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The Effect of Laminectomy on Instability in the Management of Degenerative Lumbar Stenosis Surgery: A Retrospective Radiographic Assessment

Dejeneratif Lomber Dar Kanal Cerrahi Tedavisinde Uygulanan Laminektominin İnstabiliteye Etkisi: Retrospektif Radyolojik Değerlendirme

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ABSTRACT

A retrospective study was conducted to assess the surgical outcomes of degenerative lumbar spinal stenosis. Thirty-four patients treated with decompressive surgery in Departments of III. Neurosurgery, Bakırkoy Hospital for Psychiatric and Neurological Diseases between 2000-2004 were reviewed. There were 13 males and 21 females. The average age was 57.5 (range 51 to 73 years old) and the average follow-up time was 23 (12-60) mounts. The types of surgery consisted of standard single laminectomy. The surgical outcomes were assessed with dynamic radiographic investigation and more than 15 degrees were assessed as segmental instability. Average preoperative sagittal rotation angles were measured 3.5 degrees and average postoperative angles were measured 6.5 degrees. Only one patient (%3) with two level laminectomy and 17 degrees postoperative sagittal rotation angle showed a significantly poorer clinical outcome and accepted instable. This study showed that, treatment of degenerative lumbar stenosis can be safely and effectively performed with standard laminectomy alone, resulting no significant sagittal plane instability. We concluded that single decompressive surgery offers satisfactory results in degenerative lumbar stenosis.

KEY WORDS: Decompressive laminectomy, Degenerative lumbar stenosis, Instability spinal stenosis

ÖZ

Bu çalışmada, dejeneratif lomber dar kanal nedeni ile cerrahi tedavi uygulanan hastaların klinik sonuçları retrospektif olarak değerlendirilmiştir. 2000-2004 yılları arasında Bakırköy Ruh ve Sinir Hastalıkları Hastanesi 3. Nöroşirürji Kliniği'nde, dekompressif cerrahi uygulanan 34 hasta gözden geçirilmiştir. Hastaların 13'ü erkek, 21'i kadındır. Ortalama yaşları 57.5 (51-73) ve ortalama takip süresi 23 (12-60) aydır. Bütün hastalara standart lomber laminektomi uygulanmıştır. Değerlendirme dinamik lomber grafilerle yapılmış, 15 derece ve üstü segmental instabilite olarak kabul edilmiştir. Ortalama preoperatif sagital rotasyon açıları 3.5, postoperatif sagital rotasyon açıları 6.5 derece olarak ölçülmüştür. Postoperatif sagital açısı 17 derece ölçülen ve 2 seviyeli laminektomi uygulanmış 1 hastanın (%3) klinik değerlendirmesi belirgin olarak kötü bulunmuş ve bu hasta instabil olarak kabul edilmiştir. Bu çalışma, dejeneratif lomber dar kanalın sadece standart laminektomi ile, belirgin bir sagittal instabiliteye neden olmaksızın, güvenli ve etkili bir şekilde tedavi edilebileceğini göstermiştir. Lomber dejeneratif dar kanalda, tek başına uygulanan dekompressif cerrahi tedavi ile başarılı sonuçlar alınabileceğini düşünmekteyiz.

ANAHTAR SÖZCÜKLER: Dejeneratif lomber dar kanal, Dekompresif laminektomi, İnstabilite, Spinal stenoz

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INTRODUCTION

Degenerative lumbar stenosis is the narrowing of the spinal canal due to various etiological factors, leading to compression of the spinal cord and the nerve roots. The usual presenting symptoms are back and leg pain, in addition to ambulatory difficulties (18, 21, 22). The disease particularly affects the elderly population (17). The degenerative process leads to narrowing of the spinal canal, lateral recesses and neural foramens. Consequently, compression onto the neural elements occurs (10). Analgesics, exercise programs, use of corset or local steroid injections can be tried as conservative means, but they rarely solve the problem (21). Decompressive surgery has been the method of choice for many years for those with progressive neurological symptoms (11). Recently, addition of fusion techniques and instrumentation to surgical decompression has become widely accepted; however, indications for these procedures are still unclear (3, 26). On the other hand, as Resnick et al. reported in their multi-center study, that there is no proof in favor of fusion procedures or instrumentation for degenerative lumbar stenosis cases that do not have any other additional spinal disorders (19).

In this study, patients treated with decompressive laminectomies without any additional intervention for degenerative lumbar stenosis, were evaluated retrospectively and the effects of laminectomy on spinal stability were investigated.

MATERIAL and METHODS

In this study, 37 patients who underwent laminectomy for degenerative lumbar spinal stenosis were evaluated retrospectively. Of the 37 patients; 22 females and 15 males (female to male ratio: 1.4) with adequate follow-up were included to the study. The mean follow up period was 23 months (ranging between 12 and 60 months) and the mean age of the study population was 57.5 (ranging from 51 to 73). Segmental angulations were evaluated at least 12 months after operations. (Table I, Table II, Table III)

Spinal instability was evaluated through hyperflexion and hyperextension dynamic lumbar radiographs, and the segmental angulations at the sagittal plane were measured. The angle between the line parallel to the upper vertebra's inferior end plate and the line parallel to the inferior vertebra's superior end plate were used to determine segmental angulations (20). Values higher than 15 degrees were considered as segmental instability (26). In addition to the laminectomy level, the adjacent upper and lower segmental angulations were also measured. The mean angulations at segments planned to undergo laminectomy was 3.5 degrees preoperatively, whereas it was 6.5 degrees postoperatively.

Table I: Number of lumbar stenosis levels

Levels	Number
L1-2	1
L2-3	2
L3-4	12
L4-5	5
L2-3, L3-4	4
L3-4, L4-5	13

Table II. Number of levels of laminectomy

Levels	Number
L1	1
L2	6
L3	26
L4	32
L5	12

Table III. Surgical procedures

Single level laminectomy	7
Two level laminectomy	20
Three level laminectomy	10
Unilateral facetectomy	4
Two level unilateral facetectomy	-
Bilateral facetectomy	-

RESULTS

There was no increase in angulations in the sagittal plane of more than 15 degrees and no recent spondylolisthesis in patients that underwent single-level and three-level laminectomies. On the other hand, of the 20 patients that underwent two-level laminectomies, one had developed 17-degree angulations in the sagittal plane and this case was considered as grade I spondylolisthesis. Of the 34

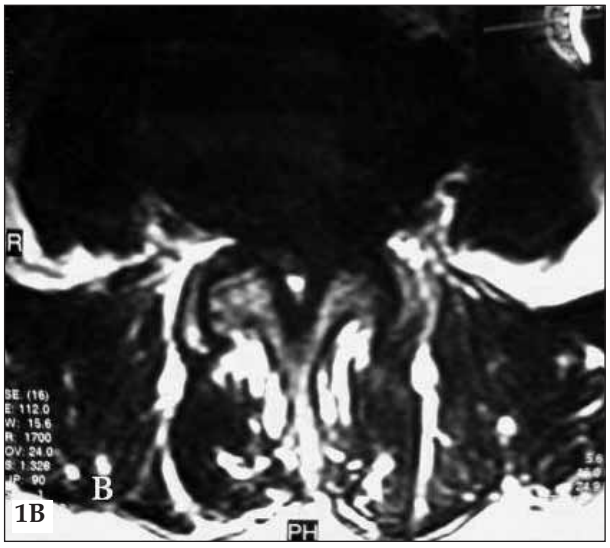
patients included in the study, one (3%) had developed recent instability.

The angulations were more than 15 degrees (17 degrees) at the laminectomy site postoperatively in the patient who had developed segmental instability. In this patient, a total laminectomy was performed at L4, and partial laminectomies were performed at L3 and L5 for L4-L5 spinal stenosis. Facet joints were carefully spared bilaterally during the procedure. He expressed that his pain complaint decreased for a short time after the operation but than while walking especially, he had extreme back and leg pain. This patient had developed neurological deficits at the sixth postoperative month and he was offered a fusion surgery; however, he refused any further intervention. (Figur 1,2).

Consequently, of the 34 cases that underwent stand-alone laminectomy procedures for degenerative lumbar stenosis, only one (3%) had developed segmental spinal instability.

DISCUSSION

Degenerative lumbar spinal stenosis is one of the most common reasons of back and leg pain in the elderly population (1, 6). It is almost inevitable for a healthy vertebra to degenerate during aging and lead to neural compression (24). There is a linear relation between the severity of the compression and the degree of the stress exposure on that vertebra. In spinal stenosis with mild compression, analgesics, exercise and local steroid injections can be helpful (5, 21). However, decompressive surgery is a must in case of severe compressions. The primary purpose of the surgery is to decompress the spinal cord and nerve roots to their outlets. The second purpose, on the other hand, is protection of segmental stability or correction of the present spinal instability. Stand-alone laminectomy has been the standard treatment method for degenerative lumbar spinal stenosis for years (8, 10, 15, 26). Excision of the spinous process and the central part of the lamina compressing the neural tissue is referred to as the standard laminectomy procedure. For some cases, decompression of medial facet joints, lateral recesses and foramens can be added to the procedure (12). According to previous reports, the long-term results of the stand-alone standard laminectomy procedure have been successful (8, 9). In their meta-analyses, Turner et al. have reported



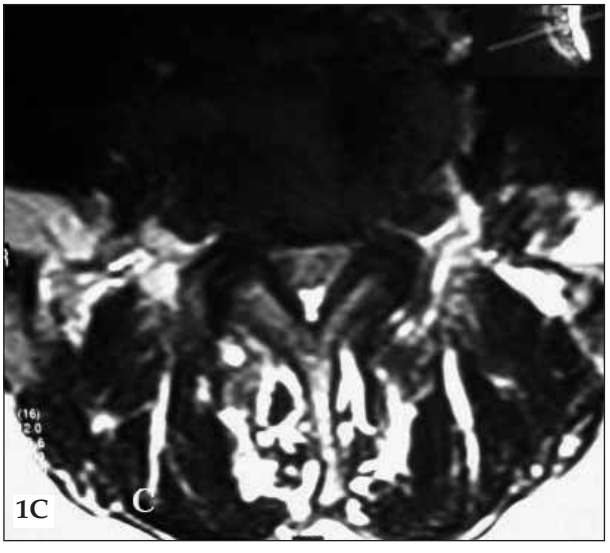


Figure 1: A 54-year-old male patient suffering from walking difficulty was referred to our clinic. Neurologic claudication was determined in 50 meters. Lumber MRI revealed L3-4, L4-5 stenosis. **A**) T2 weighted sagittal, **B**) L4-5 axial, **C**) L3-4 axial section

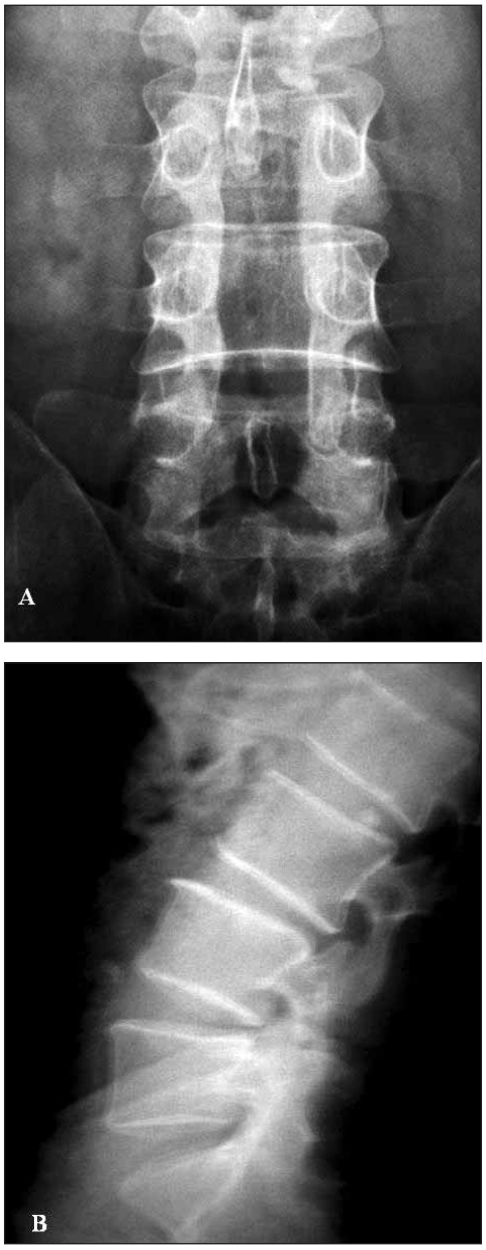


Figure 2: A) Anteroposterior lumbar graph and **B)** Lateral lumbar graph) L4 total and L3, L5 partial laminectomy was performed. Dynamic lumber graphics after 5 years. No instability was detected.

perfect results in 64% of their patients (23). The presence of degenerative hip disorders and diabetes mellitus are the most important factors that compromise this surgical procedure (2, 16).

Spondylolisthesis and spinal instability are known as potential long-term complications of stand-alone decompressive laminectomy procedure (20). However, protection of facet joints during the procedure and absence of more than grade 1 spondylolisthesis preoperatively may prevent these complications. On the other hand, Pappas et al. have reported that 5% of patients with preoperative grade 1 spondylolisthesis may require additional spinal fusion procedures. They also added that the number of laminectomies and discectomies performed during surgery has a negative correlation with spinal stability (17).

Performing additional spinal fusion during lumbar stenosis surgery is still a controversial subject (7, 13). In the absence of instability or additional deformity, the widely accepted opinion by the authors is that spinal fusion may lead to additional complications (14). However, it is well known that in cases with degenerative spondylolisthesis or scoliosis, combining decompressive laminectomy with spinal fusion increases the surgical success (25). Performing fusion with or without instrumentation is another subject of debate. Rapid symptomatic improvement, early mobilization and higher fusion rates are the main advantages of spinal instrumentation. On the other hand, increased surgical complication rates and long-term results that are not better than stand-alone laminectomy procedure, are the main disadvantages (4, 17, 20, 25).

In our report, we presented 34 patients who underwent the stand-alone lumbar laminectomy procedure. During surgical intervention, we preserved the bilateral facet joints. We observed instability in only one of the 34 patients, ie.3% of the cases. This ratio is consistent with the existing literature, setting the stand-alone lumbar laminectomy procedure as a secure and sufficient intervention in treatment of degenerative lumbar stenosis. Preoperative patient selection must be done meticulously, and surgery must be performed without hesitation in cases requiring additional spinal fusion procedure.

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