

COMPARISON OF CLINICAL EFFICACY AND SAFETY OF DIFFERENT APPROACHES IN THE TREATMENT OF LDH

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ABSTRACT

Objective: To investigate the clinical efficacy and safety of different approaches in the treatment of lumbar disc herniation (LDH).

Methods: Seventy patients with LDH treated by spinal endoscopy were divided into foramen approach group (group A) and interlaminar approach group (group B) according to different surgical methods. The operation, complications, lumbar function and clinical symptoms of the two groups were observed and compared.

Results: The intraoperative blood loss, operation time, and intraoperative fluoroscopy in group B were reduced than those in group A ($P < 0.05$), but the postoperative bed rest time, hospital stay, and curative effect of modified MacNab standard operation between the two groups were no difference ($P > 0.05$). After operation, the scores of VAS and ODI in the two groups were reduced than those before operation, while the scores of JOA score system were raised than those before operation, but there was no significant difference in VAS, ODI and JOA scores between the two groups before and after operation. The incidence of complications in group B was reduced than that in group A ($P < 0.05$).

Conclusion: PETD and PEID are effective in the treatment of LDH, but percutaneous spinal endoscopic interlaminar windowing discectomy has shorter operation time and less bleeding, and percutaneous spinal endoscopic interlaminar windowing discectomy has a lower risk of dural sac injury.

Keywords: Spinal endoscopy, lumbar disc herniation, clinical efficacy, intervertebral foramen, surgical approach.

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Introduction

Lumbar intervertebral disc herniation refers to the progressive degeneration of lumbar intervertebral disc function, including the injury of cartilage plate, fibrous annulus and nucleus pulposus, resulting in disorders and abnormalities in the internal structure and metabolic function of lumbar intervertebral disc. Patients have limited movement, lower limb numbness, waist and leg pain and other clinical symptoms and signs⁽¹⁾. During the acute attack of lumbar disc herniation (LDH), the patients have obvious severe pain in the waist, pain or radioactive

spread to the lower limbs, and even difficulty in movement, numbness in the Sellar area, incontinence and so on, which seriously affect the quality of daily life and work of the patients⁽²⁾. The symptoms of waist and leg pain can be relieved obviously in some patients with mild prolapse of lumbar intervertebral disc after conservative treatment such as recumbent rest, fixed lumbar segment with brace and oral painkillers, but for patients with ineffective conservative treatment, it is necessary to carry out further surgical treatment to cure it thoroughly⁽³⁾. At present, percutaneous endoscopic transforaminal discectomy (PETD) is one of the main minimally

invasive ways to treat LDH, but according to clinical studies, percutaneous intervertebral foramen discectomy has some problems or possibilities, such as high difficulty of operation, incomplete disc decompression, incomplete discectomy and so on, which affect the effect of surgical treatment⁽⁴⁾.

In recent years, percutaneous endoscopic transforaminal discectomy (PETD) has gradually entered the field of vision of orthopedic surgeons. This method has the advantages of less trauma, less intraoperative bleeding, short operation time, less paraspinal soft tissue peeling and so on⁽⁵⁾. Here, A retrospective analysis of different approaches for treating LDH was conducted, in order to provide reference for the choice of clinical operation.

Materials and methods

General information

70 patients with LDH treated by spinal endoscopy from March 2020 to June 2020 were retrospectively selected and divided into foramen approach group (group A) and interlaminar approach group (group B) according to different surgical methods.

Inclusion criteria:

- 120 years old \leq age \leq 80 years old;
- 2 patients with LDH diagnosed by clinical symptoms, signs and examination⁽⁶⁾;
- Receive other drugs or physiotherapy within the past week.

Exclusion criteria:

- Other spinal diseases;
- With severe cardiac, hepatic and renal insufficiency;
- With rheumatic diseases such as ankylosing spondylitis and rheumatoid arthritis;
- Incomplete clinical data;
- With severe osteoporosis.

Method

Patients in group A were treated with percutaneous intervertebral foramen discectomy: the patients were placed prone on the body pad in the operating room and flexion both hips and knee joints to ensure that the abdomen was not compressed and local infiltration anesthesia was completed.

The length of the puncture needle was determined by measuring the cross-sectional CT before operation, and the 8~14cm was selected according to the shape of the spinous process. Discography was performed at the location

confirmed by the fluoroscopy of the "C" arm X-ray machine, and the contrast needle was injected with the mixture of meglumine diatrizoate and methylene blue at 3:1 to observe the rupture of annulus fibrosus and the morphology of intervertebral disc.

Fluoroscopy of a "C" arm X-ray machine shows the lateral needle tip puncture at the vertebral body's posterior edge. Pedicle medial line safe triangle area is where the positive needle tip is located. The diameter 8mm dilatation pathway was placed in the center of the guide wire, and the large channel endoscope was placed instead of the dilatation tube. Using the German Cisco Think foramen endoscope, lamina fenestration and decompression was performed with grinding drill and lamina forceps, and the blue-stained intervertebral disc lesions were removed by nucleus pulposus forceps, radiofrequency ablation, hemostasis, annulus fibrosus repair, and suture the incision layer by layer. Patients in group B were treated with percutaneous spinal endoscopic interlaminar windowed discectomy: the patients lay prone on the body pad in the operating room and flexion both hips and knee joints to ensure that the abdomen was not compressed and local infiltration anesthesia was completed. Confirm the perspective location of the target segment through the perspective positioning of the "C" arm X-ray machine. The 1cm incision was made by 1.5cm beside the midline, and the dilatation tube was inserted step by step to establish the working channel. A fluoroscopy of the "C" arm X-ray machine confirmed the position, the large channel endoscope was put in place of the expansion tube, the large channel Delta endoscope of Joimax Company of Germany was used, part of the superior lamina and all the lower articular osseous process were resected with bone knife, the lamina was windowed and decompressed with grinding drill and lamina forceps, after the partial ligamentum flavum was removed with gun forceps, the dura mater and nerve root were pushed medially to expose the intervertebral disc area at the intervertebral foramen, and the intervertebral disc was cut open after bipolar electrocoagulation and hemostasis.

Intervertebral disc cutters were used to remove nucleus pulposus tissue and partially ruptured annulus of intervertebral discs, radiofrequency ablation, hemostasis, repair of annulus fibrosus, and layer-by-layer suture of the incision.

Operation condition

The operation time, intraoperative blood loss, intraoperative fluoroscopy times, postoperative bed

rest time and hospital stay of the two groups were observed and recorded.

Complication

The complications in the two groups were observed and recorded, and the incidence of complications was calculated.

Lumbar function

The improved MacNab standard⁽⁷⁾ was used to evaluate the lumbar function of the patients. The standard was divided into four grades: excellent, good, fair and poor according to the symptoms, functional status and working condition of the patients.

- Excellent: painless, limited movement, patients return to normal work and life;
- Good: occasional neuropathic pain;
- Can: a certain degree of functional improvement, affecting normal life;
- Poor: continuous nerve root damage, there is no difference before and after treatment, or even aggravated.

Clinical symptoms

• Visual analogue scale (VAS)⁽⁸⁾ was used to evaluate the pain degree of waist and lower extremities before and after the operation. The score ranged from 0 to 10. The higher the score, the more severe the pain.

• The degree of dysfunction of patients with low back pain was evaluated by Oswestry Disability Index questionnaire (ODI)⁽⁹⁾. The questionnaire was composed of 10 questions with a score of 0-100. the higher the score, the more serious the dysfunction.

• The lumbar function of the patients was evaluated by the Lumbar Japanese Orthopaedic Association scoring system (JOA)⁽¹⁰⁾. The highest score was 29 and the lowest was 0. The lower the score, the more obvious the neurological dysfunction.

Statistical method

SPSS20.0 was used for statistical analysis, χ^2 test was used to compare the counting data, rank sum test was used to compare the grade data, mean \pm standard deviation ($\bar{x} \pm s$) was used to express the measurement data, and t test was used for comparison.

Results

Comparison of general data

The general data showed no difference in each group ($P > 0.05$) (Table 1).

Group	n	Gender		Age (years)	Course of disease (month)	Responsibility section			Prominence type			
		Male	Female			L ₃₋₄	L ₄₋₅	L _{5-S₁}	Central	Paracentric	Accessory	Extreme lateral
A	55	28	27	40.25±11.87	10.22±3.32	4	28	13	2	19	27	7
B	55	20	25	39.88±10.25	9.88±3.08	3	30	12	3	17	28	7
$\chi^2/t/Z$		0.414		0.175	0.557	0.043			0.082			
P		0.520		0.861	0.579	0.966			0.935			

Table 1: General data ($\bar{x} \pm s$).

Comparison of operation

The operation time, intraoperative blood loss, and intraoperative fluoroscopy in group B were reduced than those in group A ($P < 0.05$); but the postoperative bed rest time and hospital stay between the two groups was no difference ($P > 0.05$) (Table 2).

Group	n	Operation time (min)	Intraoperative bleeding volume (mL)	Intraoperative fluoroscopy (times)	Postoperative bed rest time (d)	Hospitalization time(d)
B	55	86.62±12.25	32.84±7.54	5.56±1.23	1.32±0.62	5.84±1.50
A	55	112.36±18.45	43.63±8.28	24.94±6.46	1.39±0.74	6.03±1.38
t		-8.620	-7.146	-21.856	-0.538	-0.691
P		0.000	0.000	0.000	0.592	0.491

Table 2: Operation between the two groups.

Comparison of postoperative MacNab standard surgery

The curative effect of MacNab standard operation between group B and group A were no difference ($P > 0.05$) (Table 3).

Group	n	Excellent	Good	Can	Bad
B	55	30	20	5	0
A	55	28	18	8	1
Z		-0.681			
P		0.496			

Table 3: Postoperative MacNab standard surgery.

Comparison of VAS, ODI and JOA scores

After operation, the scores of VAS and ODI in the two groups were reduced than those before operation ($P < 0.05$), the JOA score was raised than that before operation ($P < 0.05$); The VAS, ODI and JOA scores between the two groups before and after operation were no difference ($P > 0.05$) (Table 4).

Comparison of operative complications

The incidence of complications in group B was reduced than that in group A ($P < 0.05$), (Table 5).

Group	n	VAS		ODI		JOA	
		Before	After	Before	After	Before	After
B	55	6.52±1.45	1.24±0.35*	31.25±5.47	8.74±2.56*	10.25±2.23*	23.20±3.58*
A	55	6.68±1.62	1.31±0.44*	30.84±6.52	9.23±3.02*	10.58±2.45*	23.85±2.76*
<i>t</i>		-0.542	-0.923	0.357	-0.918	-0.739	-1.066
<i>P</i>		0.589	0.358	0.722	0.361	0.462	0.289

Table 4: VAS, ODI and JOA scores.

Note: compared with pre-operation: * $P < 0.05$.

Group	n	Nerve root injury	Dural sac tear	Discitis	Total
B	55	0 (0.00)	0 (0.00)	1 (1.82)	1 (1.82)
A	55	1 (1.82)	5 (9.09)	2 (3.64)	8 (14.55)
χ^2					4.356
<i>P</i>					0.037

Table 5: Comparison of operative complications[n (%)].

Discussion

With people's excessive exercise, poor lifestyle and sitting posture becoming more and more common, as well as the convenience of seeking medical treatment, the incidence of LDH is on the rise year by year⁽¹¹⁾. LDH is mainly caused by the compression of the posterior spinal nerve root by nucleus pulposus tissue⁽¹²⁾. The incidence of LDH is as high as 15% to 30%, and the course of the disease is difficult to cure⁽¹³⁾. Minimally invasive endoscopic discectomy is the main method for the treatment of LDH, and transforaminal approach is the main approach for minimally invasive spinal endoscopic discectomy, but according to clinical studies, percutaneous intervertebral foramen discectomy has some problems or possibilities, such as high difficulty of operation, incomplete disc decompression and incomplete discectomy, which affect the prognosis⁽¹⁴⁾. Here, PEID was used to complete discectomy, and it was found that this approach is helpful to improve the surgical effect of patients with LDH.

The postoperative bed rest time, hospital stay, and the curative effect of MacNab standard operation between the two groups were no difference; After operation, the scores of VAS and ODI in the two groups were reduced than those before operation, while the scores of JOA were raised than those before operation, but the scores of VAS, ODI and JOA between the two groups before and after operation were no difference. It is suggested that PEID and PETD are effective in the treatment of

LDH. However, percutaneous spinal endoscopic interlaminar windowing discectomy has shorter operation time and less bleeding. It is found that the operation space of intervertebral foramen insertion is small, and the nucleus pulposus may not be completely removed in patients with free prolapse and axillary prolapse of lumbar intervertebral disc, but the nucleus pulposus can be removed more efficiently in patients with suprashoulder, central and extreme lateral LDH. However, the interlaminar approach has a large operating space, and the nucleus pulposus can be removed more efficiently for patients with free prolapse and axillary prolapse of lumbar intervertebral disc, so the two approaches can achieve good results⁽¹⁵⁾.

In addition, PEID and PETD need to use C-arm X-ray machine to accurately locate the focus in order to establish the surgical channel, but the intervertebral foramen approach has a large puncture angle. the whole puncture operation is more difficult, and the puncture distance is long, so it is difficult to observe the protruded intervertebral disc space under direct vision, which increases the number of fluoroscopy. It takes a long time to establish the surgical passage through the intervertebral foramen approach⁽¹⁶⁾; on the other hand, the interlaminar approach is simpler to establish the channel, and the puncture location of the approach is faster, so the interlaminar group has shorter operation time and less times of intraoperative fluoroscopy⁽¹⁷⁾.

The incidence of complications in group B was reduced than that in group A. It is suggested that PEID has a lower risk of dural sac in patients with injury. Studies have shown that excessive puncture in the process of discectomy can easily lead to complications such as dural sac tear, nerve root injury, cerebrospinal fluid leakage and so on. In this study, endoscopic spinal surgery was performed under local infiltration anesthesia, the patient was awake during the operation, and the surgeon could communicate with the patient during the operation. through the dynamic changes of the patients, we can

timely understand the improvement of the symptoms of LDH, so that the nerve root injury caused by improper operation can be found and avoided in time, and the prognosis can be improved. In percutaneous intervertebral foramen discectomy, the puncture needle needs to enter the patient's spinal canal through the ligamentum flavum, and the nerve root and dural sac are removed by spiral tube technique to remove the herniated nucleus pulposus, which is less difficult to operate. The anatomical structure of the surgical approach is relatively simple, but the percutaneous spinal endoscopic intervertebral foramen discectomy requires rotating working cannula for many times.

Only by successfully removing the nerve root and dural sac can the protruding nucleus pulposus be successfully removed, so there is a high risk of injury to the nerve root and dural sac during operation⁽¹⁸⁻¹⁹⁾. Especially in the patients with protruded nucleus pulposus of LDH, the dural sac is close to the ligamentum flavum, the operation of rotating working cannula is more difficult, and the risk of injury to the dural sac is higher⁽²⁰⁾. In percutaneous spinal endoscopic interlaminar fenestration discectomy, the intervertebral foramen approach and the above intervertebral foramen approach are protected by ligamentum flavum and retracted together, so it is not easy to cause injury, and this method is relatively simpler than the intervertebral foramen approach, the operation time is shorter and the patient has less bleeding⁽²¹⁻²²⁾. To sum up, PEID and PETD are effective in the treatment of LDH, but percutaneous spinal endoscopic interlaminar windowing discectomy has shorter operation time and less bleeding, and percutaneous spinal endoscopic interlaminar windowing discectomy has a lower risk of dural sac injury.

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