

The Effect of The Duration of Radiculopathy in The Improvement of The Bothersome Sensory Deficit after Single Level Lumbar Micro-Discectomy Surgery in Young and Middle Age Population in Babylon Governorate in Iraq

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ABSTRACT

Background: Pain and sensory abnormalities are the most common abnormalities which could present after lumbar disc herniation. However, Recovery of the sensory deficit after decompressive surgery is not clearly defined.

Objective: The aim of the current study is to evaluate factors which influence sensory recovery in 12 months after micro-decompression surgery.

Patients and methods: This prospective study included 82 patients who subjected to micro-discectomy of lumbar spine in single private hospital in Iraq. We included young and middle age population between 19 and 54 years old and patients who had sensory abnormalities preoperatively and followed up for 12 months postoperatively.

Results: Using ROC curve to analyse relationship between age and presence of sensory deficit, there were a sensitivity of 82% and a specificity of 42%. The AUC revealed 0.610 which gives 60% chance to consider the criterion age 37 years in which it might be associated with the worse possible outcome. Using ROC curve to analyse the relationship between duration of radiculopathy and presence of sensory deficit, there was a sensitivity of 85% and a specificity of 51%. The AUC revealed 0.575 which gives 50% chance to consider the criterion duration of more than 300 days in which it might associate with the worse possible outcome.

Conclusion: Sensory improvement after micro-decompression surgery needs to be considered with other factors. However, the shorter duration of compression the better the time needed for the nerve to recover. A cut-off value of fewer than 300 days duration of radiculopathy and age less than 37 years old might be considered.

Keywords: Bothersome sensory deficit, Radiculopathy, Lumbar, Micro-discectomy.

INTRODUCTION

Pain and sensory abnormalities are the most common abnormalities which may present after lumbar disc herniation ⁽¹⁾. Sensory deficit after Lumbar disc herniation is common in nearly half the cases and associated sometimes with motor abnormalities ⁽²⁾. However, the recovery of the sensory deficit after decompression surgery is not clearly defined ⁽³⁾.

Some studies might ignore the sensory deficit as they considered pain the most bothersome symptom for the patient ⁽⁴⁾. It has been known that The sensory deficit needs more than 3 months to recover in slow pace ⁽⁵⁾. However, this time window has not been quantified. Moreover, No literature supported the relation of the possible potential variables, BMI and Duration of radiculopathy on the sensory deficit ^(6,7,8).

The aim of this study was to examine the effect of radiculopathy duration and age on the recovery of the sensory deficit in 12 months after micro-decompression surgery. Furthermore, to examine the possibility of finding a cut off value using the ROC curve in order to predict the influence of age, level of intervention and the duration of compressed nerve on the sensory recovery.

PATIENTS AND METHODS

This is a prospective study included 82 patients who have been subjected to micro-discectomy at the level of the lumbar spine in a single private hospital in Iraq.

This study included the young and middle age population between 19 and 54 years old. The patients who had pre- existing sensory deficit were in the form of paraesthesia in the form of numbness or pins and needles presentation and reported the same or improvement after 12 months postoperatively.

In our study we excluded all other age groups, open surgery, more than level decompression, diabetic patients and patients who have preoperative motor deficit. Acute emergency patients who underwent new surgery due to re-herniation, patients who had Lumbar spine surgery because of tumours were also excluded. In our study, we suggested excluding patients with DM to avoid potential risk factors of neuropathy; purely tingling sensation neuropathy could mask the proper symptom and could be a limitation ⁽⁹⁾.

Duration of radiculopathy, age, and the pre-existing medical condition such as DM have been collected preoperatively. Diagnosis of nerve root compression confirmed by MRI.

The presence of sensory deficit has been referred as "1", while improvement of sensory deficit has been referred as "0" according to patients description.

Ethical approval

The study's ethical approval has been provided by the Ethical Committee of Al-Mustaqbal University College, Babylon, Iraq [Certificate Number Rad1/2022]. Consent to use the patients' information in the study was obtained from the

patients. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical analysis

The collected data were coded, processed and analyzed using the SPSS (Statistical Package for Social Sciences) version 20 for Windows® (IBM SPSS Inc, Chicago, IL, USA), and MedCalc version 17.8 for the ROC curve. Data were tested for normal distribution using the Shapiro Walk test.

Qualitative data were represented as frequencies and relative percentages. Chi square test (χ^2) and Fisher's exact test to calculate difference between two or more groups of qualitative variables. Quantitative data were expressed as mean and standard deviation (SD) or

median and range. Independent samples t-test was used to compare between two independent groups of normally distributed variables (parametric data). The Receiver Operating Characteristic (ROC) curve has been used to evaluate the duration of radiculopathy as a factor that might has a significant relation with the sensory disturbance. The Pearson correlation coefficient (r) was used to determine how strongly two quantitative variables are associated. P value ≤ 0.05 was considered significant.

RESULTS

Table 1 summarizes the demographic and clinical characteristics of the studied patients. The relevance of sensory deficit with the vertebral level underwent surgery is shown of Table 1.

Table 1. The characteristics of the studied patients.

Number of the patients (N=82)	
Age of the patients	Minimum: 18 years Maximum: 53 years Mean: 39.5; SD 8.9
Median LBP VAS before intervention	7
Median LP VAS before intervention	8
BMI	Minimum: 19 Maximum: 47 Mean: 28.5; SD 5.3
Duration of preoperative Radiculopathy	Minimum: 13 days Maximum: 2433 days Mean:240 days; SD 464,2
No of Patients with preoperative sensory abnormality	82
No of Patients with preoperative Motor abnormality	0
Lumbar spine Intervention	
L3/4	5 (6%)
L4/5	34 (42%)
L5/S1	43 (52%)
Sensory Improvement	55 (67.1%)
Sensory worse /same	27 (32.9%)

Using Chi square test to analyse the relationship between the level of lumbar intervention and the recovery of the sensory deficit; there were no significant relation among them with P value >0.05 (Table 2).

Table 2: Level of spine intervention in correlation with sensory deficit.

Level of intervention	Lumbar level 1/2	Lumbar level 2/3	Lumbar level 3/4	Lumbar level 4/5	Lumbar Level 5/S1
Same sensory deficit	0	0	2	9	27
Improvement sensory deficit	0	0	3	25	16

Relation of the age with sensory improvement

Using the ROC curve to analyse the relationship between ages of 82 patients and the presence of sensory deficit, there were a sensitivity (number of true positive) of 82% and a specificity (number of false positive) of 42%. The number of patients who has new onset sensory deficit or no improvement was 27 (33%). Whereas the patients who were better 55 (67%). The area under the curve revealed 0.610 which give us 60% chance to consider the criterion age above 37 years in which it might be associated with the worse possible outcome (Figure 1).

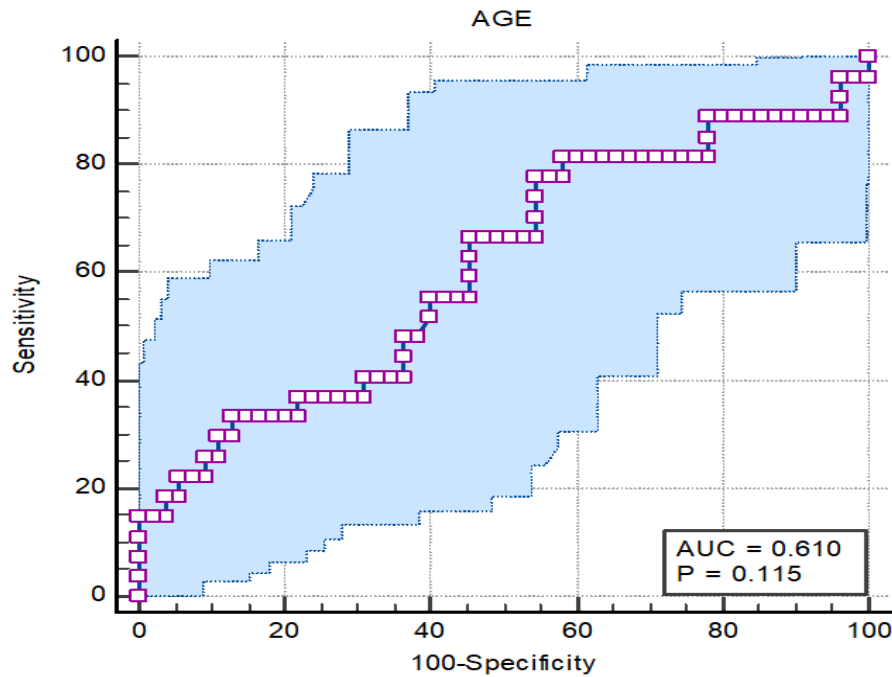


Figure 1. Youden indicator; it is the value of >37 with 82% sensitivity and 41% specificity.

Relation of the radiculopathy interval with sensory improvement

In our study, there was a significant improvement in the sensory abnormalities in overall using the Spearman correlation (P value 0.002). Using the ROC curve to analyse the relationship between the duration of radiculopathy and the presence of sensory deficit, there were a sensitivity (number of true positive) of 85% and a specificity (number of false positive) of 51%. The area under the curve revealed 0.575 which gave us more than 50% chance to consider the criterion duration of radiculopathy less than 300 days in which it might be associated with the better possible outcome.

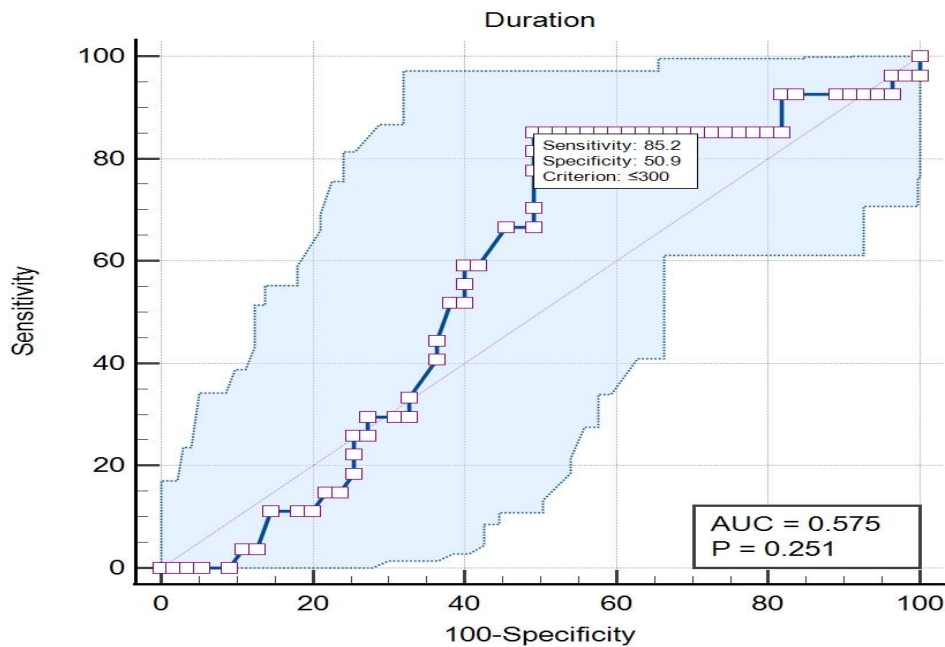


Figure 2. Youden indicator; the duration of 300 days with 85% sensitivity and 51% specificity.

DISCUSSION

The number of patients who still had sensory deficit after surgery was 27 (32.9%) out of 82 patients. Our patients were limited for single decompression microsurgery with no other associated pathological condition and in mean age of 39 years old.

In this study, the number of patients with preoperative sensory deficit, who were improved was 55 (67%) patients (P value 0.002). This study has the similar results of the study conducted by **Grovolet al.**⁽²⁾ but after 2 years of follow up. Our study has been limited for one year follow-up.

In our study, there was no significant relation between BMI and recovery of sensory deficit. Furthermore, the area under the curve suggested the discrimination of 0.5 of 2 points, but with low sensitivity. The results suggested no relationship between high BMI in sensory recovery. Although the BMI has been associated with worse radiculopathy in many studies, they didn't identify the sensory deficit as a single independent outcome^(10,11,12,13,14).

Pedowitz et al.⁽¹⁵⁾ suggested the effect of the duration of nerve compression on the sensory deficit in pigs. In spite of the reported information which stated the biochemical and ischemic changes of the nerves because of compression, there were lack of information on the effort of duration of nerve compression on its recovery. Furthermore, large myelinated nerve fibres are more liable to be damaged compared to the peripheral small unmyelinated nerves⁽³⁾. There were still questions which need to be answered for how long does the duration of radiculopathy due to compression leads to irreversible damage.

In our study, using the AUC there were a significant relationship between the duration of radiculopathy and sensory recovery after 12 months (P value 0.002). The sensitivity was 80%; the criterion suggested that radiculopathy more than 300 days might be associated with poor sensory outcome. Our study is against the study of **Rajasekaran et al.**⁽⁹⁾ which reported no relationship between duration of radiculopathy and sensory recovery.

Our results using the ROC curve suggested the age less than 37 years old have a better prognosis than others in our test the sensitivity is 77% and the AUC 0.610. Our study has the same principle of the fact that the younger the patient the better the recovery⁽⁹⁾. The improvement in generalized outcomes were the same in the study from **papadopolous et al.**⁽¹⁶⁾ which reported worse outcome at the age above 40.

The incidence of newly sensory abnormalities after surgery might be because lower spine instability, epidural fibrosis, postoperative adhesions or even reherniation at the same level or other adjacent level⁽¹⁶⁾.

The patients who suffer for long period radiculopathy may didn't give the accurate timing of sensory disturbance and mixed it with the pain, thus we used the questions in the form to analyse the sensory deficit in the form of pin and needles and numbness

regardless of the degree of deficit and depending only on the yes and no questionnaire. We applied the same methodology of the study of **Al Nazari et al.**⁽¹⁷⁾ that stated no neurological diagnostic tool would provide an accurate description of the patients' complaint.

CONCLUSION

Sensory improvement after micro-decompression surgery needs to be considered with other factors. However, the shorter duration of compression the better the time needed to the nerve to recover. A cut off value of less than 300 days duration of radiculopathy and age less than 37 years old might be considered.

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