



Review Article

Journal of MAR Orthopedics (Volume 3 Issue 3)

The History of Lumbar Disc Herniation (LDH) – Learning from the Past

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Received Date: April 03, 2022

Published Date: April 10, 2022

Introduction

Lumbar Disc Herniation (LDH) has been a cause of pain and disability from ancient times. This condition has been given many names in the Indian, German, British and various other texts.

Diagnosis of this condition has been a challenge and treatment has evolved from witch craft to endoscopic or minimally invasive surgery.

Learning from the past and reaping the benefits of the ancient texts and research papers, medical professionals can avoid making the same mistakes and evolve with the technological advances.

Early History of Lumbar Disc Herniation

In ancient times, evil forces like the German witches and the British elf's arrow were attributed to be the cause of lower back pain.¹

The ancient Hebrews believed God touches Jacob's hip which caused sciatica. Many descriptions on sciatica have been found in Indian medical texts. There is a description of marmas, discrete areas in the body where bones, muscles, joints come together. Kakundram marma is the region of lumbar and sacrum, when injured leads to lower extremity numbness or paralysis.²

The ancient Greeks and Egyptians also described a relationship between spine injury and lower extremity symptoms.³

Hippocrates wrote about the relationship between antalgic gait, sciatica and claudication. He prescribed massage, heat, rest, diet changes and music for treatment.⁴

Galen in the second century described many spinal pathoanatomic treatise.⁵

Caelius Aurelianus in fourth century wrote plate depictions of the spine and intervertebral disc spaces.⁶ He described sciatica was caused by "a sudden jerk or movement during exercise, unaccustomed digging in the ground, lifting a heavy object from a low place, lying on the ground, a sudden shock, a fall, or continuous and immoderate sexual intercourse." According to him, treatment was bedrest, massage, passive ROM and heat.

Paulus of Aegina first advised spine surgery in the seventh century, mainly for trauma.⁷

He described pain radiating to buttock and groin to the knee and to extremities. He also described bed rest as the primary management for most of the sufferers.

Turkish physician Sabuncuoglu treated sciatica with cauterization in his early accounts. After the fall of Roman empire, in the 15th century, Turkish and Arabic medical literature on sciatica came into limelight.⁸

De Ischiade Nervos Commentarius, Domenico Cotugno described radicular pain as pain arising from sciatic nerve. Radicular pain was known as Cotugno's disease for many years.⁹

Virchow in 1857 described disc pathology in the form of ruptured disc, known as Virchow's Tumor during his time.¹⁰

Luschka in 1858 described disc ruptures, but didn't relate them to symptoms of patients.¹¹

Ernest Lasegue in 1864 described close association between lower back pain and radiating pain. He described the Straight Leg Raise (SLR), also known as Lasegue's Maneuver.¹²

Lister's work on antiseptics gave a new edge to safety in surgery. William MacEwen and Victor Horsley in 1887 are known to have performed the first lumbar laminectomy.¹³

Fedor Krause in 1908 performed the first discectomy at Berlin, following advice of Oppenheim, Neuropathologist.¹⁴ The tissue was mistaken as an enchondroma.¹⁵

Kocher in 1896 described L1-L2 disc displacement in post-mortem findings a man who had fallen from height.¹⁶

Lumbar Disc Herniation in the 20th Century

Alfred Taylor in 1909 performed the first unilateral laminectomy. He is also credited with the first extradural discectomy.¹⁷

Goldthwait and Osgood in 1911 described disc pathology as the cause of lower limb pain and paresis. Surgery on the same patient gave relief of symptoms, which confirmed their findings.¹⁸

German pathologist, Schmorl in 1920s studied 10,000 spines. He gave descriptions of disc material in the canal and vertebral body. The term herniation became popular from his descriptions.¹⁹ Schmorl's Node is a term used even today for focal herniation of disc material in the Vertebral Body (VB) due to endplate injury.

In the European countries, terms like disc retropulsion, collapse and rupture were commonly used.²⁰

American neurosurgeon, Walter Dandy reported cases of lumbar spine surgery for leg pain.²¹ By 1940s, the term herniation was used to describe disc related displaced elements.²²

NASS Nomenclature and Classification of Disc pathology provide a monography where they recommend using the term LDH.²³

Mixter, a neurosurgeon and Barr, an Orthopaedic surgeon, in 1932, carried out surgery for a patient with a preoperative diagnosis of "intervertebral disc rupture".²⁴ The patient was 28 years old, with classic signs of nerve root compression, with positive SLRT and an absent ankle reflex. An L2 to S1

laminectomy was performed. Barr rejected the older theory of tumor, enchondroma. His pathologist confirmed the same.²⁵

Mixter and Barr in 1934 presented a correlation of disc prolapse and clinical symptoms resulting from nerve and cord compression. They advised a surgical approach. They used a pituitary rongeur to enter the disc space.²⁶ Later Barr presented a 35 patient series showing pre-existing degeneration as a factor for herniation.²⁷

Love in 1938 described intralaminar approach for discectomy. Recurrent herniation was described for the first time.²⁸

By 1960s, surgical removal of discs which were herniated became rapidly popular. Casper in 1977 presented good results in 102 patients who had undergone discectomy.²⁹

Hoppenfeld in 1977 described lumbar disc radicular signs and symptoms in detail in his book on Spine Neurology.³⁰

By mid 1980s many studies aimed at better identifying the clinical signs of surgically treated radiculopathy.

Weber and Hakelius in 1980 described the natural history of patients with LDH in their seminar papers. Both studies compared outcomes of surgical and conservative management of patients. Weber showed earlier relief in surgical group of patients. Hekelius described no difference in the two groups.^{31,32}

John McCulloch in 1996 wrote long term results of surgical management were slightly better than conservative treatment. He is known to be the pioneer of microdiscectomy.³³

Pstacchini et al. in 2011 described phagocytosis of the disc material by macrophages in histochemical evaluation.³⁴

Wegner et al. in 2013 presented a review on traction for spine ailments. The concluded that traction has low to moderate quality of evidence for patients with LBP with sciatica.³⁵

Patient Evaluation – Evolution of imaging

The evolution of patients through the last 100 years has been substantial. Clinical history and physical examination was the mainstay for a generation of medical professionals. Advances in imaging techniques have impacted the understanding of intervertebral disc herniation natural history, pathoanatomy, and management.

Rontgen in 1896 reported the use of medical imaging for the first time. He initially obtained only Anteroposterior views.³⁶

Davis in 1925 obtained the first lateral view. Plain radiographs were not diagnostic for neurocompressive pathology in LDH. Sicard and Forestier in 1928 introduced myelography with lipiodol.³⁷ For the next three decades, this technique was used for diagnostic purposes.

Myelography with an improved hydrosoluble contrast became popular.³⁸

Salenius in 1977 described the correlation between myelography and intraoperative findings.³⁹

Hounsfield and Ambrose in 1980s worked on Computerized axial tomography (CT) and improved resolution of neurocompressive pathologies with myelography.⁴⁰ These advances allowed preoperative classification of direction and degree of disc pathologies.

Clinically introduced in 1990s, Magnetic Resonance Imaging (MRI) offered a major advancement in evaluation of LDH. Being a non-invasive procedure without ionizing radiations, MRI allowed accurate evaluation of the condition. Some disc herniations were described as decreasing in size with natural history, some migrating and calcifying, while others symptomatic and causing significant morbidities. MRI became sensitive enough to conclude “absence of a clear cut pathology on MRI is a contraindication to surgery”.⁴¹

On the other hand, surgeon’s started observing asymptomatic disc pathologies. They realized “observation of a herniation on MRI does not necessitate symptoms associated to the same level”.⁴² The advent of contrast MRI added to the diagnostic value of the modality.⁴³

Frymoyer et al. in 1992 concluded that disc degeneration is a result of degradation and remodelling of disc and vertebrae in response to physical load and vibration of a lifetime. He enlisted age, occupation, gender, smoking and vehicular vibration as factors contributing to disc degeneration.¹

Devo et al. in 1994 described MRI as a terrific test or tar baby. He concluded that strong reliance on imaging when indicated, proper use of terminologies and recognising normal clinical findings contribute to accurate diagnosis.⁴⁴

Jensen et al in 1994 did a study on people without back pain with MRI. They concluded many people without back pain have disk protrusions or bulges, but not extrusions. They summarized, discovery of bulges or protrusions in MRI may frequently be incidental findings.⁴⁵

Michel Benoist in 2002 did a study on natural history LDH. The clinical course was found to be related to the efficacy of conservative treatment. Clinical and pathomorphological evaluation with MRI and clinical examination is necessary for accurate diagnosis.⁴⁶

Battie et al., in 2004, concluded that genetic factors play an essential role in disc degeneration. Environmental factors play a minor role in lumbar disc pathologies. They also reviewed the literature for MRI findings associated with disc degeneration in asymptomatic and symptomatic individuals. They found varied results, for both groups, due to variation in definitions of degeneration of discs.²

Javid Majlesi et al in 2008 conducted a study on sensitivity of SLR test. The results suggested 89% specificity and 52% sensitivity of SLR test. They concluded that SLR test is helpful to identify patients with herniations with root compression requiring surgery.⁴⁷

Windt et al. in 2010 conducted a study on physical examination for lumbar radiculopathy due to disc herniation. They observed poor diagnostic value of physical examination and suggested imaging combined with clinical evaluation for the management of lumbar disc herniation.⁴⁸

Younis et al. in 2011 studied the correlation between MRI and clinical findings. They concluded that patients with multi-level involvement LDH had associated lower limb symptoms. Mild disc bulge patients correlated poorly with clinical findings.⁴⁹

Bogduk et al. in 2013 concluded that false positive results in diagnosis of discogenic pain can be achieved by strict operational criteria.⁵⁰

Sangani et al. in 2014 researched on the correlation between MRI in low back pain and patient's daily travel time and mode. They summarized reliable association of findings with respect to travel time and mode. More than 2 hours of travel time and two wheeler vehicles correlated more with lower back pain and lumbar disc pathology.⁵¹

Yiping Li et al. in 2015 presented the importance of correlation of imaging findings with clinical presentation. He specifically commented on the term "disc bulges" as the source of confusion among practitioners. He suggested for additional research on the clinical applications of various nomenclatures.⁵²

Rai et al. in 2016 presented a study of MRI findings in chronic lower back pain patients. They concluded that significant correlation was found between MRI and clinical findings in majority of the patients. A few patients had poor correlation.⁵³

Thapa et al. in 2016 studied the correlation between clinical features and MRI in lumbar disc prolapse. They concluded there is fair correlation, and all imaging abnormalities don't have clinical significance.⁵⁴

Ekedahl et al. in 2017 investigated accuracy of clinical test in detecting disc herniations and compression in lumbar radiculopathy. They summarized clinical assessment as lacking diagnostic accuracy.⁵⁵

Svanbergsson et al. in 2017 presented the usability of MRI for diagnosis in low back pain. They summarized that MRI and clinical results correlate poorly, with doctor's through knowledge being more important for diagnosis.⁵⁶

Long Xiao et al. in 2017 analysed correlation between vertebral endplate change and lumbar DDD. They concluded that degree of disc degeneration and modic changes can correlate with lumbar disc degeneration.⁵⁷

Korse et al. in 2017 did a study on lumbar spinal canal in patients with herniated discs. They concluded that spinal canal diameter in patients with LDH associated with or without cauda equina syndrome (CED) would determine the course of management.⁵⁸

Zi-Xuan Wang et al. in 2018 presented a study on T2 weighted MRI showing lumbar disc high-intensity zone (HIZ). They demonstrated the presence of HIZ on MRI associated with high body weight, aging, and lower back pain. They indicated these findings as a part of natural history and not an actual source of lower back pain.⁵⁹

Raudner et al. in 2019 studied the clinical outcomes using Quantitative MRI. They suggested Quantitative T2 mapping serves as a noninvasive, clinically feasible biomarker to indicate disks at risk for herniation, which correlate with clinical outcomes.⁶⁰

Zheng et al. in 2021 studied the clinical value of MRI for LDH. They concluded that MRI has high sensitivity and correlation between various clinical signs and MRI is important. They focused on the facet joint angle along with the lumbar disc herniation in management of the patients. MRI is a valuable tool in the assessment of the posterior elements.⁶¹

Conclusion

History helps us avoid incorrect pathways taken by our ancestors. It helps us learn from their mistakes and move forward in our quest to finding the answers.

Lumbar Disc Herniation (LDH) has a natural history which evolves from simple bulge to a complicated sequestration. Knowing the natural history and the various methods of treatments from our ancestors, saves us from repeating mistakes, and impart proper treatment to the patients.

Diagnosing the condition has evolved from clinical only, to myelography to MRI and various other modalities. Evolving with technology is the key to better management of this condition.

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