



Comparison of simple lumbar discectomy and Discectomy with fusion for treatment of single level lumbar disc herniation

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ABSTRACT

Aim: This study is aimed at assessing relief from back ache, leg pain and functional outcome in cases of simple discectomy for single level lumbar disc herniation and comparing it with functional outcome in similar studies of single level lumbar disc herniation with fusion techniques.

Material and methods: This is a prospective study where 33 patients with single level lumbar disc herniation without spondylolisthesis underwent simple discectomy (SD) without instrumentation. Patients were assessed with Visual Analogue Score (VAS) and Oswestry Disability (ODI) for back pain, leg pain and functional outcome. The scores were recorded preoperatively, postoperatively after 1 month and thereafter 1 year. VAS and ODI scores of patients from our study were compared with similar pain and functional outcome studies in two studies in literature of single level lumbar discectomy with instrumentation.

Results: On statistical analysis of comparative data of our study and other studies in literature, we found that the simple discectomy group had statistically better outcome with respect to the instrumented group in back ache VAS scores and ODI in both post op 1 month and 1 year interval.

Conclusions: Our study suggests that for single level prolapse intervertebral disc with no evidence of instability, functional outcome results and backache resolution are better with simple discectomy rather than with fusion. Additionally, simple discectomy reduces operative time, complications associated with implants and cost.

Key words: Lumbar Discectomy , Fusion, Disc herniation.

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INTRODUCTION

Low back pain is one of leading cause of chronic pain, disability and lost work hours. Lumbar disc herniation is a common cause of low backache. Over the years of neurosurgical practice various surgical methods to tackle the lumbar disc

herniation have been used. Management of lumbar disc herniation remains a challenge and can be devastating when surgery fails to relieve pain in immediate post operative period as well as in long term. Lumbar disc herniation surgical procedures



are more commonly associated with failed back syndrome than other spinal surgical procedures.

Classical simple discectomy (SD) technique was first described by Mixer and Barr in 1934.(1) Simple discectomy has been known to be associated with good surgical outcome and symptom relief in early period, however it is reported that in long term follow up satisfactory outcome decreases by up to 40% to 80% due to residual pain and recurrent disc prolapse.(2) The necessity and efficacy of fusion after simple discectomy in patients with single level lumbar disc herniation without listhesis is still controversial. (3) Various procedures have been used including SD, discectomy with interbody fusion with autograft or metal implant, or discectomy with fusion added with posterior lumbar instrumentation.

Interbody fusion was first described by Cloward (4) for lumbar disc herniation. Types of interbody fusion include anterior lumbar interbody fusion (ALIF), posterior lumbar interbody fusion (PLIF) or transformational interbody fusion (TLIF). These procedures provide immediate spine stabilisation, distraction between segments, prevent disc space collapse and increase fusion rate. PLIF and TLIF are considered to provide reliable nerve root decompression and disc space height reconstruction (5,6).

Our study is aimed at comparing the functional/ clinical outcome of simple discectomy for single level lumbar disc herniation in comparison with other studies with fusion techniques.

MATERIALS and METHODS

Patient selection

This study included 33 patients operated at Neurosurgery department in a tertiary care centre in Mumbai between October 2017 to September 2020 for symptomatic lumbar disc herniation. Patients without neurological deficits were given a trial of conservative management for 3 weeks. After thorough clinical examination, MRI was done in all such patients. Patients having single level disc herniation without evidence of spondylolisthesis were selected. Surgical procedure was explained in detail and informed consent was taken from patients. After routine haematological and radiological work up, patients were posted for surgery. Surgical procedure was standardised (as mentioned later).

Inclusion and exclusion criteria

Inclusion criteria: Single level lumbar disc herniation, symptomatic, with clinical and MRI imaging correlating level of disc herniation and who have been given conservative treatment for at least 3 weeks.

Exclusion criteria: Preoperative fracture, spinal tumour, severe scoliosis, spine or disc infection, recurrent lumbar disc herniation and spondylolisthesis of any grade.

Pre-operative work up

1.Haematological: Routine blood investigations as required by anaesthesia team and coagulation profile.

2.Radiological: X ray Lumbosacral spine anteroposterior and lateral view, Plain MRI Lumbosacral spine plain axial and sagittal view.

Surgical procedure

All operations were performed by a single surgeon, at the same institute. Patients were given preoperative Cephalosporin antibiotic intravenously. All 33 patients were operated under general anaesthesia in prone position. C arm was used to mark the incision at appropriate level. With aseptic precautions cleaning, painting and draping was done. 2.5 to 3 cm skin incision was taken, paravertebral muscle dissection was done, hemi or full laminectomy was performed and excision of ligamentum flavum was done. After cord retraction, disc was identified and extruded disc was removed. To decompress the exiting nerve root, foraminotomy was done. In patients with no annular tear, a small annulotomy was performed in herniated disc and all herniated fragments were removed. Annulotomy was closed with small oxidised cellulose plug. After achieving haemostasis, layered closure was performed.

Outcome measures:

Age, gender, level of surgery, complications (if any) intraoperative and postoperative were recorded for each patient. All patients were evaluated clinically before the surgery, 1 month after surgery and 1 year after surgery with Visual Analog scale (VAS) score and Oswestry Disability Index (ODI). (7,8)

RESULTS

Our study had total 33 patients, all of whom underwent a single level simple lumbar discectomy.

- Demographic Data and Patient Characteristics:** Table 1 shows the demographic data and patient characteristics of study participants.

Sr. No	Characteristic	Value	
1	Age, in years		
	Mean ± SD	48 ± 13.11	
	Range	Min 17, Max 70	
2	Gender, n=33		
	Male	22 (67%)	
	Female	11 (33%)	
3	Symptom duration, in days		
	Mean ± SD	671.8±76.1	
	Range	Max 747, Min 8	
4	Presenting Symptoms, n=33		
	Back pain	32 (97.0%)	
	Lower limb radiating pain	32 (97.0%)	
	Difficulty in walking	25 (75.8%)	
	Lower Limb Weakness	18 (54.6%)	
	Other Sensory symptoms	4 (12.1%)	
	Bowel/bladder complaints	0	
5	Presenting Signs, n=33		
	Motor weakness in lower limbs	18 (54.6%)	
	Deranged Reflexes (Absent reflex)	9 (27.3%)	
	Lower limb hypoesthesia	4 (12.1%)	
6	Segment Level Involved, n=33		
	L2-L3	1 (3.0%)	
	L3-L4	4 (12.1%)	
	L4-L5	20 (60.7%)	
	L5-S1	8 (24.2%)	
7	Postoperative complications, n=33		
	Foot Drop	2 (6.06%)	
	CSF Leak with Discitis	1 (3.03%)	
	Cauda Equina Syndrome	1 (3.03%)	
8	Long term functional outcome, n=33		
	Minimal disability	26 (87.9%)	
	Moderate disability	6 (18.2%)	
	Severe disability	0	
	Crippled	0	0
	Bed bound		

Table 1: Patient Characteristic of 33 Patients with single level Lumbar disc herniation

- Postoperative functional outcome analysis:**

All 33 patients were followed up for 12 months, VAS and ODI were calculated preoperatively, 1 month postoperatively and 12 months postoperatively. Table 2 Shows the mean values of VAS and ODI score at above mentioned periods.



Scores	Mean Preoperative	Mean Post- Op 1 Month	Mean Post-Op 12 Months
Back Pain VAS	5.03	1.94	1.33
Leg Pain VAS	7.91	1.52	1.09
ODI	25.9 (51.8%)	13.36 (26.72%)	6.06 (12.12%)

Table 2: Pre and post operative back pain and leg pain VAS and ODI Score

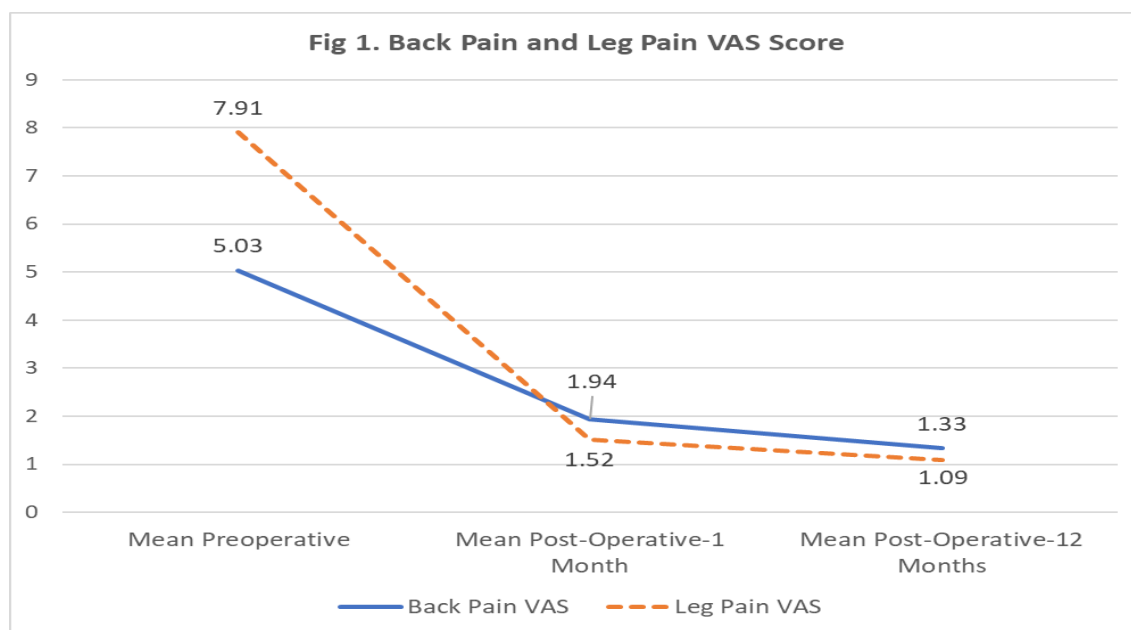


Figure 1 shows the progression of mean backpain and leg pain VAS scores.

There is significant decrease in the mean VAS backache and leg pain scores postoperatively on 1 month period, which further decreased gradually over next 11 months. So, with simple Lumbar discectomy immediate backpain relief was achieved quite significantly, which then steadily further decreased over longer postoperative period.

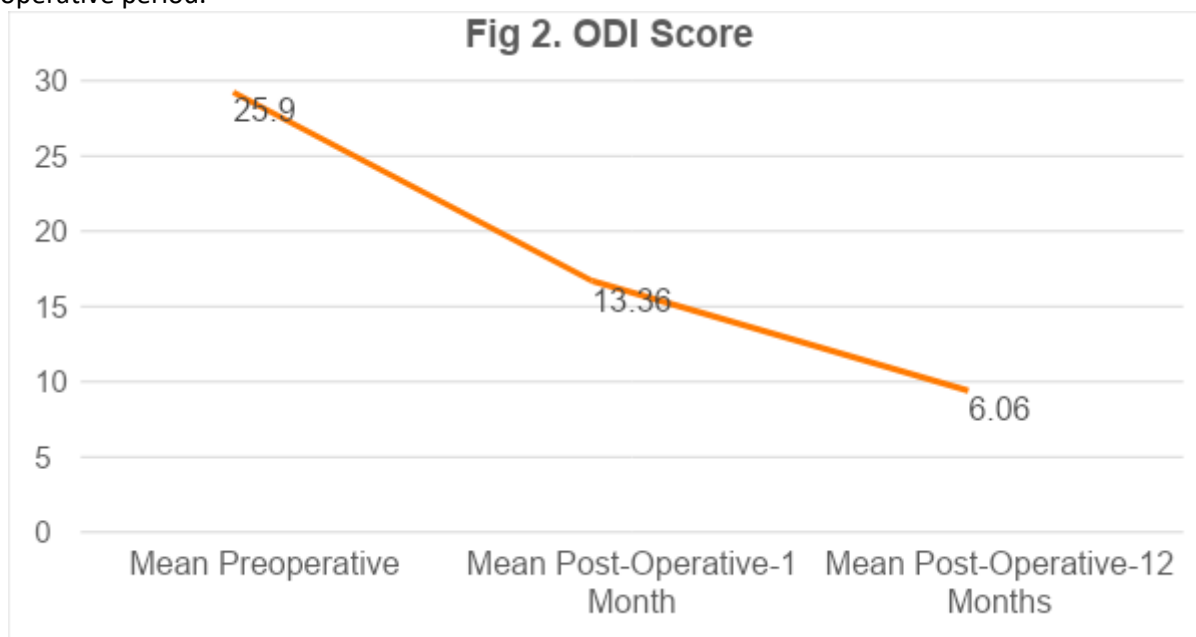


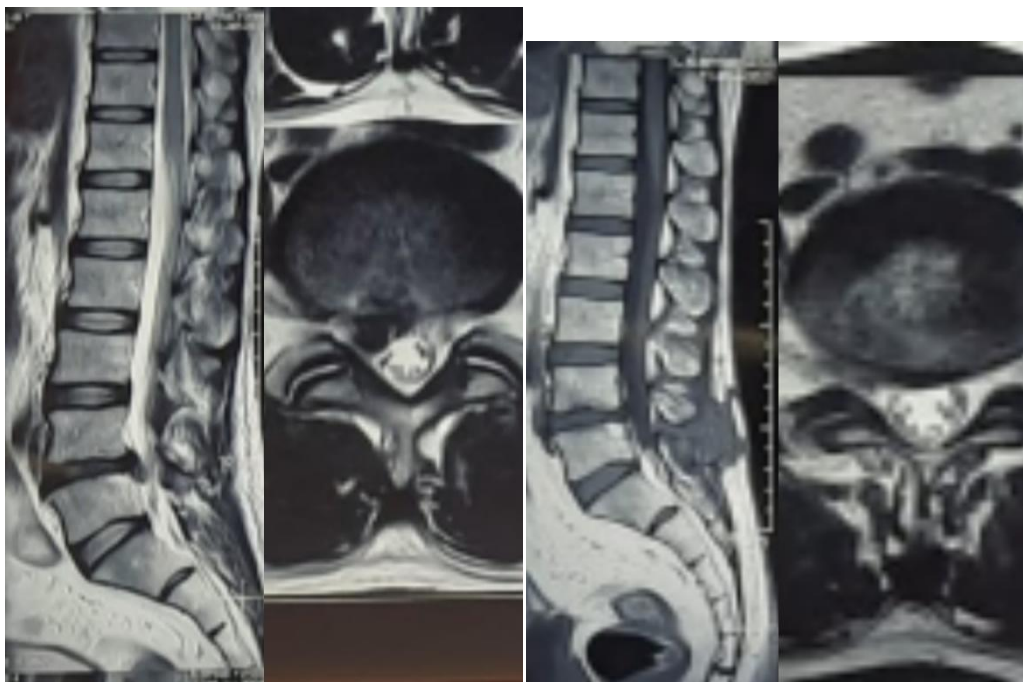
Figure 2 shows the progression of mean Oswestry disability index preoperative and in postoperative period.



ODI scores decreased gradually to nearly half in first postoperative month, with it further decreased significantly to no to mild disability level after 12 month postoperatively.

3. Illustrative cases

Case 1



A 48 year old male patient presented with complaints of lower backache radiating to right foot and sole region, without any motor, sensory or bladder/bowel abnormality. Patient had pain on straight leg raising test at 40 degrees on right side. MRI LS spine showed right paracentral disc protrusion at L4 L5 level with compression of thecal sac and right traversing nerve root (Figure 3). After all investigations, patient was operated with simple lumbar discectomy for L4 L5 herniated lumbar disc. Immediate postoperatively patient improved in backache and radicular pain. On further follow up at 12 months now patient is free of backache and radicular pain, with normal straight leg raising. Postoperative MRI showed decompression of thecal sac and nerve roots, with removal of herniated disc (Figure 4).

Figure 3: Pre-Operative T2-weighted sagittal and axial Images of L4 L5 disc herniation (Case 1)

Figure 4: Post- Operative T1-weighted sagittal and T2 weighted axial images showing removal of herniated L4 L5 disc (Case 1)



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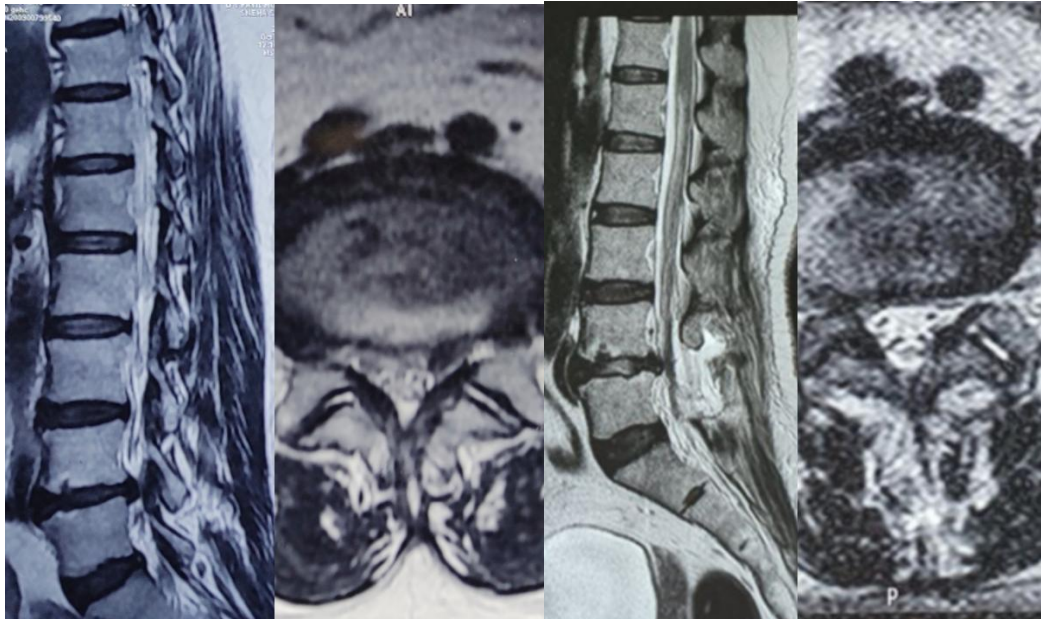
Case 2

Figure 5: Pre-Operative T2-weighted sagittal and axial Images of L4 L5 disc herniation (Case 2)

Figure 6: Post- Operative T2-weighted sagittal showing axial images showing removal of herniated L4 L5 disc (Case 2)

A 60-year-old male patient presented with complaints of lower backache, radiating pain along posterior aspect of left leg till dorsum and sole of left foot, with tingling and numbness over left foot. Straight leg raising test on left side was 30 degrees. Patient didn't have any motor weakness, hypoesthesia or bladder/bowel abnormality preoperatively. MRI LS spine showed L4 L5 disc herniation with compression of thecal sac and left L5 traversing nerve roots (Figure 5). After necessary investigations, patient was operated with simple lumbar L4 L5 discectomy. In postoperative period, patient developed LMN bladder dysfunction and constipation requiring laxatives to pass stools [cauda equina syndrome]. Patient was managed conservatively with clean intermittent self-catheterisation and pharmacotherapy (bethanecol, tamsulosin). On 12 month follow up patient had improvement in symptoms with patient being able to evacuate bladder without clean intermittent catheterisation and not dependent on laxative to pass stools. Postoperative MRI shows removal of disc (Figure 6).

and accepted treatment which gives satisfactory results in most patients with relief from symptoms in the early postoperative period (16). However, it is thought that the long-term results of discectomy are less predictable, with satisfactory results seen in only 40 to 80 percent of patients (2). Recurrent low back pain following surgery is referred to as failed back syndrome. Failed back syndromes happen more commonly after discectomy as compared to other spinal surgeries. It is thought that simple discectomy patients have chances of developing failed back syndrome in long term.

The concept of fusion was evolved to address this relapse of low back pain which could be due to multiple factors. To address the complications and failures, posterior and transforaminal lumbar interbody fusion techniques evolved. (17-20)

The number of studies comparing single segment discectomy and fusion with simple discectomy is limited. Bhatia NN et al showed that Posterior Lumbar Interbody Fusion (PLIF) is superior to simple discectomy biomechanically (21). However large transforaminal lumbar interbody fusion (TLIF) sizes have been asserted to cause nerve root

stretch and undesired neurological deficits in patients with lumbar disc herniation and lumbar spinal stenosis. Also, instrumentation has been implicated in increased immediate post operative pain, increased surgical time, significant increase in cost of surgery and instrumentation related complications.

The number of studies comparing clinical results of simple discectomy procedure and discectomy plus uninstrumented or instrumented PLIF/TLIF in patients with lumbar disc herniation is very limited.

In our study we have done simple lumbar discectomy and assessed their functional scores preoperatively, 1 month postoperatively and 1 year postoperatively. We have compared our study based on functional outcome i.e. VAS and ODI scores, with simple lumbar discectomy with instrumentation group VAS and ODI scores of studies of Ozkan Ozger et al (9) and Mubarak Basha Imam Saheb et al (10). We have compared these scores by unpaired t test and calculated the p value for statistical significance.

Study	Ozkan Ozger et al (instrumented grp) (n =50)	Our study (n=33)	P value (Significance)
Backache VAS pre operative (mean)	4.78 ± 0.98	5.03 ± 0.85 (3-6)	0.23 (NS)
Backache VAS 1 month post operative (mean)	3.60 ± 0.99	1.94 ± 1.0 (1-4)	<0.001 (S)
Backache VAS 1 year post operative (mean)	1.88 ± 0.90	1.33 ± 1.14 (1-4)	0.016 (S)
Leg pain VAS pre operative (mean)	8.72 ± 0.67	7.91 ± 1.01 (6- 9)	<0.001 (S)
Leg pain VAS 1 month post operative (mean)	1.3 ± 0.46	1.52 ± 0.97 (1-4)	0.169 (NS)
Leg pain VAS 1 year post operative (mean)	1.14 ± 0.35	1.09 ± 0.84 (1-3)	0.708 (NS)
ODI score pre operative (mean)	39.20 ± 10.07	25.91 ± 10.65 (10-47)	<0.001 (S)
ODI score 1 month post operative (mean)	-	13.36 ± 9.49 (3-46)	-----
ODI score 1 year post operative (mean)	11.20 ± 10.23	6.06 ± 3.90 (1- 16)	0.007 (S)

(Unpaired t test)

(P < 0.05 – Significant)

Table 3: Statistical analysis with calculation of significance with respect to study by Ozger et al

Study	Mubarak Basha Imam et al (instrumented grp) (n=8)	Our study (n=33)	P value (Significance)
Backache VAS pre operative (mean)	8.30 ± 0.5 (8-9)	5.03 ± 0.85 (3-6)	<0.001 (S)
Backache VAS 1 month post operative (mean)	6.12 ± 1.1 (5-8)	1.94 ± 1.0 (1-4)	<0.001 (S)
Backache VAS 1 year post operative (mean)	2.60 ± 1.4 (2-6)	1.33 ± 1.14 (1-4)	0.010 (S)
ODI score pre operative (mean)	69.75± 7.8 (62-78)	25.91 ± 10.65 (10-47)	<0.001 (S)
ODI score 1 month post operative (mean)	48.25 ± 9.5 (38-68)	13.36 ± 9.49 (3-46)	<0.001 (S)
ODI score 1 year post operative (mean)	25.75 ± 11.2 (62-78)	6.06 ± 3.90 (1- 16)	<0.001 (S)



(Unpaired t test)

Table 4: Statistical analysis with calculation of significance with respect to study by Basha Imam et al

On comparison of the functional scores of both above mentioned studies with our study at 1-month and 1-year postoperative period, we found that the simple discectomy group had statistically better outcome with respect to the instrumented group in back ache and ODi (Table 3 and 4).

CONCLUSION

Our study suggests that for single level posterior intervertebral disc herniation with no evidence of instability, functional outcome results of discectomy are better for simple discectomy rather than with fusion. There is better outcome in relief of back ache and functional outcome in simple discectomy. Additionally, we can decrease operative time, complications and cost associated with implants. However further study is required with large sample size and direct comparison of both groups done at same institute by same surgeon, to achieve more confirmatory results.

LIMITATION

1. The comparison of simple discectomy and simple discectomy with instrumentation are done in groups operated in different centres. This can be considered as a pilot study which can be followed up with study groups been operated at the same centre.
2. Our study sample size is small and needs to be followed up with a study with adequate sample size.

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(P < 0.05 – Significant)

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