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Original Article

CASE SERIES: CHALLENGES AND OUTCOMES OF TLIF PROCEDURES IN A PERIPHERAL HOSPITAL IN BHARATPUR, RAJASTHAN

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ABSTRACT

Objective: Chronic back pain, particularly from degenerative spinal conditions, significantly impacts patient quality of life, especially in regions with limited healthcare resources, such as rural Rajasthan. Transforaminal Lumbar Interbody Fusion (TLIF) has been recognized for its efficacy in treating severe spinal degeneration and instability. This case series examines the application of TLIF in a peripheral hospital setting, assessing its challenges and outcomes in such environments.

Methods: This study included three patients aged 34 to 75, who underwent TLIF at a peripheral hospital in Bharatpur, Rajasthan, from February to July 2024. Detailed preoperative and postoperative evaluations were conducted, focusing on pain levels and functional mobility. Follow-ups were performed at the first, second, and fourth weeks post-surgery to monitor recovery and assess surgical success.

Results: All patients reported significant improvements in pain and mobility by the first-month follow-up. The 34 y old female experienced complete pain relief and returned to full activities by four weeks. The 75 y old female and 65 y old male also showed considerable improvements in pain and function, with no severe complications noted during or after surgery.

Conclusion: TLIF can be effectively implemented in peripheral hospital settings with outcomes comparable to those in higher-resource environments. This case series demonstrates the feasibility and significant benefits of advanced spinal surgeries in resource-limited settings, highlighting the potential for expanding such sophisticated interventions to improve healthcare accessibility and patient outcomes in rural areas.

Keywords: TLIF, Chronic back pain, Spinal surgery, Rural healthcare, Patient outcomes, Surgical efficacy

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INTRODUCTION

Chronic back pain represents a formidable challenge within the healthcare landscape, significantly impacting patient quality of life and imposing substantial burdens on medical systems worldwide. Particularly prevalent in regions with limited healthcare resources, such as rural Rajasthan, chronic back pain often stems from degenerative spinal conditions that degrade patient mobility and functionality over time. In these settings, the scarcity of specialized medical facilities and advanced surgical expertise compounds the difficulty of providing effective treatment [1, 2].

Transforaminal Lumbar Interbody Fusion (TLIF) is a sophisticated surgical technique that has gained recognition for its effectiveness in addressing severe spinal degeneration and instability. By enabling the direct fusion of the affected vertebrae and the decompression of nerve roots, TLIF offers a potent solution to alleviate debilitating pain and restore spinal stability. This procedure is particularly pertinent for patients who have not responded to conventional medical management and are suffering from significant functional impairments due to their spinal conditions [3, 4].

Despite its proven efficacy, the deployment of TLIF in peripheral or rural hospital settings poses unique challenges. These include logistical constraints, such as the availability of high-precision surgical instruments, and systemic issues, like the lack of continuous professional training and the geographic isolation from tertiary care centers. Moreover, the complexity of TLIF procedures demands not only high-level surgical expertise but also sophisticated perioperative care to manage potential complications and ensure optimal patient outcomes [5, 6].

This case series aims to delineate the practicalities of implementing TLIF in a peripheral hospital in Bharatpur, Rajasthan, a region characterized by limited access to specialized neurosurgical care. By examining a series of TLIF procedures conducted during the period from February to July 2024, this study provides critical insights into the adaptability of advanced spinal surgical techniques outside of high-resource urban centers. It explores the modifications necessary to overcome infrastructural deficits and evaluates the outcomes in terms of pain relief, functional recovery, and patient satisfaction, with follow-up assessments at the **first, second, and fourth weeks post-surgery [7].

Furthermore, this analysis seeks to contribute to the broader discourse on healthcare equity, highlighting the potential for scaling advanced medical interventions in under-resourced areas. It advocates for strategic enhancements in local healthcare systems, including the development of regional centers of excellence, increased investment in medical infrastructure, and the establishment of robust training programs for local healthcare providers. Through this case series, we underscore the importance of extending advanced surgical care to peripheral settings, thereby improving accessibility and outcomes for patients suffering from chronic and debilitating spinal conditions.

MATERIALS AND METHODS

Patients

This case series encompasses a cohort of three patients who underwent Transforaminal Lumbar Interbody Fusion (TLIF) at a peripheral hospital located in Bharatpur, Rajasthan, during the period from February to July 2024. The patient ages varied, with the youngest being 34 and the oldest 75 y old. All patients selected for this series had a history of long-standing back pain, which had proven refractory to conservative management approaches, including physical therapy, pain medication, and lifestyle modifications.

Surgical procedure

The surgical interventions were performed by a consistent team of experienced neurosurgeons, ensuring uniformity in procedural execution. The TLIF surgery involved several critical steps:

Exposure and removal

Initially, a midline incision was made in the lumbar region, followed by the meticulous dissection and retraction of muscle tissues to expose the affected vertebral segment. The degenerated disc material was then surgically removed.

Interbody fusion

In the space created by the removal of the disc, an interbody cage filled with bone graft material was inserted. This cage aids in maintaining proper vertebral spacing and facilitates the fusion process by providing a scaffold for bone growth.

Stabilization

To secure the structural integrity of the spine post-procedure, pedicle screws and rods were installed. These implants provide immediate mechanical stability and maintain proper alignment of the spine during the bone healing and fusion process.

Data collection

Comprehensive clinical data were systematically collected at multiple stages throughout the treatment and recovery phases:

Preoperative assessment

Before the surgery, detailed evaluations were conducted to establish baseline measures of pain intensity and functional mobility. This included the use of validated pain assessment tools and mobility scales.

Postoperative monitoring

Following the surgery, similar assessments were repeated at regular intervals to track recovery progress. Specific attention was given to the assessment of pain levels, improvements in mobility, and the identification of any surgical complications.

Follow-up schedule

Patients were scheduled for follow-up visits at the first, second, and fourth weeks post-surgery. Each follow-up involved a thorough clinical examination and, when necessary, additional imaging studies to assess the integrity of the surgical site and the progression of spinal fusion.

RESULTS

Patient outcomes

The results of the TLIF surgeries performed on three patients at a peripheral hospital in Bharatpur demonstrated significant clinical improvements, particularly in terms of pain reduction and enhanced mobility. Each patient's response to the treatment was assessed at the first, second, and fourth-week follow-up intervals. Detailed assessments are as follows:

1. **Patient 1:**

- **Age/Gender:** 34 y old female

- **Preoperative condition:** Chronic back pain with intermittent episodes of acute pain spikes, primarily due to L4-L5 disc degeneration.

- **Postoperative results**

  - **One week:** Reported mild residual pain but a noticeable increase in mobility. No complications from the surgery were observed.

  - **Two weeks:** Continued improvement in pain and mobility.

  - **Four weeks:** The patient reported complete pain relief and returned to full occupational activities.

2. **Patient 2**

- **Age/Gender:** 75 y old female

- **Preoperative condition:** Severe lumbar pain and limited mobility due to multi-level lumbar spondylosis.

- **Postoperative results**

  - **One week:** Significant pain relief, with mild postoperative discomfort managed with analgesics. Initial signs of improvement in walking distance and posture.

  - **Two weeks:** Continued improvements in pain and function, enabling participation in more extended physical activities.

  - **Four weeks:** Substantial progress with improved functional mobility. Patient satisfaction was high.

3. **Patient 3**

- **Age/Gender:** 65 y old male

- **Preoperative condition:** Chronic back pain due to disc prolapse at L5-S1, accompanied by sciatic pain.

- **Postoperative results**

  - **One week:** Moderate pain relief and some improvements in leg pain. The patient started physiotherapy to enhance lower limb strength.

  - **Two weeks:** Significant reduction in spinal and sciatic pain. Increased walking distance from 50 meters pre-surgery to approximately 300 meters without significant pain.

  - **Four weeks:** Substantial improvement in overall quality of life with sustained pain relief. The patient resumed most activities of daily living with minimal discomfort.

Surgical and recovery insights

No intraoperative complications were reported for any of the patients, indicating a high level of surgical precision and effective perioperative management. The postoperative recovery for each patient was within the expected parameters, with no unexpected hospital readmissions or interventions required. The follow-up data suggests a consistent pattern of recovery, characterized by improvements in pain and mobility, which aligns with the expected outcomes for TLIF procedures.

Table 1: Patient demographic and clinical characteristics

Patient ID	Age	Gender	Preoperative diagnosis	Duration of symptoms (years)
P1	34	Female	L4-L5 Degeneration	5
P2	75	Female	Multi-level Lumbar Spondylosis	7
P3	65	Male	Disc Prolapse L5-S1	8

Table 2: Preoperative and postoperative pain scores (VAS)

Patient ID	Preoperative VAS score	1 W	2 W	4 W
P1	8	5	3	0
P2	7	3	2	0
P3	8	4	3	1

Table 3: Functional Mobility Assessment

Patient ID	Preoperative mobility score	1 W	2 W	4 W
P1	30	50	70	90
P2	20	40	80	100
P3	25	45	75	95

Table 4: Surgical data and complications

Patient ID	Surgery duration (hours)	Blood Loss (ml)	Intraoperative complications	Postoperative complications
P1	3.0	200	None	None
P2	2.5	150	None	None
P3	3.5	180	None	Mild Infection

Table 5: Patient satisfaction and quality of life indices

Patient ID	Preoperative quality of life score	1 W	2 W	4 W
P1	40	60	80	100
P2	30	50	90	100
P3	35	55	85	90

DISCUSSION

The implementation of Transforaminal Lumbar Interbody Fusion (TLIF) in a peripheral hospital setting in Bharatpur, Rajasthan, offers compelling insight into the adaptability and potential of advanced surgical procedures outside urban medical centers. This discussion elaborates on the findings of the case series, emphasizing the strategic implications for healthcare systems in similar settings [8, 9].

Surgical challenges and adaptations

The primary concern in executing complex surgeries like TLIF in peripheral settings revolves around the availability of sophisticated equipment and skilled surgical personnel. Despite these challenges, the successful outcomes observed in this series underscore the possibility of conducting advanced procedures with meticulous preoperative planning and intraoperative adaptability. The absence of intraoperative complications and the positive recovery trajectories highlight the effectiveness of the surgical techniques and protocols adapted to the resource-constrained environment [10, 11].

Impact on patient quality of life

The significant improvements in pain and mobility documented in this case series not only enhance individual patient outcomes but also contribute to broader socio-economic benefits. Reduction in chronic pain and enhanced mobility contribute to increased productivity and reduced healthcare costs associated with long-term pain management [12, 13].

Healthcare system implications

The successful implementation of TLIF in a peripheral setting suggests a viable model for decentralizing advanced medical procedures. This approach could alleviate the burden on tertiary care centers and make specialized care more accessible to populations in rural or underserved areas. Furthermore, the training of local surgeons and healthcare staff in such advanced techniques could foster more sustainable healthcare practices [14, 15].

Future directions

This case series sets a precedent for future studies to explore similar surgical interventions in other low-resource settings. Longitudinal studies with larger patient cohorts are necessary to further validate the efficacy and safety of TLIF in peripheral hospitals. Additionally, research into patient satisfaction and long-term outcomes post-TLIF can provide deeper insights into the procedural viability and its holistic impact on patients' lives.

Strategic enhancements

To replicate and scale the success of TLIF in other peripheral settings, strategic enhancements in medical infrastructure, continuous professional development, and establishment of regional centers of excellence are crucial. These initiatives can bridge the gap in healthcare disparities and ensure that advanced medical treatments become a norm rather than an exception in rural healthcare landscapes.

Overall, our study not only highlights the technical feasibility of performing TLIF in resource-limited settings but also catalyzes a shift in how healthcare systems can approach surgical care in rural areas, ultimately leading to improved patient outcomes and expanded access to advanced medical interventions.

CONCLUSION

This case series underscores the feasibility and efficacy of Transforaminal Lumbar Interbody Fusion (TLIF) in a peripheral hospital setting, demonstrating significant improvements in pain relief and functional mobility among patients. By effectively implementing TLIF in resource-limited environments like Bharatpur Rajasthan, it highlights the potential for advanced surgical procedures to be more widely adopted, enhancing healthcare equity. These findings advocate for strategic enhancements in healthcare infrastructure and training, aiming to decentralize advanced medical care and make it accessible in rural areas, thus broadening the scope of high-quality spinal care.

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AUTHORS CONTRIBUTIONS

All authors have contributed equally

CONFLICT OF INTERESTS

Declared none

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