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RESEARCH ARTICLE

Unilateral Approach Bilateral Microdecompression for Degenerative Lumbar Spinal Stenosis

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ABSTRACT

Objective: Degenerative lumbar spinal stenosis is a frequent cause of back and leg pain in elderly patients. Degenerative spinal stenosis may be due to intervertebral disk bulging, joint facet hypertrophy, thickening of the ligamentum flavum, and spondylolisthesis. The aim of this study is to investigate the results of unilateral approach bilateral microdecompression for degenerative lumbar spinal stenosis patients.

Materials and Methods: We observed 78 patients who have back and/or leg pain with neurogenic claudication. The patients were scored by visual analog scale (VAS), oswestry disability index (ODI) score, and walking distance (WD). The surgical technique used in all stenotic levels was unilateral approach bilateral microdecompression. All patients were questioned and examined before surgery, post-operative 2nd year.

Results: Thirty-nine males and 39 females total of 78 patients with the mean age of 64.3±7.2 were investigated. There was no statistically significance according to gender and age. Pre-operative mean VAS, ODI and WD values were 8.9±1.1, 65±17.20, 42±21.30 and post-operative 2nd year values were 1.2±0.23, 17±1.91, 1800±617.13. All three parameters were found statistically significant when compared between pre-operative and post-operative values ($p<0.05$).

Conclusion: The results of the unilateral approach bilateral microdecompression for treating lumbar spinal stenosis are satisfying because you can achieve sufficient decompression with minimal invasive technique without dissecting and damaging the opposite side tissues.

Keywords: Chronic low back pain, spinal stenosis, unilateral approach bilateral microdecompression

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INTRODUCTION

The primary symptoms experienced by people with lumbar spinal stenosis include chronic low back pain, leg discomfort that radiates, and neurogenic claudication characterized by a reduction in walking distance (WD). Lumbar spinal stenosis often manifests as these symptoms, particularly in the older population. The etiology of degenerative spinal stenosis may be attributed to congenital lesions or degenerative changes that occur with age. The presence of intervertebral disk bulging, hypertrophy of facet joints, thickening of the ligamentum flavum, and spondylolisthesis are concurrent factors.[1]

Magnetic resonance imaging (MRI) is the preferred radio diagnostic technique for diagnosing spinal stenosis.[2] Following the diagnosis of spinal stenosis, patients often explore conservative treatment options and algology techniques to recover. Decompressive surgery is the only therapeutic choice for individuals who do not react to non-operative treatments such as epidural steroid injections, oral steroids, non-steroidal anti-inflammatory medicine, analgesics, and physical therapy.[3]

The surgical methods used to treat spinal stenosis include whole laminectomy, bilateral partial laminectomy, and unilateral laminectomy. Endoscopic procedures may be used in suitable individuals.[4] This study aims to assess the outcomes of the unilateral approach bilateral microdecompression technique in patients with spinal stenosis. The evaluation will be conducted during the pre-operative and 2nd-year post-operative periods. The assessment will include the use of the visual analog scale (VAS) pain score, oswestry disability index (ODI) score, and WD.

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MATERIALS and METHODS

We retrospectively observed a total of 78 individuals, with 39 male and 39 female. Every patient has discomfort in their back and legs and neurogenic claudication. The diagnosis of spinal stenosis was confirmed by MRI (Fig. 1).

The inclusion criteria are the patients with lumbar spinal stenosis diagnosed with MRI and had neurogenic claudication with low back pain. Only patients operated with unilateral approach bilateral microdecompression technique is selected.

The exclusion criteria included individuals with spondylolisthesis, scoliosis, spinal neoplasms, prior lumbar vertebral surgery, and unstable processes such as pars defects, fractures, significant comorbidities, and disc herniations.

The study was approved by the Ethical Committee of Ümraniye Training and Research Hospital at December 21, 2023 with the number of 232411266. The study is appropriate with the Declaration of Helsinki. All patients have signed informed consent.

In surgical technique, unilateral approach side could be selected where the radiating pain is the more. Then, hemipartial laminectomy and flavectomy are made. After foraminotomy of the approach side, the other side is observed. Contralateral side flavectomy and foraminotomy are made from above the dura and surgery is completed. To avoid dural sac compression, the spinous processes inferior could be resected minimally.

VAS was used to assess the intensity of the patient's buttock/lower limb discomfort, ranging from 0 (indicating no pain) to 10 (representing worst pain in my life).

An ODI, specifically designed for the Turkish population, was used to assess patient impairment. The assessment has ten items, each with a score ranging from 0 to 5. A more significant sum of points indicates a more elevated degree of impairment in the patient.

The distance walked before and after surgery was recorded in meters.

All degrees of stenosis were treated using the unilateral approach bilateral microdecompression surgical technique (Fig. 2). Pre-operative and post-operative investigations were conducted on all patients at 2nd year, measuring the values of VAS, ODI, and WD.

Statistical Analysis

The two independent groups were compared using the Mann–Whitney U-test. The changes detected throughout the follow-up period were compared using the Friedman test. *Post hoc* analyses were conducted using the Wilcoxon test with Bonferroni correction in cases where a statistically significant difference was found. The statistical studies were conducted using the SPSS program developed by IBM Inc. based in the USA. The analyses of this research assumed a statistical significance threshold of $p<0.05$.

RESULTS

The research had 78 patients with a mean age of 64.3±7.2 years. Thirty-nine patients were evenly distributed between the two genders, with 39 females and 39 males. The mean age of the female participants was 65±6.4 years, whereas the mean age of the male participants was 68.6±7.3 years. The ages of the patients did not show any statistically significant differences ($p=0.567$).

The average pre-operative and post-operative 2nd-year VAS, ODI, and WD measurements in meters are shown in Table 1. The gender comparisons indicated no statistically significant disparities between men and women ($p>0.05$ for all).

The post-operative findings of VAS indicate a statistically significant difference in the values of ODI and WD when compared to the pre-operative values.

DISCUSSION

Lumbar canal stenosis often affects older individuals. The typical clinical manifestations include persistent lower back pain that spreads to the buttock, leg discomfort or sciatica, and neurogenic claudication that worsens with fatigue.[5] Despite experiencing progressive numbness and limb discomfort, many individuals may regain their ability to walk by crouching for a few minutes. Neuroradiological tests such as computed tomography or MRI reveal a decrease in the midsagittal diameter of the spinal canal to <12 mm and a narrowing of the lateral recesses or the intervertebral foramen.[6]

Lumbar surgery is most often performed in older individuals due to symptomatic lumbar spinal stenosis.[7] Increasing data suggests that decompressive surgery provides a benefit compared to non-surgical treatment for some individuals experiencing chronic and severe symptoms.[8] Typically, the conventional treatment for lumbar spinal stenosis entails performing a laminectomy along with foraminotomy and partial facetectomy. Furthermore, vertebra fusion surgery with polyaxial screws is necessary when the patient presents with severe spondylolisthesis.[9]

Ogden et al.,[10] conducted a study on 53 patients and discovered that unilateral approach bilateral microdecompression is highly effective in reducing pain, improving WD, and reducing disability. They observed a significant improvement in the clinical parameters of patients with

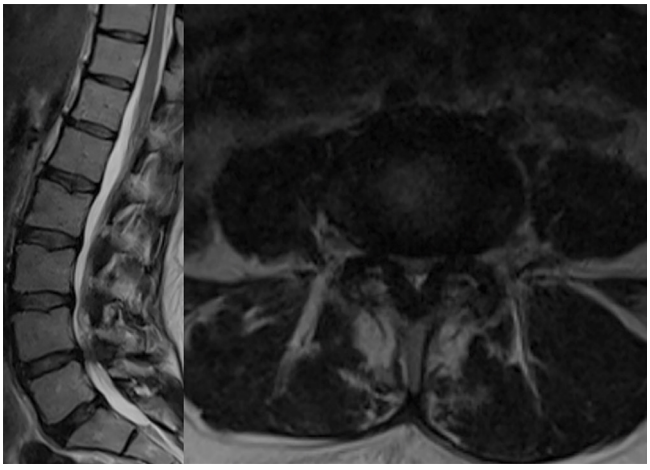

Figure 1. Pre-operative magnetic resonance images of spinal stenosis sagittal (left) and axial (right) planes

Figure 2. Post-operative magnetic resonance images of spinal stenosis sagittal (left) and axial (right) planes

degenerative spondylolisthesis without worsening the slip. In addition, elderly patients experienced similar improvements to adults. This study supports our results with the addition of spondylolisthesis patients.

Haba et al.,[11] successfully performed bilateral decompression of the central and lateral lumbar spinal canal in a consecutive series of 450 patients. They were able to preserve the anatomy and biomechanical function of the posterior spinal column. The study reported that all patients, except for two, experienced a significant improvement in standing time and WD for up to 3 years after the surgery. Haba et al.,[11] found similar results with us even their follow-up period is longer.

Table 1. Pre-operative and post-operative comparison of VAS, ODI, and WD values of patients and p-values of statistical analyses (p<0.05)

	Pre-operative value	Post-operative 2nd year value	p
VAS	8.9±1.1	1.2±0.23	0.009
ODI	65±17.20	17±1.91	0.003
WD (meters)	42±21.30	1800±617.13	0.013

VAS: Visual analog scale; ODI: Oswestry disability index; WD: Walking distance

Furthermore, there are articles available that provide information on surgeon preferences. For instance, Weber et al.,[12] found that many Norwegian spine surgeons opt for minimally invasive decompression techniques when treating lumbar spinal stenosis. Specifically, they prefer to use unilateral microsurgical decompression with crossover decompression as the preferred technique. As minimal invasive surgery is available with the technological equipments most of surgeons would use it as a primary technique when available.

Spetzger et al.,[13] effectively used a surgical technique known as unilateral laminotomy and bilateral spinal canal decompression to treat 29 patients who had symptomatic lumbar stenosis affecting one or multiple segments. After surgery, 93% of the patients (25 out of 27) with neurogenic claudication showed a significant enhancement in their WD. The 18-month follow-up of 25 patients showed that 7 (28%) had no pain and an excellent outcome. Fifteen patients (60%) had mild residual pain but were able to work usually. Three patients (12%) had unchanged low back pain after surgery, but their working capacity and WD improved significantly. This study has a very high satisfaction rate that supports us and the literature.

Costa et al.,[14] conducted a study on 473 patients and discovered that unilateral microdecompression of the lumbar spine provides a substantial improvement for individuals with lumbar spinal stenosis while also having a decreased incidence of complications. The decreased rate of complications is so important for the surgical technique. We have only one dural tear as a surgical complication and it did not go worse and heal in a short period of time.

Cavuşoğlu et al.,[15] conducted a prospective study to assess the outcomes and efficacy of bilateral decompression through a unilateral laminectomy in 50 patients with 98 levels of degenerative lumbar spinal stenosis without instability. They used the VAS, ODI, short form–36, and subjective satisfaction measurement to evaluate the results. The patient satisfaction rate was 94%, and the rate of improvement

was 96%, with a mean follow-up duration of 22.8 months. This study had also investigated short form-36 addition to our study and found satisfactory results additionally.

Şahinoğlu et al.,[16] conducted a study on 18 patients with spinal stenosis who had unilateral laminotomy bilateral decompression treatment for 3 years. The researchers used the visual analog scale and Prolo functional score for comparison. The post-operative measures of the spinal canal and the ratings showed a statistically significant benefit for the unilateral technique.

At present, conventional open procedures for decompression are often employed for therapy. However, concerns about paraspinal musculature denervation and resulting lumbar instability have led to an emphasis on minimally invasive approaches.[17] Minimally invasive surgery is essential for minimizing tissue damage, patient suffering, and post-operative problems after routine procedures.[18,19] The recent trend towards minimally invasive surgery makes the existing approaches most suitable for surgically treating multilevel lumbar canal stenosis in senior patients.

There are some limitations of our study as its retrospective nature, potential selection bias, and lack of the long-term follow-up data. However, with our results, it could be useful for future randomized controlled trials with long-term follow-up periods.

CONCLUSION

The primary objective of using the unilateral approach bilateral microdecompression technique for the treatment of lumbar spinal stenosis is to perform a less invasive surgical procedure that achieves effective decompression, resulting in favorable pain ratings and positive clinical outcomes.

Disclosures

Ethics Committee Approval: The study was approved by the Ümraniye Training and Research Hospital Clinical Research Ethics Committee (No: 232411266, Date: 21/12/2023).

Informed Consent: Written informed consent was obtained from all patients.

Peer-review: Externally peer reviewed.

Authorship Contributions: Concept: L.Ş.; Design: L.Ş.; Supervision: L.Ş., M.U.E.; Materials: L.Ş., M.U.E.; Data Collection or Processing: L.Ş., M.U.E.; Analysis or Interpretation: L.Ş., M.U.E.; Literature Search: L.Ş., M.U.E.; Writing: L.Ş., M.U.E.; Critical review: L.Ş., M.U.E.

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