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Original Research Article

A STUDY OF COMPARISON OF CLINICAL AND RADIOLOGICAL OUTCOME AMONG OLIF VS TLIF IN MULTILEVEL LUMBAR DEGENERATIVE DISC DISEASES

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ABSTRACT

Background: Multilevel lumbar degenerative disc disease is a frequent cause of chronic low back pain and disability, often requiring surgical fusion when conservative treatment fails. Transforaminal lumbar interbody fusion (TLIF) is a widely used posterior approach, while oblique lumbar interbody fusion (OLIF) has emerged as a minimally invasive alternative that may offer perioperative and radiological advantages. The objective is to compare the clinical and radiological outcomes of OLIF and TLIF in patients with multilevel lumbar degenerative disc disease.

Materials and Methods: This prospective comparative study included 30 patients with multilevel lumbar degenerative disc disease, divided into OLIF (n = 15) and TLIF (n = 15) groups. Clinical outcomes were assessed using the Visual Analog Scale (VAS) and Oswestry Disability Index (ODI). Radiological parameters included lumbar lordosis, sagittal vertical axis, anterior disc height, and posterior disc height. Operative variables such as blood loss, postoperative drainage, operative time, and hospital stay were analyzed.

Results: Baseline characteristics were comparable between groups. OLIF demonstrated significantly lower intraoperative blood loss, reduced postoperative drainage, and shorter hospital stay compared to TLIF ($p < 0.01$), with comparable operative time. Both groups showed significant improvement in VAS and ODI scores, with no significant intergroup difference. OLIF achieved significantly greater improvement in lumbar lordosis and disc height parameters ($p < 0.05$), while sagittal vertical axis was similar between groups.

Conclusion: Both OLIF and TLIF are effective for multilevel lumbar degenerative disc disease. OLIF offers superior perioperative recovery and radiological correction with comparable clinical outcomes.

Keywords: Oblique lumbar interbody fusion; Transforaminal lumbar interbody fusion; Multilevel lumbar degenerative disc disease; Lumbar lordosis; Minimally invasive spine surgery.

INTRODUCTION

Lumbar degenerative disc disease is a prevalent cause of chronic low back pain and disability, particularly when multiple levels are involved, leading to significant functional impairment and reduced quality of life. Surgical fusion becomes necessary when conservative management fails to relieve symptoms or address instability in multilevel disease. Transforaminal lumbar interbody fusion (TLIF) has long been a commonly used posterior approach that provides direct neural decompression and segmental stabilization but is associated with substantial muscle disruption, blood loss, and prolonged recovery.[1] Oblique lumbar interbody fusion (OLIF) is a minimally invasive anterior-to-psoas approach that preserves posterior musculature, reduces intraoperative trauma, and facilitates placement of larger interbody cages, potentially improving indirect decompression and sagittal alignment.[2,3] Recent

comparative studies and meta-analyses suggest that OLIF may offer advantages over TLIF in terms of reduced intraoperative blood loss, shorter hospital stay, greater restoration of disc height and lumbar lordosis, and early postoperative pain and functional outcomes, with similar complication and fusion rates; however, evidence specifically focusing on multilevel lumbar degenerative disc disease remains limited.[2–4] Therefore, robust comparison of clinical and radiological outcomes between OLIF and TLIF in multilevel lumbar degenerative conditions is essential to inform surgical decision-making and optimize patient outcomes.

MATERIALS AND METHODS

This prospective comparative study was conducted at the Department of Orthopaedics, Sarvodaya Hospital and Research Centre, Faridabad, Haryana, between February 2023 and December 2025. Thirty patients with multilevel lumbar degenerative disc disease refractory to conservative treatment were included and divided into two equal groups: Oblique Lumbar Interbody Fusion (OLIF, n=15) and Transforaminal Lumbar Interbody Fusion (TLIF, n=15).

Sample size was calculated based on expected differences in postoperative disc height restoration between groups, derived from Ravindra VM et al study.[5] Assuming an effect size of 0.9, power of 80%, and alpha error of 5%, the minimum required sample size was 14 patients per group; hence, 15 patients were included in each group to account for potential dropouts. Inclusion criteria were patients aged >18 years with lumbar disc herniation, degenerative spondylolisthesis, segmental instability, or lumbar spinal stenosis undergoing fusion at more than two levels. Patients with severe systemic illness or those undergoing multiple procedures in the same surgical setting were excluded. Consecutive sampling was employed. OLIF was performed via a retroperitoneal anterolateral approach with disc clearance and insertion of an appropriately sized interbody cage, followed by posterior percutaneous pedicle screw fixation. TLIF was performed through a posterior approach with unilateral facetectomy, interbody cage placement, and bilateral pedicle screw fixation. Standard postoperative protocols were followed in both groups. Clinical outcomes were assessed using the Visual Analog Scale (VAS). Radiological outcomes included anterior and posterior disc height measurements. Statistical analysis was performed using SPSS software. Continuous variables were analyzed using independent t-tests, while categorical variables were compared using chi-square tests. A p-value <0.05 was considered statistically significant.

RESULTS

Table 1: Sociodemographic Characteristics of the Study Population (N = 30)

Variable	OLIF (n = 15)	TLIF (n = 15)	p value
Age group, n (%)			
< 60 years	1 (6.7)	2 (13.3)	0.71
60–69 years	11 (73.3)	9 (60.0)	
≥ 70 years	3 (20.0)	4 (26.7)	
Sex, n (%)			
Female	9 (60.0)	7 (46.7)	0.46
Male	6 (40.0)	8 (53.3)	
Residence, n (%)			
Rural	10 (66.7)	8 (53.3)	0.46
Urban	5 (33.3)	7 (46.7)	

Chi square test used. p value <0.05 is considered as statistically significant

Table 2: Comparison of Operative Parameters Between OLIF and TLIF (N = 30)

Operative parameter	OLIF (n = 15)	TLIF (n = 15)	p value
	M ± SD	M ± SD	
Operative time (hours)	3.40 ± 0.80	2.80 ± 1.10	0.076
Intraoperative blood loss (ml)	58.90 ± 13.30	218.10 ± 43.30	< .001*
Postoperative drainage (ml)	72.40 ± 18.60	185.70 ± 46.20	< .001*
Length of hospital stay (days)	4.60 ± 1.20	6.90 ± 1.50	.002*

Note. Values are presented as mean (M) ± standard deviation (SD). OLIF = Oblique lumbar interbody fusion; TLIF = Transforaminal lumbar interbody fusion. *p < .05 is statistically significant

In this study, thirty patients with multilevel lumbar degenerative disc disease refractory to conservative treatment were included and divided into Oblique Lumbar Interbody Fusion (OLIF, n=15) and Transforaminal Lumbar Interbody Fusion (TLIF, n=15). Baseline sociodemographic variables were similar between the OLIF and TLIF groups, with no statistically significant changes in age distribution, gender, or residency (all p >.05) [Table 1]. The majority of patients in both groups were aged 60 to 69 years, which is consistent with the epidemiology of multilevel lumbar degenerative disease. This baseline equivalence reduces sociodemographic confounding and supports the validity of attributing differences in clinical and radiological results largely to the surgical method.

OLIF had considerably lower intraoperative blood loss, postoperative drainage, and shorter hospital stay than TLIF (all p <.01), indicating a minimally invasive method. The operational time did not change significantly between the two procedures (p >.05), showing equivalent procedural efficiency. Overall, OLIF showed superior perioperative recovery profiles without extending surgery time [Table 2].

Both OLIF and TLIF contributed to significant postoperative improvements in pain and functional outcomes, with no statistically significant intergroup differences in VAS and ODI scores at the last follow-up (p >.05). Radiologically, OLIF significantly improved lumbar lordosis and disc height parameters (ADH and PDH) compared to TLIF (p <.05), although global sagittal alignment (SVA) was equivalent between groups [Table 3]. These results indicate that OLIF delivers greater segmental and sagittal correction while preserving comparable clinical efficacy.

Table 3: Comparison of Postoperative Clinical and Radiological Outcomes Between OLIF and TLIF (N = 30)

Outcome measure	Time point	OLIF (n = 15) M ± SD	TLIF (n = 15) M ± SD	p value
Visual Analog Scale (VAS)	Preoperative	7.60 ± 1.10	7.40 ± 1.20	0.684
	Final follow-up	1.90 ± 0.80	2.20 ± 0.90	0.281
Oswestry Disability Index (ODI, %)	Preoperative	62.40 ± 9.30	60.80 ± 10.10	0.651
	Final follow-up	14.60 ± 6.20	17.90 ± 7.10	0.164
Lumbar lordosis (LL, °)	Preoperative	33.70 ±10.20	33.10 ± 11.30	0.867
	6 months	46.30 ±11.40	37.30 ± 9.70	< .001*
Sagittal vertical axis (SVA, mm)	Preoperative	1.90 ± 6.50	1.60 ± 5.40	0.887
	6 months	2.50 ± 4.30	0.80 ± 4.80	0.316
Anterior disc height (ADH, mm)	Preoperative	10.10 ± 3.90	10.20 ± 5.00	0.936
	6 months	15.60 ± 3.70	13.20 ± 2.90	.033*
Posterior disc height (PDH, mm)	Preoperative	5.70 ± 2.20	4.90 ± 2.10	0.297
	6 months	10.70 ± 2.50	8.10 ± 4.10	.045*

Note: Values are presented as mean (M) ± standard deviation (SD). OLIF = Oblique lumbar interbody fusion; TLIF = Transforaminal lumbar interbody fusion; VAS = Visual Analog Scale; ODI = Oswestry Disability Index; LL = Lumbar lordosis; SVA = Sagittal vertical axis; ADH = Anterior disc height; PDH = Posterior disc height. *p < .05 is statistically significant

DISCUSSION

This prospective comparative study evaluated the clinical and radiological outcomes of Oblique Lumbar Interbody Fusion (OLIF) and Transforaminal Lumbar Interbody Fusion (TLIF) in patients with multilevel lumbar degenerative disc disease. Multilevel lumbar degeneration predominantly affects older adults and represents a major cause of chronic low back pain, disability, and reduced quality of life. The age distribution and sex profile observed in the present study are consistent with global epidemiological trends, thereby supporting the external validity of the findings.[5,6] Furthermore, the absence of significant baseline demographic differences between the OLIF and TLIF groups minimizes selection bias and allows for a reliable comparison of surgical outcomes attributable to the operative technique.

One of the most notable findings of this study was the significantly lower intraoperative blood loss and postoperative drainage observed in the OLIF group compared with the TLIF group. This advantage can be explained by the anterior-to-psoas retroperitoneal corridor used in OLIF, which avoids extensive posterior muscle dissection and preserves paraspinal musculature.[7,8] Posterior approaches such as TLIF are associated with greater muscle stripping, ischemia, and denervation, which can contribute to increased blood loss and postoperative morbidity. Several contemporary studies and meta-analyses have consistently demonstrated that OLIF is associated with significantly reduced blood loss compared to posterior fusion techniques, particularly in multilevel procedures where cumulative tissue trauma is greater.[1-3] Reduced surgical trauma is especially beneficial in elderly patients, who often have limited physiological reserve and higher perioperative risk.

Although the operative time was marginally longer in the OLIF group, the difference did not reach statistical significance. This suggests that OLIF can be performed with procedural efficiency comparable to TLIF, particularly once the initial learning curve is overcome. Previous reports have shown that operative duration for OLIF decreases substantially with increased surgeon experience and institutional familiarity with the approach.[9] Therefore, operative time alone should not be regarded as a limiting factor when considering OLIF for multilevel lumbar degenerative disease.

The OLIF group also demonstrated a significantly shorter length of hospital stay. Faster postoperative recovery and earlier mobilization following OLIF have been attributed to reduced muscle injury, lower postoperative pain, and decreased inflammatory response.[3,10] Shorter hospitalization not only improves patient satisfaction but may also reduce healthcare costs and resource utilization, which is particularly relevant in high-volume spine centers.

Both OLIF and TLIF resulted in significant postoperative improvement in pain and functional outcomes, as reflected by substantial reductions in VAS and ODI scores at final follow-up. Importantly, no statistically significant intergroup difference was

observed in these clinical parameters. This finding is consistent with previous comparative studies demonstrating that indirect decompression achieved through OLIF can provide symptom relief comparable to direct posterior decompression in carefully selected patients.[1,4] These observations suggest that clinical improvement is influenced not only by direct neural decompression but also by restoration of disc height, foraminal dimensions, and spinal alignment.

Radiologically, OLIF demonstrated significantly greater improvement in lumbar lordosis, anterior disc height, and posterior disc height compared with TLIF. The ability to insert larger, lordotic interbody cages through the OLIF approach facilitates effective disc space distraction and segmental lordosis correction.[11] Restoration of lumbar lordosis plays a critical role in maintaining sagittal balance, optimizing spinal biomechanics, and reducing mechanical stress on adjacent segments following multilevel fusion.[12] The superior disc height restoration observed with OLIF likely contributes to indirect foraminal decompression by increasing foraminal height and reducing ligamentous infolding, thereby alleviating neural compression without direct posterior decompression.[13]

Despite superior segmental correction, global sagittal vertical axis did not differ significantly between the two groups at short-term follow-up. This may be explained by the relatively small sample size and limited follow-up duration, as changes in global sagittal alignment often evolve over longer periods. Nevertheless, improved segmental lordosis achieved with OLIF may provide long-term protective effects against sagittal imbalance and adjacent segment degeneration, particularly in multilevel fusion constructs.[14,15]

Overall, the findings of this study support the role of OLIF as a safe and effective alternative to TLIF for multilevel lumbar degenerative disc disease. OLIF offers clear perioperative advantages and superior radiological correction while achieving comparable clinical outcomes. Further large-scale, long-term studies are required to confirm these findings and to better define optimal patient selection criteria.

CONCLUSION

This prospective comparative study demonstrates that both Oblique Lumbar Interbody Fusion (OLIF) and Transforaminal Lumbar Interbody Fusion (TLIF) are effective surgical techniques for the treatment of multilevel lumbar degenerative disc disease, resulting in significant improvement in pain and functional outcomes. However, OLIF provides distinct perioperative advantages, including reduced intraoperative blood loss, lower postoperative drainage, and shorter hospital stay, reflecting its minimally invasive nature. Additionally, OLIF achieves superior radiological restoration of lumbar lordosis and disc height while maintaining clinical outcomes comparable to TLIF.

Based on these findings, OLIF may be recommended as a preferred surgical option in appropriately selected patients with multilevel lumbar degenerative disc disease, particularly when preservation of posterior musculature, reduced surgical morbidity, and improved sagittal alignment are desired. Careful patient selection, adequate surgical expertise, and longer-term follow-up studies are recommended to further validate these results and define the long-term benefits of OLIF in complex multilevel lumbar pathology.

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