



Research Article/Özgün Araştırma

Comparison of two types of surgery for lumbar spinal stenosis in elderly: decompressive laminectomy with and without fusion

Yaşlılarda lomber spinal stenoz için iki tip cerrahinin karşılaştırılması: füzyonlu ve füzyonsuz dekompresif laminektomi

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**Abstract**

**Aim:** To compare decompressive total laminectomy with and without instrumented fusion.

**Materials and Methods:** 54 patients who underwent decompression formed the group 1, and 48 patients who underwent decompression plus fusion formed group 2. Patients were compared in terms of age, sex, body mass index, duration of surgery, length of hospital stay, visual analog scale (VAS) and Oswestry disability index (ODI) scores and complications.

**Results:** No significant differences about age, sex, body mass index (BMI), length of hospital stay were found between the groups. There was significant difference between the groups about mean operative times ( $p<0.05$ ). In both of the groups VAS scores improved significantly. In both groups there was statistically significant decrease in ODI values. And second surgery requirement was significantly higher in the group 2 ( $p<0.01$ ).

**Conclusion:** Facet protective decompression surgery performed up to two levels can be successfully terminated without fusion.

**Keywords:** Spinal; Stenosis; Laminectomy; Fusion; Elderly.

**Öz**

**Amaç:** Lomber spinal stenoz cerrahisinde füzyonlu ve füzyonsuz dekompresif laminektomi yapılan hastaların 3 yıl sonundaki klinik bulgularını ve komplikasyon oranlarını karşılaştırmak.

**Gereç ve Yöntem:** Grup 1'de tek başına dekompresyon uygulanan 54 hasta, grup 2'de ise dekompresyon ve posterior transpediküler füzyon uygulanan 48 hasta vardı. Ameliyat süresi, hastanede kalış süresi, yaş, cinsiyet, vücut kitle indeksi gibi özellikler değerlendirildi. Hastaların vizüel ağrı skalası (VAS), Oswestry disability index (ODI) skorlarında değişim ve komşu segment sendromu gibi komplikasyon oranları karşılaştırıldı.

**Bulgular:** Yaş, cinsiyet, vücut kitle indeksi (VKİ) ve hastanede kalış süresi açısından anlamlı bir farklılık yoktu ama ameliyat süresi açısından anlamlı fark vardı ( $p<0,05$ ). İki grupta da VAS ve ODI açısından anlamlı şekilde iyileşme gözlemlendi. Grup 2'de 3 yıllık süreç içerisinde ikinci cerrahi gereksinimi daha yüksekti ( $p<0,01$ ).

**Sonuç:** İki seviyeye kadar yapılan dekompresyon cerrahisinin füzyon gerektirmeden başarıyla yapılabileceği sonucuna vardık.

**Anahtar Kelimeler:** Spinal; Stenoz; Laminektomi; Füzyon; Yaşlılık.

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## Introduction

Just about 80% of the society complain of low back pain in any part of their lives.<sup>1,2</sup> Lumbar spinal canal stenosis (LSCS) due to degenerative changes is one of the causes of persistent low back and leg pain and a serious disorder mainly affects elderly people.<sup>3,4</sup> Also neurogenic claudication caused by LSCS greatly reduces the quality of life. Despite the advanced age, the majority of these patients were generally decided to have surgical intervention.<sup>5-7</sup> Recent studies stated that rates of surgery have been increasing dramatically in the world.<sup>8,9</sup> Although there have been studies reporting surgical intervention is not superior to conservative treatment at long-term follow-ups, most studies have reported that satisfactory results have been obtained after decompression surgery. As a sample Deyo et al. suggest that surgical intervention was more successful than conservative treatment for selected patients according to the clinical outcomes and radiological findings.<sup>10</sup> But the need of fusion after decompression is still unclear. Thomas et al. stated in his study consisting 309 patients that, posterior fusion after decompression did not provide any advantages in degenerative LSCS patients.<sup>11</sup> In the same way Forst et al. concluded that adding fusion after decompression did not result in better clinical outcomes than decompression alone.<sup>12</sup>

Our primary aim was to compare the clinical outcomes and complications between the patients underwent decompressive total laminectomy with and without instrumented posterolateral spinal fusion at 3 years follow-up. Our hypothesis was that satisfactory clinical results can be obtained in LSCS patients who underwent only decompressive laminectomy without fusion, and, naturally, there will be no complications due to instrumentation use.

## Materials and Methods

This retrospective study was conducted at the Department of Neurosurgery of the Adıyaman University Education and Research Hospital (Adıyaman–Turkey) between 2011 and 2016 years.

## Patients

A total of 102 patients operated due to one or two level LSCS were enrolled in this study. Spinal canal less than 10 mm in MRI axial sectional images was considered as stenosis. Exclusion criteria were previous lumbar spinal surgery, history of severe lumbar spinal trauma, spinal metastasis, concomitant scoliosis, spinal infection, diabetes mellitus, and diagnosis of spondylolisthesis or deformity.

The patients were categorized into two groups: Group 1 consisted of 54 patients who underwent decompression alone, and group 2 consisted of 48 patients who underwent decompression plus posterior transpedicular instrumented fusion. Operative time, length of hospital stay, patient characteristics such as age and sex in addition to clinical characteristics such as body mass index were recorded. And change in visual analog scale (VAS), Oswestry disability index (ODI) values and presence of adjacent segment syndrome requiring second surgery were compared.

## Surgical Technique

After the midline skin incision and subperiosteal dissection of the erector spinae muscles, a standard fenestration laminectomy was performed. Then the ligamentum flavum was resected and the dura was exposed. For cases of severe stenosis or lateral recess stenosis, extensive decompression was performed by a partial undercutting facetectomy but the medial border of the superior facet was usually preserved. And for the instrumented patients pedicle screws were placed transpedicularly without destruction of the facet joints, and the position of the screws was confirmed by the C-arm. Postoperatively, patients wore a soft lumbar brace for three months. After three months, patients were allowed to return to their normal activities without restriction.

## Statistical analysis

Pearson's chi-squared and t-test were used for statistical analysis. Statistical significance was defined as a *p* value of less than 0,05. Results were reported as means and standard deviations for numerical variables, and as percentages for categorical data.

## Results

As seen in table 1 no significant differences were seen between the groups about number of surgical levels, demographic findings such as age, sex, body mass index

(BMI) and length of hospital stay. But there was a significant difference between the groups in terms of mean operation time (125±10.1 min, 217±9 min, respectively,  $p<0.05$ ).

**Table 1.** Patient characteristics.

	Group 1	Group 2	<i>p</i> value*
n	54	48	
Age mean	67.8(60-71)	64.3(60-70)	0.810
Sex			0.701
Male	24	22	
Female	30	26	
BMI	29.1	30.4	0.045
Number of surgical levels (n/%)			0.072
1	40/70.4	37/66.9	
2	14/29.6	11/33.1	
Mean operative time(min.)	125±10.1	217±9.4	<b>&lt;0,05</b>
Length of hospital stay (day)	4±1.1	6±40.8	0.12

\* chi-squared test

And in both of the groups VAS and ODI scores improved significantly within 3 years. In the group 1 VAS decreased from 9.4 (range from 10 to 7) to 3.02 (range from 4 to 1) and in the group 2 it decreased from 8.7 (range from 10 to 6) to 4.99 (range from 5 to 1). There was no significant difference between the groups in terms of improvement in VAS values ( $p=0.41$ ).

In the group 1 ODI decreased from 60.9±2.4 to 30.02±5.1 and in the group 2 it decreased from 64.1±1.9 to 35.2±3.2. There was no significant difference between the

groups in terms of improvement in VAS values ( $p=0.770$ ).

Second surgery requirement during 3 years follow-up was significantly higher in the group 2 ( $p<0.01$ ) (Table 2). In the group 1 spondylolisthesis was observed in 2 patients (3.7%) and underwent posterior stabilization (4.1%). In the group 2, 3 patients (6.25%) underwent second surgery due to malposition of the instruments. Also adjacent segment syndrom was observed in 6 patients (12.5%) and these underwent second surgery.

**Table 2.** Comparison of second surgery requirement of the groups.

	Group 1	Group 2	<i>p</i> value*
Second surgery requirement (n/%)	4.1%	9/18.7%	<b>&lt;0.01</b>

\*chi-squared test

## Discussion

This study compared the two types of surgery for LSCS in elderly patients. Patients who underwent only decompression and who underwent posterior transpedicular fusion in addition to decompression were compared for radiological findings and clinical outcomes. The need for surgical intervention in LSCS is still controversial but many studies reported satisfactory recovery in LSCS patients after surgical intervention compared with conservative treatment.<sup>10,13</sup> According to our results, patient satisfaction increased after surgery with or without fusion at the end of the third year. Although there was no difference between the two groups, we

observed more decrease in VAS and ODI scores in the non-fusion group. Similar to our results in many studies greater back pain was found in the patients underwent decompression plus fusion surgery than patients without fusion.<sup>11,14</sup> Also in group 2 we found significantly longer operative time and longer hospital stay although not statistically significant. Thomas et al. found the ratio of undesirable conditions due to surgery and longer operative time in the instrumented group operated due to LSCS.<sup>11</sup> Also in their study, Forsth et al. found longer operative time, longer hospital stay and higher complication rate in the instrumented patients.<sup>12</sup> And we found second surgery

requirement during 3 years follow-up significantly higher in the group 2. Most of them were due to adjacent segment syndrome. Probably posterior fusion causes changes in the mechanical balance of the spine, eliminates motion so increases the load at the adjacent segments.<sup>15-17</sup> Review studies on this subject reported that adjacent segment syndrome could be seen radiologically up to 100%.<sup>18,19</sup> Some of them become symptomatic and require second surgery so the rate of complications increases in patients and the length of hospitalization increases.<sup>20</sup> According to the previous studies the incidence of symptomatic adjacent segment syndrome requiring second surgery was ranging from 5 to 18% and most commonly seen on the cranial side.<sup>19,21</sup> This difference between results may be because of differences among patient populations and differing methodologies. Some researchers have reported the increased incidence of adjacent segment syndrome according to advancing age.<sup>22,23</sup> But, in the many previous studies it was reported that there was no association between adjacent segment syndrome and age.<sup>24,25</sup> In our study no significantly difference was found between age and adjacent segment syndrome. Also Zhong et al. stated that simultaneous decompression at the adjacent segment was one of the risk factors for adjacent segment syndrome.<sup>19</sup> So damage to the posterior elements appeared to be the most obvious cause.

In this present study there are some limitations. As a sample. The fact that no distinction was made between the two diagnoses; central canal stenosis and lateral recess stenosis. It was a limitation of this study. In addition, the fact that the amount of decompression was not measured postoperatively is another important limitation of this study.

## Conclusion

We obtained more satisfactory results for both surgeon and patient in patients without fusion. If there is no evidence of serious listesis, total decompressive laminectomy can be performed safely in elderly patients. This successful result may be related to the type of surgery not demographic findings.

Conventional techniques through a minimally traumatic surgical corridor by preservation of spinal stability, optimal visualization, safe well-defined osteotomy lines and adequate decompression of stenotic pathology will ultimately build on achieving improved clinical outcomes. Sodecompression surgery performed up to two levels can be successfully terminated without fusion in elderly population.

## Ethics Committee Approval

This study was approved by the Erzincan Binali Yıldırım University Medical Faculty ethics committee (2018-9/17) and continued in accordance with the Helsinki Principles Declaration.

## Informed Consent

All participants signed the Informed Consent Form and their consent was obtained.

## Author Contributions

Conceptualization, Methodology and writing—original draft: T.Ç., Ş.C.Y. Data curation and investigation: Ş.C.Y. Resources, software, visualization and editing: T.Ç.

## Conflict of Interest

In this article, there is no conflict of interest between the authors

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