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. Although symptoms of this condition are mild in most patients, the progression of manifestations appeared in about 20% of untreated patients leading serious disabilities. 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. 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. 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 and diabetes.
and some baseline characteristics including age, gender, and history of surgery on lumbar spine. 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. This manifestation is usually appeared with distal polyneuropathy and a wide variety of sensory, motor, and autonomic symptoms. Diabetic neuropathy should be considered in diabetic patients after ruling out other causes of peripheral nephropathies such as metabolic etiologies, trauma, intracranial aneurysms, spinal tumors, inflammatory neuropathies, and neural infections. 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. 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. 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.

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 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, \( P < 0.001 \)) [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, \( P = 0.290 \)).

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

**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.

**References**

1. Kalichman L, Cole R, Kim DH, Li L, Suri P, Guermazi A, et al. Spinal stenosis prevalence and association with symptoms: The Framingham Study. Spine J 2009;9:545-50.

2. Greenberg MS. Spinal stenosis. Handbook of Neurosurgery. Vol. 1.
3. Amundsen T, Weber H, Lilleås F, Nordal HJ, Abdelnoor M, Magnaes B. Lumbar spinal stenosis. Clinical and radiologic features. Spine (Phila Pa 1976) 1995;20:1178-86.
4. Pearson A, Lurie J, Tosteson T, Zhao W, Abdu W, Weinstein JN. Who should have surgery for spinal stenosis? Treatment effect predictors in SPORT. Spine (Phila Pa 1976) 2012;37:1791-802.
5. Machado GC, Ferreira PH, Harris IA, Pinheiro MB, Koes BW, van Tulder M, et al. Effectiveness of surgery for lumbar spinal stenosis: A systematic review and meta-analysis. PLoS One 2015;10:e0122800.
6. Hirschfeld G, von Glischinski M, Blankenburg M, Zernikow B. Screening for peripheral neuropathies in children with diabetes: A systematic review. Pediatrics 2014;133:e1324-30.
7. Zochodne DW. Diabetic polyneuropathy: An update. Curr Opin Neurol 2008;21:527-33.
8. Lozeron P, Nahum L, Lacroix C, Ropert A, Guglielmi JM, Said G. Symptomatic diabetic and non-diabetic neuropathies in a series of 100 diabetic patients. J Neurol 2002;249:569-75.
9. Waldman SD. Diabetic neuropathy: Diagnosis and treatment for the pain management specialist. Curr Rev Pain 2000;4:383-7.
10. Davidson MB. Diabetes Mellitus: Diagnosis and Treatment. 4th ed. Philadelphia: WB Saunders Company; 1998. p. 297-307.
11. Vinik AI. New Methods to Assess Diabetic Neuropathy for Clinical Research. San Antonio, Texas: 60th Scientific Sessions of the American Diabetes Association; 2000.
12. Cinotti G, Postacchini F, Weinstein JN. Lumbar spinal stenosis and diabetes. Outcome of surgical decompression. J Bone Joint Surg Br 1994;76:215-9.
13. Fairbank JC, Pynsent PB. The Oswestry disability index. Spine (Phila Pa 1976) 2000;25:2940-52.
14. Kim HJ, Lee KW, Cho HG, Kang KT, Chang BS, Lee CK, et al. Indirect effects of decompression surgery on glycemic homeostasis in patients with type 2 diabetes mellitus and lumbar spinal stenosis. Spine J 2015;15:25–33.
15. Arinzon Z, Adunsky A, Fidelman Z, Gepstein R. Outcomes of decompression surgery for lumbar spinal stenosis in elderly diabetic patients. Eur Spine J 2004;13:32-7.
16. Bendo JA, Spivak J, Moskovich R, Neuwirth M. Instrumented posterior arthrodesis of the lumbar spine in patients with diabetes mellitus. Am J Orthop (Belle Mead NJ) 2000;29:617-20.