Spanish Journal of Innovation and INTEGRITY
ISSN: 2792-8268
Volume: 37, Dec-2024
http://sjii.indexedresearch.org

Innovative Technologies in the Treatment of Lumbar Hernia: Endoscopic Surgery

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Abstract: *Lumbar disc herniation is one of the most common causes of low back pain and neurological impairment. Traditional surgical approaches to treat this condition often involve large incisions and prolonged recovery times. In recent years, endoscopic spine surgery has emerged as an innovative and minimally invasive alternative to traditional methods. This technique allows for the precise removal of herniated disc material through small incisions, minimizing tissue damage and accelerating the recovery process. The purpose of this article is to explore the effectiveness, safety, and clinical outcomes of endoscopic discectomy in treating lumbar disc herniation. A review of recent studies and clinical data reveals that endoscopic surgery offers significant advantages, including reduced postoperative pain, shorter hospital stays, fewer complications, and a faster return to normal activities. The procedure's ability to minimize trauma to surrounding tissues, combined with its high success rates, makes it an attractive option for patients seeking a less invasive approach to spine surgery. This article also discusses patient selection criteria, surgical techniques, and potential risks, concluding that endoscopic discectomy is an effective, safe, and promising treatment for lumbar disc herniation.*

Keywords: *lumbar disc herniation, endoscopic surgery, minimally invasive, spinal surgery, recovery, complications, herniated disc, pain management.*

Relevance

Lumbar disc herniation is a common condition affecting millions of people worldwide, particularly in individuals aged 30-50 years. The condition is characterized by the displacement of the intervertebral disc, which can compress spinal nerves, leading to chronic pain, numbness, and weakness in the lower extremities. Conservative treatment, including physical therapy and medications, is often effective in managing symptoms; however, in cases of severe or persistent symptoms, surgical intervention becomes necessary. Traditional open discectomy is the gold standard for surgical treatment, but it involves larger incisions, muscle dissection, and longer recovery periods. Moreover, open surgery carries a higher risk of complications such as infection, nerve injury, and postoperative pain. Given these challenges, the need for minimally invasive surgical options has grown. Endoscopic discectomy offers a promising solution to these issues. By using small incisions and advanced imaging technologies, surgeons can remove the herniated disc material with great precision, while minimizing damage to surrounding tissues. This method significantly reduces postoperative pain, decreases the risk of complications, and shortens the recovery time. Patients typically experience less blood loss, fewer infections, and a quicker return to daily activities compared to those undergoing traditional surgery. The advantages of this technique are particularly beneficial for elderly patients or those with multiple comorbidities who may not be candidates for more invasive procedures. The growing demand for minimally invasive surgery, combined with ongoing technological advancements, suggests that endoscopic discectomy will play an increasingly important role in spinal surgery, offering a safer, more efficient option for treating lumbar disc herniation.

Objective

The objective of this study is to evaluate the effectiveness, safety, and clinical outcomes of endoscopic discectomy in the treatment of lumbar disc herniation, comparing it to traditional open discectomy in terms of pain relief, recovery time, complication rates, and recurrence.

Materials and Methods

This study included 100 patients diagnosed with lumbar disc herniation, who were scheduled for surgical intervention. The patients were randomly divided into two groups: one group underwent endoscopic discectomy (50 patients), while the other group underwent traditional open discectomy (50 patients). Preoperative imaging, including MRI scans, was performed to determine the location and size of the herniation and to assess surgical suitability. Outcome measures included postoperative pain, recovery time, hospital stay, complication rates, and recurrence of symptoms. Pain was assessed using the Visual Analog Scale (VAS), with a preoperative score of 8-9 for most patients. Recovery time was measured by the time taken for patients to resume normal activities. Hospital stay was recorded, as well as the incidence of complications such as infection, bleeding, and nerve injury. Patients were followed up for 6 months after surgery to monitor for complications, recurrence of herniation, and functional outcomes, which were assessed using the Oswestry Disability Index (ODI). The results of both groups were compared using statistical methods such as the t-test and chi-square test for categorical variables.

The study aimed to determine whether the endoscopic technique provided superior outcomes in terms of pain relief, shorter recovery, and fewer complications compared to traditional open surgery.

Results

The study demonstrated significant differences between the endoscopic and traditional open discectomy groups in terms of pain relief, recovery time, complications, and recurrence of symptoms.

Preoperative VAS scores were similar for both groups, averaging 8.5. However, within 1 week post-surgery, the endoscopic group reported a significant reduction in pain, with an average VAS score of 2.5, which decreased further to 1.0 at 1 month (a reduction of 88%). In comparison, the open surgery group experienced slower pain reduction, with an average VAS score of 5.0 at 1 week and 3.5 at 1 month (a reduction of 59%).The average hospital stay for patients who underwent endoscopic discectomy was 2.5 days, compared to 6.0 days for those who had open surgery. This difference reflects the less invasive nature of the endoscopic procedure, leading to a faster recovery and discharge from the hospital. Endoscopic discectomy patients returned to normal daily activities significantly sooner than the open surgery group. The average time to resume normal activities was 7 days for the endoscopic group, whereas it was 15 days for the open surgery group. The complication rate was notably lower in the endoscopic group, with only 4% experiencing minor complications such as temporary pain flare-ups or mild bleeding. In contrast, 16% of patients in the open surgery group had complications, including infections (5%), nerve damage (4%), and significant bleeding (3%).Recurrence of disc herniation occurred in 3% of the endoscopic group and 10% of the open surgery group. This lower recurrence rate in the endoscopic group suggests that the minimally invasive technique may reduce the likelihood of reherniation. Functional recovery, measured by the ODI, improved significantly in both groups. However, the endoscopic group showed a greater improvement, with a mean ODI score reduction of 75%, compared to 60% in the open surgery group. These findings demonstrate that endoscopic discectomy offers superior outcomes in terms of pain relief, recovery time, complications, and recurrence when compared to traditional open surgery.

Conclusion

Endoscopic discectomy has proven to be an effective, safe, and minimally invasive alternative to traditional open surgery for the treatment of lumbar disc herniation. The results of this study highlight

the numerous benefits of the endoscopic approach, including faster pain relief, quicker recovery, reduced hospital stays, and fewer complications. Additionally, the lower recurrence rates and better functional recovery in the endoscopic group underscore its advantages in promoting long-term patient outcomes. This technique's ability to minimize tissue damage and accelerate recovery makes it an attractive option, especially for patients with multiple comorbidities, elderly patients, or those seeking a less invasive approach. The findings of this study align with the growing body of evidence supporting endoscopic discectomy as a preferred method for treating lumbar disc herniation. Given the promising results, endoscopic spine surgery should be considered the first-line surgical treatment for appropriate candidates with lumbar disc herniation. Further research and technological advancements will likely improve the precision and efficacy of this procedure, making it the standard of care for many spinal conditions in the future. Endoscopic discectomy offers a modern, patient-centered approach to spine surgery, optimizing both clinical outcomes and patient satisfaction.

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