Clinical Results of 30 Years Surgery On 2026 Patients with Lumbar Disc Herniation

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ABSTRACT

AIM: Lumbar discectomy is the most common surgical procedure performed for back and leg symptoms, but the efficacy of the procedure remains controversial. We aim to report the outcomes of surgical treatment for lumbar intervertebral disk herniation on our large series during a 30-year period of experience.

MATERIAL AND METHODS: Our study enrolled the patients considered for surgery from March 1979 to December 2009. The neuroimaging demonstrated herniated disk that was related to their symptoms and persistent symptoms despite nonoperative treatment. The outcome was assessed according to Macnab's criteria.

RESULTS: Among 41347 patients with low back pain referred to our clinic, 2026 (4.9%) cases needed surgery (1202 males, 824 females). Mean age was 42.7 years. The most common complaint was axial pain (98.8%). Sensory and motor impairment was seen in 1193 (58.9%) and 766 patients (37.8%) respectively. Follow up ranged from 1 week to 8 years. According to Macnab's criteria, an “Excellent” outcome was seen in 1453 patients (71.7%), “Good” in 444 (21.9%), “Fair” in 89 (4.4%), and “Poor” in 41 cases (2%).

CONCLUSIONS: Surgery for lumbar disc herniation is safe and has a good outcome and should be considered in patients who do not respond to conservative therapy.

KEY WORDS: Disc, Herniation, Laminectomy, Lumbar, Surgery

INTRODUCTION

Lumbar disc disease accounts for a large amount of lost productivity in the society. In the adult population the reported rate of low back pain differ from 25 to 50% and the estimated life time incidence is 50-70% (14,22,38). Lumbar disc prolapse constitutes about 1% of cases with back pain (8). In 90% of these cases, the herniations occur at the L4-L5 and L5-S1 levels; while L3-L4 and L2-L3 levels account for the majority of other herniations (5). Treatment is controversial. Treatment failures are not uncommon and are often related to posttraumatic or work-related injuries, and may result in litigation problems. Many of the clinical trials about surgical treatment had defects of design. Some of the trials included very small numbers of patients. Methods and published details often were poor. There were few proper clinical follow-ups (9), and the most common surgical outcomes were crude (1,9,12,16,27,41).

In this paper we intend to report the 30-year experience and long-term assessment of surgical outcome on a large series of patients. Using different search engines such as google, altavista and pubmed, we did not find such a large
Surgical procedures consisted of laminectomy, hemilaminectomy, and the interlaminar fenestration technique (7-9).

**Surgical procedures:**

In laminectomy and hemilaminectomy the whole or half portion of the lamina was removed respectively along with overlying ligaments.

In interlaminar fenestration, the lamina was removed partially whenever necessary, and the herniated fragment was removed after retracting the nerve roots. The remaining nucleus in the disc space was preserved as much as possible. Free fat grafts were placed over the root and the dura at the end of each procedure to prevent excessive adhesion (12,29,33,37,39).

The Mac Nab scale was used to determine the clinical outcome after surgery (1). The state of satisfaction was graded as excellent, good, fair or poor.

Excellent result meant that the patient had no complaints and was able to return to full working capacity. Good result indicated that the patient had full working capacity but slight low back and leg pain. Excellent or good were regarded as satisfactory outcome. Fair result indicated that the patient does not have normal working capacity; low back and leg pain was reduced but the patient still required the administration of analgesics. Poor result meant that the degree of pain is unchanged or worse and the patient required regular administration of analgesics (23).

The statistical analysis was performed by Wilcoxon & Fisher methods and a p-value less than 0.05 was considered statistically significant.

**RESULTS**

From March 1979 to December 2009, 116472 patients visited our neurosurgical clinic. Of these patients 41347 (35.5%) complained of low back pain. Considering the inclusion criteria, 2026 cases were considered for surgery. This finding advocated that almost 4.9% of the patients with lumbago needed surgical treatment. 1202 cases were male and 824 were female. Male to female ratio was 1.45. Mean age was 42.7 years, ranging from 8 to 84 years with standard deviation of 14.45 years.

The most common complaint was axial pain. Low back pain was observed in 2002 patients (98.8%) and
radicular pain was seen in 1988 cases (98.1%). In 910 patients (44.9%) the pain radiated to the right extremity and in 776 cases (38.3%) the pain radiated to the left extremity. In 300 cases (14.8%), the pain radiated to both legs equally.

The duration of symptoms from beginning to the time of surgery ranged from 3 days to 32 years. The average value was 16 months and the standard deviation was 32 months.

Sensory and motor impairments was seen in 1193 (58.9%) and 766 patients (37.8%) respectively. Sphincter problems occurred in 77 patients (3.8%) and 205 patients (10.1%) suffered from paresthesia.

In our study, the positive straight leg raising test (SLRT) or Lasegue sign was seen in 1497 patients (73.9%). Abnormal deep tendon reflexes were present in 1449 cases (71.5%). We found a significant negative relation between age and SLRT in our patients (i.e., the patients older than 60 years showed lower frequency of positive Lasegue sign compared with younger patients) (p=0.00003).

We performed four view lumbosacral plain X-ray studies (AP, lateral, right and left oblique) including dynamic views (flexion-extension) in all our cases. In 1317 cases (65%) the results were normal, but the rest of the cases showed decreased lordosis, scoliosis, osteoporosis, osteophytes, facet hypertrophy, spina bifida, and decreased disc height.

In 758 patients (41.5%) the radiologic diagnosis was based only on myelography because magnetic resonance imaging (MRI) was not popular in our country before 1994. For all the cases that referred to us after 1994, lumbosacral MRI was performed (1132 patients, 55.9%). In 136 patients (7.4%) myelography was also performed either due to inconclusive MRI results or in cases with contraindications (metallic fragments, claustrophobia and financial issues).

The level of lumbar disc herniation was determined based on radiologic studies. L4-L5 interspace was involved in 1078 cases (53.2%), L5-S1 in 691 cases (34.1%), L3-L4 in 130 patients (6.4%), and upper levels in 128 patients (6.3%). Concerning higher level disc herniations, older patients ( >= 60 years) had more contribution, compared with the younger ones. (p=0.00025)

1183 patients (58.4%) underwent interlaminar fenestration. In 551 cases (27.2%) laminectomy was performed and in the remaining 292 patients (14.4%) the surgical procedure was hemilaminectomy.

The period of follow up (F/U) ranged from 1 week to 8 years. The average was 12 month. 1728 patients (85.3%) had more than one year follow up visits. The average number of F/U visits was 6 with the standard deviation of 4.

According to Macnab’s criteria, in this study “Excellent” outcome was seen in 1453 patients (71.7%), “Good” in 444 (21.9%), “Fair” in 89 (4.4%), and “Poor” in 41 cases (2%).

The surgical outcome relative to the selected procedure was compared and the statistical results are summarized in Table 1.

Thirty two patients (1.6%) had recurrent disk herniations and underwent reoperation. We had no case with missed level surgery. Fifty three (2.6%) had superficial post-op wound discharge which was treated with oral antibiotics and repeated dressings and healed completely. Cauda-equina syndrome occurred in 3 cases (0.16%). In nine cases (0.49%) dural laceration occurred during surgery which were repaired and no one showed CSF leakage or meningitis.

The mortality rate was zero however we had one case with great vessel injury. In that case we noticed sudden hypotension and arterial bleeding from the disk space so we turned the patients to supine position and began laparotomy and called the vascular surgeon and repaired the aortic rupture. Fortunately the patient survived.

The relationship between age, gender, and coexisting

<table>
<thead>
<tr>
<th>Surgical procedure</th>
<th>Excellent N (%)</th>
<th>Good N (%)</th>
<th>Fair N (%)</th>
<th>Poor N (%)</th>
<th>Total N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interlaminar fenestration</td>
<td>977 (82.6%)</td>
<td>125 (10.6%)</td>
<td>56 (4.7%)</td>
<td>25 (2.1%)</td>
<td>1183 (58.4%)</td>
</tr>
<tr>
<td>Laminectomy</td>
<td>309 (56.1%)</td>
<td>219 (39.7%)</td>
<td>15 (2.7%)</td>
<td>8 (1.5%)</td>
<td>551 (27.2%)</td>
</tr>
<tr>
<td>Hemilaminectomy</td>
<td>165 (56.5%)</td>
<td>100 (34.2%)</td>
<td>18 (6.2%)</td>
<td>9 (3.1%)</td>
<td>292 (14.4%)</td>
</tr>
</tbody>
</table>
spinal stenosis and the outcome has been summarized in Table 2.

**DISCUSSION**

Management of lumbar disc prolapse has been extensively studied because of its economic impact in the society. The demographic features, clinical presentations, radiological diagnosis, surgical outcome and the contributing factors had been studied a lot but the results vary according to the society and the method of investigation (4,21). In this study we intended to report the outcome of our large series (over 2000 cases) in a 30-year period. An important feature of our study is that the surgical procedures were performed by a single team.

In our patients, the mean age was 46.3 year. The age groups mainly affected in other studies, were between 16 to 69 years (the average was 38 years) so it can be concluded that lumbar disk herniation mainly affects working group of the society and the disease affects the financial issues of the involved population (12).

In our study, men outnumbered women (M/F ratio=1.5). Our finding is compatible with other reported series. In a study performed by Yorimitsu and his colleagues the reported M/F ratio was 1.88 (12). In another study by Akbar and Mahar on 96 patients with low back, the M/F ratio was 2.6 (1). This can be explained by the fact that men are exposed to more severe mechanical stresses compared to women.

In our cases the most common presenting symptom was axial low back pain and radicular pain ranked the second. This was compatible with other series and the rate of presentation was 93.8% (1).

The least common presenting symptom was sphincter disorders in our patients. In other series the rate of sphincter problem was 6.2% (1).

In nearly half of our patients the radicular pain was on the right side. In Hudgins study the radicular pain was seen predominantly on the left side (18). In Finesson's study radiation to the left was more common (13). We did not find any other article in favor of right dominancy.

The reported frequency of occurrence of lumbar disc prolapse is highest at L4- L5 and L5- S1 levels in 90% of the cases (5). Likewise, in our study these levels are involved in 87.3% of the cases. This may be explained by the fact that in the upper lumbar spine, extra-foraminal space is proportionally larger than the lower lumbar levels and the increased mobility of lower segments result in earlier degeneration and disc herniation (15).

In both younger (< 60 y) and older (≥ 60 y) patients, lower lumbar levels were involved more than upper parts, in older cases upper level involvement was seen more than younger patients (p=0.00025), so this study showed that sequestrated herniation and herniation at high level was more common in elderly patients. These characteristics of lumbar disc herniations in elderly patients were assumed to result from severe disc degeneration and loss of movement at lower lumbar intervertebral levels and increases stress on higher levels (15,30).

Our study showed that the most common finding in clinical examination was positive Lasegue (Straight Leg Raising) test seen in 73.9% of cases. Jonsson et al reported that 86% of the patients had a positive SLR test before surgery (4).

In our study older patients showed lower rate of positive Lasegue test compared with younger ones (p=0.00003). Fuji and his colleagues reported that younger patients showed higher rate of positive SLRT compared with the elderly patients but this correlation was not significant (15).

The treatment of lumbar disc disease is the most controversial topic in the spine literature, as to whether surgical treatment should be attempted and if so which surgical approach is optimal. Since 1934, surgical treatment for lumbar radiculopathy due to disc prolapse has consisted of hemilaminectomy and removal of herniated material, which is called the standard surgical procedure (28). Outcome from disc surgery has generally been good, attempts have been made to determine factors that predict the success or failure of lumbar disc surgery (3,19) In general patients selection appears to be the most important factor to achieve satisfactory results.

According to Macnab's criteria, in this study “Excellent” outcome was seen in 1453 patients (71.7%), “Good” in
444 patients (21.9%), “Fair” in 89 patients (4.4%), and “Poor” in 41 patients (2%) (23).

Lakicevic reported that good outcome occurred in 73% of his patients and in the other cases the results were fair or poor (16).

Graves et al analyzed outcomes of 122 patients suffering from lumbar disk herniation that underwent surgery. This study reports good result for 90% of patients and 6% reoperation (17).

Approximately 80 to 90% of patients usually obtain good results with traditional hemilaminectomy and diskectomy (7, 29). In the study by Akbar and Mahar, 50% of the patients had excellent results while 40% obtained good results (1).

According to the study by Manish Garg and colleagues Good results were obtained in 86% of the cases (24).

The fair and poor results were related to subjective factors rather than to any objective impairment of function of the musculo-skeletal system.

In the review of literature the reported success rate ranged from 50 to 93% (Table 3).

In our patients the most common surgical procedure was interlaminar fenestration. We assessed the outcome of surgery relative to the surgical procedure.

The technique of limited disc excision was described by Spengler in 1982 (36). The advantages of this technique are diminished perineural fibrosis and less likelihood of damage to vessels and/or viscera anterior to the annulus.

In our study the best outcome was seen after interlaminar fenestration (p=0.0003). This is consistent with other studies (16).

In our study we did not find any statistically significant relationship between the sex and the surgical outcomes (p=0.291), but in Graves study, the outcomes of surgeries on male were better than females (17).

We found a significant correlation between the age and outcome. In our study younger patients (< 60 year) had more favorable outcome after surgical intervention (p=0.0003).

Rothorel et al reviewed 219 patients with definite indications for surgery. They showed that there is not any relationship between age and outcomes (21).

We also found that, in cases without lumbar canal stenosis the final outcome was significantly better than patients with stenosis (p=0.00002).

Complication rate in our study was 14.6% with infection, remaining on the top (7.3%) followed by dural tears, as most of the disks were adherent to the spinal dura matter. A diagnosis of cauda equina syndrome remains an absolute indication for urgent surgery.

In the series of Buchner and Schiltenwolf, 12 of 17 patients had a complete recovery of urinary function (6). In our study 4 out of 6 patients had good control over urinary sphincters while 2 got partial control (stress incontinence) after 10 months of follow up. Motor deficit such as foot drop recovery was very slow and incomplete. Only 2 out of 12 cases had good recovery, 6 had partial recovery and 4 had no improvement after 6 months of follow up, indicating long term capacity of recovery. These 4 patients had foot drop for more than 3 months duration preoperatively. Sensory impairment improved within 8 to 10 weeks, however, saddle anesthesia was found to be resistant to recovery in cauda equina lesions. One patient who developed spinal instability due to facet damage was managed by fusion after 3 months of hemilaminectomy as advocated by Epstein (10).

The most common complication in our series was superficial wound infection that occurred in 5% of our

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Patients</th>
<th>Success rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weber (44)</td>
<td>1983</td>
<td>122</td>
<td>93</td>
</tr>
<tr>
<td>Graves (28)</td>
<td>1999</td>
<td>96</td>
<td>90</td>
</tr>
<tr>
<td>Akbar (9)</td>
<td>2002</td>
<td>984</td>
<td>89</td>
</tr>
<tr>
<td>Davis (30)</td>
<td>1994</td>
<td>105</td>
<td>87</td>
</tr>
<tr>
<td>Smyth (45)</td>
<td>1983</td>
<td>456</td>
<td>73</td>
</tr>
<tr>
<td>Lakicevic (7)</td>
<td>2009</td>
<td>162</td>
<td>50</td>
</tr>
</tbody>
</table>

Table 3: The success rate of surgical treatment of lumbar disc herniation in different series.
patients and resolved completely with antibiotic therapy. One percent of our cases showed deteriorated motor function and discitis occurred in 0.6%. In the Spangfort series local infection occurred in 21% (35). In the Rowling series wound infection occurred in 2-3% (31).

Kardaun and colleagues in their series reported that surgical morbidity after lumbar laminectomy was 3.7% and in Pappas study this rate was 11% (20,29).

It should be noted that we had not any mortality in our series. Mortality after lumbar disc surgery may occur due to meningitis or great vessel injuries (2).

The mortality rate for a lumbar laminectomy is between 0.8% and 1%. Rates of complications depend partly on whether a spinal fusion is performed as part of the procedure; while the general rate of complications following a lumbar laminectomy is given as 6-7%, the rate rises to 12% of a spinal fusion has been done (11,26). Recent case reports or large series studies concerning surgery for herniated discs have either reported no vascular or visceral injury or an incidence of less than 1%. Few surgeons have had personal experience with more than one or two instances, and the exact incidence of vascular injury in lumbar discectomy may not be known (41).

**CONCLUSION**

A review of the literature reveals success rates for lumbar discectomy ranging from 46–96% (34,40). In our study the success rate (including excellent and good outcome) was 93.6%. Surgery can therefore be considered as a safe and useful option especially in cases intractable to conservative treatments. The outcome of lumbar discectomy depends more on patient selection than on surgical technique (25,34).

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Manuscript submitted November 01, 2012.
Accepted December 08, 2012.

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