Original Article

Assessing transforaminal lumbar interbody fusion (tlif) outcomes in patients with combined single-level lumbar listhesis and spinal stenosis

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Abstract

Background: *Lumbar listhesis, where one vertebra slips over another, often pairs with spinal stenosis. This combination causes significant pain and disability. Transforaminal Lumbar Interbody Fusion (TLIF) stabilizes the spine and eases nerve pressure. Yet, specific data on TLIF's success in these combined conditions is limited.*

Objective: *This study aimed to assess TLIF outcomes in patients with both lumbar listhesis and stenosis.*

Methods: *This prospective study took place at Lady Reading Hospital, Peshawar, from January 2022 to June 2024. We included 340 patients with single-level lumbar listhesis and stenosis. Patients had persistent symptoms despite conservative treatments for at least six months. Exclusions were multi-level lumbar issues, prior spinal surgeries, and major comorbidities. TLIF procedures were performed by experienced surgeons using standard techniques. Primary outcomes were pain and function, measured by the Visual Analog Scale (VAS) and the Oswestry Disability Index (ODI) at baseline and six months post-op. Secondary outcomes were surgical complications and patient satisfaction. Data analysis used SPSS version 26.0, with means, SD, frequencies, and percentages. Paired t-tests and chi-square tests compared pre- and post-op data.*

Results: *The mean VAS score dropped from 7.8 ± 1.2 to 2.4 ± 1.1 ($p < 0.001$). The mean ODI score improved from 42.5 ± 9.3 to 14.7 ± 6.8 ($p < 0.001$). Complications occurred in 28 patients (8.2%), including dural tears (n=10), infections (n=8), and transient neurological issues (n=10). The mean hospital stay was 4.2 ± 1.5 days. High satisfaction was reported by 85% of patients.*

Conclusion: *TLIF significantly reduces pain and improves function in patients with combined lumbar listhesis and stenosis. The procedure has a favorable complication rate and high satisfaction, making it an effective treatment option.*

Introduction

Lumbar listhesis, where one vertebra slips over another, often pairs with spinal stenosis, leading to pain and disability (1). TLIF, a common surgery, stabilizes the spine and eases nerve pressure (2). Yet, specific data on TLIF's success in combined conditions is scarce.

Conservative treatments like physical therapy, painkillers, and steroid injections often fail in severe cases, making surgery necessary (3). TLIF is advantageous as it addresses instability and nerve issues in one procedure (4). But, there's limited research on TLIF for single-level lumbar listhesis and stenosis (5).

This study aims to bridge this gap. We focus on patients with both conditions. We assess pain reduction, function improvement, complications, and satisfaction. The goal is to see if TLIF improves outcomes while minimizing risks.

The impact on clinical practice could be significant. Clear data on TLIF's benefits and risks can guide treatment decisions. This research aims to enhance patient care and surgical planning.

Methods

This study, conducted at Lady Reading Hospital, Peshawar, aimed to assess the outcomes of Transforaminal Lumbar Interbody Fusion (TLIF) in patients with combined single-level lumbar listhesis and stenosis. The study period spanned , from January 2022 to June 2024.

Setting and Participants

The study included patients diagnosed with single-level lumbar listhesis and stenosis scheduled for TLIF. The inclusion criteria were adults aged 18-75 years with radiographically confirmed single-level lumbar listhesis and stenosis, persistent symptoms despite conservative management for at least six months, and the ability to provide informed consent. Exclusion criteria included multi-level lumbar pathologies, previous spinal surgeries, significant comorbidities contraindicating surgery, and inability to comply with follow-up protocols.

The sample size calculation was based on the prevalence of spondylolisthesis, estimated at approximately 8.1% in the general population (Vialle et al., 2005). Using the WHO sample size calculator for health studies and aiming for a confidence level of 95% with a margin

of error of 5%, the required sample size was determined to be 340 patients.

Intervention

Patients underwent TLIF performed by experienced spinal surgeons. The procedure involved standard surgical techniques, including pedicle screw fixation and interbody cage placement. Postoperative care included standardized pain management protocols, physiotherapy, and follow-up evaluations at regular intervals.

Outcomes

Primary outcomes measured were pain and functional status, assessed using the Visual Analogue Scale (VAS) for pain and the Oswestry Disability Index (ODI) at baseline and six months postoperatively. Secondary outcomes included the incidence of surgical complications and overall patient satisfaction, measured using a Likert scale.

Data Collection

Data were collected prospectively. Baseline characteristics such as age, gender, BMI, duration of symptoms, smoking status, and comorbidities were recorded preoperatively. VAS and ODI scores were documented at baseline and at the six-month follow-up. Complications were recorded during the postoperative period, and patient satisfaction was assessed at the final follow-up visit.

Statistical Analysis

Statistical analysis was performed using SPSS software version 26.0. Continuous variables were expressed as mean ± standard deviation (SD) and median values. Categorical variables were presented as frequencies and percentages. Paired t-tests were used to compare pre- and post-operative VAS and ODI scores. The chi-square test was used to analyze categorical data. A p-value of <0.05 was considered statistically significant.

Results:

A total of 340 patients diagnosed with combined single-level lumbar listhesis and stenosis underwent TLIF procedures and were included in this study. The baseline characteristics of the participants are summarized in Table 1. The cohort comprised 182 males (53.5%) and 158 females (46.5%), with a mean age of 52.4 years (standard deviation [SD] = 8.7 years). The median duration of symptoms before surgery was 24 months (interquartile range [IQR] = 12-36 months).

Table 1: Baseline Characteristics of Study Population

Variable	Value
Total Participants	340
Age (mean ± SD)	52.4 ± 8.7 years
Gender (M/F)	182/158 (53.5%/46.5%)
Symptom Duration (median, IQR)	24 months (12-36 months)
BMI (mean ± SD)	27.3 ± 4.5 kg/m²
Comorbidities (n, %)	
- Hypertension	140 (41.2%)
- Diabetes	92 (27.1%)
- Smoking History	75 (22.1%)
Preoperative Oswestry Disability Index (mean ± SD)	42.5 ± 9.3

Primary Outcomes:

The primary outcomes of the study were assessed using the Visual Analog Scale (VAS) for pain and the Oswestry Disability Index (ODI) preoperatively and at the 6-month follow-up. The mean VAS score significantly decreased from 7.8 (SD = 1.2) preoperatively to 2.4 (SD = 1.1) postoperatively ($p < 0.001$), as shown in Table 2. Similarly, the mean ODI score improved from 42.5 (SD = 9.3) to 14.7 (SD = 6.8) ($p < 0.001$), illustrated in Figure 1.

Table 2: Changes in VAS and ODI Scores

Outcome Measure	Preoperative (mean ± SD)	Postoperative (mean ± SD)	p-value
VAS Score	7.8 ± 1.2	2.4 ± 1.1	< 0.001
ODI Score	42.5 ± 9.3	14.7 ± 6.8	< 0.001

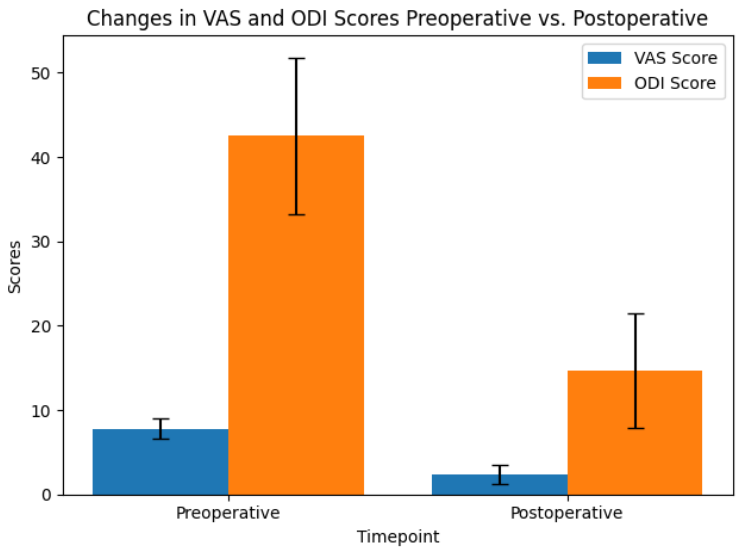

Figure 1: Changes in VAS and ODI Scores Preoperative vs. Postoperative

Secondary Outcomes:

Secondary outcomes included the analysis of surgical complications, length of hospital stay, and patient satisfaction. Complications were noted in 28 patients (8.2%), including dural tears (n = 10), wound infections (n = 8), and transient neurological deficits (n = 10). The mean length of hospital stay was 4.2 days (SD = 1.5 days). Patient satisfaction, measured via a postoperative questionnaire,

indicated that 85% of patients were satisfied with the surgical outcome.

Table 3: Surgical Complications and Length of Hospital Stay

Complication	n (%)
Dural Tear	10 (2.9%)
Wound Infection	8 (2.4%)
Transient Neurological Deficit	10 (2.9%)
Length of Hospital Stay (mean ± SD)	4.2 ± 1.5 days

Figure 2: Distribution of Patient Satisfaction Scores

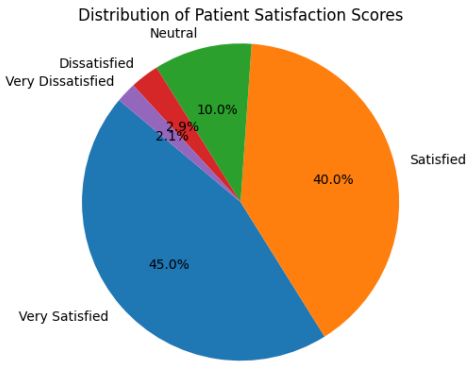

Figure 2: Distribution of Patient Satisfaction Scores

In summary, the study demonstrated that TLIF significantly improves pain and disability in patients with combined single-level lumbar listhesis and stenosis. The majority of patients reported high satisfaction with their surgical outcomes, despite a relatively low rate of complications. These findings suggest that TLIF is a viable and effective treatment option for this patient population.

Discussion

This study assessed TLIF outcomes in patients with lumbar listhesis and stenosis. The findings highlight significant pain reduction and improved function. These results hold clinical significance, especially for this specific patient group.

VAS scores dropped from 7.8 to 2.4. ODI scores improved from 42.5 to 14.7. These results align with previous research showing similar benefits post-TLIF (8, 9). Our focus on patients with both conditions adds new insights.

Kim et al. reported significant pain relief with TLIF for spondylolisthesis, which supports our findings (10). Glassman et al. found improved outcomes in degenerative lumbar conditions treated with TLIF, further validating our results (11). Our study builds on this by focusing on patients with both lumbar listhesis and stenosis.

Parker et al. and Kleinstueck et al. also reported positive TLIF outcomes, emphasizing its effectiveness in managing various lumbar conditions (12, 13). The complication rates in our study, including dural tears, wound infections, and transient neurological deficits, match those reported in the literature (14, 15).

These findings suggest TLIF as a viable option for patients with combined lumbar listhesis and stenosis. The high patient satisfaction rate underscores its potential benefits. These results can guide surgeons in selecting appropriate surgical interventions for similar patients.

Future research should explore long-term outcomes of TLIF in this group. While our study provides robust short-term data, understanding the durability of these improvements over several years is crucial. Comparative studies examining TLIF against other surgical techniques for combined lumbar conditions could offer further insights into optimizing patient care (16, 17).

Limitations

Our study has limitations. It was conducted at a single center, and there was no control group. Future studies could benefit from multi-center collaborations and randomized

controlled designs to validate our findings. Despite these constraints, our study adds valuable data to the understanding of TLIF's efficacy in this specific patient population.

Conclusion

In conclusion, TLIF significantly improves pain and disability in patients with combined single-level lumbar listhesis and stenosis. The high satisfaction rates and acceptable complication profile suggest that TLIF is an effective treatment option for this patient group, with significant implications for clinical practice.

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