ORIGINAL ARTICLE

Comparison of the Clinical Effects of Unilateral Biportal Endoscopic and Microscopic Lumbar Discectomy

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ABSTRACT

Introduction: Micro discectomy is the surgical procedure of choice for treating lumbar disc herniations. A laminectomy can cause instability, significant epidural fibrosis, continued radiated pain, and surgical site infection, although there is still concern about the dangers of muscle damage, such as to the multifidus, and excessive articular facet resection. Unilateral biportal endoscopic discectomy has been suggested as a less invasive therapeutic approach.**Objective:** To compare the clinical effects in terms of pain, impairment, and complications associated with percutaneous endoscopic lumbar discectomy with standard micro discectomy for the treatment of disc herniations. **Materials and methods:** A study of 60 people with disc herniations who were treated with either microdiscectomy or unilateral biportal endoscopic lumbar discectomy. The Oswestry Disability Index and visual analogue score for back and leg pain was evaluated after three, six, and twelve months. **Results:** In comparison to Group E, Group M's mean operating time was substantially lower ($p<0.05$). In addition, it took group M more time on average to get back to work. ($p<0.05$), and the VAS score at 3 showed a statistically significant change ($p<0.05$). At three months, group M's Oswestry Low Back Pain Disability score was considerably greater than group E's. ($p<0.001$). **Conclusion:** In terms of a three-month return to work and wound infections, endoscopic surgery has a little advantage over microscopic surgery. Both techniques are efficient and safe for lumbar discectomy. However, after 6 months of follow-up, the results seem to be comparable.

KEY WORDS: Intervertebral Disc Prolapse, Discectomy, Endoscopy, Intervertebral Disc, Micro Discectomy, Visual Analog Scale, Oswestry Low Back Pain Disability Score.

Introduciton

Low back pain is one of the most frequent human disabilities - a cost of upright posture - and every human being will experience back pain at some point in their lives[1].The rising incidence is most likely attributable to today's hurried lifestyle as a result of fast industrialisation, supplemented by poor posture as an employment hazard, particularly in computer professions, poor food habits leading to obesity, and a lack of regular exercise. Today, it is widely accepted that intervertebral disc degeneration accounts for the vast majority of occurrences of low back pain and sciatica[1].

A localised movement of disc material outside the intervertebral disc space is termed as intervertebral disc prolapse[1].Intelligent therapy of lumbar disc prolapse must be predicated on a complete understanding of the disorder's natural history. Although there are non-surgical treatments for herniated disc treatment, some patients may require surgery for nerve root and thecal decompression. Surgical treatment frequently fails due to incorrect diagnosis and the selection of the wrong patients.

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The majority of research found that conservative treatment is the primary mode of treatment to begin with, with surgical treatment being advised only when conservative treatment fails or in other extreme circumstances. An open discectomy, a minimally invasive method, offers prolapsed disc surgery with a smaller incision, better cosmetic results, and less injury to nearby tissues[2,3]. However, it is unclear what the proportional advantages and disadvantages of these tactics are. It is unclear whether the actual benefits of several minimally invasive procedures outweigh one another due to a lack of data, particularly for Indians. We therefore aimed to compare the clinical effects in terms of pain, impairment, and complications associated with percutaneous endoscopic lumbar discectomy with standard micro discectomy for the treatment of disc herniations.

Methodology

After receiving approval from the institutional ethical committee vide no. BMC&H/IEC/190/2022-23, dated: 27/01/2022 a comparative study was conducted for 2 years in department of Neurosurgery of a tertiary care centre.

Based on the primary outcome of pain reduction (VAS), we estimated the sample size, assuming that a difference of more than 2 points between groups indicates a difference. Using two points as the standard deviation, we calculated a 10% loss to follow-up. To find a minimal difference of 2 points on the VAS, the study would need 20 patients in each group, assuming a type I error of 5% ($P<0.05$). In each category, we included 30 patients for statistical purposes.

After taking informed written consent from 60 patients who were surgically treated for lumbar disc herniations at L3/L4, L4/5, and L5/S1 levels participated in this study. We included patients who were undergoing lumbar discectomy for Cauda equina syndrome, failed conservative treatment and increasing neurological impairments. Patients who had far lateral discs, canal stenosis, or had undergone revision disc surgery were excluded.

Non-surgical treatment given before surgery consists of non-steroidal anti-inflammatory medicines mixed with muscle relaxants, 2–4 days of bed rest, lower back exercises were started as soon as the patient is comfortable, followed by physical treatment under the direction of a physiotherapist. Radicular discomfort was treated with a short-course steroid if necessary.

All patients underwent a thorough clinical examination and had their medical history recorded. Neurological involvement was evaluated prior to surgery and the results of the imaging studies were correlated. Radiographic examinations included traditional antero-posterior and lateral views in flexion and extension and MRI was done for every subject.

Patients were chosen based on odd/even randomisation, with odd cases being posted for microscopic lumbar discectomy and others being listed for endoscopic lumbar discectomy. One surgeon with knowledge of both procedures carried out each procedure. Each group had thirty individuals that had surgery.

Group M: Microdiscectomy was done using Sanma Microscope.

Group E: Unilateral biportal endoscopic discectomy was done by Striker camera and scope system.

To achieve post-operative analgesia, opioids and NSAIDs were administered. To treat neuralgic pain, oxycarbamazepine was given as needed. Three intravenous antibiotic dosages were given. (Inj. 1.5 mg Cefuroxime). All patients were allowed to walk as soon as they felt safe doing so, which was typically the first post-op day. At the time of discharge, all patients received instructions to continue taking their medications and nutritional supplements as prescribed and to avoid spending too much time sitting down, moving heavy objects, or travelling for long periods of time while seated. Blood loss and other intra-operative data were noted. Following surgery, the time needed to resume work was observed.

Suture removal was evaluated on the tenth post-operative day, at three months, six months and ultimately after twelve months. Patients were asked about any ongoing pain during follow-up exams, and a neurological evaluation was performed. In addition to the standard features, the Oswestry Low Back Pain Disability Questionnaire (ODI) and a Visual Analogue Scoring (VAS) for back and leg pain were employed to obtain additional data.

All data was entered into Microsoft Excel, and statistical analysis was performed using SPSS version

21.0. To compare continuous variables, which are shown as mean and standard deviation, the independent sample t-test was utilised. To compare categorical data presented as frequencies and percentages, the Chi-square test was utilised.

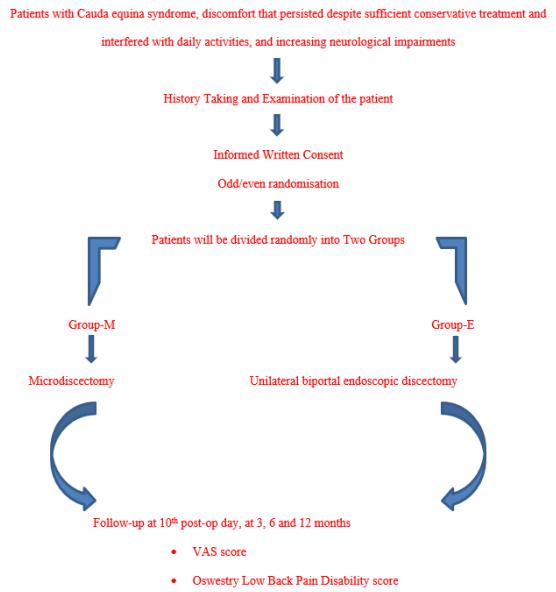

Figure 1: Study flow chart

Results

A total of 30 cases from group M and 30 from group E were analysed. The baseline characteristics of our research groups are displayed in Table 1. The average age of the endoscopic group was 38.7±11.2 years, whereas the age of the microscopic group was 39.4±12.8 years. ($p>0.05$)

The surgical characteristics of the study groups are shown in Table 2. The mean operative time in Group M was significantly less than that in Group E ($p<0.05$), and the average time to return to work was longer in Group M ($p<0.05$).

According to Table 3, there was a statistically significant difference in VAS score at 3 and 6 months ($p<0.05$) At 3 months, the Oswestry Low Back Pain Disability score was substantially higher in group M than in group E ($p<0.001$).

We had minimal complications in our study which was comparable in both the study groups. Superficial infection and epidural bleed was seen in one patient in both the groups.

Figure 2: (A-B-C): Incision, interlaminar window andIntra-operative images during unilateral biportal endoscopic Discectomy

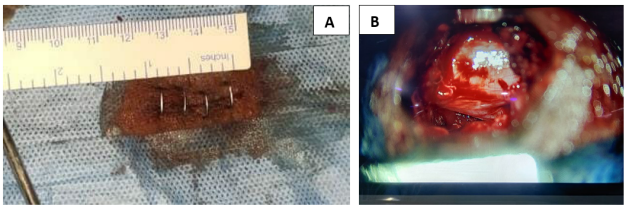

Figure 3: (A-B): Incision and Intra-operative image duringmicroscopic Discectomy

Discussion

When the cases are carefully chosen, conventional disc operations typically have positive outcomes. Research on endoscopic Transforaminal discectomies has shown positive clinical outcomes[4]. Similar outcomes for the endoscopic interlaminar procedure have been described[4]. The success rate of microscopic discectomies ranges from 75% to 100%[5–7].

At 3 months, the microscopic discectomy group had considerably higher VAS than the endoscopic discectomy group ($p<0.05$). In Endoscopic group, postoperative discomfort and job impairment were decreased. The endoscopic group is also favoured by the outcomes of these factors in a literature comparison. This suggests that endoscopic group patients have seen an early functional recovery. After six months, there is no discernible difference in vas scores between the groups, which is consistent with the findings of the literature[8,9]. Many studies have shown that the endoscopic method is both secure and efficient[10–15].

According to our findings, both groups differed significantly in terms of ODI after three months. This suggests that patients undergoing endoscopic discectomy recover functionally quickly. Similar to the findings in the literature, there is no discernible difference in ODI between the two groups after three

Table 1: Baseline characteristics

Variables		Group M	Group E	P value
Age	<30 years	2 (6.7%)	3 (10%)	0.925
	30-40 years	8 (26.7%)	7 (23.3%)	
	41-50 years	16 (53.3%)	14 (46.7%)	
	51-60 years	3 (10%)	5 (16.7%)	
	>61 years	1 (3.3%)	1 (3.3%)	
Gender	Males	21 (70%)	20 (66.7%)	0.78
	Females	9 (30%)	10 (33.3%)	
Onset of symptoms	Insidious	18 (60%)	15 (50%)	0.436
	Sudden	12 (40%)	15 (50%)	
Duration of symptoms	≤6 months	6 (20%)	5(16.7%)	0.73
	6 months to 1 year	9 (30%)	7 (23.3%)	
	1 to 2 years	8 (26.7%)	7 (23.3%)	
	≥2 years	7 (23.3%)	11 (36.7%)	
Symptoms	Low back pain	23 (76.7%)	24 (80%)	0.754
	Radiating leg pain	24 (80%)	28 (100%)	0.129
	Neurological symptoms	30 (100%)	30 (100%)	1
	Bladder disturbance	2 (6.7%)	0	0.15
Signs	Sciatic scoliosis	16 (53.3%)	15 (50%)	0.796
	Decreased lumbar lordosis	24 (80%)	21 (70%)	0.371
	SLR positive	30 (100%)	30 (100%)	1
	Well leg raising test	9 (30%)	7 (23.3%)	0.559
	Neurological signs	30 (100%)	30 (100%)	1
	Limitation of spinal movements	27 (90%)	26 (86.7%)	0.687

Table 2: Comparison of surgical variables among study groups

		Group M	Group E	P value
Level of surgery	L3/L4	3 (10%)	1 (3.3%)	0.398
	L4/L5	18 (60%)	16 (53.3%)	
	L5/S1	9 (30%)	13(43.3%)	
Mean operative time in minutes		31.45±14.7	81.34±12.9	**<0.001**
Mean time taken to return to work		21.6±3.9	15.15±1.3	**<0.001**

months[9].

None of the patients experienced any significant intraoperative problems, such as dural tears. This makes it notable that many authors consider dural rips to be a possible risk of endoscopic discectomy, which may need conversion to an open operation. In neither group did any cases repeat. It has been suggested that a protective biomechanical element is the endoscopic technique's ability to minimise the operation-related annular deformity.

The benefits of endoscopic versus microscopic surgery include superior visualisation, less damage to soft tissues, less intraoperative blood loss, cost effectiveness due to quicker recovery times, and cosmetic scars after surgery. The equipment is affordable since it can be re-sterilized.

Due to fewer interlaminar windows, executing proximal lumbar discectomies was technically difficult when removing far lateral discs, and vice versa.

Table 3: Comparison of outcome variables among study groups

Outcome		Group M	Group E	P value
VAS score	Pre-operative	8.96±1.21	8.67±1.19	0.353
	Post-operative	7.80±1.02	7.60±1.05	0.457
	3 months	4.78±0.91	4.13±0.68	**0.0027**
	6 months	2.78±1.1	2.72±1.3	0.848
	12 months	1.39±1.02	1.31±1.7	0.826
Oswestry Low Back Pain Disability score	Pre-operative	70.12±4.2	69.9±3.21	0.821
	Post-operative	60.89±3.8	59.7±2.9	0.178
	3 months	45.6±2.5	36.4±2.1	**<0.001**
	6 months	19.3±3.1	17.91±2.9	0.0781
	12 months	10.58±2.9	9.61±1.5	0.109

The study's limitations include the small sample size, operating surgeon's bias which can be remedied by carrying out further research and including more instances. The outcomes also depend on the patients' postoperative long-term compliance, as disc degeneration is a pathologic process that is ongoing and requires patients to grasp the importance of consistent exercise and lifestyle changes. So future research which includes long-term follow-up and lifestyle modifications are encouraged.

Conclusion

Endoscopic discectomy has clinical outcomes comparable to microdiscectomy in terms of reduction in radiating pain and disability, but it has the advantage of lessening soft tissue dissection, protecting bony structures, allowing patients to recover faster after surgery, and possibly reducing blood loss. A safe and efficient method that can be alternative to the gold standard micro discectomy is unilateral biportal endoscopic discectomy.

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