



Comparative Study of Functional Outcome of Lumbar Discectomy By The Fenestration and Laminectomy Method

KEYWORDS

Disc, laminectomy, fenestration

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ABSTRACT INTRODUCTION

Low back pain is thought to occur in almost 80% of adults in some point of their life. Its most frequent cause is due to limitation of activity in their lifestyle. Intervertebral prolapsed disc is a common cause of low back pain. This study aimed at comparison of two different modalities of discectomy namely laminectomy and the fenestration discectomy via clinical trials in patients who suffered from prolapsed lumbar disc with low back pain and/or sciatica after failure of medical treatment.

MATERIALS AND METHODS

This is a prospective randomized study conducted in 58 patients which were diagnosed with degenerative disc disease and required surgical intervention at the level of a single lumbar segment from L2 to S1. 29 patients amongst them underwent laminectomy discectomy procedure and the remaining 29 patients underwent fenestration discectomy procedure.

RESULTS

VAS (Visual Analog Scale) observed for lumbar pain post operatively was approximately 1.9+0.7 and 1.4+0.6 and Prolo scale observed for lumbar pain post operatively was approximately 7.6+0.5 and 8.9+0.7 respectively in laminectomy and fenestration groups which showed significant difference. Laminectomy also produced significant instability in spine after procedure.

CONCLUSION

The above results led to a conclusion that the fenestration lumbar discectomy has the advantages of lesser tissue trauma, lesser duration of surgery, lesser intraoperative blood loss, early return to work, better functional and economic outcome and it would not jeopardize the stability of the spine when compared to open laminectomy procedure.

INTRODUCTION

Low back pain is thought to occur in almost 80% of adults in some point of their life. Amongst the chronic conditions, back problems are the most frequent cause of limitation of activity in persons.

In orthopedic practice, patients having lesions of lumbosacral region causing low backache with sciatica are not uncommon. Lumbar disc disease forms the second most common cause for medically authorized absence from work[1].

Discectomy is a common procedure carried out for the treatment of lumbar disc prolapse. In lumbar disc surgery, pain is the most important indication, but the neurologic symptoms and signs are also considered, although they are usually of far less functional consequences. Perhaps because they appear to be more objective than the pain related signs[2].

The first disc prolapse operation falsely accredited to MIXTER AND BARR had been conducted by Oppenheim and Krause in Berlin but was interpreted as an Enchondroma of spinal disc. Later Mixter and Barr's classical paper on "The rupture of intervertebral disc with involvement of spinal canal" opened an era of systematic diagnosis and operative treatment of lumbar disc prolapse. Their operative ap-

proach was an extensive laminectomy[3].

Laminectomy was performed thereafter by many surgeons for the relief of disc related symptoms. Excellent exposures were obtained and the disc removal was done under direct vision.

'LOVE' described extradural removal of herniated disc and devised interlaminar fenestration for treatment of lumbar disc prolapse[4]. Refinement of fenestration technique was described by 'WILLIAMS' who coined the term "Conservative surgical approach to the virgin herniated disc" which required the use of operating microscope to facilitate better visualization of dural sac, nerve roots and other inter-spinal structures including disc[5].

The recent techniques like Percutaneous lumbar disc decompression (PLDD), Percutaneous endoscopic lumbar discectomy (PELD) and Young endoscopic spine system (YESS) need lots of expertise, experience and expensive equipments which are not available at every center. Therefore in most of our centers also these facilities are not available.

A prospective randomized trial is needed which can guide about the approach taken for discectomy since there are very few studies in literature which directly compare the discectomy by laminectomy and the fenestration approach.

This study aimed at comparison of these different modalities of discectomy namely laminectomy and fenestration discectomy via clinical trial in patients who suffer from prolapsed lumbar disc with back pain and or sciatica after failure of medical treatment.

MATERIALS and METHOD

Study Design:

This is a prospective randomized study conducted after ethical committee approval at S.M.S Medical college and attached group of hospital, Jaipur Rajasthan.

58 Patients were diagnosed with degenerative disc disease and required surgical intervention at a single lumbar segment from L2 to S1.

29 of them went under laminectomy discectomy and the other 29 went under fenestration discectomy.

Patient Selection:

Patients enrolled into this study included those who were atleast 18 years and not older than 60 years of age with unilateral symptomatic disc herniation, at single level from L2 to S1 and not associated with bony canal stenosis which was confirmed by physical examination and MRI of lumbosacral spine.

Cases in which patients were not fulfilling above criteria or had undergone any previous back surgery or had severe osteoporosis or osteomalacia or had an active systemic or localized infection at the area of the spine where the surgery would be performed or had a significant emotional or psychosocial disturbance were excluded from this study.

Most patients had been operated upon, after a previous trial of conservative therapy that had failed and suffered acute-onset disabling sciatic pain, which was relieved only by high doses of analgesics, in association with or without major objective neurological deficits.

Patient evaluation:

Patients were required to undergo a thorough pre-operative evaluation prior to the surgery and return for follow-up evaluations according to a pre-determined follow-up schedule. During each surgical procedure we noted the operative duration, operative complications and blood loss by calculating the blood in the container of suction in every case.

Statistics:

Linear regression and comparison groups were performed, using a linear regression computer program and an unpaired two-tailed t test computer program, respectively; the P value of < 0.05 was considered to be statistically significant.

Surgical Techniques

Preoperatively, patients in both the study groups undergoing the laminectomy lumbar discectomy or the fenestration discectomy were given an intravenous dose of prophylactic antibiotics. Patients were then shifted to the operating room, given general endotracheal anesthesia, and placed on the operating room table in a prone position or in knee chest position. The back was shaved and cleansed with an alcohol swab and preoperative radiographic labeling of the affected disc space was done.

For the laminectomy discectomy group (A):

A 5cm length of the skin incision was made, and the para-

spinal muscles were retracted bilaterally followed by bilateral excision of lamina, taking care not to damage the facets. Decompression of the root with removal of disc fragment was done and the wound was closed in layers.

For the fenestration discectomy group(B):

A 5 cm length of the skin incision was made. The fascia incision of same length on the symptomatic side was done. The ligamentum flavum was removed and careful hemostasis was ensured by using cautery. Decompression of the root with removal of disc fragment through inter laminar space was then done. An operating microscope was not used during the procedure. In each case, the disc space itself was also entered and all available disc material was removed and the wound was closed in layers.

RESULTS

The results of 29 consecutive patients operated on laminectomy (Group A) were compared with the group of 29 patients who underwent a fenestration discectomy (Group B). The laminectomy operated (group A) consisted of 18 men and 12 women with a mean age of 29.3±6.1years. The fenestration discectomy operated(group B) comprised of 17 men and 11 women with a mean age of 29.7±6.1 years.

All our 58 patients were operated at either level L4-L5 or L5-S1; there were no other affected levels in our study. A high incidence at operative level L4-L5 was noted in both groups of treatment modalities with higher incidence in males as compared to females. (Table 1)

Table no. 1

	Group A(laminectomy)	Group B (fenestration)	Total
Number of cases	29	29	58
Male:female	18:12	17:11	35:13
PIVD L4-5	18	19	37
PIVD L5-S1	11	10	19

The mean operative time was 85.2 ± 9.7 minutes in laminectomy discectomy, and 67.6 ± 7.5 minutes in fenestration discectomy (P=0.0000); the mean amount of bleeding was 95.7±15.5 cc in laminectomy discectomy group, and 47.8±12.6 in fenestration discectomy Group (P<0.05); and these data showed significant difference for each parameter between the 2 groups. The mean follow up time was 58.6 ± 4.2 months in laminectomy discectomy, and 57.8 ± 7.9 months in fenestration discectomy (P=0.1008).

The Clinical Results

We used the assessment tools as questionnaires or scales, which helped to translate the subjective experience of pain into more objective evidence that could be analyzed and used for comparison on subsequent visits. We used the VAS for lumbar pain, sciatica and the Prolo scale (functional and economical outcome scale) [6].

VAS for lumbar pain(Table 2) improved from 7.9 ± 0.6 to 1.9 ± 0.7 in laminectomy discectomy group, and from 8.0 ± 0.7 to 1.4 ± 0.6 in fenestration discectomy group, these values suggested that there was no significant differences between the 2 groups before surgery(before surgery : P=0.4411) but after surgery significant difference was seen. (after surgery: P = 0.0000).

VAS for sciatica(Table 2) improved from 7.6 ± 0.6 to 1.4 ± 0.5 in laminectomy discectomy group, and from 7.6 ±

0.5 to 1.3 ± 0.5 in fenestration discectomy group, showing no significant difference between the 2 groups either before and after surgery (before surgery: $P = 0.6252$, after surgery: $P = 0.4213$).

Prolo scale (Table 2) improved from 3.5 ± 0.7 to 7.6 ± 0.5 in laminectomy discectomy group, and from 3.7 ± 0.6 to 8.9 ± 0.7 in fenestration discectomy group, these values showed there were no significant differences between the 2 groups before surgery (before surgery: $P=0.2286$) but after surgery significant difference was observed (after surgery: $P = 0.0000$).

Regarding complications: Dural tear occurred in one patient in the fenestration discectomy group, but no complications occurred in laminectomy discectomy intraoperative group.

Instability of spine occurred in 16 patients in laminectomy group and in one patient in fenestration groups postoperatively on long follow up, patients had come with complains of increasing backache.

Table 2: Comparison of variables between two groups; figures are MEAN \pm SD values

Parameter	Group A (laminectomy)	Group B (fenestration)	P value
Age (years)	29.3 \pm 6.1	29.7 \pm 6.1	0.7964
Duration of surgery(minutes)	85.2 \pm 9.7	67.6 \pm 7.5	0.000
Blood loss (cc)	95.7 \pm 15.5	47.8 \pm 12.6	0.000
Vas score back pain pre operatively	7.9 \pm 0.6	8.0 \pm 0.7	0.4411
Vas score back pain post operatively	1.9 \pm 0.7	1.4 \pm 0.6	0.0059
Vas score leg pain pre operatively	7.6 \pm 0.6	7.6 \pm 0.5	0.6252
Vas score leg pain post operatively	1.4 \pm 0.5	1.3 \pm 0.5	0.4213
Prolo scale pre operatively	3.5 \pm 0.7	3.7 \pm 0.6	0.2286
Prolo scale post operatively	7.6 \pm 0.5	8.9 \pm 0.7	0.0000
Return to work (weeks)	14.0 \pm 4	7.6 \pm 1.5	0.000
Follow up (months)	58.6 \pm 4.2	57.8 \pm 7.9	0.1008

DISCUSSION

Proapsed intervertebral disc occurs in about 5- 10 % of backache patients and its the common cause of sciatica. Even small herniated disc in presence of narrow spinal canal can be responsible for compression of caudaequina and its roots. Most cases of sciatica are due to intervertebral disc lesion which were due to partial caudaequina lesion, mostly unilateral and characterized by muscle weakness, reflex abnormality, wasting and sensory impairment due to compression of one and more nerve roots. Stand-

ard treatment is surgical excision of disc, but the method of discectomy might vary. Lumbar discectomy is a very common surgical procedure. There are many ways to do a lumbar discectomy, ranging from the standard laminectomy and discectomy to the endoscopic, chemonucleolysis and laser disc surgeries. The results of these surgeries may vary. There are generally no accepted predictive factors for lumbar disc surgery, because different predictive factors seem to apply for different outcome measurements. Some authors use the patients overall assessment as a single measure of success [7, 8]. Other studies apply the pain grading scale [9,10] and some use a combination of other findings, for example professional rehabilitation, residual symptoms, paresis or activities of daily living and narcotic medication at the follow-up [11, 12,13]. J. Pappas et al. and Davis applied the Functional-Economic Rating Scale of Prolo et al., which takes into consideration professional rehabilitation and residual pain symptoms [14, 15]. Negi 1985 and Mishra 1998 found that fenestration discectomy has an advantage over laminectomy as it included less blood loss, less operating time, early return to work and less postoperative complications[16,17]. In our study, the mean operation time was 85.2 ± 9.7 minutes for the laminectomy lumbar discectomy, and 67.6 ± 7.5 minutes for fenestration discectomy, showing that the laminectomy required significantly prolonged time. In laminectomy more soft tissue dissection is required, it may have been one of the reasons for the longer operation time. The mean amount of bleeding was 95.7 ± 15.5 cc with the laminectomy lumbar discectomy and 47.8 ± 12.6 cc with fenestration discectomy. From that we found out that more bleeding occurred in the laminectomy discectomy with a significant difference.

The VAS for lumbar pain after surgeries with the laminectomy lumbar discectomy and fenestration discectomy were 1.9 ± 0.7 and 1.4 ± 0.6 , respectively, showing a significant difference between these two groups. In addition, there was no significant difference in preoperative VAS for lumbar pain between these two groups which was 7.9 ± 0.6 and 8.0 ± 0.7 respectively. In laminectomy more soft tissue dissection and bone removal was done and spine instability also occurred, it might have been one of the reasons for this difference.

The postoperative VAS of sciatica after surgeries by the laminectomy lumbar discectomy and fenestration discectomy were not significantly different: 1.4 ± 0.5 and 1.3 ± 0.5 . Sciatica which is the main symptom of lumbar disc herniation, improved smoothly after both types of surgery. In both methods, pressure was removed from the nerve root, it might have been one of the reasons for the minor

difference. On follow up 16 patients complained with back pain which were previously operated with laminectomy method, and one patient who was operated by fenestration method. On examination we found there was instability of spine. The return to work was in between 14.0 ± 4 weeks with the laminectomy lumbar discectomy and 7.6 ± 1.5 weeks with fenestration discectomy, showing a significant difference between these groups. We found that patients returned early to their respective work with fenestration method.

The prolo score after surgeries with the laminectomy lumbar discectomy and fenestration discectomy were 7.6 ± 0.5 and 8.9 ± 0.7 , respectively, showing a significant difference between these groups. In addition, there was no significant difference in preoperative prolo scale between the 2

groups: 3.5 ± 0.7 and 3.7 ± 0.6 , respectively. Therefore it suggested that the patients who were treated with fenestration lumbar discectomy have better functional and economical outcome as compared to patients operated via laminectomy method.

Statistically significant differences were observed in the amount of bleeding, operation time, postoperative VAS of lumbar pain, return to work and postoperative prolo scale and post op spine instability.

The fenestration lumbar discectomy is a safe and an effective procedure for intervertebral discs. Its results are comparable to laminectomy discectomy procedure. The fenestration procedure technique offers the benefits of limited tissue trauma and early return to work.

CONCLUSION

From above discussion we found that the fenestration lumbar discectomy has the advantages of less tissue trauma, less duration of surgery, less intraoperative blood loss, less spine instability post operatively, early return to work and better functional and economic outcome.

Where ever micro surgical instruments are not available and surgeon does not have experience about micro discectomy, there fenestration procedure is a better method for discectomy.

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