**Al-Rafidain J Med Sci. 2024;6(2):89-93.**
**DOI:** https://doi.org/10.54133/ajms.v6i2.737

A J M S
Online ISSN (2789-3219)

**Research Article**

# Preoperative Leg Pain as a Predictor of Clinical Outcomes after Single Lumbar Microdecompression Surgery in Young and Middle-Aged Groups: A Retrospective Study

Zaid Saad Madhi[1]*, Muhanad Dawood Al-Jubouri[2], Imad Saad Madhi[3], Jameel Tahseen Mehsen[4], John Leach[5], Rajat Verma[5], Mohammed Naveed Yasin[5], Saeed Mohammed[5], Frances Arnell[6], Irfan Siddique[5]

*[1]Department of Radiological Techniques, College of Medical and Health Sciences, Al-Mustaqbal University, Iraq; [2]Department of Surgery, College of Medicine, University of Baghdad, Baghdad, Iraq; [3]NHS Wythenshawe Hospital, Southmoor Rd, Wythenshawe, Manchester M23 9LT, UK; [4]Department of Surgery, Hammurabi Medical College, University of Babylon, Babylon, Iraq; [5]Department of Spinal Surgery, Salford Royal NHS Hospital, Stott Ln, Salford M6 8HD, UK; [6]School of Health and Society, University of Salford, Manchester, UK*

Received: 15 March 2024; Revised: 25 April 2024; Accepted: 16 May 2024

## Abstract

***Background***: Previous studies have stated that the higher the LP VAS, the better the outcome. However, there is no quantification of this relationship. ***Objectives***: To maximize the understanding of the effect of symptom duration and intensity of leg pain on surgical outcome at one year, ascertain whether the level of radiculopathy influences outcome, and examine the possible factors that may lead to repeat surgery at the same level in young and middle age groups. ***Methods***: Retrospective data was collected from patients who underwent primary, single-level lumbar decompression surgery with a 12-month follow-up period. We used the ROC curve to determine the LP VAS cutoff value. ***Results***: 500 patients were included. There was a significant improvement in LBP VAS and LP VAS after 12-month follow-up (84% and 95%, respectively). There was a significant relationship between the reoperation rate and LP VAS, with a p-value of 0.001. LP VAS (>7.0) is the maximum area under the curve, with 92% sensitivity and 37% specificity to predict reoperation. There was no significant relationship with the duration of radiculopathy. ***Conclusions***: Patients (92%) with a preoperative LP VAS >7.0 are more susceptible to re-operation surgery. LP cannot be used as a predictor of surgical outcome independently of other factors. Surgeons should be more cautious in selecting patients for surgery and not base their decision only on preoperative leg pain.

***Keywords***: Clinical outcome, Leg pain, Microdecompression, Microdiscectomy, Predictors, Radiculopathy.

## ألم الساق قبل الجراحة كمؤشر للنتائج السريرية بعد جراحة تخفيف الضغط القطنية الدقيقة في مجموعات الشباب ومتوسطي العمر: دراسة بأثر رجعي

### الخلاصة

**الخلفية**: ذكرت الدراسات السابقة أنه كلما ارتفع LP VAS ، كانت النتيجة أفضل. ومع ذلك، لا يوجد تقدير كمي لهذه العلاقة. **الأهداف**: تحقيق أقصى قدر من الفهم لتأثير مدة الأعراض وشدة آلام الساق على النتيجة الجراحية خلال عام واحد، والتأكد مما إذا كان مستوى اعتلال الجذور يؤثر على النتيجة، وفحص العوامل المحتملة التي قد تؤدي إلى تكرار الجراحة على نفس المستوى في الفئات العمرية الشابة والمتوسطة. **الطريقة**: تم جمع البيانات بأثر رجعي من المرضى الذين خضعوا لجراحة تخفيف الضغط القطني الأولية أحادية المستوى مع فترة متابعة مدتها 12 شهرا. استخدمنا منحنى ROC لتحديد قيمة قطع LP VAS. **النتائج**: تم تضمين 500 مريض. كان هناك تحسن كبير في LBP VAS و LP VAS بعد متابعة استمرت 12 شهرا (84٪ و 95٪ على التوالي). كانت هناك علاقة ذات دلالة إحصائية بين معدل إعادة التداخل الجراحي وقيمة LP VAS بقيمة p تبلغ 0.001 . LAP VAS أقل من 7 هي أقصى مساحة تحت المنحنى مع حساسية 92٪ وخصوصية 37٪ للتنبؤ بإعادة التأهيل. لم تكن هناك علاقة ذات دلالة إحصائية مع مدة اعتلال الجذور. **الاستنتاجات**: المرضى (92٪) الذين يعانون من LP VAS قبل الجراحة >7.0 هم أكثر عرضة لإعادة الجراحة مرة ثانية. لا يمكن استخدام LP كمؤشر للنتائج الجراحية بشكل مستقل عن العوامل الأخرى. يجب أن يكون الجراحون أكثر حذرا في اختيار المرضى للجراحة ولا يبنوا قرارهم فقط على آلام الساق قبل الجراحة.

* ***Corresponding author***: Zaid S. Madhi, Department of Radiological Techniques, College of Medical and Health Sciences, Al-Mustaqbal University, Iraq; Email: zaid.saad@uomus.edu.iq

***Article citation***: Madhi ZS, Al-Jubouri MD, Madhi IS, Mehsen JT, Leach J, Verma R, Yasin MN, Mohammed S, Arnell F, Siddique I. Preoperative Leg Pain as a Predictor of Clinical Outcomes after Single Lumbar Microdecompression Surgery in Young and Middle-Aged Groups: A Retrospective Study. *Al-Rafidain J Med Sci*. 2024;6(2):89-93. doi: https://doi.org/10.54133/ajms.v6i2.737

## INTRODUCTION

In young and middle-aged groups, lumbar disc herniation-induced radiculopathy is a common spine pathology that necessitates surgery. In the USA, approximately 2.1 out of 1000 patients underwent discectomy or laminectomy in 2003 [1–6]. Variable surgical outcomes have been reported in the literatures, with more than 40% experiencing recurrent lower back pain (LBP) and/or leg pain (LP) requiring further surgery at the same level [5,7]. It is important to identify the risk factors that lead to unsuccessful decompression and the appropriate patients for surgery in order to avoid recurrent pain, distress, and the development of chronic pain syndrome [6,8-11]. Research also suggests that the best clinical outcome is the absence of recurrent intervertebral disc prolapse [12]. There is no clear indication for lumbar spine decompression surgery. Therefore, the definitive indication for decompression surgery has been limited to patients who present with motor dysfunction or cauda equine syndrome [10,13]. Most studies stated that the higher the LP VAS (visualize analog scale), the better the outcome; however, none of them quantified this relationship [6,9,10,14]. Previous studies have reported numerous potential factors that could influence the outcome of lumbar spine decompression surgery. However, these studies either have a small sample size [6,8,14-20], or did not consider the duration of radiculopathy [7,21,22]. Furthermore, including all age groups in previous studies may not be reliable and may produce conflicting results. This is due to the old age group's degeneration and aging process [10]. These studies have not specifically addressed the microsurgical decompression intervention. In addition to that, the evaluation of the reoperation rate due to recurrent disc prolapse was poorly defined after a one-year follow-up period [12]. Thirty-nine surgeons at a single tertiary center performed primary microdecompression on patients between August 2011 and December 2016. This study assesses the influence of preoperative existing leg pain and the duration of leg pain and buttock pain on the surgical outcome after 12 months. We used the Core Outcome Measures Index (COMI) questionnaire preoperatively and after a 12-month follow-up as the outcome measure to assess the patient's outcome. The primary objective of this study was to maximize the understanding of the effect of symptom duration and intensity of leg pain on surgical outcome at one year. Finding out if the level of radiculopathy affects the outcome of surgery, developing a score to predict the outcome, and investigating factors that might lead to repeat surgery at the same level are the secondary goals [8].

## METHODS

### *Study design and setting*

We enrolled 9000 patients in this retrospective study. Between August 2011 and December 2016, a single tertiary-level spine center at Salford Royal Infirmary Hospital NHS Trust performed microdecompression/microdiscectomy lumbar spine surgery on these patients.

### *Ethical Approval*

Written consent to use the data was obtained from each patient before the surgical intervention. The study was formally approved by the ethical committee board at the University of Salford Ethical Approval Application HST1617-342, University of Salford, U.K.

### *Inclusion criteria*

The study included young and middle-aged groups between 18 and 57 years old. Patients underwent single-level lumbar spine microdecompression or microdiscectomy surgery, completed their COMI questionnaire at 12 months, and had a confirmed radiological diagnosis (MRI) of lumbar disc herniation and/or stenosis. The surgical interventions were completed through a posterior approach. The lumbar spine underwent decompression in the form of a discectomy, sequestrectomy, hemilaminectomy, and facet joint resection of the lumbar spine, which was only microscopically performed. We included the patients who underwent both emergency and elective surgery.

### *Exclusion criteria*

Exclusion criteria included patients who had reoperative lumbar surgery for the same level (not primary surgery), multiple level microdecompression surgery, lumbar spine stenosis with underlying spine pathologies (oncological or congenital), and patients who had uncompleted hospital data and/or did not complete their COMI questionnaire at 12 months. The duration of leg pain (radiculopathy) was determined from hospital records and surgery notes. The duration of radiculopathy was determined from the moment of beginning till the microdecompression surgery.

### *Outcome Measurements*

We used the Core Outcome Measures Index (COMI) questionnaire [23] to assess the outcome, which was the VAS score to determine the intensity of pain for both lower back pain (LBP) and leg pain (LP) on a scale of 0 to 10, where 0 indicated "no pain" and 10 indicated "worst intense pain." The patients who underwent reoperation within one year for recurrent disc prolapse were collected from hospital data.

### Statistical analyses

The statistical analysis was performed using Microsoft Excel 2016, MedCalc version 17.8 and the statistical package of social science (SPSS version 24, IBM, USA). The descriptive statistics of the continuous variables were reported as mean and standard deviation (SD). The categorical variables were reported as medians, percentages and frequencies. Simple linear regression analysis was used to examine whether there was any relationship between the VAS score variables. Firstly, we used Spearman correlation to determine the

significance of preoperative LP VAS on the re-operation rate. The Receiver Operating Characteristic (ROC) curve was used to determine the maximum area under the curve for the preoperative LP VAS, which can be used to predict the susceptibility for further operations due to lumbar disc re-prolapse. Secondly, determine the cut-off value that could serve as a potential tool for selecting suitable patients for surgery and forecasting their outcomes. We used non-parametric multinomial logistic regression analysis to predict the 12-month outcome category (improvement or worse) for postoperative sensory disturbance improvements and reoperations. In the multivariate linear analysis of variance to examine the relationship between preoperative LP VAS and the other confounders, we used a chi-square test to report the correlation between the improvement in LP VAS and LBP VAS and the level of the surgical intervention. A *p*-value of <0.05 was considered significant.

## RESULTS

Of the 9000 patients whose spine surgery was performed in a single tertiary-level spine center between August 2011 and December 2016, with a completed preoperative (COMI) questionnaire, completed hospital data and follow-up at a 12-month period, 500 patients satisfied our study's inclusion criteria. The baseline characteristics of the study are shown in Table 1.

**Table 1**: Baseline characteristics of the patients who included in the study

| Baseline data (*n*=500) | |
|---|---|
| Age (year) (19-56) | 42.15±7.98 |
| Preoperative LBP VAS | 5.9±2.8 |
| Preoperative LP VAS | 7.8±2.0 |
| *Level of Intervention* | |
| L1/2 | 0.0 (0.0) |
| L2/3 | 2(0.4) |
| L3/4 | 24(4.8) |
| L4/5 | 218(43.3) |
| L5/S1 | 256(51.2) |
| *Surgical outcome* | |
| VAS LBP same/Improvement | 414(82.8) |
| VAS LBP Worse | 86(17.2) |
| Improvement percentile | Median: -2.0 |
| VAS LP same/Improvement | 477(94.8) |
| VAS LP Worse | 26(5.2) |
| Improvement percentile | Median: -5.0 |
| *Reoperation within 12 months* | |
| For Re-prolapse | 26 (5.2%) |

Data were expressed as frequency, percentage, and mean±SD.

In the linear regression analysis, there was a significant relationship between preoperative LP VAS and postoperative LP VAS COMI score outcome ($p$= 0.0001). Furthermore, using the same statistical model, there was a significant difference between preoperative LP VAS and LP VAS COMI changes (LP post-LP pre) ($p$=0.0001). In the Spearman correlation model, there was a significant relationship between preoperative LP VAS and the rate of reoperation due to disc re-herniation after 12 months ($p$=0.001). The Receiver Operating Characteristic (ROC) curve was used to determine the maximum area under the curve, which was 0.688. The area under the curve was highly significant ($p$<0.0001). In the Youden index, the criterion value (>7.0) was revealed as a maximum area under the curve (Figure 1) with 92% sensitivity and 37% specificity.

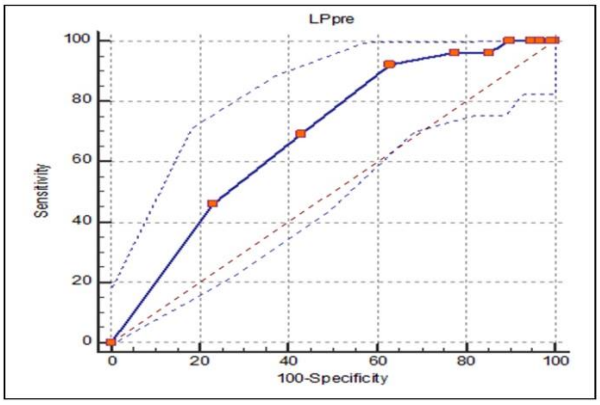


**Figure 1**: Youden index revealed the criterion value (>7.0) as a maximum area under the curve with 92% sensitivity and 37% specificity.

Out of all the 26 (5.2%) patients who underwent reoperation due to recurrent disc re-prolapse, 24 (92%) had a preoperative LP VAS >7.0. A univariate analysis of variance was used to quantify the relationship between the preoperative LP VAS and the duration with the level of lumbar intervention and their impact on the postoperative LP VAS COMI score outcome; there was no significant relationship between them and the LP VAS outcome ($p$>0.05). The mean duration of preoperative LP (412 days) and the duration of radiculopathy were categorized into five duration groups: 1 (≤183 days), 2 (184-365 days) 3 (366-730 days), 4 (731-1460 days) and 5 (>1460 days). The statistical analysis general linear model was used to identify the effect of radiculopathy`s duration on the postoperative LP VAS and Kendall's correlation was used to determine the improvement in the COMI score. The results show no significant relationship between them. There was no significant relationship between the reoperation rate and re-prolapse in Kendall's correlation test ($p$ > 0.05). Chi-squared statistical analysis was used to determine the relation between the level of lumbar intervention and the postoperative improvement in the COMI score for LP VAS. The most common level of intervention was L5/S1, with 256 patients (51.5%), followed by L4/5, with 218 patients (43.3%). It wasn't clear whether the LP VAS outcome got better or worse at all lumbar levels where the intervention happened: L2/3; 2 patients (100%), L3/4; 23 patients (95.8%), L4/5; 206 patients (94.5%), and L5/S1; 243 patients (94.9%) (Table 2).

**Table 2:** Relation of LP VAS improvement after decompression surgery with the level of Intervention

| Level of surgery | L1/2 | L2/3 | L3/4 | L4/5 | L5/S1 |
|---|---|---|---|---|---|
| Number of patients | 0 | 2 | 24 | 218 | 256 |
| Worse LP VAS | 0 | 0 | 1(4.2) | 12(5.5) | 13(5.1) |
| Improvement LP VAS | 0 | 2(100) | 23(95.8) | 206(94.5) | 243(94.9) |

Data were expressed as frequency and percentage.

L3/4 was the most common level that underwent re-operative surgery, with 2 patients (8.3%) due to re-

prolapse within one year, followed by L4/5, 12 patients (5.5%), and L5/S1, 12 patients (4.7%) (Table 3).

## DISCUSSION

In this study, there was a significant improvement in the VAS mean of preoperative LP VAS after 12-month follow-up (95%). Preoperative LP changes VAS 8 to LP VAS 2; the mean improvement of the VAS score was 5 points ($p$=0.0001). In 417 patients (83.4%), there was an overall improvement or no change in sensory disturbance, and in 83 patients (16.6%), new sensory abnormalities arose. These results demonstrate the great role of surgical decompression in relieving radiculopathy. These findings were consistent with the majority of literature that reported the effectiveness of surgery in the treatment of lumbar disc herniation, 74%–98% [1,3,10,14,15,17,22,24]. In this study, preoperative LP has a significant role in influencing the surgical outcome. The preoperative LP VAS was associated with an improvement in the postoperative LP VAS ($p$=0.0001); i.e., the worse the LP, the better the improvement in the VAS scale.

**Table 3:** Relation of re-operative decompression surgery with the level of Intervention

| Level of surgery | L1/2 | L2/3 | L3/4 | L4/5 | L5/S1 |
|---|---|---|---|---|---|
| Number of patients | 0 | 2 | 24 | 218 | 256 |
| Reoperation | 0 | 0 | 2(8.3) | 12(5.5) | 12(4.7) |

Data were expressed as frequency and percentage.

Silverplats *et al*. [5] reported improvements in (96%) of the patients with worse LP VAS and in (80%) of patients with better LP VAS. Furthermore, they demonstrated that LP VAS, among other possible predictors, is a significant predictor. Pearson et al. demonstrated that patients with a predominant preoperative LP had a better surgical outcome. Mannion *et al*. [25] suggested using LP-LBP as a diagnostic tool; they used the ROC curve to test the reliability of using LP-LBP as a unique predictor of outcome. However, assessing LP individually is crucial to quantify the relationship between LP and surgical outcome, as LBP and LP have distinct pain mechanisms and, consequently, require different management approaches [8,17,25]. In this study, the reoperation rate of the lumbar spine due to lumbar disc re-prolapse within 12 months was 5.2%. The Receiver Operating Characteristic (ROC) curve has been used to calculate the maximum area under the curve, which was 0.686 for the preoperative LP VAS, in order to predict the reoperative rate at the same lumbar level ($p$<0.0001). In the Youden index, the criterion value (>7.0) was revealed as a maximum area under the curve (Figure 1) with 92% sensitivity and 37% specificity. Out of all the 26 (5.2%) patients who underwent reoperation due to recurrent disc re-prolapse, 24 (92%) had preoperative LP VAS (>7.0). In most literature, there was conflict regarding the reoperation rate. Jonsson *et al*. [26] reported that within five years, the reoperation rate due to lumbar disc re-prolapse was 15%. Some studies reported a lower reoperation rate compared to ours; Sedighi *et al*. [14] reported 2.6 % recurrence at the same level; and Dewing *et al*. [15] reported 3% recurrence at the same level, in spite of the similarity in the mean age in all groups of their studies compared to ours (41–46 years). Moreover, Parker *et al*. [7] reported a 5% recurrence of lumbar hernia at the same level. However, our sample study size was larger and highly effective (type II error 0.95) compared to the referred studies, which might influence these results. In the analysis of variance, the duration of preoperative radiculopathy greater than 12 months has no significant relationship with the postoperative LP VAS. Furthermore, there was no significant relationship between radiculopathy duration and COMI score improvement. Similar results have been reported in the following studies [11,14,18-20,27]. The results of those studies did not match up with those of other studies, which said that when a disc prolapse causes nerve root compression for a long time, the area will go through fibrinolytic activity and an inflammatory process because of the acid leaking out of the ruptured disc [18,19,28]. There were no significant differences between the improved LP VAS COMI outcome and the level of intervention—about 95% in all lumbar level groups. The results in this study were similar to those from Sedighi *et al*. [14]. Furthermore, this study and Sedighi *et al*. have the same limitations, in that the number of patients who underwent surgical microdecompression surgery at L1/2 and L2/3 was statistically weak.

### Study limitations

We acknowledge a limitation in this study. We did not differentiate between patients with lumbar stenotic disease and those with lumbar herniation discs, as some of our patients underwent both microdecompression and microdiscectomy at the same level. The number of cases that underwent L1/2 and <l2/3 decompression was limited.

### Conclusion

The preoperative LP VAS is greater than 7.0 in 92% of patients. They are more susceptible to re-operation surgery. Independent of other factors, LP cannot predict surgical outcome. Surgeons should be more cautious in selecting patients for surgery and not base their decision on only preoperative leg pain.

### Conflict of interests

No conflict of interests was declared by the authors.

### Funding source

The authors did not receive any source of fund.

### Data sharing statement

Data sharing has been allowed officially from Dr. Irfan Siddique, Head of Complex Spine Department, Department of Spinal Surgery, Salford Royal NHS Trust, UK, email: irfan.siddique@srft.nhs.uk

## REFERENCES


1. Pearson AM, Blood EA, Frymoyer JW, Herkowitz H, Abdu WA, Woodward R, et al. SPORT lumbar intervertebral disk herniation and back pain: does treatment, location, or morphology matter? *Spine (Phila Pa 1976)*. 2008;33(4):428-435. doi: 10.1097/BRS.0b013e31816469de.
2. Awad JN, Moskovich R. Lumbar disc herniations: surgical versus nonsurgical treatment. *Clin Orthop Relat Res*. 2006;443:183-197. doi: 10.1097/01.blo.0000198724.54891.3a.
3. Haugen AJ, Brox JI, Grøvle L, Keller A, Natvig B, Soldal D, et al. Prognostic factors for non-success in patients with sciatica and disc herniation. *BMC Musculoskelet Disord*. 2012;13:183. doi: 10.1186/1471-2474-13-183.
4. Huang W, Han Z, Liu J, Yu L, Yu X. Risk factors for recurrent lumbar disc herniation: A systematic review and meta-analysis. *Medicine (Baltimore)*. 2016;95(2):e2378. doi: 10.1097/MD.0000000000002378.
5. Spratt KF, Keller TS, Szpalski M, Vandeputte K, Gunzburg R. A predictive model for outcome after conservative decompression surgery for lumbar spinal stenosis. *Eur Spine J*. 2004;13(1):14-21. doi: 10.1007/s00586-003-0583-2.
6. Hebert JJ, Fritz JM, Koppenhaver SL, Thackeray A, Kjaer P. Predictors of clinical outcome following lumbar disc surgery: the value of historical, physical examination, and muscle function variables. *Eur Spine J*. 2016;25(1):310-317. doi: 10.1007/s00586-015-3916-z.
7. Parker SL, Mendenhall SK, Godil SS, Sivasubramanian P, Cahill K, Ziewacz J, et al. Incidence of low back pain after lumbar discectomy for herniated disc and its effect on patient-reported outcomes. *Clin Orthop Relat Res*. 2015;473(6):1988-1999. doi: 10.1007/s11999-015-4193-1.
8. Silverplats K, Lind B, Zoega B, Halldin K, Rutberg L, Gellerstedt M, et al. Clinical factors of importance for outcome after lumbar disc herniation surgery: long-term follow-up. *Eur Spine J*. 2010;19(9):1459-1467. doi: 10.1007/s00586-010-1433-7.
9. Cook CE, Arnold PM, Passias PG, Frempong-Boadu AK, Radcliff K, Isaacs R. Predictors of pain and disability outcomes in one thousand, one hundred and eight patients who underwent lumbar discectomy surgery. *Int Orthop*. 2015;39(11):2143-2151. doi: 10.1007/s00264-015-2748-0.
10. Wilson CA, Roffey DM, Chow D, Alkherayf F, Wai EK. A systematic review of preoperative predictors for postoperative clinical outcomes following lumbar discectomy. *Spine J*. 2016;16(11):1413-1422. doi: 10.1016/j.spinee.2016.08.003.
11. den Boer JJ, Oostendorp RA, Beems T, Munneke M, Oerlemans M, Evers AW. A systematic review of bio-psychosocial risk factors for an unfavourable outcome after lumbar disc surgery. *Eur Spine J*. 2006;15(5):527-536. doi: 10.1007/s00586-005-0910-x.
12. Abdu RW, Abdu WA, Pearson AM, Zhao W, Lurie JD, Weinstein JN. Reoperation for recurrent intervertebral disc herniation in the spine patient outcomes research trial: Analysis of rate, risk factors, and outcome. *Spine (Phila Pa 1976)*. 2017 ;42(14):1106-1114. doi: 10.1097/BRS.0000000000002088.
13. Lee BH, Yang JH, Lee HM, Park JY, Park SE, Moon SH. Surgical outcome predictor in degenerative lumbar spinal disease based on health related quality of life using Euro-Quality 5 Dimensions Analysis. *Yonsei Med J*. 2016;57(5):1214-1221. doi: 10.3349/ymj.2016.57.5.1214.
14. Sedighi M, Haghnegahdar A. Lumbar disk herniation surgery: outcome and predictors. *Global Spine J*. 2014;4(4):233-244. doi: 10.1055/s-0034-1390010.
15. Dewing CB, Provencher MT, Riffenburgh RH, Kerr S, Manos RE. The outcomes of lumbar microdiscectomy in a young, active population: correlation by herniation type and level. *Spine (Phila Pa 1976)*. 2008;33(1):33-38. doi: 10.1097/BRS.0b013e31815e3a42.
16. Kleinstück FS, Grob D, Lattig F, Bartanusz V, Porchet F, Jeszenszky D, et al. The influence of preoperative back pain on the outcome of lumbar decompression surgery. *Spine (Phila Pa 1976)*. 2009;34(11):1198-1203. doi: 10.1097/BRS.0b013e31819fcf35.
17. Kleinstueck FS, Fekete T, Jeszenszky D, Mannion AF, Grob D, Lattig F, et al. The outcome of decompression surgery for lumbar herniated disc is influenced by the level of concomitant preoperative low back pain. *Eur Spine J*. 2011;20(7):1166-1173. doi: 10.1007/s00586-010-1670-9.
18. Nygaard OP, Romner B, Trumpy JH. Duration of symptoms as a predictor of outcome after lumbar disc surgery. *Acta Neurochir (Wien)*. 1994;128(1-4):53-56. doi: 10.1007/BF01400653.
19. Ng LC, Sell P. Predictive value of the duration of sciatica for lumbar discectomy. A prospective cohort study. *J Bone Joint Surg Br*. 2004;86(4):546-549. PMID: 15174551.
20. Omidi-Kashani F, Ghayem Hasankhani E, Kachooei AR, Rahimi MD, Khanzadeh R. Does duration of preoperative sciatica impact surgical outcomes in patients with lumbar disc herniation? *Neurol Res Int*. 2014;2014:565189. doi: 10.1155/2014/565189.
21. Kerr D, Zhao W, Lurie JD. What are long-term predictors of outcomes for lumbar disc herniation? A randomized and observational study. *Clin Orthop Relat Res*. 2015;473(6):1920-1930. doi: 10.1007/s11999-014-3803-7.
22. Atlas SJ, Keller RB, Wu YA, Deyo RA, Singer DE. Long-term outcomes of surgical and nonsurgical management of sciatica secondary to a lumbar disc herniation: 10 year results from the maine lumbar spine study. *Spine (Phila Pa 1976)*. 2005;30(8):927-935. doi: 10.1097/01.brs.0000158954.68522.2a.
23. Mannion AF, Elfering A, Staerkle R, Junge A, Grob D, Semmer NK, et al. Outcome assessment in low back pain: how low can you go? *Eur Spine J*. 2005;14(10):1014-1026. doi: 10.1007/s00586-005-0911-9.
24. Peul WC, Arts MP, Brand R, Koes BW. Timing of surgery for sciatica: subgroup analysis alongside a randomized trial. *Eur Spine J*. 2009;18(4):538-545. doi: 10.1007/s00586-008-0867-7.
25. Mannion AF, Mutter UM, Fekete TF, Porchet F, Jeszenszky D, Kleinstück FS. Validity of a single-item measure to assess leg or back pain as the predominant symptom in patients with degenerative disorders of the lumbar spine. *Eur Spine J*. 2014;23(4):882-7. doi: 10.1007/s00586-014-3193-2.
26. Jönsson B, Annertz M, Sjöberg C, Strömqvist B. A prospective and consecutive study of surgically treated lumbar spinal stenosis. Part I: Clinical features related to radiographic findings. *Spine (Phila Pa 1976)*. 1997;22(24):2932-2937. doi: 10.1097/00007632-199712150-00016.
27. Jönsson B, Annertz M, Sjöberg C, Strömqvist B. A prospective and consecutive study of surgically treated lumbar spinal stenosis. Part II: Five-year follow-up by an independent observer. *Spine (Phila Pa 1976)*. 1997;22(24):2938-2944. doi: 10.1097/00007632-199712150-00017.
28. Blazhevski B, Filipche V, Cvetanovski V, Simonovska N. Predictive value of the duration of sciatica for lumbar discectomy. *Prilozi*. 2008;29(2):325-335. PMID: 19259056.