Original Research

FUNCTIONAL OUTCOMES OF LUMBAR DISCECTOMY VERSUS CONSERVATIVE MANAGEMENT IN LUMBAR DISC PROLAPSE: A PROSPECTIVE COMPARATIVE STUDY

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ABSTRACT

Background: Lumbar disc prolapse (LDP) is a common cause of low back pain and radiculopathy, significantly affecting functional capacity and quality of life. Although both surgical and conservative treatments are widely used, the optimal management strategy remains controversial.

Objective: To compare the functional outcomes of lumbar discectomy versus conservative management in patients with lumbar disc prolapse.

Methods: This prospective comparative study was conducted at Government Dindigul Medical College Hospital from January 2024 to January 2026. A total of 50 patients aged 30–60 years with clinically and radiologically confirmed lumbar disc prolapse were included. Patients were divided into two groups: surgical (lumbar discectomy) and conservative management. Outcomes were assessed using the Visual Analog Scale (VAS) for pain and Oswestry Disability Index (ODI) for functional status at baseline, 6 weeks, 3 months, 6 months, and 12 months.

Results: Both groups showed significant improvement in VAS and ODI scores over time. The surgical group demonstrated significantly greater reduction in pain and disability at early follow-up (6 weeks and 3 months) compared to the conservative group ($p < 0.001$). However, by 12 months, the difference between groups was not statistically significant (VAS: $p = 0.08$; ODI: $p = 0.06$). Patients undergoing surgery returned to work earlier (6.2 ± 1.8 weeks vs 10.4 ± 2.3 weeks; $p < 0.001$). Minor complications were noted in the surgical group, while a subset of conservatively managed patients required delayed surgical intervention.

Conclusion: Lumbar discectomy provides faster pain relief and earlier functional recovery compared to conservative management. However, long-term outcomes are comparable between the two approaches. Treatment should be individualized, with surgery reserved for patients with persistent symptoms or neurological deficits, while conservative management remains effective in selected cases.

Keywords: Lumbar Disc Prolapse, Lumbar Discectomy, Conservative Management, Radiculopathy, Oswestry Disability Index, Visual Analog Scale, Functional Outcome.

INTRODUCTION

Lumbar disc prolapse (LDP) is a common spinal disorder and a leading cause of low back pain and radiculopathy, particularly affecting individuals between 30 and 60 years of age. It occurs due to herniation of the nucleus pulposus through the annulus fibrosus, resulting in compression of adjacent nerve roots. Clinically, patients typically present with low back pain radiating to the lower limbs, often accompanied by sensory disturbances and, in some cases, motor deficits. This condition contributes significantly to disability, reduced

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quality of life, and loss of productivity, thereby imposing a considerable socioeconomic burden.

The management of lumbar disc prolapse has evolved over time; however, the optimal treatment strategy remains a subject of ongoing debate. Broadly, treatment options are categorized into conservative and surgical approaches. Conservative management includes analgesics, nonsteroidal anti-inflammatory drugs, physiotherapy, and lifestyle modifications. A substantial proportion of patients show improvement with nonoperative care, supporting its role as the initial treatment modality in most cases without severe neurological deficits. Observational studies have demonstrated that even patients with significant symptoms can achieve satisfactory outcomes with conservative treatment over time [1,2].

Surgical intervention, most commonly lumbar discectomy, is generally reserved for patients with persistent symptoms, progressive neurological deficits, or failure of conservative therapy. The primary aim of surgery is to relieve nerve root compression and provide rapid pain relief and functional recovery. High-quality studies have compared surgical and nonoperative treatments. The Spine Patient Outcomes Research Trial (SPORT) demonstrated that surgical treatment offers faster improvement in pain and function compared to nonoperative care, particularly in the early phases [5,6]. However, long-term follow-up indicates that the differences in outcomes between the two approaches tend to diminish over time.

Randomized controlled trials have further examined this comparison. Peul et al. reported that early surgical intervention for sciatica due to lumbar disc herniation resulted in quicker relief of leg pain, although outcomes at two years were similar to prolonged conservative management [3]. Similarly, cohort studies have shown that while surgery leads to faster symptom resolution, both treatment strategies ultimately achieve comparable functional outcomes in many patients [7].

Beyond clinical outcomes, quality of life and cost considerations are important. Health-related quality of life measures, such as the EuroQol-5D, have demonstrated that surgical intervention can provide significant early improvements [8]. Advances in minimally invasive techniques, including tubular microdiscectomy, have further enhanced outcomes by reducing perioperative morbidity [10].

Despite these developments, concerns remain regarding complications and reoperation rates following surgery, highlighting the need for careful patient selection and long-term follow-up [4]. Therefore, this study aims to compare functional outcomes of lumbar discectomy versus conservative management in patients with lumbar disc prolapse.

MATERIAL AND METHODS

Study Design

This study was conducted as a prospective, comparative, observational study to evaluate and compare the functional outcomes of lumbar discectomy versus conservative management in patients diagnosed with lumbar disc prolapse. The prospective nature of the study allowed for systematic patient enrolment, uniform data collection, and longitudinal follow-up, thereby improving the reliability of outcome assessment and minimizing retrospective bias.

Study Setting

The study was carried out at Government Dindigul Medical College Hospital, Tamil Nadu, a tertiary care teaching institution that serves as a major referral centre for spinal disorders. Patients were recruited from the Orthopaedics and Pain Clinic outpatient departments, as well as from inpatient wards.

Study Duration

The total duration of the study was 24 months, from January 2024 to January 2026, which included:

- Patient recruitment phase
- Intervention phase
- Follow-up and outcome assessment phase

Study Population

All patients presenting with symptoms suggestive of lumbar disc prolapse during the study period were screened. Diagnosis was established through comprehensive clinical evaluation and MRI confirmation, ensuring accuracy and consistency in patient selection.

Sample Size and Sampling Technique

A total of 50 patients were included in the study using a non-probability convenience sampling method, based on patient availability and eligibility during the study period.

Patients were allocated into two groups based on treatment modality after clinical evaluation and informed decision-making:

- **Group A (Surgical Group):** Patients undergoing lumbar discectomy
- **Group B (Conservative Group):** Patients receiving nonoperative treatment

Although randomization was not performed, efforts were made to maintain baseline comparability between groups in terms of age, sex, and severity of symptoms

Eligibility Criteria

Inclusion Criteria

Patients were included if they satisfied all of the following:

- Age between 30 and 60 years

- Clinical features of lumbar disc prolapse (low back pain with radiculopathy)
- MRI-confirmed lumbar disc herniation
- Symptoms persisting for at least 4–6 weeks despite initial conservative care
- Ability and willingness to provide informed consent and comply with follow-up

Exclusion Criteria

Patients were excluded if they had:

- History of previous lumbar spine surgery
- Spinal trauma, infection (e.g., tuberculosis), or malignancy
- Congenital spinal deformities
- Cauda equina syndrome requiring emergency intervention
- Severe systemic comorbidities contraindicating surgery
- Pregnancy
- Inability to participate in follow-up or incomplete clinical data

Baseline Clinical Assessment

All patients underwent standardized clinical evaluation at presentation. Detailed history included symptom duration, radicular pain characteristics, neurological symptoms, and functional limitation. Physical examination assessed spinal alignment, paraspinal tenderness, and lumbar range of motion. Neurological examination included motor strength (MRC grading), sensory deficits, deep tendon reflexes, and provocative tests such as the Straight Leg Raising Test. Clinical findings were used to localize the affected level and correlated with imaging.

Radiological Assessment

All patients underwent MRI of the lumbosacral spine, which was used to confirm the diagnosis, identify the level of disc prolapse, determine the side of nerve root compression, and assess the severity of herniation.

The commonly evaluated levels included L3–L4, L4–L5, and L5–S1. MRI findings were correlated with clinical symptoms before deciding the line of management.

Treatment Protocol

Conservative Management

Patients allocated to conservative management underwent a structured, stepwise treatment approach. Pharmacological therapy included nonsteroidal anti-inflammatory drugs, muscle relaxants, and neuropathic agents such as pregabalin or gabapentin. In selected patients with severe radicular inflammation, short courses of oral corticosteroids were administered.

A supervised physiotherapy program was implemented for all patients, incorporating McKenzie extension exercises, core stabilization, lumbar strengthening, and flexibility training, particularly hamstring stretching. Patients were also counselled regarding ergonomic modifications, avoidance of aggravating activities, and adherence to rehabilitation protocols. In cases of persistent radicular pain despite initial therapy, epidural steroid injections were administered under aseptic conditions.

Surgical Management

Indications for Surgery

Surgical intervention was considered in patients with persistent symptoms beyond 6–12 weeks of adequate conservative treatment, progressive neurological deficits, or severe functional impairment.

Preoperative Preparation and Anaesthesia

All patients underwent routine preoperative evaluation and anesthetic assessment. Procedures were performed under spinal or general anaesthesia based on patient suitability. Patients were positioned prone on a radiolucent table with adequate padding, and intraoperative fluoroscopy was used for level localization.

Surgical Technique

A standard posterior midline approach was employed. After sterile preparation, a midline incision was made, followed by subperiosteal dissection of paraspinal muscles to expose the lamina. The affected level was confirmed using fluoroscopy. Laminotomy and partial flavectomy were performed to expose the dural sac and nerve root. The herniated disc material was removed using pituitary rongeurs to achieve adequate decompression. In selected cases, microdiscectomy using magnification was performed to reduce tissue trauma and improve visualization.

In selected cases, microdiscectomy using magnification was performed to reduce tissue trauma and improve visualization. In some cases, along with laminectomy and discectomy, stabilization with pedicle screw fixation was performed to address associated instability or spondylolisthesis.

Intraoperative Parameters

Key intraoperative parameters recorded included duration of surgery, estimated blood loss, level and type of disc herniation, use of magnification, and intraoperative complications such as dural tears or nerve root injury.

Postoperative Care

Postoperatively, patients were monitored for neurological status, pain relief, and wound condition. Early mobilization within 24–48 hours

was encouraged. Analgesics and prophylactic antibiotics were administered as per institutional protocol. Physiotherapy was initiated early, focusing on gradual mobilization and strengthening, along with guidance on spinal precautions and staged return to routine activities.

Outcome Measures

The primary outcome measure was functional improvement assessed using the Oswestry Disability Index (ODI). Secondary outcomes included pain intensity measured using the Visual Analog Scale (VAS) and neurological recovery assessed through serial clinical examination.

Additional outcome parameters included time to return to daily activities and work, patient satisfaction, and incidence of complications or recurrence.

Follow-up Protocol

Patients were followed prospectively at 6 weeks, 3 months, 6 months, and 12 months post-intervention. At each follow-up visit, standardized assessment of VAS, ODI, and neurological status was performed. Any adverse events or complications were documented.

Data Collection and Management

Data were collected prospectively using a structured case record form. All clinical, radiological, intraoperative, and follow-up data were systematically recorded. Data integrity was ensured through periodic verification by senior investigators. All data were anonymized and entered into a secure electronic database for analysis.

Statistical Analysis

Statistical analysis was performed using standard statistical software. Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequencies and percentages. Comparisons between groups were performed using the student's t-test for continuous variables and the Chi-square test for categorical variables. A p-value of <0.05 was considered statistically significant.

Ethical Considerations

The study protocol was approved by the Institutional Ethics Committee of Government Dindigul Medical College Hospital. Written informed consent was obtained from all participants prior to enrolment.

The study was conducted in accordance with the Declaration of Helsinki and adhered to ethical principles governing biomedical research involving human subjects. Patient confidentiality was strictly maintained, and participation in the study did not interfere with standard clinical care.

RESULTS

Patient Demographics and Baseline Characteristics

A total of 50 patients were included in the study, with 25 patients in the surgical group and 25 in the conservative management group. The mean age of the study population was comparable between the two groups, with no statistically significant difference. There was a slight male predominance in both groups.

The most commonly affected level was L4–L5, followed by L5–S1. Baseline pain (VAS) and disability (ODI) scores were similar between the groups, indicating homogeneity at the start of the study.

Table 1: Baseline Demographic and Clinical Characteristics

Variable	Surgical Group (n=25)	Conservative Group (n=25)	p-value
Mean Age (years)	44.8 ± 7.2	45.6 ± 6.9	0.68
Male (%)	16 (64%)	15 (60%)	0.77
Duration of symptoms (weeks)	8.4 ± 2.1	8.8 ± 2.3	0.54
L4–L5 level	14 (56%)	13 (52%)	0.78
L5–S1 level	9 (36%)	10 (40%)	0.77
Baseline VAS	7.8 ± 0.9	7.6 ± 1.0	0.42
Baseline ODI (%)	62.4 ± 8.5	61.2 ± 7.9	0.59

Pain Outcomes (VAS Score)

Patients in the surgical group demonstrated a significant reduction in pain scores as early as 6 weeks, compared to the conservative group. At 3 months, the difference remained statistically significant. However, by 12 months, both groups showed substantial improvement, with no significant difference between them.

Table 2: Comparison of VAS Scores over Time

Time Interval	Surgical Group	Conservative Group	p-value
Baseline	7.8 ± 0.9	7.6 ± 1.0	0.42
6 weeks	3.2 ± 1.1	5.6 ± 1.2	<0.001

3 months	2.4 ± 0.8	4.1 ± 1.0	<0.001
6 months	1.8 ± 0.7	2.6 ± 0.9	0.01
12 months	1.4 ± 0.6	1.8 ± 0.7	0.08

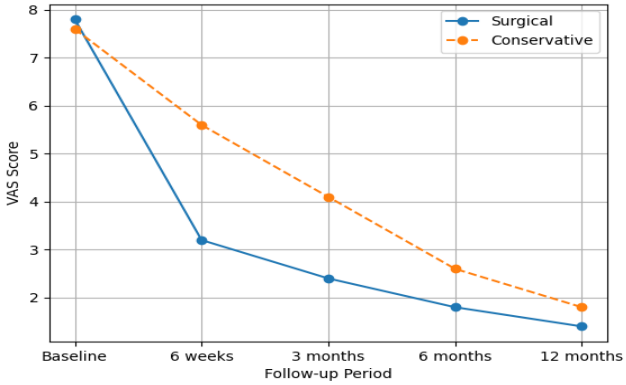

Figure 1: Trend of Visual Analog Scale (VAS) scores over time in surgical and conservative groups.

Functional Outcomes

Functional disability, as measured by ODI, improved significantly in both groups. The surgical group showed earlier and greater improvement at 6 weeks and 3 months, while the difference narrowed at later follow-up intervals.

Table 3: Comparison of ODI Scores over Time

Time Interval	Surgical Group (%)	Conservative Group (%)	p-value
Baseline	62.4 ± 8.5	61.2 ± 7.9	0.59
6 weeks	28.6 ± 6.4	42.8 ± 7.1	<0.001
3 months	20.2 ± 5.2	34.5 ± 6.3	<0.001
6 months	14.6 ± 4.8	20.8 ± 5.5	0.002
12 months	10.8 ± 4.2	13.6 ± 4.9	0.06

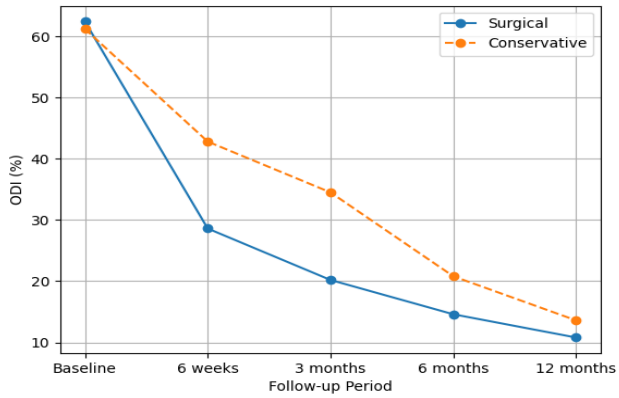

Figure 2: Trend of Oswestry Disability Index (ODI) scores over time in surgical and conservative groups.

Neurological Recovery

Improvement in neurological deficits was observed in both groups; however, recovery was more rapid in the surgical group, particularly in patients with motor weakness. By 12 months, most patients in both groups showed near-complete neurological recovery, with no statistically significant difference.

Return to Work

Patients in the surgical group returned to routine activities and work significantly earlier than those in the conservative group.

Table 4: Return to Work

Parameter	Surgical Group	Conservative Group	p-value
Mean time to return (weeks)	6.2 ± 1.8	10.4 ± 2.3	<0.001

Complications

In the surgical group, minor complications were observed, including superficial wound infection in 2 patients (8%) and dural tear in 1 patient (4%), which was managed intraoperatively. No major neurological deterioration was noted.

In the conservative group, 5 patients (20%) reported persistent symptoms requiring prolonged treatment, and 2 patients (8%) eventually opted for delayed surgery.

Table 5: Complications

Complication	Surgical Group	Conservative Group
Wound infection	2 (8%)	—
Dural tear	1 (4%)	—
Persistent symptoms	—	5 (20%)
Delayed surgery	—	2 (8%)

Summary of Findings

The present study demonstrates that lumbar discectomy provides significantly faster pain relief and functional recovery compared to conservative management, particularly in the early postoperative period. However, long-term outcomes at 12 months were comparable between the two groups, indicating that conservative management remains a viable treatment option in selected patients.

DISCUSSION

The present prospective study evaluated and compared the functional outcomes of lumbar discectomy and conservative management in patients with lumbar disc prolapse. The findings demonstrate that surgical intervention provides more rapid pain relief and earlier functional recovery, whereas long-term outcomes between the two treatment modalities are largely comparable, aligning with contemporary evidence.

A key observation in this study was the significant early improvement in pain (VAS) and disability (ODI) scores in the surgical group, particularly within the first 6 weeks to 3 months. This is consistent with the findings of the Spine Patient Outcomes Research Trial (SPORT), which reported superior short-term outcomes in patients undergoing discectomy compared to nonoperative care [5,6]. Similarly, Peul et al. demonstrated that early surgery leads to faster relief of sciatica symptoms, although differences diminish over time [3]. These findings support the role of surgical decompression in providing immediate mechanical relief of nerve root compression.

Despite the early benefits of surgery, our study found that long-term outcomes at 12 months were comparable between the two groups, with no statistically significant difference in VAS and ODI scores. This observation is in agreement with several long-term cohort studies and randomized trials. Atlas et al. reported similar long-term functional outcomes between surgical and nonoperative groups despite initial differences [7]. Gugliotta et al. and Bailey et al. also observed that although surgery provides faster symptom relief, conservative treatment yields comparable results over time in many patients [1,2].

The results of the present study further reinforce the concept that lumbar disc prolapse is often a self-limiting condition, with a substantial proportion of patients improving with conservative treatment. This is supported by evidence suggesting favourable outcomes with nonoperative care even in patients initially considered surgical candidates [1,2]. However, the delayed recovery observed in the conservative group in our study highlights the potential trade-off between avoiding surgery and prolonged symptom burden.

Return to work was significantly earlier in the surgical group, which is an important functional outcome with socioeconomic implications. Early restoration of function following surgery has been consistently reported in the literature and is a critical factor in treatment decision-making, particularly in working-age individuals [5,6]. From a health economics perspective, early return to productivity may offset the higher initial costs of surgical intervention.

Neurological recovery in this study was comparable between groups at final follow-up, although improvement occurred earlier in the surgical cohort. This finding is consistent with the understanding that decompression facilitates rapid neural recovery, while gradual resolution of inflammation and edema contributes to recovery in conservatively managed patients [3,7].

With regard to complications, the surgical group demonstrated a low incidence of adverse events, including minor wound infection and dural tear, which were managed effectively. These findings are in line with previously reported complication rates in lumbar discectomy. However, the risk of recurrence and reoperation remains a concern. Kim et al. reported measurable reoperation rates following discectomy, emphasizing the importance of patient selection and surgical technique [4].

Advancements in surgical techniques, including microdiscectomy and minimally invasive approaches, have contributed to improved outcomes and reduced perioperative morbidity. Meta-analyses

have demonstrated that tubular and minimally invasive discectomy techniques provide comparable or improved outcomes with reduced tissue trauma and faster recovery [10]. Although such techniques were selectively used in the present study, their broader application may further enhance surgical outcomes.

The findings of this study must also be interpreted in the context of evolving evidence on spinal surgery. While more extensive procedures such as fusion have been explored in degenerative spinal conditions, randomized trials suggest that increased surgical complexity does not necessarily translate into superior outcomes [9]. This underscores the importance of selecting the least invasive yet effective intervention for lumbar disc prolapses.

Overall, the results of this study support a patient-centred approach to management, where treatment decisions are individualized based on symptom severity, functional impairment, and patient preference. Surgery offers clear advantages in terms of rapid symptom relief and early return to function, while conservative management remains a valid and effective option for many patients, particularly those without severe neurological deficits.

CONCLUSION

Lumbar discectomy provides faster pain relief, earlier functional improvement, and quicker return to work compared to conservative management in patients with lumbar disc prolapse. However, long-term outcomes between both groups are comparable, indicating that conservative treatment remains effective in selected patients. Surgical intervention is most beneficial in those with persistent symptoms or neurological deficits, while nonoperative care is appropriate as initial management in the absence of red flags. These findings support an individualized, patient-centred approach, balancing the need for early recovery with the risks and costs of surgery, as both modalities ultimately achieve similar long-term functional outcomes.

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