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Role of Visual Analogue Pain Score at Day 1 and 30 in Predicting Outcome after Full Endoscopic Lumbar Discectomy

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ABSTRACT

Objective: To compare the change in pain score one month after full endoscopic lumbar discectomy in the patients who showed substantial improvement of pain vs those who did not at 1st post- operative day.

Study Design: Quasi experimental study

Place and Duration of Study: Department of Spinal Surgery, Combined Military Hospital Rawalpindi, Pakistan from Aug 2023 to Apr 2024.

Methodology: A quasi-experimental study was conducted that included 100 patients of prolapsed lumbar intervertebral disc. Preoperative pain assessment was done via Visual Analog Scale (VAS). Interlaminar Endoscopic Discectomy was performed in all cases. Postoperative VAS was recorded on day 1, 3, 15 and 30 and analyzed by Nonparametric Independent-Samples Mann-Whitney U test.

Results: Substantial pain relief observed in 79(79%) cases making satisfactory group while 21(21%) cases showed persistent pain from 1st postoperative day constituting unsatisfactory group. Intergroup comparison of VAS revealed significant difference (p<0.001) on postoperative day 1, 3. 15 and 30. In both groups VAS recorded on 1st postoperative day did not change significantly till day 30 suggesting the importance of VAS on 1st postoperative day as a predictor of the surgical outcome.

Conclusion: In the patients with poor outcome in terms of pain relief on 1st postoperative day following FELD, there are least chances of improvement of pain score on subsequent days. Repeat MRI may be done in such cases without further delay to rule out presence of remnant disc fragment or to find other causative factors at the site of surgery.

Keywords: Endo discectomy, Lumbar disc herniation, Open discectomy

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INTRODUCTION

Lumbar disc herniation (LDH) is one of the common manifestations of degenerated intervertebral disc tissue caused by various etiologies. The disease presents with series of clinical symptoms because of nerve root or dural sac compression in the posterior spinal canal.[1] The frequently observed presenting symptoms include low back pain and radiculopathy resulting in chronic disability in adults affecting 4% to 33% of population of varied age groups.[2] The incidence of LDH increases with aging, exerting severe effects on patient's quality of life. Magnetic Resonance Imaging (MRI) is considered gold standard technique for the diagnosis and considering management options for the disease. Based on extent of displacement of the disc nucleus towards annulus on MRI scan, LDH is classified into four stages (I, II, III & IV).[3] Conservative management including physiotherapy, bed rest, analgesics and muscle relaxants are preferred treatment options for all stage I & II and 80-85% cases of stage III LDH. Only those stage III & IV cases who do not respond to conservative management merit surgical intervention.[4] The eventual aim of treatment is to settle the pain with accompanying other symptoms and enable the patient resume usual life activities at the earliest.[5] Early surgical decompression of LDH enables return to the routine pain free life in the patients with radicular pain not responding to conservative therapy.[6]

Endoscopic discectomy was introduced by Kambin in 1973. Since that time it is rapidly evolving in terms of instruments and technique for the procedure.[4] In recent years, the minimally invasive spine surgery has gain much attention among the surgeons as well as in the patients due to its evident advantages.[7] The advantages of full endoscopic lumbar discectomy (FELD) includes minimum surgical trauma, less blood loss, better paravertebral muscle preservation, rapid postoperative recovery, minimal impact on spinal stability and shortened hospital stay.[8] Most of the times the pain settles

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immediately following FELD. However, some cases do report persistent postoperative pain even after apparently successful decompression confirmed at surgical field. The plausible causes of persistent postoperative pain includes incomplete decompression, development of epidural hematoma and injury to nerve root all can present themselves differently.[9] The dilemma in such cases is between waiting and observing the pain pattern for a month or getting an immediate MRI done to identify the causative factor.[10] If we could predict the outcome of surgery based on the results obtained on 1st postoperative day, the problem may be lessened. The present study is designed to ascertain the change of pain score for one month following FELD in patients who demonstrated significant pain relief and those who did not at 1st postoperative day.

METHODOLOGY

This Quasi experimental study was conducted at Department of Spinal Surgery, Combined Military Hospital Rawalpindi, Pakistan from August 2023 to April 2024. Prior to commencement of the study, formal approval was obtained from Institutional Ethical Review Committee (IRB Serial No. 607, dated 25 July 2023).). Sample size was calculated using WHO sample size calculator, taking the postoperative day 1 VAS in satisfactory group at 2.5±1.8 and in unsatisfactory group at 4.8±2.0.[10] A total number of 100 patients suffering from prolapsed lumbar intervertebral disc disease were included in the study. An informed written consent was obtained from all patients to participate in the study. Nonprobability consecutive sampling was done. Unilateral radiculopathy was the patient's primary complaint. Using MRI scan, the extent of nerve root compression was evaluated.

Inclusion Criteria: Patients with age ranging between 20 to 50 years of either gender and having signs and symptoms of prolapsed lumbar intervertebral disc disease proven on MRI scan, needing surgery as per standard protocol were included in the study.

Exclusion Criteria: Patients with spinal stenosis or concurrent facet and/or ligamentum flavum hypertrophy, previously operated patients for same complaints as well as patients with comorbids like diabetes mellitus, ischemic heart disease, chronic renal failure were excluded.

Preoperative pain assessment of all the cases was done clinically using Visual Analog Pain Scale (VAS, 0 - 10) and recorded on predesigned proforma. Interlaminar endoscopic discectomy technique was performed for all the cases. Postoperative pain assessment was done clinically using VAS on day 1, 3, 15 and day 30. The surgical outcome was assessed by modified MacNab criteria which identifies four grades of surgical outcome as "Excellent" no pain, "Good" occasional mild radicular pain, "Fair" mild improvement but patient is still handicapped and "Poor" symptoms continued without improvement. On the basis of VAS on 1st postoperative day, patients were divided into two groups i.e Satisfactory (MacNab excellent and good) and unsatisfactory (MacNab fair and poor) for comparative analysis as shown in the Figure.

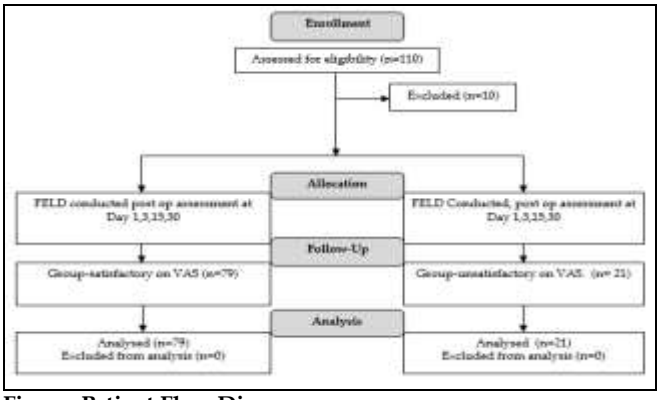

Figure: Patient Flow Diagram

Data was analyzed using Statistical Package for the Social Sciences (SPSS) version 25.00. Quantitative variable (age) was presented as Mean±SD. Qualitative variables (gender and cases) were presented as frequency and percentages. Discrete variable (MacNab Grade, VAS) was presented as Median (IQR). To determine significance of continuous variables between the groups, Independent-Samples t test was applied whereas to compare VAS between the groups Nonparametric Independent-Samples Mann-Whitney U test was applied. A p-value of < 0.05 was considered statistically significant.

RESULTS

The study was conducted on 100 cases of prolapsed lumbar intervertebral disc out of which 77 cases had prolapsed lumbar intervertebral disc between 4th and 5th lumbar spine (L4-5), and 23 cases had prolapsed lumbar intervertebral disc between the 5th lumbar spine and 1st sacral spine (L5-S1). The gender distribution among the cases was 78 % male and 22% female. The age of patients ranges between 20-50 years (overall mean 36.74±8.02 years). At 30th

postoperative day 67% of cases had shown excellent surgical outcome and 12% had shown good surgical outcome constituting satisfactory group (79% cases) whereas 14% had shown fair and 7% of cases had shown poor surgical outcome constituting unsatisfactory group (21%). Preoperative mean age and median VAS was insignificant (p=0.703 and p=0.387 respectively) between the groups. Demographic distribution and preoperative VAS is presented in Table –I.

Table-I: Demographic Distribution and Comparison of Age and Preoperative VAS. (n=100)

Gender and Cases Distribution Among Groups				
Variable		Groups		Total
		Satisfactory (n=79)	Unsatisfactory (n=21)	
Gender (%)	Male	60(76%)	18(86%)	78(78%)
	Female	19(24%)	3(14%)	22(22%)
Cases (%)	L4-5	62(78%)	15(71%)	77(77%)
	L5-S1	17(22%)	6(29%)	23(23%)
Age and Preoperative VAS Comparison Among Groups				
Variable		Satisfactory	Unsatisfactoy	p-value
Age (mean ± SD)		36.9±8.38	36.14±6.64	0.703
Preoperative VAS Median (IQR)		8(1)	8(2)	0.387

Visual analog pain scale score assessed on post op day 1, 3, 15 and 30 is presented in Table-II. Compared to the preoperative score, the satisfactory group revealed marked decrease in VAS (86%) on 1st postoperative day which was statistically significant (p< 0.001). Contrary to this, unsatisfactory group showed only 40% decrease in VAS on 1st postoperative comparing to the preoperative VAS. Thereafter gradual decline in VAS was noticed in satisfactory group on day 3, 15 and day 30, while such pattern was not noticed in unfavorable group. Instead, increase in VAS was noticed in unsatisfactory group on day 3, 15 and day 30 comparing to the 1st postoperative day. Overall decline of VAS in satisfactory group on day 30 was 89.6% whereas in unsatisfactory group it remained 33% comparing to the preoperative VAS. Intergroup comparison of VAS revealed statistically significant difference on postoperative day 1, 3. 15 and day 30 as presented in Table-II.

In current study, 7 patients showed poor surgical outcome as per modified MacNab criteria. These patients were kept hospitalized postoperatively for longer than usual time and then kept on medications at home. With no improvement in their symptoms till 30th postoperative day, MRI lumbar spine was repeated which revealed incomplete removal of ruptured disc in 5 out of 7 cases whereas in two case there was no residual disc on MRI and their pain remain unexplained. The cases with disc remnants underwent revision surgery in which complete removal of disc remnants was performed which showed satisfactory outcome.

Table-II: Intergroup Comparison of VAS on Post Operative Day 1, 3, 15 And 30.(n=100)

MacNab Grade	Visual Analog Pain Score - Median (IQR)				
	Pre-op	POD* - 1	POD - 3	POD - 15	POD - 30
Excellent	8(1)	1(0)	1(0)	1(0)	1(1)
Good	8(0)	2(0)	2(0)	2(1)	2(1)
Fair	8(1)	4(0)	4(0)	4(1)	4.5(1)
Poor	7(1)	5(1)	5(1)	5(1)	5(1)

Intergroup Comparison of VAS

POD	Visual Analog Pain Score - Median (IQR)		*p*-value
	Satisfactory (n=79)	Unsatisfactory (n=21)	
POD - 1	1 (0)	4 (1)	< 0.001
POD - 3	1 (0)	4 (1)	< 0.001
POD - 15	1 (0)	5 (1)	< 0.001
POD - 30	1 (0)	5 (1)	< 0.001

POD; Postoperative day

DISCUSSION

Our study demonstrated that in the patients with poor outcome in terms of pain relief on 1st postoperative day following FELD, there are least chances of improvement of pain score on subsequent days. Lumbar disc herniation when treated with open surgical technique, requires large incision in order to achieve adequate exposure and depth at the surgical site resulting in greater soft tissue and paravertebral muscles injury, increased blood loss and higher risk of infections.[11] Open discectomy also involve partial resection of vertebral lamina along with medial edge of facet joint attributed to greater postoperative pain.[12] Endoscopic discectomy, on other hand, has rapidly evolved in the past two decades with aim to reduce per-operative and postoperative complication rate along with delivering comparable results and possibly shortened hospital stay.[13] All attributed to minimal incision, least injury to the normal tissue, absence of paravertebral muscles retraction and less blood loss during the procedure.[14] However, some cases do report persistent postoperative pain even after apparently successful decompression confirmed at

surgical field due incomplete decompression, development of epidural hematoma or injury to the nerve root.[15, 16]

In present study 79% of patients have shown substantial improvement of VAS on 1st postoperative day that is comparable to the study conducted by Amer *et al.* showing 66% decline in VAS following ED.[17] Bai *et al.* presented the data of meta-analysis consisting of 14 trials which includes 2,528 patients. The authors concluded that ED provides better surgical outcomes in terms of shorter surgical time and hospital stay, less blood loss, and substantial decline in postoperative VAS for leg pain. However, in contradiction to current study, they have reported significantly higher rate of recurrent disc herniation following ED.[18] In current study, 7% cases had shown poor outcome of surgery with mean VAS declining only 27% from preoperative value which was comparable to the finding of Yagi *et al.*, who reported persistent low back pain in 10% of the patients following ED in a 2-year follow-up study.[19] In current study the cases of poor outcome with no further improvement till 30th postoperative day were further investigated by repeat MRI scan showing remnant of disc in 5% of cases. Our finding is consistent with the study conducted by Rathore *et al.*, who evaluated functional outcome of back pain after ED reported recurrent disc herniation in 5.8% of cases requiring 2nd surgery which is comparable to the complication rate of current study.[20] In a study conducted by Kim *et al.*, the authors reported substantial decrease of VAS following ED (>80% on the leg and >60% on trunk) in favorable group starting from 1st postoperative day and further gradual improvement till 30th postoperative day whereas in unfavorable group there was only 22% decrease in pain score observed on trunk and 42% in leg on 1st postoperative day with no further significant improvement seen till the 30th postoperative day 10. The results of their study are comparable to current study whereby we also reported 79% decline in pain score in satisfactory and only 40% decline in unsatisfactory group on 1st postoperative. In both the groups of the present study VAS which was recorded on 1st postoperative day did not change significantly on subsequent recording till the day 30 suggesting the importance of VAS on 1st postoperative day in predicting the outcome of the surgery. In current study, we attribute poor outcome of surgery to the remnant disc fragments in 5/7 cases whereas 2/7 cases in which there was no MRI findings correlating to the clinical pain may be attributed to psychological factor.

LIMITATIONS OF STUDY

In current study we could not perform repeat MRI scan of all the cases of unfavorable outcome to find out the causative factor due patient's reluctance and fear of 2nd surgery as well as financials constraints. The study also could not present long-term outcome of the surgeries as most of the patients missed follow-up visits.

CONCLUSION

In the patients with poor outcome in terms of pain relief on 1st postoperative day following FELD, there are least chances of improvement of pain score on subsequent days. Repeat MRI may be done in such cases without further delay to rule out presence of remnant disc fragment or to find other causative factors at the site of surgery.

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Authors' Contribution

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

BS & SA: Data acquisition, data analysis, critical review, approval of the final version to be published.

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

SI & 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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