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Original Research Article

# Outcomes of Surgical Intervention in Postoperative Lumbar Intervertebral Discitis: A Clinical Evaluation

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**Abstract:** ***Background:*** Postoperative lumbar intervertebral discitis (PLID) is a rare but serious complication of spinal surgery, often resulting in significant pain, functional impairment, and prolonged recovery. This study aimed to evaluate the clinical and laboratory outcomes of surgical intervention in managing PLID and to identify factors influencing recovery. ***Methods:*** This cross-sectional study was conducted over one year at multiple hospitals. Data from patients who underwent surgical intervention for PLID were analyzed. Clinical outcomes, including Visual Analog Scale (VAS) and Oswestry Disability Index (ODI) scores, and laboratory parameters such as C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), and white blood cell count, were compared preoperatively and postoperatively. Subgroup and logistic regression analyses were performed to identify predictors of delayed recovery. ***Results:*** A total of 50 patients were included in the study. Significant improvements were observed in postoperative VAS ($8.2 \pm 1.1$ vs. $3.1 \pm 0.8$, $p < 0.001$) and ODI scores ($65.4 \pm 8.9\%$ vs. $24.3 \pm 6.5\%$, $p < 0.001$). Laboratory markers, including CRP ($112.4 \pm 35.7$ mg/L vs. $8.2 \pm 3.1$ mg/L, $p < 0.001$) and ESR ($68.5 \pm 21.4$ mm/h vs. $14.2 \pm 4.7$ mm/h, $p < 0.001$), also showed significant reductions postoperatively. Subgroup analysis revealed that diabetes mellitus and prolonged preoperative symptom duration were associated with delayed recovery. Logistic regression identified elevated preoperative CRP levels and symptom duration as independent predictors of prolonged recovery. ***Conclusion:*** Surgical intervention is highly effective in improving pain, functional outcomes, and inflammatory marker resolution in patients with PLID. Early diagnosis and timely surgical management are crucial to optimizing recovery, especially in patients with comorbid conditions.

**Keywords:** postoperative lumbar intervertebral discitis, spinal surgery complications, surgical intervention, pain relief, functional recovery, inflammatory markers

## INTRODUCTION

Postoperative lumbar intervertebral discitis (PLID) is a rare yet serious complication that can occur following lumbar spine surgery. It is characterized by inflammation of the intervertebral disc and adjacent vertebral endplates, often resulting from bacterial infection [1]. The incidence of PLID is estimated to range from 0.2% to 2% following spinal surgery, with higher rates reported in cases involving instrumentation or prolonged surgery [2]. Although this condition is uncommon, its clinical consequences can be severe, including chronic pain, neurological deficits, and the potential for permanent disability if not properly managed [3].

The pathogenesis of PLID is believed to be multifactorial, with factors such as surgical trauma, infection, and the patient's immune status playing a crucial role. Microbial infection is often the primary cause, with Staphylococcus aureus being the most commonly isolated pathogen [4]. Other microorganisms, including Escherichia coli, Pseudomonas aeruginosa, and Enterobacter spp., have also been implicated in PLID cases, particularly in immunocompromised patients or those with diabetes mellitus [5]. In addition to infection, surgical procedures, especially those involving hardware placement or spinal fusion, increase the risk of discitis due to tissue manipulation, prolonged operative time,

and the presence of foreign materials that can act as a nidus for infection [6].

Clinical presentation of PLID can vary, but patients commonly present with persistent or worsening back pain, fever, and elevated inflammatory markers such as C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) [7]. Neurological deficits, including weakness, sensory loss, or bowel and bladder dysfunction, may also be present, particularly when the infection spreads to involve the spinal cord or nerve roots. Diagnostic evaluation typically involves a combination of clinical assessment, imaging studies (e.g., MRI, CT scans), and laboratory investigations to confirm the diagnosis. Magnetic resonance imaging (MRI) is the gold standard, revealing characteristic findings such as disc space narrowing, vertebral endplate destruction, and the presence of abscesses [8].

Treatment of PLID primarily involves antibiotics, but surgical intervention may be necessary for patients who fail conservative management or develop complications such as abscess formation or spinal instability [9]. Surgical options include debridement of infected tissue, spinal stabilization, and in some cases, spinal fusion. The goal of surgery is to remove infected tissue, control the spread of infection, and restore spinal stability. However, surgical treatment carries inherent risks, including further infection, nerve injury, or mechanical failure of instrumentation, making the decision to operate complex and individualized [10].

Despite advancements in both diagnostic and therapeutic modalities, PLID remains a significant challenge due to its potential for long-term morbidity. In recent years, there has been increasing attention on evaluating the outcomes of surgical interventions for PLID, particularly in terms of pain relief, functional recovery, and infection resolution. A better understanding of the clinical, radiological, and laboratory outcomes after surgical management is critical to improving patient care and optimizing treatment strategies. This study aims to evaluate the outcomes of surgical intervention for PLID, with a focus on clinical improvement, inflammatory marker resolution, and the identification of potential predictors of recovery. By reviewing patient records from a one-year period at a tertiary care hospital, this study seeks to provide valuable insights into the effectiveness of surgical treatment for this challenging condition.

## METHODS

### Study Design

This cross -sectional study was conducted at multiple hospital, over a one-year period from January 2015 to December 2015. The study aimed to evaluate the outcomes of surgical intervention in patients diagnosed with postoperative lumbar intervertebral discitis (PLID). The research focused on assessing clinical outcomes, pain relief, functional recovery, and infection resolution after surgical treatment, as well as identifying factors that influence recovery.

### Study Population

The study population consisted of 50 patients who were diagnosed with postoperative lumbar intervertebral discitis (PLID) and underwent surgical intervention over a one-year period. These patients were selected from a larger cohort of individuals who experienced lumbar spine surgery and subsequently developed PLID, a rare but serious complication.

**Patients who met the following inclusion criteria were considered for the study:**

- Diagnosis of postoperative lumbar intervertebral discitis, confirmed through clinical assessment, imaging studies (e.g., MRI, CT), and laboratory investigations (elevated inflammatory markers such as C-reactive protein [CRP] and erythrocyte sedimentation rate [ESR]).
- Failure to respond to conservative treatment, including prolonged use of antibiotics and pain management, for a minimum of 4–6 weeks.
- Underwent surgical intervention, including debridement and, where necessary, spinal stabilization.
- Available follow-up data for a minimum of 6 months post-surgery.

**Exclusion criteria included:**

- Patients with active systemic infections not related to PLID.
- Patients with incomplete medical records or lost to follow-up.

### Data Collection

This study utilized a cross-sectional design to assess the outcomes of surgical intervention for postoperative lumbar intervertebral discitis (PLID) at multiple hospitals over the course of one year. Data were retrospectively collected from hospital records, including patient charts, surgical logs, and follow-up reports. The following systematic approach was used to gather relevant information:

### Patient Identification and Selection

Patients diagnosed with PLID and who underwent surgical intervention during the study period were identified through the hospital's electronic health record (EHR) system. Inclusion and exclusion criteria were applied to select a final cohort of 50 patients. Patient identifiers were anonymized to ensure confidentiality and compliance with ethical standards.

### Clinical Data Collection

Comprehensive patient data were collected from hospital charts and EHRs, which provided detailed information on the following parameters:

- Demographic Information: Age, sex, and relevant medical history (e.g., comorbidities such as

diabetes mellitus, hypertension, smoking history, and obesity).

- Preoperative Data:
  - Clinical Presentation: Symptoms such as pain (Visual Analog Scale [VAS]), fever, and neurological deficits (e.g., motor weakness, sensory loss).
  - Radiological Findings: MRI and CT scans were reviewed to confirm the diagnosis of PLID, including identifying disc space narrowing, endplate destruction, abscess formation, or other relevant features.
  - Laboratory Data: Preoperative inflammatory markers such as CRP, ESR, and white blood cell count were recorded.

**Surgical Intervention Data**

Details of the surgical procedures were extracted from the hospital's surgical log, including:

- Type of Surgery: The nature of the surgical intervention (e.g., debridement, spinal stabilization, fusion) was documented.
- Intraoperative Findings: Information on the presence of infection, the extent of debridement, and any need for spinal stabilization or fusion.
- Antibiotic Treatment: Antibiotics administered during and after surgery were noted, along with any changes in regimen based on culture results.

**Postoperative Data Collection**

Postoperative data were collected during routine follow-up visits, typically scheduled at 1 month, 3 months, 6 months, and 12 months after surgery. Follow-up assessments included:

Clinical Outcomes:

- Pain Relief: Measured using the Visual Analog Scale (VAS), with comparisons made between preoperative and postoperative pain levels.
- Functional Recovery: Evaluated using the Oswestry Disability Index (ODI), documenting improvements in patients' ability to perform daily activities.
- Neurological Status: Documentation of any improvement in neurological deficits such as motor function, sensation, or bowel/bladder control.

Laboratory Outcomes:

- Postoperative CRP, ESR, and white blood cell count were measured at regular intervals (usually 1 week, 3 weeks, and 3 months after surgery) to assess infection resolution.

**Complications and Adverse Events**

Any surgical complications, such as wound infection, hematoma formation, or neurological deterioration, were identified through medical records and follow-up visits. These were classified as either minor or major complications based on clinical severity.

**Data Validation and Quality Control**

To ensure the accuracy of the data, a second researcher performed an independent review of a subset of patient records (10% of the total cohort). Discrepancies were resolved through consensus and consultation with the attending surgeons and clinical team. Missing or incomplete data were handled by reviewing the patient's full medical history, ensuring that all relevant outcomes were captured for analysis.

**Data Analysis**

Data analysis was performed using SPSS Statistics (Version 25), incorporating both descriptive and inferential statistical methods. Descriptive statistics were used to summarize continuous variables, including age, Visual Analog Scale (VAS) scores, Oswestry Disability Index (ODI) scores, C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), and white blood cell count, with results presented as means ± standard deviations (SD). Categorical variables, such as sex, comorbidities, and complications, were reported as frequencies and percentages. For comparative analysis, paired t-tests were conducted to assess the significance of changes in preoperative and postoperative continuous variables, including VAS scores, ODI scores, CRP, and ESR. Additionally, Chi-square tests were utilized to evaluate the relationship between categorical variables, such as complications and comorbidities, and recovery outcomes. Subgroup analyses were performed to explore the impact of factors like comorbidities (e.g., diabetes and hypertension), preoperative symptom duration, and baseline inflammatory markers (CRP and ESR) on recovery time and surgical outcomes. To further investigate predictors of delayed recovery, logistic regression was employed, identifying independent variables such as age, sex, comorbidities, and preoperative laboratory markers, with results reported as odds ratios and 95% confidence intervals. A significance level of $p < 0.05$ was set for all statistical analyses.

**Ethical Considerations**

The study was conducted in compliance with ethical guidelines and institutional review board (IRB) regulations. Patient consent for participation was not required as this was a retrospective study using anonymized data, but approval was obtained from the institutional ethics committee. Data confidentiality was strictly maintained throughout the study period.

**RESULTS**

A total of 50 patients with postoperative lumbar intervertebral discitis (PLID) were included in the study. Most patients were male, with a mean age of 48.2 years. Common symptoms included severe back pain, fever, and elevated inflammatory markers. Neurological deficits were present in 38% of the patients. The mean duration of symptoms before surgical intervention was approximately 6 weeks. The baseline characteristics are summarized in Table 1.

**Table 1: Baseline Characteristics of Patients with PLID**

| Variable | Mean ± SD / n (%) |
|---|---|
| **Age (years)** | 48.2 ± 12.6 |
| **Gender** | |
| Male | 33 (66%) |
| Female | 17(34%) |
| **Body Mass Index (BMI, kg/m²)** | 27.1 ± 3.4 |
| **Diabetes Mellitus** | 15 (30%) |
| **Hypertension** | 12 (24%) |
| **Smoking History** | 10 (20%) |
| **Duration of Symptoms (weeks)** | 6.3 ± 2.7 |
| **Neurological Deficit** | 19 (38%) |
| **Preoperative CRP (mg/L)** | 112.4 ± 35.7 |
| **Preoperative ESR (mm/h)** | 68.5 ± 21.4 |
| **Preoperative White Blood Cell Count (×10⁹/L)** | 13.8 ± 4.2 |
| **Prior Conservative Treatment** | 50 (100%) |

Table 2 presents a detailed comparison of clinical and laboratory outcomes before and after surgical intervention for postoperative lumbar intervertebral discitis. The Visual Analog Scale (VAS) scores showed a marked reduction from a preoperative mean of 8.2 ± 1.1 to a postoperative mean of 3.1 ± 0.8, reflecting significant pain relief ($p < 0.001$). Similarly, the Oswestry Disability Index (ODI) demonstrated substantial functional improvement, with mean scores decreasing from 65.4 ± 8.9% preoperatively to 24.3 ± 6.5% postoperatively ($p < 0.001$). Laboratory markers of inflammation, including C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR), showed significant declines, with CRP levels reducing from 112.4 ± 35.7 mg/L to 8.2 ± 3.1 mg/L and ESR from 68.5 ± 21.4 mm/h to 14.2 ± 4.7 mm/h (both $p < 0.001$). Additionally, the mean white blood cell count decreased from 13.8 ± 4.2 × 10⁹/L preoperatively to 6.9 ± 1.8 × 10⁹/L postoperatively ($p < 0.001$). These results collectively underscore the effectiveness of surgical intervention in alleviating pain, improving functional outcomes, and resolving systemic inflammation.

**Table 2: Clinical and Laboratory Outcomes Before and After Surgery**

| Parameter | Preoperative (Mean ± SD) | Postoperative (Mean ± SD) | P-value |
|---|---|---|---|
| **Visual Analog Scale (VAS, 0–10)** | 8.2 ± 1.1 | 3.1 ± 0.8 | <0.001 |
| **Oswestry Disability Index (ODI, %)** | 65.4 ± 8.9 | 24.3 ± 6.5 | <0.001 |
| **C-Reactive Protein (CRP, mg/L)** | 112.4 ± 35.7 | 8.2 ± 3.1 | <0.001 |
| **Erythrocyte Sedimentation Rate (ESR, mm/h)** | 68.5 ± 21.4 | 14.2 ± 4.7 | <0.001 |
| **White Blood Cell Count (×10⁹/L)** | 13.8 ± 4.2 | 6.9 ± 1.8 | <0.001 |

Table 3 highlights the follow-up outcomes of patients undergoing surgical intervention for postoperative lumbar intervertebral discitis. The majority of patients (92%) achieved complete resolution of infection, with only 8% requiring additional management for partial resolution. Functional recovery was notable, as 84% of patients successfully returned to normal daily activities within six months postoperatively. Furthermore, 72% of patients achieved good-to-excellent scores on the Oswestry Disability Index (ODI), indicating substantial improvement in physical function. Neurological recovery was observed in 84% of patients who initially presented with deficits, demonstrating the effectiveness of surgery in addressing neurological compromise. Minor surgical complications, such as wound dehiscence or transient neurological irritation, were reported in only 8% of patients, underscoring the safety and efficacy of the surgical approach in managing this challenging condition.

**Table 3: Follow-Up Outcomes After Surgical Intervention**

| Outcome | n (%) |
|---|---|
| **Complete Resolution of Infection** | 46 (92%) |
| **Partial Infection Resolution** | 4 (8%) |
| **Return to Normal Activities** | 42 (84%) |
| **Good-to-Excellent ODI Scores** | 36 (72%) |
| **Neurological Recovery** | 16 (84% of affected patients) |
| **Minor Surgical Complications** | 4 (8%) |

Table 4 presents the results of a subgroup analysis examining factors that influence delayed recovery in patients undergoing surgical intervention for postoperative lumbar intervertebral discitis. The analysis identifies several key variables associated with slower recovery. Notably, patients with diabetes mellitus experienced significantly delayed recovery, with 75% of those in the delayed recovery group having this comorbidity, compared to 21% in the timely recovery group ($p < 0.01$). Similarly, hypertension was more prevalent in the delayed recovery group (50% vs. 19%, $p = 0.02$). A longer duration of preoperative symptoms (mean of 9.1 ± 2.2 weeks in the delayed recovery group versus 5.7 ± 1.9 weeks in the timely recovery group, $p < 0.001$) was also associated with poorer outcomes. Elevated preoperative C-reactive protein (CRP) levels (145.6 ± 22.3 mg/L vs. 105.1 ± 30.4 mg/L, $p < 0.01$) further correlated with delayed recovery, suggesting that higher levels of systemic inflammation may impede recovery. These findings underscore the importance of managing comorbidities and addressing prolonged symptom duration to improve recovery times in this patient population.

**Table 4: Factors Influencing Delayed Recovery**

| Factor | Delayed Recovery (n=8) | Timely Recovery (n=42) | P-value |
|---|---|---|---|
| **Diabetes Mellitus** | 6 (75%) | 9 (21%) | <0.01 |
| **Hypertension** | 4 (50%) | 8 (19%) | 0.02 |
| **Smoking History** | 3 (38%) | 7 (17%) | 0.12 |
| **Duration of Symptoms (weeks)** | 9.1 ± 2.2 | 5.7 ± 1.9 | <0.001 |
| **Preoperative CRP (mg/L)** | 145.6 ± 22.3 | 105.1 ± 30.4 | <0.01 |

## DISCUSSION

This study aimed to assess the outcomes of surgical intervention for postoperative lumbar intervertebral discitis (PLID), focusing on clinical improvement, inflammatory marker resolution, and predictors of recovery. Our findings suggest that surgical treatment for PLID significantly improves clinical outcomes, with notable reductions in pain (VAS scores), functional disability (ODI scores), and inflammatory markers (CRP, ESR, white blood cell count). These results align with previous studies that have demonstrated the effectiveness of surgical intervention in managing postoperative discitis.

The significant reduction in Visual Analog Scale (VAS) scores from a preoperative mean of 8.2 ± 1.1 to a postoperative mean of 3.1 ± 0.8 ($p < 0.001$) observed in our study is consistent with findings from a study, where reported substantial improvements in pain relief after surgery for PLID. In their cohort, surgical debridement and stabilization were associated with decreased VAS scores and improved pain control [11]. Similarly, another study found that surgical intervention, especially debridement and spinal stabilization, led to significant pain relief and better long-term outcomes for patients suffering from postoperative discitis [12]. The reduction in pain observed in our study may be attributed to the removal of infected tissue and the restoration of spinal stability, which are critical in alleviating discomfort associated with discitis.

Our results regarding the Oswestry Disability Index (ODI) are similarly consistent with the literature. The significant improvement in functional status observed in our cohort (ODI reduced from 65.4 ± 8.9 preoperatively to 24.3 ± 6.5 postoperatively, $p < 0.001$) corroborates findings, where noted that surgical management led to considerable functional recovery in PLID patients. Their study emphasized that, beyond pain reduction, restoring function is a key outcome in PLID management, with patients reporting improvements in daily activities, mobility, and overall quality of life post-surgery [13]. Our study similarly highlights the substantial functional improvements after surgical intervention, underscoring its importance in the treatment of PLID.

In terms of inflammatory marker resolution, our study demonstrated a marked reduction in C-reactive protein (CRP) (from 112.4 ± 35.7 mg/L preoperatively to 8.2 ± 3.1 mg/L postoperatively, $p < 0.001$) and erythrocyte sedimentation rate (ESR) (from 68.5 ± 21.4 mm/h preoperatively to 14.2 ± 4.7 mm/h postoperatively, $p < 0.001$), aligning with the findings of a study. They observed a significant decrease in inflammatory markers following surgical debridement and antibiotic therapy, indicating a resolution of infection [14]. Our results further confirm that postoperative reductions in CRP and ESR are valuable indicators of infection resolution and successful surgical intervention.

The white blood cell count in our study also showed a significant decline postoperatively, from 13.8 ± 4.2 × $10^9$/L to 6.9 ± 1.8 × $10^9$/L ($p < 0.001$). Elevated white blood cell count is commonly associated with infection, and the normalization of this marker after surgery suggests the successful eradication of the infective process. This aligns with the results, where found similar trends in white blood cell count reduction following surgical intervention for PLID, reinforcing the role of surgery in managing this potentially devastating condition [15].

Subgroup analysis in our study revealed that comorbidities such as diabetes mellitus and prolonged symptom duration prior to surgery were associated with

delayed recovery. This finding is consistent with previous studies that have suggested that patients with diabetes or other immune-compromising conditions are at higher risk of developing more severe infections and slower recovery postoperatively [16]. Another study also reported that longer preoperative symptom duration correlated with worse postoperative outcomes, potentially due to prolonged infection and its associated complications [17].

Our study also highlights the importance of early intervention in managing PLID. The patients who underwent surgery earlier in the course of infection experienced more favorable outcomes, similar to the findings of the study, where emphasized that timely surgical intervention, particularly before neurological deficits or abscess formation occur, significantly improves prognosis and reduces long-term complications [18].

## CONCLUSION

This study highlights the significant effectiveness of surgical intervention in the management of postoperative lumbar intervertebral discitis (PLID). Our findings demonstrate that surgery, particularly debridement and spinal stabilization, results in marked improvements in pain relief, functional recovery, and the resolution of inflammatory markers such as CRP, ESR, and white blood cell count. These outcomes are consistent with previous literature, reinforcing the role of surgery in managing this serious complication following lumbar spine procedures. However, the presence of comorbidities such as diabetes and prolonged symptom duration before surgery were identified as factors influencing delayed recovery, underscoring the importance of early diagnosis and timely intervention.

Given the positive outcomes observed in our cohort, early surgical intervention should be considered a critical part of the treatment strategy for PLID, especially in patients at risk for more severe infections or complications. Future studies with larger sample sizes and longer follow-up periods are needed to further validate these findings and explore the long-term outcomes of surgical treatment for PLID.

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