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Postoperative evaluation of quality of life in lumbar spinal stenosis patients following instrumented posterior decompression

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Objectives: Spinal stenosis is a clinical condition in which bone and soft tissues compress the spinal canal, neuronal foramina and nerve roots. In this study, we aimed to evaluate the effectiveness of surgical treatment on patient satisfaction. Our sample included 64 patients with degenerative lumbar spinal stenosis on whom posterior decompression and instrumentation was applied.

Methods: In this retrospective study, files of 64 patients who underwent posterior decompression surgery with instrumentation for degenerative lumbar spinal stenosis between March 2004 and April 2008 were examined. Patients were evaluated with Japanese Orthopaedic Association (JOA) form, form of degenerative lumbar spinal stenosis and the most recent postoperative orthopedic inspection findings for a minimum of one year after surgery.

Results: Mean age of patients was 59.9 years and mean follow-up was 27.9 months. When evaluated using the Japanese Orthopaedic Association form, postoperative scores in 63.5% of the patients improved. Based on this postoperative improvement; Japanese Orthopaedic Association scores were found statistically significant ($p<0.001$). Gender ($p=0.651$), age ($p=0.192$), with the length of complaint ($p=0.095$), time passed after surgery ($p=0.933$), number of laminectomy level ($p=0.997$), deformity before operation ($p=0.773$) and systemic disease were not statistically correlated with improvement based upon Japanese Orthopaedic Association scores ($p=0.052$). But Japanese Orthopaedic Association scores were found to have improved (83%) in cases with no systemic diseases.

Conclusion: Our findings show that posterior decompression surgery with instrumentation is a useful treatment modality for patients with severe degenerative lumbar spinal stenosis. There is no secondary factor affecting improvement and instability after surgery is not observed in patient groups.

Key words: Health related quality of life; posterior decompression surgery with instrumentation; spinal stenosis.

Spinal stenosis is a clinical condition in which bone and soft tissues compress the spinal canal, neuronal foramina and canal of neuronal roots.[1,2] This stenosis is usually the result of osteophytes which usually occur after intervertebral joint degeneration or thickening of the ligamentous structures.

Degenerative lumbar spinal stenosis (DLSS), causes functional disability with back and lower extremity pain at older ages.[3,4] Clinical findings are progressive. Frequently, no clinical signs can be observed until later stages in life. Females are more affected and clinical signs may be observed in the 7th decade of life.[2,5]

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There are different treatment modalities. Most patients can be treated with conservative treatment modalities in the early stages of the disease while patients having obstinate pain with a high grade of stenosis and neurological impairment and patients who could not be managed by conservative treatment modalities can be treated with surgical treatment methods.[1] There are articles showing different results about limited and wide decompression, fusion and instrumentation. A definitive conclusion with regards to the most beneficial treatment technique has not been reached.[1,6]

In this study, we aimed to evaluate the effects of surgical treatment on the quality of life for 64 DLSS patients, who were subject to posterior decompression with instrumentation.

Patients and methods

The data set includes 64 DLSS patients who were treated with posterior decompression with instrumentation (PDI) between March 2004 and April 2008. Cases were evaluated retrospectively. Patients with a minimum follow-up period of 1 year were called back and re-examined. Cases in which neurogenic claudication, serious radicular pain, degenerative changes like scoliosis or spondylolisthesis causing instability and pain, persistent need for analgesia, conservative treatments with no positive outcome (minimum 3 months follow-up by a physical therapy and rehabilitation clinic, persisting pain in spite of bed rest and non-steroidal anti-inflammatory drugs) occurred were referred for surgical treatment along with the radiologically confirmed (MRI, CT) DLSS patients. In lumbar spinal stenosis patients; degenerative spondylosis, spondylolisthesis and scoliosis were the etiological factors included in the study. All patients were differentiated based on central stenosis, foraminal and no extraforaminal stenosis.

In DLSS patients, instrumentation with posterior decompression (PDI) was the preferred surgical treatment modality. While posterior instrumentation and posterior fusion techniques were used; 360° fusion techniques were not used. In some cases, lateral recess decompression was applied in addition to total laminectomy but this patient group was not separately classified. All patients were operated by the same surgeon (EY). One gram of cefazolin sodium was administered for prophylaxis, one hour preoperatively.

On DLSS patients follow-up forms, patients information regarding patient ID, protocol numbers, gender, occupation, surgical indications, disease duration, conservative treatment analgesia, the most frequent problem, pain characteristics, positive physical signs, level of stenosis, preoperative accompanying deformities, surgical technique (level of instrumentation), level of decompression, complications, postoperative mobilization time, systemic diseases, brace use, length of symptoms decrease, length of full activity and postoperative activity time was recorded.

Patients were divided into 4 different groups based on age. Patients aged between 41 and 50 were included in the first group, between 51-60 in the 2nd, 61-70 in the 3rd and those older than 71 in the fourth group.

The most frequent symptoms were back pain, leg pain and low back pain radiating to the lower extremities. The patients were evaluated for pain characteristics and physical status. Type and severity of pain, claudication, straight leg raise test, sensory examination, motor examination and neurogenic incontinence were assessed.

In the last round of examinations, DLSS examination form and JOA score forms[7] were filled in through questionnaires and physical examination. Preoperative and postoperative subjective symptoms and urinary symptoms were assessed and clinical findings based on first examination during the first hospitalization and last physical examination. The scores were calculated by applying the preoperative and postoperative JOA scores.

Back pain, leg pain and/or numbness which are among the subjective symptoms in the JOA score, were grouped as no symptom group (0 points) and frequent and continuous pain group (3 points). Walking ability was graded by questioning the walking distance, pain, numbness and/or muscle weakness on 0 to 3 points interval. If the patient has claudication, which is an indication of ability to walk only within a distance of less than 100 meters, the relevant score was 0. If walking ability is normal, the score was 3 points. The maximum sum of the subjective symptoms scores were 9 points.

In clinical findings, straight leg raise test, sensory and motor deficits were evaluated. If straight leg raise test was normal; the respective score was set to 2 points, 30-70 degrees got 1 point and less than 30

degrees got 0 point. Sensory and motor deficits were evaluated based on normal, mild and severe levels and these levels got 2, 1 and 0 points respectively. The maximum sum of the clinical symptoms was 6 points.

Urinary functions were also evaluated. Neurogenic urinary dysfunctions were considered as normal and got assigned 0 point, minimal dysurea got -3 points and severe dysurea (incontinence) got -6 points. The maximum sum of the urinary dysfunctions score was 0 point.

The patients were evaluated through the JOA score, preoperatively and postoperatively. The maximum healing capacity was a total of 15 points. The healing rate was calculated by the formula as healing rate = (Postoperative score - Preoperative score) x 100 / (15 - Preoperative score).

The results were evaluated statistically. Evaluation was made in 4 groups. For points between 0 and 25, in evaluation results were considered as "poor", between 26 to 50 points as "fair", and between 51 to 75 as "good" and 76 to 100 points as "very good". In PDI-applied patients, preoperative and postoperative JOA scores were compared with Wilcoxon T test. Comparison of the independent groups based on JOA scores was analyzed with Mann Whitney U test. Descriptive statistics were shown as arithmetic mean ±standard deviation and median (minimum-maximum). The evaluation of the relationship between the JOA score and duration of preoperative complaints, postoperative time interval, age and laminectomy levels, was conducted through Spearman Correlation Analysis.

For this study, Trakya University Medical Faculty local ethics committee issued an approval notice on 22 January 2009 (Protocol number: TUTFEK 2009/16, 02/10).

Results

The study group included 64 patients, 56 females (87.5%) and 8 males (12.5%). Mean age for female patients (n=56, 87.5%) was 59.41±7.203 (41-75), mean age for male patients (n=8, 12.5%) was 63.25±12.014 (45-83), and the mean age for all patients was 59.9 (41-83). No statistically significant difference could be observed between female and male patients based on age. Mean follow-up time was 27.83±12.366 months (12-61). A statistical analysis of follow-up years distribution showed that the group with the highest number of patients included 26 patients with a 2 year follow-up period and the group with the least number of patients included 5 patients with a 5 year follow-up period.

An evaluation of patient roentgenograms and magnetic resonance images showed that 25 out of the 64 patients had degenerative scoliosis, 12 had spondylolisthesis and 27 had degenerative spondylosis. The most frequent laminectomy level was L3-5 (19 patients) and L4-5 (17 patients). On operated patients, one level decompression was performed in 6 patients, two levels decompression in 22 patients, 3 levels decompression in 23 patients and 4 levels decompression in 12 patients. Since five levels decompression group included only 1 patients, this patient was also included in the 4 levels decompression group due to the fact that the case was statistically non significant.

When complaint durations were evaluated, dispersion pattern was found to be 2.36±1.384 years with mean and standard deviation (1 to 5 years) (Fig. 1).

While back pain was observed in 63 (98%) patients, sciatica was observed in 58 (90%) patients, claudication in 45 (70%) patients, sensory loss in 31 (48%) patients, motor deficit in 16 (25%) patients and incontinence in 13 (20%) patients. Urogenital problems were eliminated in patients having incontinence. Forty-one of the patients had systemic diseases affecting their daily life such as diabetes mellitus, hypertension, goiter, gonarthrosis, rheumatoid arthritis and heart failure. This group was not divided into sub-groups.

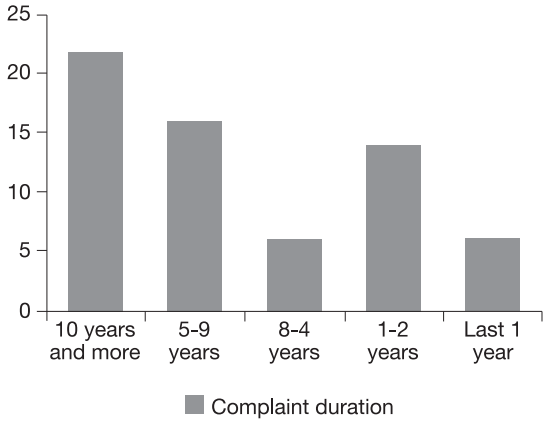

Fig. 1. Number of patients according to complaint durations.

Healing rates and satisfaction levels of patients were evaluated with preoperative and postoperative JOA scores (Fig. 2). In patients with severe DLSS, it was observed that 86% of the patients were satisfied as symptoms regressed (64.1% very good and good results); whereas 14% of patients were dissatisfied with postoperative results. When reasons for dissatisfaction were inquired, no significant relation between the groups could be observed. While back pain was observed in 7 patients in the dissatisfied patients group and urinary dysfunction continued in 1 patient. Significant difference could be observed (p=0.001) in the preoperative (4.52±3.703) and postoperative (11.45±3.3223) JOA scores statistically (Wilcoxon 2 example match test).

No statistical significance could be observed when healing rate (JOA score) was compared to gender (p=0.651), age (p=0.192), preoperative deformities (p=0.773) and systemic diseases (p=0.052). JOA score was higher in the patient group with no systemic diseases. No significant relation could be observed between the healing rate (JOA score) and the number of laminectomy levels (r=0.0005, p=0.997).

The short duration of preoperative complaints did not increase the JOA scores (p=0.095), postoperative time interval did not decrease the JOA scores (p=0.933) due to restenosis of the spinal canal and recurrence of complaints.

In our study group, preoperative score based on JOA scoring system was 5 (-4, 11) (33%) and postoperative score after PDI application was 12 (1, 15) (80%). According to satisfaction levels, 64.1% of the results were placed in the "very good" and "good" group, 21.9% of the results were placed in the "fair" group and 12.5% of the results were placed in the "dissatisfied" group. In the poor results group, 2 patients had no recovery whereas 6 patients had 5-25% level of recovery. No symptoms in any patient got worse following PDI.

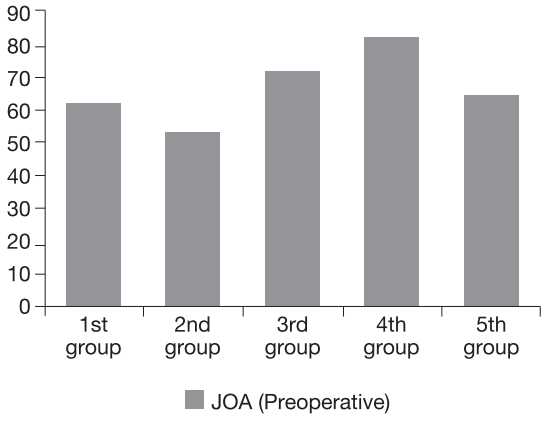

Fig. 2. JOA score according to groups.

One patient had degenerative scoliosis and 2 patients had no deformity in the pseudoarthrotic (3 patients) group. L3-5 laminectomy was applied on 2 of them and L4-5 laminectomy was applied on the third patient. JOA scores were, 63, 25 and 33 respectively. Superficial wound infections were observed in 5 patients with wound problems and pain. These wounds healed by repetitive debridement and wound care. No supplementary attempt was applied to instrumentation. Follow-up times were calculated based on first interventions.

In the post-hoc strength analysis, when descriptive statistics to JOA scores, satisfaction level in the Silvers et al study at (93%)[17] and satisfaction rate at 64% in our study were taken into consideration; at the level of 0.005 significance, the strength of our study was 1.00. The border of the significance was regarded as p≤0.05.

No instability was observed in patients who underwent facetectomy as posterior instrumentation provided rigid fixation. For the determination of instability, patient complaints and roentgenograms were taken into consideration. Instability was evaluated in flexion and extension views.

Discussion

Degenerative lumbar spinal stenosis is the most frequent reason for back pain and radiculopathy in the elderly patient group. DLSS includes symptoms such as pain increasing with activity, neurogenic claudication, numbness and paresthesia decreasing with lumbar flexion and increasing with lumbar extension.[7] Nonoperative treatment is the usual choice for DLSS. However, surgical treatment is needed for patients with neurologic deficit and progressive symptoms.[7]

Spinal fusion is a technique that improves success level of surgery in patients with instability and deformity (severe spondylosis, degenerative spondylolisthesis and scoliosis). Fusion combined with instrumentation may raise the level of success to perfection. Multilevel laminotomy and laminectomy are

frequently preferred techniques in the treatment of DLSS. It should not be forgotten that who have undergone laminectomy are prone to back pain due to extraction of the posterior bony structures. In order to prevent postoperative spinal instability, posterior instrumentation and fusion are usually performed after laminectomy.[7]

While Wiltse et al.[8] concluded that fusion is not needed in any of DLSS patients; Whiffen and Neuwith[1] state that they perform fusion in only 5% of degenerative spondylolisthesis cases.

Lumbar spinal fusion was first performed by Hibbs and Albee in 1911. These degenerative cases having fusion with a short follow-up period have a high percentage of pseudoarthrosis. A meta-analysis including 37 studies shows that mean fusion rate is 86% ranging between 56% and 100%. Multi level fusion is less successful than single level fusion.[5]

Instrumentation systems have been used successfully in deformity correction. Successful use of instrumentation systems resulted in expectations that clinical results may improve which made the use of these systems in DLSS patients more frequent. The major objectives of the instrumentation are to correct the deformity and increase the fusion rate. On the other hand, instrumentation eliminates the need for external immobilization during the postsurgical period and allows early mobilization.[5]

A study with sublaminar wires use reports a 86% fusion rate. In a multi-center study with 250 patients, fusion rate has been reported at 97% with VSP screws.[5]

The most important indications for instrumentation are laminectomy at 2 or more levels and arthrodesis, iatrogenic instability, lengthening the first fusion, pseudoarthrosis revision, and stenotic channel due to degenerative spondylolisthesis and degenerative scoliosis.[5,9] Glassman et al.,[10] in a multi-center study (5 spinal surgery centers) evaluated 497 patients who underwent 5 different fusion and non fusion techniques and these patients have been evaluated with SF-36. As a result, no clinical correlation was found between postoperative satisfaction and surgical process.

Bjarke Christensen et al.[11] evaluated long term results in posterolateral fusion applied patients. They applied fusion with instrumentation and without instrumentation in 129 patients. In the postoperative period these patients were evaluated through a questionnaire that includes satisfaction of the patients. Instrumentation did not affect the results and satisfaction was at the 70% level in both groups after a 5 year follow-up. In our study, 27 (42.2%) patients had severe spondylosis, 25 (39.1%) patients had degenerative scoliosis and 12 (18.8%) patients had spondylolisthesis. In order to prevent instability, to correct the deformity and to apply enough decompression, PDI was applied to all the patients. We think PDI is a suitable technique for severe DLSS patients, which is useful in preventing re-operations and securing enough decompression.

When re-operation rates were evaluated in the stenotic channel operated patients, Lenoir et al.[12] stated that 15% of 262 patients who were operated for DLSS were re-operated 10 years after the first operation. Bjarke Christensen et al.,[11] stated a 25% rate of re-operation in the 5 year follow-up of instrumented patients. In our series, 3 (4.6%) of 64 patients were re-operated due to implant failure (pseudoarthrosis) and 5 (8%) due to wound problems and pain.

Many scoring systems and forms are being used for evaluating postoperative quality of life and satisfaction of the lumbar spinal stenosis operated patients. In patients who underwent surgical decompression for DLSS Haro et al.,[13] evaluated clinical results and patient satisfaction prospectively. Visual Analogue Scale (VAS), SF-36, Oswestry and JOA scores were used for evaluation. Preoperative and postoperative 2 year follow-up forms were evaluated. All scoring systems remained below JOA scores in the evaluation of healing. But, when combined with each other, Oswestry, VAS and SF-36 forms are also valuable, compared to JOA. We also used JOA scoring system for the ability to evaluate subjective symptoms and clinical evaluation.

In a study by Altınmakas and Oğuz,[7] 30 patients undergoing subtotal lateral and medial facetectomy, bilateral ligamentum flavum excision, posterior instrumentation and fusionwere evaluated with a follow-up period of 4 years. While preoperative JOA score was at 16.7%: postoperative JOA score was at 83.3%.

In the surgical treatment of spinal stenosis, inadequate decompression is a reason for continuous complaints. In order to avoid this problem, surgeons prefer wide decompression. This is the most important reason for post surgical instability.[1,14,15] In our

study group, we did not observe any post surgical instability.

Patients in whom wide decompression is performed, to avoid instability, instrumentation has to be done.[5,9] Some reports indicate that time between the compression and decompression is more important than decompression level. Ng et al.,[16] state that decompression is successful in patients with stenosis for less than 33 months. In our study, no correlation was found between the postoperative JOA score and preoperative complaint duration.

Silvers et al.[17] evaluated 244 DLSS patients who underwent decompressive laminectomy and they found a satisfaction level of 93% in the short term follow-up and 75% satisfaction level in the long term follow-up. They concluded no correlation based on age, gender, occupation, activity level, back pain grade, coexisting deformity, myelographic block and number of operated levels.

Our study offers the advantages of evaluation of many parameters with sufficient number of patients who were all operated by a single experienced surgeon (EY). However, short follow-up time is a drawback in our study.

Through the guidance of the available data, patients with DLSS were operated with the PDI technique in our clinic and followed up with JOA score. JOA healing capacity was compared to age, gender, stenosis level, decompression level, coexisting systemic disease, duration of preoperative complaint and postoperative time interval and no statistical significance was observed between these parameters. In the ongoing postoperative period, complaints did not recur, 86% of the patients were satisfied with the surgical results.

We think PDI is an advantageous technique in treating DLSS patients when patient satisfaction, deformity correction, sufficient level decompression and avoidance of spinal instability are taken into consideration.

Conflicts of Interest: No conflicts declared.

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