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A PROSPECTIVE STUDY OF FUNCTIONAL OUTCOME OF PATIENTS WITH LUMBAR INTERVERTEBRAL DISC HERNIATION TREATED BY MINIMALLY INVASIVE MICRODISCECTOMY

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Abstract

Introduction: Low back pain is one of the most common complaints in clinical practice with life time prevalence ranging from 65-80%. Lumbar disc herniation is the cause for less than 5 % of back pain problems but is the most common cause of sciatica. Absolute indication for surgery includes cauda equine syndrome and progressive neurological weakness. More often, surgery is done to provide more rapid pain relief and disability in those patients whose recovery is unacceptably low with non-operative treatment.

Materials and methods: A prospective study was conducted in the Department of Orthopedics, Maharaja Institute of Medical Sciences, Nellimarla, Vizianagaram from January 2023 till December 2023. A patient case report form was designed to collect patient related informaton. Informed written consent was taken from the entire patient prior to interviewing the patient. All patients aged more than 18 years, who presented to the outpatient clinic of the Department of Orthopedics, Maharaja Institute of Medical Sciences, Nellimarla, Vizianagaram with complaints of leg or back pain, or other neurological symtoms, supported by Magnetic Resonance Imaging (MRI) suggestive of disc herniation, were included in the study.

Results: We included 106 patients during the study period, average age was 40.17 ± 8.5 years. 64 patients were males. Most of the patients have had symptoms for less than 6 months. L4-L5 was the most commonly level involved. None of the patients had any post-operative infections. 40% of the patients had 5 to 6 days of hospital stay, followed by 32% having 7 to 10 days of hospital stay. We assessed the patients using the Macnab's criteria postoperatively at the time of surgery, 1 month, 3 months and 6 months after surgery. 57% of the patients reported excellent level of well being at the end of 6 months as compared to only 4% at the time of surgery. 35% reported good level of well being and no patient reported poor level of well being at the end of 6 months postoperatively.

Conclusion: Microdiscectomy, as demonstrated by our outcome scores, has a high success rate for patients with lumbar disc herniations who have failed a period of conservative management. Findings of our study demonstrate that minimally invasive lumbar microdiscectomy cause very few postoperative complications, shorter stays in hospital, improve objective functionality scores postoperatively and patients rate well being assesment scores as good to excellent.

Key Words: Low back pain, neurological weakness, Microdiscectomy, lumbar disc herniations.

INTRODUCTION

Low back pain is one of the most common complaints in clinical practice with life time prevalence ranging from 65-80%. Lumbar disc herniation is the cause for less than 5 % of back pain problems but is the most common cause of sciatica. Absolute indication for surgery includes cauda equine syndrome and progressive neurological weakness. More often, surgery is done to provide more rapid pain relief and disability in those patients whose recovery is unacceptably low with non-operative treatment.[1]

Treatment for such patients with acute lumbosacral radiculopathy aims to decrease and improve upon the pain (symptomatic treatment) and to address the specific underlying process. When disc herniation causes radiculopathy symptomatic treatment is usually given during the acute period.[2] However, mechanism-specific treatment is indicated if there is progressive neurologic compromise and/or persistent symptoms that are unresponsive to time and conservative measures.[3] Nornarcotic analgesics, activity modification, physical therapy, opioid analgesics, glucocorticoids are some of the conservative management options available for such patients. But a small percentage of patients require surgical interventions to alleviate their pain.[4] There is no evidence that early referral for surgery, in the absence of severe or progressive neurologic deficits, improves outcomes for lumbar disc prolapse with radiculopathy or symptomatic spinal stenosis. There is a scarcity of literature from India which has reported on the success and postoperative assessments in patients who undergo microdisectomy for disc herniation. In this study we aimed to assess the functional outcome in patients who underwent minimally invasive microdisectomy at our institution. We used validated objective as well as subjective scales to assess the clinical outcomes in such patients.[5]

MATERIALS AND METHODS

A prospective study was conducted in the Department of Orthopedics, Maharaja Institute of Medical Sciences, Nellimarla, Vizianagaram from January 2023 till December 2023. A patient case report form was designed to collect patient related informaton. Informed written consent was taken from the entire patient prior to interviewing the patient. All patients aged more than 18 years, who presented to the outpatient clinic of the Department of Orthopedics, Maharaja Institute of Medical Sciences, Nellimarla, Vizianagaram with complaints of leg or back pain, or other neurological symtoms, supported by Magnetic Resonance Imaging (MRI) suggestive of disc herniation, were included in the study. All patients were advised non-operative conservative

measures first. Those patients who did not respond to conservative management were selected for minimally invasive microdisectomy. All patients included in the final sample population had a confirmed diagnosis of disc herniation and unilateral straight leg raise (SLR) test positive. We excluded patients aged more than 50 years because of their unsutaibility for undergoing a surgery procedure, those with asymptomatic or recurrent disc herniation, bilateral dischernation, history of lumbar spinal surgery, operative site infections, spinal infections, medically unfit for surgery, not willing for surgery or those with psychiatric illness. We also excluded patients with back pain due to tumors, vertebral fractures, spinal canal stenosis, cauda equina or listhesis. All patients were followed for a period of 6 months postoperatively.

Data collection and analysis

Using the pre-designed semi-structured question are we collected basic sociodemographic and clinical information of the patient. We assessed pre-operative and postoperative pain and functionality using Japanese Orthopedic Association questionnaire (JOA). JOA was assessed for all patients preoperatively, 1 month, 3 months and 6 months postoperatively. All patients underwent minimally invasive microdisectomy. Patient was discharged once he/ she was pain free and able to ambulate on their own (usually on 5th post-operative day). Suture removal was performed after 10 days post-operative (after wound inspection). Patients were asked to rate their level of well being after surgery using the Macnab's criteria. This is a validated tool to assess patients' level of well being and satisfaction postoperatively. Macnab assessment was rated as 1= poor, 2= fair, 3= good, 4= excellent. Macnab's score was calculated at the time of surgery, 1 month, 3 months and 6 months postoperatively. Results after the surgery were assessed according to the rate of improvement, which was calculated using the following formula (Hirabayashi's method). Rate of Improvement (RI) = Postoperative score-Preoperative score / Total score (29) – Preoperative score] * 100. The rate of improvement (RI) was graded into 4 groups: Excellent as ≥ 90 %; Good as 75 - 89 %; Fair as 50 – 74 % and Poor as < 49 % improvement. Collected data was entered in Microsoft excel sheets and later imported in the Statistical Package for Social Sciences software for appropriate analysis. Significance over the period was calculated for JOA score by repeated measures ANOVA. For all statistical tests, p value < 0.05 was considered significant and $p < 0.001$ was highly significant. Statistical analysis was performed using SPSS 17 software (Statistical Package for Social Sciences).

RESULTS

We included 106 patients during the study period, average age was 40.17 ± 8.5 years. 64 patients were males. Most of the patients have had symptoms for less than 6 months. L4-L5 was the most commonly level involved. None of the patients had any post-operative infections. 40% of the patients had 5 to 6 days of hospital stay, followed by 32% having 7 to 10 days of hospital stay. We assessed the patients using the Macnab's criteria postoperatively at the time of surgery, 1 month, 3 months and 6 months after surgery. 57% of the patients reported excellent level of well being at the end of 6 months as compared to only 4% at the time of surgery. 35% reported good

level of well being and no patient reported poor level of well being at the end of 6 months postoperatively. JOA score was used to assess functionality and pain preoperatively and postoperatively. 30 cases (28.3 %) had excellent, 66 cases (62.3 %) had good, 8 cases (7.5 %) had fair and 2 (1.9 %) had poor results with JOA score at the end of the study. JOA score over the period was assessed by repeated measures ANOVA. JOA score improved from a mean of 10.3 pre-operatively to 25.45 post-operatively at 6 months (p value <0.001), with a rate of improvement 81.20 %.

	N
Number of patients	106
Average age	40.17±8.5 years
Males	64
Duration of symptoms	
0-6 months	56
7-12 months	40
More than 12 months	10
Levels of lesions	
L3-L4	14
L4-L5	72
L5-S1	20

Table 1: Demographic characteristics

Variable	**N (%)**
Post-operative infections	
Absent	106 (100%)
Present	0 (100%)
Length of stay in hospital (days)	
3-4	26 (24%)
5-6	41 (40%)
7-10	34 (32%)
More than 10 days	4 (4%)
Postoperative Macnab assessment*	
Macnab score at the time of surgery	
1	14 (13%)
2	28 (26%)
3	60 (57%)
4	4 (4%)

Macnab score at 1 month after surgery	
1	4 (4%)
2	28 (26%)
3	68 (64%)
4	6 (6%)
Macnab score at 3 months after surgery	
1	0 (0)
2	16 (15%)
3	72 (68%)
4	18 (17%)
Macnab score at 6 months after surgery	
1	0 (0)
2	8 (8%)
3	38 (35%)
4	60 (57%)

Table 2: Post-operative assessments of the patients

JOA Scores		N (%)	P Value
Preoperative	Poor	12 (11.3%)	<0.001
	Fair	88 (83%)	
	Good	6 (5.7%)	
	Excellent	0 (0%)	
Postoperative at 1 month	Poor	4 (3.8%)	<0.001
	Fair	74 (69.8%)	
	Good	28 (26.4%)	
	Excellent	0 (0%)	
Postoperative at 3 months	Poor	4 (3.8%)	<0.001
	Fair	52 (49.1%)	
	Good	50 (47.2%)	
	Excellent	0 (0%)	
Postoperative at 6 months	Poor	2 (1.9%)	<0.001
	Fair	8 (7.5%)	
	Good	66 (62.3%)	
	Excellent	30 (28.3%)	

Table 3: Preoperative and postoperative assessment using Japanese Orthopedic Association score

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.[6]

Complications encountered with minimally invasive spine surgery are intraoperative bleeding, cerebrospinal fluid leak, nerve damage, wound infection, development of new neurological deficits and recurrence of disc herniation. In our study, our mean blood loss was 92.4 ml, accidental dural tear in one case and no infection rate correlating with Stolke's study, where incidental dural tears occurred in 1.8% of microdiscectomies. In a review by Ross of 1231 cases operated over a 12 year period and in an earlier study by O'Toole9 over 1338 cases operated by minimally invasive spinal surgery observed less rate of wound infection, durotomy and new neurologic deficits. The possible reasons hypothesised by the authors for the low rate of surgical site infection were reduced tissue exposure, minimal skin exposure to wound so less chance of contamination, smaller wounds heal rapidly, lack of use of monopolar coagulation, symmetrical distribution of retraction forces, incision made by single stroke and absence of skin sutures.[7]

It has been considered by Wen et al that the choice of surgical method depends on the preference of doctors and personal ability. Lu et al pointed out that it has been the goal to maintain lumbar stability under the premise of ensuring the efficacy with the orthopaedic surgeon damage to the lumbar spine of normal structure as little as possible.[8] Though so many theoretical advantages of the minimally invasive lumbar discectomy compared to the conventional one are spoken off, they are yet to be proven for better patient outcomes. Lumbar disc herniation removal techniques have evolved in terms of instrumentation without any appreciable improvement in clinical results.[9] Correct indication, expertise of the surgeon and the patients informed consent remain the key factor in deciding the technique. A good control of the indication for surgery is the basis, accurate positioning is the prerequisite, protecting the nerve is the key, complete discectomy is the guarantee, full decompression is the fundamention and all the factors work together to make minimally invasive perfect.[10]

CONCLUSION

Microdiscectomy, as demonstrated by our outcome scores, has a high success rate for patients with lumbar disc herniations who have failed a period of conservative management. Findings of our study demonstrate that minimally invasive lumbar microdiscectomy cause very few postoperative complications, shorter stays in hospital, improve objective functionality scores postoperatively and patients rate well being assesment scores as good to excellent.

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