# COMPARATIVE STUDY OF TWO LEVELS DISCECTOMY WITH OR WITHOUT POSTERIOR INTERBODY FUSION IN A TERTIARY CARE HOSPITAL

TAFSEEL AHMED[1], MUHAMMAD ABDUL HANAN[2], ADEEL HAMEED[3], AFZAL JAVED[4], UZMA QAYYUM[5], MUHAMMAD ZAFAR IQBAL SHAHID[6]

*[1,3]Senior Registrar, Department of Orthopedic Surgery, Jinnah Hospital , Lahore, [2]Associate Prof, Khawaja Safdar Medical College, Sialkot, [4]Consultant Orthopedic Surgeon, Allied Hospital, Faisalabad, [6]Professor, Department of Orthopedic Surgery, Allama Iqbal Medical College, Jinnah Hospital , Lahore*

## ABSTRACT

**Background**: Lumbar disc herniation is considered as major cause of chronic backache & radiculopathy. Recurrent disc herniation and instability are common with multilevel discectomy while degenerative problems of adjacent segment are more common with interbody fusion.

**Objectives**: To compare the functional outcomes & complications of two levels disc excision with or without posterior lumbar interbody fusion.

**Methods:** This prospective randomized controlled study was carried out at Department of Orthopaedic Surgery Jinnah Hospital, Lahore from Jun 2024 to Nov, 2025. A total number of 50 patients with two levels intervertebral disc prolapse , divided into two equal groups A & B with 25 patients in each group. In group A, we performed discectomy in group A while in group B, discectomy with posterior Lumbar interbody fusion was done. The functional outcomes were evaluated by using Owestry Disability Index(ODI) & Visual Analogue Score(VAS) at 06 weeks, 03 months, 06 months & one year after the surgery.

**Results:** A significant pain reduction at $6^{th}$, 12 weeks and $6^{th}$ months in both groups but Group A typically shows faster pain relief in the immediate postoperative phase ( $p< 0.05$), while Group B shows better long-term stability for back pain. VAS Score was 7.4- 7.6 as base line in both groups. At the end of one year, it was 2.0 to 3.0 in group A while 2.8 to 3.5 in group B. There was no significant difference in terms of Owestry Disability Index (ODI) at 6 and $12^{th}$ week ($p> 0.05$) but had a significant difference at $6^{th}$ months ($p< 0.05$).

**Conclusion:** For L4-5 and L5-S1 herniation, discectomy (Group A) alone offers less operative duration and better pain relief after followup of one year but the recurrence rate of disc herniation is high I.e;22%in our study. Posterior lumbar inter body fusion in group B is more technically demanding and provides a definitive solution for recurrence, making it an alternative option for patients with risk of instability

**Key words:** Lumbar Spine, Disc Herniation, Posterior lumbar interbody fusion, Discectomy

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**Correspondence to:** *Muhammad Zafar Iqbal Shahid Professor, Department of Orthopedic Surgery, Allama Iqbal Medical College, Jinnah Hospital, Lahore*

**Email:** *dr.zafar2014@gmail.com*

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## INTRODUCTION

In normal humans the inter vertebral disc provides the cushion and it transmit the body weight from one vertebra to other one to permit the safe mobility of spine.Each disc has got certain hydro-static pressure which is approximately 30 pounds for lumbar disc. This pressure is markedly increased during repetitive bending or weight lifting in addition to compressive forces exerted by spinal musculature.[1] It results in increase in pressure ,causing tear in annulus leading to extrusion of Nucleus pulposus in a direction where surrounding tissue is weak either as a

result of degenerative disease, repetitive bending movements of spine,trauma or as a result of some developmental defects. This bulging disc matter tracks around the nearby spinal nerves, either as a result of compression or chemical irritation, causes pain, weakness or numbness of the legs or feet.Massive posterior protrusion may compress one or more lumbar nerve roots. In 90% of the cases,it is at $4^{th}$& $5^{th}$ lumbar disc.[2,3]

Although prolapsed intervertebral disc can occur at any age ranging from teens to elderly people but the most common age for prolapsed intervertebral disc is between 30 to 50 years. Males are the most common sufferer as compared to Females. The people most commonly affected from prolapsed herniated disc are Physically demanding people who are involved in repetitive movements like bending, twisting or rotational movements etc; in labour class people , health care professional, auto mechanics and in ware house workers . It also involves persons who have prolonged sitting like drivers, software enginee03rs and office bearers. Likewise dentist , factory workers and professional athletes are also equally affected by this problem during their life.[4]

Although disc herniation can occur at cervical & thoracic spine but it commonly involves low back at lumbar spine (L4 &L5 Disc). Depending upon severity of disc herniation, it can be simple bulge , prolapsed,extrusion or it can be sequestration. The most common type of lumber disc which are symptomatic are central & post central disc herniation and mostly these are the result of axial biomechanical forces acting upon the lumbar disc levels. In case of large central prolapsed disc, the patient may present with cauda equina syndrome leading to weakness of legs with bladder & bowel involvement. The posterocentral disc herniation can cause compressive neuropathy depending upon the location & size of the extruded disc. A massive posterolateral disc herniation can cause the compression of exiting nerve roots in the foraminal zone.[5]

Prolapsed Inter vertebral Disc (PIVD) is a major reasonfor chronic low back pain and radiculopathy, often necessitating surgery when conservative treatments are ineffective.A single-level disc herniations are morecommon. When there is multi-level pathology, particularly involving two adjacent segments, it poses a considerable challenge for the spine surgeon. The treatment option varies from conservative to surgical options. The conservative option is adopted when there is no cauda equina syndrome. It is in form of nonsteroidal anti inflamatory drugs, opiods, neuropathic drugs like gabapentin, physical therapy, Epidural steroid injections, platelet rich plasma and cell based therpies, bone marrow aspirate concentrate, low intensity pulsed ultrasound.[8] The surgical treatment options are adopted when conservative measures are failed after an extended period of 06 or more weeks.It is also adopted when there is progressive neurological deficit or cauda equina syndrome. The commonly performed procedures are Microdiscectomy, endoscopic disc excision, laminotomy, posterior lumbar spine interbody fusion, transforaminal lumbar interbody fusion(TLIF) & disc replacement. The choice of procedure depends upon surgeon,s experience & symptoms of the patient. When treating two-level PIVD, neural decompression is the primary surgical goal, but the optimal approach—two-level disc excision alone versus two-level disc excision with posterior lumbar interbody fusion (PLIF)—remains a topic of discussion among spine surgeons.[7]

## METHODS

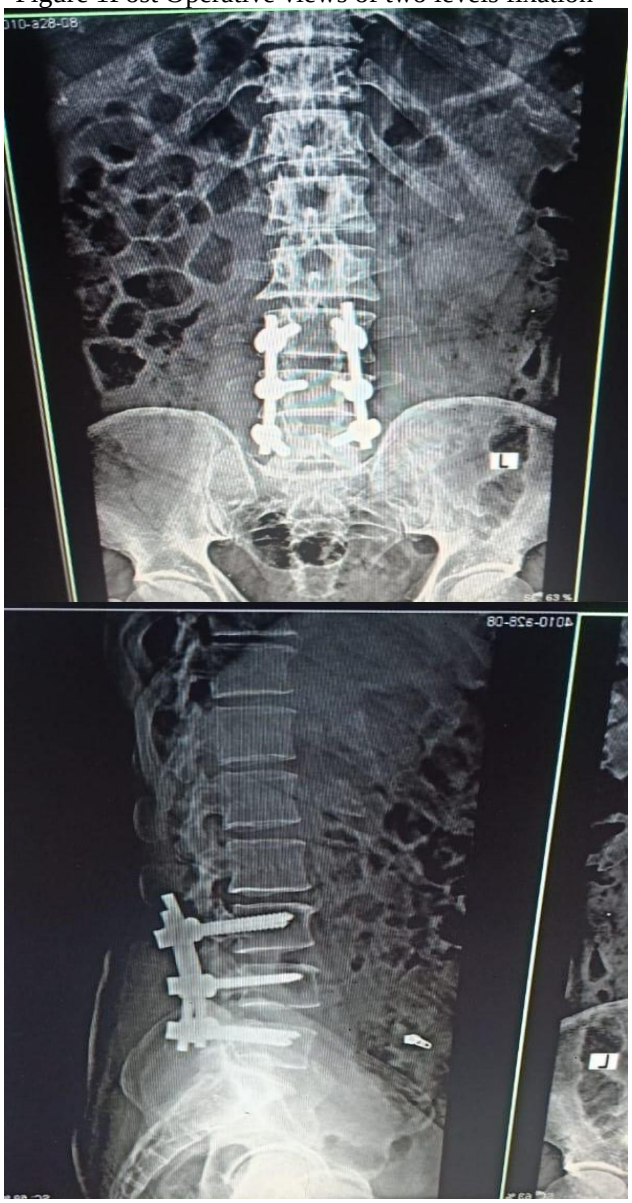
This comparative interventional study was carried out at Department of Orthopaedic & Spine surgery Jinnah Hospital / Allama Iqbal Medical College Lahore. A total number of 50 patients with diagnosed cases of two levels (L4-5& L5-S1) on MRI, were divided into two equal groups A& B,each group having 25 patients.The sample method used, was convenience/ purposive sampling technique based upon the strict inclusion criteria from the Out patient spine clinic of the Hospital. The mean age was46.25 $\pm$ 11.24 with age range of 20 to 65 years. Patients having with multilevel disc extrusion(more than two disc extrusion), associated trauma of spine, head injury and patients with associated extremity trauma were excluded from the study. In group A ,25patients having two levels (L4-5& L5-S1) underwent Discectomy alone to remove the disc fragment that were compressing the neural elements while in group B, we performed Discectomy with posterior lumbar interbody fusion by pedicle screws & rods to achieve the fusion. All patients were operated on $2^{nd}$ day after the admission under General anaesthesia with patient in prone position with a posterior mid line incision and discharged on second day after the surgery in group A and on $3^{rd}$ postoperative day in group B.The operative time, intra operative blood loss & hospital stay was recorded for each patient.

## FOLLOWUP

Each patient was evaluated for one year at baseline, 06 weeks,03 months,06 months & at the end of one year after the surgery. The functional status was assessed via Oswestry Disability Index (0-100) in the form of questionnaire that measures the functional disability in patients having low backache. Score of 0-20% indicate minimal disability, 21-40% shows the moderate disability, 41-60% indicates for severe disability ,61-80% indicates crippling life while 81-100% is reserved for bed ridden patients. Similarly for pain assessment, visual Analog Scale was used (A subjective tool for measurement to quantify the pain sensation, often a

100mm line, with no pain on the left of line while worst pain on the right) for both back & leg pain.

Figure 1Post Operative views of two levels fixation



**Statistical Analysis:** All data was analysed by using SPSS Version 17.Student T-Test was used to compare the means between these two Groups at specific intervals while Paired T-Test was used to compare the means of the same group at different time points. A p-value of 0.05 was considered as significant. Chi-Square test was used for recurrence of disc herniation.

**RESULTS**

A significant pain reduction at 6th, 12 weeks and 6th months but Group A typically shows faster pain relief in the immediate postoperative phase ( p< 0.05), while Group B shows better long-term stability for back pain. VAS Score was 7.4- 7.6 as base line in both groups. At the end of one year, it was 2.0 to 3.0 in group A while 2.8 to 3.5 in group B. There was no significant difference in terms of Owestry Disability Index (ODI) at 6 and 12th week (p> 0.05) but had a significant difference at 6th months (p< 0.05).

The operative duration in Group A was 50–60 minutes per level, while Group B averages 130–150 minutes due to the complexity of fusion( p< 0.0001). Group A had higher recurrence rate for (22% after one year) where in group B, it reduces the chances of recurrence at the fusion level due to better stability( p<0.000).

Table-1 Visual Analogue Score (VAS)(paired T-Test)

| Time Period | Group A | Group B | p-value |
|---|---|---|---|
| Pre-operative | 7.4 + 2.6 | 7.1 + 2.9 | .702 |
| At 6th Weeks | 3.0 + 1.2 | 5.5 + 2.1 | 0.000 |
| 03 months | 2.8 + .99 | 3.8 + 1.1 | 0.001 |
| 06 months | 3.6 – + 1.2 | 2.9 + .93 | 0.026 |

Table -2 Owestry Disability Index (ODI **)**

| **Time Interval** | **ODI** | **Group A Discectomy (n=25)** | **Group B (PLIF) (n=25)** | **Chi-square p-value** |
|---|---|---|---|---|
| **Before surgery** | Crippled (61%-80%) | 25 | 25 | - |
| **06 weeks** | 41%-60% severe disability | 08 (12.0%) | 12 (44.0%) | .382 |
| | 21%-40% moderate disability | 17 (68.0%) | 14 (46.0%) | |
| **12 weeks** | 41%-60% severe disability | 05 (12.0%) | 06 (44.0%) | .301 |
| | 21%-40% moderate disability | 20 (68.0%) | 19 (46.0%) | |
| **06 months** | 21%-40% moderate disability | 03 (12.0%) | 10 (44.0%) | .024 |
| | 0% to 20% minimal disability | 22 (68.0%) | 15 (46.0%) | |

## DISCUSSION

In the present study, 50 patients were divided into two equal groups A & B, each group having 25 patients. Both these groups underwent discectomy but in group B, we did posterior lumbar interbody fusion in addition to discectomy. VAS Score and ODI was considerably improved in both groups. VAS Score was 3.6 + 1.2 in Group A and 2.9 + .93 in group B (p<0.001) after 6

months which was statistically significant.ODI at 6th month showed 68.0% in Group A had minimal disability (0 -20%) and 46.0% in Group B after 6th month which was also statistically significant (p<0.024). There was 22% recurrence in Group A clearly reveals that for two-level herniation, the biomechanical environment may demand posterior lumbar interbody fusion in addition to decompression to ensure long-term stability. The operative duration was also long in group B (p < 0.0001) which was statistically significant and represent a great physiological burden. It suggests that although discectomy remains the primary choice for radiculopathy, fusion must be done when there is an associated instability. A lot of studies are consistent with our study.

In a comparative study conducted by A. Kishore et al; in 2024 at Department of General Surgery Madhubani Medical Coll ege and Hospital, India on 60 patients which were divided into 2 equal groups. In group A, 30 patients underwent discectomy while in in group B,remaining 30 patients underwent discectomy with interbody fusion. There was no significant statistical difference in VAS Score (0.97+- 2.27 group A& 1.27+-2.42 group B, P<0.62) Owestry Disability Index(9.40+-11.14 group A and 12.40+-16.08 in group B, p<0.40) in both groups at follow-up.[8]

In another study conducted by Imam Sehab et al; at combiator medical college, India, on 36 patients operated for herniated lumbar with discectomy & discectomy with posterior lumbar interbody fusion . There was no difference in VAS Score on short term basis in both groups but it was better in patients where discectomy was performed with interbody fusion after 06 months. However Owestry disability index was compare able in both groups.[9]

In a study conducted by Siani on 36 patients where they perormed discectoy in group A and discectomy with PLIF in group B. There was no significant difference in terms of pain relief and functional outcomes but in patients in whom discectomy with interbody fusion was performed, had better long term functional outcomes.(p<0.0042 after 06 months of surgery) for rediculopathy.[10]

In a similar study carried out by Aghayee HN et al; reveals 14 patients (82.3%) who underwent discectomy and 21 patients (87.5%) who underwent discectomy with posterior inter-body fusion were able to return to their origional activities indicate that it was not statistically significant (p=0.679).[11]

In a retrospective study by Mucuoglu et al on 49 patients with upper lumbar disc prolapse, 33 patients underwent discectomy while in16 patients fusion surgery was performed. The visual analog scale (VAS) scores was improved in both groups after the surgery. Oswestry Disability Index score (ODI) was significantly better in patient where fusion was done . The "satisfactory" outcomeswere 66.7% in the groupA and 93.8% I where fusion was done ($p = 0.034$) after 03 months. They came to the conclusion that overall results were satisfactory in this study. The fusion should be considered where extended laminectomy is carried out.[12]

All these studies are consistent with our study in terms of functional outcomes as revealed by VAS Score and ODI Score. Similar studies suggest that discectomy should be reserved as primary choice for radicular pain while posterior interbody fusion should be considered in case of pre-existing instability or if there is risk of recurrent disc prolapse.[14,15] The 22% recurrence rate in Group A underscores that for two-level disc herniations, the mechanical environment demands that fusion should be carried out than just decompression to prevent long-term instability. However fusion increases surgical morbidity, at the same time it effectively eliminates the recurrence by stabilizing the motion segment.[16]

## CONCLUSION

For L4-5 and L5-S1 herniation, discectomy (Group A) alone offers faster operative duration and better pain relief after followup of one year but the recurrence rate of disc herniation is high I.e;22%in our study. Posterior lumbar interbody fusion in group B is more technically demanding and provides a definitive solution for recurrence, making it an alternative option for patients with risk of instability

## LIMITATIONS OF STUDY

In the present study ,sample size was small. There were only 50 patients which were divided into 2 equal groups so the study may be underpowered to conclude clinically any meaningful difference in two surgical techniques. The results were almost equal in both groups.This could be chances of false negative results due tosmall sample size.Moreover the followup period was short. A large sample size with longer follow up is required to solve this problem.

## ETHICAL APPROVAL

Ethical approval of article was granted by the Institutional Review Board of Allama Iqbal Medical College/Jinnah Hospital, Lahore vide reference No. ERB 00181/24 dated 07 May, 2024.

## CONFLICT OF INTEREST

Authors declare no conflict of interest.

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## AUTHOR'S CONTRIBUTIONS

**TA:** Manuscript writing, review of manuscript, supervision
**MAH:** Data analysis, review of manuscript
**AH:** Manuscript writing, statistical analysis
**AJ, SAD:** Manuscript writing, references
**UQ:** Radiological analysis
**MZIS:** concept and sdesign, manuscript writing
**All Authors:** Approval of the final version of the manuscript to be published

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