

Successful clinical outcomes of microscopic discectomy in patients with lumbar disc herniation -correlation of clinical and radiological factors

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Abstract

Study Design: Prospective longitudinal study

Objective: The aim of our study article was to find the factors related to successful outcomes with clinical factors like level, side of disc herniation and type of herniation in patients undergoing the microscopic discectomy.

Methods: One hundred and seven patients between the ages of 20 years to 45 years, who have undergone single-level lumbar micro discectomy in our institution, operated by a single surgeon were taken in to the study and were followed prospectively for 2-years period. Patients with failed conservative management either with rest, physical therapy and epidural/transforaminal steroid infiltration were included with in the age group of 20-45 years. Pre and Postsurgical visual analog scale, pre and post Prolo score, patient satisfaction and return to duty along with the need of additional surgery and neurological recovery were noted in relation with the level of the disc herniation, side of disc herniation and the type of disc herniation stenosis.

Results: Patients with L5-S1 Disc herniation had better Visual Analog Scale score compared to L4-L5 level. Sequestered disc herniation had better clinical outcomes than other types. Patients with L5-S1 Disc herniation had better Visual Analog Scale score compared to L4-L5 level. Sequestered disc herniation had better clinical outcome compared to contained discs. During the final follow up, patient's return to unrestricted duty was seen in 85%, 10% in restricted duty and 5% have changed their previous profession.

Conclusion: Microscopic discectomy is a well-known procedure for the lumbar disc herniations and one of the most common spinal procedure performed in today's world. Patients with L5-S1 disc herniation had better Visual Analog Scale score and Prolo score compared to L4-L5 level. Sequestered disc herniation had better clinical outcomes. Patient with left side disc herniation had better outcomes and lesser complication rates. This factor might be due to predominant right handedness with better instrument guidance and root retraction during the surgical procedure.

Keywords: Microdiscectomy, VAS score, Prolo score, Disc herniation level, Side of disc herniation

Introduction

Among the surgeries performed on the lumbar spine, Discectomy is one of the most commonly performed procedures for treating radicular pain caused by lumbar herniated nucleus pulposus.^(1,2) The mechanical and inflammatory mechanism of lumbar disc herniation involved in causing radicular pain is by compression of nerve roots.⁽²⁾

Discectomy can be performed through microscopic or open technique. The development of microscopic discectomy is attributed to its advantage of decreased surgical trauma, quicker recovery time, and the lower incidence of complications.

The intradiscal pressure is significantly lowered in microscopic discectomy by removing small amount of disc following which the nerve pressure will be relieved and radicular leg pain will be reduced.

The outcomes of micro discectomy in patients with contained small disc herniation are poorer when compared to sequestered disc herniation.⁽³⁾

Compared to non-operative management improved outcomes in terms of satisfaction and symptomatic relief have been seen in patients treated with micro discectomy.⁽⁴⁾

Our study was aimed to find about the factors which are related to successful outcomes with respect to clinical

factors like the level of disc lesion, the side of disc herniation and the type of herniation in patients undergoing the microscopic discectomy.

Materials and Methods

A prospective longitudinal study was done in our institution with one hundred and seven (107) patients who had undergone a single-level lumbar micro discectomy for Inter Vertebral Disc Prolapse (IVDP).

Patients with age group of 20-45 years who had presented with radicular signs and symptoms for more than 1 month despite conservative management (e.g., rest, analgesics, physiotherapy and epidural/trans foraminal steroid infiltration) were included in the study.

Patients presenting with Cauda Equina syndrome, previous history of lumbar disc surgery, multiple level disc involvement and radiological evidence of other spinal pathologies like spinal stenosis and spinal cord tumour that can explain the clinical presentation were excluded from the study.

In our study, we have collected the patient's demographic data along with the clinical characteristics like age, sex, smoking history, duration of pain and neuromuscular examination and Straight Leg Raising test (SLR). MRI scan for lumbosacral spine was also done for confirming the single level of disc prolapse and

to rule out other spinal pathologies. We also have noted the side and level of disc herniation.

We had adopted the North American Spine Society for classifying disc herniation into 'protrusion', 'extrusion', and 'sequestration'.⁽⁶⁾ In our study, there were 46 patients with protrusion, 24 patients with extrusion and 37 patients with sequestration as described below in Table 1. Preoperatively, Visual Analog Scale and Prolo scale measurements were done.

Table 1: No of Patients with disc herniation

S. No	Disc herniation type	No of patients(%)
1	Protrusion	46(42.99%)
2	Extrusion	24(22.42%)
3	Sequestration	37(34.57%)

Table 2: Patient data based on side of disc herniation

S. No	IVDP level	Right (%)	Left (%)
1	L2-L3	1 (0.9%)	-
2	L3-L4	2 (1.8%)	-
3	L4-L5	24(22.4%)	29(27.10%)
4	L5-S1	21 (19.6%)	30(28.0%)

Visual Analog Scale: VAS or visual analogue scale is a subjective scale to assess the amount of pain in an individual. VAS is usually a horizontal line, 100 mm in length having values from 0 to 10. It can be divided for assessment from no to worst pain.

No to mild: 0-2

Moderate: 3-6

Severe: 7-9

Worst: 10

Prolo Scale: Prolo scale was used to assess the functional outcome of the patients which includes questions to assess functional and economic status. Fig. 1 shows Prolo score

Score	Criteria
functional status	
1	total incapacity
2	mild to moderate level of low-back pain &/or sciatica
3	low level of pain & able to do everything except sports
4	no pain, but has had >1 recurrence of low-back pain or sciatica
5	complete recovery w/o recurrent pain, no activity restriction
economic status	
1	complete disability
2	no gainful occupation but can do housework or some retirement activities
3	able to work but not at previous occupation
4	able to work at previous occupation but w/ restrictions or limited status
5	able to perform previous occupation w/o restrictions

Fig. 1: Prolo score

Scores of functional and economic status are added and interpreted as follows

>9: excellent results

5- 8: moderate

<4: poor results

Surgical Technique: All the patients were operated by a single orthopaedic spine surgeon. A 2cm incision starting from the midspinous process of the upper vertebra to the superior margin of the spinous process of the lower vertebra at the involved level was taken. A limited laminotomy was done as described by Delamarter and McCulloch.⁽⁷⁾ When the nerve root was identified, root was carefully mobilized medially and this may require some bony removal. Gently the nerve is dissected free from the disc fragment to avoid excessive traction on the root. Spengler's method was used to remove the fragment of disc using a small annulotomy.⁽⁸⁾ The canal was inspected and the foramen was probed for residual disc material. Then the nerve root was completely decompressed and was found mobile.

Patients were mobilised with lumbosacral brace following the next day of surgery. During the follow up, the patient's wound was inspected and staplers were removed after 2 weeks of surgery. Postoperatively, Visual Analog Scale and Prolo scale were also noted. Patients have been encouraged to return to their pre injury activities as soon as possible with no restrictions at 6 weeks. Patients were followed up for minimum of 2 years.

Results

Micro discectomy was performed between January 2012- December 2014 in 107 patients and follow up was done for minimum 24 months. The complete follow up data was obtained in 98 patients. 9 patients have lost follow up. The mean age of presentation is 34.07 yrs.

Among the involved vertebral levels, L5-S1 herniation had better clinical outcomes and better Visual Analog Scale scores compared to other vertebral levels. L5-S1 level had better Prolo score on comparing with other levels. The better clinical outcome was noted in patients with left side disc herniation and also had better Visual Analog Scale and Prolo scores. Patients with sequestered disc had better clinical outcomes than other types. Patients with positive SLR showed negative correlation in terms of clinical outcomes when compared to negative SLR who performed better post operatively. Patients presented with shorter duration of illness showed significant different Visual Analog Scale score and Prolo scores which is attributed to recurrent herniation/additional surgeries. The results were summarised in Tables 3, 4, 5, 6 below.

Table 3: VAS scores and Prolo scores for disc herniation level

S. No	IVDP level	Pre op VAS(10)	Post op VAS(10)	Post op Prolo(10)	Pre op Prolo(10)
1	L2-L3	7	3	3	8
2	L3-L4	7.5	3.5	2.5	8
3	L4-L5	7.715	3.396	2.81	7.63
4	L5-S1	7.65	3.01	2.66	8.24

Table 4: VAS scores and Prolo scores for disc herniation level and side of herniation

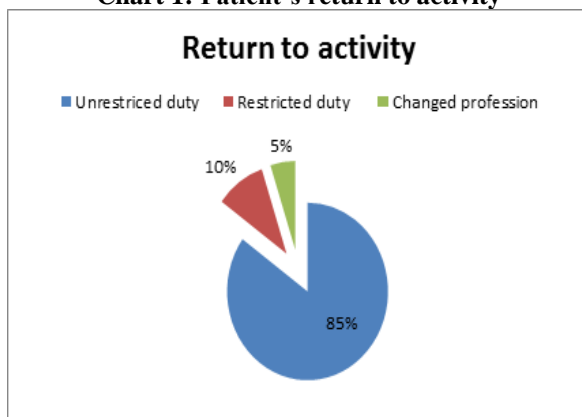
S. No	IVDP level	Side	Pre op VAS(10)	Post op VAS(10)	Post op Prolo(10)	Pre op Prolo(10)
1	L2-L3	Right	8	3	3	8
2	L3-L4	Right	7	2	2.5	8
3	L4-L5	Right	7.32	2.83	2.49	7.63
		Left	7.54	2.21	2.12	7.68
4	L5-S1	Right	7.41	2.92	2.41	7.45
		Left	7.85	2.15	2.08	7.87

Table 5: VAS scores and Prolo scores for disc herniation type

S. No	Disc herniation type	Pre op VAS(10)	Post op VAS(10)	Postop Prolo(10)	Pre op Prolo(10)
1	Protrusion	7.5	2.9	3.24	7.21
2	Extrusion	7.6	1.9	3.65	7.53
3	Sequestration	7.4	1.5	3.14	7.91

Table 6: VAS scores and Prolo scores for SLR test and duration of pain

Clinical variable		No of patients	Pre op VAS(10)	Post op VAS(10)	Postop Prolo(10)	Pre op Prolo(10)
SLR	Positive	76	7.9	2.5	3.24	7.43
	Negative	31	7.1	1.7	3.01	7.71
Duration of pain(months)	1-6 months	43	7.8	1.9	2.78	7.81
	>6 months	64	7.2	2.3	3.12	7.64

Chart 1: Patient's return to activity

Post operatively after 2 months, 85% of patients have returned to unrestricted duty, 10% to restricted activity and 5% have changed their previous profession.

Among the 107 patients, 6 patients had presented with complications after 6 months of index surgery. Among the 6 patients, 4 patients developed disc extrusion, 2 patients had sequestered disc following which these patients had posterior instrumentation. 2

patients had surgical site complication of local abscess which required second surgery of incision and drainage along with antibiotics and regular dressings.

Discussion

Lumbar disc herniations can be treated operatively or non-operatively. Non-operative treatment includes rest, analgesics, epidural injections and physiotherapy. Weinstein et al⁽⁹⁾ showed that results were better with discectomy than non-operative treatment.

Micro discectomy is done for radicular leg pain following lumbar disc herniations in patients with a preponderance of leg pain who have failed non-operative treatment has a high success rate, as demonstrated by validated outcome scores, patient satisfaction, and return to active military duty.

Micro discectomy allows better lighting, magnification and angle of view with much smaller exposure. It involves limited dissection which allows shorter hospital stay and less postoperative pain.

In our study, we found that L5-S1 level had good VAS and Prolo scores postoperatively. Christopher et al⁽¹⁰⁾ studied on disc herniation level outcome and postulated that L5-S1 level disc herniations had better

outcomes because of the inherent stability by the lumbo-pelvic ligaments, there may be less reherniations. Moreover, the neuroforamen for the S1 nerve is larger and less affected by progressive disc degeneration and foraminal narrowing.

Disc herniation types have also influenced the surgical treatment outcome. Sequestered discs had better clinical outcome scores compared to extruded and contained disc herniations. Contained disc herniations had poorer functional outcomes than either sequestered or extruded disc types. Our findings were consistent with previous studies that had correlation between disc herniation type and the surgical treatment outcome.⁽⁹⁾

Carragee et al⁽¹¹⁾ showed that the best surgical outcomes and lowest reherniation rates have been reported in association with small annular tears with large disc fragments, and the worst outcomes with contained herniations and no isolated fragments. In our study, we have found that the sequestered type performed better based on Visual Analog Scale and Prolo scores.

Lumbar herniated disc causes a direct mechanical pressure over the nerve root while performing the straight leg raising test.⁽¹²⁾ Micro discectomy relieves mechanical compression by removing herniated disc and thereby lowering the intra discal pressure. Patients had relief of pain following surgery and it proved to have a successful outcome which correlated with other study.⁽¹³⁾

In our study, patients with left side disc herniation had better clinical outcomes with Visual Analog Scale, Prolo scores and lesser complication rates. This factor might be due to predominant right handedness of surgeon with better instrument guidance and root retraction during the surgical procedure.

Post operatively in our study, we found that the patients returned to unrestricted duty was seen in 85%, 10% in restricted duty and 5% have changed their previous profession.

Conclusion

Discectomy is a well-known procedure for the lumbar disc herniations and Microscopic discectomy is one of the most common spinal procedures performed in today's world. Patients with L5-S1 disc herniation had better VAS score and Prolo score compared to L4-L5 level. Sequestered disc herniation at level had better clinical outcomes compared to other types. Patient with left side disc herniation had better clinical and functional outcomes and lesser complication rates. By our study, we have found that there are several factors have been related to successful outcomes in patients with different disc herniation level, side of disc herniation and type of herniation in patients undergoing the microscopic discectomy.

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