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LUMBAR DISC HERNIATION: PATHOGENESIS, DIAGNOSIS, AND MODERN TREATMENT APPROACHES

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Abstract: Lumbar disc herniation (LDH) is a common spinal disorder characterized by displacement of intervertebral disc material beyond the disc space. It is a leading cause of low back pain and radiculopathy, particularly affecting individuals in their productive years. The condition results from progressive disc degeneration, mechanical stress, and genetic predisposition. Diagnosis is primarily based on clinical features and confirmed with imaging techniques such as MRI. Modern treatment strategies range from conservative management to minimally invasive surgical procedures. This article reviews the pathogenesis, clinical manifestations, diagnostic approaches, and current treatment modalities for LDH.

Key words: lumbar disc herniation, intervertebral disc, low back pain, radiculopathy, microdiscectomy, minimally invasive spine surgery.

1. Introduction

Lumbar disc herniation affects 1–3% of the general population, with peak incidence between 30 and 50 years. It is one of the most frequent causes of disability, work absence, and healthcare utilization worldwide.

2. Pathogenesis

The intervertebral disc is composed of the nucleus pulposus (gelatinous core) and the annulus fibrosus (fibrous outer layer). Degeneration or trauma can lead to annular tears and extrusion of the nucleus pulposus.

Risk Factors:

- ✓ Age-related degeneration
- ✓ Mechanical loading and heavy lifting
- ✓ Genetic predisposition
- ✓ Smoking and obesity
- ✓ Sedentary lifestyle

Types of Herniation: Protrusion, Extrusion, Sequestration

3. Clinical Features

- ✓ Low back pain (90% of patients)
- ✓ Radiculopathy (sciatica)
- ✓ Neurological deficits
- ✓ Cauda equina syndrome (rare, emergency)

4. Diagnosis

4.1 Clinical Examination

Includes straight leg raise test and neurological examination.

4.2 Imaging

MRI is the gold standard. CT and X-rays play supportive roles.

Table 1. Diagnostic Modalities for LDH

Modality	Utility	Limitations
MRI	High sensitivity, soft tissue detail	Expensive, not suitable for all patients
CT	Good for bony structures	Radiation exposure, less soft tissue detail
X-ray	Rule out fractures, deformities	Cannot visualize disc herniation

5. Management

5.1 Conservative Treatment

Rest, NSAIDs, physical therapy, epidural steroid injections.

5.2 Surgical Treatment

Indicated in persistent symptoms (>6 weeks), progressive neurological deficits, or cauda equina syndrome.

Common procedures: Open discectomy, Microdiscectomy, Endoscopic discectomy, Fusion procedures

Table 2. Comparison of Surgical Techniques

Technique	Advantages	Limitations	Success Rate
Open discectomy	Widely available	Higher morbidity	70–80%
Microdiscectomy	Less invasive, faster recovery	Requires microscope	85–95%
Endoscopic discectomy	Minimal scarring, outpatient possible	Steeper learning curve	80–90%

6. Prognosis and Outcomes

Most improve with conservative therapy (70–80%). Surgery gives faster relief, especially for leg pain. Recurrence: 5–15%.

7. Future Directions

Biologic therapies, artificial disc replacement, personalized rehabilitation protocols.

8. Conclusion

Lumbar disc herniation is prevalent and impacts global health. Diagnosis is clinical and radiological. Conservative treatment is first-line, while minimally invasive surgery provides excellent outcomes. Future regenerative therapies are promising.

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