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# Comparative study between Transpedicular Screws Alone versus Transpedicular Screws with Intervertebral cage in Management of Recurrent Lumbar Disc Prolapse

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ORIGINAL ARTICLE

# Comparative Study Between Transpedicular Screws Alone Versus Transpedicular Screws with Intervertebral Cage in Management of Recurrent Lumbar Disc Prolapse

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**Abstract**

*Background*: **The most frequent surgical technique for people with low back and leg discomfort is lumbar disc surgery. The persistence or recurrence of symptoms arises as a prominent consequence of primary surgery, despite the enhanced success of lumbar disc surgery with many new technological and surgical procedures.**

*Aim*: **In order to manage recurrent lumbar disc prolapse, this research compares the surgical results of transpedicular screws alone or in conjunction with posterior interbody fusion (PLIF) polyetheretherketone (PEEK) cage.**

*Patients and methods*: **This is a prospective and retrospective comparative research of 20 patients suffering from recurrent lumbar disc prolapse, Patients are included randomly in either of the two groups, each group includes 10 patients, Group A: included patients who had interbody fusion added to the transpedicular screw, Group B: included patients who were subjected to transpedicular screws alone.**

*Results*: **The study's findings demonstrated that mean ± SD of Pain (VAS score) preoperatively was in group A 7.79 ± 1.41, and VAS score after 3 months postoperatively was 1.25 ± 0.576, and in group B was 7.59 ± 1.64, and the VAS score after 3 months postoperatively was 1.62 ± 0.638, there was a very statistically substantial variation between pre and postoperative regarding pain ($P < 0.001$), the majority of case had no complications.**

*Conclusion*: **Posterior Lumbar Interbody Fusion Combined with Transpedicular Screws is more technically feasible and enhanced reduced back pain and radicular pain more than Transpedicular Screws alone and it can be the best option for management of recurrent lumbar disc prolapse.**

*Keywords:* Discectomy, Low back pain, Lumber interbody fusion, Recurrent

## 1. Introduction

Recurrent lumbar disc herniation (RLDH) is often defined as an ipsilateral or contralateral disc herniated at the same level of prior surgery that results in radiculopathy symptoms following a symptom free period of at least 6 months after surgery.[1]

Back or leg pain persists in 10−30% of patients following primary discectomy, the risk of recurrence with microdiscectomy is 3.5%−10.8%, and this rate will rise if the postsurgical follow-up time is extended.[2]

Revision lumbar discectomy and instrumented fusion are the two primary surgical treatments for the therapy of recurrent lumbar disc herniation. Since there is no proof that one surgical procedure is better than another, choosing the best surgical intervention may be difficult.[3]

There is ongoing debate regarding the best course of action for recurrent disc herniation. While some surgeons choose fusion, others favor a straightforward discectomy. Recurrent discectomy increases

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the risk of segmental instability because it necessitates more disc and posterior spinal component withdrawal (lamina and/or facet joint); dural tear, and nerve damages may be more severe at simple re-discectomies; some surgeons advise fusion surgery at first reoccurring, regardless of whether instability exists.[4]

BAK titanium (Ti) was utilized in interbody cages because it improves cell adhesion and osseointegration, encouraging bone fusion; nevertheless, because of variations in the modulus of elasticity, it may subside more quickly than polyetheretherketone (PEEK).[5]

## 2. Patients and methods

Population: 20 patients suffering from recurrent lumbar disc prolapse. Patients are included randomly in either of the two groups, each group includes 10 patients, group A*:* included patients who had interbody fusion added to the transpedicular screw, group B*:* included patients who were subjected to transpedicular screws alone.

Study Design: This research provides a retrospective and prospective comparison.

Place of Work: From February through November 2022, the research will be conducted at Damietta Specialized Hospital and Al-Azhar University Hospitals.

### 2.1. Inclusion criteria

(1) Both sexes (male and female).
(2) Failed medical treatment for 6 weeks.
(3) Patients with single or multiple levels of recurrent lumbar disc suffering from either low back pain or radicular pain.
(4) Patients who have no contraindication for general anesthesia and are generally fit for surgery.

### 2.2. Exclusion criteria

(1) Patients who have contraindication for general anesthesia or generally unfit for surgery.
(2) Patients with spondylolisthesis.
(3) Patients with developed lumber canal stenosis.

### 2.3. Preoperative assessment

The preoperative data including: History, preoperative neurological examination as well as, visual analogue score (VAS), oswestry disability index (ODI), for treatment for low back pain.

Radiology as preoperative MRI and plain radiography (dynamic views) were done.

Preoperative investigations: Complete Blood count (CBC), Bleeding profile (bleeding time), partial thromboplastin time (PTT), prothrombin time (PT), kidney function and liver function. ECG, Echocardiography (if indicated), Plain chest radiography.

Consent for surgery: Under general anesthesia, the patient consents to a lumbar laminectomy and discectomy with pedicle screw fixation and interbody fusion. The surgeon and patient discuss the surgical procedure's expected advantages, including pain alleviation and potential improvements in function and walking problems. Talking about neurological decline, problems such a Dural rupture, an infection, a hematoma, and nerve root damage.

Operative information comprised the surgical level, the amount of blood lost, the length of the procedure, the kind of fixation employed, the postoperative discomfort, and any neurological impairment both before and after the procedure. In order to evaluate the results, we employed the ODI questionnaire. Additionally, each patient was asked to rate the level of their experienced pain using a VAS.

Position: The patient is lying on their back with their abdomen free, and their spine is bent to allow for the opening of their interlaminar gaps.

Procedures: The incision is made routinely midline over the old skin incision, dissection carried down with electro cautery through the subcutaneous tissue, fascia is reached, expose the posterior tip of the spinous process, When the lamina has been reached, scrape the Paraspinal muscles laterally to the facet joints, Sometimes total facetectomy was needed to insure nerve root untethering without injury. A blunt nerve hook was used to palpate the margins of the foramen. The most superior tip of the superior articular facet was resected in performing the foraminotomy.

The wound was irrigated, and homeostasis was maintained in the epidural space with bipolar electro cautery of the epidural veins, then disc material is removed and end plates prepared, all nuclear disc material is removed to ensure good bone graft to vertebral bone contact. The location of the pedicles is identified by anatomical land marks (pars interarticular is) and by image intensification fluoroscopy in the operating room, Follow the progress of the pedicle finder by feeling inside the pedicle with a pedicle feeler and by checking with the fluoroscopy.

The bone is generally decorticated and a bone graft is placed between the lamina and transverse process before the final placement of screws. A broad laminectomy and bilateral partial facetectomies are performed as part of the PLIF method in order to see and remove the intervertebral disc. A PEEK cage is then securely packed with autologous

bone graft and put into the disc space. The Cage is radiolucent and allows visualization of bony healing by normal plane radiographs.

Follow-up with the patient: In this research, we evaluated our patients three months after surgery, 1 week after surgery, and immediately after surgery:

(1) Clinical examination: motor and sensory.
(2) Outcome scores: including the visual analogue score, Oswestry disability index, and Length of postoperative hospital stay.
(3) Neuro imaging: all patients will undergo post-operative radiography antero-posterior and lateral view to access the pedicle screws and cage placement.

### 2.4. Statistical analysis

SPSS statistical program version 10 was utilized for data input and analysis (SPSS, Inc., Chicago, IL, USA). A mean and standard deviation were utilized to show the quantitative data. To assess the effect of surgery on the mean of result ratings, a paired *t*-test was utilized. The qualitative data were presented as percentages and numbers. The connection between the variables in the qualitative data was determined using the chi-square ($\chi^2$). Substantial and strongly substantial findings are indicated by *P* values of less than or equal to 0.05 and less than or equal to 0.001, respectively.

## 3. Results

In the current work, patients were mostly in their forties, with male sex predominance and slightly overweight. The most affected levels were L5-S1 followed by L4-5. The associated comorbid conditions were smoking, diabetes mellitus, hypotension, cardiac disease and previous operations (Table 1).

Both groups A and B are comparable regarding pain free interval, preoperative low back pain, preoperative radicular pain, and disability index.

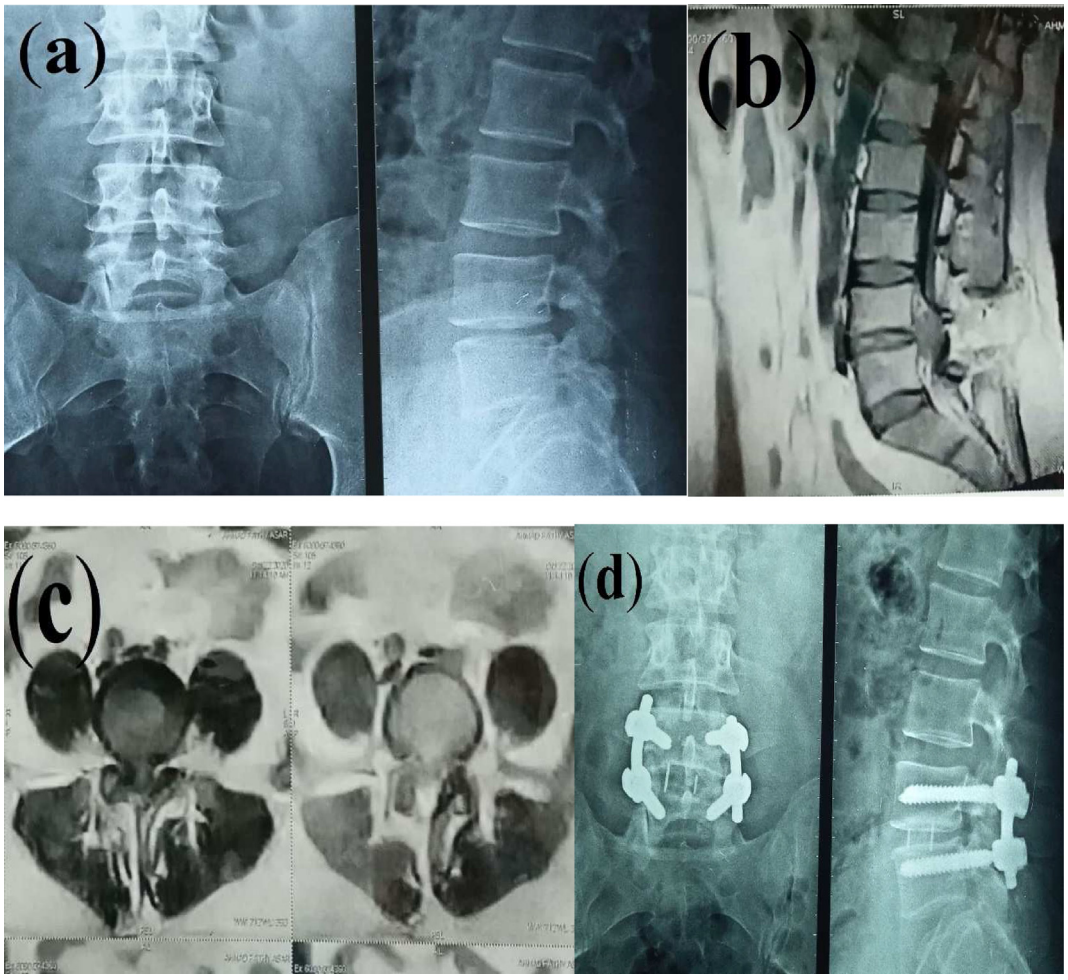


*Fig. 1. (a) Plain radiography lumbar spine AP and Lat. views showing right unilateral fensteration and discectomy L4-5 was operated in July 2019, (b and c) MRI sagittal and axial views showing recurrent disc herniation at the same level, (d) plain radiography lumbar spine 3 months after surgery showing PLIF with PEEK cage with bone graft and stabilized by pedicle screw and rod with good fusion on June 2022.*

*Table 1. Demographic data, the affected levels and comorbidities of the two studied groups.*

| Variable | Group A ($n = 10$) | Group B ($n = 10$) | $t/\chi^2$ | $P$ |
|---|---|---|---|---|
| Age (years) | 43.36 ± 7.51 | 41.83 ± 9.32 | 0.438 | 0.651 |
| Sex | | | | |
| Male | 9 (90%) | 4 (40%) | 0.156 | 0.688 |
| Female | 1 (10%) | 6 (60%) | | |
| BMI (kg/m$^2$) | 24.61 ± 5.62 | 25.69 ± 5.73 | 0.379 | 0.680 |
| Affected Levels | | | | |
| L4-5 | 7 (70%) | 7 (70%) | | |
| L5-S1 | 3 (30%) | 3 (30%) | | |
| Associate Comorbidities | | | | |
| Smoking | 6 (60%) | 1 (10%) | 0.132 | 0.702 |
| DM | 1 (10%) | 3 (30%) | 0.557 | 0.458 |
| HTN | 2 (20%) | 4 (40%) | 0.135 | 0.718 |
| Cardiac diseases | 1 (10%) | 1 (10%) | 0.373 | 0.534 |
| Previous operations | 0 | 1 (10%) | 0.142 | 0.654 |

Additionally, the length of surgery, length of stay in the hospital, and intraoperative blood loss were not substantially different across the groups. However, the symptom duration was significantly longer among group A than group B (Table 2).

Both groups showed significant improvement of low back pain and radicular pain after surgery than the preoperative values. Both were comparable regarding VAS score for low back pain except significant reduction in group A than group B at 3 months of follow-up. Additionally, group A had significantly higher ODI at three months follow-up (Table 3).

Table 4 revealed that, regarding the clinical, radiological, and overall outcomes, there was no discernible variation between the two groups Fig. 1.

## 4. Discussion

The most frequent side effect of lumbar disc herniation surgery is RLDH. Because of the perineural scarring and adhesions, revision surgery is more challenging and riskier than first surgery Ahsan and colleagues.[6]

There are several known risk variables for repeated disc herniation. Radicular pain was often

*Table 2. Preoperative data, clinical assessment and operative data.*

| | Group A ($n = 10$) | Group B ($n = 10$) | $t$ | $P$ |
|---|---|---|---|---|
| Pain free interval (month) | 15.95 ± 5.83 | 14.87 ± 7.11 | 0.455 | 0.653 |
| Symptoms duration (months) | 4.45 ± 1.09 | 4.28 ± 0.924 | 3.17 | 0.432 |
| Preoperative clinical Assessment | | | | |
| Low back pain VAS | 7.82 ± 1.38 | 7.68 ± 1.65 | 0.252 | 0.803 |
| Radicular pain VAS | 7.34 ± 0.733 | 7.64 ± 1.57 | 0.671 | 0.508 |
| Oswestry Disability index | 31.2 ± 6.64 | 28.5 ± 6.92 | 1.09 | 0.285 |
| Operative data | | | | |
| Operative time (min) | 141.2 ± 25.7 | 130.6 ± 17.58 | 0.579 | 0.571 |
| Hospital stay (days) | 1.74 ± 0.33 | 1.56 ± 0.15 | 0.389 | 0.691 |
| Blood loss (ml) | 525.4 ± 127.7 | 519.3 ± 117.6 | 0.469 | 0.637 |

*Table 3. Low back and radicular pain VAS and ODI between the two studied groups.*

| | Low back pain VAS | Group A ($n = 10$) | Group B ($n = 10$) | $t$ | $P$ |
|---|---|---|---|---|---|
| Low back pain (VAS) | Preoperative | 7.79 ± 1.41 | 7.59 ± 1.64 | 0.254 | 0.779 |
| | Postoperative | 2.56 ± 0.742 | 2.88 ± 0.854 | 1.28 | 0.213 |
| | 1 week Postoperative | 2.11 ± 0.245 | 2.09 ± 0.236 | 1.12 | 0.193 |
| | 3-months follow-up | 1.25 ± 0.576 | 1.62 ± 0.638 | 2.12 | 0.042 |
| Radicular pain (VAS) | Preoperative | 7.13 ± 1.45 | 7.70 ± 1.49 | .668 | 0.511 |
| | Postoperative | 2.17 ± 0.785 | 2.99 ± 0.879 | 2.81 | 0.009 |
| | 1 week Postoperative | 1.92 ± 0.522 | 1.23 ± 0.572 | 3.9 | 0.005 |
| | 3-months follow-up | 1.70 ± 0.509 | 1.06 ± 0.556 | 3.7 | 0.001 |
| ODI | Preoperative | 30.1 ± 6.64 | 28.4 ± 6.89 | 1.08 | 0.283 |
| | Postoperative | 26.44 ± 4.19 | 22.59 ± 5.41 | 2.27 | 0.034 |
| | 1 week Postoperative | 21.69 ± 5.16 | 18.23 ± 5.60 | 1.92 | 0.076 |
| | 3-months follow-up | 20.35 ± 5.08 | 17.21 ± 5.52 | 1.66 | 0.090 |

*Table 4. Outcome distribution between studied groups.*

| | Group A ($n = 10$) | Group B ($n = 10$) | $\chi^2$ | $P$ |
|---|---|---|---|---|
| Outcome | | | | |
| Excellent | 8 (80%) | 7 (70%) | | |
| Good | 1 (10%) | 1 (10%) | 1.8 | 0.591 |
| Fair | 1 (10%) | 1 (10%) | | |
| Poor | 0 | 1 (10%) | | |
| Complications | | | | |
| Dural tear | 2 (20%) | 1 (10%) | | |
| Superficial wound infections | 0 | 1 (10%) | | |
| Discitis | 0 | 0 | 3.08 | 0.495 |
| Neurological deficits | 0 | 0 | | |
| Final clinical and radiological outcome | | | | |
| Fusion rate | 10 (100%) | 8 (80%) | 1.14 | 0.285 |
| Patient satisfaction | 8 (80%) | 8 (80%) | 0.369 | 0.539 |
| Radiculopathy improvement | 10 (100%) | 7 (70%) | 0.369 | 0.539 |

the most prevalent symptom and indication of RLDH, and it was identical to those of primary one Dave and colleagues.[7]

Simple discectomy or discectomy with instrumented fusion are only two of the surgical treatment options for RLDH. There is ongoing debate on the ideal course of action or whether fusion is preferable to a simple corrective discectomy for RLDH Ahsan and colleagues.[6]

By increasing fusion rates, restoring intervertebral height, and preserving lumbar lordosis, an interbody fusion prosthesis may further enhance the clinical outcomes Ahmed and colleagues.[8]

Various surgical interbody fusion procedures, such as anterior (ALIF), posterior (PLIF), and transforaminal (TLIF) lumbar interbody fusion, are being discussed Guerin9.

There were no substantial variations in the age, sex, BMI, or related comorbidities between the two study groups in terms of demographic data. Concerning distribution of disease characteristics between the two studied groups, both groups were in match with no substantial variations in pain free interval, or symptoms duration.

In terms of preoperative low back pain and radicular pain VAS and ODI, both groups matched.

A verified, subjective measure of both acute and ongoing pain is the VAS. A handwritten mark on a 10 cm line that indicates a continuum between 'no pain' and 'worst agony' is used to record scores Younger and colleagues.[10]

The ODI is a measure of low back pain disability developed from the Oswestry Low Back Pain Questionnaire and used by doctors and academics. In the treatment of spinal diseases, it has emerged as one of the key condition-specific outcome metrics Fairbank and Pynsent.[11]

In this study, both groups showed a substantial reduction in the low back pain VAS scores from preoperative to 3 months postoperatively with lower mean score shown at the fusion group. This may be attributed to that body fusion technique added more stability and reduced pain resulting from unstability Ahsan.[6]

The fusion group, however, showed reduced VAS scores after surgery and at 3 months follow-up. Similar results were reported by Ahsan which was preoperative ($7.86 \pm 1.36$ for back pain and $7.30 \pm 0.77$ for radicular pain) and ($1.06 \pm 1.01$ for back pain and $1.50 \pm 0.504$ for radicular pain) postoperative.[6]

The current study revealed that ODI scores decreased in both groups postoperatively and at 3 months follow-up, with significant decrease in fusion group compared with nonfusion group in the postoperative mean scores.

Warner reported that The ODI score has good accuracy in defining a successful result. When comparing results across groups, the baseline ODI score should be taken into account. This was achieved in our study, as both groups were matching in the preoperative ODI scores Warner and Tubbs.[12]

The present study showed that both groups had comparable outcomes, with better satisfactory rate was achieved in the fusion group, as excellent outcomes represented 80% in fusion group compared with 70% in nonfusion group. These findings are in line with Lehmann and Larocca who found that Patients in the fusion group tended to have higher results than those with disc resection alone.[13]

Mansour MH reported that one-sided transpedicle fixation by screws for recurrent herniation of the lumbar disc provides slightly better outcome than bilateral approach, especially for recovery rate with $P$ value less than 0.05 Alhady and colleagues.[14]

El Shazly and colleagues documented that fusion groups showed better outcomes than the nonfusion group.[15]

Early postoperative complications such as cage subsidence may cause the disc height to gradually shrink, which might affect the anterior support of

the spine and hinder effective fusion, leading to negative results. It is caused by the axial compression force at the cage endplate interface, low bone mineral density (BMD), the quantity of cartilaginous endplate removed during surgery, the form, size, and location of the cage inside the disc space, among other factors Abbushi.[16]

In 2004, Paul Park determined that adjacent segment disease (ASD), a late postoperative complication of lumbar fusion surgery, could be caused by age, osteoporosis, female sex, postmenopausal state, anterior lumbar interbody fusion, injury to the facet joint of the adjacent segment, long-segment fusion, sagittal alignment, preexisting degenerated disc at the adjacent level, and injury to the facet joint Park.[17]

The final clinical and radiological findings of both groups were analyzed in the current work. No significant differences were noted in either of the evaluated items. However, the fusion group showed higher fusion rate, higher satisfaction and higher radiculopathy improvement. This provides further evidence for better outcome of the fusion group.

## 5. Conclusion

A common surgical procedure that produces much superior outcomes, maintains disc height, prevents disc recurrence, ensures load sharing, and promotes spinal stability is lumbar fusion with neural decompression. In our study, both techniques were comparable to each other regarding outcomes, pain tolerance and complications. In the majority of patients, we effectively accomplish firm fusion with appropriate mechanical alignment. Posterior Lumbar Interbody Fusion Combined with Transpedicular Screws was more technically feasible and enhanced reduced back pain and radicular pain and it can be the best option for management of recurrent lumbar disc prolapse.

## Disclosure

The authors have no financial interest to declare in relation to the content of this article.

## Authorship

All authors have a substantial contribution to the article.

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## Conflicts of interest

The authors declared that there were no conflicts of interest.

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