

Technical Report

Irrigation endoscopic decompressive laminotomy. A new endoscopic approach for spinal stenosis decompression

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Abstract

BACKGROUND CONTEXT: The classic surgical treatment of spinal stenosis involves bilateral dissection of paraspinal muscles to expose all the involved levels, wide laminectomy, and medial facetectomy and foraminotomy. The surgical morbidity of the procedure is further magnified by being more common in elderly with associated medical comorbidities and being usually global involving multiple levels. To address this problem, several less invasive techniques have been introduced over the past decade including the microendoscopic decompression.

PURPOSE: The aim was to describe and evaluate a new endoscopic technique for lumbar spinal canal decompression named irrigation endoscopic decompressive laminotomy.

STUDY DESIGN: This was a technical report.

PATIENT SAMPLE: One hundred four consecutive patients suffering from neurogenic claudication and resistant to 3 months of conservative management were included in the study. Grade I degenerative spondylolisthesis and degenerative scoliosis were not considered a contraindication. Patients with segmental instability and predominant low back pain were excluded.

OUTCOME MEASURES: Primary outcome measures included the final functional outcome using modified Macnab criteria and the Oswestry Disability Index (ODI). In addition, the operative time and complication rate have been evaluated. Secondary outcome measures included the evaluation of the early postoperative course using visual analog scale for postoperative incisional pain, time for ambulation, and length of hospital stay.

METHODS: Two 0.5-cm portals were used, one for the endoscope and the other for instruments. For every additional level, one portal is added. The endoscope and instruments are directly placed over the surface of lamina without any dissection, and saline under pump pressure is used to open a potential working space. Unilateral laminotomy/laminectomy is performed according to the severity of stenosis, followed by bilateral decompression beneath the midline structures.

RESULTS: Mean follow-up period was 28 months. The final outcome was excellent in 63%, good in 24%, fair in 9%, and poor in 4%. The preoperative ODI dropped from a mean of 64.2 ± 10.0 to 23.1 ± 20.8 postoperatively. Complications were limited to six cases of dural tear, which required no open conversion.

CONCLUSIONS: Irrigation endoscopic decompressive laminotomy allows the surgeon to safely perform effective central and foraminal decompression resulting in satisfactory midterm clinical results. Substituting long surgical incisions with 0.5-cm stabs and direct placement of instruments without dissection or dilatation could result in an improved postoperative course, shortened time for hospitalization, and reduced infection rate. However, still multicenter studies and randomized trials are needed before making final conclusions. © 2015 Elsevier Inc. All rights reserved.

Keywords: IEDL; Irrigation endoscopic decompressive laminotomy; Spinal stenosis; Minimally invasive spine surgery; Endoscopic spine surgery; Endoscopic spine decompression; Minimally invasive decompression; Endoscopic laminotomy; Endoscopic laminectomy

FDA device/drug status: Not applicable.

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Introduction

Spinal canal stenosis is the most common indication for lumbar spine surgery in adults older than 65 years [1]. The traditional surgical treatment involves bilateral dissection of paraspinal muscles to expose all the involved levels, removal of the supraspinous and interspinous ligaments, wide laminectomy, and medial facetectomy with foraminotomy [2]. Frequent failures have been attributed to paraspinal muscle atrophy and denervation resulting in potential chronic pain [3,4] and to the increased incidence of postoperative spinal instability [4–9].

To overcome these problems and reduce the time for hospitalization and postoperative recovery, several less invasive techniques have been introduced including multiple laminotomies, chimney sublaminar decompression [10–12], and the “over the top technique,” which describes bilateral spinal decompression using an ipsilateral hemilaminotomy and contralateral decompression beneath the midline structures [13,14]. This technique was later modified by the introduction of the endoscope through a tubular retractor and named microendoscopic decompressive laminotomy [15–17].

In the current clinical series, a new minimally invasive procedure for spinal canal decompression named the irrigation endoscopic decompressive laminotomy (IEDL) is presented. The latter is based on the irrigation endoscopic discectomy technique [18] where the endoscope and instruments were directly placed over the surface of the lamina through 0.5-cm skin portals without any muscle stripping or dilatation. This is followed by spinal canal decompression using “over the top technique” under continuous endoscopic vision.

The purposes of the present study were to evaluate the results of decompression using the IEDL technique and assess its effect on the postoperative course.

Materials and methods

The study was conducted after the approval of the institutional review board. All patients signed a consent that they will be enrolled in clinical study involving a new endoscopic technique for spinal canal decompression.

Primary outcome measures were assessed using the Oswestry Disability Index (ODI) [19] and the modified Macnab criteria [20]. In addition, the operative time and complication rate were evaluated. Secondary outcome measures included the extent of surgical invasion, which has been assessed using the incision size, postoperative visual analog scale (VAS) for incisional pain [21], the time for ambulation, and hospital stay.

Patient population

One hundred four consecutive patients complying with the eligibility criteria of the study were selected from the outpatient clinic at our institution (Table 1).

Table 1
Inclusion and exclusion criteria

Inclusion criteria:
1- Neurogenic claudication or radicular leg pain with or without back pain, and/or a neurologic deficit.
2- Symptoms and signs correlating with moderate to severe spinal canal stenosis as shown on MRI (degenerative and congenital bony stenosis were included).
3- Failure of 3-mo conservative treatment.
4- Grade I degenerative spondylolisthesis and degenerative scoliosis.
Exclusion criteria:
1- Segmental instability.
2- Lytic spondylolisthesis.
2- Predominant low back pain.

MRI, magnetic resonance imaging.

Segmental instability was defined as more than 4-mm translation or 15° to 25° angulation between adjacent segments on flexion-extension radiographs [22].

Surgery

All operations were performed by a single surgeon.

Instruments

In addition to the ordinary spine instruments, the standard facilities for knee arthroscopy were used (Table 2).

Anesthesia and patient positioning

The procedure is performed under general anesthesia. The patient is positioned prone with the abdomen free and the spine flexed to open the interlaminar space.

Operative techniques

Endoscopic portals placement

Under image intensification, a spinal needle is inserted in the paraspinal muscles 1 cm parallel to the midline to localize the desired surgical level. After level confirmation, the needle is removed, and two portals 0.5 cm in diameter are formed using a number 15 surgical blade with a 5-mm handle so that it could be advanced to pierce the fascia, which is markedly deep in obese patients. The first portal is used for the introduction of the endoscope, and the second is 3 cm caudal to the former and is used for the surgical instruments (Fig. 1). However, switching the portals through the operation could be done according to the

Table 2
Standard surgical arthroscopic facilities

- High-resolution camera.
- Video monitor.
- Light source.
- Arthroscopic fluid pump.
- Arthroscopic shaver with abrader and burr functions.
- Arthroscope with a view angle 30°, length 18 cm, and outer diameter 4 mm.
- Arthroscope cannula with a port for pump irrigation.

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