

Comparison of postoperative clinical outcome after repairing surgery for lumbar spinal stenosis between diabetic and nondiabetic patients

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ABSTRACT

Background: Poorer postoperative outcome is suggested after repairing surgery in diabetic patients with lumbar spinal stenosis in comparison with nondiabetic patients. The present study aimed to compare the clinical outcome of surgery for lumbar spinal stenosis and diabetic and nondiabetic patients to highlight the effect of diabetes on prognosis of this surgical procedure.

Methods: This prospective cohort study is conducted on 25 diabetic patients with lumbar spinal stenosis who were candidate for surgical treatment. A gender, age, and body mass index-matched group including 30 nondiabetic patients with lumbar spinal stenosis was considered as the control. The clinical condition of the patients was assessed based on Oswestry disability index (ODI) before and immediately after surgery.

Results: There was no difference in baseline ODI index between diabetes and diabetes group (73.68 ± 18.89 vs. 71.20 ± 18.27 , $P = 0.625$), whereas postprocedure ODI was significantly higher in diabetic patients than in nondiabetic group (54.32 ± 19.03 vs. 29.47 ± 18.75 , $P < 0.001$). The multivariable logistic regression analysis could show a difference in postoperative ODI between diabetic and nondiabetic patients with the presence of baseline variables as the confounders ($\beta = -24.509$, $P < 0.001$).

Conclusion: Lower improvement in physical ability is expected in diabetic patients after surgery for lumbar spinal stenosis when compared to nondiabetes patients.

Key words: Clinical outcome, diabet, lumbar spinal stenosis

Introduction

Lumbar spinal stenosis is a localized or segmental condition manifested by the reduced diameter of the canal or neural elements because of the compression of spinal cord and spinal nerves frequently following spinal degeneration, spinal disk herniation, age-related osteoporosis, and even spinal tumors.^[1] Although symptoms of this condition are mild in most patients, the progression of manifestations appeared in about 20% of

untreated patients leading serious disabilities.^[2] Although lumbar spinal stenosis is more specifically occurred in old ages, the younger can also affected due to congenitally narrowed canal, deformity, or previous trauma.^[3] There are a variety of procedures that are commonly used for the surgical treatment of lumbar spinal stenosis including de-compressive procedures with or without concomitant fusion.^[4] In most cases, the clinical outcome of this procedure is favorable. Reviewing a recent meta-analysis including 17 trials, it was shown good to excellent outcomes in 72% of the patients. In this regard, no relationship was reported between the surgical outcome

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and some baseline characteristics including age, gender, and history of surgery on lumbar spine.^[5] However, the effect of the history of diabetes for deteriorating outcome of lumbar decompression has remained unclear.

Diabetic neuropathy is a common finding among diabetic patients especially in end-stage phase of disease that overall affect half of the diabetic patients.^[6] This manifestation is usually appeared with distal polyneuropathy and a wide variety of sensory, motor, and autonomic symptoms.^[7] Diabetic neuropathy should be considered in diabetic patients after ruling out other causes of peripheral neuropathies such as metabolic etiologies, trauma, intracranial aneurysms, spinal tumors, inflammatory neuropathies, and neural infections.^[8-11] More importantly, the symptoms of diabetic neuropathy mimic those of lumbar stenosis and there may be a risk of inappropriate surgical intervention in patients with both diabetes and spinal stenosis.^[12] Moreover, in the presence of diabetes, a poor surgical outcome might be expected. Thus, the assessment of the prognosis of surgical treatment of lumbar spinal stenosis in the presence of diabetes condition seems to be necessary. The present study aimed to compare the clinical outcome of surgery for lumbar spinal stenosis and diabetic and nondiabetic patients to highlight the effect of diabetes on prognosis of this surgical procedure.

Methods

This prospective cohort study was conducted on 30 diabetic patients with lumbar spinal stenosis who were candidate for surgical treatment and hospitalized in Imam Hossein Hospital in Tehran between 2012 and 2014. A gender, age, and body mass index-matched group including 30 nondiabetic patients with lumbar spinal stenosis was considered as the control. The exclusion criteria were the presence of diabetic neuropathy or other neuromuscular disorders on electrodiagnostic study of lower limbs before surgery and history of previous surgery on lumbar spinal column. In both groups, the clinical condition of the patients was assessed based on Oswestry Disability Index (ODI) before and immediately after surgery. This index is considered by many as the gold standard for measuring degree of disability and estimating quality of life in a person with low back pain. The self-completed questionnaire contains 10 topics concerning intensity of pain, lifting, ability to care for oneself, ability to walk, ability to sit, sexual function, ability to stand, social life, sleep quality, and ability to travel.^[13] Each topic category is followed by 6 statements describing different potential scenarios in the patient's life relating to the topic. The patient checks the statement which most closely resembles their situation. Each question is scored on a scale of 0–5 with the first statement being zero and indicating the least amount of disability and the last statement is scored 5 indicating most severe disability. The scores for all questions answered are summed, and then multiplied by two to obtain the

index (range 0–100). Zero is equated with no disability and 100 is the maximum disability possible.^[13]

Results were presented as mean \pm standard deviation for quantitative variables and were summarized by absolute frequencies and percentages for categorical variables. Categorical variables were compared using Chi-square test or Fisher's exact test when more than 20% of cells with expected count of <5 were observed. The association between quantitative variables was examined using the Pearson's correlation test. Multivariate linear regression analysis was used to compare between-group differences (between diabetes and nondiabetes) in outcome with the presence of study confounders including demographics parameters and clinical indices. For the statistical analysis, the statistical software SPSS version 19.0 for windows (SPSS Inc., Chicago, IL, USA) was used. *P* values of 0.05 or less were considered statistically significant.

Results

In the group with diabetes, five patients were excluded because of diabetic neuropathy and thus 25 diabetic patients were finally assessed. Comparing baseline characteristics between the diabetic and nondiabetic groups showed similarity in male gender (20.0% vs. 36.7%, $P = 0.175$), mean age (61.92 ± 6.58 years vs. 58.57 ± 8.71 years, $P = 0.119$), and mean body mass index (28.17 ± 2.38 kg/m² vs. 27.21 ± 2.23 kg/m², $P = 0.131$). Regarding baseline risk profile, smoking was revealed in 24.0% and 26.7% ($P = 0.821$) and hypertension in 8.0% and 3.3% ($P = 0.585$), respectively.

There was no difference in baseline ODI index between diabetes and nondiabetes group (73.68 ± 18.89 vs. 71.20 ± 18.27 , $P = 0.625$), whereas postprocedure ODI was significantly higher in diabetic patients than in nondiabetic group (54.32 ± 19.03 vs. 29.47 ± 18.75 , $P < 0.001$) [Figure 1]. In diabetic group, no difference was revealed in postoperative ODI between men and women (52.00 ± 27.09 vs. 54.90 ± 17.36 ,

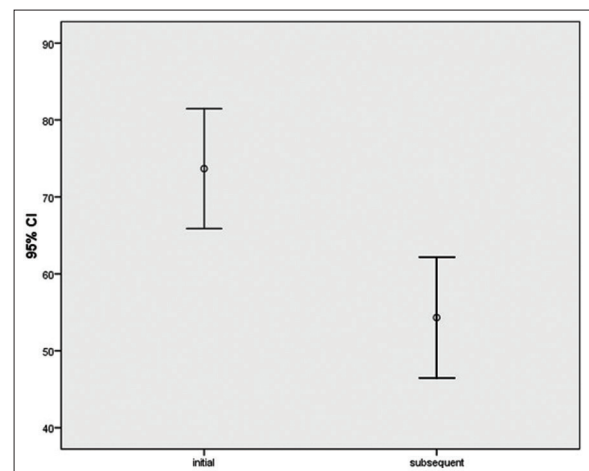


Figure 1: The change in Oswestry disability index after surgery before that in diabetic patients

$P = 0.768$). There was also association between postoperative ODI and patients' age ($r = -0.277$, $P = 0.179$) and also body mass index ($r = 0.038$, $P = 0.858$). In diabetic group, the mean postoperative ODI in smokers was 60.33 ± 23.58 and in nonsmokers was 52.42 ± 17.68 with no difference ($P = 0.386$). In this regard, none of the variables including gender, age, and body mass index could predict postoperative ODI in diabetic patients. The multivariable logistic regression analysis could show a difference in postoperative ODI between diabetic and nondiabetic patients with the presence of baseline variables as the confounders (beta = -24.509 , $P < 0.001$) [Table 1]. In this regard, the improvement in ODI score was significantly lower in diabetes when compared with nondiabetes postoperatively.

Discussion

The present study attempted to assess the role of diabetes as a risk profile to predict poorer quality of life prognosis in patients with lumbar spinal stenosis. In this regard, we assessed the role of diabetes as an independent variable to affect patients' clinical condition via mediating vascular changes and neural degeneration. In this study, the mean ODI score was measured at baseline and also postoperatively in both diabetic and nondiabetic patients. We showed that despite similarity in baseline ODI score, the change in ODI score was significantly lower in diabetes group when compared to nondiabetes group. On the other hand, although both group experienced improvement in physical ability, but this improvement significantly occurred lower in diabetic patients even after considering the effects of other variables including gender, advanced age, and the history of hypertension and smoking. Our study could indicate the powerful effect of diabetes mellitus to lower physical ability of patients who suffer lumbar spinal stenosis even after repairing surgery. In addition, despite deleterious effect of smoking on postoperative outcome in these patients, our study could not demonstrate this role for smoking, while introduced diabetes as the most important factor affecting patients' physical disability.

Table 1: The multivariable logistic regression analysis could show a difference in postoperative Oswestry disability index between diabetic and nondiabetic patients

Item	Unstandardized coefficients		Standardized coefficients	t	P value
	B	SE	Beta		
Constant	123.596	50.500	-	2.447	0.018
Group	-24.509	5.606	-0.548	-4.372	0.001
Sex	1.183	7.245	0.024	0.163	0.871
Age	-0.177	0.366	-0.062	-0.485	0.630
Body mass index	-0.005	1.238	0.000	-0.004	0.997
Smoking	-1.768	7.333	-0.035	-0.241	0.810
Hypertension	-17.014	12.106	-0.173	-1.405	0.166

SE – Standard error

The previous limited studies could also point the deleterious effects of diabetes and glucose intolerance on poor outcome of patients who undergoing repairing surgery due to lumbar spinal surgery. As shown by Kim *et al.*^[14] in 2015, the ODI score significantly decreased after surgical or conservative treatment. In the surgical treatment group, the HbA1c levels were significantly decreased at the first and second assessments after surgery, whereas the conservative treatment group did not show significant reductions in HbA1c levels at the first and second follow-up assessments. In Arinzon *et al.* study,^[15] surgical treatment of elderly diabetic patients suffering from spinal stenosis could improve basic activities of daily living and ameliorates pain, but the results remained worse than those observed in nondiabetics. Contrarily, Bendo *et al.*^[16] also showed that posterolateral lumbar spinal fusion surgery with internal fixation in diabetic patients yields clinical results comparable to those of nondiabetic patients, with similar risks of perioperative complications. Cinotti *et al.*^[12] indicated similar outcome of surgery in the two groups. In total, it seems that the postoperative outcome can be deteriorate in diabetic patients probable because of the presence of other comorbidities, concurrent diabetic neuropathy, duration of diabetes, and insulin treatment. Of course, the type of procedure should not be ignored that is more assessed in further studies.

Conclusion

In total, the clinical improvement following repair of lumbar spinal stenosis is predicted less in diabetic than in nondiabetic patients. However, more studies should be performed to determine underlying factors deteriorating prognosis in diabetic group.

The main objective of this study was to evaluate the surgical results of lumbar stenosis between the two groups (diabetic and nondiabetic) patients. Therefore, evaluating the relationship between the severity of diabetes and surgical result of lumbar canal stenosis was not performed in this research and another study should be designed to investigate the relationship between the severity of diabetes and surgical result of lumbar canal stenosis only in diabetic patients.

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Conflicts of interest

There are no conflicts of interest.

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