

ORIGINAL RESEARCH

Prospective study of surgical management of inter vertebral disc prolapse by fenestration

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ABSTRACT

Background: Low back pain (LBP) is the most widely reported musculoskeletal disorder in the world, and 70-80% of all people will develop LBP in their life. It results in loss in productivity than any other medical condition.

Objectives: To evaluate 30 cases of lumbar disc prolapse in NMC Hospital and to compare and correlate the results with figures published in standard text books or results submitted to standard literature.

Methods: A prospective study was carried out on 30 cases of lumbar disc prolapse at NMC Hospital. Cases were selected considering the inclusion and exclusion criteria and ODI Score more than 40%. The data were collected using detailed clinical proforma, clinical examination, required investigations, pre-operative, post-operative & follow up (6, 12, 24 weeks) assessment - focused on pain, SLRT, Neurological assessment, spinal movements, occupational functioning, subjective analysis of satisfaction and ODI (Oswestry Disability Index) Score.

Methods: A prospective study was carried out on 30 cases of lumbar disc prolapse at NMC Hospital. Cases were selected considering the inclusion and exclusion criteria and ODI Score more than 40%. The data were collected using detailed clinical proforma, clinical examination, required investigations, pre-operative, post-operative & follow up (6, 12, 24 weeks) assessment - focused on pain, SLRT, Neurological assessment, spinal movements, occupational functioning, subjective analysis of satisfaction and ODI (Oswestry Disability Index) Score.

Conclusion: The results demonstrated that, the procedure of Open Discectomy (fenestration) for Lumbar Intervertebral Disc Prolapse in relieving symptoms and restoring the function of patients were excellent.

Key words: Fenestration, IVDP, low back ache

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INTRODUCTION

Back pain is one of the most prevalent and costly health problem in the industrialized world. It is the most widely reported musculoskeletal disorder in the world, and 70-80% of all people will develop LBP in their life ^[1, 2]. Back pain results in loss of productivity than any other medical condition. It usually is the first symptom and paraesthesia begins to radiate down the lower extremity.

Low Back ache can be classified into three types ^[3]

1. Acute low back pain which lasts less than 6 weeks.
2. Sub acute low back pain which lasts between 6 to 12 weeks
3. Chronic low back pain which lasts more than 12 weeks.

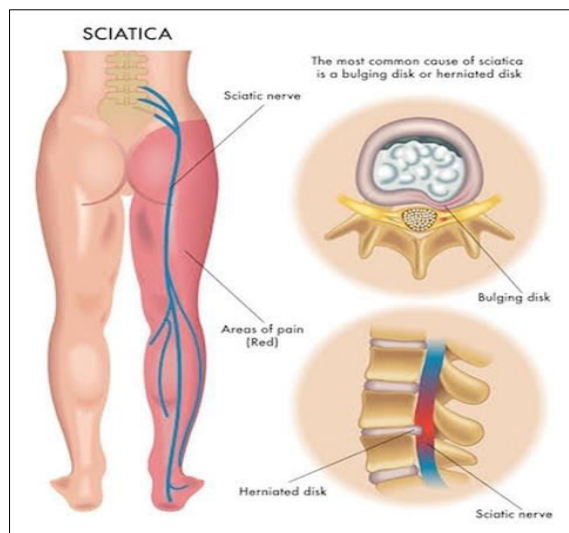
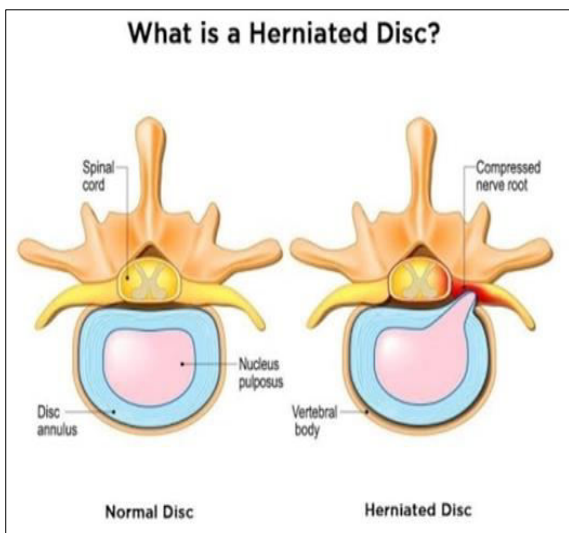


There are various causes of Low Back Pain like injury to, the supporting paraspinal muscles, the complex network of supporting ligaments, facet joint cartilage, vertebral bones and compression of neuronal structures due to herniated nucleus pulposus of lumbar disc ^[4], out of which the lumbar disc herniation is one of the most frequent reason for physical, functional restriction in patients ^[5].

Repetitive bending and twisting activity may lead to a single back injury which can create a shear stress across the disc. Over time this stress may cause the outer fibrous rings of the disc to break down one layer at a time. Gradually, the semiliquid centre of the disc will work its way through the outer ring and push on a nerve radicular pain. This is known as a ruptured, slipped or herniated disc ^[6].

Radicular pain in the lower extremities results from the herniation of the disc material into the spinal canal and resultant pressure on a nerve root. The constellation of symptoms can include numbness and weakness, but most often consists solely of leg pain that radiates posterior laterally below the knee from nerves L-5 and S-1 ^[7].

Initial management for herniated disc should include absolute bed rest, physical therapy, and appropriate use of pain medication. Patients, with symptoms that persist beyond six weeks in the setting of demonstrable MRI disc pathology, are candidates for surgical referral ^[7]. It has been found that patients who had undergone surgical treatment had experienced fast pain relief, improvement of function and satisfaction in comparison to conservative patients ^[8].



Numerous outcome measures have been adopted and these measures range from limits which offer a numerical score to physical and psychosocial elements. For example, the low back outcome scores. The Oswestry Disability Index was used for easy categorization of methods which includes good, fair

and poor. The "Visual Analog Scale" (VAS) used to measure the severity of pain is employed to visualize the suffering of the patient during patient's clinical care. This tool was introduced in medical science by Clarke and Spear (1964) in order to assess patient's health. In 1934, Mixter and Barr published their study

which concluded that laminectomy with decompression and extraction of herniated lumbar disc could improve suffering caused by sciatic pain. Open discectomy is now the "gold standard" for operative intervention in patients with herniated lumbar disc whose conservative treatment has failed."^[9] Thus the present study tried to analyse the efficacy of this procedure in NMC Hospital and comparing it with the available studies in the literature.

Aims and Objectives

1. To evaluate 30 cases of lumbar disc prolapse treated by surgical intervention at NMC.
2. To assess the precipitating factors of lumbar disc prolapse.
3. clinical evaluation of the incidence, level of disc prolapsed, signs and symptoms
4. Effectiveness of the surgical treatment (open discectomy), by comparing the ODI score pre-operatively and post operatively.

Methodology

Sample size: 30 cases

Study duration: August 2021 to January 2022

Sampling procedure: Prospective study.

Method: Patients with signs and symptoms, ODI >40%, MRI showing conclusive disc prolapse and who come under the inclusion criteria were selected and admitted.

1. Detailed history and clinical examination was done.
2. Investigations required for surgery was done.

3. A pre anaesthetic evaluation was done.
4. Pre-operative preparations were performed and informed written consent was taken.
5. Methods such as fenestration, extended fenestration, hemi laminectomy, total laminectomy was chosen according to the pre-operative requirement for discectomy.
6. Follow ups - 6, 12 and 24 weeks were made.

Inclusion criteria

1. Un-relieved pain radiating along the course of the nerve in the lower limb.
2. Nerve tension signs-positive
3. Associated neurological deficits
4. Confirmed by MRI scan
5. Above 18 years of age

Exclusion criteria

1. Thoraco- lumbar injuries
2. Lumbar - canal stenosis
3. Spondylolisthesis
4. Fail back syndrome
5. Medically unfit for surgery
6. Peripheral neuropathy
7. Infective conditions
8. Tumours (neoplastic) lesion

ODI Scoring

- 0 to 20%- (minimal disability)
- 21 to 40%- (moderate disability)
- 41 to 60%- (severe disability)
- 61 to 80%-(Crippled)
- 81 to 100%- (Bed ridden)



**Technical terminology concepts used in the report
Operative procedure**

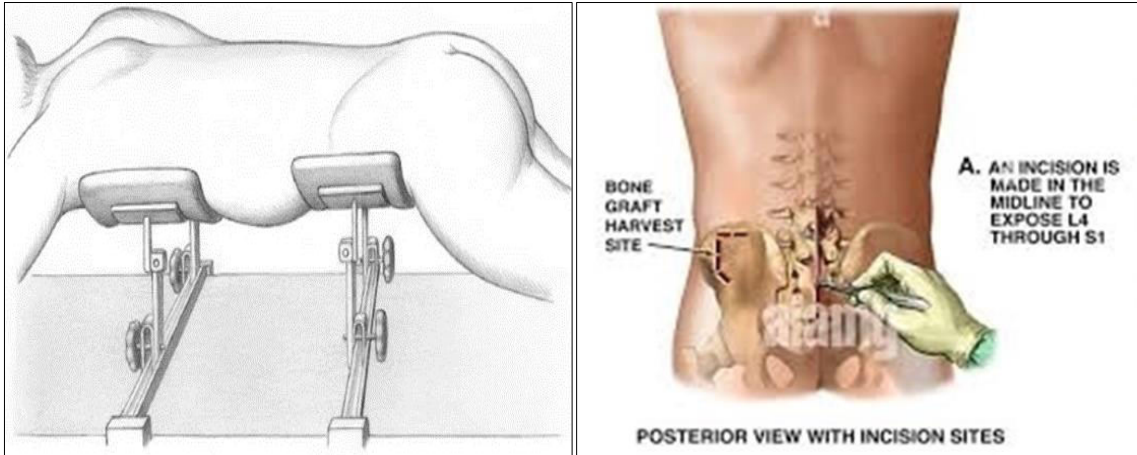
Anaesthesia: General anaesthesia

Position: The patient was placed on Relton-Hall frame. The abdomen becomes free and intra abdominal pressure reduces thereby minimizing epidural venous bleeding. Preparation and antibiotics Prophylactic antibiotics used were a third generation

cephalosporin and an amino glycoside just before the operation and continued after surgery up to 5 days.

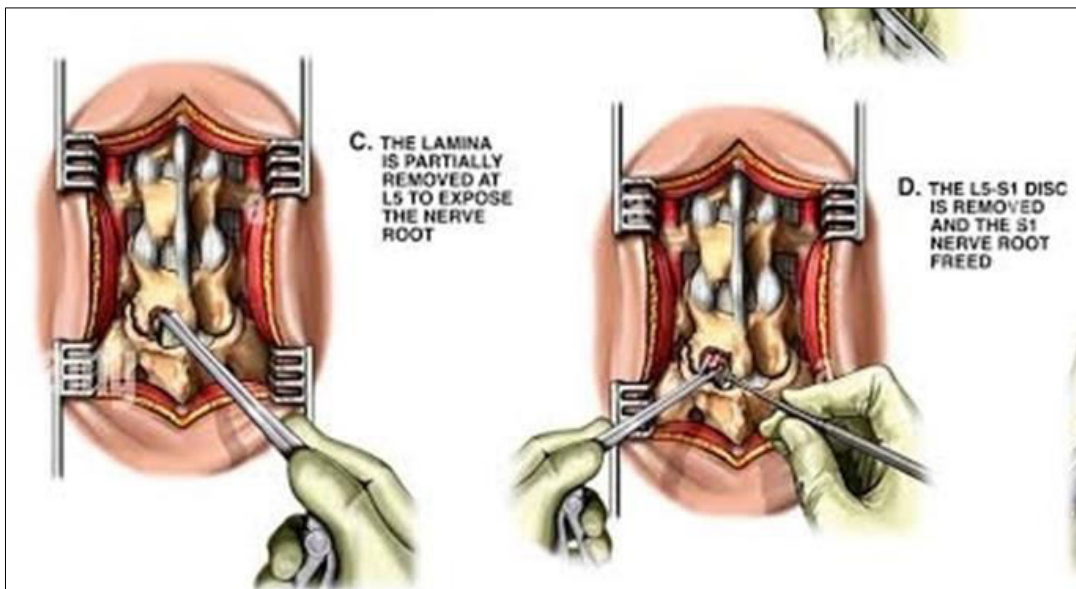
Incision: The placement of incision was determined by the help of image intensifier Noting the level of iliac crest (highest point) corresponding to LA spinous process. A steinmann pin is used to mark the level of the disc space. A sterile needle was taken to mark the level over the skin. The length of the incision for a

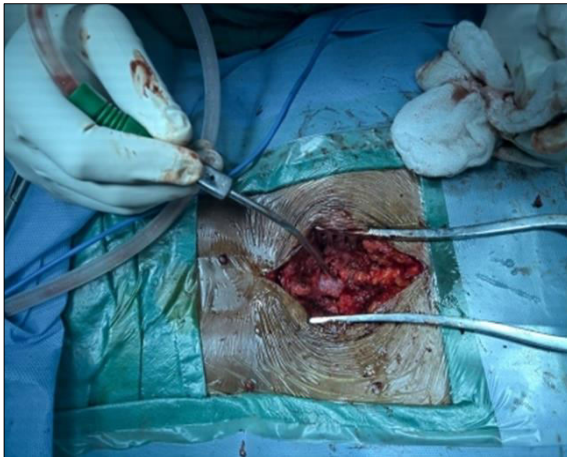
single level laminectomy was usually 3-6 cm. Haemostasis was maintained at each tissue level by local infiltration of adrenaline mixed normal saline, electro-cautery packing with gauze. The paraspinous muscles were retracted from the laminae with the help of a cobbs elevator. Self retaining retractors were put to improve the field of vision. The level of the spinous process was then confirmed with the help of intraoperative fluoroscopy.



The spinous process was removed and the ligamentum flavum beneath the caudal aspect of lamina was retracted. The laminae were carefully nibbled and ligamentum flavum removed with the help of a Kerrison rongeur. After the dura was exposed adequately inspection of the nerve root was done. A dural retractor was used to displace the anterior surface of nerve root dura from the floor of spinal

canal. The nerve root was retracted medially to visualize the underlying disc. It is usually seen as a bulging posterior longitudinal ligament or as an extruded fragment. If frank extrusion was encountered an effort was made to remove it early in the direction of nerve to avoid retraction on the nerve root. If frank extrusion was not encountered posterior longitudinal ligament was carefully examined for any defect.





A cruciate incision was made by second knife over the annulus and posterior longitudinal ligament to remove the disc fragments using disc forceps. Disc space is irrigated with saline; disc excision with disc forceps is repeated. After this the nerve root is traced up to the intervertebral foramen and root canal decompression is done at that level. Root was re-examined and made to move with minimum force. The free movement of nerve signified that the procedure was complete.

Wound closure

After removing the disc material and making the nerve root free, the exposed dural surface was covered with gel foam or free fat graft. Wound is closed in layers, keeping the vacuum suction drain.

After care

Postoperative IV antibiotics were given for a period of 5 days and later continued orally until suture removal.

Allowed to roll on bed, with active hip, knee and ankle movements. Isometric abdominal and lower extremity exercises started immediately after surgery depending upon the patients' tolerance and reaction of the wound. The drain was removed and patient was allowed to sit with the lumbar corset on 3rd post operative day. Post operative analgesia was continued as per required basis and stopped after 4 postoperative day. Patients' spine flexion exercises were started and allowed to walk with lumbar corset on the 5th post operative day. Sutures were removed on 10 post operative day and spine extension exercises were allowed. During this period they were told to avoid bending, sitting for prolonged periods, straining, lifting heavy weight and usage of western commode for defecation till 12 weeks. Lumbar corset was used for 12 weeks.

Analysis of data and interpretation

Table: 1 Distribution of the study subjects based on the gender (n=30)

Serial no	Gender	Total	Percentage
1	Male	21	70
2	Female	09	30
Total		30	100

The above table-01 depicted the gender distribution of the patients. It revealed that 70 percent (n=21) of the subjects were males and 30(n=09) percent of the

subjects were females. The study revealed that maximum subjects were males (70 percent)

Table 2: Distribution of the study subjects based on the age (n=30)

Serial no	Gender	18-30 years	31-40 years	41-50 years	Above 50 years	Total	Percentage
1	Male	03	09	04	05	21	70
2	Female	01	04	00	04	09	30
Total		04	13	04	09	30	100
Percentage		13.33	43.33	13.33	30.00	100	

The above table-02 indicated that 43.34 percent(n=13) of the patients were between the age group of 31-40 years,30 percent of the patients fall in the category of above 50 years. Another13.33 percent of the patients respectively belongs to the age group of 18 to 30

years and 41 to 50 years. The study revealed that majority of the patients (43.34%) fall in the age group of 31 to 40 years.

Mean age: 43.3 years.

Table 3: Distribution of the study subjects based on the Occupation (n=30)

Serial no	Occupation	No of patients	Percentage
1	Agriculture	11	36.67
2	Housewife	8	26.67
3	Coolie	5	16.67
4	Clerk	1	03.33
5	Merchant	3	10.00
6	Student	1	03.33
7	Mechanic	1	03.33
Total		30	100.00

The above table-03 highlighted the occupation of the study subjects. Out of total number of the subjects 36.67 percent (n=11) were Agricultures, 26.6 percent (n=8) were house wives, 16.67percent (n=5) were

coolies, 10 percent (n=3) were Merchants, another 3.33 percent (n=1) were respectively Clerks, Students, Mechanics. The studies revealed that majority (36.67 percent) of the patients were agriculturists.

Table 4: Distribution of the study subjects based on the level of disc prolapse (n=30)

Serial no	Gender	L4-l5	L5-s1	L3-l4	Total	Percentage
1	Male	14	5	2	21	70
2	Female	6	2	1	9	30
Total		20	7	3	30	100
Percentage		66.67	23.33	10.00	100	

From the above table-04 shows that 66.67 percent (n=20) of the subjects having L4-L5 disc prolapse, 23.33percent (n=7) were having L5-S1 disc prolapsed, 10 percent (n=3) were having L3-LA disc prolapse. The study revealed that majority of the patients (66.67) had L4-L5 disc prolapse.

Table 5: Distribution of the study subjects based on the Symptoms (n=30)

Serial no	Symptoms	No of patients	Percentage
1	Low back ache	30	100
2	Radicular pain	30	100
3	Paraesthesia	07	23.33
4	Weakness	06	20.00
5	Sensory loss	12	40.00

The above table-05 indicates that majority 100%(n=30) had lower backache and radicular pain, 23.3%(n=7) had paraesthesia,20%(n=6) had

weakness, 40%(n=12) had sensory loss. The study revealed that majority 100% (n=30) had lower backache and radicular pain.

Table 6: Distribution of the study subjects based on Duration of illness (n=30)

Serial no	Duration of illness	No of patients	Percentage
1	<3 weeks	01	03.33
2	3 weeks- 1 month	07	23.33
3	2 – 4 months	16	53.33
4	>4 months	06	20.00
Total		30	100

The above table-06 revealed that 53.33 percent (n=16) of the patient having illness between 2-4 months of duration, 20 percent (n=6) of the patient having illness more than four months of duration, 23.33 percent (n=7) of the patients having illness from three weeks to one month of duration, 3.33 percent (n=1) of the

patient having illness less than three weeks of duration.

The study revealed that majority (53.33 percent) of the patients had their illness from 2-4 months of duration.

Table 7: Distribution of the study subjects based presentation of Clinical Signs (n=30)

Serial no	Clinical sign	No of patients	Percentage
1	Tenderness	26	86.7
2	Para spinal muscle spasm	25	83.3
3	Obliteration of lumbar lordosis	4	13.3
4	Sciatic scoliosis	10	33.3
5	Restricted rom	24	80

The above table-07 highlighted that presence of the clinical signs in the study subjects. Out of total number of the study subjects, 86.7percent (n= 26) had tenderness. Another 83.3 percent (n=25) of the patients had Para spinal muscle Spasm, 80 percent (n=24) of the patients had Restricted ROM and 33.3

percent(n=10) of the patients had Sciatic scoliosis. Only 13.3 percent (n=4) of the patients had the Obliteration of Lumbar Lordosis. The study revealed that majority (86.7) of the study subjects had clinical symptoms as a Tenderness

Table 8: Distribution of the study subjects based on nerve tension signs (n=30)

Serial no	Nerve tension signs	No of patients	Percentage
1	SLRT	27	90
2	Lasegue test	25	83.3

The above table-08 revealed that 90 percent (n=27) of the patients had positive SLRT. Another 83.3 percent (n=25) of the patients had positive lasegue test.

The study revealed that majority (90 percent) of the patients had positive SLRT.

Table 9: Distribution of the study subjects based on the quadrants of IVDP

Serial no	Quadrants of IVDP	No of patients	Percentage
1	Central	1	3.4
2	Para central	24	80
3	Foraminal	3	10
4	Far lateral	2	6.6

The above table-09 depicts that majority 80% (n=24) had a presentation of para central type and others had 10% (n=3) foraminal type, 6.6%(n=2) far lateral and 3.4%(n=1) central.

The study revealed that majority 80%(n=24) had a presentation of para central type.

Table 10: Distribution of the study subjects based on return to work in weeks (n=30)

Serial no	Return to work	No of patients	Percentage
1	4-6 weeks	2	6.6
2	8-10 weeks	12	40
3	10-12 weeks	16	53.3
Total		30	100.0

The above table-10 revealed that majority 53.3% (n=16) of the patients who were agriculturist and coolie's returned to work between 10-12 weeks, 40% (n=12) of the patients who were house wives, merchant and mechanics return to work after 8-10

weeks and only 6.6% (n=2) of the patients who were students and bench clerk return to work after 4-6 weeks following surgery. The study revealed that majority of the patient 53.3% (n=16) who were agriculturist and coolie's returned to work between 10-12 weeks following surgery.

Table 11: Distribution of Results of the Surgical Treatment

Serial no	Results	No of patients	Percentage
1	Fair	02	06.67
2	Good	07	23.33
3	Excellent	21	70.00
Total		30	100.00

The table-11 explained that 70 percent (n=21) of the study subjects showed excellent improvement after the surgical treatment, another 23.33 percent (n=7) of them showed good improvement and only 6.7 per cent (n=2) of them showed poor improvement after the surgical treatment.

The study revealed that majority 70 percent of the patients showed excellent result after the surgical treatment

Table 12: Comparison of pre operative and post-operative ODI score

ODI score	N	Pre-op		Post-op		t	P value
		Mean	SD	Mean	SD		
	30	58.28	5.06	15.38	2.40	38.56	0.000*

*Significant at $p < 0.001$

The above table-12 showed mean score obtained on ODI scale among the study subjects. The pre operative mean score was 58.285.06 and post operative mean score was 15.38+2.40. The comparison of the pre and post operative mean score done with paired t test (38.56). The P Value showed. 000 ($p < 0.001$)

The p value suggest that there is a significant improvement of ODI score (functional outcome) between pre operative and post operative level of function.

Discussion

Gender

Males are more exposed to stress and strenuous activities in their daily life; hence they are more prone to have IVDP

Age

Commonest age group for the disc to degenerate is 30-40 years. This is a formidable age group who are exposed to more work and stressful activities they are more prone for IVDP.

Occupation

All the study subjects included in the present study had the daily activities which involves bending forwards, lifting weights, squatting and sitting cross legged are the precipitating factors for IVDP

Level of disc prolapse

L4-L5 level is the commonest level of presentation of disc prolapsed, comparable to other studies

mentioned. The maximum amount of movement occurs at the L4-L5 level hence it is subjected to more stress and repeated trauma which leads to degeneration and has an end result of IVDP

Symptoms

All subjects had (100%) lower back ache and radicular pain, followed by sensory loss in 40%.

Presentation of Neurological signs

Nearly 53.3% presented with neurological signs unlike other studies, may be due to delayed presentation to hospital.

Treatment outcome

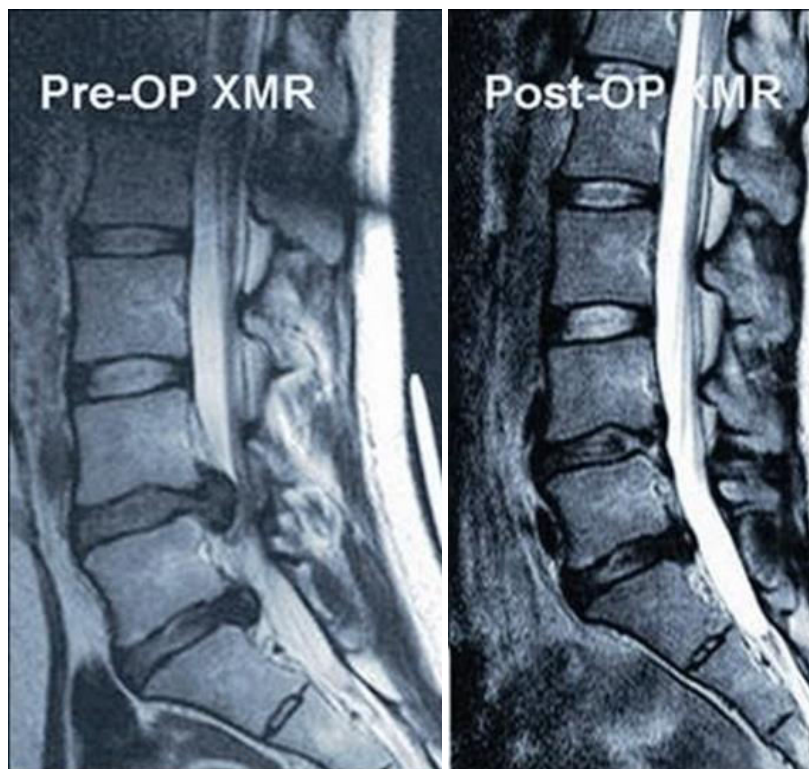
Open disc excision under direct vision offers adequate exposure for lumbar disc excision with smaller incision, lesser morbidity, shorter convalescence and hence lesser complication rate.

Surgical approach

Fenestration showed excellent results (70%) as there is minimum soft tissue insult and the facet joints are left intact therefore does not cause instability and provides best functional out come.

Comparison of pre and post operative ODI score obtained on the ODI scale

The significant reduction of post operative score showed that the surgery and technique had provided excellent improvement in the functional out come.



Conclusion

The clarity of the surgical procedure is now very well defined with regards to approach, dissection, dural handling and discectomy. Therefore the scopes of mistakes are reduced to a greater extent compared to before. The results demonstrated that, the procedure of open discectomy (fenestration) for lumbar intervertebral disc prolapse in relieving symptoms and restoring the function of patients is excellent. Open discectomy by fenestration is an easy procedure, economical, with least complication and the most effective means of treating lumbar disc prolapse. Standard open discectomy is still the "gold standard" in operative treatment of lumbar disc prolapse.

References

1. Jayant Joshi, Prakash Kotwal, Essentials of orthopedics and applied physiotherapy Definition of low back pain and its incidence, 2nd Edition, Elsevier, 2006, 401.
2. John Ebnezar, Essentials of Orthopedics for Physiotherapists. Definition of the low back pain, Epidemiology and structures involved in low back pain. 1st edition. JP Medical Book Publishers, New Delhi, 2003, 293-4.
3. Guido R. Zanni, Jeannette Y. Wick. Medscape Today; Low Back Pain: Definition and classification. Available from: http://www.medscape.com/viewarticle/457101_3
4. Bruce Carl Anderson. Lumbosacral Spine, chapter-9. Office Orthopedics for Primary Care: Diagnosis. Elsevier Health Science. 3rd edition-2005, 150.
5. Figen Yilmaz, Adem Yilmaz, Funda Merdoi, Demet Parlar, Fusun Sahin and Banu Kuran. Efficacy of Dynamic Lumbar Stabilization Exercise in Lumbar Microdiscectomy. Journal of Rehabilitation Medicine. 2003;35:163-7.
6. Orthopedics International Lumbar microdiscectomy Available From: http://www.Oispine.Com/pdf/lumbar_microdiscectomy.pdf
7. Andrew J Schoenfeld, Bradley K Weiner. Evidence-based practice. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2915533/>
8. Peul WC, van Houwelingen HC, van den Hout WB, Brand R, Eekhof JA, Tans JT, *et al.* Surgery versus Medicine prolonged conservative treatment for sciatica. New England Journal of 2007; 356(22):2245-56.
9. Mixter WJ. JS Barr. Rupture of the intervertebral disc with involvement of the spinal canal. New England Journal of Medicine. 1934;211:210-215.