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Original Article

Comparison of Outcomes of Endoscopic Microdiscectomy versus Conventional Discectomy for Lumbar Disc Diseases

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ABSTRACT

Objective: This study focused to compare the results of endoscopic microdiscectomy and conventional discectomy procedure through the Oswestry Disability Index (ODI).

Material and Methods: We included 54 patients with severe lower back pain who did not improve after long-term conservative treatment and who had level 3 disc prolapse, radiating to one or both lower limbs. Half patients were included in group endoscopic discectomy and the other half were included in & conventional discectomy. Oswestry Disability Index -ODI was documented and applied as a clinical tool for evaluation. A t test was applied to find the significant difference between ODI scores from both methods preoperatively and postoperatively.

Results: The average age of the 54 patients was 46 years and 75% of patients have paracentral disc protrusion. The mean endoscopic microdiscectomy surgery time was 110 minutes; was longer than conventional discectomy (82 minutes). However, blood loss was very small compared to conventional discectomy. It was perceived that there was no substantial alteration in the postoperative ODI result in both methods from the previous values. Moreover, the comparison through t-test showed that preoperative and postoperative ODI scores were significantly different ($p < 0.0001$) in both methods (endoscopic discectomy & conventional discectomy).

Conclusion: According to the ODI result, both conventional and endoscopic discectomy gave same outcomes in all classes. Endoscopic microdiscectomy is a new, effective and safe procedure that reduces the invasiveness of the surgical approach. The results obtained by this approach are comparable with those obtained with open discectomy to alleviate symptoms during prolonged observation, and because the tissue has minimal trauma, it is much better in early mobilization and morbidity.

Keywords: Spine, orthopedics, endoscopic discectomy, lumbar disc prolapse, disc degenerative disease.

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INTRODUCTION

Chronic lumbo-sacral pain is a communal and difficult clinical entity at the center of pain management. Since the first definition of Mixter Barr in 1934, a lumbar disc herniation is one of the few abnormalities in which there is a clear link between morphological abnormality and lumbar spine pain.¹⁻² Although pure mechanical compression has previously been seen as a source of radiculopathy, there is cumulative indication that the nerve root chemical irritation plays a significant, perhaps the most important, role. Olmarker et al. In the experimental animal model, it has been shown that epidural administration of the autologous nucleus pulposus without the cauda equina compression leads to a substantial decrease in the nerve conduction velocity.³ Autoimmune response, inflammatory reactions and microvascular changes are potential causes of this phenomenon. The most common surgical indication is back pain or intractable leg and significant functional impairment that does not respond to conservative measures.⁴ An absolute indication for decompression of a disk herniation in wood is cauda equina syndrome and major motor weakness. The herniated disc diagnostic appearance can determine the pathology, but the choice on the operation depends mainly on the clinical course of the patients, and not on the disc herniation size or the extruded material of the disc.⁵⁻⁶ In recent years, it has been possible to remove the protruding disk endoscopically due to advances in modern equipment, operating room equipment, fiber optic videography and miniaturization of the operating system. This study aimed to compare the results of conventional discectomy and endoscopic discectomy procedure.

MATERIAL AND METHODS

Study Settings and Patients

This comparative study was conducted in the department of Neurosurgery Hayatabad Medical Complex, Peshawar. After getting approval from Hospital ethical and research committee, the study was conducted from March 2019 to February 2020. The written informed consent was taken from all patients. The patients were divided randomly into two groups: endoscopic microdiscectomy or conventional discectomy.

Inclusion & Exclusion Criteria

We included 54 subjects with retractable leg or severe low back pain that did not improve after long-term conservative treatment and had disk prolapse below level 3 or both lower limbs. The study excluded multiple disc prolapse, spinal stenosis, traumatic disc prolapses, disc injury with spondylolisthesis and medically unsuitable patients.

Oswestry Disability Index

The pre-operative Oswestry disability index (for lower back pain) was documented with a response to the questionnaire. Each question is scored on a scale of 0–5 with the first statement being zero and indicating the least amount of disability and the last statement is scored 5 indicating most severe disability. The scores for all questions answered are summed, then multiplied by two to obtain the index (range 0 to 100). All patients were operated in general anesthesia in prone position.

Techniques of Endoscopic Microdiscectomy

Rear Approach: A 2 cm incision was made in the center line over a length of more than 2 cm. The small dilator or K wire was inserted down under fluoroscopic control until the bone contacts the

lamella above the operated level. The K wire must be in line with the disk. Muscle dilators were inserted down the muscle, sustaining contact with the bone. An 18-mm operative canal was replaced by the dilators on a hinged arm. The endoscope was attached to a tube and to a hinged arm stable with the table. Soft tissue was removed with forceps to ensure good ligament flavum exposure. Laminotomy was performed using a small osteotome/speed burr. The dura was exposed with the help of Kerrison runners, being careful not to damage the nerve root or dura mater. The cord was then medially displaced to find the disc removed through the rent with disc forceps.

Posterior-Lateral Approach: A 4 cm in the midline was given. The small dilator or K wire was inserted diagonally downwards and placed transversely in the disk axis under the lateral and AP fluoroscopic control. After contact with the bone, the dilators were lowered and the procedure continued as described above. After the operation, the patient took painkillers and antibiotics for three days. The patient was walking the next day after surgery. Patients were observed at periods of six weeks, three months and 6 months.

Data Analysis

Age, gender distributions as well as the distribution of patients as per type & site of disc protrusion and level of disc protrusion were done with respect to the conventional discectomy and endoscopic discectomy. Clinical information such as postoperative and intraoperative findings were gathered. An independent samples t test was applied to find the significant difference between ODI scores of two groups preoperatively and postoperatively.

RESULTS

We conducted the study after selecting 54 patients. There were 27 patients in each group, i.e., conventional discectomy and endoscopic discectomy. Age ranged from 21 to 70 years with mean age 48.6 years, consisting of 30 (55.5%) men and 24 (44.4%) women. The male to female ratio was 1:1. The maximum number of patients were found in the age group 31-40 years. The distribution of different parameters is shown by tables 1-3.

Table 1: Age distribution of patients.

Age Group	Conventional Discectomy	Endoscopic Discectomy
21 – 30	5	2
31 – 40	10	9
41 – 50	4	10
51 – 60	4	6
61 – 70	4	0
Total	n =27	n = 27

Table 2: Sex distribution of patients.

Sex	Conventional Discectomy	Endoscopic Discectomy
Male	20	10
Female	7	17
Total	n = 27	n = 27

Table 3: Distribution of patients as per type and site of disc protrusion.

Disc Prolapse		Conventional Discectomy	Endoscopic Discectomy
Central	Contained	6	5
	Extruded	2	0
	Sequestered	0	0
	Total	8 (29.6%)	5 (18.5%)
Paracentral	Contained	6	8
	Extruded	9	8
	Sequestered	4	6
	Total	19 (70%)	22 (81.4%)
Total		n = 27	n = 27

Table 4: Distribution of patients, according to level of disc protrusion.

Level of Disc	Conventional Discectomy	Endoscopic Discectomy
L1-2	0	0
L2-3	0	3
L3-4	5	0
L4-5	13	14
L5-S1	9	10
Total	n = 27	n = 27

Table 5: Postoperative and intraoperative findings.

Parameter	Conventional Discectomy	Endoscopic Discectomy
Average Operative time	82 minutes	110 minutes
Average blood loss	124.5 ml	Minimal
Mean duration of hospital stay	4.8 days	2.5 days
Post-operative Visual Analogue Scaling for pain	3.45	3.4

Table 3 shows the distribution of patients with respect to the type and the site of the disc protrusion. 81.4% patients received the paracentral disc protrusion in endoscopic

discectomy. The maximum number of patients (n = 9) received extruded paracentral disc protrusion in conventional discectomy. Moreover, more number of patients (n = 8) received contained and extruded paracentral disc protrusions in endoscopic discectomy.

As can be clearly seen, the maximum number of patients in both sections (n = 27) belongs to the disk protrusion group at level L4-5 (table 4).

The table 5 shows that although the endoscopic procedure takes longer, blood loss and hospitalization are much smaller.

It was perceived that there was no substantial alteration in the postoperative ODI result in both methods from the previous values. Moreover, the comparison through t-test showed that preoperative and postoperative ODI scores were significantly different (p < 0.0001) in both methods (endoscopic discectomy & conventional discectomy).

The above table 7 compares the results of both methods according to the classification of ODI score result. Both methods gave excellent and good results in a similar fraction.

Table 6: Comparison of Preoperative and postoperative ODI score of both methods.

Method	Mean Preoperative ODI Score (n = 27)	Mean Postoperative ODI Score (n = 27)	p values, T test value and CI (95%)
Endoscopic Discectomy	59.23 ± 2.77	23.62 ± 4.38	p < 0.0001*, t = 35.7045 df = 52, CI: 33.6087 to 37.6113
Conventional Discectomy	64.34 ± 3.66	24.44 ± 4.56	p < 0.0001*, t = 35.4577, df = 52, CI: 37.6420 to 42.1580

*significant result.

Table 7: Comparison of Results of Endoscopic and Open Discectomy according to ODI Score.

Results (ODI Score)	Conventional Discectomy	Endoscopic Discectomy
Excellent (0 – 20)	7 (25.9%)	8 (29.6%)
Good (21 – 40)	20 (74.1%)	19 (70.4%)
Fair (41 – 60)	0 (0%)	0 (0%)
Poor (> 60)	0 (0%)	0 (0%)

Total **n = 27 (100%)** **n = 27 (100%)**

DISCUSSION

Chronic lumbosacral pain is a communal and difficult clinical condition at the center of pain management. The most common surgical indication is back pain or intractable and severe functional impairment that does not respond to conservative measures. In this study, we have

compared the results of endoscopic microdiscectomy and conventional discectomy procedure. Lower back pain is an important cause of morbidity among professionals and employees and is considered the main cause of absence due to illness, and therefore has economic consequences.⁷⁻⁸ Many forms of patient management are offered, but performance data are generally not impressive. The literature is inconsistent in reporting the location and type of disc herniation and its predictive value in the treatment of sciatica.⁹ In our study, most patients were 41 – 50 years old, while the disc was in the process of degeneration. The resistance of the disc in younger patients, protects it from degeneration. In patients older than 50 years, the disc has achieved some natural stability due to fibrous changes due to loss of water content. The most common disc prolapse was paracentric (75%). In the paracentric disc, patients experienced a greater radicular pain than central disc prolapsed.¹⁰ This can be probable anatomically, because the laterally located nerve roots are more probable to be irritated by the paracentric hernia than the central hernia, because the lateral recess is narrower than the central canal to allow relative root displacement to prevent direct compression. The paracentric disc herniation apex is much closer to the traverse and comes out of the nerve roots compared to the central herniation. We found that there was no substantial alteration in the postoperative ODI result of both methods from previous values. Both methods: endoscopic discectomy & conventional discectomy, gave excellent and good results in a similar fraction. We also found a significant difference in between preoperative and postoperative ODI scores in both methods (endoscopic discectomy & conventional discectomy).

Patients treated with endoscopic discectomy have a better result in terms of a better ODI result, because it is a minimally invasive method, so it does not cause injury to the paravertebral

muscle.¹¹⁻¹² In addition, Laminotomy is not performed, as in conventional discectomy, so the spine is not unstable. It also reduces the frequency of infection. In our study, the average duration of surgery for endoscopic microdiscectomy is 110 minutes and can be compared with other similar tests. Shortening of hospital stays resulting from the lack of epidural fibrosis and immobilization of the nerve roots, which are common after open technique.¹³ The epidural vein system does not change during endoscopic technique. This helps prevent venous stasis and chronic swelling of the nerve roots. Minimal surgical trauma to myo-ligament structures can facilitate rapid healing. In addition, traumatic nerve excision does not involve additional bone removal or large skin incisions.¹⁴ The risk of complications of scars, blood loss, infection and anesthesia is significantly reduced or eliminated. All this causes less pain in the postoperative period in patients treated endoscopically, and therefore the need for postoperative analgesia is also reduced, and thereby future radial pain was reduced, despite alleviating root pain in the operated patients. Since the paravertebral muscles are not reduced, they decrease and hence severely damaged.¹⁵

CONCLUSION

Endoscopic discectomy is a new, effective and safe procedure that reduces the invasiveness of the surgical approach. The outcomes obtained by this procedure are comparable to those obtained by the method of open discectomy to alleviate symptoms with prolonged observation and are much improved in terms of fast mobilization and low morbidity, since there is negligible tissue injury. The technique should be specialized, and the choice of open or endoscopic discectomy belongs to the surgeon only after consulting the patient and only when necessary. Although, endoscopic discectomy is better than open discectomy, the steep learning curve, as well as

good anatomy, and the surgeon should be ready to turn it into the opening of the surgical procedure if any complications arise.

Limitation

We understand that our sample is very limited for accurate advice. A study with more patients is needed to make the final assessment.

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Additional Information

Disclosures: Authors report no conflict of interest.

Human Subjects: Consent was obtained by all patient(s)/participant(s) in this study.

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Conflicts of Interest:

In compliance with the ICMJE uniform disclosure form, all authors declare the following:

Financial Relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.

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AUTHORS CONTRIBUTIONS

Sr.#	Author's Full Name	Intellectual Contribution to Paper in Terms of:
1.	Imran Khan	1. Study design and methodology.
2.	Sohail Amir	2. Paper writing and referencing.
3.	Atif Amman	3. Data collection and calculations.
4.	Hanif-ur-Rehman	4. Analysis of data and interpretation of results.
5.	Ayaz Afridi	5. Literature review.
6.	Muhammad Ali Numan	6. Literature review.
7.	Shahid Ayub	7. Final proof read.