Open discectomy versus microdiscectomy for lumbar disc herniation: comparative study

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Abstract

Background and Objective Discectomy for symptomatic lumbar disc herniation is a commonly performed spinal surgical procedure.Since the introduction of lumbar microdiscectomy in the 1970's, many studies have attempted to compare the effectiveness of this method with that of standard open discectomy with conflicting results. This study evaluates effectiveness of microdiscectomy compared with open discectomy in treatment of lumbar disc herniation relating in relieving chronic leg pain, postoperative back pain, postoperative hospital stay and return to daily activity.

Method: 60 patients were included in this study, 30 patients underwent open discectomy and 30 patients underwent microdiscectomy. Those patients were followed for 12 months after surgery. Each patient was evaluated for the postoperative back pain, chronic leg pain, duration of hospital stay postoperatively and return to daily activity.

The methods used to evaluate each patients are Visual analogue scale and Oswestry disability index.

Results: There is significant difference in the postoperative back pain, duration of postoperative hospital stay and the time of return to daily activities between two groups making micrdisiectomy superior to open discectomy while no significant difference in the relieving chronic leg pain between the two groups. The

disadvantage of Microdiscectomy in our study is longer operative time in comparing to open discectomy.

Conclusion: Microdisctomy is effective as open discectomy in relieving the chronic leg pain with advantage of less postoperative back pain, less postoperative hospital stay and early return to daily activities.

Introduction

Discectomy for symptomatic lumbar disc herniation is a commonly performed spinal surgical procedure. Mixter and Barr performed the first lumbar discectomy by a laminectomy and transdural approach in 1934. Semmes described the hemilaminectomy approach with retraction of the dura to remove the disc. Discectomy via a laminectomy was the popular approach for a long time. However, this involved removal of a large amount of normal bone, muscle tissue and sometimes facet joints which resulted in iatrogenic instabilities to the spine and failed back syndromes. Hence, conventional laminectomy and discectomy has been replaced by bone-sparing techniques. With the advent of better retractor systems and illumination and magnification, discectomies are performed via a more conservative route of inter-laminar approaches. Lowe [1] described his inter-laminar fenestration technique as early as 1939. Surgeons have modified Lowe's technique to make it more tissue sparing. Conventional fenestration technique used bilateral paraspinal muscular elevation and larger incisions and retractor systems. Inter-laminar approach was used to enter the epidural space. Minimally invasive techniques evolved where paraspinal muscular elevation is done for only 2 to 3 cm using specialized retractor systems. Caspar [2] in 1977 and Williams [3] in 1978 described micro-lumbar discectomy technique. Adequate illumination and magnification are achieved via the use of microscopes, operating loupes and head

lamps or endoscopes. Minimally invasive techniques have the theoretical advantage of less tissue scarring and better visualization of the dura, roots and disc space (as they are done under magnification of operating loupes or microscopes), and hence are expected to have better postoperative outcomes.[4-7]

We attempted to compare outcomes of two techniques for lumbar discectomy; conventional open fenestration and minimally invasive lumbar Microdiscectomy.

Methods

This study was done in Erbil teaching hospital and PAR private hospital by Neurosurgeon and orthopedic surgeon from March 2015 until October 2016 and involved 60 patients which were divided into two matched groups; Group A: 30 patients was treated with conventional fenestration laminectomy and discectomy and Group B: 30 patients was treated with Microdiscectomy. The age of patients involved in this study ranged from 19 year old to 46 year old with mean of 35. Half of the patients are females and half are males.All patient were suffered from symptomatic lumber disc herniation L4-5. Each patient was assessed clinically and MRI was done for all patients to prove clinically symptomatic lumber disc herniation which was present in all patients. Conservative treatment for 6weeks was failed in all the patient selected for this study.

Exclusion criteria are smoking, previous lumbar spine surgery, D.M and neuromuscular disorders.

Selection of patients into 2 groups done randomly by computer system and when 3 patient were lost during follow up were replaced by 3 matched patients.

All patient were assessed preoperatively and postoperatively by two methods; VIS and ODI.Those patients were followed for 12 months after surgery. Each patient was evaluated for the postoperative back pain, chronic leg pain, duration of hospital stay postoperatively and return to daily activity.

Surgical technique: General anesthesia and prone position had been used for all patients in both groups.

Conventional fenestration discectomy involved skin incisions (5 cm), bilateral paraspinal muscle elevations, fenestration laminotomy/flavotomy and discectomy. The level was identified by using spinal needle as a marker with C-arm image.

In minimally invasive lumbar Microdiscectomies, the operating level was first identified by same method overlying the disc space, and a C-arm image was taken. Skin incision of 1.5cm was centered on the marker. The paraspinal elevation was done only on the symptomatic side and the operation done with microscope and specialized retractors were used for this type of surgery.

Results:

Table 1. Classification of patients according to Oswestry Disability Index, before and after the operation.

ODI		
Group	**Pre-operative ODI**	**Post-operative ODI**
Group A	9 patients —moderate disability	minimal disability
	17 patients —severe disability	minimal disability
	4 patients —crippled disability	minimal disability
Group B	11 patients —moderate disability	minimal disability
	16 patients —severe disability	minimal disability
	3 patients —crippled disability	minimal disability

Table 2. VAS for back pain and radicular leg pain

	Group A		**Group B**	
	Back pain	**Radicular leg pain**	**Back pain**	**Radicular leg pain**
Pre-operative	8.6	9.5	8.9	9.7
Day 7	3.7	1.3	2.1	0.9
3 months	1.2	0.6	1.1	0.6
6 months	0.8	0.2	0.7	0.3
1 year	0.7	0.1	0.4	0.2

Table 3. Operative outcomes of the two study groups.

	Group A	Group B
Operative time	45 minutes	65 minutes
Post-operative back pain	7.8	4.6
Post-operative hospital stay	1-2 days	0-1 day
Time to return to daily activities	10 days	3 days

The results of Operative time, Post-operative back pain,Post-operative hospital stay and time to return to daily activities

Discussion

In our study, we found that both open discectomy and Microdiscectomy have same good results in relieving radicular leg pain but the post operative back pain is significantly less with microdiscectomy and the same better results regarding postoperative hospital stay and return to daily activities with microdiscectomy. Regarding the operative time, we found that with Microdiscectomy more operative time is needed in comparing with open discectomy with longer learning curve.

Katayama [8] et al. concluded that there is no significant difference between the two groups(conventional and microsurgical techniques) in outcomes based on JOA score and VAS for leg pain as in our study. Although a statistically significant difference was noted in the duration of surgery and VAS for lumbago in the Katayama study which is also has been found in our study.

Huang [9] et al. found a smaller blood loss in the group of patients treated endoscopically when compared to those treated with the classic technique as we found in Microdiscectomy, minimal soft tissue dissection and less blood loss.

Kelly [10] et al. concluded that patients undergoing microdiscectomy had less tissue trauma when compared with those who underwent the classic technique; however, no difference could be noted in the clinical response and this also matched our study.

Acharya [11] et al. have found good results in 96.5% of patients with minimally invasive lumbar discectomy in primary cases. However, there is no control group for this study.

Findlay [12] et al. retrospectively reviewed a cohort of 88 patients and reported the outcome of microlumbar discectomy at 10 years. They reported an initial success rate of 91% which declined to 83% at 10-year follow-up.

In a controlled randomised trial, Henrikson[13] et al. concluded that there is no significant advantage in postoperative outcomes and duration of hospital stay between conventional fenestration discectomy and microlumbar discectomy.

Porchet et al. [14] in an observational study have concluded that there is no difference between the two techniques when patient response outcomes were studied.

Tureyen[15] compared the outcome of single- sided, single-level, first-time lumbar disc herniation treated with and without the help of a microscope in 114 patients followed up for 1 year. They found that MLD had 90% success rate while conventional surgery had 89% success rate.

Majeed et al.[16] showed that both Minimally invasive lumbar discectomy (MLD) and fenestration give comparable results at short-term follow-up. There is statistically significant improvement in MLD with regard to improvement in (Japanese Orthopedic Association) JOA, VAS and Roland-Morris (RM) scores at 2 years. However, the difference is not large and may not be clinically significant.

Righesso and colleagues[17]and Ryanget al.[18]reported the results of 2 prospective randomized trials of minimally invasive versus open microdiscectomy in patients with first-time lumbar radiculopathy caused by disc herniation. In both studies the investigators identified no differences in clinical outcome between the groups at a mean follow-up of 16 months as determined by Visual Analog Scale, Oswestry Disability Index, and Short Form- 36 score. It should be noted that a power anlysis was not included in either study, and it is possible that these studies were underpowered to identify small differences between groups.

German et al.[19] concluded in their retrospective study, that patients who underwent minimally invasive discectomy were found to have similar perioperative results as those who underwent open microsurgical discectomy. The differences, although statistically significant, are of modest clinical significance.

Conclusion

Microdisctomy is effective as open discectomy in relieving the chronic leg pain with advantage of less postoperative back pain, less postoperative hospital stay and early return to daily activities. The operative time is more with Microdiscectomy because of prolonged learning curve of Microdiscectomy

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