



Fenestration and Discectomy is Safe and Effective Procedure for the Treatment of Prolapse Lumbar Intervertebral Disc

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Abstract

Majority of cases the backache is associated with degeneration of the intervertebral discs in the lower lumbar spine. This is an age-related phenomenon that occurs in over 80 percent of people who live for more than 50 years and in most cases it is asymptomatic. Disc excision by fenestration technique has superiority over laminectomy in respect of tissue damage, neurological decompression, early postoperative mobilization, early return to work and low incidence of backache. It is safe, effective and reliable surgical technique for treating properly selected patients with the herniated disc. The technique is free from spinal instability. The general objective of this study is to find out the effectiveness and functional outcome of fenestration and discectomy for the prolapsed lumbar intervertebral disc in Bangladesh. The study was undertaken in National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh from July 2016 to June 2018. Out of 31 patients Majority of 20 (64.51%) patients showed good outcome followed by excellent in 08 (25.80%) patients, 02 (06.45%) patients had fair outcome and 01 (03.22%) patient had poor outcome. By considering all aspects fenestration and discectomy is a better technique in the context of our country with the advantage of less tissue injury, good spinal function, smooth patient recovery, improve working status with early rehabilitation and maintain clinical efficacy.

Introduction

Prolapsed lumbar intervertebral disc is one of the most common problems encountered in medical

practice¹. In orthopaedic practice patients having lesions of lumbosacral region causing low back pain with sciatica are not uncommon since the

beginning of recorded history. Hippocrates (460-370 BC) was probable the first to mention sciatica and low-back pain. A.G. Smith was the first to perform a successful laminectomy in 1829 in the United States².

Majority of cases the backache is associated with degeneration of the intervertebral discs in the lower lumbar spine. This is an age-related phenomenon that occurs in over 80 percent of people who live for more than 50 years and in most cases it is asymptomatic. Overall, degeneration of the lumbosacral discs correlates closely with age. This process begins surprisingly early in life and increases gradually with age³. Disc prolapse at the L4-5 level has been shown to be the most commonly herniated disc, resulting in L5 radiculopathy and at L5-S1 level is second in frequency of herniation⁴. Approximately 70% - 80% people have experienced low back pain at some point in their life⁵.

Disc excision by fenestration technique has superiority over laminectomy in respect of tissue damage, neurological decompression, early postoperative mobilization, early return to work and low incidence of backache. It is safe, effective and reliable surgical technique for treating properly selected patients with the herniated disc. The technique is free from spinal instability. The most recent techniques such as percutaneous lumbar disc decompression (PLDD), percutaneous endoscopic lumbar discectomy (PELD), young endoscopic spine system (YESS), percutaneous laser disc decompression need lots of expertise, experience and it is expensive too⁶. In an open discectomy, a skin incision is made in the posterior midline of back over the affected level between two spinous processes. The length of the incision depends on how many discectomies will be performed. A single level incision is about 1 to 2 inches long. The back muscles are retracted on one side to expose the lamina⁷.

Objective(s)

General Objective

To find out the effectiveness and functional outcome of fenestration and discectomy for the prolapsed lumbar intervertebral disc in Bangladesh.

Specific Objective

- To evaluate the pain, neurological and functional improvement after the operation.
- To find out postoperative complications, hospital stay, operation time, spine mobility and return to work.
- To assess functional outcome according to Macnab criteria.

Materials and Methods

Study Design

Prospective observational type of study.

Place of Study

The study was undertaken in National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh.

Duration of the Study

From July 2016 to June 2018 [Enrollment of the patient was started after obtaining approval from Institutional Ethic Committee].

Sample size

Total sample for this study was 31.

Inclusion Criteria

- Traumatic and degenerative cause of prolapsed lumbar intervertebral disc.
- Single level of disc involvement
- Positive radiology and imaging – MRI or CT scan.
- Patient of both sex – male and female.
- Age – between 16 - 55 years.

Exclusion Criteria

- Disc herniation from tumour and infection.
- Two or more level of disc involvement.
- Age below 16 years and above 55 years.
- Uncontrolled comorbidity – such as uncontrolled hypertension, uncontrolled diabetes mellitus.

- Patient having previous single or more level discectomy.

Study Procedure

A DATA SHEET was prepared considering key variables like age, sex, occupation, presenting complaints, clinical findings, investigations, preoperative findings, peroperative findings, postoperative period and outcome of surgery.

Patient was evaluated in each follow up visit as per protocol. Follow up visits has been carried out at 15 days, 1 month, 3 months, 6 months, 9 months and 12 months postoperatively.

Results

Table 1 shows that out of 31 patients 3 patients (09.67%) were aged below 25 years, 11 (35.48%) aged 26-35 years, 13 (41.93%) aged 36-45 years and 4 (12.90%) aged 46-55 years. Mean age was (35.98 ± 8.50) years with the range from 17 to 50 years.

Table 1: Frequency of the patients by age (n=31)

Age (years)	Frequency	Percentage
16-25	3	09.67
26-35	11	35.48
36-45	13	41.93
46-55	4	12.90
Total	31	100
Mean ± SD (range)	35.98 ± 8.50(17-50 years)	

Figure 1 shows that out of 31 patients, 26 (83.87%) patients were male and 05 (16.12%) were female.

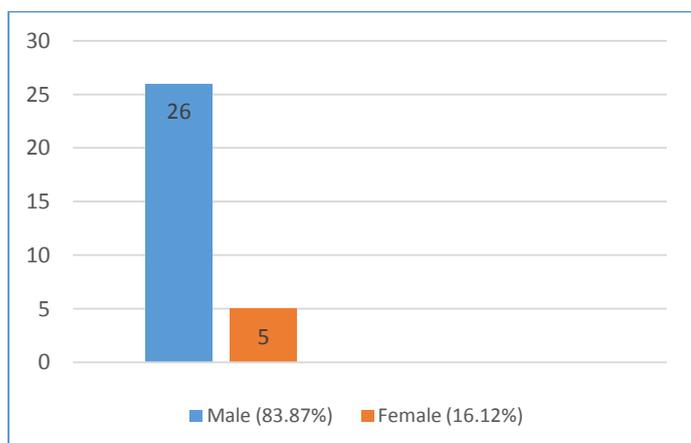


Figure 1: Frequency of the patients by sex (n=31)

Figure 2 shows that out of 31 patients 23 (74.19%) had at the level of L4-L5 and 08 (25.81%) had at the level of L5-S1.

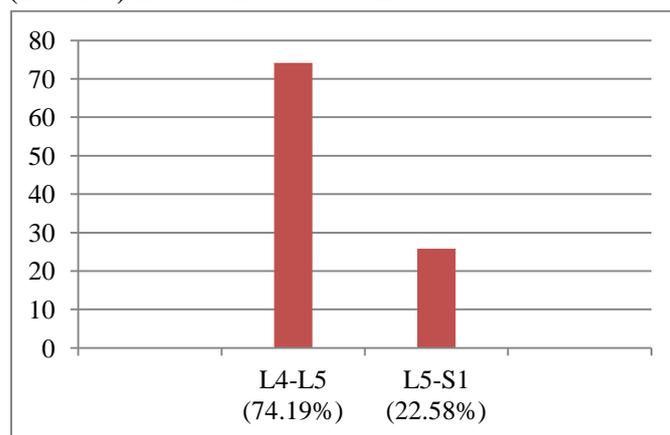


Figure 2: Frequency of patients by level of disc prolapse (n=31)

Table 2 shows all cases was specifically diagnosed by MRI findings. On X-ray all patients had obliteration of lumbar lordosis, 17 (54.83%) patients had reduced disc space at the level of prolapse and 14 (45.16%) patients had marginal osteophyte formation.

Table 2: Frequency of the patients by investigation findings (n=31)

SL. No.	Investigations	No. of patients	Percentage(%)	
1	Plain Xray of lumbosacral spine			
	Loss of lumbar lordosis	31	100	
	Diminished disc space	17	54.83	
	Osteophytes	14	45.16	
2	MRI of lumbosacral spine			
	Side of disc prolapsed			
	Posterolateral	Right	12	38.70
	Left	11	35.48	
	Central	08	25.80	

Table 3 shows that in this series the most common cause type of muscle weakness in EHL. Out of 31 patients, 22 (70.96 %) patients were in this group. 08 (25.80%) cases had weakness in FHL and another group was both muscle weakness 01 (3.22%). All patients had muscle weakness at affected level but postoperatively 04 (12.89%) patients had muscle weakness (p < 0.05).

Table 3: Comparison of motor weakness in before and after operation(n=31)

Muscle power	Preoperative		Postoperative		P value
	No. of patient	Percentage	No. of patient	Percentage	
EHL	22	70.96	02	6.45	
FHL	08	25.80	01	3.22	
Both EHL & FHL	01	3.22	01	3.22	< 0.05
Total	31	100	04	12.89	

N.B.: EHL – Extensor HallucisLongus.

FHL – Flexor HallucisLongus.

Significance test was done using paired t-test.

Table 4 shows that the distribution of patients having most of 17(54.83%) patients had the sensory deficit at L5. Sensory deficit at the level of L4 was 02(06.45%) and that of S1 was 08(25.80%). Sensory deficit at the level of both

L5 &S1 was 03(09.67%) and 01 (03.22%) patient had no sensory deficit. Out of 31 patients, 30 (96.78%) patients had preoperative sensory deficit and 03 (09.67%) patients had postoperative sensory deficit, which is statistically significant.

Table 4: Comparison of preoperative and postoperative sensory deficit (n=31)

Level of sensory deficit	Preoperative		Postoperative		P value
	No. of patient	Percentage	No. of patient	Percentage	
L4	02	06.45	00	00	
L5	17	54.83	01	3.22	
S1	08	25.80	01	3.22	
L5 & S1	03	09.67	01	3.22	< 0.05
None	01	03.22	28	90.32	
Total	31	100	31	100	

Significance test was done using Wilcoxon signed-ranked test.

Table 5 shows the distribution of patients for the status of preoperative pain, and postoperative pain after 3 months. In preoperative period, moderate pain in 27 (83.87%) patients, severe pain in 04 (12.90%) patients. In postoperative period had no

pain in 22 (70.96%) patients, mild pain was noted in 08 (25.08%) patients, moderate pain in 01 (03.22%) patient. Statistical paired t-test value was significant; P value was < 0.05.

Table 5: Comparison of pain score in before and after operation (n=31).

Sl. No.	Preoperative VAS Score (mm)	Postoperative VAS Score (mm)	P value	Sl. No.	Preoperative VAS Score (mm)	Postoperative VAS Score (mm)	P value
1	50	0	< 0.05	17	80	30	< 0.05
2	50	0		18	60	0	
3	60	0		19	70	20	
4	50	30		20	70	0	
5	60	0		21	60	0	
6	50	20		22	70	0	
7	50	0		23	60	20	
8	60	0		24	70	0	
9	50	0		25	70	0	
10	50	0		26	60	0	
11	55	0		27	60	0	
12	60	0		28	70	30	
13	60	40		29	70	50	
14	70	0		30	50	0	
15	80	0		31	60	0	
16	90	0					

VAS scale	Preoperative		Postoperative		P value
	Frequency	%	frequency	%	
No pain	00	00	22	70.96	
Mild	00	00	08	25.08	
Moderate	27	83.87	01	03.22	< 0.05
Severe	04	12.90	00	00	
Total	31	100	31	100	
Mean ± SD	63.258 ± 8.32		11.306 ± 11.48		

(N.B.: VAS – Visual Analog Scale
Significance test was done using paired t-test).

Table 6, Table 7, Table 8, and Figure 3 shows the postoperative details of the sample.

Table 6: Comparison of preoperative and postoperative muscle spasm (n=31)

Spasm	Preoperative		Postoperative		P value
	Frequency	%	Frequency	%	
Absent	11	35.48	31	100	
Present	20	64.51	00	00	< 0.05
Total	31	100	31	100	

Table 7: Comparison of preoperative and postoperative straight leg raising test finding (n=31)

SLR	Preoperative	Postoperative	P value
Mean ± SD	45.97 ± 11.137	81.94 ± 4.774	< 0.05
Range	30° -60°	70° -90°	

Table 8: Comparison of preoperative and postoperative spine mobility (n=31)

Mobility	Preoperative		Postoperative		P value
	Frequency	%	Frequency	%	
Normal	11	35.48	29	93.54	
Restricted	20	64.51	02	06.45	< 0.05
Total	31	100	31	100	

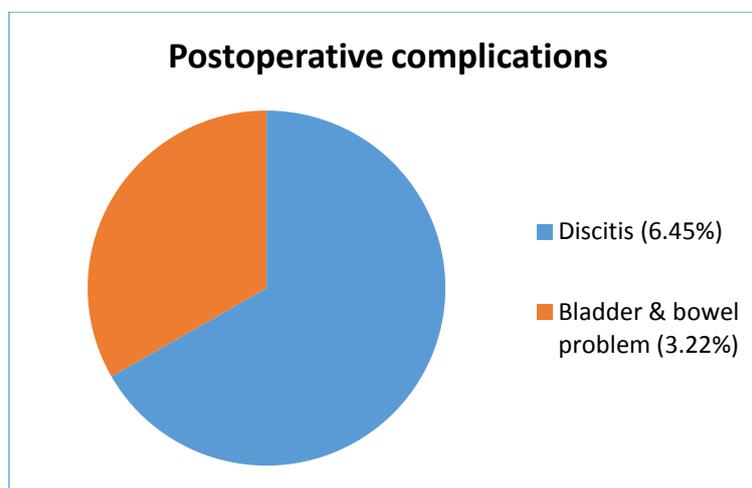


Figure 3: Frequency of the patients by postoperative complications

Table 9 shows results are classified according to Macnab criteria⁸ for characterizing outcome after surgery. In this study, patients were classified as excellent, good, fair and poor. Majority of 20

(64.51%) patients showed good outcome followed by excellent in 08 (25.80%) patients, 02 (06.45%) patients had fair outcome and 01 (03.22%) patient had poor outcome.

Table 9: Overall functional outcome according to Macnab criteria

Result	Frequency	%
Excellent	8	25.80
Good	20	64.51
Fair	2	06.45
Poor	1	03.22

Discussion

All of the patients were evaluated and analyzed after 3 months of operation, motor weakness is an important neurological feature mostly involving lumbar 4, lumbar 5 and sacral 1 myotomes. In this series, out of 31 patients, 22 (70.96 %) patients were in EHL weakness group. 08 (25.80%) cases had weakness in FHL and another group was both muscle weakness 01 (3.22%). All patients had muscle weakness at affected level but postoperatively 04 (12.89%) patients had muscle weakness and result was statistically significant (P value < 0.05).

In my series, most of the cases prolapsed occur at L4-L5 level followed by L5-S1 level. Shapiro (1993) reported that 64.28% had prolapse at the L4-L5 level, 21.42% had prolapse at the L5-S1 level, 14.28% had prolapse at L3-L4 level. In this series, most of the patients had disc prolapse at the level of L4-L5 and it may be due to more movement and more chance of abnormal axis of weight transmission at the junction of mobile and fixed part. But, in respect of side of prolapse there may be no specific predilection.

Two patients had peroperative complications – one was dural tear due to adhesion of ligamentum flavum and another was excess blood loss of about 500 ml due to injury to epidural vessels. Dural tear was repaired with muscle patch and postoperative period was uneventful. Regarding complication, most striking is peroperative bleeding, dural tear, wrong level selection, anesthetic problems, postoperative wound infection, discitis and failed back syndrome. O'Connell⁹ reported wound infection in 3% of cases, haematoma formation in 2% of cases, pulmonary embolism in 1% of cases,

operative pain in back in 1.6% of cases. Rish¹⁰ reported total complication rate of 4% out of 205 cases. In this series, postoperative complications, 02 (06.45%) of patients had discitis, 01 (03.22%) patient had bowel and bladder problems and total complication rate was 09.67%.

All patients were followed up at least for 3 visits. Pain was evaluated by using visual analog scale (VAS). Chakrabarty¹¹ reported postoperative VAS score was 2.96 ± 1.02 . In this series, preoperatively pain was present in all cases, but after 3 months of operation pain was absent in 22 cases, mild pain was in 8 cases, moderate pain was in 1 case. Preoperatively pain score was 63.258 ± 8.32 and postoperatively it was 11.306 ± 11.48 which was statistically significant (P < 0.05). Mean SLR in preoperative period was 45.97 ± 11.137 degrees and postoperatively it was 81.94 ± 4.774 degrees, which was significantly improved after 3 months of follow up. Statistical significance is measured by paired t-test and P value was < 0.05. Postoperatively spinal movement and muscle spasm were improved significantly (P < 0.05). Majority of reports¹² suggests the incidence of recurrent disc herniation is 6-13%. In my study period, no patient had recurrent herniation.

Weinstein, et al. found that 79.2% improvement in the surgery group and 51% in the non-operative group at 4 years¹³. Different criteria were analyzed for measuring outcome in different series. In my present series, functional outcome was assessed according to Macnab criteria. 08 (25.80%) cases were excellent, 20 (64.51%) were good, 02 (06.45%) were fair, 01 (03.22%) was poor and improved outcome was found in 96.76% of cases. One poor result may be due to negligence in obeying instructions in postoperative period after discharge and two fair outcomes may be due to more preoperative compression of nerve root with degenerative changes in spine.

Postoperative recovery, movements and exercises can be given earlier leading to faster improvement

in patients physical and mental status with the earlier return to normal daily work. In respect of neurological outcome, compared with endoscopic and other advanced discectomy procedures outcome was similar to many studies.

Conclusion

By considering all aspects fenestration and discectomy is a better technique in the context of our country with the advantage of less tissue injury, good spinal function, smooth patient recovery, improve working status with early rehabilitation and maintain clinical efficacy. On the basis of results in the present study, I believe the surgical management of prolapsed lumbar intervertebral disc by fenestration and discectomy is a relatively safe, effective and a good option for surgeons in properly selected patients with limited complications and provides substantial benefit.

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