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The Clinical Effect of Percutaneous Transforaminal Endoscopic Discectomy in the Treatment of Low Lumbar Single Segment Disc Herniation

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Abstract

Objective: To observe the clinical effect percutaneous transforaminal endoscopic discectomy (PTED) in the treatment of single lumbar disc herniation. **Methods:** From August 2017 to June 2019, 42 patients with low lumbar single segment lumbar disc herniation were treated with percutaneous transforaminal endoscopic discectomy surgery in our hospital. The operation time, incision size, bleeding volume and hospitalization time were recorded respectively. The patients were evaluated before operation, 1 month and 6 months after operation. Visual analogue scale (VAS) and assessment were used to evaluate the lumbocrural pain. The JOA score and the Oswestry disability index (ODI) were used to evaluate the lumbar function, and the modified macnab score was used to evaluate the clinical effect in the last follow-up. **Results:** All the 42 patients successfully completed the operation without any other operation. There were no severe complications such as dural injury and nerve root injury. The operation time was (76.98 ± 8.58) min, the incision size was (8.45 ± 1.2) mm, the bleeding volume was (20.14 ± 2.93) ml, and the hospitalization time was (4.55 ± 1.13) d. One month and six months after the operation, the visual analogue scale (VAS), the evaluation of lumbar function (Oswestry) and the disability index (ODI) were significantly improved compared with those before the operation ($P < 0.05$). The last follow-up evaluation of the clinical effect of modified macnab: excellent in 30 cases, good in 8 cases, fair in 3 cases and poor in 1 case. The excellent rate was 90.47%. One patient developed back pain and discomfort. One case recurred. **Conclusion:** The treatment of low lumbar but segmental lumbar disc herniation with percutaneous intervertebral foramen, with small incision, less

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bleeding and quick recovery, can improve the pain and dysfunction of patients.

Keywords

Lumbar Disc Herniation, Percutaneous Transforaminal Endoscopic Discectomy, Clinical Effect

1. Introduction

Lumbar disc herniation is one of the most common orthopedic diseases, and single segment disease is more common. Non-surgical treatment can alleviate the symptoms of most patients, and a small number of patients need surgical treatment [1]. At present, the median approach is the most common after the operation, but it is easy to cause FBSS (failed back surgery syndrome). Therefore, in 1968, Wihse proposed the approach through the longest muscle and multi split muscle space. However, there are still some disadvantages, such as the greater damage in the operation area, spinal injury, adhesion of the surrounding tissues and so on. Then with the progress of science and technology and spine surgery, percutaneous transaminal endoscopic surgery can reach the target area for surgery, which not only effectively avoids the shortcomings of the traditional surgery, but also has the advantages of small amount of bleeding, short operation time and quick recovery. And this operation can be carried out under local anesthesia, the patients stay awake during the operation, keep in touch with the patients during the operation, and effectively avoid serious complications such as nerve injury. From August 2017 to June 2019, 42 patients with single level lumbar disc herniation were operated with percutaneous transaminal endoscopic surgery, and the postoperative effect was satisfactory. The report is as follows.

2. Data and Methods

2.1. General Information

From August 2017 to June 2019, 42 patients with single lumbar disc herniation in our hospital were selected, all of whom were 24 males and 18 females, aged 27 - 68 years with an average age of 48.5 years. After more than 3 months of regular conservative treatment, it was ineffective. There was no previous operation history; exclusion criteria: 1) Lumbar instability, lumbar fracture, lumbar tuberculosis, lumbar tumor, and infection of intervertebral space; 2) Lumbar surgery history, sacral canal sealing treatment history; 3) Patients with multiple segments.

2.2. Operation Method

2.2.1. Preoperative Preparation

Prepare the preoperative reading film (X-ray film, CT, MRI) and physical ex-

amination to determine the lumbar disc herniation segment and the relative position with the nerve root. During the close to the shoulder of the superior articular process. Fluoroscopy confirmed that the puncture needle was located at the shoulder of the superior articular process. 2 ml of 1% lidocaine hydrochloride was injected to anesthesia around the articular process. Then, the puncture needle enters the intervertebral disc of the protruding part, where the prepared contrast agent (iohexol and methylene blue) can be injected. Insert the guide wire and pull out the puncture needle. At this time, pay attention to maintain the position of the guide wire. No. 11 scalpel made an incisi operation, the patient took the prone position, the chest and abdomen cushion C-arm positive and lateral position fluoroscopy to locate the responsible segment, adjust the body position, make the lumbar spine forward, and bend the hip and knee, so as to expand the intervertebral foramen. After positioning, the marker marks the needle feeding point.

2.2.2. Operative Procedure

The operation of this study was completed by the same senior chief physician, taking L4/L5 as an example, the conventional operation area disinfection towel. 1% lidocaine hydrochloride was used for local infiltration anesthesia. The puncture needle was inserted about 8 mm long at the puncture point. The catheter should be placed along the guide wire and expanded step by step. It should be confirmed that the catheter is close to the articular process at each step. At the same time, the catheter can be rotated clockwise to reduce the pain of the patient. The anterior end of the circular saw shall not exceed the line between the pedicle and the medial margin at any time. Put in the guide rod, establish the working channel and then put into the intervertebral foramen system. The blue stained nucleus pulposus was removed and radiofrequency ablation was performed to confirm that the nerve roots were fully released. When loosening the nerve root, the patient can be communicated. If the nerve symptom is relieved, 40 mg triamcinolone acetonide and 2 ml 1% lidocaine can be injected and the intervertebral foramen system can be pulled out. After washing with normal saline, the incision was sutured layer by layer and the drainage tube was retained.

2.2.3. Postoperative Management

The drainage tube can be pulled out 24 hours after operation, and a small amount of waist circumference can be worn to get out of bed. Weight bearing and strenuous exercise should be avoided within 3 months after operation, and standing and sitting for a long time should be avoided.

2.3. Observation Indicators

The operation time, incision size, bleeding volume and hospital stay were evaluated by visual analogue scale (VAS). The higher the score of 0 - 10, the more serious the pain was. The JOA score and Oswestry disability index (ODI) were used to evaluate the lumbar function. ODI included 10 items such as lumbago

and leg pain, walking and standing. Each item had 5 points and 50 points in total. ODI = total score/50 points × 100%, the higher the score, the more serious the obstacle [2]. The final follow-up evaluation of clinical efficacy was performed with modified macnab efficacy score. Specific evaluation criteria: excellent: straight leg elevation > 70˚, lower extremity sensation and movement are normal, muscle strength is normal, and lumbocrural pain disappears; good: straight leg elevation is 30˚ higher than that before operation, but < 70˚, muscle strength grade IV, occasionally with slight lumbocrural pain but not affecting work and life; can: straight leg elevation is 15˚ higher than that before operation, but < 70˚, muscle strength grade III, lumbocrural pain is less than that before operation, and painkillers are occasionally used; poor There is no change or even aggravation before and after the operation, so it is necessary to take painkillers [3].

2.4. Statistical Analysis

SPSS 22.00 software is used, the counting data is expressed in rate (%), and the measurement data is expressed in mean ± standard deviation ($\bar{x} \pm s$) indicated that the operation time, incision size, bleeding volume and hospitalization time were recorded respectively, and the paired sample t-test was used before operation, 1 month and 6 months after operation, and the last follow-up was compared with that before operation. The difference was statistically significant ($P < 0.05$).

3. Result

3.1. Perioperative Conditions

3.2 patients successfully completed the operation without any other operation. There were no severe complications such as dural injury and nerve root injury. The operation time was (76.98 ± 8.58) min, the incision size was (8.45 ± 1.2) mm, the bleeding volume was (20.14 ± 2.93) ml, and the hospitalization time was (4.55 ± 1.13) d.

3.2. Follow-Up Results

One month and six months after the operation, the visual analogue scale (VAS), the evaluation of lumbar function (Oswestry) and the disability index (ODI) were significantly improved compared with those before the operation ($P < 0.05$; Table 1). The last follow-up evaluation of the clinical effect of modified macnab was excellent in 30 cases, good in 8 cases, fair in 3 cases and poor in 1 case. The excellent rate was 90.47%. One of the patients suffered from back pain and discomfort after operation. The above symptoms were relieved by NSAIDs and physiotherapy. There was no recurrence during the follow-up period after the pain symptom was eliminated. Figure 1 is the imaging data of surgical patients.

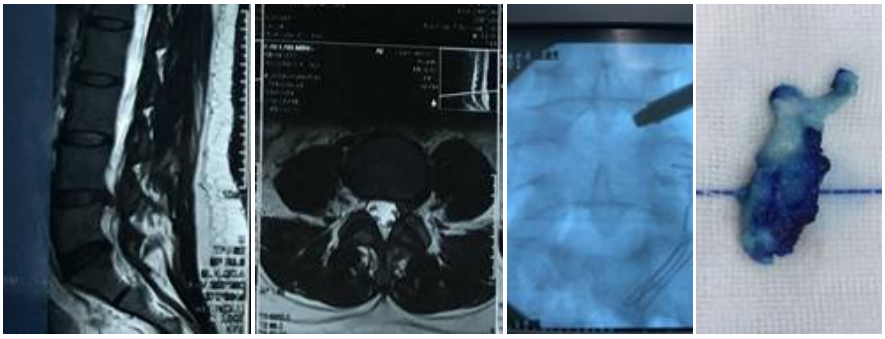
4. Discussion

Lumbar disc herniation is one of the most common causes of low back and leg pain. It is a syndrome caused by degeneration of lumbar disc, rupture of fiber

Table 1. Comparison of observation indexes before and after operation ($\overline{x} \pm s$).

time	Low back pain VAS (sub)	Lower limb pain VAS (sub)	JOA score	ODI (%)
Preoperative	6.64 + 1.14	6.71 + 0.97	12.07 + 2.25	70.33 + 4.95
1 month after operation	2.93 + 0.51a	2.57 + 0.59b	20.14 + 2.67c	35.05 + 2.69d
6 months after operation	1.21 + 0.47a	0.91 + 0.43b	23.33 + 2.19c	22.43 + 1.76d
Last follow-up	0.60 + 0.63a	0.64 + 0.62b	24.55 + 2.14c	21.45 + 2.12d

Note: a compared with preoperative, the difference was statistically significant, $P < 0.05$; b compared with preoperative, the difference was statistically significant, $P < 0.05$; c compared with preoperative, the difference was statistically significant, $P < 0.05$; d compared with preoperative, the difference was statistically significant, $P < 0.05$.



(a) (b) (c) (d)

Figure 1. (a) The sagittal MRI of the lumbar spine showed 4/5 lumbar disc herniation; (b) the transverse MRI of the lumbar spine showed 4/5 lumbar disc herniation; (c) During the operation, the puncture needle entered along the lumbar 4/5 intervertebral foramen; (d) the nucleus pulposus of the extracted intervertebral disc.

ring, extrusion of nucleus pulposus and stimulation of lumbosacral nerve root and cauda equina nerve. The following lumbar lesions are common, of which L4/5 and L5/S1 account for more than 90% [4]. Traditional open surgery can relieve the pain and dysfunction of the patients & apos; waist and legs, but it can damage the tissues around the operation area and affect the stability of the lumbar spine. Tissue adhesion can also increase the difficulty of reoperation [5].

With the development of society and aging, the incidence rate of lumbar disc herniation is increasing and younger. After more than 3 months of formal non-surgical treatment are invalid, we can consider the operation. The principle of surgical treatment is to relieve the nerve compression and remove the protruding nucleus pulposus [6]. The percutaneous transforaminal endoscopic discectomy surgery, which starts from the "kambin triangle" [7], can protect the original structure of the spine as much as possible, and can hardly damage the posterior structure of the spine, such as muscles, ligaments, lamina and facet processes. At the same time, it can remove the diseased tissue and release the compressed nerve root. In addition, under local anesthesia, the patient is in a conscious state, which reduces the occurrence of important nerve injury. Be-

cause of the advantages of small trauma and fast recovery, it is accepted by more and more patients with lumbar disc herniation [8].

In this study, 42 patients successfully completed the operation, the operation time was (76.98 ± 8.58) min, and the rotation and movement of the working pipe increased the operation time. Yeung *et al.* Analyzed 307 cases of lumbar disc herniation treated with percutaneous foramen, the excellent and good rate was 89.3% [9]. Hermantin *et al.* [10] compared traditional open surgery with percutaneous endoscopic surgery in the treatment of lumbar disc herniation, the results showed that the satisfaction rate of the traditional open group was 93.0%, and that of the percutaneous endoscopic group was 97.0%. The excellent and good rate is 90.47%, which is consistent with the previous reports.

Although there are many advantages mentioned above, we should also correctly recognize and prevent the occurrence of complications such as infection of intervertebral space and dural tear. The incidence of infection of intervertebral space after traditional operation is about 1% - 5%. Because of the small wound and the large amount of liquid used in the operation, the infection rate was greatly reduced to 0.12% [11].

To sum up, the clinical efficacy of this study is satisfactory, and percutaneous transforaminal endoscopic discectomy surgery is safe and minimally invasive, which is worthy of clinical promotion. The indication of operation should be strictly controlled to reduce the occurrence of postoperative complications. The learning curve of the technique itself is long [12], which can only be carried out after the surgeon is familiar with the anatomical structure and strict training.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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