DESTANDAU ENDOSCOPIC DISCECTOMY IN PATIENTS WITH LUMBAR INTERVERTEBRAL DISC HERNIA*

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Objective. To analyze results of microsurgical and endoscopic discectomy and to estimate potentialities of low invasive endoscopic surgery for various forms of lumbar intervertebral disc hernia.
Material and Methods. Microsurgical discectomy was performed in 37 patients (mean age 43.4 ± 1.9 years), and Destandau endoscopic discectomy — in 31 patients (mean age 38.7 ± 1.7 years). All patients had intervertebral disc hernia in the lumbar-sacral spine. Diagnosis was based on complex examination results including dynamic clinical-neurological examination, radiography, CT, MRI, and electromyography. The intensity and dynamics of radicular pain syndrome were assessed using the Pain Audit Scale, and patients' quality of life was evaluated using the Euro-QUAL-5D scale.
Results. Regression of clinical symptoms was the same in both groups. Postoperative quality of life in patients operated on by microsurgical technique was considerably lower than that in patients operated on endoscopically. The activation and rehabilitation periods were much shorter in the endoscopic group.
Conclusion. Endoscopic discectomy has a number of advantages, thus being a technique of choice for treatment of intervertebral disc hernia in the lumbar-sacral spine with the efficacy equal to that of microsurgical discectomy.
Key Words: intervertebral disc hernia, endoscopic microdiscectomy, endoscopic discectomy, lumbar-sacral spine.

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Introduction

According to the data reported in global periodicals, the large number (several tens of thousands) of individuals with degenerative lesions of intervertebral discs is nowadays one of the pressing medical and economical problems [15]. Up to 70 % of population had experienced back pain that made them consult a neurologist at least once in their lives [11, 16], while 19 % of population had to undergo a surgery as no significant result was achieved by non-surgical treatment [12]. The pronounced clinical signs of the disease cause temporary disability. Taking into consideration the long-standing intermittent course of the disease, management of this population places an enormous burden on the economy [13, 17]. For example, the annual disability payments to this group in the USA alone make several million US dollars [18, 19]. This fact attests to the apparent urgency of the problem under study: searching for new advanced treatment techniques.

Surgical treatment of intervertebral disc hernia is currently the leading technique [7]. Of note, however, that almost all patients with disc hernia undergo a course of non-surgical treatment and it is only when the treatment is inefficient for more than four weeks the patient can be referred for surgical management [20]. The rate of hospitalization for surgical treatment of this patient group has increased thrice over the past decade [10].

In 1993, J. Destandau elaborated an endoscopic discectomy technique and introduced it into clinical practice in 1997. The treatment outcomes were estimated according to the clinical symptoms. The author's data have shown excellent results in 95.5 % of cases, good results in 0.6 % of cases, satisfactory results in 0.1 % of cases, and poor results in 3.7 % of cases [4].

The objective of this study was to analyze the outcomes of microsurgical and endoscopic discectomy and to estimate potentialities of low invasive endoscopic surgery for various forms of lumbar intervertebral disc hernia.

Material and Methods

The efficiency of intervertebral disc hernia treatment at the lumbar and sacral levels using either microsurgical discectomy or Destandau endoscopic discectomy was compared. Microsurgical discectomy was performed in 37 patients (mean age 43.4 ± 1.9 years, 15:22 female : male ratio). J. Destandau endoscopic discectomy was performed in 31 patients (mean age 38.7 ± 1.7 years, 11:20 female : male ratio). The intergroup difference in age and gender ratio was insignificant; the concomitant somatic pathology and its severity were similar in both groups. All patients were operated on by the same surgical team in 2003–2005.

The diagnosis was based on the results of complex examination, including dynamic clinical neurological examination, radiography, CT, MRI, and electromyography. The severe radicular pain syndrome, presence of motion and sensitive disorders, pelvic organ dysfunction, and inefficiency of non-surgical treatment for four weeks or longer served as indications for surgical treatment.

Absolute contraindications for surgical treatment included instability of spinal motion segment, spondylolisthesis, spondylosis, and reoperations at the same level.

Surgical strategy. All patients were operated on under general endotracheal anesthesia. Patient's position on the operation table was face-down with knees and hips flexed. An electron-optical image converter was used to monitor the intervention level and plan the preoperative attack angle.

During microsurgical discectomy, skin incision 5 to 6 cm long was performed along the median line over the spinous processes of two adjacent vertebrae (Fig. 1). Spinous processes and arches of the adjacent vertebrae were skeletonized with a sharp raspatory or an electrical knife. Soft tissue bleeding was arrested with gauze wads steeped in hydrogen peroxide and via bipolar coagulation. A Williams' wound retractor was placed within the wound to expand the wound track up to the desired dimensions. Further, the arch edges were resected and yellow ligament was excised completely to penetrate into the spinal canal (Fig. 2). The radix and edge of the dural sac, along with the surrounding bone structures, were used as landmarks during surgical manipulations. The fragments of the intervertebral disc hernia were separated and removed (Fig. 3). A portion of the degenerated intervertebral disc is removed when a fibrous ring lesion is revealed. Onset of pulsation in the radix and visible part of the dural sac, easy displaceability of the radix, and easy movement of a bougie between the radix and the walls of the intervertebral foramen are the criteria for total resection of an intervertebral disc hernia. Revision of the ventral surface of dural sac and radix, meticulous hemostatis using temporary compression with a hemostatic sponge and via bipolar coagulation, and layered closure of the wound are the final surgical steps.

When performing endoscopic discectomy, the skin incision was positioned in view of the damaged disc under fluorographic monitoring and was 2.5–3.0 cm long depending on the thickness of patient's subcutaneous tissue and conical shape of the tubus. The further interventions were performed according to the J. Destandau's procedure [4]. It should be mentioned that the technique was subjected to some modifications. For example, the instrumentation was supplemented with both general surgical instruments and instruments from a portal discectomy set designed by Leu. The use of a regular spatula when placing a tubus considerably reduces the effect of muscles creeping under the tubus as it is being moved and manipulations with an operational insert are performed. The use of thin conchotomes (in particular, a flat raspatory from the portal discectomy set) allows a surgeon to remove a disc hernia in more careful manner and to open the yellow ligament quickly and safely.

It still remains disputable whether radical resection of an intervertebral disc is needed or not. Most patients of the group under discussion had no fibrous ring lesion; hence, the incision of fibrous rings and resection of the degenerated portion of the disc was considered to be unreasonable in these patients. In all cases, the onset of pulsation in the radix and visible part of the dural sac, easy displaceability of the radix, and easy motion of a bougie between the radix and the walls of the intervertebral foramen were the criteria of total resection of an intervertebral disc hernia.

The treatment outcomes were registered both using the aforementioned diagnostic tools (dynamic clinical neurological examination, radiography, CT, MRI, and EMG) and the scales, which were employed to objectify the dynamics objectivization of such indices as radicular pain syndrome, pain in the intervention area, and the patient's quality of life.

The severity and dynamics of the radicular pain syndrome were assessed using the Pain Audit Scale [2]; patient's quality of life and its dynamics were assessed according to the Euro-QUAL-5D scale [22].

The data were statistically processed with Biostat 3.03 software package. The means (M ± m) of indices in the experimental and control groups were compared. The paired Student t-test [3] was

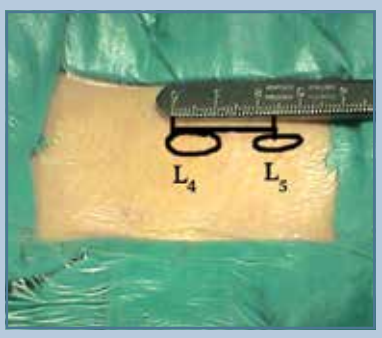

Fig. 1
Positioning of a skin incision

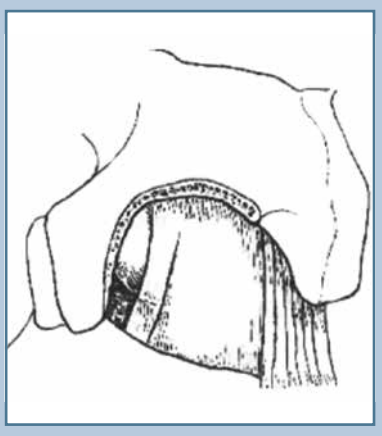

Fig. 2
Resection of the arch and yellow ligament

Fig. 3
Removal of the disc hernia

Table 1

Dynamics of neurological symptoms in patients operated on for lumbar intervertebral disc hernia, n (%)

Symptoms	At admission		First day after surgery		At the discharge	
	I*	II**	I*	II**	I*	II**
Radical pain syndrome	29 (93.5)	37 (100.0)	–	–	–	–
Segmental sensitive disorders	26 (83.8)	34 (91.8)	24 (77.4)	37 (100.0)	14 (45.1)	26 (70.2)
Motion disorders	16 (51.6)	10 (27.0)	5 (16.2)	2 (5.4)	5 (16.1)	2 (5.4)
Vegetative disorders	10 (32.2)	7 (18.9)	–	–	–	–
Depression or failure of tendon reflexes	25 (80.6)	27 (72.9)	–	–	–	–
Cauda equine syndrome	6 (19.3)	3 (8.1)	–	–	–	–

* group of patients operated on endoscopically (n = 31);

** group of patients operated on microsurgically (n = 37).

used to assess the dynamics of intragroup indices and intergroup differences.

Results and Discussion

Unfortunately, the surgical techniques being currently used fail to show 100% efficiency. Clinical signs of a disease are often caused by many pathophysiological disorders, and surgical intervention can aggravate them [10]. The number of surgeries for intervertebral hernia of various localizations, along with the number of patients with degenerative lesions of intervertebral discs, is increasing all over the world [14, 21]. Meanwhile, an increase in the total number of surgeries leads to an increase in the number of patients in which a surgical intervention has not relieved the pain [1].

Searching for the optimal surgical strategy for treatment of intervertebral discs hernia still remains a topical problem. Each method described in literature has its own advantages and disadvantages.

J. Destandau endoscopic discectomy [4], which examined in this study, is the relatively new and insufficiently investigated area of surgical treatment of intervertebral discs hernia. This technique is used rather widely; nevertheless, its efficiency is rarely compared with that of microsurgical discectomy, the gold standard of surgery of intervertebral discs hernia [8]. Moreover, some publications present the comparisons by clinical syndromes only, without using the scales.

We have examined the dynamics of the clinical symptoms in patients operated on for hernia of lumbar intervertebral discs. In groups of patients operated on using either the endoscopic or microsurgical techniques, the severity of baseline neurological symptoms both before the and after surgery was the same. Therefore, the scales for estimating patient's quality of life and the severity and dynamics of the main symptom of the disease (pain radical syndrome) were used.

Patients in both groups had typical preoperative symptoms with different severity of pain syndrome; the intergroup differences were insignificant ($P > 0.05$). The particulars of the detected neurological symptoms in both groups are summarized in Table 1. One can see the lack of significant difference in surgery outcomes in both groups ($P > 0.05$).

The rate of a preoperative syndrome regression is the main efficiency indicator of a surgery for intervertebral disc hernia. The Pain Audit Scale was used to objectify the pain syndrome dynamics [2]. The results are summarized in Table 2. The difference of pain syndrome regression between the groups was insignificant ($P > 0.05$). This fact suggests that efficiency of both surgical strategies for treating intervertebral discs hernia in lumbar-sacral spine is identical.

Quality of life and its dynamics are another indicator. Health-related quality of life is currently the main concept employed for integrative assessment of health. It reflects the emotional, social, and physical well-being of an individual and his/her ability to fulfill the routine life tasks [9]. According to the WHO Project on development of a quality of life assessment instrument named WHOQOL (World Health Organization, Quality of Life), a quality of life questionnaire should meet a number of requirements [9]:

– the test must encompass five main spheres (physical health, psychological health, level of independence in daily life, social relations, and support);

– the emphasis should be placed on patient's self-perception;

– no results of objective examination are be included;

– the questionnaire must be completed by a patient him- or herself.

Table 2

Regression of the pain syndrome following endoscopic and microsurgical procedures according to the Pain Audit Scale, scores (M ± m)

Period	Endoscopic discectomy	Microsurgical discectomy	P
Before the operation	48.29 ± 2.47	46.00 ± 1.92	0.460
After the operation	6.10 ± 1.26	8.03 ± 1.31	0.301

The Euro Quality of Life – 5D dimensions [22], the questionnaire that is easy to complete and to assess, and that meets the main WHO requirements on quality of life, was chosen for our study. Our data are summarized in Table 3. Preoperative patients' quality of life differed insignificantly ($P > 0.05$). This fact can be explained by the uniformity of groups and similarity of the preoperative condition of patients in these groups. Significant postoperative difference was detected: quality of life in patients operated on endoscopically was higher than that in patients operated on using microsurgical technique ($P < 0.05$). We mostly attribute this result to the fact that endoscopy is less traumatic and for this reason it causes the minimal pain (if any) and no discomfort in the intervention area. According to V.I. Matveev [5, 6], the main factor of postoperative pains in the intervention area occurring after the standard approach is the presence of muscle trauma, local fibrosis, and muscle necrosis.

The quality of life indicator is directly related to the length of postoperative stay. Most of patients operated on endoscopically insisted on early discharge (excellent self-assessed health status being used as an argument). The average number of patient days in the group of patients operated on endoscopically was 4.54 ± 0.27, while that for the patients operated on using microsurgical techniques was 6.35 ± 0.19. This fact indicates that the use of endoscopic procedure dramatically decreases the length of postoperative stay ($P = 0.001$).

It is worth mentioning that we faced some problems associated with the total hernia removal while mastering the endoscopic procedure. The problems included central localization of a sequester, presence of large osteophytes, and displacement of a sequester from the plane of intervertebral disc by the distance greater than half of the vertebral body. These disadvantages were revealed when revising the ventral surface of the radix and dural sac using an angular bellied bougie. We failed to remove the invertebral disc hernia endoscopically in these cases, thus being forced to use microsurgical discectomy. Hence,

Table 3

Quality of life of the patients following endoscopic and microsurgical procedures according to the Euro Quality of Life – 5D, scores ($M \pm m$)

Period	Endoscopic discectomy	Microsurgical discectomy	P
Before surgery	0.0920 ± 0.0249	0.0950 ± 0.0186	0.921
After surgery	0.9620 ± 0.0143	0.8290 ± 0.0521	0.001

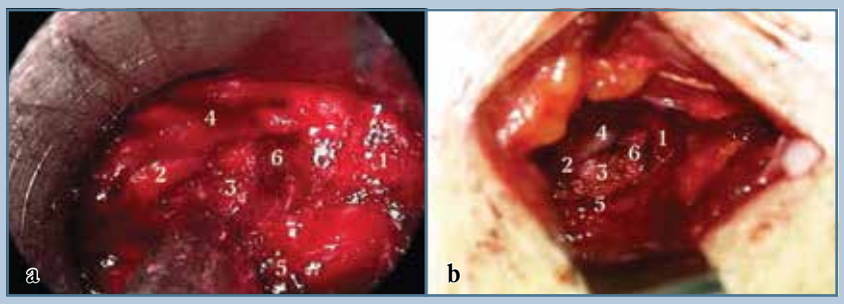

Fig. 4
View of the surgical wound: **a** – endoscopic view; **b** – microscopic view; *1 – the arch of the upper vertebra; 2 – radix; 3 – hernia of the intervertebral disc; 4 – dural sac; 5 – intervertebral joint; 6 – yellow ligament.*

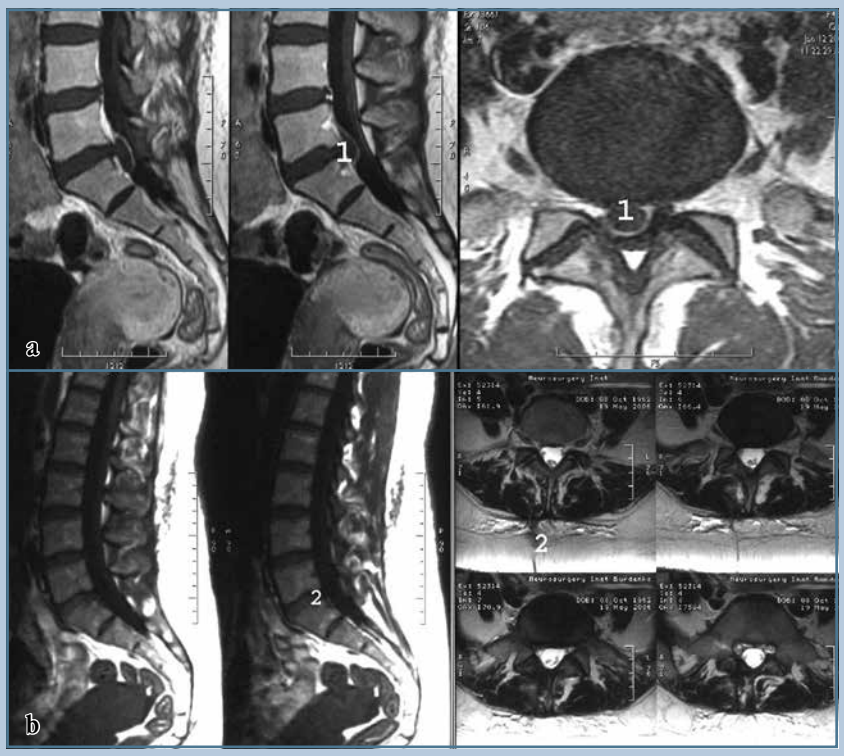

Fig. 5
MRI of the patient with the right intervertebral disc hernia at the L5–S1 level: **a** – before surgery; **b** – 3 months after surgery, no hernia is detected

this patient group was included into the patient group who were operated on microsurgically.

Thus, the advantages of endoscopic procedure in treatment of intervertebral discs hernia in the lumbar spine were determined in this study. The first main advantage is that this approach causes the least damages in soft tissues and bone structures. The visual effect referred to as the "eye inside" effect in foreign literature is the second main advantage. This effect is illustrated by Fig. 4 presenting the view of a surgical wound. Fig. 5 presents the MRI data of a patient operated on for the right invertebral disc hernia at the L5–S1level. One can see that the endoscopic procedure causes the minimal injuries in soft tissues.

Conclusion

Endoscopic discectomy has a number of advantages along with its efficiency equal to that of microsurgical discectomy. Advantages of this low invasive surgery of invertebral discs hernia include the reduced time and volume of surgical intervention, shortening of the length of patient's stay, a decrease in postoperative administration of narcotic analgesics, and improvement of postoperative outcomes.

An analysis of the dynamics of postoperative indicators under study detected lack of significant difference in regression of clinical symptoms between groups of patients operated on using the aforementioned strategies. This fact, along with the advantages of endoscopic procedure, makes it a strategy of choice for treatment of intervertebral disc hernia in the lumbar-sacral spine.

The further development of this strategy in treatment of degenerative spine diseases allows one to expect substantial increase in efficiency of surgical interventions stipulated by the decrease in their traumatic impacts.

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