



## COMPARISON OF THE EFFICIENCY AND CAPABILITIES OF ENDOSCOPIC AND MICROSURGICAL METHODS OF REMOVING HERNIATED INTERVERTEBRAL DISCS OF THE LUMBOSACRAL SPINE

*Saidov Komronbek Jumanazarovich*

*Samarkand State Medical University, Neurosurgery department*

---

The question of the advantages of endoscopic treatment of intervertebral disc herniations is debatable. Throughout the development of endoscopic technologies, these methods have been compared with microsurgical methods. The experience of active use of endoscopic methods over a 2-year period is analyzed. The study included 183 patients. The effectiveness of the treatment was assessed using the MacNab surgical outcome scale. Good and excellent results were obtained in 170 (92.9%) cases. This indicator of effective treatment was compared with a similar indicator of good and excellent results of the microsurgical method of treatment according to the literature. An article by American authors who conducted a multicenter study was used (Lumbar microdiscectomy: a historical perspective and current technical considerations. Koebbe CJ, Maroon JC, Abla A., El-Kadi H., Bost J. Neurosurg Focus 2002; 13: 2: E3). Our study has shown that endoscopic discectomy is more effective than microsurgical techniques. The technical capabilities of the endoscopic method of removing intervertebral disc herniations have been thoroughly analyzed in comparison with microsurgical minimally invasive techniques. It has been noted that there are no significant limitations on the use of instruments when using endoscopic techniques, and angular optics and excellent color rendering allow for better visualization of structures in the area of the surgical wound and more efficient use of the access space. Considering that this method is not inferior to the microsurgical method in its technical characteristics and capabilities, this technology can be used instead of the standard method of removing intervertebral disc herniations. In addition, the technical capabilities of the method allow for extensive decompression of nerve structures during surgery, which can be used in the treatment of spinal canal stenosis.

Key words: portal endoscopic discectomy, lumbosacral intervertebral disc herniation, endoscopic spinal surgery.



Currently, according to WHO, 80-83% of the adult population of the globe suffers from herniated discs of the lumbosacral spine. Since these statistics are dominated by people of the most working age, the relevance of finding the most effective method of treating herniated discs of the lumbosacral spine is beyond doubt. There is still no clear answer as to which treatment method should be preferred. Algorithms for treating herniated discs are being developed in different countries, taking into account all the possibilities of conservative methods, and it is already obvious that not every herniated disc requires surgery. If there are indications for surgical treatment, there is a need to choose the most adequate approach in each case. Any surgery is developing along the path of minimizing surgical trauma. According to the definition of NASS (North American Association of Spine Surgeons), a minimally invasive procedure is one that is performed through a small incision. However, reducing the incision does not always reduce the surgical trauma, and in most cases is absolutely not an indicator of minimal invasiveness, since the trauma to the underlying structures is significant. In this case, the question arises of the rational use of the space formed during the access process. Historically, the opinion has been that the only correct and fairly effective method of surgical treatment of intervertebral disc herniations is microsurgical removal, the so-called "gold standard". On the one hand, this access provides excellent visualization and comfort for the surgeon, thereby providing the opportunity to remove any disc herniation from a fairly standard and economical access, but, on the other hand, there is a negative side to this approach - the vastness of the access and the frequent destruction of important anatomical structures that determine the mobility of the spine, such as the intervertebral joint and the ligamentous apparatus surrounding the intervertebral joint. Due to the aggressiveness of the microsurgical method, many attempts have been made to reduce access and randomized studies have been conducted [1], which did not reveal a statistically significant difference between minimally invasive microsurgical methods and "open" methods. According to the same study [1], when using minimally invasive techniques, there is a significant increase in the number of unwanted injuries to the dura mater. Minimally invasive access, despite its undeniable positive features, limits the view, which can affect the quality of surgery. Therefore, for the comparison group, the "open" method of removing intervertebral disc herniations was chosen as the most effective and reliable way to achieve the surgical goal. As an endoscopic method for removing intervertebral disc herniations, a method using a tubular distractor with video assistance was chosen. The method was first proposed in 2003 by Medtronic (Metr'X system), but technical perfection was achieved by M. Oertel [2] in 2007. This method is not a purely endoscopic method. There are practically no indications



in the literature on the division of surgical methods by technical characteristics. The American Medical Organization divided all existing approaches into four fundamentally different techniques: 1) percutaneous - the operation is performed with instruments directly passing through the skin under X-ray control, or any other type of indirect navigation; 2) endoscopic - the operation is performed through the working channel in the endoscope; 3) minimally invasive - the surgeon operates under vision control, any distractors (tubular or any other) can be used for access to reduce the surgical impact on the surrounding tissues. Access is performed with muscle separation without skeletonization. Visualization can be supplemented with a microscope or endoscope; 4) open - the surgeon operates under vision control, the operation is performed through an open incision, under direct vision using muscle skeletonization. The access includes removal of bone and ligament apparatus in the area of surgical interest. According to this classification, this method is minimally invasive with video assistance. The main technical disadvantage compared to the operating microscope was and still is the lack of three-dimensional vision of structures in the access area. In 2008, we conducted a detailed comparison of the endoscopic method of removing intervertebral disc herniations and standard microsurgical access [3], which showed no difference in the clinical outcome of the operation, but faster recovery of patients and a higher quality of their life occurred after endoscopic discectomy. Over the next 10 years, the development of technologies led to the emergence of more advanced methods for removing intervertebral disc herniations, but a full comparison of their effectiveness with standard methods has not been carried out in the literature.

#### Material and methods

The study included 183 patients (97 men, 86 women, average age 38 years) who underwent surgery over 2 years (from January 2012 to January 2014) in the Neurosurgical Department of the Scientific Center of Neurology. Considering that by that time the authors had almost completely abandoned the use of microsurgical techniques, a comparison was made with a group of patients based on literature data. Literature data were used for comparison - an article by C. Koebbe et al. [4], published in the journal *Neurosurgical Focus* 2002; 13: 2: E3. This publication was chosen because it covers the largest number of patients included in the study - 3,000 patients with herniated intervertebral discs of the lumbosacral spine. The comparison was made based on the clinical effect of the operation according to the MacNab scale (see table). The table provides information on the compliance of symptoms with the MacNab criteria. The



method is considered effective if a good or excellent result is achieved according to the MacNab scale. The concept of the method's effectiveness includes the sum of good and excellent results according to the MacNab scale, expressed as a percentage. The study included patients aged 20 to 69 years with radicular pain syndrome lasting more than 4 weeks with the ineffectiveness of conservative treatment. The diagnosis of intervertebral disc herniation was confirmed on the basis of an MRI study. The study excluded patients with repeated operations on the spine in the area of surgical interest, as well as patients with confirmed instability or hypermobility of this vertebral-motion segment, with the presence of non-discogenic stenosis of the spinal canal or spondylolisthesis. All patients underwent a complete neurological examination before, after the operation and 6 months later, the effectiveness of the surgical intervention was determined according to the MacNab scale (see table). Surgical technique used The method using a tubular dilator and video assistance has been used in our clinic since 2007. Over the past few years, this method has become routine for all possible types of lumbosacral intervertebral disc herniations. All surgeries were performed under general anesthesia. The thoracic-knee position was used to reduce intraoperative bleeding from the epidural veins [5], as well as to reduce the necessary resection of bone structures during access due to the positional increase in the intralaminar space. The first stage of the surgery is fluoroscopic control of the intervention level using an EOP (electron-optical converter). A sterile needle for intramuscular injections was used for control (Fig. 1). It is very important to position the needle strictly perpendicular to the patient's skin - this way we get a clear vector relative to which we plan the skin incision. Using an EOP, the needle is positioned in the direction of the desired intervertebral disc. After determining the access level using the X-ray image, the position of the intervertebral disc relative to the specified access trajectory is noted. If the vertebral arch is visualized on the access trajectory, it is advisable to shift the center of the incision somewhat caudally for better visualization of the yellow ligament and ease of work in the intralaminar space. We also consider it necessary at this stage to assess the location of the intervertebral disc herniation in relation to the bone structures that will be in the access area (intervertebral joint, pedicle of the vertebral arch, edge of the underlying vertebral body). The next step is to incise the skin and subcutaneous tissue 0.5 cm lateral to the midline. Then, the aponeurosis of the muscles that straighten the spine is opened with a linear incision and dilators are installed, forming access through the muscles for the working port. The latter is fixed on a holder to the operating table (Fig. 2). From this point on, manipulations are performed under endoscopic control. The intralaminar space is cleared of cellular tissue and soft tissues, then the yellow ligament is opened. We



recommend opening the yellow ligament using a blunt method due to the lack of three-dimensionality of the endoscopic picture and the high probability of damaging the dura mater when opening the yellow ligament with a sharp instrument. After partial resection of the yellow ligament, we consider it most appropriate to visualize the site of origin of the spinal nerve. In this case, the mechanism for rotating the endoscope along the port helps to visualize the areas behind the intervertebral joint and prevent its excessive resection (Fig. 3). After medial displacement of the nerve, the herniated intervertebral disc is isolated. Particular attention at this stage of the operation should be paid to hemostasis, since aggressive removal of the herniated disc usually damages the ventrally located veins, which significantly complicates further manipulations in the narrow space of endoscopic access. Opening and removing the herniated intervertebral disc is not the last stage of the operation. It is necessary to open the posterior longitudinal ligament, revise the ventral surface of the dural sac, using the ability to rotate the endoscope and change the angle of the port. Then, free fragments of the intervertebral disc are removed and excess hydraulic pressure is created in the disc cavity to check the completeness of the hernia removal and prevent the development of acute relapse. At the final stage, we always perform an economical foraminotomy to increase the reserve space for the spinal nerve. The goal of the surgical intervention is to eliminate compression of the nerve structures in the access area. Guided by this, in most cases, the central osteophyte was not removed, since it does not compress the nerve structures. Also, in no case was curettage of the intervertebral disc performed due to the high risk of developing spondylodiscitis according to the literature.

## Results

In the period from January 2012 to January 2014, 183 patients underwent surgery for herniated lumbosacral intervertebral discs. The neurological status of the patients before surgery varied in terms of the intensity of radicular pain syndrome and duration of the disease. Immediately after surgery, most patients experienced complete regression of radicular pain syndrome; all patients were subject to the same activity restrictions — limitation of axial loads and mandatory wearing of an orthopedic lumbar corset for 1 month after the intervention. Of the 183 patients in the endoscopic group, 2 (1.1%) had a relapse, which required a repeat operation. 4 (2.2%) patients experienced prolonged pain for 1 month after discharge, which corresponded to an unsatisfactory result according to the MacNab scale. 7 (3.8%) patients experienced short-term nagging pain for no more than 1 week after surgery. Another 11 patients (6%) had short-term sensations, qualified by patients as aching pain in the same dermatome as before the operation, but regressed



within 1-2 days after the operation. The remaining 159 (86.9%) patients noted a complete disappearance of all symptoms and returned to normal life soon after discharge. Thus, the effectiveness of the endoscopic method was 92.9%. In the comparison group, according to the publication of C. Koebbe et al. [4], excellent and good results were observed in 90% of cases. The frequency of complications - damage to the disc membrane and damage to the roots was 2%, the frequency of repeated operations for recurrent disc herniations was 5%. In the course of the work, an analysis of the technical characteristics and usability of the endoscopic discectomy method was compared with the microsurgical method. It was noted that with the endoscopic method it is possible to use standard microsurgical instruments; due to the technical possibility of rotating the endoscope around the port, more efficient use of the access space during endoscopic interventions was achieved.

### Discussion

The analysis of the results of intervertebral disc herniation removal by the portal endoscopic method 6 months after the operation showed that portal endoscopic techniques are highly effective and minimally invasive. According to our data, the effectiveness of portal endoscopic microdiscectomy in removing intervertebral disc herniations is 92.9%, while with microsurgical discectomy it is 90%. The most significant complication of both types of operations was recurrence of intervertebral disc herniations. In the 1st group of patients, recurrence was in 1.1% of cases, and in the 2nd group - in 5%. Such results may be associated with more significant aggression during surgery and destabilization of the segment in the postoperative period with subsequent development of recurrence of the disc herniation in the operated segment. In 1.1% of cases, endoscopic microdiscectomy caused damage to the dura mater, which did not lead to any symptoms. According to S. Koebbe et al. [4], damage to the membrane occurred in 2% of cases. Analysis of the technical capabilities of endoscopic microdiscectomy showed the possibility of using all standard microsurgical instruments during the operation without impairing the visibility of the surgical intervention area. When using this method, the space formed during access is used much more effectively. Given the low trauma of access, less pronounced bleeding was noted throughout the operation. However, the convenience of using standard bipolar coagulation was lower than microsurgical, due to the limited ability to change the angle of the coagulator branches. We noted that the use of other hemostasis methods, such as hemostatic gauze and SurgiFlo, was more effective than bipolar coagulation.

### Conclusion



Based on the conducted research, it can be said that endoscopic discectomy is comparable in efficiency to microsurgical technique. Considering that this method is comparable in its technical characteristics and capabilities to microdiscectomy, this technology can be used to remove intervertebral disc herniations. In some cases, the technical capabilities of the method allow decompression of nerve structures, which can be used in the treatment of non-discogenic stenosis of the spinal canal.

#### References:

1. Bahodirovich A. B. et al. Approaches to intestinal decompression during different appendicular peritonitis in children //Достижения науки и образования. – 2018. – №. 18 (40). – С. 92-95.
2. Мамадалиев А. М. и др. Клинический случай риносинусогенного абсцесса головного мозга и обзор литературы //Uzbek journal of case reports. – 2022. – Т. 2. – №. 2. – С. 7-11.
3. Aliev, M. A., et al. "Use of Magnetic Resonance Spectroscopy for the Diagnosis of Brain Tumor Recurrence." *Journal of Applied Spectroscopy* 89.5 (2022): 898-904.
4. Djalolov D. A. et al. Features of microflora in the etiological structure of diffuse appendicular peritonitis //Вопросы науки и образования. – 2018. – Т. 8. – №. 2. – С. 116.
- 5.