

Case Presentation

Unilateral Biportal Endoscopy Discectomy for High Grade Migrated Lumbar Disk Herniation with a Homemade Guider

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Abstract

Percutaneous endoscopic discectomy treating high-migration disc herniation is still technical challenging. Unilateral biportal endoscopic discectomy is a potential surgical method for migrated herniation discectomy. Although UBE discectomy is more minimally invasive compared with the open surgery, the dissection of soft tissue during surgical exposure has received increasing research attention. To reduce the damage of paravertebral muscle, we introduced a homemade guider assisting UBE discectomy of high-migrated upper lumbar disc herniation and reported the related clinical outcomes. The use of self-designed guidelines for UBE can quickly and accurately establish the surgical field, simplify the operation process and reduce paravertebral muscle damage.

Keywords: Percutaneous Endoscopic Discectomy (PED), Unilateral biportal endoscopy (UBE), Magnetic resonance imaging (MRI), Computed tomography (CT).

Introduction

Compared with open lumbar disk herniation discectomy, percutaneous endoscopic discectomy (PED) has advantages of smaller incision and faster recovery in the treatment of lumbar disk herniation [1]. Although successful results have been achieved with the improvement of technology and equipment, the application of PED to treat high-migrated disc herniation is still technical challenging [2]. The failure rate is as high as 20% for both transforaminal approach and interlaminar approach [3].

Unilateral biportal endoscopy (UBE) is a minimal invasive surgery system with one portal for endoscopy and another for surgical instruments similar to joint arthroscopy system [4,5]. UBE can provide flexible and sufficient surgical field exposure, and the instruments can be moved freely for processing without being crowded. It is a potential surgical method for migrated disc herniation discectomy. While the dissection of soft tissue during UBE surgical exposure has received

increasing attentions. To reduce the damage of paravertebral muscles, we performed UBE discectomy with a homemade guider for high-grade migrated lumbar disc herniation of the L5-S1 disc.

Case presentation

A 41 years old male presented with a 2 months history of low back pain and left leg pain. He complained flexion weakness (level III) of left ankle plantar combined with left foot numbness after lifting heavy things 1 month before admission to hospital. After conservative treatment for 4 weeks, the patient's symptoms were not improved. The patient had no previous medical history. Preoperative physical examinations demonstrated a positive straight leg raise test for the left leg. Left knee reflexes and achilles tendon reflexes of the left lower limb were normal. The visual analogue scale (VAS) score was 6 point for the lower back and that for the left leg was 8 point before the surgery. Magnetic resonance imaging (MRI) showed a L5-S1 disc herniation on the left side and the herniated nucleus pulposus migrated to the upper edge of the L5 vertebral body. Computed tomography (CT) scan showed no calcification of the pulposus. The dynamic imaging X-ray indicated no instability of the L5-S1 disc space (Fig. 1).

This patient was diagnosed with high-grade migrated lumbar disc herniation (L5-S1) according to the schematic representation of disc herniation. We decided to remove the highly migrated nucleus pulposus with a homemade guider assisted unilateral biportal endoscopic discectomy technique. The surgical procedure was approved by ethics committee of the 3rd hospital of Xiamen.

Surgical procedure

Under epidural anesthesia, the operation was carried out in the prone position. The patient was prostrated on a bow-type frame to widen the intervertebral window. Under anterior posterior fluoroscopy, the lumbar process at the surgical segment was superficially located and the posterior midline was marked. The portals were located at about 1.5 cm lateral to the middle line. With the guidance of the fluoroscope, the viewing portal was marked targeting to the lower edge boundary of the upper lamina, and an 8 mm incision was made with a sharp scalpel. An arthroscopy metal sheath, 7 mm in outer diameter, was bluntly

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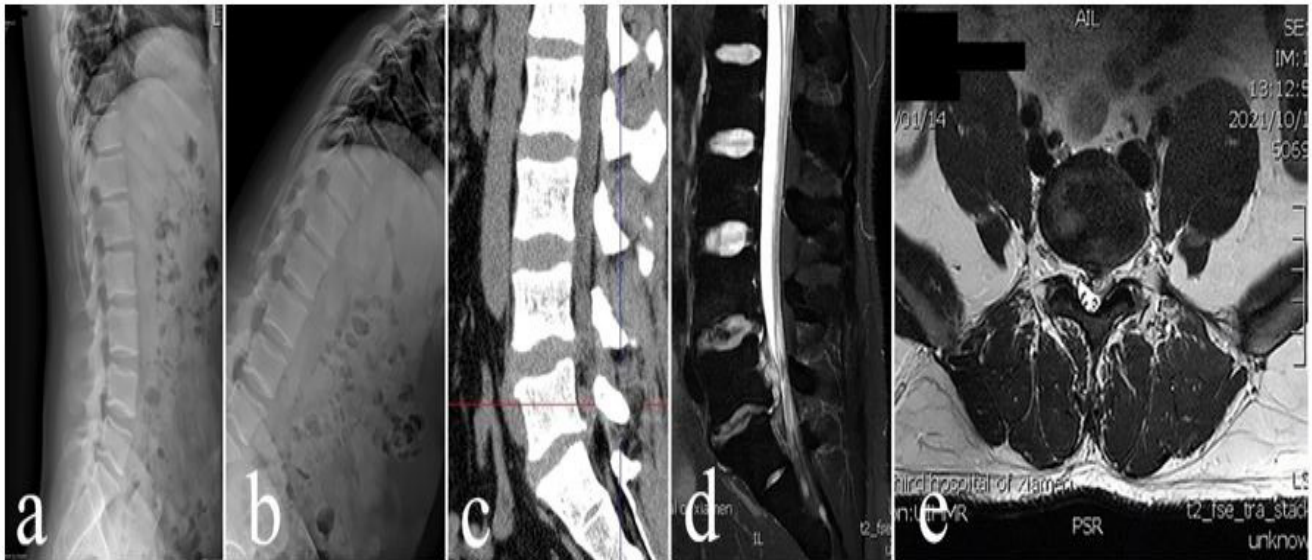


Figure 1: Preoperative imaging of L5–S1 upper migrated disk fragment
a,b: A dynamic imaging X-ray indicated no instability of the L5–S1 disc space.
c: A computed tomography (CT) scan showed no calcification of the nucleus pulposus.
d,e: Preoperative T2 magnetic resonance imaging (MRI) showed L5–S1 disc herniation on the left side and the herniated nucleus pulposus migrated to the upper edge of the L5 vertebral body.

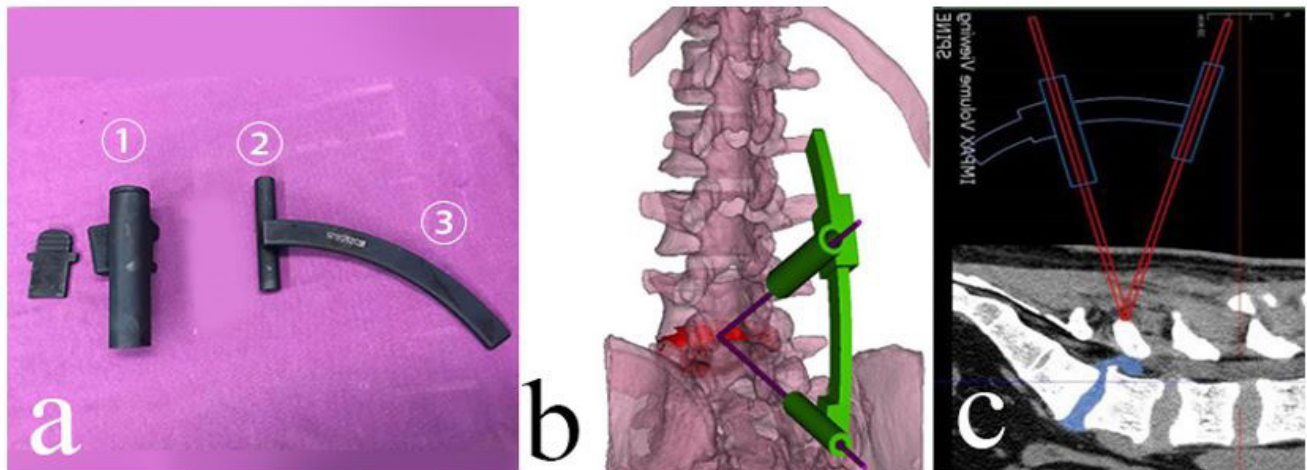


Figure 2 The structure of homemade guider assisted and preoperative plan.
a. The structure of the homemade guider contained: the positioning hole(①), fixed end (②) and adjustable angle slide rail(③).
b,c. The computer designed the lower edge of the L5 lamina as the target point.

inserted on the surface of L5 left inferior articular process. Then, the homemade guider was installed clamping the sheath, and adjusting the angle of sight of the working portal (Fig.2). A 2.5 mm positioning pin was inserted from the positioning hole of the guider directly touching the lamina, which showed the skin entry point of the working portal. After confirmation by C-arm fluoroscopy, the guider was integrated. (Fig. 3). A 4 mm 30°arthroscope (ConMed Arthroscope QuickLatch®) was inserted through the viewing portal under saline irrigation with a pressure of 30–40 mm Hg. The positioning pin could be found in the endoscopic view. Following pinning, soft tissue dilatations were performed. Then the poisoning pin was removed. Instruments such as high-frequency cautery, drilling, puncture, and pituitary were placed through the working port, the obstructing muscle and fat were removed to visualize the lamina and the ligamentum flavum. Laminoplasty was made by drill and Kerrison rongeur. The ligamentum flavum was vertically split by a dissector. And the bevel, fat tissue, dural sac, and nerve roots in could be identified when entering the epidural space. After confirmation of the structures under clear endoscopic vi-

sualization, the herniated disc was removed by using various graspers (Fig. 4a, b). The neural tissues were pushed and, thus, protected by Nerve Hook, which allowed the fragments in the ventral and axillary part of the nerve root to be removed. The completeness of decompression was assessed. It was necessary to reconfirm if there were any remaining disc fragments in the S1 root. Annulus fissure coagulation and haemostasis were performed by using the radiofrequency at 15 W for coagulation (VAPR VUE Radiofrequency Electrode System). Skin was sutured after removal of the scope.

Postoperative outcome

The symptoms of low back and leg pain were significantly improved after operation, and the VAS score of low back and leg pain were 1 point. Physical examination revealed a negative femoral nerve sprain. Postoperative MRI (Fig. 5a, 5b) showed the migrated nucleus pulposus was removed and the intervertebral joints was intact. Postoperative computed tomography shows a bone-limited laminectomy.

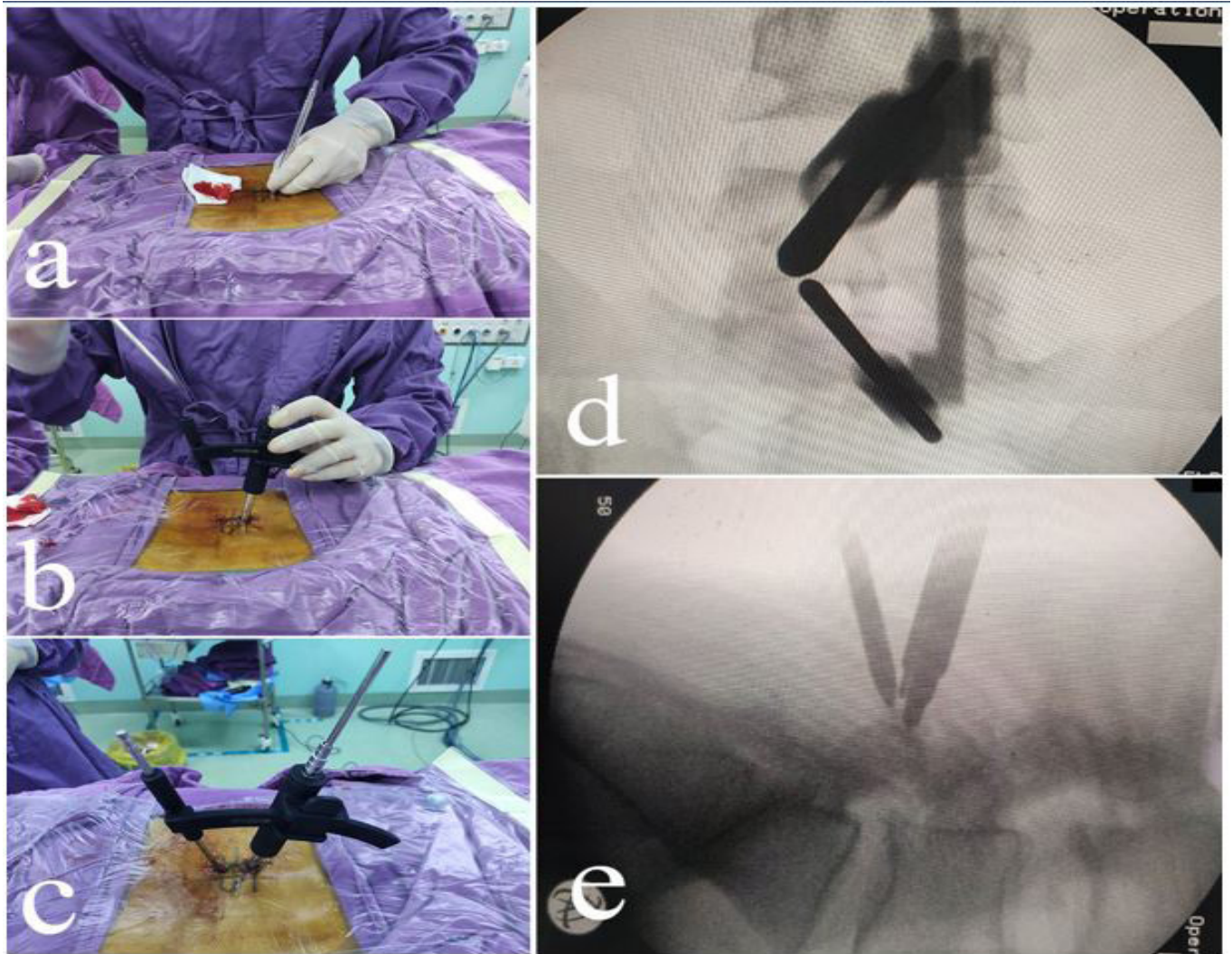


Figure 3 Surgical procedure of homemade guider unilateral biportal endoscopic lumbar discectomy

a. A 0.8 cm incision was made with a sharp scalpel at the entry point of the viewing portal.

b. An arthroscopy metal sheath, 7.0 mm in outer diameter, was bluntly inserted in the lateral edge of the interlaminar window.

c. A 2.5-mm positioning pin was inserted from the positioning hole of the guider directly touching the lamina, which showed the skin entry point of the working portal.

d,e. After being confirmed by C-arm fluoroscopy during the operation, the homemade guider was assisted.

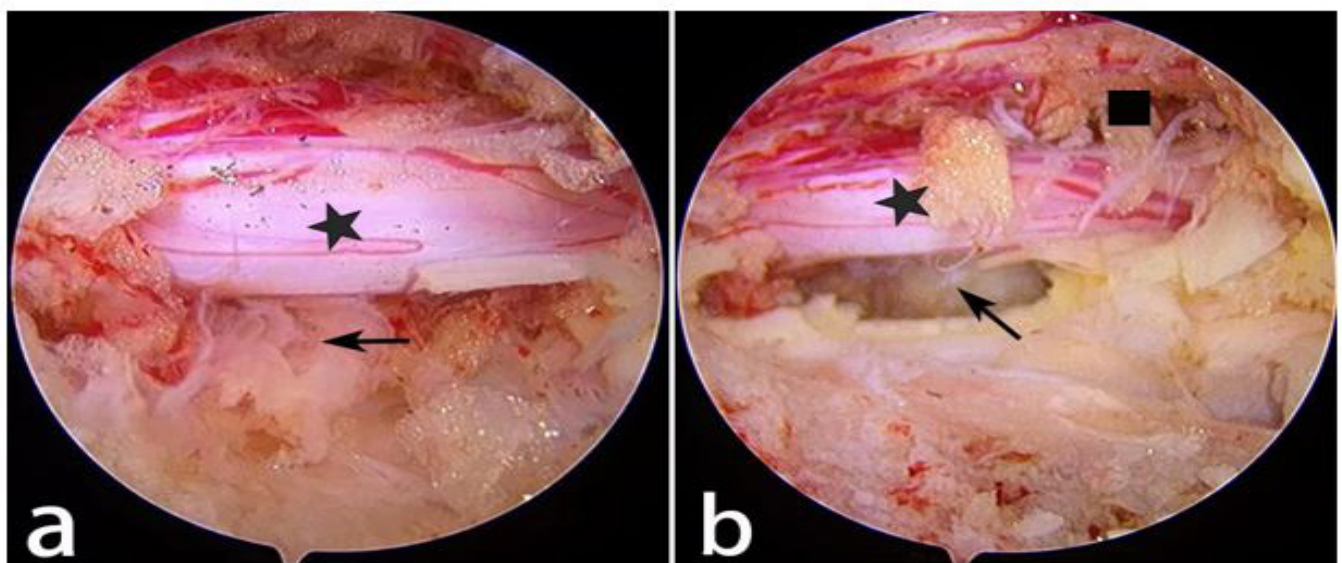


Figure 4 Endoscopic view of unilateral biportal endoscopic lumbar discectomy

a. Intraoperative view of the S1 nerve root (star) and herniation (arrow).

b. Intraoperative view of the S1 nerve root (star), and ruptured annulus fibrosus (arrow) after removal of the herniation. The axillary looseness of the S1 nerve root (Cube).

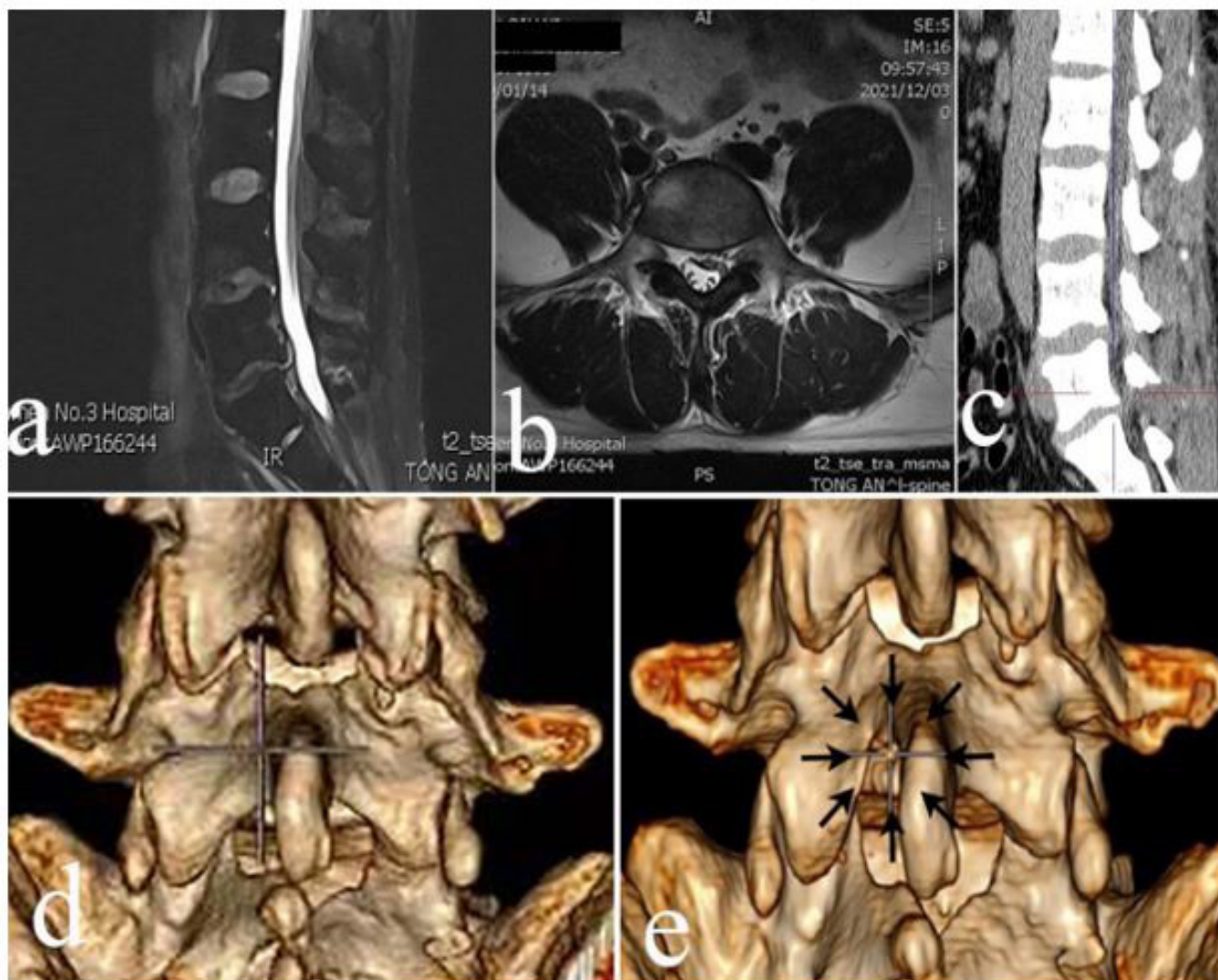


Figure 5 Postoperative MRI and CT scan.

a,b,c. Postoperative examination revealed clean removal of the nucleus pulposus and the absence of paravertebral muscle damage was found after 6 weeks.

d,e. Postoperative computed tomography scan shows bony limited laminectomy (black arrows).

Discussion

Anatomically, disc herniation is usually located at the same level of the disc. The incidence of disc fragments prolapse is as high as 35% ~ 72% [6-8]. Although there are numerous reports showed that PED has achieved good clinical results in the treatment of migrated disc herniations, there are still technical limitations [9]: ①the anatomical position of migrated intervertebral disc orbit is special, and the endoscope tube is often blocked by the bone structure. ②the prolapsed nucleus pulposus often have several fragments. For endoscopic intervention, there is a risk of residual nucleus pulposus. Studies have shown that 5-13% of cases of residual nucleus pulposus required revisions. ③Care should be taken not to damage the sclera or nerve roots when opening the lamina with drilling burr because this area lacks protection of the ligamentum flavum. ④Bony structure restricts the movement of the root canal, which trapped the nucleus pulposus at the level of the disc. Whereas, for UBE, larger diameter drill bits and pliers can be used, which improves the efficiency of manipulating the bone structure compared with PED. The operating channel is separated from the observation channel and the lamina is opened under direct vision in order to avoid the risk of nerve damage from trephines on the uniaxial canal.

The interference of lumbar paraspinal muscles in UBE has attracted increasing attention from researchers [10-12]. Ahn Jae-Sung found that significant postoperative changes in the paraspinal muscles of UBE surgery by comparing the MRI scans [13]. The changes would last for several months and the extent of soft tissue irritation increases with increasing operation time. The working space out of the laminar was created by bipolar radiofrequency probes splitting and continuous rinsing with saline. If the beginner was not familiar with this procedure, the more detachment of the paraspinal muscles from the lamina would be performed, and the surgical time was prolonged. In this case, according to the position of the migrated nucleus pulposus on the preoperative Imaging examination, we made the lower layer of the fifth lumbar lamina the target edge point, and moved the conventional incision position of dual-channel endoscopic surgery to the head side properly. The use of self-designed guidelines can quickly establish the surgical field, in addition to simplifying the operation process. Through the two-portal technique, we were able to check whether the migrated nucleus pulposus had been completely removed through two different angles of view by exchanging the view channel and work channel. The postoperative VAS scores for back and leg pain showed good clinical outcomes that completely disappeared 6 weeks

after surgery. No residual nucleus pulposus or paravertebral muscle damage was found by MRI scans examination.

Conclusion

The use of self-designed guidelines can quickly establish the surgical field, in addition to simplifying the operation process, reducing soft tissue dissection and intraoperative fluoroscopy.

Announcement: All authors have contributed to the creation of this manuscript for important intellectual content and read and approved the final manuscript. We declare there is no conflict of interest.

Reference

1. Li Z, Zhang C, Chen W, Li S, Yu B, Zhao H, Shen J, Zhang J, Wang Y, Yu K. Percutaneous Endoscopic Transforaminal Discectomy versus Conventional Open Lumbar Discectomy for Upper Lumbar Disc Herniation: A Comparative Cohort Study. *Biomed Res Int*. 2020 Mar 2;2020:1852070. [PMID: 32190653 DOI: 10.1155/2020/1852070]
2. Choi G, Lee SH, Lokhande P, Kong BJ, Shim CS, Jung B, Kim JS. Percutaneous endoscopic approach for highly migrated intracanal disc herniations by foraminoplasty technique using rigid working channel endoscope. *Spine (Phila Pa 1976)*. 2008 Jul 1;33(15): E508-15. [PMID: 18594449 DOI: 10.1097/BRS.0b013e31817bfa1a]
3. Sh L, Bu K, Y A, G C, Yg C, Ku A, Sw S, Hy K. Operative failure of percutaneous endoscopic lumbar discectomy: a radiologic analysis of 55 cases. *Spine (Phila Pa 1976)*. 2006 May 1;31(10):E285-90. [PMID: 16648734]
4. Hwa Eum J, Hwa Heo D, Son SK, Park CK. Percutaneous biportal endoscopic decompression for lumbar spinal stenosis: a technical note and preliminary clinical results. *J Neurosurg Spine* 2016; 24: 602–607. [PMID: 26722954 DOI: 10.3171/2015.7.SPINE15304]
5. Eun SS, Eum JH, Lee SH, Sabal LA. Biportal Endoscopic Lumbar Decompression for Lumbar Disk Herniation and Spinal Canal Stenosis: A Technical Note. *J Neurol Surg Part Cent Eur Neurosurg* 2017; 78: 390–396. [PMID: 27652804 DOI: 10.1055/s-0036-1592157]
6. Sp S, J H, T E, D F, J B, Pr C. The unique characteristics of ‘upper’ lumbar disc herniations. *Neurosurgery* 2004; 55. [PMID: 15271245 DOI: 10.1227/01.neu.0000129548.14898.9b]
7. J W, C Z, W Z, Cs H, C L, Y Z. Analysis of the Characteristics and Clinical Outcomes of Percutaneous Endoscopic Lumbar Discectomy for Upper Lumbar Disc Herniation. *World Neurosurg* 2016; 92. [PMID: 27168234 DOI: 10.1016/j.wneu.2016.04.127]
8. Yüce I, Kahyaoglu O, Mertan P, Çavuşoğlu H, Aydın Y. Analysis of clinical characteristics and surgical results of upper lumbar disc herniations. *Neurochirurgie*. 2019 Aug;65(4):158-163. [PMID: 31100349 DOI: 10.1016/j.neuchi.2019.04.002]
9. Gx L, Cw P, Tk S, V K, Sg J, Js K. Full Endoscopic Technique for High-Grade Up-Migrated Lumbar Disk Herniation via a Translaminar Keyhole Approach: Preliminary Series and Technical Note. *J Neurol Surg Part Cent Eur Neurosurg* 2020; 81. [PMID: 32045944 DOI: 10.1055/s-0039-1700574]
10. Park S-M, Kim G-U, Kim H-J, Choi JH, Chang B-S, Lee C-K, Yeom JS. Is the Use of a Unilateral Biportal Endoscopic Approach Associated with Rapid Recovery After Lumbar Decompressive Laminectomy? A Preliminary Analysis of a Prospective Randomized Controlled Trial. *World Neurosurg* 2019; 128: e709–e718. [PMID: 31077891 DOI: 10.1016/j.wneu.2019.04.240]
11. Hong Y-H, Kim S-K, Hwang J, Eum J-H, Heo D-H, Suh D-W, Lee S-C. Water Dynamics in Unilateral Biportal Endoscopic Spine Surgery and Its Related Factors: An In Vivo Proportional Regression and Proficiency-Matched Study. *World Neurosurg* 2021; 149: e836–e843. [PMID: 33540105 DOI: 10.1016/j.wneu.2021.01.086]
12. Wang H, Wang K, Lv B, Li W, Fan T, Zhao J, Kang M, Dong R, Qu Y. Analysis of risk factors for perioperative hidden blood loss in unilateral biportal endoscopic spine surgery: a retrospective multicenter study. *J Orthop Surg* 2021; 16: 559. [PMID: 34526051 DOI: 10.1186/s13018-021-02698-7]
13. Choi K-C, Shim H-K, Hwang J-S, Shin SH, Lee DC, Jung HH, Park HA, Park C-K. Comparison of Surgical Invasiveness Between Microdiscectomy and 3 Different Endoscopic Discectomy Techniques for Lumbar Disc Herniation. *World Neurosurg* 2018; 116: e750–e758. [PMID: 29787880 DOI: 10.1016/j.wneu.2018.05.085]