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ORIGINAL ARTICLE

Early Pain Outcome of Open Lumbar Discectomy Versus Endoscopic Lumbar Discectomy

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ABSTRACT

Introduction: A prolapsed intervertebral disc is one of the principal causes of low back pain in the adult population. It is most common in the fourth and fifth decades of life and occurs in lumbosacral and cervical regions.

Objectives: This study was conducted to compare mean postoperative pain after endoscopic discectomy and open discectomy for the surgical treatment of lumbar disc herniation by utilization VAS.

Methodology: This was a randomized controlled trial conducted in the department of Neurosurgery Sir Ganga Ram Hospital Lahore. The study was conducted from 15 January 2020 to 15 August 2021. Inclusion and exclusion criteria were defined and a total of 100 patients were recruited for the study. The patients were randomized into two groups. VAS scores for both the groups were recorded pre-operatively and were compared with post-operative VAS scores. One group underwent open discectomy, whereas, others underwent minimally invasive endoscopic lumbar discectomy.

Results: A total of 100 subjects with a mean age of 41.32 ± 11.88 years were recruited for this study. Males accounted for 67% of the subjects whereas females accounted for 33% of the subjects. L4-L5 disc prolapse accounted for 71% of the cases. The average duration of complaint was 72.17 ± 27 days. VAS Score improvement at 24 hours, 01 week and 01 month was compared among the 2 groups and a statistically significant difference was found among endoscopic and open discectomy with a p value of <0.005.

Conclusion: Our results have shown that minimally invasive endoscopic lumbar discectomy is superior to conventional open discectomy in terms of pain outcomes. In trained hands, endoscopic lumbar discectomy is a better treatment modality as compared to conventional open discectomy if patient is carefully selected.

Keywords: Sciatica, Intervertebral Disc Displacement, Discectomy, Percutaneous, Intervertebral Disc Degeneration

INTRODUCTION

Low back pain (LBP) is one of the chief causes of physical discomfort, and functional limitations in patients and adversely affects the quality of life by causing permanent disability in certain cases. The economic costs of LBP management are significant and can be reduced with proper management of patients with LBP[1]. Degenerative Disc Disease (DDD) is the chief etiology of LBP and one of the most common reasons that patients seek neurosurgeon's consultation[2]. Another common cause of LBP is prolapsed intervertebral disc (PIVD), other causes are spinal canal stenosis, instability of the lumbar spine, and soft tissue pathology. LBP secondary to DDD affects most of the adult population and has a significant disease burden globally affecting nearly 600 million people[3]. LBP is most common during the 4th and 5th decades of life but it can occur in younger (20 years and above) and older (60 years and above) patients. In older patients, DDD is the cause of LBP whereas in younger population, trauma is the most common cause[1]. PIVD is one of the chief causes of LBP that radiates to legs in all age groups. LBP is one of the most frequent reasons for medical leave from job missed workdays. LBP secondary to PIVD is the most prevalent cause of Neurosurgery OPD consultation in our local adult population[4]. DDD can occur anywhere in the vertebral column, but the most common sites are lumbosacral (LS) and cervical regions. A healthy intervertebral disc is hydrated, supple, elastic, and acts as a shock-absorbing cushion between adjacent vertebrae, reducing friction and supporting a standard range of vertebral movements. The disc is made up of a central gelatinous nucleus pulposus surrounded by thick, fibrous annulus fibrosus. The strength of annulus fibrosus keeps the intervertebral disc patent. As the person ages, the annulus becomes weak due to constant stress, and the central nucleus pulposus loses its elasticity. With progressive stress on the intervertebral disc, the annulus ruptures and central nucleus pulposus protrudes out, pinging on the intervertebral foramen's exiting nerve root leading to neurologic symptoms of PIVD, most noticeable of which is LBP radiating to legs[5,6]. Lumbar and Lumbosacral PIVD can be diagnosed based on history and clinical examinations and confirmed by MRI scans of the affected spinal segment. In addition to back pain, paresthesia is commonly reported by patients and confirmed on neurological examination. Neurological deficit is seen in moderate to severe cases and merits urgent decompression of nerve root by discectomy[7]. If diagnosed in time, most LBP cases secondary to PIVD can be managed conservatively, and only 10-15% require surgical intervention[8]. Majority of the PIVD cases are occupation-related, and weight-bearing plays a significant role in developing this condition. Most of the herniated discs are postero-lateral in the LS region and can be surgically accessed by utilizing a posterior approach[2]. Lushka was the first to describe degenerative spine disorders, and Mixter & Barr were the first to publish their 34 cases of lumbar discectomy[9]. Endoscopic lumbar discectomy is one of the latest approaches worldwide in the surgical management of patients with lumbar PIVD[10-12]. In Pakistan, most cases are being performed by conventional open discectomy or microdiscectomy[13]. Limited local data is available about endoscopic discectomy in Pakistan. Studies have shown that minimally invasive endoscopic discectomy is safe and associated with a less post-operative hospital stay, less blood loss, reduced morbidity, higher patient satisfaction, and similar results as compared to open discectomy[9,13]. The purpose of this study is to compare the mean postoperative pain by utilization of VAS after endoscopic discectomy and open discectomy for the surgical treatment of symptomatic lumbar disc herniation.

Objective: The main objective of this research was to compare mean postoperative pain after endoscopic discectomy and open discectomy for the surgical treatment of lumbar disc herniation by utilization VAS.

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METHODOLOGY

This Randomized Controlled Trial was conducted at Department of Neurosurgery, Sir Ganga Ram Hospital / FJMU, Lahore from 15

January 2020 to 15 August 2021. Patients fulfilling the inclusion criteria were included and informed consent was taken. Patients were stratified into two groups at the time of admission. A sealed envelope, prepared beforehand by the principal investigator, was opened at time of admission of the patient that indicated whether the patient was to be assigned to group A or group B. The procedure to be performed was decided at random. Half of the patients underwent endoscopic discectomy whereas the other half underwent open discectomy. The sample size of 100 was estimated by using 95% confidence level, 80% power and 5% alpha.

Inclusion Criteria:

1. Patient's age 20–70 years
2. Both genders
3. Undergoing surgical treatment of lumbar disc herniation confirmed on MRI

Exclusion Criteria:

1. Previous history of lumbar spine operations
2. Patients with deformities in the lumbar spine (spondylolisthesis or scoliosis)
3. Cauda equina syndrome
4. Paracentral and central herniation
5. Spinal stenosis

SURGICAL TECHNIQUE

Open Discectomy: After anesthetizing the patient, the patient was placed in supine position on Wilson's frame, painted and draped. The level was confirmed with the help of fluoroscopy and incision was marked. Midline incision approximately 3–5 cm was made. Subcutaneous tissues were separated with monopolar cautery on coagulation settings. The spinous processes were identified and lamina exposed. Bilateral laminectomy of the affected level was done by using bone nibblers and Kerrison punch of different sizes. Ligamentum flavum was identified and excised. The corridor was widened, axilla was identified, nerve root retracted, annulotomy done and disc removed bilaterally. After meticulous hemostasis, the wound was closed in layers (muscles with Vicryl 1, facia with Vicryl 1, subcutaneous with Vicryl 2/0, and the skin closed with Prolene 2/0). The wound was dressed, and the patient was shifted to the ward after an uneventful recovery.

Endoscopic Lumbar Discectomy: The surgical technique defined by Ruetten et al. was used for to intra-laminar approach. All patients were put in the prone position after GA on Wilson's frame. The surgical site was confirmed with fluoroscopy. About 0.5mm incision was given 1 cm lateral to the midline. Surgical dilator trocars (Easy Go system of Karl Storz) were inserted one by one, dilating the surgical corridor and the endoscope was fixed with holding arms, a 23 mm Easy Go trocar, and a 23 mm endoscope holder. Karl Storz's endoscopic unit was used. Medial facetectomy was done using a Midas drill, ligamentum flavum was opened, thecal sac was retracted, and the axilla was identified. An amniotomy was done, and a discectomy was done. With fixing the arm, as both hands would be free, so the surgeon could easily concentrate on surgery instead of fixing the endoscope. After discectomy, hemostasis was secured by using bipolar, and the wound was closed in 2 layers, subcutaneously Vicryl 2/0 and skin with Prolene 2/0.

Ethical Consideration: Approval from the ethical committee of FJMU was obtained before the data collection. Informed consent was taken from the sampling units.

Data Collection: The 100 patients fulfilling the inclusion criteria were enrolled in the study. All patients were admitted to the Neurosurgery department of SGRH after complete workup and anesthesia fitness. Demographic details and relevant medical data were collected. The patients were randomized into groups A & B. Group A underwent Endoscopic Discectomy, and Group B underwent Open discectomy under the supervision of qualified neurosurgeon on the earliest elective list. To minimize procedural bias, the same surgeon, assistant, and scrub nurse washed up on each surgery. VAS was noted before surgery, 24-hour post-op, 1st follow-up visit (1st week) and on subsequent visits (4th week).

Data Analysis: Collected data was entered and analyzed using SPSS 22.0. Quantitative data like age, gender, pain on VAS, number of discs involved was analyzed by mean and standard deviation. Qualitative data like gender and success was analyzed by frequency and percentages. Stratification was done on the basis of age, gender, pain on VAS, number of Discs involved to see its effect on outcome variable i.e. success. Qualitative and quantitative data was tabulated and comparison of two groups was done. Chi-square and odds ratio p-value ≤ 0.05 was taken as significant.

RESULTS

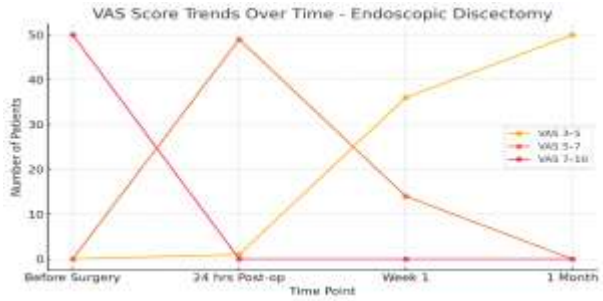
Among the 100 patients included in the study, the L4–L5 level was the most commonly involved site of disc prolapse, observed in 71% of cases. It was more prevalent among males (76.11%) compared to females (60.61%). In contrast, the L5–S1 level was involved in 29% of cases, with a higher relative proportion seen in females (39.39%) than in males (23.89%). Overall, the male-to-female ratio in the study population was 2:1.

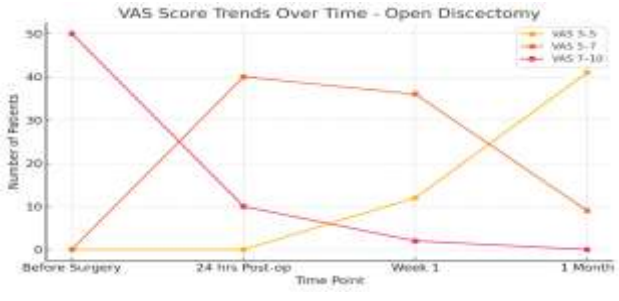
Table-1: Stratification of Gender with Respect to Level of Disc Prolapse Frequency

Level of Disc	Male (n = 67)	%	Female (n = 33)	%	Total (n = 100)	%
L4–L5	51	76.11%	20	60.61%	71	71.0%
L5–S1	16	23.89%	13	39.39%	29	29.0%
Total	67	67.0%	33	33.0%	100	100.0%

Table-2: Stratification of Endoscopic vs Open Discectomy Groups with Respect to VAS Scores

Time Point	Endoscopic Discectomy 3–5	5–7	7–10	Open Discectomy 3–5	5–7	7–10
Before Surgery	0 (0%)	0 (0%)	50 (100%)	0 (0%)	0 (0%)	50 (100%)
24 hrs Post-op	1 (2%)	49 (98%)	0 (0%)	0 (0%)	40 (80%)	10 (20%)
Week 1	36 (70%)	14 (28%)	0 (0%)	12 (24%)	36 (72%)	2 (4%)
1 Month	50 (100%)	0 (0%)	0 (0%)	41 (82%)	9 (18%)	0 (0%)





Before surgery, all patients in both the endoscopic and open discectomy groups reported severe pain (VAS 7–10). At 24 hours post-op, 98% of endoscopic patients had mild to moderate pain (VAS 5–7) compared to 80% in the open discectomy group, with 20% still experiencing severe pain. By week 1, 70% of endoscopic cases reported mild pain (VAS 3–5) versus only 24% in the open group. At one month, 100% of endoscopic discectomy patients reported mild pain, while only 82% of open discectomy patients achieved the same, indicating superior and faster pain relief with the endoscopic approach.

DISCUSSION

This randomized controlled study compared postoperative pain outcomes following endoscopic discectomy versus open discectomy for lumbar disc herniation. Our findings strongly support the superiority of minimally invasive endoscopic discectomy in achieving faster and more effective pain relief. At baseline, all patients in both groups presented with severe pain (VAS 7–10), affirming the debilitating nature of symptomatic lumbar disc prolapse. However, a striking difference emerged postoperatively: within 24 hours, 98% of endoscopic discectomy patients had already shifted to moderate pain (VAS 5–7), with no cases of severe pain. In contrast, 20% of open discectomy patients continued to experience severe pain at this early stage, indicating a slower initial recovery. By the first week, 70% of endoscopic patients had reached mild pain levels (VAS 3–5), compared to only 24% in the open discectomy group. This rapid recovery trajectory continued at one month, where all patients in the endoscopic group reported complete transition to mild pain, while 18% in the open group still experienced moderate pain[14]. These results are consistent with global trends highlighting the benefits of minimally invasive spinal surgery, including less tissue trauma, reduced inflammation, quicker mobilization, and enhanced patient satisfaction[15,16]. The lumbar region is the most common site of musculoskeletal pain. More than 60% of disc herniations occur in the lumbar spine[17]. A significant proportion of patients with chronic low back pain have underlying intervertebral disc pathology. Management of such conditions has evolved to include not only surgical but also non-surgical interventions such as patient education, lumbar supports, behavioral therapy, TENS, traction, superficial and deep heat therapy, and even laser treatment[18]. The primary goal remains pain control, prevention of recurrence, and acceleration of return to normal function. Furthermore, exercises and lumbar stabilization training have emerged as key elements in reducing recurrence and disability associated with disc herniation[19]. In some cases, chronic low back pain may also be linked to psychological distress, emphasizing the need for a biopsychosocial approach to treatment. Our study also identified L4–L5 as the most commonly involved disc level, particularly among male patients, which is consistent with previous studies indicating higher mechanical loads and mobility at this segment[20]. The findings of our study are in concordance with Chen et al. (2020), who reported favorable early pain outcomes in endoscopic lumbar discectomy[7]. Ahn (2019) also reported shorter hospital stays, reduced postoperative complications, and high patient satisfaction with endoscopic techniques[12]. Despite these promising outcomes, our study is limited by its short-term follow-up. Long-term data regarding functional outcomes, recurrence rates, and need for reoperation were not assessed. Additionally, VAS is a subjective measure of pain and can be influenced by individual perception and psychological factors.

CONCLUSION

Our results have shown that minimally invasive endoscopic lumbar discectomy is superior to conventional open discectomy in terms of superior pain outcomes. In trained hands, endoscopic lumbar discectomy is a better treatment modality as compared to conventional open discectomy if patients are carefully selected.

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