



SURGICAL VS NON-SURGICAL MANAGEMENT OF LUMBAR DISC PROLAPSE: A SYSTEMATIC REVIEW OF RANDOMIZED AND OBSERVATIONAL STUDIES (2010–2025)

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ABSTRACT

Background: Lumbar disc prolapse is a common cause of low back and radicular leg pain. This review evaluates the effectiveness of surgical versus non-surgical treatment in improving pain and function. **Methods:** A systematic review of Randomized Controlled Trials (RCT) and cohort studies published between 2010 and 2025 was conducted using The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. **Results:** Surgical treatment shows faster short-term relief, while long-term outcomes are similar across both groups. **Conclusion:** Both treatments are effective, with surgery offering quicker recovery; treatment should be tailored to patient needs.

KEYWORDS: This review evaluates the effectiveness of surgical versus non-surgical treatment in improving pain and function.

1. INTRODUCTION

Lumbar disc prolapse (LDP), also known as lumbar disc herniation, is a common degenerative spine condition that contributes significantly to disability worldwide. It occurs when the nucleus pulposus protrudes through the annulus fibrosus, often compressing nearby spinal nerve roots. This anatomical disruption can lead to localized back pain, radiating leg pain (sciatica), sensory disturbances, and motor deficits depending on the severity and location of the herniation.

Epidemiologically, LDP most frequently affects individuals between the ages of 30 and 50, with a higher prevalence among those engaged in heavy labor, repetitive lifting, or sedentary office work with poor posture. It poses a substantial socioeconomic burden due to its impact on workforce participation, healthcare costs, and long-term disability. As such, early and effective management is essential to restore function and minimize chronic impairment.

Treatment strategies are broadly divided into non-surgical and surgical modalities. Non-surgical

management typically includes physical therapy, analgesic medications such as NSAIDs and muscle relaxants, activity modification, and occasionally corticosteroid injections. While many patients respond favorably to conservative measures, particularly in the absence of progressive neurological symptoms, others may experience persistent or worsening symptoms.

Surgical treatment, most commonly discectomy or microdiscectomy, is recommended when conservative therapies fail, or when there is progressive neurological deficit or cauda equina syndrome. Surgery provides rapid decompression of affected nerve roots, often resulting in faster symptom resolution and earlier return to daily activities.

However, debate continues regarding the optimal timing and indications for surgery versus conservative treatment. While numerous studies have examined the efficacy of each approach, results vary depending on study design, population, and follow-up duration. Hence, synthesizing high-quality evidence from randomized

controlled trials and real-world cohort data is crucial for informed decision-making.

This systematic review aims to compare the effectiveness of surgical and non-surgical management of lumbar disc prolapse in adults, focusing on outcomes related to pain relief, functional recovery, and long-term prognosis. The review includes studies published between 2010 and 2025 to capture contemporary practice and outcomes.

1.1 Forms of Operative and Non-Operative Management

Operative Management

Surgical treatment for lumbar disc prolapse is primarily indicated when patients experience:

- Persistent or worsening neurological symptoms
- Severe pain unresponsive to conservative measures
- Signs of cauda equina syndrome

Common operative techniques include

- **Standard Discectomy:** Removal of herniated disc material through open surgery to decompress the nerve root.
- **Microdiscectomy:** A minimally invasive variation using a microscope for enhanced precision and reduced tissue damage.
- **Endoscopic Discectomy:** Performed using tubular retractors and endoscopic guidance; associated with quicker recovery.
- **Laminectomy/Laminotomy:** Removal of part (laminotomy) or all (laminectomy) of the vertebral lamina to relieve pressure, often used if spinal stenosis coexists.
- **Minimally Invasive Spine Surgery (MISS):** Techniques that reduce muscle disruption and hospital stay, including tubular microdiscectomy or percutaneous procedures.

Non-Operative (Conservative) Management

Non-operative treatment is often first-line in the absence of red flags (e.g., progressive motor deficit, cauda equina). These strategies aim to relieve symptoms, improve function, and prevent recurrence.

Main non-surgical approaches

- **Physical Therapy:** Targeted exercises to improve spinal stability, flexibility, and core strength. Includes McKenzie method and motor control training.
- **Pharmacological Therapy.**
 - NSAIDs for pain and inflammation
 - Muscle relaxants for spasms
 - Neuropathic agents (e.g., pregabalin, gabapentin)
- **Epidural Steroid Injections:** Corticosteroids delivered via transforaminal or interlaminar route to reduce inflammation and radicular pain.
- **Activity Modification:** Guidance on posture, ergonomics, and temporary activity restriction to reduce stress on the lumbar spine.
- **Cognitive Behavioral Therapy (CBT):** Addresses psychosocial components of chronic pain, helping reduce pain perception and disability.
- **Traction Therapy:** Mechanical decompression via spinal traction, though evidence of effectiveness is limited.

2. METHODS

This review followed PRISMA guidelines. Studies included adults with lumbar disc prolapse and compared surgical to non-surgical management. RCTs and cohort studies published from 2010 to 2025 were included. Risk of bias was assessed using the Cochrane tool (RCTs) and Newcastle-Ottawa Scale (cohorts).

3. RESULTS

A total of 8 RCTs and 6 cohort/meta-analysis studies were included. Surgical treatment consistently led to faster pain relief and functional improvement in the short term.^[1,2,4,5,9,14]

Long-term outcomes (12–24 months) showed minimal or no significant differences between surgical and non-surgical approaches. Meta-analytic data confirmed that while early surgery offers meaningful pain and functional gains within 6 to 12 weeks, the benefits level off over time.^{[1,3,6,9,13] [13]}

List of studies

Study	Year	Sample Size	Surgical Intervention	Non-Surgical Comparator	Primary Outcomes	Key Findings
Weinstein et al.	2014	1007	Microdiscectomy	Physical Therapy, Meds	VAS, ODI, 2-year	Faster relief with surgery; similar at 2 years
Yuan et al.	2015	238	Microdiscectomy	Physiotherapy + NSAIDs	VAS, ODI	Greater improvement with surgery
Rönnberg et al.	2017	122	Discectomy	Exercise Therapy	VAS, QoL	Early benefit with surgery; equal at 1 year
Choi et al.	2018	180	Microdiscectomy	Epidural Steroid + PT	ODI, RTW	Surgery enabled faster RTW
Singh et al.	2020	300	Microlumbar Discectomy	Traction, Exercise	VAS, ODI	Better early outcomes with surgery
Gugliotta et al.	2016	370	Microdiscectomy	Standard PT	Pain,	Surgery improved

				+ Meds	Function	outcomes early; similar later
Japanese Cohort	2021	128	Microdiscectomy	PT + NSAIDs	VAS, ODI, EQ-5D	Faster initial gains with surgery
Maine Spine Study	2015	995	Standard Discectomy	Conservative Care	BP, Function, Work Status	Surgery benefits lasted 8 years
Gonzales et al.	2016	370	Standard Discectomy	Conservative Therapy	NASS, SF-36	Early benefit; no difference at 2 years
JHSCI Meta-Analysis	2018	784	Surgical (various)	Conservative (various)	VAS, ODI	Short-term benefit with surgery; equal later
Arfaaz et al.	2021	75	Open Discectomy	Bed rest + Meds + PT	VAS, ODI, Neuro Recovery	Faster pain/ODI gains; similar neuro recovery
Weinstein et al.	2006	501	Discectomy	Nonoperative Care	Leg Pain, SF-36, ODI	Surgical group had superior 2-year outcomes

4. DISCUSSION

The accumulated evidence from randomized controlled trials, prospective cohort studies, and meta-analyses presents a coherent narrative: surgical intervention for lumbar disc prolapse generally provides faster and more substantial short-term improvements in pain, function, and patient satisfaction compared to non-surgical treatments. These benefits are particularly pronounced in patients with severe symptoms, significant neurological deficits, or those who need to return quickly to work or physical activity.

Studies such as the SPORT trials (Weinstein et al., 2006; Lurie et al., 2014) consistently demonstrated superior outcomes for surgically treated patients, especially when assessed as-treated rather than intent-to-treat. These trials reported significant gains in leg pain relief, bodily pain scores, physical function, and disability indexes, which were sustained for up to eight years post-intervention. However, the high crossover rates between groups in these studies pose limitations to drawing definitive conclusions from their randomized arms alone.^[1,15]

Similarly, the BMJ Open cohort by Gugliotta et al. (2016) and the JHSCI meta-analysis (2018) confirm short-term benefits of surgery but show diminishing relative advantages beyond one year. These findings were echoed by Arfaaz et al. (2021), who found that while both groups experienced neurological recovery, surgical patients had significantly greater pain relief and functional improvement across all follow-up points.^[9,12]
[13] [14]

The results suggest that surgical intervention is particularly effective in managing acute or severe presentations, especially in cases involving motor deficits, sciatica, or intractable pain. Conversely, conservative treatment remains a valid and often successful approach for patients with milder symptoms or those who prefer to avoid the risks associated with surgery. Non-operative measures typically include structured physical therapy, medications, lifestyle

modifications, and, in some cases, epidural steroid injections.^[14]

Importantly, patient preference and individual clinical context must guide decision-making. For some, the prospect of avoiding surgery—even at the cost of slower recovery—may outweigh the benefits of early relief. Others may prioritize rapid symptom control to maintain employment or daily function, making surgery the preferred route.

In sum, this review supports a stratified care approach, where early surgical intervention is prioritized for patients with severe or persistent symptoms, especially with neurological involvement, and conservative care is offered to those with milder symptoms or lower surgical readiness. Shared decision-making between patients and clinicians remains crucial, informed by the best available evidence and tailored to the patient's clinical profile and personal goals.

5. CONCLUSION

Surgical management of lumbar disc prolapse provides faster symptom relief, while both approaches yield similar long-term outcomes. The evidence consistently demonstrates that surgery is particularly beneficial in the early phase of treatment, resulting in quicker resolution of radicular pain and faster return to functional activity. However, the advantages of surgery tend to converge with non-surgical treatment outcomes over extended follow-up periods.

This underscores the importance of tailoring treatment plans to individual patient characteristics, including symptom severity, neurological status, personal preferences, comorbidities, and socioeconomic factors such as the need for a rapid return to work. Patients with mild to moderate symptoms may benefit from a trial of conservative management, reserving surgery for those who do not respond adequately or who develop progressive neurological impairment.

Shared decision-making should remain central to clinical

care, ensuring that patients are informed about the risks and benefits of each treatment strategy. Future research should continue to explore predictive factors for successful outcomes, optimal timing of surgical intervention, and the long-term cost-effectiveness of each approach.

6. Limitations

This review includes both RCTs and cohort studies, which differ in methodological rigor. While RCTs offer high internal validity, cohort studies provide real-world insights at the cost of potential confounding. Meta-analytic conclusions are limited by study heterogeneity. Nonetheless, consistency across diverse study designs strengthens overall findings.

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