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Original Research Article

A Prospective Study of Fenestration Discectomy of Lumbar Intervertebral Disc Prolapse

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Abstract

The 30 cases of lumbar disc prolapse treated with fenestration discectomy were included in the current investigation. with a six-month follow-up. Incidence was higher among male patients (70%) than female patients (30%). Affectation is more prevalent in the 31 to 50 age group, with a mean age of 39.7±8.82 years. Pain in the radicle was the most frequent symptom. The most typical indicator was a positive SLRT. Pre-operative JOA scores for each case ranged from 6 to 10. The most frequent disc level to herniate was L4-5. A post-op JOA score between 11 and 15 was present in 86.67% of patients. 77% of cases ended well. There is a statistically significant improvement in motor deficit correlation with JOA score with P value of 0.053. The sensory improvement in correlation with JOA score is statistically significant with P value of 0.034. Complications were superficial infection in 2 (6.66%) and dural rupture in 2 (6.66%) cases.

Keywords: MRI, Intervertebral Disc Prolapse, JOA, Lumbar Spine.

Introduction

One of the most incapacitating disorders in the world, low back pain affects every group. One of the most prevalent and debilitating musculoskeletal conditions is low back pain. The percentage of persons who have had low back pain at some point in their lives ranges from 70% to 80%. Low back pain is extremely common each year, with a prevalence that varies from 15% to 45% depending on the population being researched and surveillance techniques. Reduced function, decreased productivity, job loss, psychological suffering, and higher healthcare expenditures are all consequences of low back pain. As a result, low back pain places a significant financial strain on countries due to the direct cost of therapies and the indirect cost of lost productivity.

Sciatica is reported by 40% of people with low back pain. Yet, 4-6% of people have clinically significant sciatica as a result of lumbar disc prolapse. While L3-4 and L2-3 levels account for the majority of residual herniations, L4-5 and L5-S1 levels are more frequently affected by lumbar disc prolapse. [1-3]

Treatment for lumbar disc prolapse frequently involves a discectomy. Pain is the primary indicator for lumbar disc surgery, but neurologic symptoms and indications are frequently taken into account, even though they typically have much less functional significance. This may be because they seem more objective than pain-related signals.

The majority of investigations have found notable differences in the post-operative changes in neurological signals and functional recovery from pain. Different patient selection and examination methods may be the causes of these variances, but it is challenging to determine this because methodological details are rarely supplied. Neurologic symptoms are moderately reproducible, and there are differing views on their importance.

In the management of severe sciatic pain, surgical removal of the problematic disc offers a straightforward and efficient solution, and this approach has proven itself as a reasonably safe operation with positive outcomes in the majority of patients.

The different procedures available for the removal of the offending prolapsed disc are laminectomy, hemilaminectomy, fenestration, microdiscectomy, endoscopic discectomy, gold standard being the wide decompression using bilateral laminectomy. However, laminectomy is time consuming, causes more blood loss and has chances of causing instability which might lead to failed back syndrome in the future.

Because of the substantial disruption of the posterior stabilising structures of the spine and its subsequent consequences, the classic comprehensive laminectomy and discectomy have fallen out of favour. Due to the inherent minimally invasive nature of surgery, the technique of fenestration discectomy is reported to be less time-consuming, with less blood loss, with less postoperative complications, and it does not compromise the stability of the spine compared to laminectomy.

This study's focus is on the functional and neurological recovery after discectomy and fenestration for lumbar disc prolapse.

Aim

To study the extent of functional recovery (i.e. improvement in JOA score) in surgically treated patients of lumbar intervertebral disc prolapse by fenestration discectomy.

Objectives:

1. Assessment of the functional out come and neurological improvement in lumbar disc prolapse patient undergoing fenestration discectomy.

2. To analyze complications associated with fenestration discectomy.

Materials And Method

In Sri Siddhartha Medical College Hospital and Research Centre, 30 patients of either sex aged between 20-60 years who fulfilled the understated criteria were included in the study during October 2019 to March 2021.

Inclusion criteria:

- Individuals with neurological impairments and low back pain that has persisted despite conservative therapy for at least six weeks.
- The patient has a confirmed disc prolapse on MRI with prominent unilateral leg discomfort that extends below the knee and has been present for at least six weeks.

Exclusion criteria:

- Presence of associated spine pathology

- local infection at operative site including Discitis
- Lumbar canal stenosis and central disc bulge
- Previous history of spine surgery

a comprehensive clinical examination of every patient, as well as a thorough history taken at the time of admission. For the purpose of diagnosing prolapsed discs, magnetic resonance imaging is performed on all patients.

The Japanese Orthopaedic Association's low backache score was used to evaluate the patients both before and after surgery (50). In the immediate post-operative period, one month, and six months after the surgery, patients were followed up on.

Results And Analysis

This study consists of 30 cases of MRI proven lumbar disc prolapse treated by fenestration and discectomy from October 2019 to March 2021.

The patients age range from 20-60 years and the mean age affected are 39.7 ± 8.82.

Age Distribution

Table 1: Age Distribution

Age	No. of cases	%
20-30	5	16.67%
31-40	13	43.33%
41-50	8	26.67%
51-60	4	13.33%
Total	30	100.00%

Sex Distribution

Male patients were affected more (70%) in comparison to female patients (30%) in our study.

Table 2: Sex Distribution

Gender	No. of cases	%
Male	21	70%
Female	9	30%
Total	30	100%

Events which predisposing to the onset of pain were analyzed. History of lifting heavy weight present in 37% (4) of cases, with average duration of symptoms before surgery was 4.4 months, ranging from 3 months to 6 months. All patients had either light or heavy lifting of weight in day to day activities.

Type of Work

Table 3: Type of Work

Type of work	No of cases	%
Heavy	11	37
Light	19	63
Total	30	100

Type of Pain

Table 4: Type of Pain:

Type of pain	No of cases	%
Radiating(shooting)	19	57%
Non Radiating(localised)	11	43%

Majority of cases came with complaints of low backache and radiating pain) 19(57%), than non-radiating pain 11(43%)

Side of Radiculopathy

Table 5: Side of Radiculopathy

Radiation	No of cases	%
Left	16	63.33
Right	14	46.66

In our study radiating pain more to left than right.

Duration Of Symptoms In Months

Table 6: Duration of Symptoms In Months

Low back pain in months	No of cases	Percentage
3 months	8	26.67%
4 months	9	30.00%
5 months	10	33.33%
6 months	3	10.00%
Total	30	100.00%

In our study most patients (63.33%) had the symptoms for 4-5 months.

Distribution Of Neurological Findings

Table 7: Distribution of Neurological Findings

Signs	No. cases	%
Motor deficits	23	77%
Sensory deficits	7	23.33%
Positive SLRT	27	90%

Positive SLRT (90%) was the most common finding followed by motor deficit(77%) and sensory deficit(23.3%).

Distribution Of Level Of Disc Prolapse

Table 8 : Distribution of Level of Disc Prolapse

Level of disc prolapse	No. of cases	%
L3-L4	3	10.00%
L4-L5	18	60.00%
L5-S1	9	30.00%
Total	30	100.00%

All patients underwent MRI scan to know the level of the lesion. The most commonly affected level in our study was L4-L5 disc (60%) followed by L5-S1 disc (30%) and L3-L4 affecting 10%.

Distribution Of Pre-Op Joa Score

Table 9: Distribution of Pre-Op JOA Score

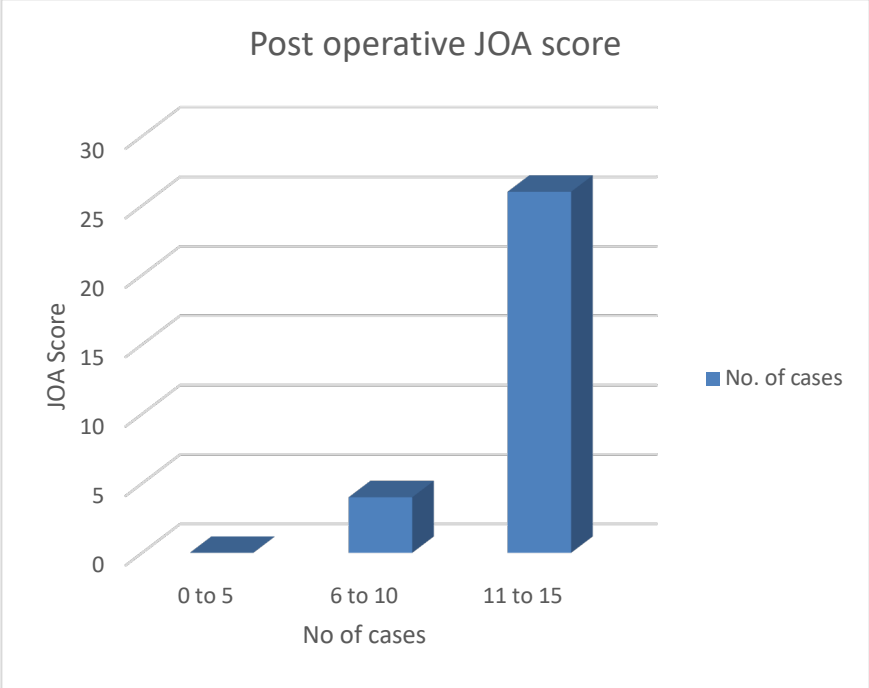
Pre-op JOA score	No. of cases	%
0 to 5	0	0.00%
6 to 10	30	100.00%
11 to 15	0	0.00%

In our study all patient's pre-operative Japanese orthopaedic association score is ranged from 6-10.

Distribution Of Joa Score Post-Op

Table 10: Distribution of JOA Score Post-Op

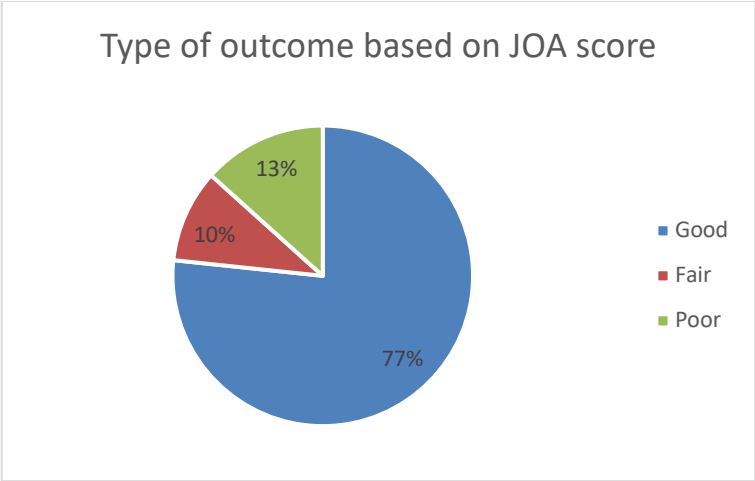
Post-op JOA score	No. of cases	%
0 to 5	0	0.00%
6 to 10	4	13.33%
11 to 15	26	86.67%



Graph 1: Distribution of JOA Score Post-Op

The post-operative JOA scores after 6 months show 4 subjects (13.3%) have score between 6-10 and 26 subjects (86.67%) have scores from 11-15.None of the JOA scores reduced below 6, implying none of them deteriorated postoperatively.

Type Of Outcome Based On Joa Score



Graph 2: Type of Outcome Based On Joa Score

The JOA percentage was calculated at the end of 6 months and based on percentage obtained, outcome was divided as below. In our study 23(77%) patients have good outcome and 3(10%) have fair and 4(13%) had poor outcome. In 4 patients 2 had a Dural tear sutured by Nylon and covered with fat patch. 2 patients had surgical site infection controlled with appropriate antibiotics based on culture and sensitivity.

The outcome according to the JOA score was correlated and analyzed for the following variables.

1. Sex
2. Age
3. Duration of symptoms
4. Motor deficit
5. Sensory deficit

1. Correlation with Sex

Table 12 : Correlation with Sex

Outcome	Male	Female	Total cases
Good	16	7	23
Fair	3	0	3
Poor	2	2	4
Total	21	9	30

In our study 7 out of 9 females had a good outcome, 16 out of 21 male had a good outcome and 3 male had a fair outcome, 2 male and 2 female had poor outcome, one male and female had dural tear and surgical site infection each. This difference in gender distribution is not statistically significant (P=0.121).

2. Correlation with Age.

Table 13 : Correlation with Age.

Outcome	<40 years	>40 years	Total cases
Good	15	8	23
Fair	3	0	3
Poor	0	4	4
Total	18	12	30

Based on age distribution in the study 8 out of 12 patients above 40 years had a good outcome, and all 4 having poor outcome belong to the same age group. In less than 40 years 15 had good and 3 had fair outcome. The difference between the groups is not statistically significant (0.935).

3. Correlation with duration of symptoms.

Table 14: Correlation with Duration Of Symptoms.

Outcome	< 4months	> 4months	Total cases
Good	22	1	23
Fair	2	1	3
Poor	3	1	4
Total	27	3	30

22 patients less than 4 months and one more than 4 months of symptoms had good outcome.

Fair outcome in 2 patients of <4 months and 1 patient >4 months is seen. Poor outcome in 3 patients of <4 months and 1 of >4 months. There was no statistically significant difference between the two groups (P=0.864)

4. Correlation with motor deficit

Table 15: Correlation with Motor Deficit

Motor deficits		Fair	Good	P Value
Absent	[n=3]	2 (6.67%)	1 (3.33%)	**0.053**
Present	[n=27]	11 (36.67%)	16 (53.33%)	

In our study out of 30 patients 27 had motor deficit pre operatively and 3 patients with no motor deficit. In all 27 patient's significant improvement in the motor component noticed.
The improvement is statistically significant with a p value of 0.053

5. Correlation with sensory deficit

Table 16: Correlation with Sensory Deficit

Sensory deficits		Fair	Good	P Value Fair
Absent	[n=22]	7 (23.33%)	15 (50%)	**0.034**
Present	[n=8]	6 (20%)	2 (6.67%)	

In our study 8 patients had sensory deficit preoperatively out of which all improved with 6 having fair and 2 good outcome based on JOA.

The improvement is statistically significant with P value of 0.034.

Discussion

Low back pain undoubtedly makes up for any lethality it lacks in the general misery it causes in contemporary industrial society. The most prevalent musculoskeletal problem today is low back pain, which has a significant financial impact on health care and is a leading cause of disability.

It is important to understand that low back pain is a symptom with a variety of origins, the most typical of which is a protruding disc. It wasn't until the 20th century that the cause of disc-related sciatica was discovered, along with its obvious morphologic and clinical neurologic symptoms. Since Mixter and Barr first identified disc protrusions in 1934 and demonstrated how well surgery works to treat them, there has been a growing interest in using disc excision to medically treat sciatica issues.

Yet, the literature shows that between 51 and 89% of patients with lumbar disc excision had satisfactory outcomes. There have been a lot of back operations that have failed and may need to be revised. According to numerous research, the lumbar disc excision recurrence rate ranges from 6% to 11%.

This suggests that a variety of factors affect how lumbar disc surgery turns out. The need of careful patient selection should therefore be emphasised. Conservative therapy offers adequate symptom alleviation for the vast majority of people with sciatica caused by disc prolapse. The natural history of disc disease should be considered while assessing it because it shows that surgery is only a palliative treatment option. Even when there is some neurological loss, conservative treatment for lumbar disc herniation provides good results.

Hence, every surgical procedure without the proper conservative therapy results in needless surgery and an inferior result.

Nonetheless, a protracted conservative regimen should be avoided when there are

severe radicular symptoms present as this raises morbidity and lowers the likelihood of a favorable outcome. In patients with persistent sciatica, a longer preoperative delay was linked to a less predictable result. Therefore, it is the responsibility of the doctor to appropriately choose for surgery those patients with the right reasons, who are anticipated to experience symptomatic relief from the procedure with the lowest possible risk and cost.

Improved diagnostic tools (myelography, CT, and MRI) have improved the accuracy of disc lesion diagnosis. By precisely visualizing all of the components inside the neural canal, they have transformed the diagnosis of spinal diseases.

Also, it provides the chance to draw a rough outline of the neural foramen and extraforaminal regions, aiding the surgeon in planning a precise surgical correction and avoiding pointless examination of levels that are not involved, especially with MRI. When the clinical presentation and imaging data are in agreement, lumbar disc surgery has great results.

Demographics

Sex	R.Davis [3]	Pappas et al [2]	Present study
Male	64%	61%	70%
Female	36%	39%	30%

In our study, men comprised nearly 70% of the cases while women accounted up to 30%. According to research by Pappas and Richard Davis, who also had a predominance of men, men were impacted more frequently than women.

Age	R.Davis	Pappas et al	Present study
Range	16-77yrs	15-83 yrs	20-60 yrs
Mean	42 yrs	42 yrs	39.7±8.82 yrs

Level of Disc Prolapse

The most commonly affected level in our study was L4-L5 disc (60%) followed by L5-S1 disc (30%) and L3-L4 affecting 10%. In comparison to pappas et al most affected L4-L5 (49%) followed by L5-S1 (40%) and, R.Davis most affected level being L5-S1(47%) followed by L4-L5(46.7%)

Level of disc Prolapse	R.Davis	Pappas et al	Present study
L1-2	0.2%	-	-
L2-3	0.9%	2%	-
L3-4	4.4%	9%	10%
L4-5	46.7%	49%%	60%
L5-S1	47%	40%	30%
Multipel level	0.8%	-	-

In our study 23(77%) patients had good outcome and 3(10%) had fair outcome in consistenc with R.Davis and pappas et al seris. In 4 patients had poor outcome, 2 had a Dural tear and 2 had surgical site infection.

Outcome	R.Davis	Pappas et al	Present study
Good	89	77.3	77
Fair	7.7	10.5	10
Poor	3.3	11.4	13

Conclusion

For the treatment of lumbar disc prolapse, the fenestration discectomy is a very practical and successful procedure. Our study's consistently positive outcomes (87%) can be attributable to careful case selection and a rigorous surgical approach. When there is a link between the clinical presentation and imaging investigations, as was the case in our study, lumbar discectomy findings are positive. At presentation, the majority of our patients complained of radicular pain. Single level disc prolapse affected the majority of the patients.

Thus we conclude that the procedure of fenestration discectomy is a simple and reliable method for treatment of meticulously selected lumbar disc prolapse patients having advantages of less morbidity and devoid of spinal instability

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