Original Article

Clinical and Radiological Factors Associated with Failure of Conservative Management in Lumbar Disc Herniation

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Abstract

Background: Identifying predictors of conservative treatment failure in lumbar disc herniation (LDH) may facilitate individualized management. This study evaluated clinical and radiological factors associated with unsuccessful conservative treatment. **Material and Methods:** This prospective observational study included 150 adults with symptomatic, MRI-confirmed LDH at a tertiary care hospital in Jharkhand during 2025. Baseline clinical characteristics, pain severity, Oswestry Disability Index (ODI), neurological findings, and MRI parameters were evaluated. Patients were followed for 12 weeks. Treatment failure was defined as surgical requirement or persistent radicular pain with inadequate functional improvement. Associations were assessed using logistic regression. **Results:** Among 149 patients with evaluable outcomes, conservative management failed in 46 (30.9%) and succeeded in 103 (69.1%). Longer symptom duration (OR 1.30; p = 0.034), higher baseline leg-pain severity (OR 1.59; p = 0.013), and greater ODI (OR 1.60; p = 0.021) were associated with failure in unadjusted analyses. MRI characteristics showed no significant associations. No predictor remained statistically significant after multivariable adjustment. The optimism-corrected model AUROC was 0.641. **Conclusion:** Greater symptom duration, radicular pain, and disability were associated with conservative treatment failure in unadjusted analyses, whereas conventional MRI findings demonstrated limited prognostic utility.

Keywords: Lumbar disc herniation, Conservative management, Treatment failure, Magnetic resonance imaging, Oswestry Disability Index.

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Introduction

Lumbar disc herniation (LDH) is a frequent source of low back pain associated with radiculopathy and is a significant source of functional disability in adults. The herniated disc material can cause mechanical compression and inflammation of nearby nerve roots, leading to radiating pain in the leg, sensory disturbances and sometimes motor weakness. The natural history of lumbar radiculopathy is generally good, but a percentage of patients continue to have symptoms even with proper treatment. Therefore, it is important to identify patients with a higher risk of poor recovery to optimize clinical management.[1]

Conservative treatment (such as analgesics, activity modification, physiotherapy and selected interventional procedures) is usually recommended first in patients who do not have progressive neurological deficits or cauda equina syndrome. Peul et al. showed that early surgery resulted in quicker relief of sciatica than conservative treatment, but there was no difference in the results after 1 year.[2] Likewise, the Spine Patient Outcomes Research Trial (SPORT) found that both surgical and nonoperative treatment yielded significant benefits, highlighting the potential benefits of conservative treatment in suitable patients.[3] However, there is individual variation in response to treatment and some patients will eventually need surgical treatment.

Several clinical parameters, such as symptom duration, pain intensity, functional disability, neurological deficits, and work demands have been studied as predictors of failure of conservative treatment. Their prognostic value is however not consistent. In a systematic review, Ashworth et al. found conflicting evidence for the effect of baseline clinical factors on recovery from sciatica.[4] Ostafiński et al. in a case-control study of 240 patients, however, found that leg paraesthesias and more severe spinal canal compromise were independent factors associated with failure of conservative treatment.[5] These results emphasize the importance of clinical predictors in addition to radiological abnormalities in further evaluation.

Magnetic resonance imaging (MRI) is a crucial tool in the diagnosis of disc disease and the correlation of disc disease with neurologic symptoms. The relationship between imaging and clinical outcomes is still unclear, however. Jensen et al. have reported that some disc shapes were correlated with good clinical

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results in conservative management, but that radiological improvement was not always correlated with clinical improvement.[6] Chiu et al. showed that spontaneous disc regression occurred more often in sequestrated and extruded herniations than in protrusions or bulging discs.[7] In addition, El Barzouhi et al. reported that follow-up MRI results were not predictive of recovery or persistence of symptoms.[8] These observations indicate that structural abnormalities may not be enough to predict treatment outcomes.

Although there is growing knowledge of the natural history of LDH, there remains some doubt about the combined effects of clinical and radiological variables on failure of conservative therapy. There are variable results due to differences in patient characteristics, treatment protocols, follow-up duration, and failure definitions. The aim of the present prospective observational study was therefore to assess the rate of failure of conservative treatment within 12 weeks in patients with MRI-confirmed LDH, to investigate any association with baseline clinical and radiological features and to identify possible independent predictors of conservative treatment failure. The results can help with risk stratification, personalized treatment planning and early detection of those who need to be treated more intensively.

Materials and Methods

Study design and setting: The study protocol was a prospective observational cohort study conducted in the Department of Orthopaedics, Laxmi Chandravansi Medical College and Hospital, Bishrampur, Palamu, Jharkhand, India. The study period was from January to December 2025 and consecutive recruitment was scheduled for January to September 2025. The target sample size was 150 adults and assessments were conducted at baseline, 6 weeks, and 12 weeks.

Eligibility criteria: Patients included in the study were adults ≥18 years of age with clinically significant unilateral or bilateral lumbar radiculopathy, concordant lumbar MRI findings of disc herniation and a duration of symptoms of 2 weeks to 6 months, who were appropriate for initial conservative treatment.

Exclusion criteria included cauda equina syndrome, severe or rapidly progressive motor deficits that required immediate surgical evaluation, previous surgery at the affected level, spinal infection, tuberculosis, malignancy, or traumatic fracture, severe degenerative spinal stenosis or high-grade spondylolisthesis as the primary pathology, mechanical low back pain without concordant radiculopathy, neurological conditions that would interfere with outcome assessment, and inability to undertake treatment or follow-up.

Evaluation by clinical and radiological examination: Baseline variables included age, sex, anthropometric measurements, occupation, physical workload, smoking status, comorbidities, symptom duration, previous episodes of low back pain and previous conservative treatment. BMI was measured as weight (kg)/height (m^2).

The pain in the back and in the leg was evaluated separately on a numeric rating scale (NRS) from 0 to 10. Disability was measured by the Oswestry Disability Index (ODI), which is a percentage score ranging from 0 to 100. Examination variables were straight leg raise, motor weakness, Medical Research Council muscle-power grade, sensory impairment and deep tendon reflex abnormalities.

MRI variables included the principal symptomatic disc level, multilevel involvement, disc morphology, herniation location, anteroposterior dimension, transverse width, nerve-root relationship and spinal canal compromise. The morphology was categorized as protrusion, extrusion or sequestration, and the location as central, paracentral, foraminal or extraforaminal. The involvement of the nerves was described as contact, displacement or compression of the nerve roots. For multilevel disease, the major symptomatic level was determined by clinical–radiological concordance.

Conservative management and follow-up: Analgesics, nonsteroidal anti-inflammatory drugs, neuropathic pain medications, physiotherapy, core stabilization exercises, activity modification, patient education and epidural steroid injection were all management variables. Treatment duration, adherence, modification, escalation and adverse events were recorded. Epidural injection did not independently constitute failure of conservative treatment.

The follow-up assessments were back pain NRS, leg pain NRS, ODI and neurological findings. Surgical consultation, recommendation, requirement and actual intervention were documented separately, along with their indications and timing. Postoperative assessments were identified and excluded from analyses of clinical trajectories during conservative management.

Outcome definitions: The primary outcome was failure of conservative management within 12 weeks, defined as either a requirement for lumbar disc surgery because of persistent disabling radicular symptoms or neurological deterioration within 84 days of enrolment, or persistent radicular leg pain with NRS ≥4 accompanied by <30% improvement in ODI at 12 weeks despite appropriate conservative management.

Percentage improvement in ODI was calculated as:

$$\text{ODI improvement (\%)} = \frac{\text{Baseline ODI} - \text{Follow-up ODI}}{\text{Baseline ODI}} \times 100.$$

Surgery-related and persistent-symptom failures were recorded separately, with overlap permitted. Meeting either component established composite failure. Successful management required both components to be negative. Outcomes remained unclassifiable when the available assessments could not establish success or failure.

Statistical analysis: Analyses were performed using SPSS version 22. Continuous variables were summarized as mean (SD) or median [Q1, Q3], and categorical variables as n (%). Between-group comparisons used Mann–Whitney U, Pearson chi-square, Fisher's exact or Monte Carlo chi-square tests, as appropriate. Longitudinal changes were assessed using paired t-tests with Holm adjustment, excluding postoperative measurements. Univariable and multivariable logistic regression reported odds ratios, 95% confidence intervals and Wald statistics. The adjusted model included symptom duration, baseline ODI, motor weakness and nerve-root involvement. Model performance was assessed using AUROC, Brier score and bootstrap internal validation with 500 resamples. Missing values were not imputed,

and unclassifiable outcomes were excluded from comparative analyses. Two-sided $p<0.05$ indicated statistical significance.

Results

The cohort comprised 150 records. The 12-week assessment was completed in 149 (99.3%); 1 (0.7%) had an unclassifiable primary outcome. Among the 149 records with known outcomes, conservative management was successful in 103 (69.1%) and failed in 46 (30.9%).

Of the 46 failures, 23 (50.0%) met the surgery-requirement component and 27 (58.7%) met the persistent-symptom component, including 4 (8.7%) meeting both. Actual surgical intervention occurred in 22 (14.7%) of the overall cohort.

The failure group had longer symptom duration and greater baseline pain and disability. Demographic characteristics, comorbidities and neurological examination findings did not differ significantly between the outcome groups [Table 1]. L4–L5 and L5–S1 were the predominant symptomatic levels. None of the evaluated MRI characteristics showed a statistically significant difference between the groups [Table 2].

Back pain, radicular pain and disability decreased during follow-up in the successful-management group. Improvements were smaller among records classified as failures, particularly for back pain. Detailed paired changes are presented in [Table 3], and the ODI and radicular pain trajectories are shown in [Figure 1].

Longer symptom duration, higher baseline leg-pain NRS and greater baseline ODI were associated with failure in unadjusted analyses [Table 4]. None of the four baseline factors in the adjusted model reached statistical significance [Table 5, Figure 2]. The model had an apparent AUROC of 0.681 and a bootstrap optimism-corrected AUROC of 0.641. The corrected Brier score was 0.210, and the corrected calibration slope was 0.775.

Table 1: Baseline demographic and clinical characteristics

Characteristic	Overall (n=150)	Success (n=103)	Failure (n=46)	Test	Statistic (df)	p value
Age, years	44.7 (12.2)	43.9 (11.9)	46.1 (12.5)	Mann–Whitney U	2090.5	0.253
Male sex	93 (62.0)	60 (58.3)	32 (69.6)	Pearson χ^2	1.72 (1)	0.189
BMI, kg/m²	25.3 (3.5)	25.1 (3.7)	25.8 (3.0)	Mann–Whitney U	2111.0	0.290
Heavy physical workload	50 (33.3)	37 (35.9)	13 (28.3)	Pearson χ^2	0.84 (1)	0.360
Current smoking	17 (11.3)	12 (11.7)	4 (8.7)	Fisher exact	—	0.777
Diabetes mellitus	22 (14.7)	18 (17.5)	4 (8.7)	Pearson χ^2	1.95 (1)	0.163
Hypertension	26 (17.3)	17 (16.5)	9 (19.6)	Pearson χ^2	0.21 (1)	0.649
Symptom duration, weeks	7.9 [5.3, 12.9]	7.4 [5.0, 12.1]	10.3 [5.5, 14.4]	Mann–Whitney U	1859.5	0.036
Previous low back pain	50 (33.3)	35 (34.0)	14 (30.4)	Pearson χ^2	0.18 (1)	0.670
Previous conservative treatment	57 (38.0)	36 (35.0)	20 (43.5)	Pearson χ^2	0.99 (1)	0.321
Back pain NRS at baseline	5.0 [4.0, 6.0]	5.0 [4.0, 5.0]	5.0 [4.0, 6.0]	Mann–Whitney U	1844.5	0.025
Leg pain NRS at baseline	7.0 [6.0, 8.0]	7.0 [6.0, 7.0]	7.0 [7.0, 8.0]	Mann–Whitney U	1775.5	0.011
ODI at baseline, %	44.7 (9.2)	43.6 (9.2)	47.4 (8.7)	Mann–Whitney U	1689.0	0.005
SLR positive	113 (75.3)	74 (71.8)	38 (82.6)	Pearson χ^2	1.97 (1)	0.160
Motor weakness	18 (12.0)	14 (13.6)	3 (6.5)	Pearson χ^2	1.57 (1)	0.210
Sensory impairment	66 (44.0)	46 (44.7)	19 (41.3)	Pearson χ^2	0.15 (1)	0.703
Reflex abnormality	39 (26.0)	24 (23.3)	14 (30.4)	Pearson χ^2	0.85 (1)	0.356

Values are mean (SD), median [Q1, Q3], or n (%). Percentages use the column denominator. Overall includes one record with unknown outcome; outcome-group tests exclude it. U denotes the success-group Mann–Whitney statistic. χ^2 tests are uncorrected Pearson tests. Fisher exact has no separately reported test statistic. BMI, body mass index; NRS, numeric rating scale; ODI, Oswestry Disability Index; SLR, straight leg raise.

Table 2: Baseline MRI characteristics according to outcome

Characteristic	Overall (n=150)	Success (n=103)	Failure (n=46)	Test	Statistic (df)	p value
Disc level: L2-L3	3 (2.0)	2 (1.9)	1 (2.2)	χ^2 Monte Carlo	6.14 (3)	0.100
L3-L4	11 (7.3)	5 (4.9)	6 (13.0)			
L4-L5	74 (49.3)	48 (46.6)	26 (56.5)			
L5-S1	62 (41.3)	48 (46.6)	13 (28.3)			
Disc morphology: Extrusion	52 (34.7)	36 (35.0)	15 (32.6)	χ^2 Monte Carlo	0.59 (2)	0.745
Protrusion	85 (56.7)	57 (55.3)	28 (60.9)			
Sequestration	13 (8.7)	10 (9.7)	3 (6.5)			
Disc location: Central	28 (18.7)	17 (16.5)	11 (23.9)	χ^2 Monte Carlo	3.36 (3)	0.347
Extraforaminal	7 (4.7)	4 (3.9)	3 (6.5)			
Foraminal	24 (16.0)	19 (18.4)	4 (8.7)			
Paracentral	91 (60.7)	63 (61.2)	28 (60.9)			
Nerve root relationship: Compression	53 (35.3)	32 (31.1)	21 (45.7)	Pearson χ^2	3.90 (2)	0.142
Contact	44 (29.3)	34 (33.0)	9 (19.6)			
Displacement	53 (35.3)	37 (35.9)	16 (34.8)			
AP dimension, mm	5.6 (1.4)	5.5 (1.4)	5.6 (1.3)	Mann–Whitney U	2290.5	0.748
Transverse width, mm	9.8 (2.2)	9.6 (2.1)	10.1 (2.3)	Mann–Whitney U	2041.0	0.178
Canal compromise, %	23.4 (6.7)	23.0 (6.8)	24.4 (6.2)	Mann–Whitney U	2046.5	0.186
Multilevel herniation	32 (21.3)	22 (21.4)	9 (19.6)	Pearson χ^2	0.06 (1)	0.803

Values are mean (SD) or n (%). Overall includes one record with unknown outcome. Categorical p values refer to the whole factor and appear on its first category row. Monte Carlo χ^2 uses 9,999 conditional samples for sparse tables. AP, anteroposterior. χ^2

statistics are followed by df in parentheses; continuous comparisons use Mann–Whitney U.

Table 3: Changes in pain and disability during conservative management

Measure and group	Visit	Baseline mean (SD); n	Follow-up mean (SD); n	Mean change (95% CI)	Paired n	t (df)	Adjusted p
Back pain NRS Success	6 weeks	4.7 (1.0); n=103	3.2 (1.1); n=103	-1.46 (-1.63, -1.29)	103	-16.95 (102)	<0.001
Back pain NRS Success	12 weeks	4.7 (1.0); n=103	2.1 (1.0); n=103	-2.57 (-2.78, -2.37)	103	-25.24 (102)	<0.001
Back pain NRS Failure	6 weeks	5.0 (1.1); n=46	4.9 (1.4); n=46	-0.13 (-0.39, 0.13)	46	-1.00 (45)	0.323
Back pain NRS Failure	12 weeks	5.0 (1.1); n=46	4.6 (1.5); n=27	-0.41 (-0.85, 0.03)	27	-1.89 (26)	0.139
Leg pain NRS Success	6 weeks	6.9 (1.0); n=103	4.2 (1.3); n=103	-2.68 (-2.93, -2.43)	103	-21.42 (102)	<0.001
Leg pain NRS Success	12 weeks	6.9 (1.0); n=103	2.5 (1.3); n=103	-4.38 (-4.64, -4.11)	103	-32.89 (102)	<0.001
Leg pain NRS Failure	6 weeks	7.4 (0.9); n=46	7.0 (1.2); n=46	-0.35 (-0.64, -0.06)	46	-2.43 (45)	0.058
Leg pain NRS Failure	12 weeks	7.4 (0.9); n=46	6.5 (1.4); n=27	-0.81 (-1.31, -0.32)	27	-3.41 (26)	0.009
ODI Success	6 weeks	43.6 (9.2); n=103	26.9 (8.2); n=103	-16.68 (-17.94, -15.42)	103	-26.19 (102)	<0.001
ODI Success	12 weeks	43.6 (9.2); n=103	15.9 (7.7); n=103	-27.65 (-29.42, -25.88)	103	-31.04 (102)	<0.001
ODI Failure	6 weeks	47.4 (8.7); n=46	44.4 (10.2); n=46	-3.00 (-4.56, -1.44)	46	-3.87 (45)	0.002
ODI Failure	12 weeks	47.4 (8.7); n=46	42.7 (9.3); n=27	-5.04 (-7.75, -2.33)	27	-3.82 (26)	0.004

Change is follow-up minus baseline. Postoperative measurements are excluded. Baseline descriptive values use the full outcome group; paired changes use only records with both relevant nonsurgical measurements, so they need not equal the difference between the displayed group means. Paired t-tests are used; p values are Holm-adjusted across the 12 comparisons. ODI changes are percentage points. CI, confidence interval.

Table 4: Unadjusted associations with conservative management failure

Baseline factor	n	Failures	Odds ratio (95% CI)	Wald z	p value
Age per 10 years	149	46	1.16 (0.87, 1.55)	1.03	0.305
BMI per 5 kg/m²	149	46	1.31 (0.79, 2.18)	1.05	0.294
Symptom duration per 4 weeks	149	46	1.30 (1.02, 1.65)	2.12	0.034
Leg pain NRS per point	149	46	1.59 (1.10, 2.28)	2.47	0.013
Baseline ODI per 10 points	149	46	1.60 (1.07, 2.38)	2.31	0.021
SLR positive	149	46	1.86 (0.78, 4.47)	1.39	0.164
Motor weakness present	149	46	0.44 (0.12, 1.63)	-1.23	0.220
Sensory impairment	149	46	0.87 (0.43, 1.76)	-0.38	0.703
Diabetes mellitus	149	46	0.45 (0.14, 1.41)	-1.37	0.171
Root displacement or compression	149	46	2.03 (0.88, 4.67)	1.65	0.098
AP dimension per mm	149	46	1.05 (0.81, 1.36)	0.40	0.692
Canal compromise per 10%	149	46	1.35 (0.80, 2.29)	1.11	0.267
Multilevel herniation	149	46	0.90 (0.38, 2.13)	-0.25	0.803
Extrusion or sequestration	149	46	0.80 (0.39, 1.62)	-0.63	0.529

Each factor is estimated in a separate logistic regression. Two-sided Wald tests and Wald 95% CIs are reported. Binary reference is absence of the characteristic. Root displacement/compression is compared with contact. Extrusion/sequestration is compared with protrusion. Unknown outcomes are excluded. Associations are exploratory; p values are unadjusted for multiplicity.

Table 5: Adjusted associations with conservative management failure

Baseline factor	n	Failures	Odds ratio (95% CI)	Wald z	p value
Symptom duration per 4 weeks	149	46	1.25 (0.98, 1.60)	1.77	0.076
Baseline ODI per 10 points	149	46	1.49 (0.96, 2.32)	1.77	0.077
Motor weakness present	149	46	0.34 (0.09, 1.31)	-1.57	0.116
Root displacement or compression	149	46	1.57 (0.62, 3.95)	0.96	0.339

The logistic model simultaneously includes symptom duration per 4 weeks, baseline ODI per 10 points, motor weakness and root displacement/compression versus contact. Model n=149, with 46 failures. Odds ratios are adjusted for the other listed factors. Wald z statistics and two-sided p values are reported. All confidence intervals include 1.

Model performance: apparent AUROC 0.681; optimism-corrected AUROC 0.641; apparent Brier score 0.197; corrected Brier score 0.210; corrected calibration slope 0.775. Internal bootstrap validation used 473 successful fits from 500 attempted resamples.

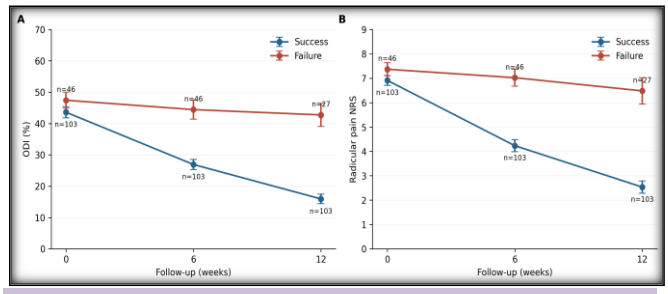


Figure 1: Changes in ODI and radicular pain during conservative management

Panels show (A) ODI and (B) radicular leg-pain NRS by final management outcome. Points are observed means and error bars are pointwise 95% t-based confidence intervals. Labels show the observed n at each visit. Postoperative observations are excluded. Groups are defined by the final outcome; the figure describes trajectories and does not estimate a causal treatment effect.

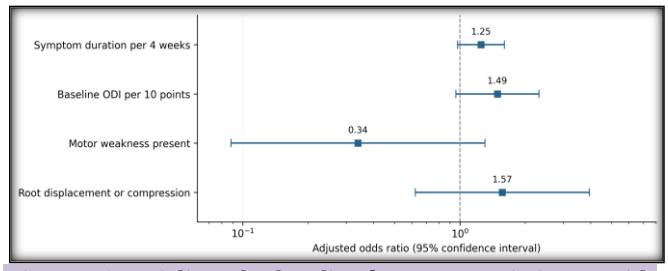


Figure 2: Adjusted baseline-factor associations with conservative management failure

Squares indicate adjusted odds ratios and horizontal bars indicate 95% confidence intervals from the four-factor logistic model. The vertical reference line represents an odds ratio of 1. The horizontal axis uses a logarithmic scale. Estimates use 149 records with known outcomes, including 46 failures.

Discussion

The current prospective observational study aimed to assess clinical and radiological parameters that are associated with failure of conservative treatment in patients with LDH. Of 149 patients with evaluable outcomes, 46 (30.9%) failed treatment within 12 weeks, of which 23 met the surgical-requirement criterion and 27 had persistent pain and disability (four fulfilled both criteria). Longer symptom duration, greater baseline radicular pain, and higher Oswestry Disability Index (ODI) scores were associated with failure in unadjusted analyses. None of the assessed magnetic resonance imaging (MRI) features were statistically significant, however, and no baseline predictor remained statistically significant after multivariable adjustment. These results emphasize the clinical and biological diversity of LDH and the fact that clinical and/or radiological parameters are insufficient to predict treatment outcomes.

The treatment failure rate observed should be assessed in the light of the definition and follow-up duration. In a multi-centre observational study of 466 patients with sciatica and LDH, Haugen et al,[9] reported success rates of 49% to 58% at 12 months, depending on the instrument used to measure success. In total, 126 patients received surgery during follow-up, emphasising the need for escalation of treatment and definitions of outcomes. Lilly et al,[10] also studied 277,941 patients, and determined that 97.0% were treated non-surgically, with 3.0% going on to have microdiscectomy. Surgical conversion was independently associated with male sex and opioid use, and the cost of treatment was almost double for those who had surgery ($1,718 vs $906). The higher failure rate in our cohort may be due to the fact that we included persistent symptomatic disability, as well as surgical requirement, while the database study only included surgical failure.

Clinical symptom burden proved to be an important correlate of treatment response. Patients who failed had a longer median duration of symptoms compared to those who were successfully managed (10.3 weeks vs 7.4 weeks, respectively; p = 0.036). For every four additional weeks of symptoms, there was an increase in the odds of failure (OR 1.30; 95% CI 1.02–1.65). In the prospective cohort by Konstantinou et al,[11] with 609 patients, 55% improved at 12 months. Longer leg-pain duration was independently associated with a reduced likelihood of improvement (OR 0.41; 95% CI 0.19–0.90), while expectations of prolonged symptoms also predicted poorer recovery (OR 0.27; 95% CI 0.13–0.57). These observations complement the clinical importance of symptom chronicity, but were performed in a different population of primary-care patients and with a longer follow-up than in the current MRI-confirmed sample.

Failure of treatment was also related to baseline radicular pain and disability in the present study. For every point increase in leg-pain numeric rating scale, failure odds increased by 1.59 (p = 0.013) and for every 10-point increase in ODI, failure odds increased by 1.60 (p = 0.021). Suri et al,[12] followed 154 patients with lumbosacral radiculopathy for two years, and 26 of these patients had surgery. Baseline leg-pain intensity was associated with subsequent surgery, but not significantly (adjusted OR 1.22, p = 0.08), while previous low back pain (adjusted OR 4.79) and positive straight leg raise (adjusted OR 4.38) predicted surgical intervention. In contrast, straight leg raise positivity and prior LBP were not significantly related to failure in our cohort. These differences may be due to variations in the characteristics of the population, treatment pathways, or outcome definitions.

Another significant finding is the lack of MRI predictors. The morphology (p = 0.745), location (p = 0.347), anteroposterior dimension (p = 0.748), and canal compromise (p = 0.186) of the herniations were not associated with treatment outcome. In another study of 368 patients, Gupta et al,[13] reported that 91.3% of patients with significant variation in herniation size did not undergo surgery. The mean canal occupancy was almost the same for surgical versus nonsurgical patients (31.5% versus 31.2%) and the adjusted analysis showed no predictive effect of herniation size (OR 1.00). The results confirm the concept that the size of herniations is not sufficient to make a prognosis.

But, in some populations, anatomical location may affect results. Gupta et al,[14] conducted another retrospective study of 500 patients and found that 90.2% did not undergo surgery within 1 year. Patients with L3–L4 and L4–L5 herniations had lower odds of surgery relative to those with L5–S1 herniations (OR 0.19 and 0.45, respectively; p = 0.0047). L4–L5 and L5–S1 were the most commonly involved levels in our cohort, although there was no significant association with failure (p = 0.100). The smaller number of individuals, shorter observation time, and composite outcome may have limited the power to detect level-specific associations.

Spontaneous resorption further complicates the association of disc morphology with prognosis. In a prospective study, Hornung et al,[15] studied 93 patients with symptomatic LDH and found 23 patients (24.7%) who had early resorption. Patients with higher baseline herniation volume, sacral slope, and posterior vertebral height of L4 had earlier resorption, and patients with early resorption showed significantly larger total herniation size reduction (p = 0.007). These results indicate that the anatomical characteristics that are associated with structural regression can differ from those associated with symptomatic recovery. Thus, the lack of associations of conventional MRI features with clinical failure in our study does not rule out more complex relationships between disc biology and longitudinal morphological change.

In the follow-up, patients who were successfully treated conservatively showed significant improvements in pain and disability. The mean ODI decreased from 43.6 to 15.9 at 12 weeks, whereas improvement was considerably smaller among evaluable nonsurgical patients who were determined to be treatment failures. However, the adjusted prediction model showed only moderate discrimination (apparent AUROC 0.681; optimism-corrected AUROC 0.641), and none of the variables was an independent predictor. The single-centre design, small number of failure events, short follow-up and exclusion of postoperative observations from longitudinal analyses limit generalizability and long-term prognostic interpretation. In addition, the composite outcome included surgical requirement and persistent symptoms, which may have introduced heterogeneity. There is a need for larger prospective multicentre studies with standard treatment protocols, serial imaging and longer follow-up to develop clinically useful prediction models.

Conclusion

Conservative treatment was not successful in about one-third of patients diagnosed with lumbar disc herniation using MRI, and required surgery within 12 weeks. In an unadjusted analyses, longer symptom duration, higher baseline radicular pain, and higher functional disability were correlated with failure of treatment. However, none of the usual MRI parameters were significantly linked with failure and none was significant when adjusted. The results suggest that the burden of clinical symptoms at the beginning may be useful for prognosis, and that MRI abnormalities may not be sufficient to predict treatment failure, but should be evaluated along with clinical symptoms.

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Conflicts of interest

There are no conflicts of interest.

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