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The role of JOA score as an indication for surgical or conservative treatment of symptomatic degenerative lumbar spinal stenosis

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Abstract The aim of this study was to evaluate the short- to medium-term results (up to 2 years) of conservative and surgical treatments of patients with symptomatic lumbar stenosis. To our knowledge, no previous study has provided strict indications for conservative or surgical treatment. We retrospectively studied 184 patients, who were divided into 3 groups according to JOA (Japanese Orthopaedic Association) score. A cutoff JOA score was arbitrarily fixed at 7. Patients with a score ≤7 (n=12; group A) underwent surgery, while patients with a score >7 (n=172) were conservatively treated. Group A included patients surgically treated within two months from diagnosis. Group B consisted of 144 patients who received conservative treatment, while group C (28 patients) represented patients who underwent surgery after a period of failed conservative treatment. The outcomes of surgical and conservative treatments were evaluated after 12 and 24 months, and were rated as satisfactory, not totally satisfactory, not satisfactory or totally unsatisfactory. Conservative treatment consisted of physical, orthotic and drug therapy, whereas surgical treatment included spinal decompression and instrumentation (if indicated), either rigidly or dynamically performed. Surgery was indicated in 22% of all patients and we obtained excellent results in 85% of them. Operative treatment provides excellent results for patients with severe clinical presentation (JOA score ≤7), while individuals with mild to moderate spinal stenosis (JOA score >7) should receive conservative treatment.

Key words Lumbar spinal stenosis • Conservative treatment • Decompression • Laminectomy • JOA score

Introduction

The narrowing of the spinal canal has been known for 200 years, when Portal first reported pathological stenosis of the lumbar spinal canal in three individuals affected by rickets and syphilis. A comprehensive analysis of this condition began in the early 1950s when Verbiest successively modified both clinical and therapeutic approaches for lumbar stenosis [1]. When clinical presentation includes inferior limb numbness and paraesthesia, and if imaging and electrodiagnostic tests confirm the diagnosis, surgical management is considered the routine therapeutic choice. Nevertheless, clinical experience shows that good results can also be achieved without surgical treatment [2, 3].

A number of studies had shown good results with conservative treatment [4–6]. Operative treatment should be indicated when the patient's quality of life has deteriorated to the point that pain is no longer tolerable [4]. Decompressive laminectomy associated with nerve root

decompression is the standard operative strategy [7]. Treatment of all affected levels is mandatory. As an alternative, limited laminotomy with foraminotomy can be performed to preserve osteoligamentous tissues and, therefore, vertebral stability.

Factors determining whether or not to instrument have been described by Garfin et al. [4]. Not only does vertebral arthrodesis and instrumentation prevent further instability, but it also permits re-alignment of sagittal and frontal curves. Disc degeneration in segments adjacent to rigid fixation occur in a wide range of cases: a 5%-100% incidence rate has been reported [8, 9]. We previously reported a novel method for elastic vertebral stabilization [10], which seems to prevent junctional disease.

The aim of this study was to evaluate results of conservative and surgical treatments of patients with symptomatic lumbar stenosis. Defining a JOA score as cutoff value for identifying patients who would more likely benefit from surgical or conservative treatment was also an endpoint of the present study.

Materials and methods

We retrospectively studied a group of 184 patients affected by symptomatic lumbar spinal stenosis who had been treated at different institutions from January 1999 to August 2002. Diagnostic studies included plain lumbosacral roentgenograms in lateral and anteroposterior (AP) views, dynamic roentgenograms in flexion-extension, computed tomography (CT), magnetic resonance imaging (MRI) [11] and axial loaded-computed tomography (ALCT). Pre-operative work-up of vertebral instability by means of ALCT allowed vertebral stabilization planning, because administered axial load makes it possible to reveal the presence of non-physiological mobility among different functional spinal units, which would otherwise remain unknown. For patients to enter this study, the following inclusion criteria had to be met: subjective complaints, imaging studies and physical examination indicative of lumbar spinal stenosis; positive electrodiagnostic testing; no major general conditions associated; no previous surgery sustained.

Patients were evaluated with JOA score [12], which considers both subjective and objective issues. We arbitrarily fixed a cutoff value at 7. Patients with JOA score of ≤7 (group A) underwent surgery within 2 months of diagnosis, while patients with JOA score more >7 were submitted to conservative treatment (group B).

Group A consisted of 12 patients (8 men and 4 women) with a mean age of 58 (range, 35–81 years). Group B initially included 172 patients, but 28 underwent surgery after 2 months when conservative treatment gave no or minimal improvement. Group B was therefore made up of 144 patients (83 men and 61 women) with a mean age of 79 years (range, 58–95 years). Group C included 28 individuals (18 men and 10 women) with a mean age of 72 years (range, 60–88 years). The patients were re-evaluated 12 and 24 months after treatment.

The recovery rate was evaluated by the following equation: [(post-operative JOA score - pre-operative JOA score)/(15 - pre-operative JOA score)]x100 [12, 13]. Outcomes were classified as: *satisfactory* if the result was greater than 75%; *not totally satisfactory*, with results ranging from 50% to 74%; *not satisfactory*, if the results were between 49% and 25%; and *completely unsatisfactory*, if less than 24%.

Conservative treatment consisted of physical therapy and strengthening exercises for lumbar paraspinal and abdominal muscles. Modalities included infrared heating, ultrasonic diathermy, active lumbar exercises, deep tissues massage, aerobic conditioning and modification of activities of daily living. Treatment also included braces and drug therapy. Medications most frequently prescribed were non-steroidal anti-inflammatory drugs, COX-2 inhibitors, muscle relaxants, vitamin B complex and gabapentin.

Operative treatment aimed to relieve compression of neural tissues at stenosis level, and eventually considered concomitant instability or deformities. Diskectomy was performed when a herniated disc [14] caused neurological impairment. Decision about whether or not to instrument was based upon criteria described by Garfin et al. [4], including segmental instability diagnosed with dynamic roentgenograms or ALCT and presence of herniations below the olisthetic vertebra. We used "soft" stabilization devices in 8 degenerative segmental stenoses diagnosed by means of ALCT or dynamic roentgenograms.

Results of conservatively and surgically treated patients were compared by Student's t test

Results

Results of surgical treatment after 12 months in group A were rated as satisfactory in 5 patients (42%), not totally satisfactory in 3 patients (25%), not satisfactory in 3 patients (25%), and totally unsatisfactory in 1 patient (8%). After 24 months, the patients' conditions were as follows: satisfactory in 6 patients (50%), not totally satisfactory in 3 patients (25%), not satisfactory in 2 patients (17%), and totally unsatisfactory in 1 patient (8%).

Results after 12 months of conservative treatment (group B) were classified as satisfactory in 59 patients (41%), not totally satisfactory in 45 (31%), not satisfactory in 20 patients (14%) and totally unsatisfactory in 20 patients (14%). After 24 months, the results were as follows: satisfactory in 66 patients (46%), not totally satisfactory in 62 patients (43%), not satisfactory in 10 patients (7%) and totally unsatisfactory in 6 patients (4%).

Twelve months after treatment in group C, we observed satisfactory results in 9 patients (32%), not totally satisfactory results in 14 patients (50%), not satisfactory results in 3 patients (11%) and totally unsatisfactory results in 2 patients (7%). After 24 months, the patients' conditions were as follows: satisfactory in 15 patients (54%), not totally satisfactory in 10 patients (36%), not

satisfactory in 2 patients (7%) and totally unsatisfactory in 1 patient (3%).

The overall rates of good results (satisfactory and not totally satisfactory) in groups A, B and C were 75%, 89% and 90%, respectively. The differences between groups were not statistically significant.

Discussion

Lumbar stenosis can be addressed either by conservative or surgical treatment, depending on neurological involvement and the patient's general conditions. In this study, we compared surgical decompression, with or without vertebral instrumentation, to conservative treatment, as a standard procedure for lumbar stenosis treatment, with a maximum follow-up of 24 months.

We arbitrarily fixed a JOA score (which ranges from 0 to 15) cutoff value at 7. We aimed to verify whether such a cutoff value could indicate the appropriate treatment for each individual. To our knowledge, no previous study provides strict indications for conservative or surgical treatment. Patients with a score more than 7 underwent conservative treatment, while a score of 7 or less was considered an indication for surgery. JOA score can be helpful in assessing stenosis severity; it is a validated instrument which considers both subjective features (low back pain, leg pain, gait disturbances) and objective features (straight leg raise test, sensory impairment, motor impairment, and urinary bladder dysfunction). In a study comparing surgical and conservative treatment, Johnsson et al. [15] noted that 60% of surgically treated patients improved and 25% worsened, while 30% of conservatively treated patients improved and 60% had their clinical situation unchanged. These authors found that after a follow-up of 49 months, only 15% of patients had worsened, while 70% of patients experienced no variations in clinical status and 15% of patients had an improvement: therefore, conservative treatment for lumbar stenosis can be considered a valid alternative to the surgical approach [3]. In a recent meta-analysis, Gunzburg and Szpalski [5] reported that 64% of surgically treated patients had good to excellent results. Another review [6] stated that the majority of conservatively treated patients may either improve or remain stable over years.

We considered as good results the satisfactory and not totally satisfactory ratings. Using this clinical criterion, outcomes from conservative and surgical treatment were not statistically different: 75%–90% for surgically treated patients vs. 89% for conservatively treated patients. These findings suggest that conservative and surgical treatments are equally effective if performed on correctly selected patients. A JOA score cutoff value of 7 seems to be reliable in defining the best therapeutic choice for each patient.

Our first surgical choice included laminectomy or laminotomy without fusion when degenerative spinal stenosis was noted, whereas spinal instrumentation was necessary if vertebral stability could not be guaranteed. There are 5 factors indicating instrumentation: curve flexibility, documented curve progression, radiculopathy in the concavity of the curve, lateral subluxation and reduction in lumbar lordosis [4].

In previous surgical studies with short-term follow-ups [16–18], good to excellent results were obtained in up to 85% of patients, while in this study good or excellent results were obtained in 75%–90% of surgically treated patients 24 months after surgery; 11% of our patients, and 12% of patients in other studies [3, 18], did not experience any improvement 2 years after surgery. These data are encouraging, since results of decompressive surgery tend to worsen with time [3, 16, 18]. These findings seem to be related to high percentage of lumbar disk degeneration in segments adjacent to the instrumented vertebrae [8, 9]. Moreover, postoperative outcomes are affected by iatrogenic segmental instability resulting from laminectomy or partial arthrectomy performed to treat nerve root compression. Increased vertebral motion seems to facilitate disc degeneration. Conversely, using vertebral transpedicular fixation, it was possible to perform wider decompressions and to treat associated conditions (e.g. spondylolisthesis and scoliosis). In these patients, results have been good; however, it would be interesting to verify whether after a longer follow-up such stabilizations cause an adjacent-segment failure syndrome [20]. Vertebral stabilization has not been considered an absolute indication when vertebral osteoarthritis with concomitant bony spurs was greatly evident, because it mechanically mimics vertebral fusion [21].

We separately evaluated patients with unsatisfactory surgical outcomes in groups A and C, and observed that results were slightly better in patients in group C. This is probably related to the worse initial conditions of patients in group A. From a surgical point of view, unsatisfactory results have been more frequently observed when multiple laminectomy was performed without spinal instrumentation.

This study indicates that surgical treatment is needed in 22% of patients affected by lumbar stenosis, and provides good results in 85% of them. Patients selected for surgery should have a JOA score ≤7. Main determinants of surgical treatment are pain and neurological signs supported by imaging studies. The surgical strategy of choice is wide laminectomy to decompress the narrowed canal, followed by spinal instrumentation, if indicated, to obtain vertebral stability as well. Conservative treatment is a valid alternative for patients with mild to moderate stenosis with a JOA score >7.

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