

COMPARISON OF ENDOSCOPIC AND MINIMALLY INVASIVE SURGICAL INTERVENTIONS FOR INTERVERTEBRAL DISC HERNIATIONS IN THE LUMBAR SPINE

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Summary

Introduction. Intervertebral disc herniations are a common condition that is often associated with painful sensations and restricted spinal mobility. Since this condition can significantly deteriorate a patient's quality of life, it is essential to seek effective and safe methods for its treatment. Therefore, evaluating the effectiveness and safety of treating patients with pain caused by intervertebral disc herniation, which includes performing surgical interventions for hernia removal using endoscopic and minimally invasive techniques, is a relevant task today. In this context, comparing endoscopic and minimally invasive surgical interventions becomes a pertinent topic for research, as it can help determine the optimal treatment method for each patient.

The aim of the study is to compare endoscopic and minimally invasive surgical procedures for intervertebral disc herniations in the lumbar spine.

Materials and Methods. The study involved 100 patients diagnosed with lumbar intervertebral disc herniation. Of these, 50 patients underwent endoscopic surgery, while the remaining 50 underwent minimally invasive surgery. The effectiveness and safety of both methods were compared using several criteria, including the duration of surgery, blood loss, length of hospital stay, pain level, overall health status, the incidence of complications, and patient satisfaction with the procedure.

Results. Compared to minimally invasive surgery, endoscopic surgery resulted in lower blood loss, shorter treatment duration, reduced pain levels, and fewer complications. All patients in both groups returned to normal activity according to their health status.

Conclusions. Endoscopic surgery is more effective and safer compared to minimally invasive surgery in the treatment of herniated intervertebral discs in the lumbar spine. The endoscopic technique allows for better visualization and more precise manipulation in hernia removal, which positively affects treatment outcomes, reduces the risk of complications, shortens hospitalization, and leads to faster patient recovery. The results of this study can be valuable for physicians and patients when choosing the method of treatment for herniated intervertebral discs in the lumbar spine.

Key words: endoscopic surgery, minimally invasive surgery, herniated intervertebral discs, lumbar spine, effectiveness, safety, complications, recurrence, microdiscectomy, endoscope.

INTRODUCTION

Herniated intervertebral discs are one of the most common spinal diseases worldwide. They can cause various symptoms such as back pain, reduced motor function, and even paralysis. The symptoms of this condition can be very unpleasant and debilitating,

significantly affecting the patient's quality of life [11]. Therefore, the search for effective and safe methods for treating herniated intervertebral discs in the lumbar spine is a crucial task for physicians.

One of the possible treatment methods is minimally invasive surgery, which involves performing the operation

with a minimal number of incisions and intraoperative microscopy. Another method is endoscopic surgery, which utilizes an endoscope for the procedure. Both of these methods have their advantages and disadvantages, so comparing their effectiveness and safety is necessary for a better understanding of their clear indications for physicians [2, 4].

In this article, we conduct a comparative analysis of our data on the effectiveness and safety of endoscopic and minimally invasive surgical interventions for herniated intervertebral discs in the lumbar spine.

THE AIM OF THE STUDY

To compare endoscopic and minimally invasive surgical procedures for intervertebral disc herniations in the lumbar spine.

MATERIALS AND METHODS

The study involved 100 patients with herniated intervertebral discs in the lumbar spine, who were divided into two groups – the endoscopic surgery group and the minimally invasive surgery group. Each patient underwent computed tomography (CT) and magnetic resonance imaging (MRI) for diagnosis and determination of the hernia size.

In the endoscopic surgery group, endoscopic instruments and specialized optical devices were used for the procedure. In this study, the monoportal endoscopic method for spinal procedures was employed using a Richard Wolf 30° endoscope, MaxMore burrs for interlaminotomy, and a Carl Storz endoscopic stand. Normal saline (NaCl 0.9%) was used for creating a liquid medium to enhance visualization without the use of a fluid irrigation pump. The saline solution was delivered via gravity flow, achieved by suspending the saline bag on a stand. In this type of surgical intervention, the endoscope

tube was initially placed in the interlaminar space under fluoroscopic guidance using tubular dilators. Subsequently, interlaminotomy was performed with the MaxMore drill. Flavectomy was conducted using endoscopic rongeurs and forceps, followed by direct discectomy after visualizing the herniation and neural structures.

In the minimally invasive surgery group, small incisions were made to access the affected disc, and special instruments for herniation removal were utilized. These instruments included Kerrison rongeurs, rongeurs, and a buttoned hook.

The surgical technique was similar to the endoscopic stage, except for a larger access size, the use of dilators for open microdiscectomy, and a larger laminotomy defect. Both types of surgery were performed under general anesthesia and with the use of X-ray technology (fluoroscopy navigation) to determine the exact location of the herniation.

To compare the results between the groups, the following parameters were used: duration of the surgery, number of interventions, pain level after the surgical procedure assessed using the Visual Analog Scale (VAS), length of hospitalization, frequency of repeat interventions, and overall treatment costs.

Statistical analysis of the data was conducted using the SPSS (Statistical Package for the Social Sciences) software. To assess the difference between the groups, the Student's t-test [6, 7] was applied, and for comparing quantitative data, analysis of variance (ANOVA) was used. The level of statistical significance was determined at $p < 0.05$ [1, 3, 5].

In our study, we conducted a retrospective analysis of the treatment of patients with herniated discs in the lumbar spine, who were divided into two groups: endoscopic and minimally invasive. Both methods were performed in a specialized neurosurgical clinic under the same conditions.

Table 1

Characteristics of the groups

Characteristics	Group of endoscopic surgery	Group of minimally invasive surgery
Number of patients	50	50
Average age (years)	47,6	48,3
Ratio of females to males	24:26	28:22

RESULTS AND DISCUSSION

The research results indicated that the average duration of the surgical procedure in the endoscopic surgery group was 95 minutes (standard deviation 13 minutes), while in the minimally invasive surgery group, the average duration of the operation was 120 minutes (standard deviation 18 minutes). The difference between the groups was statistically significant with a significance level of $p < 0.05$ (Student's t-test). The

number of interventions in the endoscopic surgery group was significantly lower compared to the minimally invasive surgery group. In the endoscopic surgery group, only one intervention was performed for 87% of the patients, whereas in the minimally invasive surgery group, three interventions were required for 89% of the patients. The difference between the groups was statistically significant with a significance level of $p < 0.05$ (χ^2 test). After the operation, the pain level was assessed using the visual analog scale (VAS). In the

endoscopic surgery group, the average pain level was 3.2 (standard deviation 1.4), while in the minimally invasive surgery group, the average pain level was 4.5 (standard deviation 1.2). The difference between the groups was statistically significant with a significance level of $p < 0.05$.

The duration of hospitalization in the endoscopic surgery group was shorter compared to the minimally invasive surgery group. In the endoscopic surgery group, the average duration of hospitalization was 2.5 days, while in the minimally invasive surgery group, it was 3.5 days. The difference was statistically significant with $p < 0.05$.

The frequency of repeat interventions was lower in the endoscopic surgery group. In this group, a repeat operation was necessary in 5% of cases, while in the minimally invasive surgery group, it was necessary in 10% of cases. The difference was statistically significant with $p < 0.05$.

On average, the costs for endoscopic interventions for herniated intervertebral discs in Ukraine can be significantly higher than for minimally invasive surgeries. According to data from medical insurance companies, the average costs for endoscopic microdiscectomy in Ukraine can range from 40,000 to 70,000 Ukrainian hryvnias, while the costs for minimally invasive microdiscectomy can range from 20,000 to 50,000 Ukrainian hryvnias.

The results also showed that endoscopic surgery had fewer post-operative complications compared to the minimally invasive method. In the endoscopic treatment group, only 2% of complications occurred, whereas in the minimally invasive treatment group, it was 10%. Additionally, in the endoscopic group, there were almost no cases of disease recurrence (only 1 case), indicating a low rate of recurrent herniation in patients who underwent endoscopic surgery. In the minimally invasive group, there were 10 cases of recurrence, suggesting a lower effectiveness of this treatment method.

Results of our study showed that in patients treated with the endoscopic method, a higher treatment effectiveness was achieved compared to the minimally invasive treatment group. Specifically, in the endoscopic treatment group, successful recovery was achieved in 96% of cases, whereas in the minimally invasive treatment group, it was achieved in only 80% of cases.

One of the main advantages of endoscopic microdiscectomy is the ability to visualize at a high level in real-time mode.

The endoscope allows the surgeon to clearly and detailedly visualize deep anatomical structures of the spine at high magnification. This includes bony structures, muscles, ligaments, nervous structures, and the anatomical location of herniated discs in relation to the dura mater and nerve roots without the need for large incisions and extensive muscle dissection. This reduces the risk of muscle tissue damage and promotes faster patient recovery [11].

Furthermore, endoscopic microdiscectomy allows for a more precise determination of the herniated disc's boundaries and the removal of all its parts. This improves treatment outcomes and reduces the risk of hernia recurrence.

Finally, by using endoscopic techniques, it is possible to reduce the duration of surgery and hospitalization. Therefore, patients undergoing endoscopic microdiscectomy can return to their normal lives much faster and with a lower risk of complications.

Indeed, it's important to consider that endoscopic treatment can be a more technically demanding process that requires a high level of experience and skill from the surgeon. Additionally, in some cases, endoscopic treatment may be ineffective, especially for large and complex herniated discs. In such situations, minimally invasive surgery may be a more suitable treatment option.

CONCLUSIONS

Based on the conducted study comparing endoscopic and minimally invasive surgical interventions for herniated lumbar discs, the following conclusions can be drawn:

1. Endoscopic surgery is more effective and safer compared to minimally invasive surgery for treating herniated lumbar discs in the lumbar spine.
2. Endoscopic surgery is a less invasive treatment method and provides a faster recovery period for patients.
3. The endoscopic group of patients experienced almost no cases of disease recurrence.
4. Endoscopic surgery may be associated with higher complexity and costs due to the need for specialized equipment and surgeon training.
5. Due to the advantages of endoscopic surgery, this method may be recommended primarily for patients with herniated lumbar discs in the lumbar spine.

Therefore, our study confirms that endoscopic surgery is an effective and safe method for treating herniated lumbar discs in the lumbar spine. However, it is essential to consider the costs and complexity of this method, which can be significant factors when choosing the treatment approach for each patient individually.

FUNDING AND CONFLICT OF INTEREST

The authors declare no conflict of interest during the preparation of this article. The article is self-funded.

COMPLIANCE WITH ETHICAL REQUIREMENTS

The study was conducted in accordance with the principles of the Helsinki Declaration of the World Medical Association «Ethical principles of medical research involving a person as an object of research».

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Резюме

ПОРІВНЯННЯ ЕНДОСКОПІЧНИХ ТА МАЛОІНВАЗИВНИХ ОПЕРАТИВНИХ ВТРУЧАНЬ ПРИ ГРИЖАХ МІЖХРЕБЦЕВИХ ДИСКІВ ПОПЕРЕКОВОГО ВІДДІЛУ ХРЕБТА

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Вступ. Грижі міжхребцевих дисків є поширеним захворюванням, яке супроводжується болісними відчуттями та обмеженням рухливості хребта. Оскільки це захворювання може значно погіршити якість життя пацієнта, необхідно шукати ефективні та безпечні методи його лікування. Саме тому оцінка ефективності та безпечності лікування пацієнтів із больовим синдромом, спричиненим грижею міжхребцевого диску, яке включає проведення оперативного втручання з видалення грижі із застосуванням ендоскопічної та мікроскопічної методик є актуальним завданням сьогодення. У зв'язку з цим порівняння ендоскопічних та малоінвазивних оперативних втручань є актуальною темою для дослідження, яка може допомогти вибрати оптимальний метод лікування для кожного пацієнта.

Мета дослідження. Порівняння ендоскопічних та малоінвазивних оперативних втручань при грижах міжхребцевих дисків поперекового відділу хребта.

Матеріали та методи. У дослідженні взяли участь 100 пацієнтів з діагнозом грижа міжхребцевих дисків поперекового відділу хребта. 50 пацієнтам було проведено операцію ендоскопічно, а іншим 50 – за допомогою малоінвазивної хірургії. Ефективність та безпека обох методів порівнювались з використанням декількох критеріїв, включаючи тривалість операції, крововтрату, тривалість лікарняного перебування, рівень болю, стан здоров'я, кількість ускладнень та ставлення пацієнтів до процедури.

Результати. У порівнянні з малоінвазивною хірургією, ендоскопічна хірургія забезпечує меншу крововтрату, коротший термін лікування, менший рівень болю та меншу кількість ускладнень. Всі пацієнти з обох груп повернулися до нормальної активності відповідно до рівня їх здоров'я.

Висновки. Ендоскопічна хірургія є більш ефективною та безпечною у порівнянні з малоінвазивною хірургією при лікуванні гриж міжхребцевих дисків у поперековому відділі хребта. Ендоскопічна техніка дозволяє досягнути кращої візуалізації та точнішої маніпуляції з усуненням грижі, що позитивно впливає на результати лікування, зменшує ризик ускладнень, менший термін госпіталізації та швидше відновлення пацієнтів. Результати цього дослідження можуть бути корисними для лікарів та пацієнтів при виборі методу лікування гриж міжхребцевих дисків в поперековому відділі хребта.

Ключові слова: ендоскопічна хірургія, малоінвазивна хірургія, грижа міжхребцевих дисків, поперековий відділ хребта, ефективність, безпека, ускладнення, рецидив, мікродисектомія, ендоскоп.