interbody fusion with bilateral facet screw fixation to decrease the incidence of postoperative complications.

Study Design: A prospective randomized controlled trial including 40 patients.

Patients and Methods: Forty patients diagnosed with lumbar disc prolapse causing sciatic pain with or without lower limb weakness not responding to conservative treatment were included in the study. Twenty patients (group A) was submitted to PLIF together with bilateral facet screw fixation after having conventional lumbar laminectomy and discectomy, while 20 other patients (group B) was submitted only to conventional lumbar laminectomy and discectomy and will be used as controls.

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Results: None of group A patients had recurrent LDP, while 8 patient of group B had a significant recurrence at the same level that required surgery ($P=0.0364$). At 2 years follow-up, 3 patients of group A and 14 of group B had persistent LBP, the difference being statistically significant ($P=0.0168$).

Conclusion: Combined posterior lumbar interbody fusion and bilateral facet screw fixation in lumbar disc prolapse is technically easy to be done and significantly reduce the incidence of recurrent lumbar disc prolapsed, as well as the postoperative lumbar instability and chronic low back pain. (2016ESJ108)

Key words: Lumbar disc prolapsed, posterior lumbar interbody fusion (PLIF), bilateral facet screw fixation, laminectomy and discectomy.

Introduction

Lumbar disc prolapse is a common neurosurgical diagnosis. It often results in low back pain with or without lower limb pain caused by compression of the nerve roots. Conservative treatment in the form of analgesics and muscle relaxants together with bed rest is resorted to at first and often results in improvement in a significant proportion of patients. Physiotherapy is sometimes used in patients not responding satisfactorily to drug therapy and may improve the patient's symptoms and signs. However, for patients who fail conservative measures, surgery is often resorted to. Indications of surgery include severe persistent sciatic pain not responding to conservative treatment, lower limb weakness, sphincteric disturbances as well as cauda equina syndrome.^{10,11,20,24,29}

Lumbar discectomy often results in improvement of sciatic pain and weakness. However, some complications can arise after lumbar discectomy including vertebral instability, persistent low back pain as well as recurrence of disc prolapse.^{1,5} Several procedures were suggested to minimize the incidence of these complications such as endoscopic discectomy. The minimally invasive procedure often results in less soft tissue trauma and less bone removal resulting in decreased incidence of postoperative instability and low back pain.⁶ Other procedures that were

suggested to overcome these postoperative complications include fixation of the segment affected by the lumbar disc prolapse e.g. pedicle screw fixation with bone grafting and cage fixation. However, pedicle screws and cage fixation is more traumatic, prolongs the duration of the surgery, is more expensive and requires C-arm monitoring and special equipment for application of the screws.^{7,8,13}

Facet screws have been used as a means of fixation in lumbar instability, either alone or combined with pedicle screws, each on one side.^{1,21} Facet screw fixation was first described in 1948 by King.¹³ It was found to have an excellent fixation profile comparable to bilateral pedicle screw fixation. Translaminar facet screw fixation was also used and was thought to have better fixation properties than direct facet screws because it fixed a longer segment of bone including the lamina and the facet joint.^{2,4,9,25,28} Percutaneous facet screw fixation system was also invented, however, it is expensive, uses the C-arm guidance and only used for cases of instability not requiring discectomy or foraminotomy.^{12,15}

In this study, we evaluate the role of bilateral facet screw fixation together with posterior lumbar interbody fusion (PLIF) using autologous bone graft as an easy and cheap means for reducing or preventing postoperative instability and recurrence of disc prolapse after lumbar discectomy.

Patients and Methods

It is a prospective randomized controlled trial including 40 patients. Patients with age of 18 to 80 years, significant LBP (VAS>5) with sciatica, an MRI confirmed diagnosis of degenerated lumbar disc with radicular compression, and no response to conservative treatment for at least 3 months were included in this study (Figure 1). Patients with acute soft lumbar disc hernia, sciatica without significant back pain, lumbar instability in the dynamic X-ray, recurrent LDP, and significant comorbidities (cancer, ischemic heart disease, uncontrolled diabetes mellitus, etc.) were excluded from this study.

The study was conducted in the Department of Neurosurgery at Alexandria University from June 2013 till May 2015. Patients were recruited from the outpatient clinic. In order to have a confirmed diagnosis of LDP, all possibly eligible patients were submitted to history-taking, general and neurological examination, laboratory investigations, plain X-ray of the lumbosacral spine; anteroposterior, oblique and dynamic lateral in flexion and extension positions and MRI of the lumbosacral spine. Those who met the inclusion criteria were offered participation in the study. In order to recruit the required 40 patients, we needed to offer 61 sequential eligible patients participating in the study and 21 of them declined.

Simple randomization with blocks of two generated by a computer program was utilized to assign selected patients to either group A or B. Group A, the treatment group included 20 patients, were submitted to PLIF together with bilateral facet screw fixation after having conventional lumbar laminectomy and discectomy, while group B, the control group comprised the other 20 patients who were submitted only to conventional lumbar laminectomy and discectomy.

Preoperative dose of antibiotic (a third generation cephalosporin) was given immediately before surgery for all patients. After general anesthesia, patients were put in prone position over chest and hip support. After scrubbing and draping of the lumbar area, a midline lumbar skin incision centered on the site of the lumbar disc prolapsed was made, determined by palpating the spinous processes starting from the sacrum. Paravertebral muscles were stripped off the spinous processes and the laminae laterally till the medial margin of the facet joint at the level affected in group B and was extended to the lateral margin of the facet joint in group A. Conventional laminectomy were done to expose the prolapsed lumbar disc and the affected nerve roots. Excision of the extruded disc material and removal of the remaining nucleus pulposus as much as possible with decompression of the nerve roots with foraminotomy was done at the affected level in all patients of both groups. In group A, curettage of the cartilaginous end plate and decortication to expose the cancellous bone was done to facilitate bony fusion. Bone graft took from the laminectomy site was impacted in the disc space making sure that it was not compromising the thecal sac.

Technique of Facet Screw Application:

First, a manual drill was utilized to make a trajectory crossing the inferior articular process of the vertebra above, the facet joint line then through the superior articular process of the vertebra below heading towards the pedicle of the vertebra below. The entry point was on the medial aspect of the upper half of the inferior articular process of the vertebra above, with 45 degrees inclination downwards and 10 degrees laterally. This trajectory ensured that the screw would pass through the inferior articular process of the vertebra above, the facet line, the

superior articular process of the vertebra below with the screw tip terminating into the pedicle of the vertebra below. Self-tapping threaded facet screws made of titanium with a diameter of 3.5 mm and a length of 35 mm were then applied coursing through the trajectory created by the drill using a screw driver under direct vision. Facet joint line was seen to become narrower during the completion of the process of facet screw application. This procedure was then repeated on the other side. No X-ray guidance was employed during the whole procedure. The wound was closed in layers with a closed drainage system and blood loss as well as duration of surgery was estimated in all cases. (Figure 2-6)

Postoperatively, all patients were monitored for vital signs, examined neurologically immediately postoperatively and then daily for three days. 3 days of a third generation cephalosporin given every 12 hours and analgesics were administered as required. Postoperative plain X-ray as well as CT scan of the lumbosacral spine was done for all patients once within the first three postoperative days. Patients were followed-up every 3 months for two years except in case of any new complaint emerges, in such a case; the patient had an appointment as soon as possible. Points that were assessed during the follow-up appointments were neurological status, any complications of the surgery and manifestations suggesting LDP recurrence. Plain X-ray of the spine was routinely done 6 months after surgery to confirm fusion and stability of the operated segment. The primary outcome measure was the occurrence of significant recurrent LDP that would require surgical intervention. The secondary outcome measures were persistent low back pain and vertebral instability confirmed on dynamic X-rays.

Statistical Analysis:

Using a specially designed sheet on Microsoft Excel, data was entered and thoroughly revised and was transferred to IBM SPSS version 17 format (SPSS Inc., Chicago, IL, USA) and the following statistics were performed: descriptive statistics; mean and standard deviation were calculated, and comparative statistics: Comparison between the two groups in all variables using t-test, Chi square test, Fisher exact test, Wilcoxon rank sum test, ANOVA test and regression analysis tests as appropriate. A 5% alpha error and 80% beta error were adopted. P significance was measured at 0.05%. Approval by the ethical committee in the Faculty of Medicine, Alexandria University was taken for this research.

Results

32 (53%) of patients were males. Age and gender did not show significant difference between both groups ($P < 0.05$). Most of the patients under study (48%) were in the age group of more than 30 to 50 years, while the least (20%) were in the age group of more than 50 years without statistically-significant difference between both groups ($P < 0.05$). L4-5 level was the commonest affected followed by L5-S1 then by L3-4 without significant difference between both groups ($P < 0.05$). Most of group A patients had a duration of surgery of 30 to less than 60 minutes (55% of cases), while most of group B patients (55%) had a duration of less than 30 minutes without significant difference regarding categorization of the duration of surgery between both groups ($P < 0.05$). Most of the patients in the two groups had intraoperative blood loss of 100-300 ml without significant difference between both groups ($P < 0.05$). The duration of postoperative hospital stay did not vary significantly between both groups ($P < 0.05$).

Most of the patients (80% in group A and 85% in group B) had a postoperative hospital stay of less than 2 days.

Postoperative complications occurred mostly in group B, mostly in the form of postoperative persistent low back pain that was persistent two year after surgery (55% of cases) as compared to only 15% of group A patients.

The follow-up period ranged from 12 to 24 months with a mean of 14.5 months. At 2 years follow-up, 20 and 17 patients were available for follow-up in groups A and B respectively. None of group A patients had recurrent LDP, while 8 patient of group B had a significant recurrence

at the same level (6 patients at L4-5 level and 2 at L5-S1 level) that required surgery (P=0.0364).

At 2 years follow-up, 3 patients of group A and 14 of group B had persistent LBP, the difference being statistically significant (P=0.0168). All patients in group A and 12 patients of group B (available for follow-up) returned to work, which did not reach statistical significance (P=0.1027). There was no significant difference existed between both groups as regards to age, gender, lumbar disc level affected, mean duration of surgery, volume of intraoperative blood loss and the duration of postoperative hospital stay.

Table 1. Comparing Both Groups as Regards to Different Variables

Variable		Group A	Group B	P-value
Mean age/year		38.1	34.6	0.548
Gender	Males (%)	9 (45)	12 (60)	0.5273
	Females (%)	11 (55)	8 (40)	0.432
Sex	18-	6 (30)	7 (35)	0.523
	30-	11 (55)	8 (40)	0.456
	50-	3 (15)	5 (25)	0.489
Operated Level	L3-4	2 (10)	0 (0)	0.487
	L4-5	15 (75)	13 (65)	0.731
	L5-S1	3 (15)	7 (35)	0.2733
Operative Time/min		39	31	0.329
Operative blood loss/ml		153	136	0.614
Hospital stay/day		1.9	1.8	0.951

Table 2. Postoperative Complications in the Two Groups of Patients at One Year Follow-Up.

Complications	Group A (%)	Group B (%)	Total (%)
Recurrence at operated level	0 (0)	3 (15%)	3 (7.5)
Recurrence at another levels	0 (0)	0 (0)	0 (0)
Lumbar instability	0 (0)	3 (15%)	3 (7.5)
Persistent back pain	3 (15%)	11 (55%)	14 (35)

Table 3. Recorded Oswestry Disability Index for Pre & Postoperative Low Back Pain in Both Groups

Patient Group	PreOp ODI	PostOp ODI	P value
Group A	59.3	11.1	0.002
Group B	54.9	23.2	0.013
P value	0.78	0.038	

Table 4. The Mean Pre and Postoperative Pain (VAS) Among the Two Patients Groups

Patient Group	Parameters	PreOp VAS	PostOp VAS	P Value
Group A	LBP	6±0.6	1.7±0.2	0.004
	Leg pain	6.9±0.71	2.1±0.23	0.002
Group B	LBP	6.1±0.65	4.6±0.53	0.113
	Leg pain	6.7±0.73	3.7±0.44	0.04

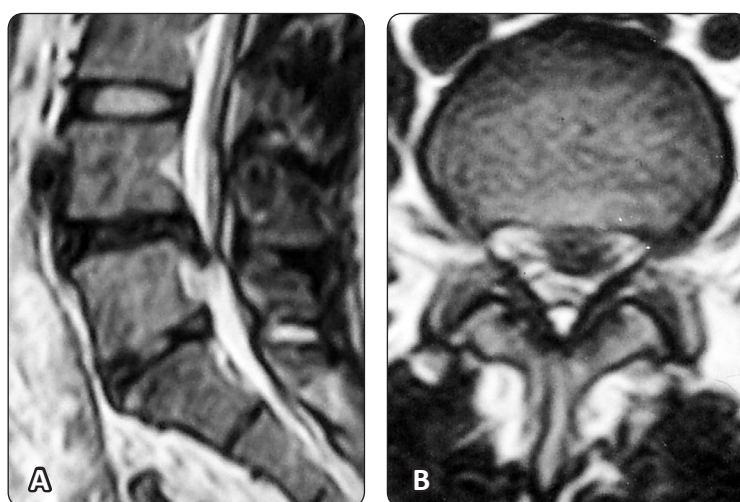


Figure 1. Preoperative MRI T2 sagittal (A) and T2 axial (B) cuts showing degenerated and herniated lumbar disc prolapse between L4/5 segment.

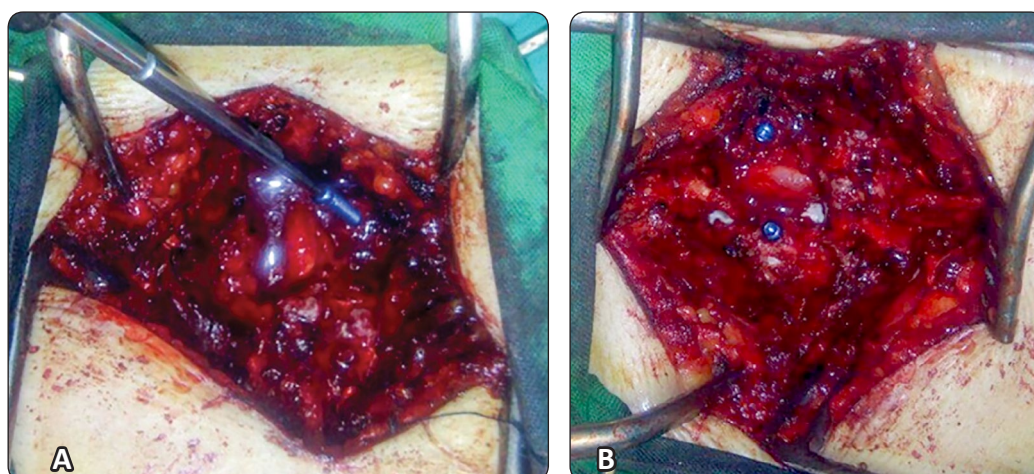


Figure 2. Intra-operative images showing (A) the introduction of the facet screw with an inclination 45° inferiorly and 10° laterally, (B) Both facet screws after insertion.

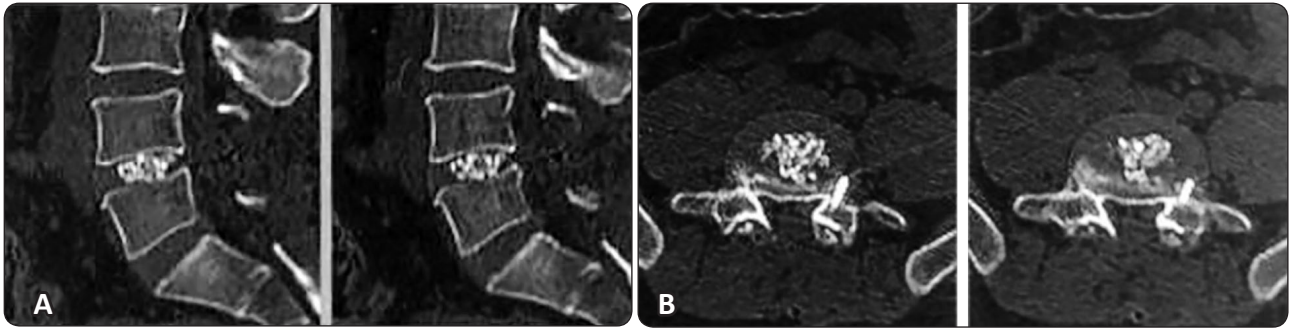


Figure 3. MS CT-scan sagittal (A) and axial(B) cuts showing the PLIF and the facet screws are seen crossing through the inferior articular process of L4 vertebra, the facet joint space, the superior articular process of L 5 vertebra and into the pedicle of L5 vertebra.

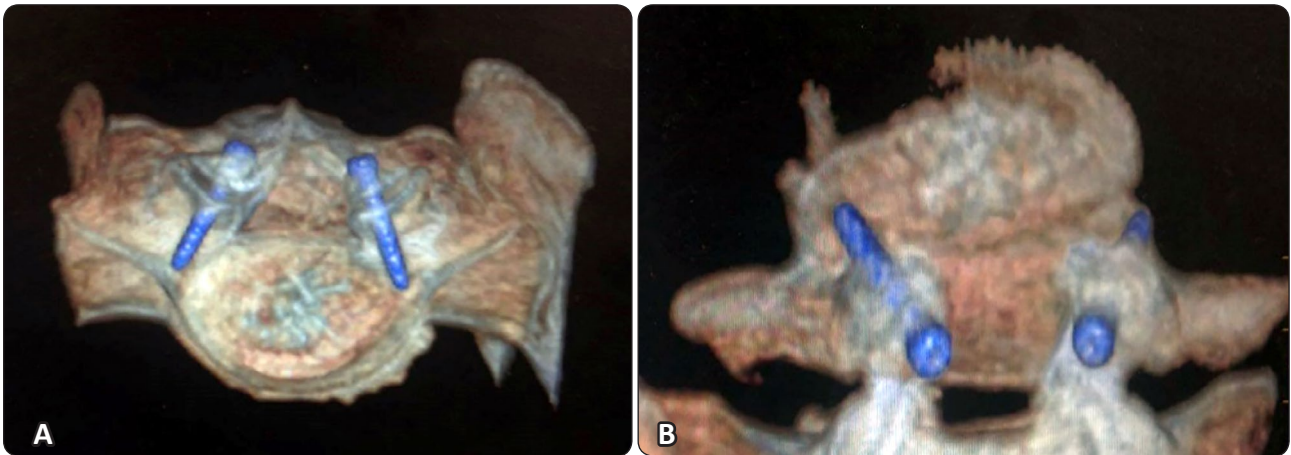


Figure 4. 3D CT-scan axial (A) and coronal (B) views showing the facet screws are seen crossing through the inferior articular process of L4 vertebra, the facet joint space, the superior articular process of L 5 vertebra and into the pedicle of L5 vertebra.

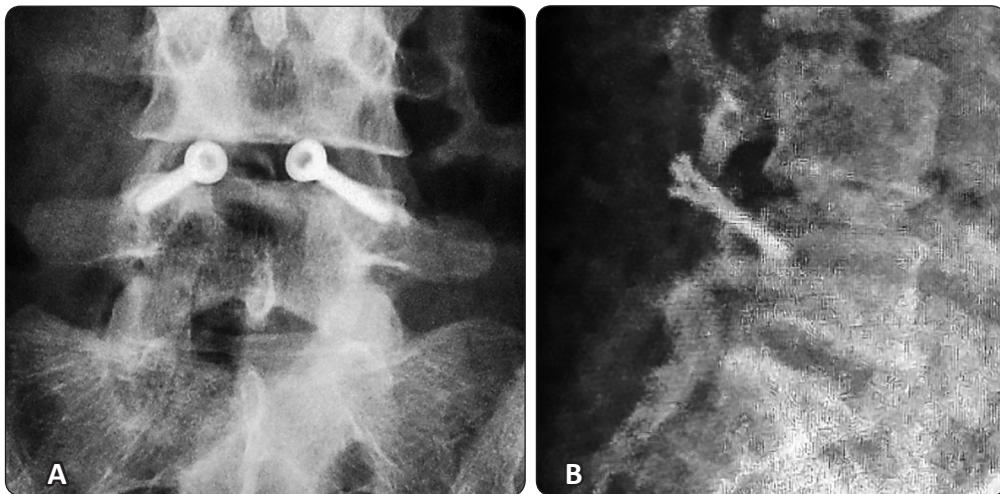


Figure 5. Postoperative X-Ray in the anteroposterior (A) lateral (B) views showing the facet screws crossing into the pedicle of L5 vertebra, and the start of fusion between L4/5 vertebrae after (PLIF) interbody fusion.

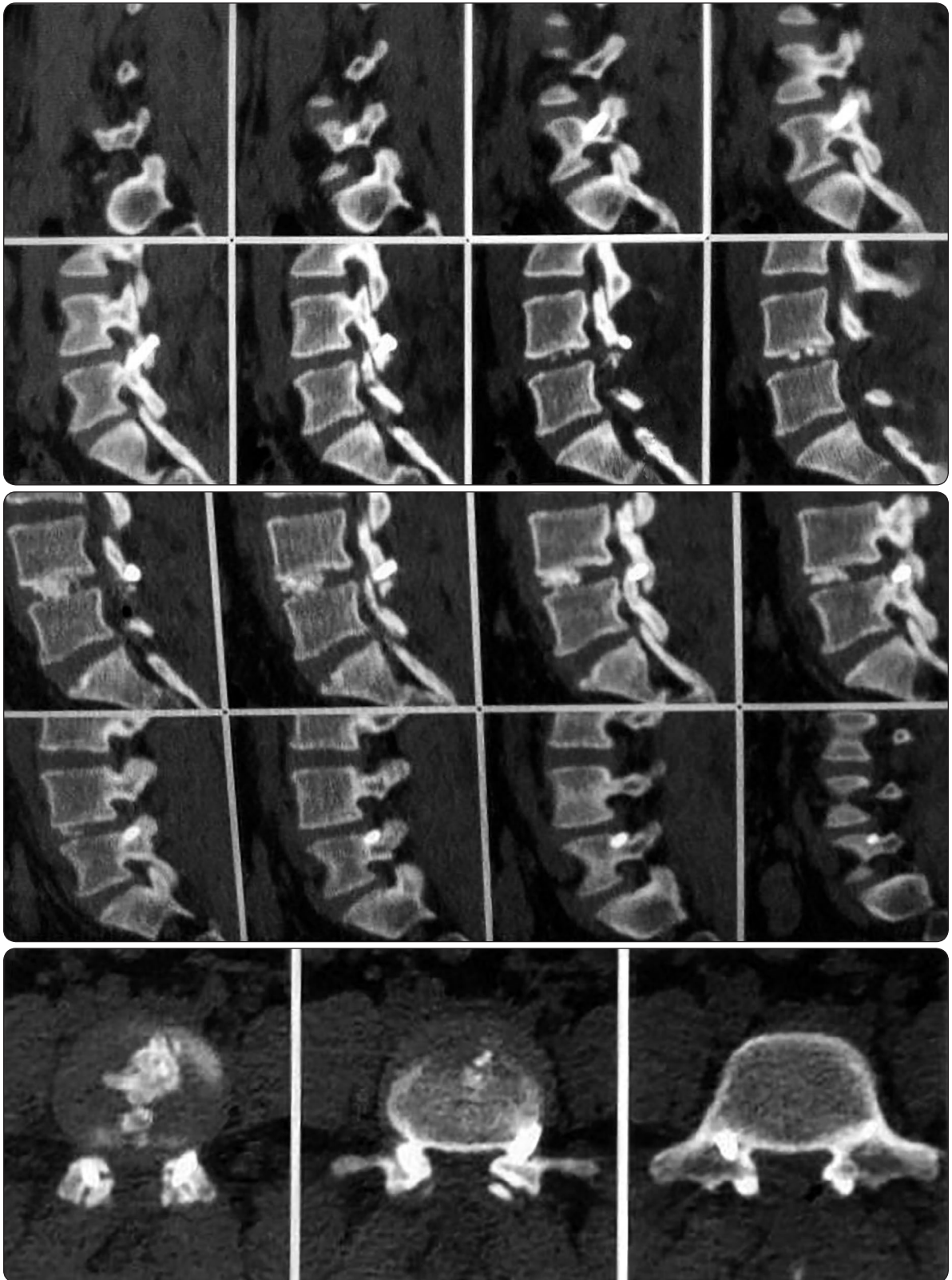


Figure 6. MS CT-scan sagittal and axial cuts showing the PLIF and the facet screws are seen crossing through the inferior articular process of L4 vertebra, the facet joint space, the superior articular process of L 5 vertebra and into the pedicle of L5 vertebra.

Discussion

Lumbar discectomy is a common neurosurgical practice; however, this procedure has also common complications including recurrent disc prolapsed and instability. Several approaches were investigated to reduce these complications including posterior lumbar interbody fusion (PLIF) and lumbar fixation. PLIF operation offers advantages including total nuclear disc excision, restoration of disc-space height, root decompression, limited muscle retraction and injury, and solid mechanical arthrodesis. Major disadvantages have included graft displacement, neurologic injury and nonunion. The use of posterior fixation as an adjunct to PLIF reduces the probability of these complications and increases the chances of fusion.²⁶ Bilateral facet screw fixation was introduced as an alternative to pedicle screw fixation as it has several advantages; being cheaper, takes much less time than pedicle screw fixation, requires less dissection of tissues hence reducing blood loss and can often be done without the help of C-arm guidance, thus can be performed in operating theaters that do not have this device and avoiding radiation hazards.^{16,18,19,22,23,27} PLIF provides support to the anterior and middle columns reducing the stress forces imposed on the facet screws and utilizing bone graft from the laminectomy site further lowers the cost of the operation by avoiding using artificial prosthesis (e.g. cage). Recently, percutaneous facet screw fixation was introduced as a means of vertebral fixation. However, it do not address the root compression caused by disc prolapsed or bony compromise and exposes the patient and operator to radiological hazards.^{10,11,24}

Concerns were raised regarding the solidarity of facet screw fixation and several studies confirmed the adequate vertebral fixation using this technique. Benzel EC et al,³ found that the

stability provided by both trans-facet pedicle screw (TFPS) fixation and traditional pedicle screw fixation was not compromised after repetitive cycling. In this model, trans-facet screw fixation appears equivalent biomechanically to traditional pedicle screw fixation. Cunningham BW et al,¹⁴ found that stand-alone interbody cage placement results in a significant reduction in acute range of motion (ROM) at the operative segment in the absence of posterior supplemental fixation. If added fixation is desired, facet screw placement, including the Viper F2 facet screw system using an integrated compression washer and transfacet-pedicular trajectory, provides similar acute stability to the spinal segment compared with traditional bilateral pedicle screw fixation (PSF) in the setting of lateral interbody cage deployment. Lee et al.,¹⁰ found that of 84 patients treated for degenerative spondylolisthesis or degenerative disc disease, the results of facet screw fixation (FSF) following anterior lumbar interbody fusion (ALIF) appear to be clinically equivalent to those achieved after pedicle screw fixation (PSF), and the procedure represents a safe and minimally invasive modality to achieve solid fusion in the lumbar spine.

Stonecipher et al,²⁶ conducted a study on 35 patients who underwent combined PLIF and bilateral facet screw fixation with a follow-up period ranging from 6 to 18 months. There were no patients with significant neurologic injury or functional root loss and only one patient developed graft displacement and failure of fixation (laminar fracture in markedly obese patient). Three patients had subcutaneous hematomas (no surgical treatment required). None of the cases required blood replacement. The authors have concluded that the addition of facet fixation/fusion to the PLIF operation substantially reduces the complication rate of

the procedure. Their study, in contrast to ours was retrospective and uncontrolled. Their indications for surgery included disabling low-back pain with discographic/MRI-demonstrated disc derangement, recurrent disc herniation, and failed inter-transverse process fusions, that was different from the indication for inclusion in our study which was a fresh lumbar disc prolapse. In our study, no patient had significant neurologic injury and no graft displacement or failure of fixation was reported.

In our study, there was no selection bias in assigning the patients to either groups as every other patient was admitted to one of the groups sequentially without other factors affecting the admission until we had 20 patients admitted to each group. Twenty one males (52%) and 19 females (48%) were included in the study with similar sex distribution between both groups (Table 1). The age ranged from 18 to 72 years with a mean of 37 years. The mean age in both groups did not show statistically-significant difference. Age from more than 30-50 years presented the most frequent category of patients (48%) (Table 1). L4-5 LDP represented the most frequent level affected followed by L5-S1 LDP then L3-4 level; which is consistent with the literature (Table 1). There was not statistically significant difference between both groups as regards to the distribution of the disc level affected ($P<0.05$).

Group A patients had a longer duration of surgery as compared to group B patients. This was expected because of the extra duration required to perform PLIF and the application of the facet screws. The duration difference, however, was not statistically-significant ($P<0.05$). Sixteen patients (80%) of group A patients had duration of surgery less than 60 minutes as compared to 18 patients (90%) of group B. Most of the patients in the two groups

had blood loss of 100-300 ml without significant difference between both groups ($P<0.05$). This could be explained by the short duration required for facet screw application and minimal additional tissue dissection that did not add to the blood loss. Although group A patients had additional surgical procedures, the duration of postoperative hospital stay was not significantly longer than in group B which could indicate no increasing morbidity by the combined PLIF and facet screw fixation (Table 1).

At the follow-up period of one and two years, the difference in the incidence of postoperative complications was significant. No cases of group A patients had recurrence of lumbar disc prolapse at the operated level or at other levels. In addition, there was no postoperative instability as compared to group B. Postoperative low back pain was also significantly lower in group A patients ($P<0.05$, Table 2). These results emphasize the possible long-term beneficial therapeutic effects obtained by combined PLIF and facet screw fixation. Margulies and Seimon¹⁷ in his study on 57 consecutive patients who had a degenerative disc disease demonstrates that facet screw fixation has advantages. They mentioned that the technique not only was easy to implement by placing a small screw through a facet joint and its respective pedicle, but produced excellent clinical results that are comparable to the other more bulky spinal instrumentation systems.

No significant difference existed between both groups before surgical interventions. The ODI significantly improved in both groups after surgical intervention. Interestingly, significant postoperative improvement in ODI was reported in group A (treatment group) as compared to group B (control group) (Table 3).

Correspondingly, the VAS was significantly improved in both groups post-operatively. A

significant postoperative improvement was obvious in group A (the treatment group) in contrast to group B (Table 4).

Jacobs et al,⁹ described 88 patients who underwent isolated dorsal fusion with translaminar screws. They mentioned only three nerve root palsies, two of which were transient. No nerve root palsies were reported in our study probably because we did laminectomy first and then facet screw fixation under direct vision avoiding any direct nerve root injury in contrast to translaminar screws where a longer trajectory of the screw is required and the nerve roots are not under direct vision. Grob et al,^{5,6} reported on 72 patients who underwent 109 levels of instrumentation without a ventral fusion. Complications were described in general terms and included pseudoarthrosis rates of 5.5% (four patients), transient nerve root irritation in 4.1% (three patients), two deep vein thromboses, and one durotomy. Reich et al,²¹ reported on 61 patients who underwent isolated posterior fusion using translaminar screw fixation. Average follow-up was 26 months, with a minimum of 16 months. No nerve palsies were described. One superficial infection was noted, and four patients had subcutaneous hematoma which did not require intervention. No comparison group was mentioned, and no other indices of perioperative morbidity were described. Benini and Magerl¹ described 166 patients in whom translaminar screw fixation was applied as the primary fusion modality. This technical note, a retrospective study without a comparison group, made no mention of perioperative complications. In another retrospective study on translaminar screw fixation, Grob and Humke⁵ described a longer follow-up period, but little discussion of perioperative morbidity was provided. In

addition, there was no comparison to pedicle screws or non-instrumented fusions.

In their retrospective study, Thalgott et al,²⁷ reported on 46 patients who underwent anterior lumbar interbody fusion and translaminar screw fixation. The median hospital stay was 2 days, and the mean blood loss was 255 cc for 30 single-level and 16 two-level fusions. They did not, however, have a comparison group of pedicle screw patients. Although the postoperative hospital stay was comparable to our results, the mean blood loss in their study was more than our mean probably because their series included cases that had two-level fusion which were not reported in our study.

Conclusion

Combined posterior lumbar interbody fusion and bilateral facet screw fixation in lumbar disc prolapse is a relatively cheap, technically easy to be done and significantly reduce both the incidence of recurrent lumbar disc prolapse as well as the postoperative lumbar instability and chronic low back pain without significantly increasing the operative time or blood loss while avoiding the hazards of radiological exposure both to the patient and the operators.

Study Limitations:

This is a relatively small study, although including 40 patients. The follow-up period was relatively short. In this study, all group A patients had facet screw fixation at one level only. Other studies are needed to include a larger population of patients for an extended period of follow-up and probably including patients having facet screws inserted at more than one level. Also, a comparison group undergoing pedicle screw fixation may give further insight to the beneficial aspects of the facet screw fixation.

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الملخص العربي

تثبيت الوجيحات القطنية بالمسامير على الجانبين مع الالتحام الخلفي القطني بين الفقرات في حالة فتاء الغضروف القطني

البيانات الخلفية: الشكاوى المعتادة للمريض في حالة فتاء الغضروف القطني هي ألم في الظهر والأطراف السفلية. في البداية يتم اللجوء إلى الراحة في الفراش والعلاج الطبي والطبيعي. ثم نتجه إلى العلاج الجراحي في حالة فشل العلاج المحافظ.

في محاولة للحد من مضاعفات ما بعد الجراحة، سوف نستخدم الالتحام الخلفي القطني بين الفقرات PLIF جنباً إلى جنب مع تثبيت الوجيحات بالمسامير على الجانبين أثناء استئصال الغضروف للحد من عدم الاستقرار بعد العملية الجراحية. هذا الأسلوب يتجنب الكثير من سلبيات المسامير العنقي.

إنها أقل تكلفة، لديها أقل معدل حدوث مضاعفات، لا تحتاج إلى معدات خاصة، وسهلة التطبيق وأقل تشريح للأنسجة وتستغرق وقتاً أقل.

الغرض: دراسة الالتحام الخلفي القطني بين الفقرات PLIF مع تثبيت الوجيحات القطنية بالمسامير على الجانبين لتقليل نسبة حدوث مضاعفات ما بعد الجراحة.

تصميم الدراسة: دراسة استباقية عشوائية مضبوطة.

المرضى والطرق: وسيتم إدراج ٤٠ حالة في هذه الدراسة، شُخصت بفتاء بالغضروف القطني وأدى إلى الألم الوركي والتي لا تستجيب إلى العلاج المحافظ - مع أو بدون - ضعف بالأطراف السفلية.

سيقدم ٢٠ مريضاً إلى الالتحام الخلفي القطني بين الفقرات PLIF مع تثبيت الوجيحات بالمسامير على الجانبين بعد استئصال الصفيحة الفقرية وإزالة الغضروف القطني، في حين سيقدم ٢٠ مريضاً آخرين فقط لاستئصال الصفيحة الفقرية وإزالة الغضروف القطني وسوف يستخدموا كضوابط.

سيتم اتخاذ موافقة من المرضى بعد منحهم الاختيار أما المشاركة في الدراسة أو مجرد إجراء العملية التقليدية.

النتائج: تحسن المرضى في المجموعتين ولكن من حيث آلام الظهر وجد فروقاً واضحة عند المقارنة بين المجموعتين دون زيادة كبيرة في وقت العملية أو فقدان الدم مع تجنب مخاطر التعرض الإشعاعي إلى كل من المريض والمشغلين.

الاستنتاج: الالتحام الخلفي القطني بين الفقرات PLIF مع تثبيت الوجيحات بالمسامير على الجانبين بعد استئصال الصفيحة الفقرية وإزالة الغضروف القطني هو وسيلة رخيصة نسبياً، وسهلة من الناحية الفنية وتقلل إلى حد كبير حدوث كل من انزلاق مرتجع بالغضروف القطني أو عدم الاستقرار باستقامة الفقرات أو آلام أسفل الظهر المزمنة بعد العملية الجراحية.