Lumbar spinal stenosis in elderly patients: is a unilateral microsurgical approach sufficient for decompression?

Clinical article

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Object. For the treatment of lumbar spinal stenosis, less invasive procedures, which preserve maximal bony and ligamentous structures, have been recommended to reduce associated morbidity. The authors examined the outcome after decompression of spinal stenosis in the elderly by comparing 3 different surgical approaches. Their focus was whether a unilateral microsurgical decompression provided sufficient outcomes in the elderly population.

Methods. The authors investigated 108 elderly patients (age ≥ 60 years) with lumbar spinal stenosis (mean age 71 years [range 60–93 years]) who underwent surgery between 2004 and June 2006 at the authors’ institution. Three different modes of decompression were analyzed in this study: a unilateral partial hemilaminectomy, a hemilaminectomy, and a laminectomy. The outcome was assessed 12 months postoperatively using the Quebec Back Pain Disability Scale and the Hannover Functional Back Pain Questionnaire.

Results. The authors performed a unilateral partial hemilaminectomy in 53 patients (49%). Patients who underwent unilateral partial hemilaminectomies achieved favorable results of at least 80% as assessed using the Quebec Back Pain Disability Scale and Hannover Functional Back Pain Questionnaire. Hemilaminectomies were performed in 45 patients (41.7%), and laminectomies were performed in 10 patients (9.3%). However, there was no statistically significant difference between the various techniques regarding the postoperative results (p < 0.05).

Conclusions. Laminctomies did not show any advantage when compared with unilateral transmedian approaches. A unilateral partial hemilaminectomy combined with a transmedian decompression sufficiently treated the stenosis. This method seemed advantageous in minimizing the procedure and associated morbidity in this elderly population. Further investigations with long-term results (> 5 years) are still necessary.

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Key Words • elderly population • lumbar spinal stenosis • spinal claudication • spinal decompression • unilateral partial hemilaminectomy • laminectomy

Lumbar spinal stenosis is becoming more common in neurosurgical practice. The pathophysiological and anatomical changes that arise with the degenerative process include thickening of the intraspinous dorsal ligaments and enlargement of the facet joints. These changes may lead to a considerable narrowing of the spinal canal. The mechanisms involved in the development of stenosis have been discussed in detail in other papers.

Lumbar spinal stenosis may eventually cause signs of neural claudication, and patients can suffer from substantial loss of quality of life. Conservative measures may improve the symptoms for a certain period of time, but many patients will need surgery to decompress the neurovascular structures.

At present, a considerable number of different surgical options are available. The surgical armamentarium includes procedures such as interspinous spacer implantation and different kinds of unilateral and bilateral partial or full hemilaminectomies. Nowadays, it is not very clear which of the techniques in practice is the most favorable. There are also results that did not confirm long-term effects of surgery when compared with conservative treatment only.

The number of patients suffering from lumbar spinal stenosis has increased considerably. Notably, most of these patients are in the elderly population and have concomitant problems of associated comorbidities. Therefore, when planning the surgical treatment of lumbar spinal stenosis, surgeons will have to address the issue...
Methods

This study is a retrospective analysis of 108 consecutive patients who underwent surgery for lumbar spinal stenosis between 2004 and June 2006 at our institution. Patients were included in the study if they had lumbar spinal stenosis at 1 or more levels, if they were 60 years of age or older, and if conservative treatment lasting longer than 3 months had failed. Patients were excluded from the study if they had undergone previous lumbar spinal surgery; if they suffered from developmental spinal deformities or severe comorbid conditions (ASA class > 3); if they sustained vertebral fractures; or if they had an inflammatory spondylopathy, spinal infarct, or tumor.

History and Examination

When taking the patient’s history, the key symptom was reduced mobility that did not allow the patient to walk longer distances without interruption due to the presence of neural claudication (assessment of neural claudication). The duration of this history was significant, as were the conservative measures that had been used up until then. In the case of chronic pain, the medical history regarding the use of different medications was also evaluated.

The clinical examination was followed by a vascular investigation to exclude vascular claudication. Further diagnostic procedures for the clarification of a vascular claudication were performed as required.

Radiological Evaluation

Initially, most patients underwent MR imaging of the lumbar spine at our clinic, and the extent of spinal stenosis could be estimated. Compression of the lumbar dural sac was clearly delineated. However, we also saw patients who needed further decompression postoperatively. In these cases, the initial MR imaging procedure that was done with the patient in a horizontal position did not reveal the full extent of the true compression that was seen with the patient standing vertically. Therefore, in cases in which 2 or more spinal levels seemed to be involved, we performed functional lumbar myelography with the patient lying horizontally, and sitting and standing vertically. This procedure was completed by a postmyelography CT scan. We also routinely performed plain anteroposterior and lateral radiography of the lumbar spine prior the surgery to exclude developmental disorders.

Comorbidities of the Elderly Patients

All patients were evaluated specifically for additional comorbidities such as cardiovascular, renal, or pulmonary problems. If a patient presented in ASA Class 3, we usually operated only when serious neurological disorders were present, such as a severe acute paresis or a cauda equina syndrome. In this series, patients in an ASA class greater than 3 were excluded from decompression.

Indications for Surgery

We performed the surgery when the following criteria were met: there were clear symptoms of neural claudication with corresponding signs of a radiological correlate, 3 months of conservative treatment did not improve the patient’s symptoms, and the exclusion criteria were met.

Choice of Surgical Procedure and Randomization

The target criterion of this study was to achieve decompression of the spinal stenosis. All patients presented with signs of neural claudication, and in all patients lumbar spinal stenosis was found on radiological examinations as the anatomical correlate.

We undertook the following 3 different approaches: a unilateral partial hemilaminectomy, a full hemilaminectomy, and a laminectomy. In this study, all 3 techniques were used interchangeably for the same condition. The type of procedure was chosen by the surgeon. Most surgeons had preferences for one of the procedures. In this study, we did not find it necessary to divide the patients into 3 different treatment groups prior to surgery. Therefore, we also did not perform a double-blind randomization but left the decision to the surgeon.

Statistical analysis of the patients regarding the distribution of age, clinical symptoms, signs, and concomitant diseases revealed that it was possible to retrospectively compare the 3 different groups regarding the outcome.

The study population was specifically examined regarding demographic characteristics. This was done to ascertain whether these patients were homogeneous and comparable. The following parameters were examined: sex, age, marital status, the number of children of the patient, the educational level of the patient, the housing tenure, and the number of adults who lived with the patient at home. These data were obtained through an additional telephone interview. A statistical comparison was also performed.

Surgical Approach

Unilateral Partial Hemilaminectomy. The unilateral partial hemilaminectomy was our most common choice. The spine was exposed via a midline incision. The thoracolumbar fascia was incised, and the paravertebral muscles were carefully mobilized from the bony structures only on the side of the operation. Parts of the caudal and cranial portions of the ipsilateral hemilamina were removed subsequently. The base of the spinous process was then undercut. The intraspinal dorsal ligaments, which were mostly thickened, were also removed. Thereafter, the contralateral recess was decompressed by medial angulation of the operating microscope. The contralateral foramen could also be inspected and decompressed under direct vision. This approach resulted in a good expansion of the dural sac and was used whenever possible.

Hemilaminectomy. A hemilaminectomy was frequently chosen when 2 adjacent levels needed to be decompressed. The spine was exposed via a midline incision. After incising the fascia, the muscles were mobilized only on the side of the operation. Two adjacent levels of spinal...
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stenosis could also be operated on by partial hemilaminectomy.

Laminectomy. Full laminectomies were also performed by some of our surgeons to relieve spinal stenosis. However, we rarely perform this procedure. Nowadays we try to avoid this approach to prevent additional instability.

Surgical Procedure

All patients underwent surgery in the prone position after induction of anesthesia. An operating microscope was used in all cases. Surgery was performed in a standardized manner. Care was taken in all groups to minimize facet joint resection. An undercutting technique was used to remove osteoligamentous structures on the opposite side. Suction drains were placed routinely. The patients were mobilized on Day 1 after surgery. A postoperative control CT scan was obtained only if the patient did not show adequate clinical improvement.

Postoperative Evaluation

The patients in this study were examined 12 months postoperatively. The evaluation included performing a full neurological examination, determining the duration of the postoperative pain and type of pain medication, and assessing the improvement of neural claudication measured by the distance the patient could walk uninterrupted (assessment of neural claudication). For a detailed analysis of the outcome we used 2 separate tests: the QBPDS and the HFBPQ. A 4-step questionnaire regarding overall outcome (result: very good, good, unchanged, and worse) was filled out.

Statistical Evaluation

For statistical analysis the results of the QBPDS and the HFBPQ were used. The 3 surgical methods were compared regarding the differences between preoperative and postoperative characteristics (QBPDS and HFBPQ scores, assessment of neural claudication, use of pain medication, and overall patient satisfaction). The ANOVA test on ranks and the Kruskal-Wallis 1-way ANOVA as well as the Tukey test were used to analyze changes over a period of time within each group. Changes were regarded as statistically significant at p < 0.05. The 3 different population groups were also compared regarding demographic differences. For this evaluation we used the ANOVA test on ranks and the Kruskal-Wallis 1-way ANOVA.

Patient Population

Between 2004 and June 2006, 170 consecutive patients with lumbar spinal stenosis met our inclusion criteria. One hundred eight (63.5%) of these patients (51 men and 57 women, mean age 71 years [range 60–93 years]) returned the questionnaires and were included in this study. All of the results refer to these 108 patients.

The majority of patients (38.1%) presented with symptoms lasting between 2 and 10 years, and 35% of the patients had symptoms lasting for less than 1 year (Fig. 1).

Spinal claudication was present in 96.4%, and radicular pain was noted in 50.8% of patients. Preoperative and postoperative neural claudication was assessed by the distance a patient could walk uninterrupted (assessment of neural claudication). There was good overall improvement after the surgery with respect to the neural claudication (Fig. 2). Some form of mild weakness was found in 55% of the patients.

Demographic Analysis of the Study Population

The data of all patients could be obtained except in 2 (1 patient who underwent hemilaminectomy and 1 patient who underwent unilateral partial hemilaminectomy). The results are shown in Table 1. Regarding sex, age, education, housing tenure, children, and number of people who lived with the patient at home, there were no major differences among the 3 groups. However, there was a certain difference regarding the number of widows, which was statistically not significant. The patient population appeared homogeneous when analyzed statistically (p < 0.05).

Additionally, we examined the number of levels treated using each technique (Table 2). This analysis also revealed no difference between the 3 different study groups regarding the invasiveness of the procedure.

Duration of Pain

The assessment of the duration of pain prior to and after surgery revealed a substantial decrease in pain (Fig. 3). Preoperatively, 74.4% of the patients presented with pain lasting longer than 1 year. Nine percent of the patients had pain for longer than 10 years prior to the operation.

Concomitant Diseases

More than two-thirds of patients had additional co-morbidities (70.7%), cardiovascular (43.1%) being the most prominent group followed by endocrine (12.2%) and pulmonary (7.3%) problems (Table 3). Thirteen percent of the patients had severe additional morbidities (ASA Class...
3). Because of severe neurological deficits and deterioration, these patients also underwent surgery.

Evaluation of the Different Modes of Surgical Decompression

The HFBPQ and QBPDS scores were transformed into percentages and could be compared directly. Zero percent revealed the worst result and 100% the best.

Both tests showed similar results for the same groups under investigation. There were no statistically significant differences between the results of the QBPDS and the HFBPQ scores regarding the same groups.

Unilateral Partial Hemilaminectomy. We performed unilateral partial hemilaminectomies in 53 patients (49%) (Fig. 4). Patients who underwent unilateral partial hemilaminectomies achieved favorable results of at least 80% as assessed using the QBPDS and HFBPQ. There was a statistically significant improvement (p < 0.05) between the pre- and postoperative assessments. The reduction in postoperative pain medication in these groups was significant.

Hemilaminectomy. Hemilaminectomies were undertaken in 45 patients (41.7%). With this mode of decompression, there was also a statistically significant improvement between pre- and postoperative results (p < 0.05). The postoperative outcome reached 72% as judged using the HFBPQ and 74% using the QBPDS (Fig. 4).

Laminectomy. We performed laminectomies without fusion in 10 patients (9.3%). The outcome after the operation reached 74% on the HFBPQ and 71% on the QBPDS. The postoperative results after laminectomies significantly improved (p < 0.05).

Comparison of the Different Methods of Decompression

The statistical results of the QBPDS did not vary from those of the HFBPQ regarding the 3 modes of decompression. There was a statistically significant improvement between the pre- and postoperative status after all techniques. The less invasive procedures (unilateral partial hemilaminectomies and hemilaminectomies) revealed results of 72% to more than 80%. The more invasive procedure, the laminectomy, reached a lower postoperative score. However, there was no statistically significant difference between the 3 different techniques regarding the postoperative results (Fig. 4). The reduction in the requirement of postoperative pain medication was significant in all groups.

A concern about unilateral decompression is the failure to adequately decompress the contralateral lateral recess and foramen. We did not use the visual analog scale to assess leg symptoms. The improvement in neurological symptoms following surgery was assessed in all cases. In 80% of the patients who underwent a unilateral partial hemilaminectomy and in 76% of those who underwent a hemilaminectomy, neurological symptoms improved. Major improvement was noted regarding the increase in the postoperative walking distance. In the group treated with laminectomy, neurological symptoms improved in 72% of the cases following surgery. When symptoms persisted, there was no relationship regarding the side of decompression.

Complications

We encountered complications in 8 patients (7.4%). The decompression was insufficient in 3 patients (3%) without any prevalence of the different techniques in use. In 2 of these patients, myelography had not been performed prior to surgery, and the diagnosis was based only on lumbar MR imaging. Postoperatively, stenosis at another level was still apparent. These patients underwent reoperation. Postoperative instability occurred only in 2 cases, and these patients required fusion (1.8%). A CSF fistula was apparent in 3 cases (2.8%), but this was treated using external lumbar drainage.

Discussion

Lumbar spinal stenosis is a pathological condition that is increasingly seen in elderly patients. It originates from typical pathoanatomical changes leading to a nar-
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rowing of the spinal canal. The ligamenta flava thicken, the facet joints hypertrophy, and a progressive disc degeneration results in a narrowing of the neural pathways. 21

Patients often present with a history of numbness, weakness, and radicular pain. Neural claudication is one of the key features, and it may be difficult to differentiate it from vascular impairment.

Due to a change in the age distribution of the population, lumbar spinal stenosis is gaining more clinical significance. There is an increasing interest in the quality of life, and more elderly patients are prepared to undergo surgery as a result. 9

Although different surgical methods of decompression are available, the general aim is to achieve a sufficient decompression while maintaining segmental stability. Patients with symptomatic stenosis should undergo multimodal conservative treatment for up to 3 months and then be considered for surgery. 9

<table>
<thead>
<tr>
<th>TABLE 1: Demographic analysis of the study population*</th>
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<tr>
<td>Characteristic</td>
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<tr>
<td>sex</td>
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<tr>
<td>male</td>
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<tr>
<td>female</td>
</tr>
<tr>
<td>age (yrs)</td>
</tr>
<tr>
<td>60–70</td>
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<tr>
<td>71–80</td>
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<tr>
<td>81–90</td>
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<tr>
<td>&gt;90</td>
</tr>
<tr>
<td>martial status</td>
</tr>
<tr>
<td>married</td>
</tr>
<tr>
<td>divorced/widowed</td>
</tr>
<tr>
<td>unmarried</td>
</tr>
<tr>
<td>no. of children</td>
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<tr>
<td>0</td>
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<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>&gt;2</td>
</tr>
<tr>
<td>level of education</td>
</tr>
<tr>
<td>no qualification</td>
</tr>
<tr>
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</tr>
<tr>
<td>higher education</td>
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<td>housing tenure</td>
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<tr>
<td>lives in a flat</td>
</tr>
<tr>
<td>owned/mortaged</td>
</tr>
<tr>
<td>no. of adults at home</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>&gt;1</td>
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</table>

* Data are not included for 1 patient each in the hemilaminectomy and unilateral partial hemilaminectomy groups. All values represent the percentage of patients. Abbreviation: Hemilam = hemilaminectomy.

<table>
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<th>TABLE 2: Comparison of spinal levels treated in each group</th>
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<tr>
<td>No. of Patients (%)</td>
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<tr>
<td>No. of Levels Treated</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
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<tr>
<td>3</td>
</tr>
</tbody>
</table>

Radiological Evaluation

Radiographs should include plain as well as functional views to exclude spondylolisthesis and developmental disorders. Some of the characteristics of spinal stenosis, such as short pedicles, a short interpedicular distance, and degenerative changes in the 3-joint complex, will also be present on plain radiographs. 22

To delineate the level of the stenosis, several techniques are available, including MR imaging, CT scanning, and invasive procedures such as myelography and functional myelography followed by postmyelography CT scanning. We prefer to perform functional myelography at our institution when more than 2 levels of stenosis seem to be involved. The main advantage of this technique is the accuracy in demonstrating all levels of stenosis when the patient stands with his or her full weight compressing the spine and neural structures. Flexion and extension views with this technique and the subsequent postmyelography CT scan will complete the investigation and offer valuable information about possible compressive elements on neural structures.

Functional myelography has added tremendous information to the understanding of the dynamics of degenerative lumbar spinal stenosis. 25 The mechanics of axial loading of the vertebral column can be clearly demonstrated through myelography, especially regarding the decrease in the anteroposterior diameter of the spinal canal. Despite these advantages, myelography is not used in all centers anymore because of its invasiveness and the frequent need for hospitalization. 25

Magnetic resonance imaging can represent not only morphological but also pathological changes of osteoligamentous and neural components of the lumbar spine. 28 The modality seems to offer the greatest potential for the future evaluation of lumbar spinal stenosis. Measurements of central stenosis, the transverse area of the dural sac, and the lateral stenosis can be performed. 22 Open MR imaging with the patient standing during the examination process will certainly add a new range of possibilities to the evaluation of spinal stenosis.

Issues Associated With Elderly Patients

Aging and the development of lumbar spinal stenosis are related. 11 Because of the tremendous reduction in overall mobility, lumbar spinal stenosis can be very disabling especially in elderly patients. Some of the major problems regarding this age group are the associated comorbidities. According to Quigley et al. 19 and others, 17 there have been no major differences between the younger and older age groups regarding complications. Other pub-
lications, however, have noted that advanced age predicts a greater risk of late recurrence of symptoms.\textsuperscript{27} There are also studies that present the opposite of these findings.\textsuperscript{10,12} Some investigations undertaken for lumbar spinal stenosis surgery have noted that comorbidity is associated with poorer postoperative symptoms, motor function, and overall satisfaction. Katz et al.\textsuperscript{14} found that greater cardiovascular, musculoskeletal, and overall comorbidities led to poorer scores in most of the outcome measurements. In our current study, we found a low complication rate regarding additional morbidities in the elderly. Despite the fact that elderly patients have an increased number of comorbidities, old age per se does not seem to be a contraindication for spinal surgery.

**Methods of Decompression and Outcome**

There are a variety of different surgical methods available to relieve lumbar spinal stenosis. These techniques require different levels of invasiveness. Depending on the speciality (orthopedic surgery, spinal surgery, and neurosurgery) and the institution using these techniques, these procedures are applied in varying degrees of frequency.

At our institution we try to minimize destabilizing anatomical alterations during the operation. The unilateral partial hemilaminectomy with a transmedian approach and undercutting technique is our most favored method at present. However, the main problem with such a limited approach is its effectiveness especially in the long run. Other techniques such as laminectomies seem to allow wide decompression, but experience has revealed problems of subsequent or later instability and increased postoperative pain and reconvalessence.\textsuperscript{23} There is no clear indication as to which of the numerous techniques available should be used to ensure a good long-term outcome. Therefore, we would like to discuss different methods regarding the results in the literature.

**TABLE 3: Concomitant diseases in 108 elderly patients who underwent surgery for spinal stenosis**

<table>
<thead>
<tr>
<th>Condition</th>
<th>% Patients</th>
</tr>
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<tbody>
<tr>
<td>heart disease</td>
<td>35</td>
</tr>
<tr>
<td>vascular disease</td>
<td>24</td>
</tr>
<tr>
<td>pulmonary disease</td>
<td>7</td>
</tr>
<tr>
<td>renal disease</td>
<td>7</td>
</tr>
<tr>
<td>diabetes</td>
<td>19</td>
</tr>
<tr>
<td>tumor</td>
<td>7</td>
</tr>
<tr>
<td>multiple diseases</td>
<td>31</td>
</tr>
</tbody>
</table>

**Fig. 3.** Bar graph showing the duration of pain pre- and postoperatively. After surgical decompression, 25.6% of the patients had no more pain and 10.7% had pain for up to 3 months. Fifty-two percent of the patients still had pain that persisted for the entire period of the postoperative observation (1 year). However, most of the patients had long-standing chronic pain (> 1 year) prior to the operation.

**Fig. 4.** Box plot graph showing the comparison of the 3 different modes of decompression using the HFBPQ. Less invasive procedures such as the unilateral partial hemilaminectomy and the hemilaminectomy revealed favorable results of 72% to greater than 80%. Laminectomies reached a lower postoperative score. However, there was no statistically significant difference between the various techniques regarding the postoperative results after 1 year (p < 0.05).
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Laminectomy. Laminectomies are regarded as a standard surgical treatment for lumbar spinal stenosis. Kalbarczyk and colleagues performed a laminectomy accompanied by bilateral medial facetectomy in 70% of their patients with lumbar spinal stenosis. Cirak et al. concluded that in cases of lumbar spinal stenosis, decompressive laminectomy and extensive foraminotomy without instrumentation have good outcomes. Galiano and coworkers showed that in the long term, decompressive laminectomies in selected octogenarians resulted in decreased disability, decline of analgesic use, and increased quality of life. However, there currently seems to be much less consensus regarding the extent of decompression in patients with lumbar spinal stenosis. Turner and colleagues reported only a 64% success rate after wide laminectomies. Local tissue trauma and postoperative instability, resulting from a destabilizing decompression, have been frequently attributed to the unsatisfying results of this technique.

Unilateral Partial Hemilaminectomy. Less invasive procedures, such as unilateral partial hemilaminectomies with transmedian removal of the compressive elements, are being used more frequently for the decompression of lumbar spinal stenosis in elderly patients. This procedure is of a shorter duration. Compared with laminectomy, a unilateral partial hemilaminectomy results in less injury to paraspinal structures and provides a sufficient decompression. In their series, Kalbarczyk and colleagues reported that a high percentage of results after interlaminar decompression (32%) was similar to that after a standard laminectomy. Although interlaminar decompression uses a more limited but tissue- and stability-preserving approach, it still seemed to be sufficient for decompression.

Spetzger et al. demonstrated that less invasive and more limited interlaminar decompression resulted in an increase in interfacet diameter measured on postoperative neuroradiological images, as well as in gross pathological specimens. This surgical approach preserved the neural arch and protected the dura from epidural scarring. The main advantages of this limited approach are a reduction of the surgical trauma and the avoidance of surgically induced instability. The facet joints are spared, because only the hypertrophic and compressive medial parts are resected. Midline structures (interspinous ligaments and thoracolumbar fascia) are completely preserved. The contralateral supporting lumbar musculature with its physiological attachment to the spinous process is not disrupted, and the integrity is left intact.

Radiographic evaluation for the assessment of possible postoperative instability was not performed on a routine basis. However, when clinical symptoms and signs gave such an indication, radiographic investigations were performed to rule out a possible instability. Only 2 patients (1.8%) in this series required reoperation and fusion because of subsequent instability.

Minimally Invasive Techniques. The treatment of lumbar spinal stenosis especially in elderly patients has been further supported by the introduction of minimally invasive techniques. These techniques differ from the commonly used open procedures because of the smaller skin incisions and the sparing of the posterior ligamentous and muscle complexes. Rosen and coworkers used a microendoscopic approach for the decompression of a lumbar spinal stenosis. These authors performed a bilateral decompression through a unilateral paramedian approach. They showed that minimally invasive lumbar spine surgery had several advantages over conventional approaches. Minimally invasive surgery causes less soft-tissue trauma, results in a shorter hospital stay, and there is less need for narcotic analgesics. Hospital-related complications such as infections, thrombophlebitis, pneumonia, and urinary retention also occur less frequently. Podichetty and coworkers reported that minimally invasive decompression strategies consistently resulted in a low rate of readmissions and complications.

However, although microendoscopic approaches use smaller skin incisions, the amount of bone and ligamentous structures that need to be removed for a sufficient decompression seem to be similar between the minimally invasive approach and established open microsurgical decompression. There is also the need for a future evaluation and comparison of long-term results with these techniques.

Conservative Versus Surgical Treatment

Lumbar spinal stenosis is being treated surgically with more frequency. However, clinical experience indicates that many patients also do well on a regimen conservative treatment only. Several studies have been undertaken to compare conservative and surgical treatment of lumbar spinal stenosis.

Amundsen and coworkers performed a 10-year follow-up in their patients and found that those who underwent surgical treatment had considerably better outcomes than those who underwent conservative treatment. Patients with multilevel involvement, whether surgically treated or not, did not have a poorer outcome than those with single-level involvement. The authors also could not find any clinical or radiological predictors for the final outcome. Atlas and coworkers noted that after a 1-year evaluation, patients with severe lumbar spinal stenosis who were treated surgically had a greater improvement than those treated conservatively. Athiviraham and Yen reported that the majority of patients who choose surgery will improve but will have residual symptoms, and therefore should be counseled about the realistic procedures’ expectations. Further long-term studies have demonstrated superior outcomes after surgery than after conservative management.

Conclusions

In this series, laminectomies hardly seemed to be necessary for sufficient decompression. Unilateral partial hemilaminectomies with transmedian decompression showed good postoperative results after 1 year with favorable outcomes of at least 80% on the HFBPQ and QB-PDS. With all the techniques used, a significant improvement in the outcome after surgical decompression could be demonstrated. In this study, there was no significant difference between the various techniques regarding the later outcome. However, less invasive procedures seem to
be more favorable in elderly patients. Long-term results (> 5 years) will still have to be evaluated further.

Disclosure

The authors do not report any conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Author contributions to the study and manuscript preparation include the following. Conception and design: Morgalla, Noak. Acquisition of data: Morgalla, Noak. Analysis and interpretation of data: Morgalla, Noak. Drafting the article: Morgalla, Noak. Critically revising the article: Morgalla, Merkle, Tatagiba. Reviewed final version of the manuscript and approved it for submission: all authors. Statistical analysis: Morgalla, Merkle. Administrative/technical/material support: Morgalla, Tatagiba. Study supervision: Morgalla.

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