

ORJİNAL MAKALE / ORIGINAL ARTICLE

CLINICAL AND RADIOLOGIC RESULTS OF POSTERIOR DECOMPRESSION AND FUSION SURGERY IN DEGENERATIVE LUMBAR SPINAL STENOSIS

DEJENERATİF LOMBER SPİNAL STENOZDA POSTERİÖR DEKOMPRESYON VE FÜZYON UYGULAMASININ KLİNİK ve RADYOLOJİK SONUÇLARI

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SUMMARY

Background: The aim of this study is to evaluate the results of radiological and clinical data of patients treated by posterior decompression and fusion who have degenerative lumbar spinal stenosis (DLSS).

Materials and Method: 30 patients (17 female, 13 male) evaluated in this study who diagnosed as DLSS and underwent to surgery between 1999 and 2005. Lumbar spinal canal measured with CT scans of the operated level, one level upper and one level under from the operated level. All patients evaluated with Oswestry questionnaire and clinic examination scale (existence of back pain, leg pain, numbness, prickle, motor deficiency and sensory deficiency). Preoperative and postoperative satisfaction was evaluated by Visual Analog Scale (VAS).

Results: Mean follow-up time was 4.3±3.7 years. Preoperative spinal canal diameter was 12.4±3.3 mm whereas postoperative 14.0±2.8 mm. Postoperative clinic scale and Oswestry questionnaire found to be beter significantly (p<0.05). Mean preoperative VAS satisfaction was 27.4±13.6. Mean postoperative VAS satisfaction was increased to 56.3±24.5. Significant negative correlations (Spearman Rank Correlation) found in VAS scores; as between VAS and Oswestry questionnaire (r=-0.65) and VAS and postoperative clinical scale (r=-0.63) (p<0.05).

Conclusion: Statistical significant recovery found in patients treated by posterior decompression and fusion who have degenerative lumbar spinal stenosis (DLSS). Clinic finding score related with radiological data. Posterior decompression with instrumented-fusion is an effective way of treatment in DLSS.

Key Words: Lumbar spinal stenosis, degenerative, decompression, clinic results.

Level of Evidence: Retrospective clinical study, Level III

ÖZET

Amaç: Dejeneratif lomber spinal stenoz (DLSS) nedeniyle posterior enstrümanlı dekompresyon ve füzyon uygulanan olguların sonuçlarının klinik ve radyolojik olarak değerlendirilmesi.

Materyal ve Metod: 1999-2005 yılları arasında DLSS nedeniyle opere olan 30 olgu (17 K, 13 E) değerlendirmeye alındı. Tüm olguların opere olduğu seviyede ve opere olduğu seviyenin bir üst ve bir alt vertebra arasındaki lomber spinal kanalları bilgisayarlı tomografi (BT) eşliğinde ölçüldü. Olgular klinik olarak Oswestry soru anketi ve 6 puanlık klinik bulgu ölçeği (bel ağrısı, bacak ağrısı, uyuşukluk, karıncalanma, motor kayıp ve duyu kaybı varlığı) ile değerlendirildiler. Preoperatif ve postoperatif memnuniyet Visual Analog Skala (VAS) ile ölçüldü.

Bulgular: Olguların ortalama takip süresi 4.3±3.7 yıl olarak saptandı. Operasyon öncesi kanal çapı 12.4±3.3 mm iken ameliyat sonrası 14.0±2.8 mm olarak ölçüldü. Postoperatif klinik bulgu ve Oswestry anketi anlamlı olarak iyi yönde değişti (p<0.05). Olguların ortalama preop VAS memnuniyeti 27.4±13.6 idi. Ortalama postoperatif VAS ile memnuniyeti ise 56.3±24.5 olarak artmış saptandı. VAS ile diğer parametrelerin korelasyonuna bakıldığında (Spearman Rank Korelasyon) Oswestry (r=-0.65) ile postoperatif klinik bulgu ölçeği (r=-0.63) ile anlamlı negatif korelasyonlar elde edildi (p<0.05).

Sonuç: DLSS nedeniyle cerrahi olarak tedavi edilen olgularda gerek klinik, gerek radyolojik olarak takipleri sonucunda istatistiksel olarak anlamlı bir iyileşme saptanmıştır. Olguların klinik ve radyolojik iyileşme oranları birbirleri ile uyumlu olarak tespit edilmiştir. LSS'un tedavisinde posterior dekompresyon ve enstrümanlı füzyon yöntemi etkili bir tedavi yöntemidir.

Anahtar Kelimeler: Lomber spinal stenoz, dejeneratif, dekompresyon, klinik,

Kanıt Düzeyi: Retrospektif klinik çalışma, Düzey III

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INTRODUCTION:

Spinal stenosis is narrowing of spinal canal, lateral recess or neural foramen due to bone or soft tissue compression⁽¹⁾. The structure of normal vertebra is a tripod configuration that permits symmetrical rotation and angulations without any narrowing in discs, facet joints and ligaments, spinal canal or neural foramina. However, in acquired-degenerative form occurring especially in mobile lumbar region, as a result of degenerative changes in joint complexes providing lumbar spine mobility, in the elderly central canal and neural foramina accompany to rotational forces lesser and do not adapt to tensional stress. Lamina thickening in various degrees, facet hypertrophy and annular displacement lead to nerve root compression and inflammation in neural structure of cauda equina. Thus, neural claudication, the fundamental clinical picture of spinal stenosis, occurs⁽¹⁰⁾.

This condition frequently occurs in women during 7th decade and is generally called degenerative lumbar spinal stenosis (DLSS). Due to slow progression of the disease, onset of clinical symptoms is generally slow and insidious. Mostly, L3-L4 and L4-L5 levels are involved. Besides low back pain, neural claudication and pain spreading to lower extremities reduce walking capacity and limit mobility. Conservative treatments may reduce symptoms, but underlying pathology remains and it is not possible to achieve very good results by conservative treatment in long-term period. However, patients with mild symptoms may be candidates for conservative approach as the first line⁽¹¹⁾.

Indication for surgery includes patients unresponsive to conservative methods and patients with severe pain limiting their daily life activities. The most convenient patients for surgery are those with severe neural claudication and without gross low back pain, neurological deficits and severe co-morbidity. First, differential diagnosis should be made by vascular claudication. Standard surgery in spinal stenosis comprises of laminectomy and nerve root decompression. The most controversial issue is addition of

fusion (and instrumentation) to decompression. Nevertheless, the most widely used surgical techniques are decompression with or without instrumentation and fusion. Controlled clinical studies demonstrated that surgical treatment is superior to conservative treatment, but there is no consensus on surgical approaches. There is also an ongoing debate on advantages of conservative and surgical treatments^(2,4).

In our study, we evaluated radiologic and clinical results of patients who underwent posterior instrumentation, decompression and fusion due to DLSS.

MATERIAL AND METHOD:

In this retrospective study, we evaluated 30 patients who had posterior instrumentation, decompression and fusion due to DLSS between 1999 and 2005. Pre- and post-operative records of the patients were examined. All patients received some of the conservative treatments before surgery such as medication, epidural injection (EI), and physical therapy modalities (exercises to strengthen abdominal muscles, motion modifications limiting extension, orthosis, deep heating, pelvic traction, and thermal spring. They were all unresponsive to these treatments. All patients underwent a comprehensive neurologic examination. Pre-operative imaging included lumbosacral 4-way (AP, Lateral, 2 way oblique) x-ray graphics, flexion-extension x-rays to demonstrate dynamic instability and MRI. EMG and myelography were not used for diagnosis. Stenosis was not classified as foraminal and extraforaminal. All patients had posterior instrumentation together with polyaxial screw allograft and fusion under scopy (**Figure-1**). All operations were performed by the same surgeon (E.S.).

Lumbar spinal canal diameters at operated vertebra level together with upper and lower levels were measured by using computed tomography (CT) (**Figure-2**). Canal diameter measurements were performed by using the method of Hashimoto et al., which was used to measure canal diameter following vertebra fractures⁽⁹⁾. Measurement of the operated level was done. The arithmetic mean of upper and

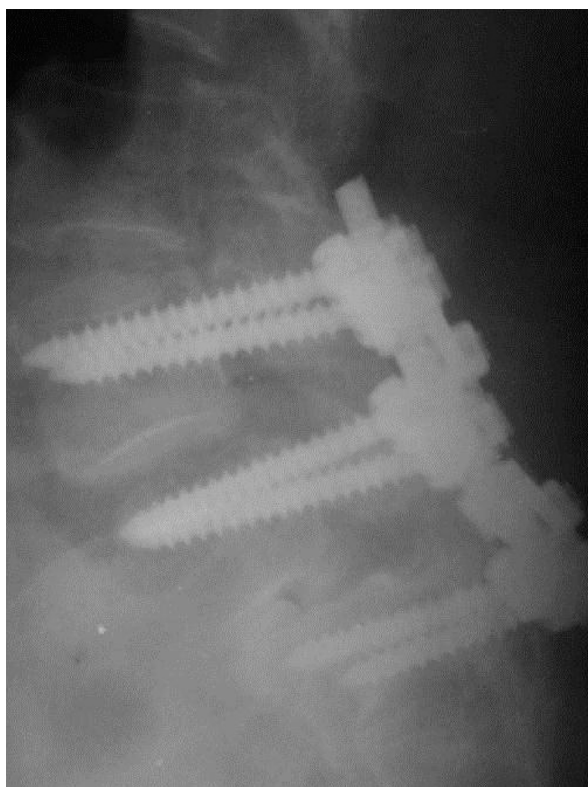


Figure-1. Lateral lumbar x-ray of a patient with posterior instrumentation

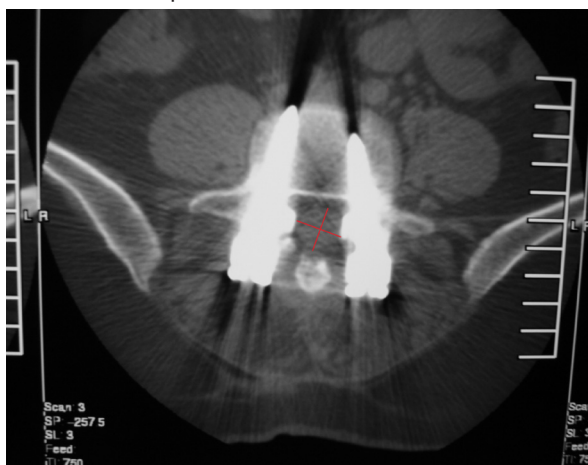


Figure-2. Measurement of canal diameter at operation level.

lower levels was accepted as the normal preoperative diameter of the spinal canal.

Patients were evaluated by clinical symptom scores and each symptom was 1 point. These symptoms comprised of low back pain, leg pain, numbness, to have pins and needles, motor deficit, and sensory deficit (**Table-1**). Each patient had a global score cal-

culated by sum of the points. Pre- and post-operative pain scores were measured by visual analogue scale (VAS). All patients checked the pre- and postoperative pain intensity on VAS. In order to determine the effect of leg pain and low back pain on daily life activities, Oswestry Disability Index (ODI) was used.

Evaluation of Clinical Symptom Scale		
	PRESENT	ABSENT
Low back pain	1	0
Leg pain	1	0
Numbness	1	0
Pins and needles	1	0
Motor deficit	1	0
Sensory deficit	1	0

Table 1. Parameters evaluated in the Clinical Symptom Scale

Comparisons of spinal canal diameters and VAS scores were made by paired samples t-test. The relationship of VAS, Oswestry and clinical symptom scores were made by Spearman's Rank Correlation.

Surgical Technique:

Preoperative antibiotic prophylaxis was done by intravenous cefazolin 1 g one hour before surgery. Pre- and postoperative antithromboembolic therapy was made by low molecular weight heparin (fragmin 5000 IU 1×1; fraxiparin 0,4-0,6 1×1; clexan 0,4-0,6 1×1), and postoperative treatment was continued up to 3 weeks. In order to prevent deep venous thrombosis, antiembolic stockings were put on both lower extremities after operation. Patient was on prone position. In order to prevent venous return blockade and femoral vein compression, cushioning was used. To prevent respiratory function, both chest sides were cushioned. Surgery was comprised of classical posterior approach (laminectomy+ facetectomy (total or more than 50%) + foraminotomy and instrumentation + fusion). Discectomy was made when necessary. Allograft was used for posterior fusion.

RESULTS:

The study included 30 patients (17 (56.7 %) women and 13 (43.3 %) men) (**Table-2**). The mean age of patients was 65.2 ± 9.3 years and the mean follow up was 4.3 ± 3.7 years. All patients had low back pain and leg pain. All patients were retrospectively examined in terms of chronic conditions such as diabetes (DM) and hypertension (HT). Five patients had HT and 4 patients had DM. One patient had both DM and HT. The mean operation time was 105 (75- 180) min. The amount of peroperative blood tranfusion was 620 (0- 1700) cc. The mean hospital stay was 4 (3-7) day.

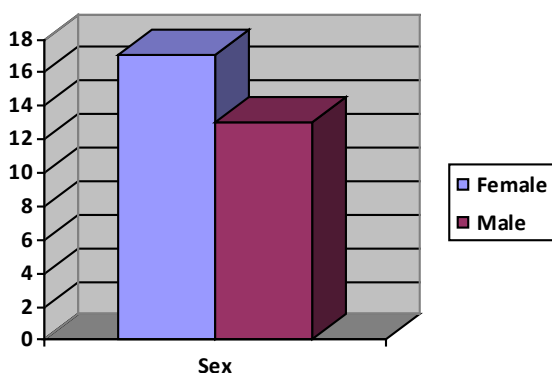


Table-2. Gender distribution of degenerative lumbar spinal stenosis

The mean canal diameter before surgery was 12.4 ± 3.3 mm, whereas it was 14.0 ± 2.8 mm after surgery. Pre- and postoperative VAS satisfaction scores were 27.4 ± 13.6 vs 56.3 ± 24.5 respectively (**Table-3**).

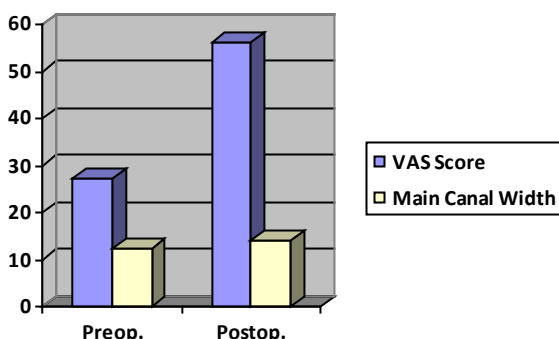


Table-3. Changes in VAS scores before and after surgery

Postoperative mean Oswestry score was 14.7 ± 8.0 . Postoperative mean clinical symptom score was

2.7 ± 1.0 . As preoperative Oswestry scores and symptom scores were not available, correlation analyses were made between postoperative VAS score, Oswestry score and clinical symptoms. There was a significant negative correlation between postoperative VAS and Oswestry ($r = -0.65$; $p < 0.05$). Furthermore, there was a significant negative correlation between postoperative VAS and clinical symptom score ($r = -0.63$; $p < 0.05$).

Two (6.7 %) patients underwent implant revision. These were external center implants. None of the patients developed infection after operation. One patient had previous surgery due to cervical herniation. Fusion was achieved in all patients.

DISCUSSION:

DLSS is the most common reason of lumbar spinal surgery above 65 years of age. Although DLSS is treated by surgery globally, long-term outcomes of surgery is not clear. Some authors report excellent-good results in long term, whereas some others report moderate-bad results^(4,6,8). The possible reasons may include differences in work plan, in excluded or included subjects, and measurement differences.

Surgical treatment of DLSS has two main goals. First, decompress degenerative tissues compressing spinal canal, intervertebral foramina and neural structures (cauda equina and nerve roots) mechanically, and second, correction of deformities in sagittal and coronal planes and eventually recover the stability of spinal canal. In large decompressive laminectomy, direct vision and decompression of nerve root make this technique the gold standard in DLSS surgery. However, long-term studies report iatrogenic instability, postoperative spondylolisthesis and epidural fibrosis after laminectomy^(6,8). We observed no such complications, but this may be due to relatively short follow up period.

In the study of Yamashita et al., surgical efficacy was investigated in 70 patients with DLSS⁽¹⁴⁾. They suggested that recurrence rate was increased with aging and VAS scores of women were higher than

men. In our study, gender stratification was not performed, but no patient had pre-operative VAS score worse than postoperative VAS score. Gelalis et al., investigated 50 operated DLSS patients⁽⁷⁾. In that study, fusion had been added to spinal decompression in 5 (10 %) of the 50 patients. The mean follow up period of 11.6 years resulted in excellent outcome in 23 patients, good in 13, moderate in 9, and bad in 5 patients. Cases with simultaneous fusion showed excellent-good results. Panagiotis et al., performed posterior instrumentation and fusion in 41 patients with DLSS with a 3.7 year follow up⁽¹²⁾. None of the patients had recurrent stenosis and 39 of 41 operated patients reported satisfactory results. None of the patients showed recurrent stenosis or increase in postoperative pain.

Fusion practice in spinal surgery is a method that increases surgical success in patients with instability and deformity (such as advanced spodylosis, degenerative scoliosis)⁽³⁾. It has been considered that fusion provides support to posterior column in long term. Various opinions on fusion are present. Some authors do not recommend fusion, whereas some others report better clinical results with fusion^(5,13). Surgical intervention takes longer time with addition of fusion. Blood loss and morbidity increase and postoperative rehabilitation lengthens. However, there is a consenses on adding fusion in DLSS when degenerative spondylolisthesis is present. The advantages of instrumentation added to fusion include correction of deformity, increase in fusion rate, limitation of seg-

ment number, and shortening of postoperative rehabilitation time. In our study, all patients underwent fusion together with posterior instrumentation.

Recently, unilateral pedicle screw and fusion have been applied in DLSS treatment⁽¹⁵⁾. Goal of this approach is to reduce the tension of implant which has been shown to increase biomechanically and clinically during postoperative period. But, the approach of posterior instrumentation and fusion is still valid in DLSS treatment.

Zhao et al., performed this technique in 79 patients with DLSS and used diagonal cage for unilateral transpedicular screw together with fusion⁽¹⁶⁾. Three years follow up period resulted in successful fusion, reduction in pain and increase in daily life activities. In our study group, all patients underwent posterior instrumentation and fusion. There was no implant failure. But revision was performed in 2 patients who received implant in an external center.

Both radiologic and clinical aspects, significant improvement was found in DLSS patients treated with surgical intervention. The rate of clinical and radiological improvements were in parallel. Weaknesses of this study were lack of long-term follow up and measurements based on subjective parameters. Besides need for surgery in DLSS, no consensus was obtained on fusion and instrumentation. Although adding fusion to posterior instrumentation is not clear in literature, our results suggest beneficial effects during midterm follow up.

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