Lumbar disc herniation (LDH)

- Comparative Efficacy of Percutaneous Laser Disc Decompression (PLDD) and Conservative Therapy for Lumbar Disc Herniation: A Retrospective, Observational, Single-Center Study
- Clinical evaluation and finite element analysis of bone cement-augmented anterolateral screw fixation versus percutaneous bilateral pedicle screw fixation co-applied with oblique lumbar interbody fusion for single-level lumbar degenerative diseases with osteoporosis
- Lumbar disc herniation modelling: a review of ex-vivo mechanical models and a comparison with clinical data
- Percutaneous transforaminal endoscopic discectomy in patients with lumbar disc herniation: a meta-analysis
- Reoperation Rates After Lumbar Discectomy in Pediatric Patients
- When can lumbar fusion be considered appropriate in the treatment of recurrent lumbar disc herniation? A systematic review and meta-analysis
- Evidence from Mendelian randomization analysis combined with meta-analysis for the causal validation of the relationship between 35 blood and urine metabolites and lumbar disc herniation
- Early effectiveness of posterior 180-degree decompression via unilateral biportal endoscopy in treatment of lumbar spinal stenosis combined with MSU-1 lumbar disc herniation

---

General information

Lumbar disc herniation (LDH) is a degenerative disease of the lumbar spine and a common cause of low back and leg pain [1) 2)]

Key concepts

● Radiculopathy: pain and/or subjective sensory changes (numbness, tingling…) in the distribution of a nerve root dermatome, possibly accompanied by weakness and reflex changes of muscles innervated by that nerve root

● typical disc herniation → radiculopathy in the nerve exiting at the level below

● massive disc herniations can → cauda equina syndrome (a medical emergency). Typical symptoms: saddle anesthesia, urinary retention, LE weakness.

● most patients do as well with conservative treatment as with surgery, ∴ initial nonsurgical (conservative) treatment should be attempted for the vast majority

● surgery indications: cauda equina syndrome, progressive symptoms or neurologic deficits despite conservative treatment, or severe radicular pain > ≈ 6 weeks

Definition

Lumbar disc herniation definition.

History

Lumbar disc herniation history.

Epidemiology

see Lumbar disc herniation epidemiology.

Classification

see Lumbar Disc Herniation Classification.

Etiopathogenesis

Lumbar disc herniation (LDH) occurs owing to the inability of the posterior longitudinal ligament (PLL) to preserve the disc material within the intervertebral space. There is apparently no study that has investigated the histopathological changes occurring in both PLL and disc material in patients with LDH.

Kilitci et al. investigated and compared the histopathological changes occurring in PLL and disc material of the patients who underwent a surgical operation for LDH.

Pathology and neurosurgery departments of a tertiary Healthcare institution. The study included patients who underwent surgical operation for LDH from January 2018 to May 2019 and whose PLL and disc material was removed together, and had disc degeneration findings that were radiologically and histologically concordant.

PLL degeneration scores according to the histopathological findings, changes in disc materials according to the MRI findings, disc degeneration scores according to the histopathological findings.

Sample size: 50.

MRI and histological examinations showed fully degenerated black discs (Grade 2) in 12 patients, partially degenerated discs (Grade 1) in 29 patients, and fresh/acute discs (Grade 0) in 9 patients. The PLL showed grade 0 degeneration in 2 patients, grade 1 degeneration in 23 patients, and grade 2 degeneration in 25 patients. PLL degeneration grades were higher than the disc degeneration grades (P=.002).

Longitudinal ligament degeneration can play a significant role in the pathogenesis of LDH. This study

represents the first to focus on the histopathological changes occurring in both the PLL and disc material in patients with LDH [3].

Pathophysiology

Lumbar disc herniation pathophysiology

Clinical Features

see Lumbar disc herniation clinical features.

Diagnosis

see Lumbar disc herniation diagnosis.

Treatment

see Lumbar disc herniation treatment.

Complications

Recurrent lumbar disc herniation.

Case series

see Lumbar disc herniation case series.

Case reports

Lumbar disc herniation case reports.

Database

Gender

Age

Smoking status

Pfirrmann grading system grade

Analgesic use

Leg pain duration

Prospective observational pre-post cohort studies without control group

A prospective observational pre-post cohort study without a control group evaluated the effectiveness of PLDD in patients with lumbar disc protrusions. It contained herniations by assessing quantitative changes in the herniated disc area on axial and sagittal MR images.

A total of 58 patients with lumbar radiculopathy due to disc herniation underwent MRI two months after PLDD to evaluate changes in disc area. Axial and sagittal MR images with the greatest protrusion and neural compromise were analyzed, and patient pain severity, clinical outcomes, and satisfaction were recorded.

Results showed a statistically significant reduction in both axial and sagittal disc areas post-PLDD. The initial mean axial disc area of 0.51 cm2 (0.44-0.58) decreased to 0.29 cm2 (0.25-0.37), reflecting a median reduction of 35.9% ($p < 0.0001$). Similarly, the sagittal disc area decreased from a mean of 0.37 cm2 (0.33-0.43) to 0.19 cm2 (0.13-0.25), with a median reduction of 49.3% ($p < 0.0001$). All patients showed reductions in disc area, with a median reduction ratio of 52.7% (IQR: 45.2-56.2).

These findings suggest that PLDD is an effective option for reducing herniated disc size in carefully selected patients with contained disc herniations who have not responded to conservative treatment. Although not a substitute for open surgery, PLDD offers a statistically significant reduction in herniated disc size, making it a valuable therapeutic option for symptomatic contained lumbar disc herniation [4].

While the study provides interesting radiological data supporting PLDD in reducing disc herniation size, it suffers from critical methodological flaws:

No control group → cannot confirm that PLDD was the cause of improvement.

No functional correlation or long-term follow-up → limits clinical relevance.

Possible measurement and selection bias.

Final Appraisal: Level of Evidence: Low (Level IV, case series with pre-post design) Recommendation: Hypothesis-generating — further RCTs with sham controls, standardized outcome measures, and long-term follow-up are needed to support PLDD as an evidence-based alternative.

1)
Wang JC, Dailey AT, Mummaneni PV, Ghogawala Z, Resnick DK, Watters WC 3rd, Groff MW, Choudhri TF, Eck JC, Sharan A, Dhall SS, Kaiser MG. Guideline update for the performance of fusion procedures

for degenerative disease of the lumbar spine. Part 8: lumbar fusion for disc herniation and radiculopathy. J Neurosurg Spine. 2014 Jul;21(1):48-53. doi: 10.3171/2014.4.SPINE14271. PMID: 24980585.

2)
Marshall LW, McGill SM. The role of axial torque in disc herniation. Clin Biomech (Bristol, Avon). 2010 Jan;25(1):6-9. doi: 10.1016/j.clinbiomech.2009.09.003. PMID: 19815318.

3)
Kilitci A, Asan Z, Yuceer A, Aykanat O, Durna F. Comparison of the histopathological differences between the spinal material and posterior longitudinal ligament in patients with lumbar disc herniation: A focus on the etiopathogenesis. Ann Saudi Med. 2021 Mar-Apr;41(2):115-120. doi: 10.5144/0256-4947.2021.115. Epub 2021 Apr 1. PMID: 33818148.

4)
Gazzeri R, Occhigrossi F, Galarza M, Mercieri M, Leoni MLG. Radiological analysis of herniated disc size changes after Percutaneous Laser disc Decompression. Pain Med. 2025 May 24:pnaf070. doi: 10.1093/pm/pnaf070. Epub ahead of print. PMID: 40418221.