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Surgical Treatment of Lumbar Spinal Stenosis in the Elderly

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Summary

148 elderly patients, aged 70 years or more, diagnosed as having lumbar spinal stenosis, were operated upon at our institution during 1983 to 1995. Totally 161 operative procedures were performed. We analysed retrospectively the results of the surgical treatment.

The most frequently performed procedure was multisegmental laminectomy, in 32% interlaminar fenestration and laminotomy were done. In 9 cases fusion was indicated, two of them being secondary operations. The mean hospital stay was 11 days. The morbidity was 6%, and there was one fatality (0.6%). The outcome was determined according to the six-grade classification proposed by Pappas and Sonntag [25]. Overall, in 91% of cases satisfactory-to-excellent result could be achieved.

We conclude, that in elderly patients with symptomatic lumbar spinal stenosis, with no evidence of instability, decompressive surgery without stabilisation can be done in the majority of patients with low morbidity and high expectation of clinical improvement.

Keywords: Lumbar spine; spinal stenosis; therapy; age, elderly.

Introduction

As the life expectancy of the elder population increases, and by virtue of modern neuro-imaging, physicians and particularly neurosurgeons are being increasingly confronted with older patients suffering from disabling lumbar spinal stenosis. Many of these patients become candidates for surgical corrective procedures, because, despite advanced age, surgical decompression may lead to significant pain relief and improve the individual's quality of life. On the other hand, the fear of medical complications and uncertainty over the results of operative treatment make many surgeons cautious as to the extent of surgery, especially the question of combining decompression with stabilisation. In an attempt to clear these issues, we reviewed all surgical procedures performed for lumbar spinal stenosis at our institution from 1983 to 1995 on patients over 70 years of age.

Patients and Methods

There were 148 patients, 70 males and 78 females (ratio 47% to 53%), with the age range of 70 to 88 years; the mean age was 76 years. The mean hospital stay was 11 days. All the patients experienced low back pain accompanied in 88% by leg pain (unilateral in 41%, bilateral in 47%). Motor deficits were found in 32%, sensory deficits in 33% of the patients on initial clinical examination

Radiological investigations consisted of lumbar myelography followed by contrast-enhanced CT in 88% of patients; in 18% standard CT scans were performed, and in 11% MRI was obtained. Plain X-radiographs were available for all patients.

In 76% of patients central spinal stenosis was documented, whereas in 24% a lateral stenosis was evident. Degenerative spondylolisthesis was recorded in 26% of the cases. In almost half of all the cases (45%) only one lumbar level was affected by the stenosis (Fig. 1).

Depending on the clinical and radiological findings several different types of surgical procedures were performed, the most important point for consideration in decision making was the presence or lack of radiological signs of instability, judged from functional plain x-rays and/or functional myelography. In patients with stenosis without instability a standard decompressive laminectomy was performed; in cases of a low grade spondylolisthesis (Meyerding Grade 0 and 1) with or without disc herniation interlaminar fenestration and laminotomy were preferred; finally, only in cases with a high grade spondylolisthesis (Meyerding Grade II and higher) or an evident mobility of the involved segment, fusion was done. The patients undergoing simultaneous removal of an herniated disc were excluded from this study.

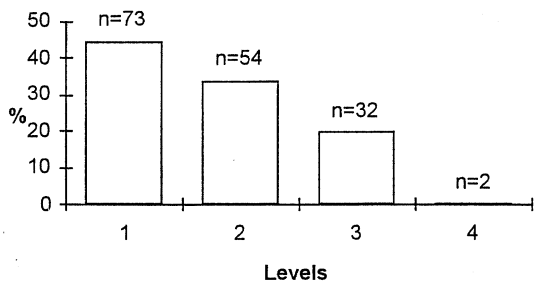

Fig. 1. Number of stenotic levels found on radiological investigations

Table 1. *Grading System by Pappas et al., 1994 [25]*

Grade	Description
1	pain free
2	mild pain, occasionally acetaminophen
3	fair pain, satisfactory with drugs
4	slight pain relief in respect to pre-operative evaluation
5	unchanged
6	worsened

The patients were evaluated 2 to 3 months after the operation. In determining the surgical outcome we applied the classification proposed by Pappas *et al.* [25]. The outcome was measured in terms of 6 grades ranging from "1" termed "free of pain" to "6" termed "worsened" (Tab. 1). Patients complaining about the lack of significant postoperative improvement were subsequently re-admitted and the degree of decompression was re-evaluated by means of myelography. If the decompression was judged to be insufficient, a second operation was done and the patients were again evaluated 2 to 3 months later.

Results

Totally 161 procedures in 148 patients were performed. In 13 cases with persistent symptoms a second decompressive procedure was necessary, within 3 to 6 months after the first operation, mostly of adjacent levels. In 2 patients of this group, who had a pre-existing spondylolisthesis, a secondary fusion was performed.

Almost 50% of the operations were multisegmental laminectomies. Only in 6% of patients was fusion considered necessary (7 primary and 2 secondary procedures) (Tab. 2). In 45% a two-level decompression was done. The most frequently decompressed level was L4/5 in over 50% followed by the L3/4 (Fig. 2 and 3).

In our series the morbidity ranged 6%. There was one surgical complication in the form of a wound abscess, which required re-operation. Of the 10 cases of medical complications deep venous thrombosis and cardiological problems (3 each) were the most frequent. The mortality rate was 0.6%, due to one 76-year-old female patient suffering from fatal central pulmonary embolism on the first postoperative day, who had undergone a fusion (Tab. 3).

The surgical outcome is outlined in Table 4. In 82% of patients the outcome was good to excellent (graded 1–2). In 4 patients (2%) the results were classified as "unchanged" (Grade 5) in respect to the pre-operative findings. Of these, one patient was re-operated (additional decompression) 8 days after the first operation; one patient refused further evaluation, and two pa-

Table 2. *Types and Frequency of Surgical Procedures Performed*

Surgical procedure	N	%
Monosegmental laminectomy	22	14
Multisegmental laminectomy	78	48
Interlaminar fenestration	52	32
Decompression & fusion	9	6
Total	161	100

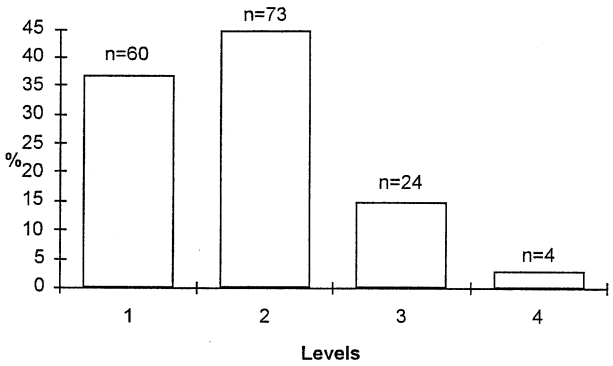

Fig. 2. Number of decompressed levels in 161 surgical procedures (in toto)

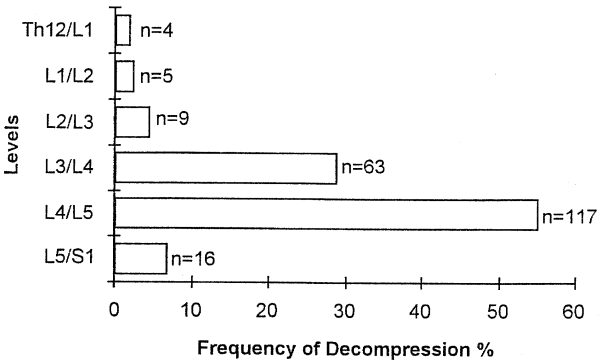

Fig. 3. Frequency of decompresed levels related to the level of the thoraco-lumbar spine in 161 procedures

Table 3. *Morbidity and Mortality of 148 Patients Undergoing 161 Surgical Procedures (in toto)*

	Morbidity N	Mortality N
Deep venous thrombosis with pulmonary embolism	3	1
Cardiological disturbances	3	
Transient ischaemic attacks	2	
Urinary tract infection	1	
Wound abscess	1	
Total	10 (6%)	1 (0,6%)

Table 4. *Outcome after Grading System by Pappas et al., 1994 [25]*

Procedure	n	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6
Laminectomy	93	44	35	7	6	1	0
ILF*	46	22	12	7	3	2	0
Fusion	8**	6	1	0	1	0	0
Total	147 (100%)	72 (49%)	48 (33%)	14 (9%)	10 (7%)	3 (2%)	0

* *ILF* Interlaminar fenestration.
** actually 9 fusions were performed, however in 1 patient the outcome could not be determined, due to his death on the first postoperative day.

tients were lost to follow-up. None of the patients worsened (Grade 6) after surgery.

Discussion

In the elderly patient, stenosis usually results from degenerative changes of intervertebral discs and facet joints. Over the years, repeated axial loading and rotational strains may lead to disc degeneration, facet hypertrophy, thickening of ligamentum flavum and osteophyte formation. The pathophysiological mechanisms involved in the development of stenosis have been extensively discussed elsewhere [7, 10, 24, 25].

Clinical presentation of patients with lumbar spinal stenosis may vary, depending on the anatomical configuration as well as the degree of the narrowing. However, back pain in the upright position is the most consistent presenting symptom (100% in our series). Neurogenic claudication, defined as pain associated with paraesthesiae and sometimes weakness in the lower limbs related to walking or exercise (and relieved by postures reducing the degree of lumbar lordosis), but with normal muscle strength at rest, was also very frequent in our patients (88%). These findings are consistent with data reported by other authors; however, in some series neurogenic claudication was surprisingly infrequent [9, 10, 26]. Demonstrable sensory or motor deficits, being useful in revealing radicular syndromes, are, according to our experience (35%), as well as other reports [7, 11–14, 20, 24, 27], less common findings.

Of the radiographic imaging modalities used to demonstrate spinal stenosis, myelography and MRI have been found to have high sensitivity, but only myelography posesses also high specificity. Caution has been adviced in interpreting the degree of stenosis on MR imaging: it may be overestimated due to signal void phenomena on T2-weighted images, resulting from artifacts from patients' movements, blood flow, respiration and pulsation of cerebrospinal fluid. On the other hand, MRI seems to be more suited in detecting scar tissue after spinal surgery. However, lumbar myelography with functional images, followed by thin-section CT, renders the most comprehensive information regarding the extent of the stenosis, enables better evaluation of bony structures and, being a dynamic examination (myelography), is particularly helpful in determining the presence of instability. Myelography combined with CT (Myelo-CT) remains, in our experience, the most useful diagnostic tool in planning of the surgical procedure. In patients with symptomatic spinal stenosis, even those with neurological deficits, an appropriate conservative treatment may lead to a significant improvement in up to 90% of cases [24]. Despite the often transient improvement, these patients should first be subjected to a trial period of conservative therapy.

Surgery should be considered when, in spite of conservative treatment the pain becomes intolerable, interfering with patient's daily activities, or in cases with signs and symptoms of progressive neurologic deterioration. Review of other published series reveals much the same criteria applied for recruiting spinal stenosis patients for surgical treatment. Most authors agree, that advanced age should not be a contra-indication for surgery, this view being supported by several studies, showing no difference in outcome and rate of complications between elderly patients and the younger population [8, 9, 13, 14, 18, 21, 26, 27, 29]. Low complication rate in our study provides further confirmation for this point of view.

There appears to be much less consensus with regard to the extent of the surgical procedure. The standard surgical treatment for lumbar spinal stenosis consists of a wide laminectomy, accompanied by bilateral medial facetectomy and, in cases with nerve root entrapment, foraminotomies (with special attention to preserve the pars interarticularis), as described by other authors [7, 10, 14, 25, 27]. Laminectomy was performed in almost 70% of our cases. The postoperative

instability after laminectomy does not exceed 2%, according to the literature [10, 28] and our own experience. A laminectomy was not undertaken in patients with radiologically evident spondylolisthesis, as such condition may increase the risk of postoperative instability. For this group of patients a limited decompression in the form of microsurgical interlaminar fenestration or laminotomy was recommended. This method, described and clinically evaluated by other authors [2, 5], emphasises preservation of important stabilising structures (interspinous and supraspinous ligaments, spinous processes as well as functionally important parts of facet joints). Microsurgical technique enables precise decompression of intraspinal neural structures, making the procedure especially useful in treating the lateral recess stenosis, both uni- and bilateral. As much as 32% (52 patients) of our collection underwent this kind of surgery, including all 19 cases of stable spondylolisthesis, of which only one patient became unstable after decompression and required a secondary fusion. In most other series interlaminar fenestration was not done or was not specifically mentioned.

The most controversial issue remains the defining of indications for spinal fusion. The literature often provides contradictory opinions and results. Whereas some authors are outspoken advocates of stabilizing procedures [1, 20, 23], the majority recommends decompressive operation alone. Turner *et al.* [32] undertook a meta-analysis of 47 articles comparing fusion procedures with decompression without fusion. No advantage of fusion was demonstrated, the range of satisfactory results was wide (16% to 95%) and lack of randomised controlled trials evident. On the other hand, it has been pointed out, that fusion procedures are associated with significant costs and complications. As for patients older than 70 years, most authors recommend no fusion at all. The chance of developing postoperative instability in this age group seems to be relatively small, partly because this group is less active than younger people, and because more spondylosis and spondylarthrosis in old patients creates more stability [10, 25, 26, 28, 29]. According to Shenkin [28], the probability of developing postoperative spondylolisthesis increases with the number of levels decompressed (from 6% for 2 levels to 15% for 3 or more levels), but no slippage was observed in his study in any patient over 70 years of age. Although the indications for spinal fusion are not clearly defined, the best candidates for such treatment seem to be patients with any kind of mobility demonstrated on lateral flexion/extension radiographs, those with a grade II spondylolisthesis and those with degenerative scoliosis. This policy has been pursued at our institution; as a result only 7 fusions were performed initially and only 2 patients out of 141 needed a secondary fusion.

The relatively short period of follow-up in our study results from the following considerations. First, as other series have shown [12–14, 21, 28], no significant difference in outcome was found at long-term follow-up compared with results of short-term evaluation in the same patients. In an analysis of 108 patients with a mean age of 50.7, Herno [12] reports even further improvement of outcome during the course of the longitudinal follow-up time of 7 and 13 years. Caputy and Luessenhop [4] come to an opposite conclusion, based on the results of a 5-year follow-up of 88 patients (mean age 67 years), with a failure rate of 27% and a predicted failure rate of 50% after 10 years. However, in the latter study the outcome was categorized as either a success or a failure, leading probably to different results from those that would have been obtained by a method relying on excellent-to-poor categories, such as employed in our study.

Secondly, since the life expectancy of the population over 70 years of age is limited, it is often not possible to obtain a representative long-term follow-up. In this category of patients, surgical procedures should aim at achieving an immediate improvement of the individual's quality of life; thus the short-term outcome is especially relevant. In our series it was satisfactory to excellent (grades 1 to 3) in 91% of patients, which corresponds with the results reported in other major studies concentrating on elderly patients [25–27].

Conclusions

The high percentage of interlaminar decompression in our series (32%) shows, that even with more limited but tissue- and stability preserving surgery the same results can be achieved in properly selected cases as with the standard laminectomy. Decompressive operations may be undertaken with low morbidity and high expectation of clinical improvement. Stabilisation procedures can be avoided in the vast majority of elderly patients.

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Comments

The authors argue that in patients with spondylolisthesis, a microsurgical interlaminar fenestration or laminotomy should be performed. This was apparently done in 32% of the patients. I think the authors should tell the readers specifically whether any of these patients became unstable. They mentioned that two patients needed a secondary fusion, and seven had primary fusion; however, I believe the authors need to be specific as to whether this subgroup of interlaminar fenestration patients were in the group of nine. In the subgroup of patients who received interlaminar fenestration, what is the length of their follow-up concerning their stability?

V. Sonntag

Author's Reply

Interlaminar fenestration or laminotomy were indicated in patients with stable spondylolisthesis, but this was not the only indication for interlaminar fenestration. Actually, only in 19 cases out of 52 who underwent interlaminar fenestration, was spondylolisthesis found on pre-operative evaluation. One patient of this group became unstable postoperatively and needed secondary fusion (the other patient with secondary fusion had had spondylolisthesis prior to the primary laminectomy performed on two other levels; his spondylolisthesis was found to be unstable on the follow-up examination).

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