

Original Research Article

Functional outcome of patients with lumbar intervertebral disc herniation treated by minimally invasive microdiscectomy

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ABSTRACT

Background: The disorder lumbosacral radiculopathy affects the function of one or more lumbosacral nerve roots. The aim of this research is to understand the clinical and epidemiological features of patients diagnosed with disc herniation and treated at our facility using minimally invasive microdiscectomy.

Methods: From August 2021 to August 2022, we conducted a prospective research in the Department of Orthopedics at a tertiary care hospital in Pathankot. During the study period, all patients over the age of 18 who presented with complaints of leg or back pain, or other neurological symptoms supported by Magnetic Resonance Imaging (MRI) suggestive of disc herniation, were included. All patients were operated using a minimally invasive micro lumbar discectomy method.

Results: The majority of patients had less than 100 mL of blood loss (75%) and 72% underwent surgery in less than an hour. Only one patient had an intraoperative cerebrospinal fluid leak and no patient had post-operative infection. It was observed that 81% were admitted for 5 to 8 days. Immediately post-operatively, we observed that 50% had good outcome on MacNab score and 9% had excellent functional outcome. At the final outcome at 6 months, 44% had good functional outcome and 47% had an excellent functional outcome. At the final outcome at 6 months, 44% had good and 50% had excellent functional outcomes.

Conclusions: The findings of our study can aid us in budgeting and infrastructure planning for disc herniation patients. Long-term clinical outcomes in these individuals should be the focus of future study.

Keywords: Functional outcome, Lumbar disc herniation, Minimally invasive

INTRODUCTION

The disorder lumbosacral radiculopathy affects the function of one or more lumbosacral nerve roots. According to research, the most prevalent cause of lumbosacral radiculopathy is nerve root compression produced by a disc herniation or spondylosis. Mixter and Barr reported the relationship between disc disease and lumbosacral radiculopathy in 1934.¹ Disc herniation is clinically described as the movement of the nucleus pulposus, cartilage, or fragmented annular tissue beyond the intervertebral disc space.² Depending on the position of the spinal nerve roots as they leave the spinal cord, disc

protrusion can induce varying degrees of nerve root compression.

Depending on the form and location of compression, roots can be damaged at any disc level in the spine. Anatomically, the lumbosacral spine is prone to disc herniation due to its mobility to produce flexion, extension, and torsion. It has been shown that from regular spinal motions, the L4-L5 and L5-S1 levels are the most vulnerable to injuries, and as a result, around 90% of compressive radiculopathies occur at these levels.³ However, lateral herniations occur more frequently at the L2-4 levels and can harm the rostral root. This is

uncommon, as only 10% of far lateral herniations cause nerve root compression.⁴

The purpose of this study was to better understand the clinical and epidemiological features of patients diagnosed with disc herniation and treated at our facility using minimally invasive microdisectomy.

METHODS

From August 2021 to August 2022, we conducted a prospective research in the Department of Orthopedics at SKR Hospital and Trauma Centre Pvt Ltd. Pathankot, Punjab. Before enrolling patients in the trial, the institutional ethics committee was consulted and its approval was obtained. For this prospective study, we created a patient case report form including questions on the patient's demographic and clinical characteristics. Prior to collecting patient information, all patients provided informed written consent. During the study period, all patients over the age of 18 who presented to the Department of Orthopedics, at a tertiary care hospital in Pathankot, with complaints of leg or back pain, or other neurological symptoms supported by Magnetic Resonance Imaging (MRI) suggestive of disc herniation, were included. All patients were urged to try non-surgical conservative options first. Patients who failed to respond to conservative treatment were chosen for minimally invasive microdisectomy. The final sample group included all patients with a verified diagnosis of disc herniation and a positive unilateral straight leg raise (SLR) test. We excluded patients over the age of 50 who were medically unfit for surgery, those with asymptomatic or recurrent disc herniation, bilateral dischernation, a history of lumbar spinal surgery, operative site infections, spinal infections, those who were medically unfit for surgery, those who were unwilling to undergo surgery, and those who had psychiatric illness. Patients experiencing back discomfort caused by tumours, vertebral fractures, spinal canal stenosis, cauda equina, or listhesis were also eliminated. All consecutive patients during the study duration fulfilling the study criteria were included in the study (non-probability sampling).

Operative details

Once cleared for surgery, the patients were operated on in our tertiary level operating rooms under general anaesthetic and aseptic precautions by senior specialists using a minimally invasive micro lumbar discectomy method. Throughout the procedure, the patients were

monitored and findings were documented. The patient was kept completely immobile on the day of operation. Starting on the first post-operative day, the patient is mobilised and encouraged to ambulate. Intravenous antibiotics were administered until the fifth post-operative day. Analgesia was administered as needed. Once the patient was pain-free and able to ambulate on their own, he or she was released (usually on 5th post-operative day). Suture removal was conducted 10 days following surgery (after wound inspection). For at least 6-12 weeks, the patient was advised to avoid bending, carrying large weights, and rigorous labour tasks. Patients with occupations that require prolonged sitting were advised to return to work just 4 to 6 weeks following surgery.

Data collection and data analysis

We gathered patient-related information such as demographics, socioeconomic history, clinical history, and clinical signs and symptoms using pre-designed semi-structured questions. Some of this information was obtained directly from the patient, while others were obtained through their medical records. We recorded a summary of the patient's examinations and therapies after he was diagnosed with disc herniation. The patient's employment was classified as major (hard work) or not significant (light work). Light labour was classified as lifting things (8-10 kg) on occasion, walking or standing for 2 hours in an 8-hour work period, and retirement activities. Heavy labour was defined as pushing, dragging, or lifting 30-40 kg or more and/or carrying weights up to 20 kg during the course of an 8-hour work day. The Japanese Orthopedic Association questionnaire was used to assess pre-operative pain.⁵ SLR was conducted on each patient prior to surgery, and the results were recorded. Post-operative functional outcome was assessed using JOA score and MacNab score.⁶ We also took note of the level of lesion implicated in disc herniation. Collected data was entered in Microsoft excel sheets and later imported in the Statistical Package for Social Sciences software for appropriate analysis.

RESULTS

We enrolled 32 patients during the study period. The patients' average age was 43.27 years, and 59% of the patients were males. The most common age group involved was 41 to 60 years. The majority of them (56%), conducted light work. When we analysed individuals for leg and back pain, we discovered that 63% reported greater leg pain than back discomfort (Table 1).

Table 1: Baseline variables of the patients included in the study.

Variable	Frequency	Percentage
Age groups (years)		
18 to 40	9	28
41 to 60	15	47
More than 60	8	25

Continued.

Variable	Frequency	Percentage
Gender		
Male	19	59
Female	13	41
Type of work		
Heavy	14	44
Light	18	56
Preoperative pain		
Leg pain less than back pain	4	13
Leg pain equal to back pain	8	25
Leg back more than back pain	20	63
Duration of symptoms		
0 to 6 months	17	53
7-12 months	9	28
More than 12 months	6	19
Side of lesion		
Right	11	34
Left	21	66
Preoperative straight leg raising test		
Positive	20	63
Negative	12	38
Levels involved in the lesions		
L3-L4	4	13
L4-L5	22	69
L5-S1	6	19

Table 2: Description of intra-operative and post-operative parameters of the patients.

Patient intra- and post-op parameters	Frequency	Percent
Intraoperative blood loss		
Less than 100 ml	24	75
More than 100 ml	8	25
Duration of surgery		
Less than equal to 1 hour	23	72
More than 1 hour	9	28
Intraoperative cerebrospinal fluid leak		
Present	1	3
Absent	31	97
Post-operative infection		
Present	0	0
Absent	32	100
Length of stay (days)		
1 to 4	1	3
5 to 8	26	81
8 to 12	5	16

Table 3: Change in MacNab score at different follow ups.

MacNab score	Poor		Fair		Good		Excellent	
	N	%	N	%	N	%	N	%
Immediate post-operative	4	13	9	28	16	50	3	9
One month post-operative	4	13	5	16	18	56	5	16
Three months post-operative	2	6	5	16	16	50	9	28
6 months post-operative	0	0	3	9	14	44	15	47

Table 4: Change in Japanese orthopaedic association (JOA) score at different follow ups.

JOA score	Poor		Fair		Good		Excellent	
	N	%	N	%	N	%	N	%
Immediate post-operative	6	19	7	22	18	56	1	3
One month post-operative	4	13	8	25	15	47	5	16
Three months post-operative	2	6	4	13	16	50	10	31
6 months post-operative	0	0	2	6	14	44	16	50

In addition, 53% of the patients experienced pain symptoms for less than 6 months prior to presentation. In our patient sample, the left side was shown to be more typically impacted than the right (66%). When the SLR test was performed prior to surgery, 63% of the patients reported discomfort at less than a 30 degree leg lift. Further examination and imaging studies revealed that level L4-L5 was the most usually affected (69%) in our patient population. The majority of patients had less than 100 mL of blood loss (75%) and 72% underwent surgery in less than an hour. Only one patient had an intraoperative cerebrospinal fluid leak and no patient had post-operative infection. It was observed that 81% were admitted for 5 to 8 days (Table 2). Immediately post-operatively, we observed that 50% had good outcome on MacNab score and 9% had excellent functional outcome (Table 3). At the final outcome at 6 months, 44% had good functional outcome and 47% had an excellent functional outcome. Based on JOA score, 56% had good and 3% had functional outcome immediately post-operatively. At the final outcome at 6 months, 44% had good and 50% had excellent functional outcomes.

DISCUSSION

The syndrome of low back and low extremity pain, weakness and numbness results from the compression of the nerve root. Due to dehydration, flexibility decrease and severe damage to the normal function, while the pressure loaded on the lumbar spine increases could cause annular fibrosus damage and intervertebral disc herniation.

The incidence of symptomatic herniated lumbar disc varies by age and gender. The male to female ratio is 2:1, with the highest occurrence among those aged 30-50 years.⁷ The average age of participants in our study was 43.27 years, with 41 to 60 years being the most prevalent age group included. This is consistent with the findings of Heliovaara et al and Deyo et al, who found that the average age of patients receiving lumbar disc herniation surgery was 40 and 43 years, respectively.^{8,9} Also, according to the Deyo et al study, the majority of lumbar disc herniations occur between the ages of 30 and 50.

In this study, 44% of the patients had a history of heavy work employment, which might have had a role in the aetiology. These findings contradict Heliovaara's study, which found that the risk of disc herniation was lowest

among professionals and white-collar employees. Our findings, however, are comparable to and explainable by the findings of a study by Kelsey et al, in which it was hypothesised that because physical activity is known to increase the diffusion of nutrients into the disc, sedentary occupations could be associated with an increased risk of disc degeneration and disc herniation.¹⁰

In this analysis, the most common presenting symptoms were radicular leg pain and low back pain, with 31 individuals having more radicular pain than back discomfort. Akbar et al discovered 47% of patients with low back pain + leg discomfort and 18% with leg pain solely in their study of lumbar disc prolapse.¹¹ Several investigations have found that the longer the symptoms of lumbar disc herniation persist, the worse the surgical prognosis. Our average symptom duration was 7.60 months, ranging from 2 to 24 months. In our study, the most prevalent result on evaluation was a positive SLR test, followed by limited movements and neurological impairments. This was similar with the findings of the Vroomen et al investigation, which demonstrated that SLR was a consistently sensitive assessment for sciatica caused by disc herniation.¹² SLR was found to be the most sensitive preoperative physical diagnostic indication for lower lumbar disc herniation by Supik and Broom. However, this study did not reveal SLR sensitivities, but it did indicate SLR patterns that were predictive of lumbar disc herniation.¹³ In our study, 46 (88%) and 51 (96%) individuals had motor and sensory impairments, respectively. Iwasaki et al. discovered a 72.6% prevalence of sensory disturbance in their investigation.¹⁴

We observed that majority of the patients had good and excellent functional outcomes at the final follow up point. In another recent study, Patil et al observed that according to the modified MacNab criteria, 84 patients (28%) and 174 patients (58%) had excellent and good results, respectively, at postoperative day 7, which improved to 132 patients (44%) and 146 patients (48.67%) at 6-month follow-up, whereas 24 patients (8%) and 18 patients (6%) had fair and poor outcomes each at postoperative day 7 which changed to 9 patients (3%) and 13 patients (4.3%), respectively, at 6-month follow-up.¹⁵ In a similar study carried out by Jhala and Mistry, the successful outcome was 94% and in a study carried out by Perez-Cruet et al, the successful outcome by MacNab criteria was 91%.^{16,17}

There are a few limitations of this study. First, it was a single centre study, so the results might not be generalizable to other surgical centres. Second, long term follow up of the patients could not be conducted.

CONCLUSION

Our study describes the patient group at our institution who had disc herniations treated with minimally invasive microdiscectomy. Understanding clinico-epidemiological features and functional outcomes of these individuals can aid us in budgeting and infrastructure planning for disc herniation patients. Long-term clinical outcomes in these individuals should be the focus of future study.

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