

Research Paper

Endoscopic thoracic laminoforaminoplasty for the treatment of thoracic radiculopathy: report of 12 cases

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Abstract

Background: Spinal stenosis of the thoracic spine is less common than that of the cervical and lumbar regions. Due to the close proximity to thoracic and abdominal organs, surgical operations can be difficult and carry a greater risk of complications. The most efficacious intervention for thoracic stenosis, whether central or foraminal, refractory to conservative management is uncertain. We aimed to evaluate the efficacy of endoscopic laminoforaminoplasty (ELFP) in the treatment of thoracic radiculopathy.

Methods: Twelve patients with radicular pain involving the lower thoracic levels (at or below T6) were treated with ELFP.

Results: Seven of twelve patients showed marked improvement in pain scores. Average follow-up scores were 2.9 and 12.08 on the Visual Analog Scale (VAS) and Oswestry Disability Index, respectively. The significance was 0.005 between the pre and post surgical data. One patient with moderate symptoms, two with severe symptoms, and two with crippling symptoms did not report significant improvement on VAS or Oswestry. No complications were encountered.

Conclusions: Endoscopic laminoforaminoplasty offers an alternative to fusion or conventional laminotomy with similar success rates. Patients additionally benefit from a decrease risk of complications, short hospital stay, and faster recovery.

Key words: thoracic, radiculopathy, laminoforaminoplasty, minimally invasive, endoscopic, spinal stenosis

Introduction

Radicular back pain is an important public health issue that can result in long term disability and poor quality of life. Conservative therapy is the initial treatment of choice, but fails to provide relief in a substantial number of patients. Central and foraminal stenosis with entrapment of descending and/or exiting nerve roots is a common cause of radicular pain, with an estimated incidence of 8 to 11% [1] [2] [3].

Spinal stenosis of the thoracic vertebrae is less common than that of the cervical and lumbar regions.

In our experience, patients tend to be older and are more commonly male. Due to the close proximity to thoracic and abdominal organs, open surgical operations can be difficult and carry a greater risk of complications due to the requirement of a transthoracic approach. The most efficacious intervention for thoracic stenosis refractory to conservative management is uncertain at this time.

Here we report on our experience with 12 patients diagnosed with thoracic radiculopathy due to

central or foraminal stenosis treated with endoscopic laminoforaminoplasty via a small incision, of less than one inch.

Materials and Methods

Twelve patients were treated with endoscopic laminoforaminoplasty (ELFP) of the thoracic spine for radicular pain. All patients were diagnosed with radicular pain involving the lower thoracic levels (at or below T6). No upper thoracic stenosis patients were encountered at our clinic. Prior to surgery, all patients were treated with conservative therapy, including physical therapy and epidural steroid injections, which failed to provide adequate relief.

The surgery commenced as follows: The patient was properly draped and prepped. Intravenous (IV) antibiotics were administered perioperatively; cefazolin was used unless there was an allergy, in which case ciprofloxacin was substituted. The patient was sedated but alert. Remifentanyl and midazolam were the most commonly used sedating agents. Utilizing fluoroscopy, the entry site was then determined and a 3/4-inch incision was made at a 30-degree angle to the vertebrae. Through this incision, a guide wire was inserted down to the lamina of the stenotic vertebra. Over this guide wire a bullet system was inserted to dilate the tissues to a final diameter of 14.5mm. A 5mm laparoscopy scope, with 3.2X magnification, was used to visualize the procedure. A 6mm drill bit was used to create a laminotomy opening. Pituitaries and Kerrisons were then used to remove bulk tissues and bone to open up the spinal canal. A standard burr with a 6mm bit was used to remove bone and smooth

the bony edges of the opening. A holmium laser and electrocautery was used for hemocoagulation and to remove soft issues. Once the region was decompressed, the surgery was completed.

Outcome measures were percent change from baseline in Oswestry Disability Index (Oswestry) and Visual Analog Scale (VAS) pain scores. Scores were assessed at baseline and again at follow-up.

Results

The author acknowledges that there are no conflicts of interest or financial benefits with the results of the study. All twelve patients (10 males, 2 females) completed the surgery without complication. Average age was 60.2 years (range: 49-73). At baseline, most patients reported moderate to disabling pain, with average scores of 6.7 and 24.75 on the VAS and Oswestry, respectively and the Individual patient data is presented in Table 1. Utilizing the Student's t-Test, the data was separated into pre and post surgical scores. Even though the sample size is small, the improvement is significant with a p value of 0.005.

With all patients, follow-up was greater than 24 months postoperatively. Seven of twelve patients showed marked improvement in pain scores. Average follow-up scores were 2.9 and 12.08 on the VAS and Oswestry, respectively. One patient with moderate symptoms, two with severe symptoms, and two with crippling symptoms did not report significant improvement on VAS or Oswestry. Of the twelve patients, 8 had foraminal stenosis and 4 had central issues per both MRI and surgical report.

Table 1. Baseline patient characteristics and postoperative outcome

Sex	Age	Baseline VAS	Baseline Oswestry*	F/U VAS	F/U Oswestry*
M	60	7	14 (28% Moderate)	1	2 (4% Minimal)
F	73	9	27 (54% Severe)	0	0 (0% Minimal)
M	56	7	19 (38% Moderate)	0	0 (0% Minimal)
M	46	7	19 (48% Moderate)	7	19 (48% Moderate)
M	57	7	21 (50% Moderate)	0	0 (0% Minimal)
M	70	3	27 (54% severe)	5	28 (56% severe)
F	73	8	33 (66% crippling)	0	4 (8% minimal)
M	69	7	21 (42% severe)	5	14 (28% moderate)
M	56	8	40 (80% crippling)	7	40 (80% crippling)
M	60	6	31 (69% crippling)	1	4 (8% minimal)
M	53	3	11 (22% moderate)	1	0 (0% minimal)
M	49	8	34 (68% crippling)	8	34 (68% crippling)

Conclusions

Thoracic radiculopathy is rare, as evidenced by the paucity of literature regarding the appropriate management of these patients. In our experience, patients with thoracic central and foraminal stenosis are more likely to be male, and tend to be of older age than patients with cervical or lumbar disease. Also, the stenosis tends to be foraminal and not central since 66% of patients had foraminal stenosis. The lower thoracic spine appears to be most commonly affected. The correct surgical management of these patients is based largely on data regarding lumbar and cervical radiculopathy. However, in the thoracic vertebrae proximity to both thoracic and abdominal internal organs as well as prominent vascular and neural structures increases the risk of adverse events with invasive approaches.

Open surgical correction is the current standard of care for foraminal stenosis of cervical and lumbar vertebrae. Open surgery requires a longer operative time, hospital stay, and postoperative recovery period and carries significant risks. The anterior approach requires a transthoracic approach with close proximity to the major abdominal and thoracic organs and neurovasculature [4], and posterior approaches require subperiosteal of the paraspinal muscles, which can result in increased pain and spasms [5]. As with any deeply invasive procedure, blood loss, infection, prolonged hospital stay, and postoperative pain are potential complications.

In contrast, interventions that are less invasive, such as endoscopic laminoforaminoplasty, should decrease the risk of major adverse events, allow for same day hospital discharge, and decrease the need for postoperative analgesia and immobility [5] [6]. In the current study, no adverse events occurred and all patients were discharged the day of surgery. Additionally, there was no need for thoracotomy, unlike other surgical approaches. At the same time, reports in the literature suggest similar patient outcomes to conventional open approaches [7] [4] [8] [9]. In this study, 7 of 12 patients (58.3%) experienced noticeable improvement as evidence by decreased VAS and Oswestry scores at postoperative follow-up, results consistent with published data.

Endoscopic laminoforaminoplasty offers an alternative to fusion or conventional laminotomy with similar success rates. Patients additionally benefit from a decrease risk of complications, short hospital stay, and faster recovery. This approach should be considered in patients with simple thoracic radiculopathy due to central or foraminal stenosis who fail to benefit from conservative management. Finally, we

do recommend that a larger study would be beneficial in confirming our data due to our small study group.

Conflict of Interest

The authors have declared that no conflict of interest exists.

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