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Comparative Evaluation of Functional Outcome of Discectomy Versus Discectomy with Posterior Lumbar Interbody Fusion for Treatment of Lumbar Disc Herniation

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Abstract

Lumbar disc herniation frequently causes lower back pain and radiculopathy, impacting individuals' quality of life. Discectomy, the traditional surgical treatment, effectively relieves symptoms but may not address post-operative spinal instability. To improve long-term outcomes, posterior lumbar interbody fusion (PLIF) is sometimes combined with discectomy. This study aims to compare the functional outcomes of discectomy alone versus discectomy with PLIF for treating lumbar disc herniation. This comparative study was conducted at Madhubani Medical College over two years, among 60 patients diagnosed with lumbar disc herniation. Patients were divided into two groups: 30 each in standard discectomy and discectomy with PLIF. Patients aged 18-65 years with confirmed lumbar disc herniation and significant radiculopathy, having failed conservative management for at least six weeks wer included for the study. Functional outcomes were assessed using the modified Oswestry Disability Index (mODI), Sciatica Bother Somesness Index (SBI), modified McNab's criterion and VAS scores for back and leg pain. No significant differences were found in demographic data or duration of follow-up between the groups. VAS scores for back and leg pain, mODI scores and SBI scores showed no significant differences between the groups. McNab's Scores indicated no statistically significant difference, with excellent outcomes in 80.0% of discectomy patients and 63.3% of PLIF patients. The study found no significant differences in functional outcomes between discectomy alone and discectomy with PLIF. Both treatments offered similar pain relief and functional recovery, indicating that discectomy alone is a viable treatment option for lumbar disc herniation.

INTRODUCTION

Lumbar disc herniation is a common cause of lower back pain and radiculopathy, significantly affecting the quality of life and functional ability of individuals^[1]. The traditional surgical intervention for lumbar disc herniation has been discectomy, which involves the removal of the herniated disc material to relieve nerve compression. While discectomy effectively alleviates symptoms and improves function, it does not address the potential for spinal instability that may arise post-operatively^[2]. To mitigate the risk of spinal instability, posterior lumbar interbody fusion (PLIF) has been introduced as an adjunct to discectomy. PLIF involves the removal of the intervertebral disc followed by the insertion of a bone graft and/or cage between the vertebrae to promote fusion and stabilize the spine^[3-4]. This combined approach aims to provide better long-term outcomes by maintaining spinal alignment and reducing the risk of recurrent herniation.

Despite the theoretical advantages of combining discectomy with PLIF, the actual functional outcomes and benefits remain a subject of debate. This article aims to provide a comparative evaluation of the functional outcomes between patients undergoing discectomy alone and those undergoing discectomy with PLIF for the treatment of lumbar disc herniation. By analyzing the differences in pain relief, functional recovery and overall quality of life, this study seeks to inform clinical decision-making and optimize treatment strategies for lumbar disc herniation.

MATERIALS AND METHODS

This comparative study was conducted at Madhubani Medical College for the duration of 2 years, focusing on patients diagnosed with lumbar disc herniation who underwent surgical treatment. Overall, 60 patients were included using a non-probable consecutive sampling technique 30 in each intervention group as per inclusion and exclusion criteria. The study included two groups: one group undergoing standard discectomy and the other undergoing discectomy with posterior lumbar interbody fusion (PLIF). Inclusion criteria comprised patients aged 18-65 years with confirmed lumbar disc herniation, significant radiculopathy and failure of conservative management for at least six weeks. Patients with previous lumbar surgeries, significant spinal deformities, or systemic diseases affecting bone metabolism were excluded.

Data collected for analysis were age, gender, affected level, duration of follow-up, The modified Oswestry Disability Index (mODI)^[5] Sciatica Bother someness Index(SBI)^[6] modified McNab's criterion and any complications. Back and leg pain were quantified using the VAS score collected from the patients at follow-up. The mODI score was used to look how

patient's back and leg pain affecting his daily life. SBI was used to quantify how bothersome a patient's back and leg pain are, if present. We also used modified McNab's criterion which reflects well surgeon's overall impression about surgery overall success in terms of patient satisfaction. Broadly, there are 4 categories-excellent, good, fair and poor. Patient with significant back and/or leg pain was further evaluated clinically and radiographically

Statistical analysis was performed using appropriate tests to compare the outcomes between the two groups, with significance set at $p < 0.05$. This methodology ensured a comprehensive assessment of the functional outcomes and effectiveness of discectomy versus discectomy with PLIF in treating lumbar disc herniation.

RESULTS AND DISCUSSIONS

In the present study total of 60 patients were involved, 30 in each intervention group.

(Table 1) presents a comparison of demographic data between patients in the Discectomy and Posterior Lumbar Interbody Fusion (PLIF) groups. The average age of patients in the Discectomy group was 39.5 ± 4.2 years, while in the PLIF group, it was slightly higher at 40.6 ± 3.9 years. Gender distribution revealed that the Discectomy group had 21 males and 9 females, whereas the PLIF group had a more balanced distribution with 18 males and 12 females. Regarding the level of surgery, in the Discectomy group, 50% of the surgeries were performed at the L4-5 level, 43.3% at the L5-S1 level and 6.7% at other levels. In the PLIF group, a higher proportion, 63.3%, had surgery at the L4-5 level, 30% at the L5-S1 level and similarly, 6.7% at other levels. The duration of follow-up was comparable between the groups, with the Discectomy group having a mean follow-up of 55.4 ± 7.8 months and the PLIF group having 52.9 ± 8.9 months. Lastly, the Body Mass Index (BMI) was similar between the groups, with the Discectomy group averaging 26.1 ± 3.2 and the PLIF group averaging 25.9 ± 3.8 .

T -Test Applied:(Table 2) presents a comparison of functional outcome scores between patients in the Discectomy and Posterior Lumbar Interbody Fusion (PLIF) groups. The Visual Analog Scale (VAS) scores for back pain were 0.97 ± 2.27 for the Discectomy group and 1.27 ± 2.42 for the PLIF group, with a total mean score of 1.12 ± 2.33 and a p-value of 0.622, indicating no significant difference. Similarly, the VAS scores for leg pain were 0.43 ± 1.04 for the Discectomy group and 0.53 ± 1.22 for the PLIF group, with a total mean score of 0.48 ± 1.13 and a p-value of 0.734, also showing no significant difference. The modified Oswestry Disability Index (mODI) scores were 9.40 ± 11.14 for the Discectomy group and 12.40 ± 16.08 for the PLIF group,

Table 1: Comparison of Demographic Data of Patients in the Discectomy and Posterior Lumbar Interbody Fusion (PLIF) Groups.

| Variables | | Discectomy | PLIF |
|-----------------------|------------------------|-----------------|----------------|
| Age | Mean \pm sd | 39.5 \pm 4.2 | 40.6 \pm 3.9 |
| Gender | M/F | 21/9 | 18/12 |
| Level | L4-5 | 15 (50%) | 19 (63.3%) |
| | L5-S1 | 13 (43.3%) | 9 (30%) |
| | Other | 2 (6.7%) | 2 (6.7%) |
| Duration of follow-up | Mean \pm sd (months) | 55.43 \pm 7.8 | 52.9 \pm 8.9 |
| BMI | Mean \pm sd | 26.1 \pm 3.2 | 25.9 \pm 3.8 |

Table 2: Comparison of Functional Outcome Scores Between Discectomy and Posterior Lumbar Interbody Fusion (PLIF) Groups.

| Measure (Mean \pm SD) | Discectomy (n=30) | PLIF (n=30) | Total (n=60) | p-value |
|-------------------------|-------------------|-------------------|-------------------|---------|
| VAS_Back | 0.97 \pm 2.27 | 1.27 \pm 2.42 | 1.12 \pm 2.33 | 0.622 |
| VAS_Leg | 0.43 \pm 1.04 | 0.53 \pm 1.22 | 0.48 \pm 1.13 | 0.734 |
| mODI | 9.40 \pm 11.14 | 12.40 \pm 16.08 | 10.90 \pm 13.80 | 0.404 |
| SBI | 1.57 \pm 1.10 | 1.67 \pm 1.09 | 1.62 \pm 1.09 | 0.726 |

Table 3: Comparison of McNab's Score Between Discectomy and Posterior Lumbar Interbody Fusion (PLIF) Groups.

| McNab's Score | Discectomy (n, %) | PLIF (n, %) | Total (n, %) |
|------------------|-------------------|-------------|--------------|
| Excellent | 24 (80.0%) | 19 (63.3%) | 43 (71.7%) |
| Good | 3 (10.0%) | 7 (23.3%) | 10 (16.7%) |
| Fair | 2 (6.7%) | 3 (10.0%) | 5 (8.3%) |
| Poor | 1 (3.3%) | 1 (3.3%) | 2 (3.3%) |
| Chi-square: 2.38 | p value: 0.497 | | |

with a total mean score of 10.90 \pm 13.80 and a p-value of 0.404, indicating no significant difference. The Spinal Back Index (SBI) scores were 1.5 \pm 1.10 for the Discectomy group and 1.67 \pm 1.09 for the PLIF group, with a total mean score of 1.62 \pm 1.09 and a p-value of 0.726, again showing no significant difference between the two groups.

(Table 3) compares McNab's Scores between the Discectomy and Posterior Lumbar Interbody Fusion (PLIF) groups. In the Discectomy group, 24 patients (80.0%) had an "Excellent" outcome, 3 patients (10.0%) had a "Good" outcome, 2 patients (6.7%) had a "Fair" outcome, and 1 patient (3.3%) had a "Poor" outcome. In the PLIF group, 19 patients (63.3%) had an "Excellent" outcome, 7 patients (23.3%) had a "Good" outcome, 3 patients (10.0%) had a "Fair" outcome and 1 patient (3.3%) had a "Poor" outcome. Overall, for the total cohort, 43 patients (71.7%) had an "Excellent" outcome, 10 patients (16.7%) had a "Good" outcome, 5 patients (8.3%) had a "Fair" outcome, and 2 patients (3.3%) had a "Poor" outcome. The chi-square value was 2.38 with a p-value of 0.497, indicating no statistically significant difference in McNab's Scores between the two groups.

Our study aimed to compare the demographic characteristics, functional outcomes and McNab's Scores between patients undergoing Discectomy and Posterior Lumbar Interbody Fusion (PLIF) for lumbar disc herniation. The findings revealed no significant differences in demographic characteristics, functional outcomes and McNab's Scores between the two groups, suggesting that both surgical techniques are similarly effective in the treatment of lumbar disc herniation.

Our study observed no significant differences in age, gender distribution, BMI, or duration of follow-up between the Discectomy and PLIF groups. This is

consistent with the findings of Gupta *et al.*, who also reported similar demographic profiles between patients undergoing these two surgical procedures, indicating that patient selection criteria are comparable across studies^[7].

The comparison of functional outcomes in our study, measured by VAS for back and leg pain, mODI, and SBI, revealed no significant differences between the Discectomy and PLIF groups. A similar study by Sun *et al.* found that both discectomy and PLIF effectively reduced pain and improved functionality, with no significant differences in VAS and ODI scores postoperatively^[8]. These results suggest that both procedures provide comparable pain relief and functional improvement in patients with lumbar disc herniation.

Evaluating the functional outcomes using both criteria at all follow-up points, Saini *et al.* concluded that at the early follow-up (second postoperative week), discectomy demonstrated a more satisfactory outcome compared to the PLIF group. However, at the six-month final follow-up, the PLIF group showed a more satisfactory outcome than the discectomy group, with a significant p-value of 0.0042^[9].

In the study by Aghayee HN, 82.3% of patients (14 subjects) who underwent discectomy alone and 87.5% of patients (21 subjects) who underwent discectomy with PLIF reported being able to return to their prior activities. However, this difference was not statistically significant (p=0.679)^[10].

In a study by Cao *et al.*, the JOA score was used to evaluate the functional outcomes between discectomy alone and PLIF. The study concluded that PLIF provided a significantly superior outcome compared to simple discectomy at the 18-month follow-up^[11].

In Imam *et al.* study, VAS score was not significant between two groups, at one month, but at 6 months,

PLIF group had better VAS score and was statistically significant. ODI scores showed a similar pattern in both the groups^[12].

Our findings align with several previous studies in the literature. For instance, a study by Evaniew^[13] and Goldstein^[14] reported that both Discectomy and PLIF provided significant relief from back and leg pain, with no significant differences in pain scores between the two procedures. Similarly, their analysis of functional outcomes using the Oswestry Disability Index (ODI) showed comparable improvements in both groups, corroborating our mODI results.

Furthermore, a systematic by Sidhu *et al.* also supports our findings, concluding that while PLIF may offer some advantages in terms of spinal stability, it does not significantly outperform Discectomy in terms of pain relief and functional recovery. This Systematic review highlighted that the choice between these procedures should be based on individual patient characteristics and surgical considerations rather than expected differences in functional outcomes^[15]. However, our study contrasts with Said *et al.* conducted a Systematic Review and Meta-Analysis of Randomized Controlled Trials for Posterolateral Fusion Versus Posterior Lumbar Interbody Fusion. The results of their analysis revealed that patients who underwent PLIF had significantly higher fusion rates. However, no statistically significant differences were identified in terms of clinical outcomes, complication rates, revision rates, operation time, or blood loss^[16]. In our study, the distribution of McNab's Scores did not significantly differ between the discectomy and PLIF groups. In contrast, Gupta *et al.* found that McNab's criterion showed excellent results in 80% of discectomy patients compared to 68% of TLIF patients^[7].

This finding aligns with the results of Musa *et al.* Musa *et al.* found no PLIF demonstrated a significantly better ODI pain score, averaging 4.21 (range 0-10) versus 9.27 (range 0-20) for repeat discectomy ($P=0.018$). Additionally, the recurrence rate was 22.5% for repeat discectomy, compared to 0% for PLIF^[17].

In the study by Saini *et al.*, the overall results of the surgery were categorized into four categories according to the Kirkaldy Willis Criteria. This classification was based on the ability of patients to return to work. In the early follow-up at the second postoperative week, patients who underwent discectomy demonstrated a more satisfactory outcome compared to those in the PLIF (Posterior Lumbar Interbody Fusion) group. However, in the six-month follow-up, the PLIF group showed a more satisfactory outcome compared to the discectomy group. This suggests that while discectomy may provide better short-term results, PLIF could offer more favorable long-term outcomes^[9].

Although our study did not specifically focus on postoperative complications, it is worth noting that previous research, such as the study by Saini *et al.*, there was one case of superficial surgical site infection (SSI) in the discectomy group. A pus culture and sensitivity test were conducted, and appropriate antibiotics were administered, which initially resolved the infection. However, the infection recurred during follow-up, necessitating debridement. Following this procedure, the infection was successfully controlled. Additionally, there was one case of a dural tear in the discectomy group, which was repaired intraoperatively. Despite the repair, the patient experienced a persistent postoperative headache lasting up to six weeks^[9].

CONCLUSION

Our study contributes to the growing body of evidence suggesting that both discectomy and PLIF are effective surgical options for treating lumbar disc herniation, with no significant differences in functional outcomes and McNab's Scores. These findings support the notion that surgical technique selection can be tailored to individual patient needs and preferences without compromising the overall effectiveness of the treatment. Further research with larger sample sizes and longer follow-up periods is needed to confirm these results and to evaluate the long-term outcomes and complications associated with each procedure.

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