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Decompressive surgery for degenerative lumbar spinal stenosis: long-term results

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Abstract We report the outcome of 50 patients with degenerative lumbar spinal stenosis who were treated surgically by spinal decompression between 1984 and 1995. Their mean age at the time of surgery was 59.9 (45–77) years and the mean follow-up was 11.6 (6.1–17.2) years. Five patients had a concomitant spinal fusion. The pre-operative data were collected retrospectively from the patients' charts. The follow-up data were obtained from a clinical examination and questionnaire including overall pain, ability to work, walking ability, use of analgesics and satisfaction with surgery. The outcome was rated as excellent in 23 patients, good in 13 patients, fair in 9 patients and poor in 5 patients. Patients with concomitant fusion had good to excellent results and were more satisfied, whereas patients with long-standing preoperative symptoms had poor to fair result and were less satisfied.

Résumé Nous rapportons le résultat de 50 malades avec une sténose lombaire dégénérative qui a été traité chirurgicalement par décompression vertébrale entre 1984 et 1995. L'âge moyen à la chirurgie était 59,9 (45–77) ans et le suivi moyen était 11,6 (6.1–17.2) années. Cinq malades avaient une fusion vertébrale concomitante. Les données préopératoires ont été rassemblées rétrospectivement. Les données du suivi ont été obtenues par un examen clinique et un questionnaire qui inclut les douleurs, la capacité de travailler, la capacité de marcher, l'usage d'analgésiques et la satisfaction de la chirurgie. Le résultat a été estimé comme

excellent pour 23 malades, bon pour 13 malades, juste pour 9 et mauvais pour 5 malades. Les patients avec une fusion concomitante avaient des résultats bons ou excellents et étaient plus satisfaits alors que ceux avec symptômes préopératoires anciens avaient des résultats moyens ou mauvais et étaient moins satisfaits.

Introduction

Lumbar spinal stenosis refers to any narrowing of the spinal canal, nerve root canal, or intervertebral foramen, resulting in highly variable signs and symptoms such as low back pain, radiating pain to the lower extremities, decreased walking capacity and disability [3, 15].

Conservative therapies may be helpful, but do not, in most cases, result in long-term improvement [15]. Controlled clinical studies comparing conservative and surgical treatment are rare and there are few reports on long-term results. The outcome of those studies favours surgical over conservative treatment [2, 16]. The most widely used surgical techniques are all based on the principles of decompression alone or decompression and fusion, with or without instrumentation [8, 11, 21, 24].

These operations are performed with increasing frequency, but information about their long-term efficacy is sparse and debatable [25]. During the past few decades, a number of studies describing the short-term outcome of surgical treatment of lumbar spinal stenosis have been published. Success rates of 26–100% have been reported for different surgical interventions [25]. However, little information has, until recently, been available about the long-term results of surgery for lumbar spinal stenosis. Although long-term outcome has been evaluated in recent studies [1, 13, 14, 18, 19, 23], there is still a wide variation in reported success rates and a continuing controversy regarding differences in long-term clinical outcome between patients undergoing decompression alone and those undergoing both decompression and fusion [7, 8, 20, 25]. There is also an ongoing debate about whether fusions should be instrumented or not [6, 20].

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The aim of this study was to evaluate the long-term outcome of surgical decompression for degenerative lumbar spinal stenosis in 50 patients over a 12-year period at the Orthopaedic Department of the University of Ioannina.

Materials and methods

We reviewed 54 patients who had undergone surgery for degenerative lumbar spinal stenosis between 1984 and 1995. There were 29 men and 25 women, with a mean age at the time of surgery of 59.9 years (range 45–77 years). Four patients had concomitant diseases (diabetes mellitus, Parkinson's disease, Addison's disease and epilepsy). All patients had limited functional activities due to leg or back pain, and the mean duration of symptoms before surgery was 24 months (range 12–60 months).

Preoperative plain radiographic findings included degenerative spondylolisthesis (grade 1) in four patients and degenerative lumbar scoliosis with a 35° curvature in one patient. Myelography or computed tomography documented central or centro-lateral compression of the cauda equina by degenerative changes of the surrounding structures in each patient.

All patients underwent total laminectomy. The level of decompression was determined by the preoperative diagnostic imaging studies. Operative procedures included: decompression at one level in three patients, at two levels in 32 patients, at three levels in 18 patients and at four levels in one patient. Discectomy and foraminotomy had been performed in two and 13 patients respectively. Decompression and fusion was performed in five patients. One patient with degenerative spondylolisthesis had a posterolateral fusion with autogenous cancellous bone and the remaining four patients had posterior bilateral transpedicular stabilization (Fig. 1).

The decompression was considered satisfactory if a small Nelaton catheter entered freely into the un-decompressed part of the spinal canal and if the dural sac and nerve roots showed no gross evidence of compression. Usually, a free fat graft was used to cover the dura.

Preoperative data were reviewed retrospectively by one of the authors (I.D.G.) and obtained from the clinical records. The data included age, sex, duration and type of symptoms, neurophysiological and electromyographic findings, walking ability, use of analgesics and coexisting diseases. Data on preoperative pain severity rating and patient working ability or level of activity were not available. All patients had varying degrees of leg pain and/or back pain prior to surgery. Thirty-eight patients reported neurogenic claudication as their major symptom and 16 patients, sciatic pain. All patients were using daily analgesics.

At follow-up all patients were invited to complete a questionnaire and undergo a clinical examination. The follow-up was performed by one of the authors (K.S.S.), who was blinded as to patient care.

The questionnaire included five criteria: severity of overall pain (low back and radiating leg pain), working

Fig. 1 Radiograph 3 years after two-level laminectomy and posterior transpedicular instrumentation for degenerative spondylolisthesis and spinal stenosis

ability and/or activity level (in retired patients), walking ability, use of analgesics and overall patient satisfaction with postoperative results. Each category was assigned a range from 5 to 20 points in 5-point increments. The questionnaire was based on a 100-point rating scale in which results were classified as excellent (100–81 points), good (80–61), fair (60–41) and poor (under 40) (Table 1).

Results

Fifty patients answered the questionnaire. Four patients were lost to follow-up. The mean follow-up period was 11.6 years (range 6.1–17.2 years). The results showed that the outcome was excellent in 23 patients, good in 13, fair in nine and poor in five patients.

Severe overall pain (back and/or leg pain) was reported in two patients, moderate pain in ten and mild pain in 18 patients, while 20 patients had no pain.

Seven patients were not working or their activities were restricted indoors, eight patients changed to lighter work or their activities were unrestricted indoors, 15 patients were working part time at their previous work and their outdoor activities were partially restricted, and 20 patients returned to their previous work or to unrestricted outdoor activities.

Preoperatively six of 54 patients were able to walk more than 1000 m without pain and/or sensory disturbances; 22 of 54 could walk between 500 m and 1000 m; 18 of 54 were able to walk between 100m and 500 m; and 8 of 54 patients were unable to walk more than 100 m without

Table 1 Selected questionnaire used for follow-up

Questions	Points
Severity of pain	
Severe	5
Moderate	10
Mild	15
None	20
Ability to work	
Not working-Restricted indoor activities	5
Changed to lighter work-Unrestricted indoor activities	10
Part time at previous work-Partially restricted outdoor activities	15
Return to previous work-Unrestricted activities	20
Walking ability	
Less than 100m	5
100-500m	10
500-1000m	15
More than 1000m	20
Use of analgesics	
Daily	5
Almost every other day	10
Weekly	15
Never	20
Satisfaction	
Dissatisfied	5
Somewhat dissatisfied	10
Somewhat satisfied	15
Satisfied	20

serious sensory disturbances and pain. Postoperatively 17 patients stated they could walk more than 1000 m; 24 were able to walk between 500 m and 1000 m; six less than 500 m; and three patients less than 100 m.

Twenty-nine patients did not use any analgesics, ten used analgesics weekly, seven used them almost every other day and four used them consistently. Twenty-six patients reported satisfied with the surgical outcome, 14 were somewhat satisfied, seven somewhat dissatisfied and three dissatisfied.

Patients with prolonged preoperative symptoms seemed to be less satisfied with the results of surgery; however, patients that had a concomitant fusion were more satisfied with the operation.

Discussion

The results of our study showed that the outcomes were excellent to good in 72% of patients, similar to the results of a meta-analysis of the literature on the outcome of surgery for spinal stenosis [25].

Airaksinen et al. [1] found a good to excellent outcome in 62% of 438 patients with spinal stenosis in a 3.5-year follow-up period after surgery. No fusions were included in

this group of patients, which is one of the largest published patient populations, even though the whole facet was removed in some patients.

Herno and co-authors, from the same spinal centre in Finland, evaluated 102 patients [12]. These patients, with a mean follow-up time of 12.4 years, were all also treated by decompression without fusion and assessed with the Oswestry Low Back Pain Questionnaire and Disability Score. They reported excellent to good results in 68% of cases.

Fox et al. retrospectively evaluated 124 patients—92 decompressions without fusions, 17 instrumented fusions and 15 uninstrumented fusions—with a questionnaire, after a mean follow-up period of 5.8 years [7]. Twenty-one per cent in their study reported a “poor outcome” and were dissatisfied—a proportion comparable with our figure of 20% dissatisfied patients. However, they reported that 91% of those who underwent concomitant fusions had good or fair outcomes, compared with 75% of those who had decompression alone.

Recently, Javid and Hadar [14] published results of a study of 86 patients evaluated with a questionnaire at, on average, 5.1 years after decompression for lumbar spinal stenosis, including four instrumented and two uninstrumented fusions. They reported a 71% positive response to the question of whether, in retrospect, the patients would still have chosen surgery. The group of patients with a fusion was too small to be separately evaluated.

Jönsson and co-authors published a prospective study of 105 consecutive patients undergoing decompression, with a facet joint preserving technique, for central lumbar spinal stenosis [18]. They examined, in particular, the clinical features related to radiographic findings and, in a 5-year follow-up, the value of preoperative parameters in predicting surgical outcome. They reported that five years after the surgical procedure, 48% of their total study population claimed an excellent result and about 65% a fair to excellent result.

Katz and co-authors [19] performed a retrospective review and prospective follow-up, a similar study design as ours, of 88 patients who had a decompressive laminectomy with or without fusion. They were followed for an average of 8.1 years. Seventy-five percent of the patients were reported as “somewhat or very satisfied” with the results of surgery. The group of patients with a concomitant arthrodesis ($n=8$) was small. All fusions were uninstrumented. At the follow-up, 53% of the patients were unable to walk two blocks. In this respect, the patients in our study seemed to perform better, with 34% of all patients claiming they could walk more than 1 km, and as many as 82% of the patients more than 500 m. However, the mean age at the time of surgery for the patients in the study by Katz and co-authors was 69.3 years, compared with 59.9 years in our study. The fact that our patients were, on average, about ten years younger at the time of surgery could, at least partially, explain the better walking ability in our study.

Cornefjord et al. [4] reported excellent or good results in 62% of patients undergoing first-time surgery for lumbar

spinal stenosis with a mean follow-up period of 7.1 years. Improvement in walking ability was significant and of clinical importance.

Many studies report better results in patients with degenerative spondylolisthesis treated with combined decompression and fusion than in similar patients treated with decompression alone [5, 8, 11].

Hansraj et al. [9, 10] suggested a therapeutic classification of degenerative spinal stenosis into simple or typical stenosis and complex stenosis, based on their experience with 157 consecutive cases of spinal stenosis treated surgically.

Fischgrund et al.'s study [6] on degenerative spondylolisthesis clearly established that instrumentation improves fusion rate but does not change the clinical outcome. The indications for the addition of instrumentation following decompression and fusion for spinal stenosis are therefore: (a) correction of a mobile or progressive deformity, (b) fusion of two or more motion segments, (c) recurrent spinal stenosis with spondylolisthesis and (d) presence of translational or angular instability.

Only five patients in our study had a combined decompression and fusion. Thus, it is difficult to comment on the benefit of fusion since the sample size is too small; however, all five patients had good to excellent results.

The main challenge in the operative treatment of spinal stenosis is to provide adequate decompression without compromising stability of the lumbar spine. Extensive laminectomy and facetectomy often provide sufficient decompression but the mechanical integrity can be severely impaired. In our series decompression was accomplished by total laminectomy; however, further decompression with discectomy and foraminotomy had been performed in two and 13 patients respectively. In all cases the facet joints were preserved during decompression to avoid subsequent instability.

Prolonged nerve root compression may cause irreversible damage to the neural elements, which limits improvement that might otherwise be gained by operative decompression. Jonsson et al. [17] reported that a long preoperative period of sciatica was associated with a poor outcome in patients with lateral spinal stenosis. In our series 28% of the patients (14/50) had poor to fair results. The mean duration of preoperative symptoms in these patients was 48 months (range 31–60 months). These patients also reported less satisfaction with the results of the operation.

Certain limitations of this study should be acknowledged. Information on preoperative pain severity, working ability, activity level and depression was not available because of the retrospective nature of the data collection. This precluded conclusions regarding improvement in these areas. On the other hand, outcome data were obtained by an author who was blinded as to patient care, thus eliminating observer bias. The five different variables used in our follow-up questionnaire were selected because they are believed to be sufficiently reliable [17, 22]. We believe that decompression of the lumbar spine in spinal stenosis should be extensive while preserving vertebral stability.

Concomitant spinal fusion should be considered only in the presence of instability (i.e. degenerative spondylolisthesis, degenerative scoliosis) or high risk of instability following surgery.

Most patients with degenerative lumbar spinal stenosis reported relief of their symptoms after decompressive surgery. Most of our patients were satisfied with the outcome of the operation, and we believe that our results justify the patients' decision to try for an improved lifestyle through decompressive surgery. However, patients with longstanding preoperative symptoms had poor to fair results and were less satisfied with the results of the operation. Thus, there is a need for prospective studies on the long-term effects of lumbar spinal stenosis surgery.

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