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Original research article

To compare the long-term results of post-op back pain in patient undergoing ligamentum flavum sparing microdiscectomy vs conventional microdisecectomy

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Abstract

Objective: To Compare the Long-term Results of Post op Back Pain In Patient Undergoing Ligamentum flavum Sparing Microdiscectomy Vs Conventional Microdisecectomy.
Methods: This is an Prospective study. The patients who were diagnosed clinically and confirmed by mri with disc prolapseand not responds to conservative treatment willing for microdiscectomy were prospectively enrolled in this study.
Relevant history and demographic details of the patient were recorded in the patients performa. A total of 30 patient were included in the study and were divided into 2 groups; one group of 15 patients underwent ligamentum flavum sparing microdiscectomy and in the other group of 15 patients, conventional microdiscectomy (ligamentum flavum sacrificing) was done.
Result: There was an almost comparable proportion of male and female patients in the two groups. the proportion of patients reporting radiculopathy on either side was the same, with more patients reporting radiculopathy in the left leg in both groups. all cases in both groups had a positive finding on SLRT, Bowstring and Bragard test. No difference in the ODI parameters between the two groups before and after the procedure was seen. In ligament sparing group, three patients reported having very severe pain before the procedure, compared to conventional group in which only one patient reported as having very severe pain. Seven cases each in conventional group reported having moderate and severe pain on VAS. In contrast, six cases each in ligament sparing group reported the same grade.
Discussion: Preserved flavum act as barrier between fibrosis and neural structure which prevents secondary neural compression as well as in case of revision surgery it decreases the chance of injury to dura or other neural structures. The ligamentum flavum (LF) has previously been indicated as an excellent barrier between hematoma organisation and the dural surface, and that severe bone structure removal may not be required to protect the LF. Surgical options that preserve both the bony structures and the LF can help overcome the challenges of revision surgery.
Conclusion: The findings of this study show that both conventional microdiscectomy and ligamentum flavum sparing microdiscectomy are both safe and effective surgical methods for the treatment of LDH. There is no significant difference in post operative back pain in patients undergoing microdiscectomy with and without preserving ligamentum flavum and there are no such additional benefits at ligamentum sparing technique as compare to conventional techniques.
Keywords: Discectomy, ligamentum flavum, low back pain, rediculopathy

Introduction

Low back pain is highly prevalent, with roughly 70% of people experiencing it at some point in their

lives[1]. Sciatica (low back-related leg pain) is one of the most frequent types of low back pain; about 5% of men and 2.5 percent of women may experience sciatica at some point in their lives[2].
Lumber Disc Herniation defined as focal displacement of nucleus, annulus and end plate material beyond the normal margins of intervertebral disc space.
The most common symptom of a herniated lumber disc is radicular pain. It's a form of pain that travels down your spine from your back and hip to your legs. The pain passes along the root of the spinal nerve. Numbness, tingling, and muscle weakness may accompany the leg pain. Lumber disc herniation is treated with both conservative and surgical methods. Microdiscectomy has lately acquired popularity, and many people consider it to be the gold standard[3].
A microdiscectomy is the surgical removal of abnormal disc material that presses on anerve root or the spinal cord. The procedure involves removing a portion of Lamina, Ligamentum flavumand prolapsed intervertebral disc which causes pain, weakness or numbness by stressing the spinal nerves.
Conventional microdiscectomy so called ligamentum flavum sacrificing microdiscectomy is associated with epidural fibrosis due to removal of ligamentum flavum. Epidural fibrosis can leads to postoperative back pain and can also cause neural compression. during revision surgery fibrosis makes the procedure difficult and there is always increase chances of injury to neural structure[4].
In the last couple of decades it is identified that this operation can be done while protecting the Ligamentum flavum[5].
Ligamentum flavum sparing microdiscectomy is also a type of discectomy procedure where we preserve the flavum intraoperatively rather than remove it and after surgery try to keep it in its normal anatomical position. This preserved flavum act as barrier between fibrosis and neural structure which prevents secondary neural compression as well as in case of revision surgery it decreases the chance of injury to dura or other neural structures. The ligamentum flavum (LF) has previously been indicated as an excellent barrier between hematoma organisation and the dural surface [6, 7]and that severe bone structure removal may not be required to protect the LF[19-20].Surgical options that preserve both the bony structures and the LF can help overcome the challenges of revision surgery[20-21].
There are many studies regarding benefits of revision surgery in ligamentum flavum sparing microdiscectomy as compare to conventional technique but no study has been done on the functional outcome of postoperative discectomy patient by these two different techniques.

Materials and Methods
Study design: It is a prospective study.
All patients (either sex) with clinically diagnosed/MRI proved lumber disc herniation, neurological deficit admitted in Sanjay Gandhi Memorial Hospital Rewa, meeting the inclusion and exclusion criteria (given below) during the study period from 1st March 2020 to 31st August 2021 (18 months) were the subjects of the study. patients who were operated in the first 12 months of the study period were included in this study the last six months of the study period were used for follow up of the patients and data analysis and compilation.

Inclusion criteria
1. All patient of age group 14-70 years MRI/clinically proven lumber discprolapse/herniation.
2. Pathology lies at level of L4-S1.
3. Single level pivd (Prolapsed Intervertebral Disc).
4. unilateral radicular pain.
5. Failure of conservative treatment.

Exclusion criteria
1. Uncontrol diabetes mellitus, hypertensive patients, patient with thyroid dysfunction.
2. Prior history of spine surgery, infection, trauma, malignancy, metastasis.
3. Instability on dynamic x-ray.
4. Cauda equine syndrome.
5. Patients on blood thinner.

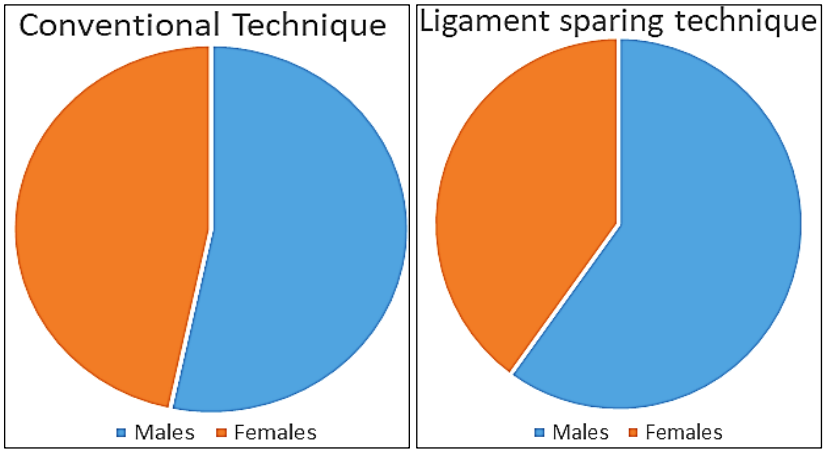
A total of 30 patient were included in the study and were divided into 2 groups; one group of 15 patients underwent ligamentum flavum sparing microdiscectomy and in the other group of 15 patients, conventional microdiscectomy (ligamentum flavum sacrificing) was done.
The patients who were diagnosed clinically and confirmed by mri with disc prolapseand not responds to conservative treatment willing for microdiscectomy were prospectively enrolled in this study.
Relevant history and demographic details of the patient were recorded in the patients performa.
These Clinical findings were confirmed by radiological examination which includes standard anero posterior and dynamic lateral radiographs and MRI of lumbosacral spine with screening of whole spine.
After all the routine investigations, pre medical and pre anaesthetic fitness, patients were posted for surgery.

Observations and Results

Table1: Comparison of patients according to sex between the two groups. (N = 30)

	Number of cases (%)		p-value
	Conventional Technique	Ligament sparing technique	
Males	8 (53.3%)	9 (60.0%)	0.713
Females	7 (46.7%)	6 (40.0%)	

The above table shows the distribution of cases according to sex. As can be observed from the above table, there was an almost comparable proportion of male and female patients in the two groups. The difference between the two groups was not statistically significant.



Graph 1: Comparison of patients according to sex in both groups

Table 2: Comparison of patients according to side of radiculopathy between the two groups. (N = 30)

Side of Radiculopathy	Number of cases (%)		p-value
	Conventional Technique	Ligament sparing technique	
Right	7 (46.7%)	7 (46.7%)	1.000
Left	8 (53.3%)	8 (53.3%)	

The above table shows the distribution of cases according to the side of radiculopathy they had reported at time of recruitment. As can be observed from the above table, the proportion of patients reporting radiculopathy on either side was the same, with more patients reporting radiculopathy in the left leg in both groups. The difference between the two groups was not statistically significant.

Table 3: Comparison of patients according to findings on neurological examination between the two groups. (N = 30)

Positive findings on neurological tests	Number of cases (%)		p-value
	Conventional Technique	Ligament sparing technique	
SLRT	15 (100.0%)	15 (100.0%)	1.000
Bowstring	15 (100.0%)	15 (100.0%)	1.000
Bragard	15 (100.0%)	15 (100.0%)	1.000

The above table shows the distribution of cases according to findings on neurological examination. As can be observed from the above table, all cases in both groups had a positive finding on SLRT, Bowstring and Bragard test. The difference between the two groups was not statistically significant for either of the neurological tests.

Table 4: Comparison of patients according to neural deficit between the two groups. (N = 30)

	Number of cases (%)		p-value
	Conventional Technique	Ligament sparing technique	
Neural deficit present	2 (13.4%)	2 (13.4%)	1.000
Neural deficit absent	13 (86.7%)	13 (86.7%)	

The above table shows the distribution of cases according to the neural deficit present in the two groups. As can be observed from the above table, there was an equal proportion of cases in both groups having neural deficit. One case each in both groups reported having foot drop and EHL weakness.

Table 5: Comparison of patients according to pre-operative ODI scores between the two groups. (N = 30)

Pre-op ODI	Mean (SD)		p-value
	Conventional Technique	Ligament sparing technique	
Pain Intensity	3.80 (0.86)	3.80 (0.94)	1.000
Personal Care	4.27 (0.46)	4.33 (0.49)	0.702
Lifting	4.33 (0.82)	4.07 (1.10)	0.457
Walking	4.00 (0.76)	4.13 (0.83)	0.650
Sitting	4.20 (0.77)	4.20 (0.68)	1.000
Standing	4.20 (0.68)	4.27 (0.80)	0.807
Sleeping	3.00 (1.19)	3.33 (0.98)	0.410
Social Life	3.80 (1.01)	3.80 (1.01)	1.000
Travelling	4.20 (0.77)	4.27 (0.46)	0.776
Employment/Homemaking	4.40 (0.74)	4.00 (0.76)	0.153
Pre-op Total ODI score	40.20 (2.60)	40.20 (1.86)	1.000

The above table shows the pre-operative ODI scores in the two groups. As can be seen from the above table, difference in none of the ODI parameters between the two groups before the procedure was statistically significant.

Table 6: Comparison of patients according to post-operative ODI scores between the two groups. (N = 30)

Post-op ODI	Mean (SD)		p-value
	Conventional Technique	Ligament sparing technique	
Pain Intensity	0.93 (0.59)	0.80 (0.68)	0.571
Personal Care	0.47 (0.74)	0.53 (0.52)	0.778
Lifting	0.93 (0.59)	0.80 (0.68)	0.571
Walking	0.73 (0.59)	0.67 (0.62)	0.765
Sitting	0.53 (0.52)	0.60 (0.63)	0.754
Standing	1.07 (0.704)	1.07 (0.46)	1.000
Sleeping	0.67 (0.90)	0.47 (0.64)	0.489
Social Life	0.53 (0.64)	0.67 (0.62)	0.566
Travelling	0.93 (0.80)	0.93 (0.70)	1.000
Employment/Home-making	0.73 (0.59)	0.60 (0.51)	0.514
Post-op Total ODI score	7.53 (1.19)	7.27 (1.16)	0.539

The above table shows the post-operative ODI scores in the two groups. As can be seen from the above table, difference in none of the ODI parameters between the two groups after the procedure was statistically significant.

Table 7: Comparison of change in ODI scores after procedure between the two groups. (N = 30)

Change in ODI scores (Pre-op-Post-op)	Mean Δ	p-value	Mean Δ	p-value
	Conventional Technique		Ligament sparing technique	
Pain Intensity	2.87	0.001	3.00	0.001
Personal Care	3.80	0.001	3.80	0.001
Lifting	3.40	0.001	3.27	0.001
Walking	3.27	0.001	3.47	0.001
Sitting	3.67	0.001	3.60	0.001
Standing	3.13	0.001	3.20	0.001
Sleeping	2.33	0.001	2.87	0.001
Social Life	3.27	0.001	3.13	0.001
Travelling	3.27	0.001	3.33	0.001
Employment/Homemaking	3.67	0.001	3.40	0.001
Change in Total ODI score	32.67	0.001	32.93	0.001

The above table shows the change in ODI scores in all parameters in the two groups. As can be seen from the above table, the change in ODI scores in all parameters was statistically significant in both the groups.

Table 8: Comparison of cases according to pre-operative VAS scores between the two groups. (N = 30)

Pre-operative VAS	Number of cases (%)		p-value
	Conventional Technique	Ligament sparing technique	
No Pain	0	0	-
Mild Pain	0	0	-
Moderate Pain	7 (46.7%)	6 (40.0%)	0.713
Severe Pain	7 (46.7%)	6 (40.0%)	0.713

Very Severe Pain	1 (6.7%)	3 (20.0%)	0.283
Excruciating Pain	0	0	-

The above table shows the distribution of cases according to the grade of pain they reported on VAS scale. In ligament sparing group, three patients reported having very severe pain before the procedure, compared to conventional group in which only one patient reported as having very severe pain. Seven cases each in conventional group reported having moderate and severe pain on VAS. In contrast, six cases each in ligament sparing group reported the same grade. The difference between the two groups was not statistically significant.

Table 9: Comparison of cases according to post-operative VAS scores between the two groups. (N = 30)

Post-operative VAS	Number of cases (%)		p-value
	Conventional Technique	Ligament sparing technique	
No Pain	8 (53.3%)	7 (46.7%)	0.715
Mild Pain	7 (46.7%)	7 (46.7%)	1.000
Moderate Pain	0	1 (6.7%)	0.309
Severe Pain	0	0	-
Very Severe Pain	0	0	-
Excruciating Pain	0	0	-

The above table shows the distribution of cases according to the grade of pain they reported on VAS scale after the procedure. In ligament sparing group, one patient still reported having moderate pain after the procedure, compared to conventional group in which NO patient reported as having pain more than mild grade. Eight cases in conventional group reported as having no pain, while seven cases reported the same in ligament sparing group. The difference between the two groups was not statistically significant.

Table 10: Comparison of change in VAS grades in the post-operative period from pre-operative grading. (N = 30)

	Median (IQR)		p-value
	Conventional Technique	Ligament sparing technique	
Change in VAS grade	3 (2 - 4)	3 (3 - 4)	0.950

The above table shows the comparison of change in VAS grade between the two groups. As can be observed between the two groups, there was a median change of three grades in both groups. The difference between the two groups was not statistically significant.

DISCUSSION

The result of our study was comparable with the following studies:

Ozer AF*et al*.(2006)The ligamentum flavum (LF) has previously been indicated as an excellent barrier between hematoma organisation and the dural surface [15,16]and that severe bone structure removal may not be required to protect the LF[19-20].Surgical options that preserve both the bony structures and the LF can help overcome the challenges of revision surgery.

At 6 months after surgery, both groups' clinical metrics had dramatically improved. Group A had mean pre-and postoperative VAPS scores of 9.2 and 3.2, respectively (P 0.05); mean Oswestry scale scores of 88 and 28.2, respectively (P 0.05); and mean straight-leg raising angles of 290 and 630, respectively (P 0.05). The mean pre- and postoperative VAPS scores in Group B were 9.2 and 2.6 (P 0.05), respectively; the corresponding mean Oswestry scores were 85.2 and 22.2 (P 0.05)and the corresponding mean straight-leg raising scores were 260 and 710, respectively (P 0.05). Groups A and B had mean scarring grades of 1.8 and 1.0, respectively (P 0.05).

They concluded that both groups had good clinical results and equivalent improvements, but that the group with maintained ligamentum flavum had much less local fibrosis six months after surgery. According to the authors, this surgical method creates a physical barrier that can lessen or even eliminate fibrosis-related problems following lumbar disc surgery.

Aydin Y*et al*. (2002)[21]In their research, they discovered Over the course of eight years, 1,500 patients had microdiscectomy with ligamentum flavum preservation. A total of 400 patients who underwent ligamentum flavum preservation surgery were chosen at random for this study (Group 1). Their findings were compared to those of 200 patients who underwent routine microdiscectomy surgery (Group 2)

In Group 1, the early clinical outcome (fourth postoperative week) was satisfactory in 96.75 percent of the patients, but only 81.5 percent in Group 2 (p 0.001). The radiographic scans demonstrated fibrosis in 18% of Group 1 patients and 37% of Group 2 patients (p 0.001). Because of fibrosis-related symptoms, none of the patients in Group 1 were readmitted. In Group 1, the reoperation rate was 4.5 percent. The disc at another level had a recurrence rate of 1.75 percent and a recurrence rate of 1.75 percent. A suture granuloma required reoperation in one case. The rate of reoperation in Group 2 was 9% (p 0.05). There was a 4.5 percent recurrence rate, a 3.5 percent disc at another level, and a 1% severe epidural fibrosis

rate. In this group, two patients who underwent surgery for epidural fibrosis had poor results.
As a result, they came to the conclusion that retaining the ligamentum flavum is beneficial in attaining a favourable long-term outcome, and reoperation, if necessary, is easier and safer.
De Divitiis E *et al*. (2002)[22] They evaluated the clinical and radiological findings of lumbar microdiscectomy with ligamentum flavum preservation to the usual microdiscectomy approach in their study. The authors examined the outcomes of surgery in 400 patients who had microdiscectomy with ligamentum flavum preservation (Group 1) and 200 individuals who had standard microdiscectomy (Group 2). Group 1 had a 36.8-month follow-up, whereas Group 2 had a 32.4-month follow-up; the outcome was assessed clinically and by a patient questionnaire. Early clinical outcomes were satisfactory in 96.75 percent of Group 1 patients and 81.5 percent of Group 2 patients, with reoperation rates of 4.5 percent and 9%, respectively. According to the patient questionnaire, Group 1 had a success rate of 91 percent and Group 2 had a success rate of 76 percent. The ligamentum flavum preservation approach, according to the authors, is beneficial in generating good long-term results.
Park YK*et al*. (2002)[23]. In their research, they discovered Three hundred and seven patients were tracked for more than two years after undergoing ligament-sparing microsurgical discectomy for a previously untreated single-level lumbar disc herniation. 93.9 percent of the patients had a favourable outcome after six months. A successful patient-assessed result was 84.1 percent after a median follow-up time of 30 months. Recurrent disc herniation was discovered in 18 individuals over a mean follow-up time of 4.2 years (range 2-6.5 years) (4.8 percent). All of these patients had many surgeries. The overall rate of complications connected to surgery was 1.3 percent.
According to the authors, ligament-sparing microdiscectomy is a safe treatment with a high success rate and low morbidity. When compared to traditional methods, this methodology makes reoperation safer and easier.
In our study The mean vas score of post-operative patients in both of the group is same.p-value is 0.950, thus there is no significantdifference in post-operative back pain in patients in the two groups at the end of one year.
The mean oswestry disability index score for the conventional approach group is 7.53, while the ligament sparing group's score is 7.27, with a p value of 0.539. As a result, at the end of one year, there is no significant difference in the functional outcomes of the two groups of patients.
In both groups of patients, there is no substantial difference in postoperative complications. Two instances in the conventional approach group had a superficial wound infection, while one case had a surgical site infection and the other had a superficial wound infection in the ligament sparing group. As a result, both groups had good functional outcomes.
Since none of our patient required a second surgery, we cannot comment on the difference between epidural scarring in the groups.

Conclusion

The findings of this study show that both conventional microdiscectomy and ligamentum flavum sparing microdiscectomy are both safe and effective surgical methods for the treatment of LDH. There is no significant difference in post-operative back pain in patients undergoing microdiscectomy with and without preserving ligamentum flavum and there are no such additional benefits at ligamentum sparing technique as compare to conventional techniques. In terms of functional results since none of our patient required a second surgery, we cannot comment on the difference between epidural scarring in the groups. Moreover, the result should be viewed with caution because it was established based on a small number of research and a small sample size. As a result, more research with a robust design and a larger sample size are needed to confirm this conclusion.

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