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Comparing results of Endoscopic microdiscectomy and conventional discectomy for lumbar disc disease: A short term study

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Abstract

Introduction: Chronic lumbo-sacral pain is a common and challenging clinical entity in pain management centre. The most commonly involved surgical indication are intractable leg or back pain and significant functional impairment that have been unresponsive to conservative measures. This is a level 2 evidence study where we have studied results of endoscopic discectomy and compared it to conventional discectomy procedure.

Material and Methods: We selected 40 patients with severe low back pain radiating to one or both lower limbs, which has failed to resolve after prolonged conservative treatment and have less than level 3 disc prolapse. Oswestry Disability Index (For Low Back Pain) was recorded with questionnaire response and used as clinical tool for assessment.

Results: Mean age of 40 patients was found to be 42.9 year with 80% patients having paracentral disc protrusion. Average operative time for endoscopic discectomy was 103 minutes which was higher than conventional discectomy (78 minutes). However, there was minimal blood loss compared to conventional discectomy. Based on ODI score, both endoscopic and conventional discectomy offered similar results in all grades.

Conclusion: Endoscopic discectomy is a novel, safe and effective method that minimizes invasiveness of the surgical approach. Results achieved with this method are comparable to those achieved with open discectomy in terms of relief of symptoms on longer follow up, and is significantly better in terms of early mobilisation and morbidity as there is minimal tissue trauma.

Keywords: spine, endoscopic discectomy, orthopaedics, disc degenerative disease, lumbar disc prolapse

Introduction

Chronic lumbo-sacral pain is a common and challenging clinical entity in pain management centre. Since its first description by Mixter Barr in 1934, lumbar disc herniation is one of the few abnormality in the lumbar spine, where a clear relationship between the morphological alteration and pain seems to exist [1]. While pure mechanical compression was considered previously as a source of radiculopathy, there is increasing evidence that chemical irritation of the nerve root plays an essential role perhaps even most important role [2, 3].

Olmarker *et al.* have shown in an experimental animal model that epidural application of autologous nucleus pulposus without compression of the cauda equina leads to a significant drop in the nerve conduction velocity of cauda equine [4]. Autoimmune response, microvascular changes and inflammatory reactions are potential causes of this phenomenon [5].

The most commonly involved surgical indication are intractable leg or back pain and significant functional impairment that have been unresponsive to conservative measures. The absolute indication for lumbar herniated disc decompression is major motor weakness and cauda equina syndrome. Diagnostic image appearance of the disc herniation can pinpoint the pathology but the decision for surgery is primarily dependent on patients clinical course rather than the size of the disc herniation or on the extruded disc material.

In recent years, due to progress in modern equipments, operation theatre instrumentation, fiber-optic videography, and miniaturization of operating system, endoscopic removal of protruded disc has been possible.

This is a level 2 evidence study where we have studied results of endoscopic discectomy and compared it to conventional discectomy procedure.

Material and Methods

We selected 40 patients with severe low back pain radiating to one or both lower limbs, which has failed to resolve after prolonged conservative treatment and have less than level 3 disc prolapse. This were randomly assigned to two groups: Endoscopic discectomy or conventional discectomy. Patients with multiple disc prolapse, spinal canal stenosis, traumatic disc prolapse, disc lesion along with spondylolisthesis and who are medically unfit were excluded from study.

Informed consent was taken from all patients. Preoperatively Oswestry Disability Index (For Low Back Pain) was recorded with questionnaire response. All patients were operated under general anesthesia in prone position.

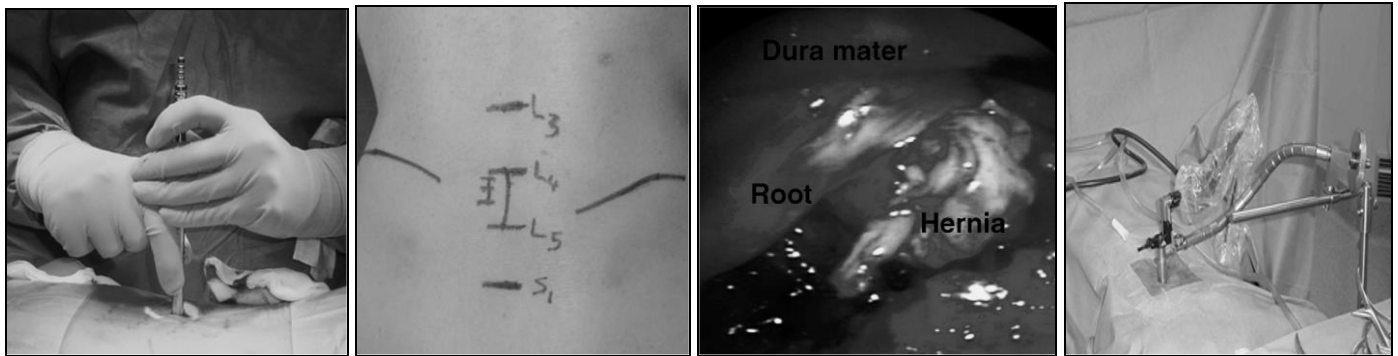
Technique of Endoscopic Discectomy.

1. **Posterior Approach:** A 2 cm incision is made over 2 cm away from midline. A K-wire or small dilator is introduced downward under fluoroscopic control until bone contact is made with the lamina above the level to be operated on. The K-wire should be in the axis of the

disc. The muscle dilators are introduced down through the muscle maintaining bone contact. The dilators are replaced by an 18-mm operative canal on a hinged arm. The endoscope is fixed onto the tube, which is attached to a hinged arm fixed onto the table. The soft tissue is withdrawn by disc forceps, so as to achieve good exposure of the ligamentum flavum. Laminotomy is done using a high speed burr/ small osteotomes. Dura is exposed using Kerrison rongeurs taking care not to injure the nerve root or dura. The cord is then shifted medially to look for the disc which is removed through the rent using disc forceps.

2. **Posterolateral Approach:** The incision is made 4 cm from the midline. K-wire or small dilator is introduced obliquely down toward the isthmus and transverse in the axis of the disc under AP and lateral fluoroscopic control. Once bone contact is achieved, the dilators are brought down and the procedure continues as above.

Post-operatively, patient is given analgesics and antibiotics for 3 days. Patient is allowed to walk on next day after surgery. Patients were followed up thereby at interval of 6 weeks, 3 months and 6 months.



Fig

Results

We undertook this study after selecting 40 patients with mean

age 42.9 years comprising of 23 males and 17 females. Age and sex distribution of patients is given in following tables.

Table 1: Age distribution of patients.

Age group	Conventional Discectomy	Endoscopic Discectomy
21-30	3	1
31-40	8	7
41-50	3	8
51-60	3	4
61-70	3	0

Table 2: Sex distribution of patients.

Sex	Conventional Discectomy	Endoscopic Discectomy
Male	16	7
Female	4	13

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

Disc Prolapse	Conventional Discectomy	Endoscopic Discectomy	
Central	Contained	4	3
	Extruded	1	0
	Sequestered	0	0
Paracentral			
	Contained	4	6
	Extruded	8	6
	Sequestered	3	5

Evidently, 80% patients have paracentral disc protrusion amongst which 14(35%) belong to paracentral: extruded disc group which is maximum amongst all. It is also evident that most paracentral disc protrusions were treated endoscopically. Central disc protrusion account for 20% amongst which 17.5% have contained discs while 2.5% have extruded disc.

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	1
L3-4	3	0
L4-5	10	11
L5-S1	7	8

As is evident, maximum number of patients (n=21) belong to L4-5 level disc protrusion group in both sections.

Table 5: Postoperative and intraoperative findings.

	Conventional Discectomy	Endoscopic Discectomy
Average Operative time	78 minutes	103 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

Above table illustrates that although endoscopic procedure takes more duration but there is significantly less blood loss and hospital stay. Post-op pain reduction is almost similar in both methods ($p < 0.05$).

Table 6: Comparison of Visual Analogue Scale Score in both methods in immediate post-operative duration (48 hours)

Method	Pre-operative VAS	Post-operative VAS
Conventional Discectomy	7.1	4.95
Endoscopic Discectomy	6.9	2.7

It is visualised from above table that there is significant reduction in pain as per VAS in patients treated with endoscopic discectomy as compared to conventional discectomy patients. This in effect leads to decreased requirement of analgesics post-operatively and hence decreased duration of hospitalisation.

Table 7: Comparison of Preoperative and postoperative ODI score in both methods.

Method	Mean ODI (Oswestry Disability Index) Score	
	Preoperative	Postoperative
Endoscopic Discectomy	62.1	28.75
Conventional Discectomy	68.05	29.15

It is seen from above values that there is no significant difference in ODI score post-operatively in both methods.

Table 8: Comparison of Results of Endoscopic and Open Discectomy according to ODI Score

Results (ODI Score)	Conventional Discectomy	Endoscopic Discectomy
Excellent (0-20)	4(20%)	5(25%)
Good (21-40)	16(80%)	15(75%)
Fair (41-60)	0(0%)	0(0%)
Poor (>60)	0(0%)	0(0%)

The above table compares results of both methods as per grading by ODI score. Both methods provide excellent and good results in similar fraction. We admit that our sample is too limited to make definite recommendations. A study with more number of patients is required to make definite judgment.

Discussion

Low back pain is prominent cause of morbidity in professionals as well as labourers and is looked upon as foremost cause for sickness absenteeism and hence has economic consequences [6, 7]. Many forms of patient management are offered but outcome data frequently remain unimpressive. The literature is inconsistent in reports of disc herniation site and type and their predictive value in sciatica treatment.

In our study, majority of patients were between age group of 41-50 years, when the disc is on its way to degeneration. In younger patients, resilience of the disc protects it from degeneration. In patients older than 50 years, disc has already developed some degree of inherent stability through fibrous changes that occurs with loss of water content [8, 9].

The most common type of disc prolapse is paracentral (80%). In paracentral disc, patients presents with more radicular pain than central disc prolapse [10, 11]. This may be expected anatomically because the laterally located nerve roots are more likely to be irritated by a paracentral herniation than central herniation as lateral recess is narrower than central canal for allowing relative displacement of root to avoid direct compression [12]. The apex of the paracentral disc herniation is much closer to the traversing and exiting nerve roots as compared with a central herniation.

Better outcome in terms of improved ODI score is seen in patients treated with endoscopic discectomy as it is a minimally invasive method, so causing no trauma to paraspinal musculature. Furthermore, laminotomy as in conventional discectomy is not done so there is no instability of spine. This also reduces prevalence of infection [13, 14, 15].

In our study, mean surgical time for endoscopic discectomy was 103 minutes which is comparable to other such studies [16, 17]. The shorter duration of hospital stay is due to absence of epidural fibrosis and tethering of nerve roots that commonly occur after open technique [18]. The epidural venous system are not disturbed during endoscopic technique. This helps to prevent venous stasis and chronic nerve root oedema [19]. The minimum surgical trauma inflicted to myo-ligamentous structures may facilitate rapid recovery. Also it does not entail traumatic nerve root dissection, extra bone removal or large skin incisions. The risk of complications from scarring, blood loss, infection and anaesthesia is considerably reduced or eliminated [20]. All this leads to less pain in post-operative period in endoscopically treated patients and thus the requirement of post-operative analgesia is also reduced and future complaints of back pain despite relief of radicular pain in operated patients, is also reduced as paraspinal muscles are not damaged to a great extent [21].

Conclusion

Endoscopic discectomy is a novel, safe and effective method that minimizes invasiveness of the surgical approach. Results achieved with this method are comparable to those achieved with open discectomy in terms of relief of symptoms on longer follow up, and is significantly better in terms of early mobilisation and morbidity as there is minimal tissue trauma. The technique must be mastered and the choice of going for

open or endoscopic discectomy rests on the surgeon after consulting the patient and only if it is indicated.

Though endoscopic discectomy is better as compared to open discectomy but it requires a steep learning curve and also good knowledge of the anatomy and the surgeon must be ready to convert the operative procedure into an open one if any complication arises.

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