Austin Journal of Orthopedics & Rheumatology

Open Access

Austin Publishing Group

Research Article

Impact of Herniation Level on Surgical Outcome of Microlumbar Discectomy

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Received: July 30, 2014; **Accepted:** October 10, 2014; **Published:** October 15, 2014

Abstract

Introduction: L4-L5 and L5-S1 are the most common sites for lumbar disc herniation (LDH). The aim of this study is to compare preoperative demographic indices and surgical outcomes in them.

Materials and Methods: We retrospectively evaluated 280 patients (Male to female: 168 to 112) who underwent simple microlumbar discectomy in our orthopedic department from March 2009 to December 2012 and followed-up for more than two years. Total mean age of the patients was 38.5 ± 11.3 (ranged 19 to 76) years old. We placed them in two groups; A: L5-S1 (128 patients) and B: L4-L5 (152). We assessed them preoperatively and at the last follow-up visit. Statistical significance was assumed as a p<5%.

Results: Group B was about 5 years older. Preoperative Oswestry Disability Index (ODI) and Visual Analogue Scale (VAS) for leg, and time to operation were significantly higher in group B. At the last follow-up visits, pain scores were comparable but ODI scores in group B remained higher, although mean improvement in ODI score in this group was also higher.

Conclusions: The patients with L4-L5 versus L5-S1 LDH have more preoperative leg pain and ODI scores and shorter time to operation, although the ultimate satisfaction rates at final follow-up visit are similar.

Keywords: Herniation Level; Lumbar disc herniation; Microdiscectomy; Outcome

Introduction

Sciatica is a symptom that is caused by compression or inflammation of the lumbosacral nerve roots [1]. Discogenic sciatica accounts for about 90% of the disease and most of the time, it resolves with conservative treatment [2-4]. In those refractory cases with progressive neurologic deficit, intractable pain, or sphincter dysfunction, surgical intervention is sometimes necessary [5]. Golden time to achieve the best surgical outcome is usually between six weeks and six months after appearance of sciatica [6-9]. Although various surgical techniques including laser therapy, percutaneous endoscopic discectomy, plasma, and etcetera have been recently introduced, microlumbar partial discectomy is still the gold standard of surgery in these patients [10,11]. Two lower lumbar intervertebral discs (L4-L5 and L5-S1) are the most common sites for lumbar disc herniation (LDH) [12]. It is usually quoted that L5-S1intervertebral space due to its deeply sitting position and extensive iliolumbar ligaments, is protected from torsional strain but susceptible relative to axial compressive loads. Vice versa, L4-L5 intervertebral disc is more vulnerable to axial torsion and is the most common site of lumbar instability [13]. Therefore, it seems logical that the factors influencing he course and prognosis of these two diseases are also to be different. Although various studies have been carried out on different aspects of LDH, a few studies report a comparison between preoperative demographic indices and surgical outcomes in these two common lumbar disc herniations [13-15]. The aim of this study is to address this important issue with a more comprehensive details and analysis.

Materials and Methods

After local institutional review board approval (code number 922153), we retrospectively evaluated the patients under went partial lumbar discectomy in our orthopedic department from March 2009 to December 2012. As the number of the patients with L4-L5 or L5-S1 LDH relative to other levels of LDH was too high, for more clarity we omitted the patients with other levels of LDH and divided the patients into two groups as shown in Figure 1: A (L5-S1 group) and

Figure 1: A) Sagittal MRI image belonged to a patient in Group A (L5-S1 disc herniation).
B) Sagittal MRI image belonged to a patient in Group B (L4-L5 disc herniation).

Citation: Omidi-Kashani F, Jarahi L, Jafarian M, Rahimi and Anjomrouz M. Impact of Herniation Level on Surgical Outcome of Microlumbar Discectomy. Austin J Orthopade & Rheumatol. 2014;1(1): 3.

Figure 1: B (L4-L5 group). We included those patients with single level L4-L5 or L5-S1 disc herniation with underlying stable spine that had been operated by microlumbar discectomy and followed-up for more than two years. Patients with cauda equina syndrome, revision surgery, spinal stenosis (pathologies not limited to disc herniation), spondylolysis, spondylolisthesis, or those needed fusion or any types of instrumentation (even non-fusion implants) were excluded. The surgical technique was the same throughout these years and was concordance with the standard microlumbar discectomy technique had been noted previously [16].

Data analysis of patients was based on preoperative information and the information achieved at the last follow-up visits. Body mass index (BMI) was calculated as dividing weight (kilogram) by height squared (meter). According to World Health Organization classification, BMI in adults can be categorized to four subgroups: under weight (BMI<18.5), normal (BMI: 18.5-24.99), over weight (BMI: 25-29.99), and obese (BMI>30) [17]. We measured pain in the leg and lumbar areas, separately. Visual analogue scale (VAS) on a scored sheet from 0, no pain; to 10, worst pain was used to measure the pain [18]. We also used Oswestry Disability Index (ODI) questionnaire version 2.1 to estimate the disability scores [19,20]. To evaluate patients' satisfaction with surgery, we took our patients into four groups: excellent (if surgery met their expectations), good (if the patients improved but not as much as they had hoped), fair (if the surgery was helpful but they did not choose the same treatment for the same outcome), and poor (if the patients were the same as or worse than they were before the operation) [21].

Statistical analysis

Statistical analysis was used by SPSS for windows, ver. 16.0 (SPSS Inc., Chicago, IL, USA). Statistical significance was assumed as a p<5%.We used Kolmogorov-Smirnov test for normality, Spearman's rank correlation coefficient (Spearman's rho), and T-test for independent samples. Mann-Whitney, paired T-test, Wilcoxon, and Chi-square tests were also used in appropriate places.

Results

Although during this period of time, we had operated 321 patients with isolated L4-L5 or L5-S1 LDH, with applying inclusion and exclusion criteria, we found that 280 patients were eligible to enroll in our study. Total mean age of the patients was 38.5 ± 11.3 (ranged 19 to 76) years old. Group A and B comprised 128 patients (35.9 ± 9.5 years old), and 152 patients (40.6 ± 12.2), respectively (group B was significantly older, p=0.015). Total male to female ratio was 168 (60%) to 112 (40%), while this ratio within the group A and B was 80 (62.5%) to 48 (37.5%), and 88 (57.9%) to 64 (42.1%), respectively. Sex ratio was not significantly different between the two groups (p=0.540).

Based on Kolmogorov-Smirnov test among all preoperative indices, only preoperative ODI had a normal distribution pattern. Statistical data of our patients at preoperative and last follow-up visits are shown in Table 1. This table shows that based on paired t- test, pre- and postoperative indices were significantly different (surgery could markedly improve pain and disability in both groups, p<0.001).

Total follow-up period was 36.1 ± 11.1 (ranged; 24 to 50 months). The mean improvement in ODI comprised 35.3 ± 20.8 in Group A and 45.7 ± 20.5 in Group B (p=0.004). In spite of this, the mean improvement in VAS (lumbar or leg) had no significant difference between the two groups (p=0.844 and 0.844, respectively for VAS lumbar and VAS leg).

Table 1: Statistical data of our patients at preoperative and last follow-up visits.

Index	Group A	Group B	P value
Preoperative			
-ODI⁺	43.2 ± 20.0	64.1 ± 15.9	0.000*
-VAS[X] leg	7.3 ± 2.5	8.1 ± 1.5	0.020*
-VAS lumbar	6.0 ± 3.1	6.1 ± 3.5	0.825
Postoperative			
-ODI	7.9 ± 11.2	18.4 ± 17.6	0.000*
-VAS leg	1.1 ± 1.9	1.7 ± 2.1	0.101
-VAS lumbar	1.2 ± 2.0	1.4 ± 1.8	0.529
Time to operation (m*)	26.9 ± 26.1	14.6 ± 14.0	0.019*
Follow-up (m)	34.6 ± 10.8	37.2 ± 9.5	0.363
Satisfaction rate (%)			
-Excellent	90(70.3)	116(76.3)	0.705
-Good	17(13.3)	16(10.5)	0.843
-Fair	11(8.6)	12(7.9)	0.521
-Poor	10(7.8)	8(5.3)	0.129

⁺ODI: Oswestry Disability Index; [X]VAS: Visual Analogue Scale; *m: Month; * = Statistically significant

Spearman's rank correlation coefficient (Spearman's rho) showed that in total studied patients, time to operation had a reverse correlation with ODI improvement (correlation coefficient= -0.174, p=0.040), but inside the groups, neither time to operation nor BMI could show a correlation with surgical outcome (improvement in ODI, VAS, or satisfaction rate).

BMI analysis demonstrated that most of our patients (65% in group A and 68% in group B) were placed in normal weight subgroup and it has shown that BMI subgroups had no correlation with the level of LDH (p=0.834). Postoperative improvement in leg and lumbar VAS and ODI in different BMI subgroups also showed that the improvement was not affected by the level of affliction.

Discussion

Throughout the spinal column, L4-L5 and L5-S1 comprise the most common sites of disc disease. In this study we found some important differences between demographic and behavioral characteristics of these two spinal disc herniations. In 2010, Okoro and Sell in a prospective cohort study compared surgical outcomes between L4-L5 and L5-S1 discectomies [13]. They found no preoperative significant difference clinically, although subjective walking distance for L5-S1 group was longer. Six months after surgery, low back outcome score in L4-L5 group was significantly higher and at 12 months, men in L5-S1 group showed a better ODI score relative to women. Evaluating all other parameters, the authors could not find any significant difference between the two groups. Recurrence and revision rates were also comparable. Unlike this study, we found that L4-L5 patients were about five years older than L5-S1 group and preoperative leg pain and ODI were also higher in this group (L4-L5). In our study time to operation was significantly lower in L4-L5 group and we believe this was probably due to more pain and disability existed in this group.

A review on the literature reveals that with increasing age, the level of lumbar disc degeneration and herniation also raises [14,15,22]. In the study conducted by Skaf et al. [14] effect of age and lumbar lordosis on the level of LDH was evaluated [14]. They found that

younger patients had higher lumbar lordotic angle and lower levels of LDH. They finally concluded that age and lumbar lordotic angle can be predictors of the level of LDH. In their study, the conclusion was similar in both sexes. In our study, we did not measure lumbar lordotic angle, but our results support the correlation between age and level of LDH. We find a mean difference age of five years between L4-L5 and L5-S1 patients, with the later was the younger group. Similarly, in an extensive retrospective study done by Dammers and Koehler, they evaluated 1431 patients with LDH and found that the mean age of the L4-L5 and L5-S1 patients were 49.5 ± 0.6 and 44.1 ± 0.5, respectively [15]. The difference is nearly the same as our study but the age of the patients in these two studies show a significant difference (the mean age of our patients with L4-L5 and L5-S1 LDH was alarmingly lower; 40.6 and 35.9, respectively). We think than this difference is somewhat explained by this fact that our study has been carried out in a teaching (versus private) hospital that usually deals with low income and labor patients and therefore, the results may not be logical to be generalized to the entire population.

Our study showed that although the mean preoperative ODI in L4-L5 group was higher, the mean improvement in ODI was also significantly higher in this group. We could not find any difference in the amount of pain relief in both groups. Dewing et al. [23], in a longitudinal prospective study evaluated clinical outcomes with level of LDH in 197 young patients (19 to 46 years) undergoing microdiscectomy [23]. In contradict to our study, their results showed that L5-S1 patients had greater improvement in both mean VAS leg and ODI scores. This apparent difference in results of these two studies may be due to the age limitation that had been applied in Dewing's study. The mean age of our patients was about 11.5 years higher (38.5 versus 27.0) and we've had some patients aged 76 years. We have not assessed the impact of age on surgical outcome of LDH, but these outcomes may be diverse in different age groups.

Although the sample size of our study was significant, it certainly had some flaws. The study had a retrospective design and inevitably had the limitations of these studies. Due to low number of the patients with upper LDH, we could not include these patients in our study. On the other hand, since the study was performed on the patients with relatively lower socioeconomic status who had been admitted to a governmental hospital, it may not make sense that we can generalize the results to the entire community. To obtain more universal and reasonable results, we propose that a prospective multicenter study on the patients undergoing lumbar microdiscectomy should be performed.

Conclusion

We concluded that patients with L4-L5 versus L5-S1 LDH who are undergoing microlumbar discectomy have more preoperative leg pain and ODI scores and shorter time to operation, although the ultimate satisfaction rates at final follow-up visit are similar and comparable.

Acknowledgment

This study was based on a medical student's thesis (Mona Nasiri, registration No 922153) and the authors would like to thank deputy of research, Mashhad University of Medical sciences for financial support.

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