

Clinical Study

Minimally invasive compared with open lumbar laminotomy: no functional benefits at 6 or 24 months after surgery

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Abstract

BACKGROUND CONTEXT: Comparative studies between open and minimally invasive surgical (MIS) approaches for the treatment of spinal stenosis have mainly investigated immediate postoperative parameters.

PURPOSE: We aimed to compare the postoperative improvements in functional and pain scores between open versus MIS lumbar laminotomy and to describe the complications of each method.

STUDY DESIGN/SETTING: We conducted a retrospective review of prospectively collected data.

PATIENT SAMPLE: We included 113 patients.

OUTCOME MEASURES: Visual analog scale for back and leg pain, Oswestry Disability Index (ODI), the North American Spine Society score on neurogenic symptoms (NS), and average Short Form Health Survey-36 (SF-36) score. Accidental durotomies and patients with reoperations are presented.

METHODS: We obtained a list of patients who underwent either MIS or open unilateral one-level lumbar laminotomy for the treatment of neural foraminal or lateral recess stenosis with unilateral leg NS. Outcome measures are presented at 6 and 24 months postoperatively.

RESULTS: From 2000 to 2008, 113 patients (30 open, 83 MIS) underwent a one-level lumbar laminotomy and had complete postoperative data available for analysis. Between the approaches, there were no differences in baseline demographic data or functional scores. At 6 and 24 months after surgery, there were no differences in improvement in back or leg pain, or improvement in ODI, NS, or SF-36 scores. The MIS group reported greater satisfaction with treatment at 6 months ($p=.009$) but not at 24 months. Within the MIS group, three patients (3.6%) experienced an inadvertent durotomy and two patients (2.4%) underwent fusion of the operated segment within 24 months.

CONCLUSIONS: Compared with an open approach, MIS lumbar laminotomy gave no clear advantages in longer term functional or pain scores. The MIS group also had patients with inadvertent durotomies and reoperation within 2 years. In any lumbar decompressive surgery, the purported advantages of an MIS approach should be carefully weighed against potential complications. For a relatively simple surgery such as laminotomy, the open approach remains a safe and straightforward option. © 2015 Elsevier Inc. All rights reserved.

Keywords:

Minimally invasive surgical procedures; Laminectomy; Spinal stenosis; Reoperation; Visual analog pain scale

FDA device/drug status: Not applicable.

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EVIDENCE & METHODS

Context

At some centers, there has been a shift toward the use of transmuscular tubular retractors and endoscopy for laminotomy. The authors compare their outcomes using this technique with those of open laminotomy.

Contribution

Using prospectively collected data and validated outcome measures, the authors found little difference between MIS and open groups. The transmuscular group was more satisfied at 6 months and also had a few more complications. Otherwise, there were no differences for all other outcome measures at 6 and 24 months.

Implications

The transmuscular approach does not appear to offer significant advantages over simple open techniques of laminotomy. Thus, individual surgeons are encouraged to use the technique with which they are most comfortable/adept.

—The Editors

Introduction

Lumbar spine minimally invasive surgery (MIS) has seen an increase in popularity within the last decade. The use of a microendoscopic system that comprised muscle-sparing tubular dilators, a working port docked over the spinolaminar junction, and an operating microscope was described by Foley and Smith in 1997 [1]. In the treatment of lumbar spinal stenosis, this technique has the benefits of smaller incisions, less operative blood loss, improved postoperative pain control, and a shorter hospital stay compared with conventional open surgeries [2,3]. Because patients with lumbar spinal stenosis requiring decompression are usually elderly and may have multiple comorbidities, surgeons have increasingly employed minimally invasive techniques in an effort to decrease iatrogenic injuries.

A recent paper by Allen and Garfin [4] reviewed the cost-effectiveness of minimally invasive spine surgery. They concluded that the current few economic studies of minimally invasive spine surgery suggested that this technique has the potential to be a cost-effective intervention, but only if improved clinical outcomes are maintained to justify the high cost of instrumentation and steep learning curves. In comparison, open lumbar decompressive laminectomy without fusion has been shown to have a cost-effective profile in treating patients with lumbar stenosis at 2 years postoperatively (0.17 quality-adjusted life-years gained compared with nonoperative treatment at a cost of \$47,900 per quality-adjusted life-year gained) [5]. Therefore, it is of significant economic importance to establish whether MIS offers improved clinical benefits that are

sustained over time compared with a conventional open procedure.

The clinical efficacy of microendoscopic lumbar laminectomy or laminotomy in reducing back or leg pain up to 4 to 5 years postoperatively have been well assessed [6–12]. However, studies comparing minimally invasive versus open surgeries have mainly been conducted investigating the immediate postoperative parameters such as intraoperative blood loss, immediate postoperative pain, and duration of hospital stay [2,3,13]. It remains largely to be seen whether MIS for the treatment of spinal stenosis offers a sustained advantage over open procedures in terms of functionality, pain scores, and patient satisfaction. We searched PubMed for comparative studies assessing the longer term functional outcomes and pain scores beyond 1 year after lumbar decompressive surgeries; however, there was a paucity of literature on this. Focusing on this, we reviewed our institution's results in treating lumbar spinal stenosis using open and MIS techniques, aiming to compare the improvements in functional and pain scores up to 2 years postoperatively. We chose only patients with unilateral leg neurogenic symptoms (NS) with corresponding one-level neural foraminal or lateral recess stenosis demonstrated on magnetic resonance imaging (MRI) to create a common ground for comparison.

Materials and methods

The Orthopedic Diagnostic Center at our institution routinely assesses patients going for elective spinal surgery. The center performs pre- and postoperative assessments and records a wide range of data, including patient demographics, preoperative symptoms, details of surgery, clinical range of motion and numerous functional scores including pain scores, Short Form Health Survey (SF-36), and North American Spine Society (NASS) questionnaire scores. Postoperative assessments are conducted at 1, 3, 6, and 24 months postoperatively. From the center's database, we obtained a list of patients who underwent either MIS or open unilateral one-level lumbar laminotomy for the treatment of neural foraminal or lateral recess stenosis with unilateral leg NS. The leg symptoms may be pain, numbness, or both. The surgeries were performed between 2000 and 2008 by any of five surgeons from our spine subspecialist service. In our institution, the surgeons discuss with the patients on conventional versus MIS approaches with the main disadvantage of MIS surgery being the cost. Patients would then be given freedom to make their choice between the approaches. Institutional ethics review board approval was obtained before commencement of data mining.

The data recorded included the pertinent demographic data and the preoperative visual analog scale pain scores for both back and leg symptoms. To assess preoperative functional status, we chose the Oswestry Disability Index (ODI), the NASS score on NS, and the average SF-36 score reported on a scale of 0 to 100. Surgical details including

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