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Original Article

Factors affecting return to work following endoscopic lumbar foraminal stenosis surgery: A single-center series

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ABSTRACT

Background: This study evaluates the factors affecting the return to work of endoscopic surgery for lumbar foraminal stenosis (LFS), including symptoms, functional status, complications, and reoperation rates.

Methods: The authors' retrospective cohort study included 100 consecutive patients (50 males and 50 females) diagnosed with LFS who underwent endoscopic surgery at Trotsky National Research Center of Surgery between January 2018 and December 2021.

Results: There were no significant differences in age and preoperative visual analog scale and Oswestry disability index scores between the male and female groups, time to return to work for different patient groups after undergoing endoscopic lumbar foraminotomy (ELF). However, patients with more severe stenosis and comorbidities may take longer to recover. Confounding factors were patient age, preoperative physical function, and job requirements.

Conclusion: This study confirms that study ELF can effectively improve symptoms associated with lumbar radiculopathy, as well as back pain, and improve patients' quality of life. Comorbidity, smoking status, and complications prolong the time to return to work following ELF surgery compared to healthy subjects.

Keywords: Clinical outcome, Endoscopic lumbar foraminotomy, Lumbar foraminal stenosis, Pain, Spine surgery

INTRODUCTION

Lumbar foraminal stenosis (LFS) is a common spinal disorder characterized by the narrowing of the neural foramen, causing compression of the exiting nerve root. LFS causes radicular and generalized back pain. Chronic low back pain, sciatica, and motor weakness may significantly affect patients' quality of life. The traditional surgical approach for LFS is open decompression.

In recent years, endoscopic spine surgery has emerged as a minimally invasive alternative treatment for LFS. Endoscopic spine surgery involves using a small camera and specialized instruments inserted

through a tiny incision, allowing the surgeon to visualize and access the affected area without extensive tissue disruption. This technique has been shown to have several advantages compared to open surgery, including reduced blood loss, shorter hospital stays, faster recovery, and lower morbidity rates.[10,28,50]

Endoscopic lumbar foraminotomy (ELF), as well as minimally invasive spinal surgery (MISS), led to the same endpoint of neural decompression when starting with more severe compression.[40] ELF can be performed under local or epidural anesthesia. Additional advantages include less blood loss and tissue damage. A recent meta-analysis also showed equivalent clinical outcomes with uniportal endoscopic and microscopic decompression.[9] The latter observation is relevant to gainfully employed patients since LFS represents the most common cause of low back pain and sciatica.[17,48]

Return to work is an essential indicator of the success of LFS surgery. Asher *et al.*[6] created a prediction model for return to work following elective lumbar surgery. In addition to the surgical approach, this model considers confounding work- and diagnosis-related factors, education, comorbidities, and patient demographics.[6] The early return has a high positive predictive value for patients' improved physical and mental health.[30] Previously reported risk factors for delayed return to work after spinal surgery include older age, preoperative work status, manual job, comorbidities, demographic factors, and prolonged preoperative sick leave.[22,30] Despite the increasing use of endoscopic spine surgery for LFS, there is little return-to-work data in gainfully employed patients. Return-to-work data are equally important to patients and their employers in managing expectations regarding when they should expect to be able to return to work. Therefore, this retrospective study evaluated patients' clinical outcomes and the return to work data 1 year after the ELF decompression for symptomatic LFS, as also to report those factors affecting the return to work of endoscopic surgery for LFS, including preoperative symptoms, functional status, surgical complications, and reoperation rates.

MATERIALS AND METHODS

Study population

A retrospective analysis was performed on 100 consecutive patients consisting of 50 males and 50 females who underwent ELF for LFS at the Department of Spinal Surgery, Central Clinical Hospital of the Russian Academy of Sciences, between January 2018 and December 2021. The mean age was 48.2 years for males and 51.7 years for females.

Inclusion/exclusion criteria

Inclusion criteria are patients diagnosed with LFS confirmed by clinical and radiological examination, who underwent ELF, were over 18, and had a minimum follow-up of 12 months. Exclusion criteria were previous lumbar surgery, pregnancy, history of cancer or autoimmune disorders affecting the spine, concomitant central lumbar spinal stenosis, spondylolisthesis, and deformity. All surgeries were performed by the senior author (RN). The grade of LFS was graded and recorded according to Lee *et al.*[32]

Outcome measures

The primary outcome measures were the visual analog scale (VAS) score and the Oswestry disability index (ODI) score.[25] Secondary outcomes included complications, length of hospital stay, and reoperation rates. Patients were asked about their return to work after surgery.

Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of the Department of Spinal Surgery, Petrovsky National Research Center of Surgery, Moscow, Russia. Informed consent was obtained from all patients before surgery. Patient confidentiality was always maintained, and the data were anonymized during analysis and reporting.

Surgical technique

Under general or regional anesthesia, a small incision on the patient's back to access the lumbar neuroforamen through the transforaminal approach. The endoscopic working cannula is inserted over sequential tubular dilators. A foraminal endoscope is used to visualize the compression pathology directly. The decompression is done with a motorized drill or Kerrison rongeurs. These endoscopic instruments are placed through the endoscope's central working channel. The skin incision is closed with stitches or surgical glue. The patient is taken to a recovery area, where they are monitored until comfortable, able to ambulate, and void before being sent home from the recovery room.

Statistical analysis

Descriptive statistics were used to summarize the patient demographics, clinical presentation, and radiological findings. The pre-and postoperative VAS and ODI scores were analyzed with a paired T-test. Statistical analysis was performed using SPSS version 26.

RESULTS

Based on the sagittal MRI, Lee *et al.*[32] classification for LFS, we found that 30 patients had a type 1 LFS, 34 patients had a type 2 LFS, 23 had a type 3 LFS, and 13 had a type 4 LFS. Most

patients (57%) underwent foraminotomy at the L4–L5 level. Twenty-two patients (22%) underwent ELF at the L3–L4 level, whereas 4% of patients and 17% of patients underwent ELF at L2–L3 and L5–S1 levels, respectively. The most common clinical presentation is leg pain (42%), followed by back pain (38%), numbness (26%), and leg weakness (18%). The median duration of symptoms from diagnosis to surgery was ten months, ranging from 4 to 25 months. The most common comorbidity was hypertension (18%), followed by diabetes mellitus (12% of cases), hyperlipidemia (6%), and coronary artery disease (3%).

The mean preoperative VAS score was 7.9 ± 1.5 for male and 8.1 ± 1.4 for female patients. The corresponding postoperative numbers were 2.4 ± 1.4 versus 2.6 ± 1.5, respectively. The mean preoperative ODI score for males was 58.3 ± 12.9 versus females 60.7 ± 14.6. The respective postoperative ODI scores were 19.5 ± 9.3 and 21.1 ± 10.1. There were no statistically significant differences between female and male patients between pre- and postoperative VAS and ODI numbers. However, the VAS and ODI score improvements were statistically significant (P = 0.021). Overall, surgical complications resulted in 6% of cases. There was one dural tear, postoperative hematoma, and nerve root injury. The reoperation rate in patients with LFS who underwent ELF was 4%. The mean time between first surgery and reoperation was 7.6 ± 3.4 months. The mean time to return to work following surgery was 2.5 weeks in patients without complications. In patients with complications, it was 4.3 weeks [Table 1]. Other confounding factors were smoking status and medical comorbidities.

DISCUSSION

Surgical management of lumbar pathology has been proven to effectively improve patients' function and allow them to return to work. However, around 25% of the surgically managed spine patients report minimal improvement in quality of life, and up to 10% experience a major complication or hospital readmission post-surgery.[19,25] Modern endoscopic techniques enable surgeons to minimize incision size, lower blood loss, and report less pain following surgery.[7,24,26,47,49] If necessary, a bilateral foraminal decompression can be carried out using one of three approaches: bilateral opening, unilateral opening to access both lateral recesses and foramina, or unilateral approach with ELF over-the-top procedure to access the contralateral side.[17,45] Evidence from systematic reviews and meta-analyses indicates that the unilateral laminectomy technique for minimally invasive bilateral decompression is comparable to the open procedure in terms of complications and long-term outcomes but results in less blood loss and a shorter hospital stay.[43] Young, active, gainfully employed patients can benefit from endoscopic methods.[21,45,46] LFS develops as a result of degenerative changes in the intervertebral disc and facet joints. The conventional surgical treatment is open or mini-open foraminotomy or MISS or total facetectomy combined with fusion surgery.[3,4,8,14,38] ELF is an effective minimally invasive alternative due to fewer postoperative complications,[1,2,5,13,33,35,42] a shorter interval to social reintegration and return to work and postoperative narcotic independence, and overall reduced utilization of painkillers.[18]

Table 1: Mean return to work after ELF and confounders.

Confounders	Mean time to return to work (weeks) (SD)
No complications, non-smoker, no comorbidity	2.5 (0.8)
Complications, non-smoker, no comorbidity	4.3 (1.2)
No complications, smoker, no comorbidity	3.8 (1.1)
Complications, smoker, no comorbidity	6.1 (1.5)
No complications, non-smoker, comorbidity	4.2 (1.3)
Complications, non-smoker, comorbidity	6.8 (1.9)
No complications, smoker, comorbidity	5.6 (1.6)
Complications, smoker, comorbidity	12.1 (4.2)

SD: Standard deviation, ELF: Endoscopic lumbar foraminotomy

Our results corroborate findings reported by others, indicating that ELF is effective in treating LFS, with a low complication and reoperation rate. Lewandrowski[34] reported an incidence of incidental durotomies in 0.1% of cases, immediate postoperative foot drop in 0.1% of cases, spinal headache in 0.4% of cases, and extravasations of irrigation fluid into the subcutaneous tissues in 3.8% of cases. In the article by Ahn *et al.*,[2] transient postoperative dysesthesia was reported in 6.1%. Houra *et al.*[20] reported that transient postoperative dysesthesia spontaneously resolves within four weeks of surgery.

However, patients with more severe stenosis and comorbidities may have longer recovery times. Further studies with larger sample sizes and longer follow-up periods are needed to confirm these findings. This is in line with previous research that has shown that the degree of stenosis is a key predictor of surgical outcomes in patients with LFS.[31,50] In terms of complications, the overall rate was relatively low, with only six out of 100 patients experiencing a surgical complication. Haufe *et al.*[16] reported just two cases of minor dural leaks occurred in two patients with an overall complications rate of 3.1 %. This is consistent with the previous studies that have reported low complication rates for endoscopic spine surgery compared to open surgeries.[11,27,39,41,44]

A recent clinical study [35] which aims to analyze the return to work and recovery time to narcotic independence following outpatient endoscopic decompression for contained lumbar herniated disc causing sciatica-type low back and leg pain,

reported a postoperative return to work and recovery time with narcotic independence on the order of 10 days or less in most patients with excellent and good outcomes in 370 patients (83.7%). A recent review with meta-analysis reported that percutaneous endoscopic lumbar discectomy had significantly better results than open lumbar microdiscectomy in the VAS scale at the final follow-up, in the ODI scale, operation time, and hospital stay, with no statistical differences in the complication rate and reoperation rate.[29] Similarly, Giordan *et al.*,[15], in their systematic review with meta-analysis (14 studies encompassing 600 patients), reported that about 85% of patients who underwent ELF for LFS had good outcomes with an overall intraoperative dural tear rate of 0.9%, whereas overall postoperative transient leg dysesthesia rate was 2.4% and overall same-level recurrent stenosis rate was 1.4%. However, other studies have reported mixed results with endoscopic surgery for LFS. One study found that endoscopic surgery had a higher reoperation rate compared to open surgery, although the difference was not statistically significant.[50] A more recent review showed that ELF for LFS was associated with a significant improvement in postoperative 12-month clinical outcome indicators (VAS and ODI).[36]

Findings showed relatively consistently that a lower level of education, a higher level of preoperative pain, less work satisfaction, a longer duration of sick leave, higher levels of psychological complaints, and more passive avoidance coping function as predictors of an unfavorable outcome in terms of pain, disability, work capacity, or a combination of these outcome measures.[12] Returning employees to work after spine surgery is a multifactorial problem of high complexity, with many determinants beyond the disease going into the equation. Patients who were not working actively and were on leave or short-term disability had a lower likelihood of returning to work.[25] The fact that such patients are at the highest risk of failing to return to work necessitates identifying them preoperatively and keeping them involved, even if it means altering their job duties and or work hours. In this context, the increasing use of telemedicine can probably reduce the time to return to work after ELF for LFS by helping patients in rehabilitation and postoperative medical care at home, as telemedicine, initially introduced out of necessity during the COVID-19 pandemic, represents an interesting tool with high patient satisfaction and significant cost savings in spine patients.[23] However, several questions for future research about telemedicine remain, as the lack of a standard legal framework can cause some doubts about patient privacy and liability coverage.[37]

CONCLUSION

ELF is a surgical technique for the treatment of LFS. The author's study suggests that ELF can effectively improve symptoms associated with lumbar radiculopathy, as well as back pain, and improve patients' quality of life. Comorbidity, smoking status, and complications prolong the time to return to work following ELF surgery compared to healthy subjects. However, more prospective and randomized studies about patients treated with ELF for LFS are needed.

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Ethical approval

The author(s) declare that they have taken the ethical approval from IRB of Department of Spinal Surgery, Petrovsky National Research Centre of Surgery, Moscow, Russia (10/21). Approval number is 10/2021.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript, and no images were manipulated using AI.

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