NEW APPROACHES TO SURGICAL TREATMENT OF RECURRENT LUMBAR INTERVERTEBRAL DISC HERNIATION*

A.A. Lutsik[1, 2], I.V. Gavrilov[1], G.Yu. Bondarenko[1], A.G. Epifantsev[1], A.I. Peganov[1]

[1]Novokuznetsk State Institute of Postgraduate Medicine, Novokuznetsk, Russia
[2]Ya.L. Tsivyan Novosibirsk Research Institute of Traumatology and Orthopedics, Novosibirsk, Russia

Objective. To assess feasibility of the proposed anterior decompression and stabilization surgery without meningoradiculolysis for recurrent herniation of the lumbar intervertebral disc.

Material and Methods. Prospective randomized controlled study involved comparative evaluation of two essentially different surgical interventions performed in 130 patients with recurrent disc herniation in 2005–2012. The control group included 62 patients who underwent posterior decompression and stabilization surgery with meningoradiculolysis to remove the herniated disc. The study group included 68 patients who underwent the proposed anterior decompression and stabilization surgery, which differs by an obligate opening of the spinal canal and intervertebral foramen to remove the disc herniation through an anterior approach without meningoradiculolysis.

Results. Immediate results of anterior and posterior decompression and stabilization operations are comparable, though posterior interventions are more frequently associated with iatrogenic injury to posterior nerve roots caused by intervertebral implant insertion and meningoradiculolysis required before the disc herniation removal. Long-term outcomes of anterior operations are reliably better.

Conclusion. Anterior decompression and stabilization operations for recurrent disc herniation compare favorably to posterior ones, since they are less traumatizing to the nerve roots and prevent herniation recurrence and epidural fibrosis progression.

Key Words: surgical treatment, recurrence of disc herniation.

Treatment of degenerative diseases of the spine is an urgent problem due to their high incidence and disabling character; they account for 20.4 % of disability due to bone and joint diseases and rank first (41.1 %) among all causes of primary disability [6, 15, 21]. Common microdiscectomies result in adverse outcomes in 15 % of cases or more, development of instability is up to 58 %, and favorable outcomes are retained only in 50 % of the cases in the long term period [13, 23, 31]. Outcomes of repeated surgeries are worse than those of initial ones and each subsequent operation reduced the percentage of positive outcomes [1, 13, 14].

Manifestation of pain syndrome often depends on the progression of epidural fibrosis, segmental instability and recurrent disc herniation (up to 60 % of cases) [1, 4, 5, 13]. According to A.A. Baikalov and A.V. Krutko [3], isolated spinal ste-nosis is diagnosed in 54.6 % of patients in 2–5 years after microdiscectomy, whereas stenosis in combination with herniation of the previously operated on disc, in 40.9 %. According to Jonsson et al. observations [27], recurrent herniation after a surgery is diagnosed in 42.0 % of the cases, epidural fibrosis, in 37.0 %, hypertrophy of the articular processes, in 47.5 %. Andreoli et al. [16] diagnosed 32 % of patients with recurrent lumbar disc herniation and 16 % of patients with spinal stenosis.

Many Russian and foreign authors note that in case of repeated surgeries cicatrical adhesion of varying severity is present in the spinal canal of 100 % of patients [1, 13]. MRI studies of patients with early postoperative complications have also revealed that after the surgery all patients developed epidural fibrosis [2, 23, 24]. There are conflicting opinions in the literature on the clinical signifi-cance of postoperative epidural fibrosis. Some authors argue that cicatrical process is responsible for postoperative spinal stenosis in half of the patients [1, 4, 5, 7, 9, 13, 28]. According to Bundschuh [19] and Jonsson et al. [27], the incidence of clinically significant epidural fibrosis after posterior decompressive surgeries ranges from 20.0 to 62.5 %. In contrast, other researchers believe that the role of epidural fibrosis in the recurrence of pain syndrome is greatly exaggerated [12, 17, 20, 25, 27]. For example, based on the analysis of literature and his own data Pavl [29] had found that only the most severe epidural fibrosis causes postoperative radicular pain. Studies by Deyo and Tsui-Wu [21] have shown that postoperative CT detect signs of stenosis in 25 % of patients, and in 60 % of cases it is caused by osteochondral over-growths of the articular processes and vertebral bodies, whereas fibrosis accounted only for 12 %.

Posterior decompression surgery can result in the instability in the operated spinal motion segment in one third of the patients [5, 11, 18, 19], and according to Iguchi et al. [26] it can amount to 53 %. Therefore, widely used approaches include posterior decompression of the root in combination with transpedicular fixation and posterior intervertebral fusion. Improvements in surgical techniques and introduction of minimally invasive microsurgical removal of disc herniations only allowed reducing the frequency of relapses to 7–10 %, but did not eliminate them completely [13, 22, 26]. According to some authors [12, 13, 30], endoscopic removal of disc herniations results in even worse outcomes than open discectomy.

Therefore, improvement of methods of surgical treatment of patients with recurrent disc herniation, which often occur in case of cicatrical adhesion in the spinal canal and segmental instability, is extremely important. Conventional posterior decompression or decompression and stabilization surgeries (with meningoradiculolysis) result in even more pronounced cicatrical process in place to re-operations and clinical outcomes are worse than in the initial surgeries. Therefore, we have chosen a more optimal treatment option for such patients:

we have developed a method of anterior decompression and stabilization to remove recurrent disc herniations from the anterior approach.

The aim of research is to assess feasibility of the proposed anterior decompression and stabilization surgery without meningoradiculolysis for recurrent herniation of the lumbar intervertebral disc.

Material and Methods

We were able to obtain complete medical records on 130 out of the total number of patients operated on in the Novokuznetsk Neurosurgical Clinic for recurrent lumbar intervertebral disc herniation in 2005–2012.

Patients have been divided into two groups based on the surgery type:

1) patients (n = 62), who underwent conventional posterior decompression and stabilization surgery with meningoradiculolysis to remove disc herniation;

2) patients (n = 68), who underwent the proposed anterior decompression and stabilization surgery, which differs from intervertebral fusion via anterior retroperitoneal access (stabilizing surgery) by obligate opening of the spinal canal and intervertebral foramen to remove the disc herniation

through an anterior approach without meningoradiculolysis.

The proportion of patients with recurrent disc herniation in the total number of patients is unknown, since 62.3 % of the patients admitted to undergo repeated surgical treatment come from other Russian cities and regions. Men represented 59.2 % and women 40.8 % of the patients. The patients' age ranged from 29 to 77 years. The time elapsed since the first surgery ranged from 12 months to 7 years. There were no significant differences between the groups of patients operated using anterior or posterior approaches in the timing of recurrence of intervertebral disc herniations. The recurrence occurred less than 6 months after the first surgery in 47 (36.2 %) patients, within 6–12 months, in 49 (37.7 %), after 12–24 months, in 29 (22.3 %), after 2 years or more, in 5 (3.8 %).

Previously, all patients underwent the removal of disc herniation using interlaminectomy or extended interlaminectomy at various levels (Table 1).

There were no fundamental differences in the localization of recurrent disc herniations in two analyzed groups of patients (Table 2).

A randomized controlled trial has developed naturally in a single neurosurgical clinic due to the fact that the City Clinical Hospital No 1 performed the pro-

Table 1

The distribution of patients by level of recurrent lumbar intervertebral disks herniation in the posterior and anterior surgeries, n (%)

Spinal motion segment	Decompression and stabilization surgery		Level of confidence (p)
	Posterior (n = 62)	Anteriror (n = 68)	
L3–L4	9 (14.5)	10 (14.7)	0.36
L4–L5	31 (50.0)	31 (45.6)	0.12
L5–S1	22 (35.5)	27 (39.7)	0.12

Table 2

The distribution of patients, operated on using anterior and posterior accesses, by localization of herniation in the disk, n (%)

Herniated disc	Decompression and stabilization surgery		Level of confidence (p)
	Posterior (n = 62)	Anterior (n = 68)	
Median	8 (12.9)	9 (13.2)	0.48
Paramedian	25 (40.3)	29 (42.6)	0.92
Posterolateral	27 (43.5)	26 (38.3)	0.92
Foraminal	2 (3.3)	4 (5.9)	0.06

posed anterior decompression and stabilization surgeries in 68 patients, and the City Clinical Hospital No 29 performed conventional posterior decompression and stabilization surgeries, which included dissection of epidural scar prior to removal of the herniated disc, in 62 patients.

The comparison of the two groups of patients by gender (χ^2-test), age (r-test), and severity of their condition (Mann-Whitney criteria) revealed their homogeneity with no statistically significant differences ($p < 0.05$ for the specified parameters).

The inclusion criteria for the study were patients with true recurrent lumbar intervertebral disc herniation at the level of one spinal motion segment, which occurred within 6 months to 3.5 years after successful microdiscectomy and were accompanied by instability in the operated spinal motion segment. The exclusion criteria were multilevel disc herniations, herniations that migrated over more than 1/4 of the height of a vertebral body cranially or caudally, posterior forms of roots compression by hypertrophied yellow ligament or pronounced osteochondral over-growths of the articular processes.

Diagnostics included clinical and neurological examination, X-ray diagnostics (plain and functional spondylography, SCT, MRI), electromyography. All patients were diagnosed with recurrent disc herniation in combination with epidural fibrosis and segmental instability of varying degrees of severity.

The surgery was indicated in case of recurrence of radicular pain, which was resistant to conservative treatment for at least two months. In 16.9 % of patients, the repeated surgery was performed earlier due to pronounced radicular pain or rapid increase in neurological disorders.

"Biostat 4.03" (license LR065635 of 19.06.1998) and "IBM SPSS Statistics 19" (license 20101223-1 of 29.03.2011) software packages were used to calculate statistical indicators. Significance of differences was assessed by paired t-test (normal distribution); in other cases, the comparison and evaluation of the significance of differences were performed using nonparametric methods. Corre-

lation relationships were assessed by Spearman and Kendall rank correlation coefficients. Mann-Whitney, Fisher, and Wilcoxon criteria were used to evaluate treatment outcomes. Differences were considered significant at $p < 0.05$.

Anterior decompression and stabilization surgeries

We used pararectal retroperitoneal access or the developed suprapubic transverse retroperitoneal access [12].

After the exposure of the clinically relevant intervertebral disc, from which the recurrent herniation was formed, adjacent parts of the neighboring vertebral bodies and lumbar segmental vessels, if they interfere with proper exposure of the disc, are mobilized or dissected. The medial border of the psoas muscle is coagulated and peeled away. Large prevertebral vessels (depending on the disc in question, aorta, inferior vena cava, common iliac vessels) are removed from the anterolateral surface of the vertebral bodies and discs, covered by padding and securely fixed with needles or special protective retractors. U-shape cut is made in the fibrous ring with a narrow scalpel to form a leaf whose base faces the vessels. The intervertebral disc and the end plates of the adjacent vertebral bodies are removed by drill with depth stop. By gradually increasing the working part of the drill, the disk and the adjacent vertebral bodies are picked up to the spinal canal. Bleeding from the cancellous bone of the adjacent vertebral bodies is stopped by rubbing in wax, which is thoughtfully removed prior to spondylosyndesis in order to prevent its interference in the formation of intervertebral block. Sharp bone spoon and pistol tongs are used to resect posterior portions of the fibrous ring, gradually expanding the opening into the spinal canal. Manipulations within the intervertebral gap and the spinal canal are facilitated by using the roller of the operating table to straighten the lumbar spine or by additional expansion of the intervertebral space with disk expander. Broken fragments of the disc, compressing the spine spinal nerve and the dural sac, are clearly differentiated in the spinal canal at the level of the tear of the posterior fibers of the fibrous ring (Fig. 1a).

They are separated from the root and the dural sac without additional meningolysis. After their removal the root and the dural sac straighten out and pulsate well.

In case of foraminal herniation, the posterior lateral parts of the fibrous ring are also resected to open the intervertebral foramen (Fig. 1b). The expansion of the intervertebral foramen (anterior foraminotomy) allows using microsurgical instruments to separate the disc herniation that compresses the spine from the root and remove it. The spine is additionally straightened by using retractable roller of the operating table. Interbody gap is carefully modeled in this position, its support walls are formed and titanium-nickel threaded porous implant (Fig. 1c) (cage, graft) is tightly screwed in. After elimination of the spine extension it becomes firmly clamped between the vertebral bodies and wedge out the vertebrae (Fig. 2).
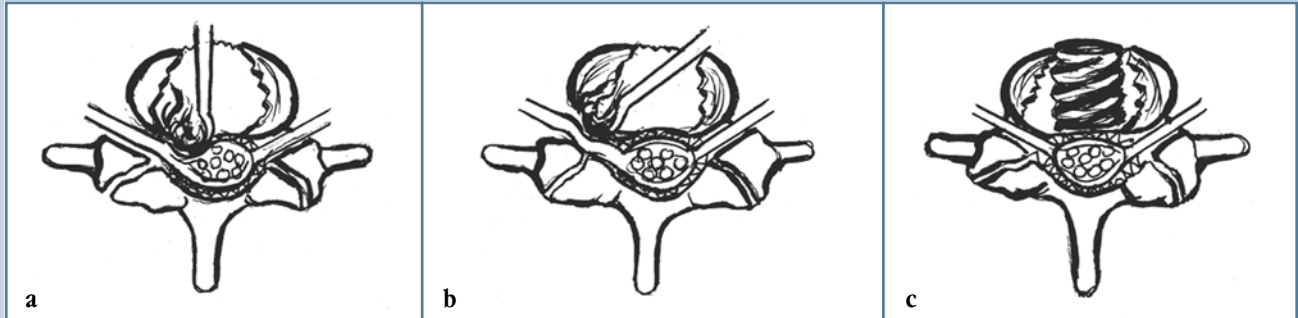
Anterior discectomy and removal of herniated disc from the anteriolateral retroperitoneal access may end with total prosthetic repair of the disc in order to preserve mobility in the operated spinal motion segment.

Once the decompression and stabilization manipulations are completed, the anterior leaf of the fibrous ring is fitted into its place and sutured, covering the anterior surface of the implant. The wound is sutured in layers. The patient is allowed to stand up on the second or third day after the surgery. External immobilization is maintained for three months using an orthopedic corset. The patient wearing a corset needs to be taught how to perform static exercises to strengthen back and abdominal muscles.

It is important to note that the surgery did not include traditional incision of scars in the spine and meningolysis.

Posterior decompression and stabilization surgeries

The volume of the posterior decompression ranges from enhanced bilateral interlaminectomy with medial facetectomy to laminectomy on 1–2 levels, resection of the articular processes and yellow ligament with full revision

Fig. 1

Scheme of anterior decompression and stabilization surgeries: **a** – removal of the posterolateral (typical) disc herniation from the anterior approach after the opening of the spinal canal; **b** – removal of foraminal disc herniation from the anterior approach after the opening of the anteromedial wall of the intervertebral foramen (anterior foraminotomy); **c** – interbody fusion with porous titanium-nickel implants

Fig. 2

MRI in the sagittal and axial planes: **a** – recurrent L5-S1 disc herniation; **b** – one year after the removal of the herniated disc from the anterior approach and interbody fusion with porous titanium-nickel implant

of the epidural space and lateral intervertebral channels. The need for such a large opening of the spinal canal arises from the fact that detection and removal of disc herniation is impossible without prior meningoradiculolysis. In all cases of repeated surgical interventions, there was cicatrical adhesion in the spinal canal. After dissection of the scard, it became possible to visualize the zone of disk-vertebrae-radicular conflict and remove compressing substrates. A thorough curettage of the disc cavity is performed. Decompressive manipulations end with interbody fusion by porous titanium-nickel implants or cages and transpedicular fixation.

In case of lateral foraminal disc herniations, the paramedian access is combined with the lateral intermuscular access to intertransverse gap and to the exit from the intervertebral foramen.

Results

Radiography of the lumbosacral spine with functional tests is affordable and informative method of diagnosis of instability in a spinal motion segment, which includes lateral projection scans of the spine in the phase of maximum flexion and extension. Functional spondylograms revealed comparable instability in the previously operated segment of the spine in both groups of patients. Sagittal translation of a vertebra within 3–9 mm was diagnosed in 114 (87.7 %) patients, within 10 mm and more, in 16 (12.3 %).

Evaluation of the treatment outcomes was based on the following criteria: excellent result corresponded to complete disappearance of pain in the back and in the leg, vocational rehabilitation and restoration of the quality of life; good result corresponded to the absence of radicular pain, with periodic pain in the back, which did not require special treatment; satisfactory result corresponded to the absence of the radicular pain, with only minor reduction in vertebral syndrome and pseudoradicular pain; unsatisfactory result corresponded to persistence or exacerbation of radicular pain and vertebral syndrome.

Immediate results of anterior decompression and stabilization surgeries (Fig. 3) were as following: excellent in 51

(75.0 %) patients, good in 14 (20.6 %) patients, satisfactory in 2 (2.9 %) patients, unsatisfactory in 1 (1.4 %) patient.

Ten-point VAS scale and ODI activity criteria were used to assess dynamics of the pain syndrome in the back and, separately, in the leg in the area of the dermatome of the compressed root.

Radicular pain was eliminated in all, but one patient in the group of anterior surgeries (in one case the surgery was performed incorrectly). Our clinic has traditionally adhered to fundamental principle that full decompression must result in immediate complete elimination of radicular pain, except for rare cases of iatrogenic injury. If the pain merely decreases, control MRI should be performed immediately. If it reveals residues of the compressing substrate, it is better to revise the wound immediately to fully decompress the root, than to perform revision surgery a few weeks or months later and face even more pronounced epidural fibrosis. For one patient the radicular leg pain intensified after the anterior surgery. The SCT detected excessive insertion of implant into the intervertebral gap. The revision of the wound and adjustment of the implant's position resulted in the disappearance of radicular compression syndrome.

For the majority of patients, the intensity of back pain regressed to 2–4 points on the VAS scale. In one third of the patients, who were operated on using anterior access, the back pain persisted for 7–20 days, whereas after the posterior decompression and stabilization surgery the vertebral syndrome was immediately alleviated in 67.7 % of the patients (p < 0.001). It can be attributed to more rigid posterior combination fusion. Six months after the surgery, the outcomes of vertebral syndrome treatment aligned, but pseudoradicular referred pain syndromes were statistically less frequent in patients operated on from the anterolateral access.

Dynamic electromyography demonstrated improvement in neural structures conduction in all patients after the surgical treatment.

Immediate results of posterior decompression and stabilization surgeries were excellent in 32 (51.6 %) patients, good in 23 (37.1 %) patients, satisfactory in 4 (6.4 %) patients, and unsatisfactory in 3 (4.8 %) patients.

Comparative analysis of intraoperative parameters revealed that differences in these indicators in the studied groups were not statistically significant. The average length of anterior decompression and stabilization surgeries was

105 ± 36 minutes, of posterior ones, 120 ± 46 min (p < 0.1). The average blood loss was 104 ± 44 mL for anterior accesses and 112 ± 40 mL for posterior one (p < 0.5). Correlation analysis revealed positive nonparametric correlation between duration of the surgery and volume of blood loss both in the first (R = 0.59; p < 0.05) and in the second (R = 0.55; p < 0.05) group.

Damage to dura matter (n = 6) and spinal nerve root (n = 3) were the most frequent intraoperative complications of posterior interventions. Three patients operated from posterior access reported increase in radicular leg pain and neurological deficit. Since their control MRI did not reveal any remaining sequesters of disc herniations, the increase in radicular leg pain was attributed to intraoperative traumatization of roots during their isolation from scars at the stage of approaching disk-radicular conflict site and during the insertion of interbody implant. Retrospective analysis of MRI for these 3 patients further confirmed rough cicatrical process in the spinal canal. In 2 patients, radicular pain regressed in the late postoperative period, in 1 it slightly decreased.

In isolated cases, there was superficial infection of the surgical wound, even rarer with the formation of intramuscular hematoma. Prophylactic use of elastic bandaging of the lower limbs and prescription of anticoagulant therapy allowed prevention of venous thrombosis and pulmonary artery embolism.

Postoperative stay in the hospital ranged from 9 to 12 days, with no significant difference between two groups (p = 0.2).

Long-term results of treatment were studied 1–7 years after the last operation by dynamic monitoring in outpatient conditions (54.6 %), in hospital (14.6 %) and/or by surveys (30.8 %). Long-term outcomes of anterior decompression and stabilization interventions were reliably better (Table 3). Full recovery was achieved in 57.3 % of patients in contrast to no full restoration of the quality of life for posterior surgeries. Taken together, excellent and good results (disappearance of radicular pain with persistence of recurrent back pain) amounted to
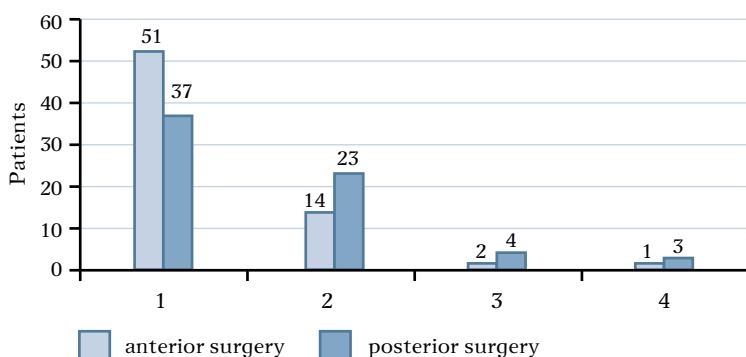

Fig. 3

Comparison of immediate outcomes of the anterior and posterior decompression and stabilization surgeries: 1 – excellent; 2 – good; 3 – satisfactory; 4 – unsatisfactory

80.8 % vs. 27.4 % for posterior surgeries (p < 0.01). Especially notable difference was observed for satisfactory outcomes due to their significant excess in patients operated from the posterior approach (58.1 % vs. 10.3 %). In these patients, vertebral syndrome, radicular or pseudoradicular pain decreased only slightly. The number of patients with unsatisfactory treatment outcomes has increased primarily due to the exacerbation of epidural fibrosis and progression of degenerative lesions of the spine. Radicular pain and vertebral syndrome either did not regress or intensified. Seven (11.3 %) out of 62 patients had a relapse of radicular pain. Two of them were operated on again with a satisfactory outcome.

The control MRI was the late postoperative period had been performed for 16.2 % of patients, who underwent anterior surgery, and 27.4 % of patients, who had posterior operations. No conclusive data on the progression of cicatrical adhesion after anterior intervention have been obtained, whereas almost all patients who had posterior interventions displayed signs of exacerbation of epidural fibrosis, which was accompanied by the onset of radicular compression process in 7 out of 17 of these patients.

Subjective self-evaluation of the long-term outcomes of anterior and posterior decompression and stabilization surgeries for recurrent disc herniation using VAS and ODI criteria was comparable to assessment of treatment outcomes based on the data of clinical and neurological examination and instrumental methods. The ODI score after anterior surgery averaged 8 ± 4 points, after posterior surgeries, 22 ± 14 points (p = 0.03). On average, the intensity of dorsalgia and pseudoradicular referred pain on VAS-10 scale remained within 1.6 ± 0.8 cm after anterior surgery and 3.8 ± 2.2 cm after posterior ones (p = 0.08).

Discussion

The analysis of published data shows that the main causes of failure in spine surgery are:

– incomplete removal of herniated disc fragments, which cause continued radicular pain;

– underestimation of instability in the spine motion segment and the role of spinal canal stenosis due to spondyloarthrosis and (or) skeletal hyperostosis in the preoperative examination;

– development of postoperative instability or spinal stenosis;

– postoperative epidural fibrosis, which can cause spinal canal stenosis and compress the spine;

– recurrent disc herniation after a few months or even years after the surgery.

Some authors argue that the regeneration of the remainder of the disk can be one of the factors in recurrence of disc herniation [32]. This list of factors can be expanded to include unjustified expansion of indications for surgery due to the misidentification of pseudoradicular (referred) pains in the limbs as radicular and overestimation of morphological findings detected by MRI or SCT [12, 13].

Modern methods of minimizing the decompression of nerve roots in case of lumbar intervertebral discs herniations and numerous attempts to prevent epidural fibrosis by using pads made of various synthetic and biological materials did not save patients from cicatrical adhesion in the spinal canal [3, 13, 16, 17, 27, 29]. All operated patients developed epidural fibrosis, which varied from single adhesions to rough planar scars which cause stenosis of the contents of the spinal canal. Expected aseptic inflammation due to tissue trauma (especially in case of insufficient haemostasis) is replaced with fibroplastic process by the end of the third week.

At the same time, as evidenced by our observations on the effectiveness of the removal of recurrent disc herniation without meningoradiculolysis, the clinical significance of epidural fibrosis is exaggerated. It is clear that long-term outcomes of reoperations are worse than those of the initial disc herniation removal since each subsequent operation is additional traumatic factor which increases cicatrical adhesion [14]. Therefore, we have developed a method to remove recurrent disc herniations from the anterior approach to the dural sac and compressed root without meningoradiculolysis by opening the central and lateral canals of the spine.

Anteriorlateral retroperitoneal approaches have been used for discectomy and interbody fusion in our clinic for more than 50 years. This access has been used for discs hernias and spondylolisthesis since 1973 to perform anterior decompression and stabilization surgeries, which are fundamentally different from interbody fusion (stabilizing surgery) by obligate opening of the spinal canal and intervertebral foramen to remove the disc herniation through an anterior approach. The complete removal of the entire intervertebral disk together with the hernia completely eliminates the possibility of recurrent disc herniation. We have performed more than

Table 3

Long-term outcomes (12 months or more after the surgery) of anterior and posterior surgeries for recurrent lumbar intervertebral disc herniations, n (%)

Treatment outcomes	Total number of patients (n = 130)	Decompression and stabilization surgery		Level of confidence (p)
		Anterior (n = 68)	Posterior (n = 62)	
Excellent	39	39 (57.3)	–	0.00
Good	33	16 (23.5)	17 (27,4)	0.88
Satisfactory	43	7 (10.5)	36 (58.1)	0.05
No Change	3	1 (1.5)	2 (3.2)	0.54
Deterioration	12	5 (7.4)	7 (11.3)	0.44

2 thousands of such decompression and stabilization surgeries. In the recent years our students and followers have also started to use these interventions [8, 10].

The next step is the study of this type of surgery was its use to remove recurrent disc herniations from the anterior approach. The essential feature of the decompression and stabilization surgeries for recurrent disc herniation was the absence of the dura mater and nerve roots isolation from the scars. We limited ourselves to gentle separation of hernial masses from the compressed root prior to the removal of the hernia and curettage of the disk cavity. It turned out that such minimization of epidural tissue trauma served as prevention of progression of epidural fibrosis.

Removal of recurrent foraminal disc herniation using posterior surgical access is technically challenging, particularly in cases where the initial surgery included combination fusion. The posterior decompression and stabilization operations are usually accompanied by polysegmental stabilization of the spinal motion segment due to the need to perform laminectomy on several levels for meningoradiculolysis. Our observations are confirmed by literature data showing that the incidence of perioperative complications after posterior combination spinal fusion ranges from 10 to 30 % [12, 13]. Extensive meningoradiculolysis is usually performed in case of posterior operations for recurrence of the median disc herniation. Bilateral meningoradiculolysis often have to be performed to access the median disc herniation in case of rough cicatricial process. Naturally, such tissue re-traumatization leads to progression of epidural fibrosis and it

may require the third surgery. In contrast, anterior decompression and stabilization surgeries allow easy removal of median hernias without meningoradiculolysis and, therefore, without additional tissue trauma. An additional advantage of the anterior decompression and stabilization surgery is the possibility to remove foraminal disc herniation even if it is located in the lateral parts of the intervertebral foramen. Posterior intermuscular approaches are much more traumatic and less reliable in such cases. Anterior foraminotomy to remove foraminal hernia require addition excision of posterolateral sections of the fibrous rings and adjacent parts of the vertebral bodies.

The anterior decompression and stabilization operations end with full interbody fusion at the level of the affected spinal motion segment. In the light of modern advances in spine surgery, it should be added that anterior discectomy, anterior foraminotomy and root decompression can be followed by installation of mobile disc prosthesis.

The opinion of some surgeons about the difficulties and dangers of the anterior retroperitoneal approaches for anterior decompression and stabilization of the spine is clearly exaggerated. These interventions are no more technically difficult and traumatic than the posterior ones. Patients begin to walk the next day after surgery.

Contraindications for use of the anterior decompression and stabilization surgeries are clinically significant osteophytes of the articular processes and hypertrophy of the yellow ligament, which are indication for posterior decompression and stabilization operations.

Conclusion

The use of anterior decompression and stabilization surgeries for recurrent lumbar intervertebral disc herniations achieves the following objectives:

1) radical and gentle removal of the recurrent disc herniation of any localization (including median and foraminal) without meningoradiculolysis and traction the root and dural sac;

2) exclusion of recurrent disc herniation due to total removal of the entire disc;

3) prevention of progression of cicatrical process in the spinal canal after the removal of recurrent disc herniation anterior to the dural sac and compressed root (by eliminating the need for extensive meningoradiculolysis);

4) gentle and radical decompression of the root with full fusion at a single spinal motion segment;

5) minimization of destabilizing influence of the operation on the level of a single spinal motion segment by preserving posterior supporting structures of the vertebrae during anterior interbody fusion;

6) significant reduction in the cost of surgery compared to the dorsal decompression and stabilization surgeries, which need to be taken into account due to commercialization of health services and limited funding [10].

Therefore, anterior decompression and stabilization operations for recurrent disc herniations allow non-traumatic anterior decompression of the root, full stabilization of the affected spinal motion segment and prevention of cicatrical process.

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Address correspondence to:
Lutsik Anatoly Andreyevich,
Frankfurt str., 1–14, Novokuznetsk, 654080, Russia,
lucikaa@bk.ru

Anatoly Andreyevich Lutsik, MD, DMSc, Prof., Novokuznetsk State Institute of Postgraduate Medicine, Novosibirsk Research Institute of Traumatology and Orthopaedics n.a. Ya.L. Tsivyan; Igor Vasilyevich Gavrilov, MD fellow; Gleb Yuryevich Bondarenko, MD, PhD; Aleksandr Gennadyevich Epifantsev, assistant professor; Anatoly Igorevich Peganov, MD fellow, Novokuznetsk State Institute of Postgraduate Medicine, Russia.