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Original Article

Comparison between Full Endoscopic Lumbar Discectomy (FELD) and Micro Discectomy (MD) in Patients with Lumber Disc Herniation in Terms of Pain Relief and Functional Outcome

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ABSTRACT

Objective: To compare pain control and functional outcome in fully endoscopic lumbar discectomies verses open discectomies in local population.

Study Design: Quasi-experimental study

Place and Duration of Study: Department of Spine Surgery, Combined Military Hospital Rawalpindi, Pakistan from October 2023 to March 2024

Methodology: Study included 200 patients divided into two groups of 100 each; Group-A endo discectomy group and Group-B open discectomy group. In Group-A patients underwent endoscopic lumbar discectomy (both transforaminal and inter laminar) while in Group-B open micro discectomy was performed. Pain relief in the patients was assessed using Numerical Rating Scale (NRS) and OSWESTRY Disability Index (ODI) at immediately post-op, at the time of discharge and at 6 weeks post-op follow-up. Functional outcome was assessed in terms of patient satisfaction at 6 week post-op follow-up.

Results: There were 140(70%) male and 60(30%) females. The mean age was 37.61±9.57 and 38.59±9.71 years in Group-A and B respectively. Intergroup comparison yields significant difference (p<0.001) of NRS in Group-A compared to Group-B at immediately post-op and at the time of discharge. Similarly, the ODI score also revealed significant improvement (p<0.001) in Group-A compared to Group-B at immediately post-op and at the time of discharge. Patient satisfaction level was significantly higher in Group-A as compared to group B.

Conclusion: Endoscopic spine surgical technique is a wonderful addition in the field of spine surgery. When performed by experienced hands, there is not only speedy recovery but also reduced hospital stay with minimal morbidity and more patient satisfaction.

Keywords: Endo discectomy, Lumbar disc herniation, Open discectomy

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INTRODUCTION

Among low back disorders disc herniation is the most common reason for surgery. Over all disc prolapse constitutes 5% of all low back pathologies.[1] Although the exact pathophysiology of lumber disc prolapse is not known but in the majority of the cases conservative management should be the initial treatment modality.[2] Despite advancement in treatment modalities, open Micro discectomy is still considered the gold standard for symptomatic disc herniations. It is because this method is relatively simple and has low rate of complications. Similarly, the satisfaction rate is high which is more than 90% in the largest series.[3] In Micro discectomy or open discectomy (MD/OD) the portion of the herniated intervertebral disc causing compression upon the nerve root or spinal cord (or both) is removed. Although there is a difference of opinion regarding surgical discectomy verses conservative management for lumber disc prolapse, studies have shown that early surgical management provides better immediate pain relief then conservative treatment, however in long term the results of both the treatment modalities are the same.[4]

Studies have shown that open lumber discectomy can cause the formation of the scar tissue and adhesions formation around the root and cord, resulting in stenosis thereby reducing overall patient's prognosis.[5] The epidural fibrosis around Dura and nerve roots at the operative site after micro discectomy is one of the possible causes of failed back syndrome. Some surgeons started using autologous fat graft after lumber discectomy to reduce the incidence of post-operative scarring, however the long term results are not convincing.[6] In minimally invasive surgery endoscopes are inserted through a small skin incision. There is minimal tissue dissection with relatively shorter operative time. Endoscopic spine surgery was started primarily for lumber disc herniation. In lumber

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spine two endoscopic approaches are used; the inter laminar and the transformational approach.[7] First endoscopic visualization of lumber disc was reported by Kambin in 1983, however first successful endoscopic removal of lumber disc was performed by Schreiber in 1988. Hermantin published his study in 1998 and stated that with endoscopic intervention showed shorter hospital stay, and less post-operative pain with higher satisfaction as compared to open method4. Likewise studies have shown that Percutaneous endoscopic lumbar discectomy leads to early ambulation with reduced iatrogenic injury to normal anatomical structures and preservation of back muscle function compared to a conventional open microscopic lumbar discectomy.[8]

Although currently open discectomy is considered as a standard technique, studies have shown that endoscopic spine surgery is far more superior in terms of post-operative pain control, shorter hospital stay and other complications. In future endoscopy is going to be the first line treatment modality as compared to open technique in the management of lumber disc herniation.[9] Although there is a learning curve associated, we believe that innovations in technology will facilitate endoscopic approach as a superior and safer method with fewer complication rates in various spinal pathologies.[10]

METHODOLOGY

This Quasi-experimental study was conducted at Department of Spine Surgery, Combined Military Hospital, Rawalpindi Pakistan from October 2023 to March 2024. Prior to initiation of study, formal approval was obtained from the Institutional Ethical Review Board of the Combined Military Hospital, Rawalpindi (IRB Serial No. 395 dated 15 September 2023). Sample size was calculated using WHO sample size calculator, taking confidence Interval 95%, margin of error 5%, postoperative mean ODI score in endo discectomy group at 22.73±5.05 and in open discectomy group at 26.32±4.49. Estimated sample size came out to be 100 patients in each group.[11] Sampling technique was nonprobability consecutive sampling. An informed written consent was obtained from all the patients to participate in the study. Patients were divided into two groups of 100 patients each: Group-A endo discectomy group and Group-B open discectomy group (Figure).

Inclusion Criteria: patients aged between 18 to 55 years, both gender, single level lumber disc herniation without concomitant pathology not responding to medical treatment were included in the study.

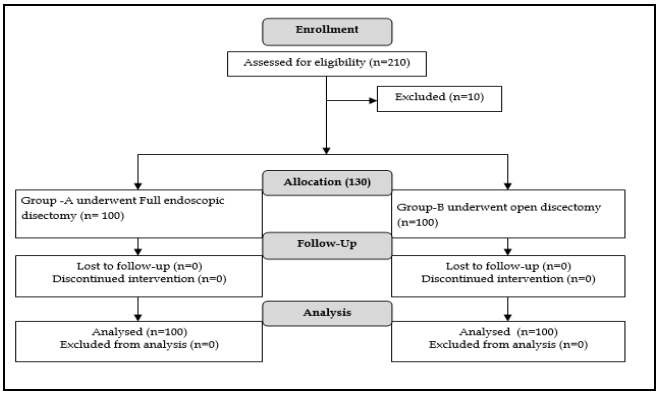

Figure: Patient Flow Diagram

Exclusion Criteria: Patient with more than one level symptomatic disc herniation, recurrent disc herniation and associated comorbidities were excluded from the study.

In Group-A, patients underwent endoscopic lumbar discectomy (both transforaminal and inter laminar) while in Group-B open micro discectomy was performed. We performed transforaminal discectomy in patients with extraforaminal herniated discs. For central disc and poster lateral disc herniations inter laminar approach was utilized. Pain relief in the patients was assessed using Numerical Rating Scale (NRS) and OSWESTRY Disability Index (ODI) at immediately post-op, at the time of discharge and at 6 weeks post-op follow-up. Functional outcome was assessed in terms of patient satisfaction at 6 week post-op follow-up. All data recorded on prescribed proforma for statistical analysis.

The data was analyzed using Statistical Package for the social sciences (SPSS) software version 25.00. Quantitative variables were calculated as Mean ± SD whereas qualitative variables were presented as frequency and percentages. To determine the significance of difference in NRS and ODI scores within the group, repeated measures ANOVA was applied whereas to determine significance between the groups independent samples t-test was applied. A p-value of < 0.05 was considered statistically significant.

RESULTS

This study included overall 200 patients; 140(70%) male and 60(30%) females. The gender distribution in Group-A was 78(78%) male and 22(22%) female whereas in Group-B it was 62(62%) male and 38(38%) females. The mean age was

37.61±9.57 and 38.59±9.71 years in Group-A and B respectively. Overall differences in demographic distribution and pre-operative measures were insignificant. Details of demography and baseline preoperative scores are presented in Table-I.

Table-I: Comparison of Demographic Characteristics, pre-Operative values of Numerical Rating Scale (NRS) and Oswestry Disability Index (ODI) Among Groups (n=200)

Parameters	Study Groups		*p*-value
	Group-A (n=100)	Group-B (n=100)	
Mean Age (years)	37.61 ± 9.57	38.59 ± 9.71	-
Gender n (%)			
Male Female	78(78%) 22(22%)	62(62%) 38(32%)	
Smoker	13(13%)	17(17%)	0.553
Pre- Operative Numerical Rating Scale score	9.43±0.7	9.56±0.5	1.32
Pre-Op Oswestry Disability index score	51.19±9.66	53.74±9.98	0.68

In Group-A, there were 73(73%) transforaminal cases (11x L2/3, 19x L3/4, 43× L4/5 levels) and 27 (27%) interlaminar cases (L5/S1 level) whereas in Group-B, open discectomy approach was adopted in all cases (17x L2/3, 39xL3/4, 31x L4/5 and 13x L5/S1 level) as shown in (Table-I). In endo discectomy group the NRS and ODI outcome scores significantly improved (p<0.001) immediate postoperatively, at the time of discharge from hospital as well as at 6 weeks post-op follow-up. Similarly in open discectomy group significant improvement (p<0.001) was noticed in NRS and ODI outcome scores postoperatively at the time of discharge from hospital as well as at 6 weeks post-op follow-up (Table-II). Intergroup comparison yielded significant difference (p<0.001) of NRS in Group-A compared to Group-B at immediately post-op and at the time of discharge from the hospital whereas the difference was insignificant (p=0.503) at 6 week post-op follow up. Similarly, the ODI score also revealed significant improvement (p<0.001) in Group-A compared to Group-B at immediately post-op and at the time of discharge from the hospital whereas the difference was also insignificant (p=0. 0.058) at 6 week post-op follow up (Table-III).

DISCUSSION

In our study patients with endoscopic discectomy had marked immediate post operative pain relief as compared to patients with open discectomies. However, pain relief at the time of discharge vs and at 06 weeks follow up was comparable in both groups although slightly better relief in endoscopic discectomies. Spinal surgery has developed and improved significantly over the time. Endoscopy in spine surgery due to advances in tools allows better visualization so that discectomies, decompressions and fusions are done endoscopically with comparable results.[12] Tools have allowed an expanded indication including decompression, discectomy and fusions.[13] Although endoscopy has been used frequently for lumber disc herniation, recently endoscopic use in cervical spine and thoracic spine pathologies has shown fruitful results. The cervical spine endoscopy has been used for degenerative diseases in posterior approach endoscopic discectomy and was well maintained post operatively. Similarly, patients had lesser blood loss and shorter as compared to conventional approach.[14] Similarly endoscopic ACDF has shown shorter operation time and hospital stay as compared to conventional ACDF.[15] Endoscopic anterior and posterior cervical screw fixation has shown better pain control postoperatively.[16] In patients who underwent endoscopic thoracic discectomy there were significant improvements in postop VAS and ODI scores.[17] The lumber spine endoscopy has been used for discectomies, decompressions and fusion. Endoscopic transforaminal interbody fusion has been performed successfully with comparable results to MIS-TLIF. There are two general approach techniques in endoscopic lumber spine discectomy surgery transforaminal and interlaminar methods. Endoscopic surgery has comparable results and in most cases has advantages over conventional discectomy including earlier recovery, decrease blood loss, less back pain and higher patient satisfaction.[18] Studies have shown that endoscopic discectomy is superior to conventional discectomy in terms of hospital stay and maintaining disc height.[19]

Transforaminal method demands better imaging facilities as well as patients anatomical land marks (iliac crest at the level of L5/S1). The advantage of transforaminal approach is that it can be performed under local anesthesia because of shorter operation time. Studies have shown less back pain and shorter hospital stay postoperatively.[20] For central stenosis Inter laminar approach is used for better results.

In our study patients with endoscopic discectomy has marked immediate post operative pain relief as compared to patients with open discectomies. Studies

Table II: Comparison of Numerical Rating Scale and Oswestry Disability Index outcome among groups (n=200)

Group wise comparison of mean NRS and ODI						
Group	Parameter	Pre-Op	Immediate Post-op	At TOD	6 weeks post-op	*p*-value
Endo Discectomy (n=100)	NRS	9.43±0.7	3.34±1.38	3.2±1.4	2.09±1.44	< 0.001*
	ODI	51.19±9.66	29.63±7.92	26.57±6.87	17.85±8.58	< 0.001*
Open Discectomy (n=100)	NRS	9.56±0.5	4.81±1.03	4.68±1.1	2.21±1.06	< 0.001*
	ODI	53.74±9.98	38.23±8.05	33.98±8.31	20.13±8.35	< 0.001*

Intergroup Comparison of Mean NRS and ODI				
Parameter		Group A (n=100)	Group B (n=100)	p-value
NRS	Pre-op	9.43±0.7	9.56±0.5	1.32
	Immediately Post-op	3.34±1.38	4.81±1.03	< 0.001*
	TOD	3.2±1.4	4.68±1.1	< 0.001*
	At 6 weeks Post-op	2.09±1.44	2.21±1.06	0.503
ODI	Pre-Op	51.19±9.66	53.74±9.98	0.68
	Immediately Post-op	29.63±7.92	38.23±8.05	< 0.001*
	TOD	26.57±6.87	33.98±8.31	< 0.001*
	At 6 weeks Post-op	17.85±8.58	20.13±8.35	0.058

NRS= numerical rating scale, ODI= Oswestry disability index, TOD= time of discharge
Functional outcome assessed at 6 week post-op follow up. Patient satisfaction level was significantly higher in Group-A as compared to Group-B. Details are presented in Table-III.

done earlier has shown similar results.[21] which could be contributed to short operating time and lesser muscle dissection. However, pain relief at the time of discharge (NPRS 3.2 vs 4.68 and ODI26.57 vs 33.98) vs and at 06 weeks follow up (NPRS 2.09 vs 2.21 and ODI 17.85 vs 20.13) was comparable in both groups although slightly better relief in endoscopic discectomies. On the other hand, literature review showed studies with no significant difference in both groups apart from hospital stay.[22] Similarly in our study on follow up patient with endoscopic discectomies were more satisfied as compared to other group which was attributed to short hospital stay, small scar and early return to work. Review of literature showed endoscopic discectomies were preferred aesthetically.[23]

Table-III: Comparison of Functional Outcome of Surgery between Group-A and B (n=200)

Functional Outcome	Group-A (n=100)	Group-B (n=100)
Very Satisfied	27%	8%
Satisfied	43%	29%
Enough Satisfied	17%	31%
Unsatisfied	11%	19%
Very Unsatisfied	2%	13%

CONCLUSION

Endoscopic spine surgical technique is a wonderful addition in the field of spine surgery. When performed by experienced hands, there is not only speedy recovery but also reduced hospital stay with minimal morbidity and more patient satisfaction. In future endoscopic surgery innovations will hopefully enhance its horizon for complex procedures like spinal tumors and deformity surgeries.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

SI & MT: Data acquisition, data analysis, drafting the manuscript, critical review, approval of the final version to be published.

BS & SAQ: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

SA & LMA: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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