Lumbar discectomy

Lumbar discectomy is one of the most common spinal surgery worldwide.

The traditional midline bone-destructive procedures together with approaches requiring extreme muscular retraction in open lumbar discectomy are being replaced by muscle sparing, targeted, stability-preserving surgical routes. The increasing speculation on LDHs and the innovative corridors described to treat them have lead to an extensive production of papers frequently treating the same topic but adopting different terminologies and reporting contradictory results.

Through the analysis of papers by Lofrese et al. it was possible to identify ideal surgical corridors for ILDHs, ELDHs, and IELDHs, distinguishing for each approach the exposure provided and the technical advantages/disadvantages in terms of muscle trauma, biomechanical stability, and nerve root preservation. A significant disproportion was noted between studies discussing traditional midline approaches or variants of the posterolateral route and those investigating pros and cons of simple or combined alternative corridors. Although rarely discussed, these latter represent valuable strategies particularly for the challenging IELDHs, thanks to the optimal compromise between herniation exposure and bone-muscle preservation.

The integration of adequate mastery of traditional approaches together with a greater confidence through unfamiliar surgical corridors can improve the development of combined mini-invasive procedures, which seem promising for future targeted LDH excisions. 3)

Indications

Lumbar discectomy is an effective therapy for neurological decompression in patients suffering from lumbar disc herniation, which can be safely performed via minimal invasive procedures 2) 3).

History

In 1908 the first successful lumbar discectomy was initiated and performed by the German neurologist Heinrich Oppenheim (1858-1919) and the surgeon Fedor Krause (1857-1937); however, neither recognized the true pathological condition of discogenic nerve compression syndrome. With the landmark report in The New England Journal of Medicine in 1934, the two American surgeons William Jason Mixter (1880-1958) and Joseph Seaton Barr (1901-1963) finally clarified the pathomechanism of lumbar disc herniation and furthermore, propagated discectomy as the standard therapy. Since then interventions on intervertebral discs rapidly increased and the treatment options for lumbar disc surgery quickly evolved. The surgical procedures changed over time and were continuously being refined.

Microsurgery

The introduction of microsurgical techniques in 1977 and 1978 was introduced for spinal surgery by the work of the famous neurosurgeon Mahmut Gazi Yasargil 4) and Wolfhard Caspar 5) and so-called microdiscectomy was introduced and represented an important evolution in lumbar disc surgery.
see Lumbar microdiscectomy

**Chemonucleolysis**

Besides open discectomy other interventional techniques were developed to overcome the side effects of surgical procedures.

In 1964 the American orthopedic surgeon Lyman Smith (1912-1991) introduced chemonucleolysis, a minimally invasive technique consisting only of a cannula and the proteolytic enzyme chymopapain, which is injected into the disc compartment to dissolve the displaced disc material.

**Percutaneous discectomy**

see also percutaneous endoscopic lumbar discectomy.

In 1975 the Japanese orthopedic surgeon Sadahisa Hijikata described percutaneous discectomy for the first time, which was a further minimally invasive surgical technique. Further variants of minimally invasive surgical procedures, such as percutaneous laser discectomy in 1986 and percutaneous endoscopic microdiscectomy in 1997, were also introduced; however, open discectomy, especially microdiscectomy remains the therapeutic gold standard for lumbar disc herniation.

Discectomy surgery has evolved from wide open to microscopic and now endoscopic.

**Herniotomy**

Microsurgery is considered a standard procedure. However, since the herniated fragment was identified as the offending agent, it has always considered necessary to remove fragment only or the entire disc. This dogma is based on the assumption that increased rates of recurrent disc herniations would follow sequestrectomy alone. For the small subgroup of patients with a free fragment compressing the nerve root, Williams was the first to report encouraging results following minimal removal of tissue from the intervertebral disc space.

The frequency of herniotomy is gradually increasing in LDH treatment. Herniotomy used to be synonymous with fragmentectomy or sequestrectomy. The term 'herniotomy' is defined as removal of the herniated disc fragment only, and the 'conventional discectomy' as removal of the herniated disc and degenerative nucleus from the intervertebral disc space.

**Minimally invasive discectomy**

Minimally invasive discectomy (MID) may be inferior in terms of relief of leg pain, LBP and re-hospitalisation; however, differences in pain relief appeared to be small and may not be clinically important. Potential advantages of MID are lower risk of surgical site and other infections. MID may be associated with shorter hospital stay but the evidence was inconsistent. Given these potential advantages, more research is needed to define appropriate indications for MID as an alternative to standard MD/OD.
In the U.S., it has been estimated that the Medicare system spends over $300 million annually on lumbar discectomies.

**Technique**

In conjunction with the traditional discectomy, a laminotomy is often involved to permit access to the intervertebral disc. In this procedure, a small piece of bone (the lamina) is removed from the affected vertebra, allowing the surgeon to better see and access the area of disc herniation.

**Types**

see Lumbar discectomy types.

**Outcome**

see Lumbar discectomy outcome.

**Reoperation**

A retrospective study includes 53 patients who underwent reoperation after failure of lumbar disc surgery to relieve pain. All patients had leg pain before reoperation, which was successful in 28% of cases. Most clinical features, such as persistence or mode of recurrence of pain, radicular quality of pain, positive straight leg raise, and myelographic root sleeve defects, were not helpful in predicting successful and unsuccessful reoperations. However, a significantly larger percentage of women than men had successful reoperations. Patients who had past or pending compensation claims, who had sensory loss involving more than one dermatome, or who failed to have myelographic dural sac indentations resembling those caused by a herniated disc did poorly with reoperation. A very convincing myelographic defect appears to be needed to justify reoperation at a previously unoperated location. Excision of scar alone or dorsal rhizotomy was of no avail in these cases.

**Rehabilitation**

see Rehabilitation after lumbar disc surgery.

**Case series**

2017

Fifty patients who were scheduled for lumbar disc surgery were divided into 2 groups, namely patients who accepted the surgery at the first offer and those who wanted to think over. Educational
level information was obtained and patients were asked whether they had searched their disorder and offered surgery on the Internet. Then, a questionnaire was administered and the reliability of the websites was evaluated. Correction: The first 30 websites on the first 3 pages of Google® search engine, the most commonly used search engine in Turkey, were evaluated with the DISCERN® instrument.

Of 50 patients, 33 (66%) had conducted a search for the surgery on the Internet. All university graduates, 88.2% of high school graduates, and 18.7% of primary-secondary school graduates had conducted an Internet search. The quality and reliability of the information was high (4.5 points) for 2 (7.1%) websites, moderate (2.3 points) for 6 websites (21.4%) and poor (1 point) for 20 websites (71.4%) as scored with the DISCERN® instrument. The mean DISCERN® score of was 1.1 for websites of health-related institutions or healthcare news, 2.75 for personal websites of physicians and 2.5 for personal websites of non-physicians. The mean DISCERN® score of all websites was 1.5.

Most of the patients undergoing lumbar disc surgery at our clinic had searched information about the surgical procedure on the Internet. We found that 92.9% of the websites evaluated with the DISCERN® instrument had inadequate information, suggesting low-level reliability.

2016

The full set of prospectively gathered Medicare insurance data (2005-2012) was retrospectively reviewed. Patients who underwent primary lumbar discectomy for lumbar disc herniations from 2009 to quarter 3 of 2012 were selected. This cohort (n=41,655) was then divided into two subgroups: those who were diagnosed with incidental durotomy on the day of surgery (n=2,052) and those who were not (control population). To select a more effective control population, patients of a similar age, gender, smoking status, diabetes mellitus status, chronic pulmonary disease status, and body-mass-index were chosen at random from the control population to create a control cohort. In-hospital costs, length of stay, and rates of 30-day readmission, 90-day wound complications, and 90-day serious adverse effects were compared.

An incidental durotomy rate of 4.9% was observed. Higher rates of wound infection (2.4 vs 1.3%; OR 1.88; 95% CI: 1.31 - 2.70; p<0.001), wound dehiscence (0.9 vs 0.4%; OR 2.39; 95% CI: 1.31 - 4.37; p = 0.004), and serious adverse events related to incidental durotomy (0.9 vs 0.2%; OR 4.10; 95% CI: 2.05 - 8.19; p<0.0001) were observed in incidental durotomy patients. In-hospital costs were increased by over $4,000 in patients with incidental durotomy (p < 0.0001).

Incidental durotomies occur in almost one in every twenty elderly patients treated with primary lumbar discectomy. Given the increased hospital costs and complication rates, this complication must be viewed as anything but benign.

127 patients (of 148 total) with data collected 3 months postoperatively. The patients' average age at the time of surgery was 46 ± 1 years, and 66.9% of patients were working 3 months postoperatively. Statistical analyses demonstrated that the patients more likely to return to work were those of younger age (44.5 years vs 50.5 years, p = 0.008), males (55.3% vs 28.6%, p = 0.005), those with higher preoperative SF-36 physical function scores (44.0 vs 30.3, p = 0.002), those with lower preoperative ODI scores (43.8 vs 52.6, p = 0.01), nonsmokers (83.5% vs 66.7%, p = 0.03), and those who were working preoperatively (91.8% vs 26.2%, p < 0.0001). When controlling for patients who were working preoperatively (105 patients), only age was a statistically significant predictor of
In this cohort of lumbar discectomy patients, preoperative working status was the strongest predictor of postoperative working status 3 months after surgery. Younger age was also a predictor. Factors not influencing return to work in the logistic regression analysis included sex, BMI, SF-36 physical function score, ODI score, presence of diabetes, smoking status, and systemic illness. Clinical trial registration no.: 01220921 (clinicaltrials.gov)\(^1\).

2000

In a prospective study of 132 consecutive patients who underwent surgery for lumbar disc herniation, the authors evaluated the prognostic value of different variables in the duration of symptoms for the 1-year period after surgery. The 1-year follow-up investigation was conducted by an independent observer. Assessment of outcome was performed using a clinical overall score (COS), which was recently assessed for its reliability and validity. As for factors predictive of outcome, only duration of leg pain and sick leave reached statistical significance in the multivariate analysis. Results of the univariate analysis demonstrated that in patients experiencing preoperative leg pain fewer than 4 months and between 4 and 8 months, a significantly lower COS at the 1-year follow up was demonstrated compared with those in whom the duration of leg pain was longer (> 8 months). One hundred eight patients returned to work within the 1st year after surgery. Patients who took a sick leave of more than 28 weeks before the operation were at higher risk of not returning to work.

Analysis of these results indicates that leg pain lasting more than 8 months correlates with an unfavorable postoperative outcome in patients with lumbar disc herniation, as well as a high risk of not returning to work\(^1\).

\(^8\) Law JD, Lehman RA, Kirsch WM. Reoperation after lumbar intervertebral disc surgery. J Neurosurg.

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