

# Treatment of cervical spondylotic radiculopathy by posterior foraminal resection of nucleus pulposus

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**Abstract:** To introduce the surgical technique of percutaneous posterior foraminal resection of cervical disc herniation in our hospital and the clinical results of 1 case. [Methods] Imaging diagnosis was C6-7 disc herniation and compression of left nerve root and dural sac. After adequate preoperative preparation, posterior foraminal resection of cervical disc herniation was performed. [Results] The prolapsed nucleus pulposus tissue was removed successfully, and the pain and numbness symptoms of the patient's neck and shoulder were improved on the first day after surgery, and the surgical incision healed well. One week later, the range of motion of the cervical spine and the function of the vertebral body were restored, and the pain and numbness symptoms completely disappeared. [Conclusion] Nucleus pulposus excision by posterior percutaneous foraminal approach in the treatment of cervical disc herniation has good clinical effect and prognosis.

**Keywords:** foraminal endoscopy, nucleus pulposus extraction, vertebral stabilization, radicular cervical spondylosis, grinding articular process

## 1. Introduction

Cervical disc herniation (CDH) is a common clinical disease with high incidence, which is manifested by pain and numbness of neck, shoulder and upper limbs, accompanied by pain of lower limbs and walking weakness[1]. As the change of the rapid modern life, modern people increasingly depend on the desk for a long time, in the long term cervical physiological curvature change, stability of the vertebral body destruction, no obvious cause cervical vertebra is slightly outside force, or easy to make the oppressive nerve root cervical intervertebral disc herniation and spinal cord related clinical symptoms, has become the medical community attention hot spot[2]. Clinical treatment of cervical disc herniation is usually preferred to conservative treatment to improve patients' symptoms, and surgical treatment is used for patients who fail to receive conservative treatment[3]. Current common methods of intervertebral disc herniation surgery is divided into open surgery for cervical spine and intervertebral foramen microscopically[4], the extraction of nucleus pulposus compared with traditional open surgical operation, intervertebral foramen microscopically not only safe and reliable operation, and the extraction of nucleus pulposus and little damage to neck muscles and the stability of the vertebral bodies, have less intraoperative bleeding, postoperative rehabilitation the advantages of the fast good prognosis[5]. This paper focuses on the treatment of cervical intervertebral disc herniation by posterior foraminal resection of nucleus pulposus and a case of clinical observation.

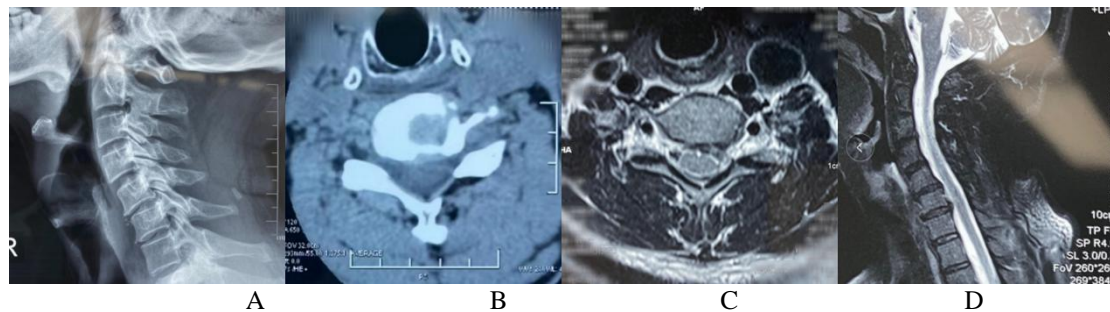
## 2. Clinical data

Patient Fan XX, male, 58 years old, conscious neck pain for 2 years, aggravated with left upper limb numbness for 4 days.

Physical examination on admission revealed: cervical scoliosis, cervical spinous process tenderness (++) , neck rotation test (-), tenderness at the medial edge of the left scapula (+), left brachial plexus pulling test (+), foraminal compression test (+), numbness at the left fingertip. Radiographs showed labial changes at the edge of the C5-7 vertebral body and narrowing of the C5-6 vertebral space. CT showed herniated disc at C6-7 with compression of the left nerve root and dural sac. MRI results showed that the curvature of the cervical spine became straighter, and the local disc shadows of 0.4, 0.2,

0.3 and 0.4cm above the posterior margin of the corresponding pyramids were observed at the posterior margin of the horizontal disc at C3-4, C4-5, C5-6 and C6-7, showing signs of narrow neck. The adjacent subarachnoid space was compressed and the spinal canal at the corresponding plane showed stenosis. Circular long T1 and long T2 signal shadows were seen in the intervertebral foramen at right C6-7 and left C7-T1 levels. Cervical disc herniation was diagnosed and the patient met the surgical indications.

Before surgery, the patients were placed prone on the operating table. After anesthesia, the surgical area was located and the needle entry point was determined with the assistance of C-arm X-ray fluoroscopy, and the nucleus pulposus was removed under intervertebral foraminal microscope. The operation was successful, and the protruded nucleus pulposus tissue was removed without intraoperative complications such as hemorrhage, nerve injury or dural tear. The X-ray film showed that the intervertebral space was equal height, and the compression of nerve root and dural sac was relieved. On the first day after operation, the patient's sleep quality was significantly improved, neck motion and function were basically restored to normal. The incision healed well 14 days after operation. Six months after the operation, the cervical spine DR reexamination showed that all the vertebrae were located in the normal anatomical position, the intervertebral space was equal height, the stability of the vertebral body was normal, and the intervertebral disc was not prolapsed. Cervical spine flexion 80°, extension 70°, lateral flexion 40°, rotation 80°.(In the figure below, A and B are preoperative imaging data; C and D are postoperative imaging data)



### 3. Surgical operation

#### 3.1 Preoperative preparation

C-arm X-ray machine, 4mm diameter cervical foraminal lens system, radiofrequency ablation system, image display and acquisition system.

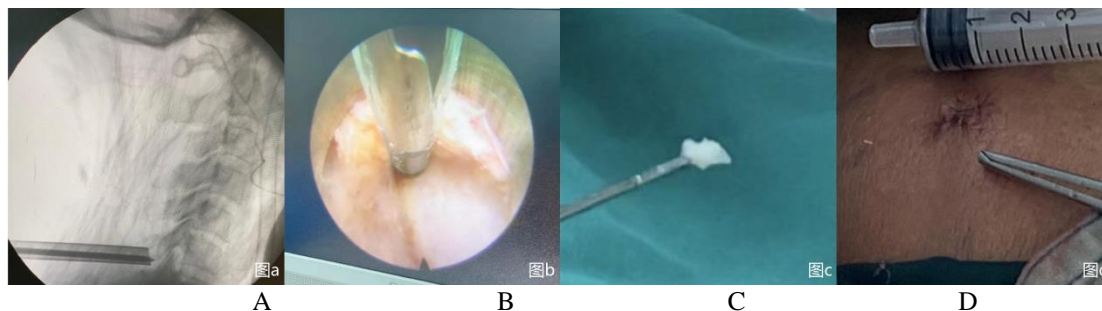
#### 3.2 Posture position and anesthesia method

The patient was prone on the operating table, and local infiltration anesthesia was used to assist intravenous sedation and anesthesia.

#### 3.3 Surgical procedure

After the general anesthesia was successful, the patient was placed in the prone position, the head was placed on the head frame, and the cervical spine was slightly flexed and fixed. A locator was used to determine the C6-7 intervertebral space under the fluoroscopy of the C-arm X-ray machine and marked with a marker. After conventional disinfection, a needle was inserted at 1.5cm near the spinous process of the C6-7 vertebral body, and a 1cm longitudinal incision was made. A fine guide needle was used to puncture to the lamina under the fluoroscopy guidance of the C-arm X-ray machine to determine the prominent intervertebral space, with the guide needle as the center. With moderate size trephine since C6 - based channel 7 vertebral plate gap, step by step to replace casing expansion into the metal tube operation channel, after installation of endoscopic head and adjust the view direction, show the catheter, see C6-7 nucleus pulposus into the spinal canal, the left side of the oppressed nerve returning for intervertebral disc herniation congestion, edema, tension is bigger and longitudinal ligament after adhesion, thickening of yellow ligament. The spinal nerve root was protected, the protruded nucleus pulposus was exposed, the annulus fibrosus was cut with a plasma knife, and the degenerated nucleus pulposus tissue was chewed off with a nucleus pulposus forceps. The compression

of the nerve root was investigated to be released. The surgical channel and endoscope were pulled out and the wound was sutured layer by layer.(In the figure below, A is the metal surgical channel tube; Fig. B shows excised denatured nucleus pulposus tissue.Fig. C shows the removed nucleus pulposus tissue. Figure D is the sutured surgical wound)



### 3.4 Postoperation

After the instruments and gauze were checked, they should be wrapped.The intraoperative bleeding was about 10ml. The operation was smooth and the patient returned to the ward safely after the operation.

## 4. Discuss

With the progress of The Times, the development of minimally invasive surgery is changing with each passing day.Nowadays, the minimally invasive concept has been widely concerned and recognized by people and has become a clinical hot topic[6]. Especially in the treatment of cervical spondylotic radiculopathy, it has great advantages compared with traditional surgery, such as stable operation, less damage to the stability of the vertebral body, less intraoperative bleeding, quick postoperative recovery, good prognosis and fewer recurrence.Patients usually recover normal neck function one week after surgery[7].The application of foraminal endoscopic treatment of spinal disorders has been widely used in clinical practice and has been widely recognized by doctors and patients.

Foraminal endoscopic technique first appeared in Europe and the United States and was applied clinically, but its clinical indications were relatively narrow due to the immature technology at that time. After it was introduced into China, modern doctors continuously developed and improved it, and it has made great progress in both operating technology and surgical equipment. More and more new technologies, such as laser, radiofrequency ablation system, intraoperative navigation system and surgical robot system, have been widely used in clinical treatment, bringing a new wave of development boom for foraminal endoscopic technology. From the initial treatment of simple vertebral nucleus pulposus prolapsed to the current widely used in a variety of vertebral degenerative diseases for 360°decompression in the spinal canal and the treatment of spinal tumors, its minimally invasive adaptability is far higher than the traditional surgery. With the continuous breakthrough and innovation in the indications of foraminal endoscopic technology, there are more excellent clinical efficacy and decreasing intraoperative complication rate and recurrence rate. Minimally invasive technology not only brings good news to patients, but also brings a new technical revolution to the surgical operation technology in the medical field.

This patient was diagnosed with cervical disc herniation according to the diagnostic criteria of "Applied Osteology". The use of foraminal endoscopic treatment of cervical disc herniation, removal of the prolapsed nucleus pulposus, improvement of nerve and dural sac compression, mainly from the patient's physical condition, the typical manifestations of clinical symptoms, the prolapsed degree of nucleus pulposus, the stability of the vertebral body, postoperative rehabilitation and other comprehensive considerations. Discuss the complete operation plan before surgery, and formulate corresponding countermeasures for various conditions that may occur during the operation. During the operation, the cervical spine was operated under posterior approach microscopy, the puncture point was located under the C-arm X-ray film, and the foraminal lens was placed to observe whether the soft tissue, ligamentum flava, and the articular process of the upper and lower joints affected the surgical operation, and the operation was cleaned and cleaned. The protruding nucleus pulposus was removed with nucleus pulposus forceps to relieve the compression. The surgical procedure was standardized and

reasonable. After the removal of the protrusion nucleus pulposus tissue, the patient's sleep was significantly improved. One week after the operation, the neck pain disappeared, and the patient's activity and function were basically restored.

In the author's opinion, the application of foraminal nucleus pulposus extraction in the treatment of cervical spondylotic radiculopathy has unique clinical advantages :(1) Due to the small opening of foraminal surgery, muscle pulling is avoided, so the risk of postoperative infection is reduced, and the exogenous stability of the vertebral body is less damaged, which can effectively maintain the stability of the spine[8].(2) The use of foraminal endoscopy can effectively avoid the neck blood vessels and nerves, and reduce the possibility of intraoperative bleeding and nerve injury.(3) The advantages of foraminal surgery, such as less cervical vascular injury and avoidance of muscle pulling, are conducive to accelerating postoperative recovery and improving postoperative quality of life of patients[9].(4) For experienced physicians, foraminal endoscopic treatment is not only simple, quick, safe and efficient, but also much lower in intraoperative complications and postoperative recurrence than traditional surgery[10].

Interforaminal nucleus pulposus extraction has unique clinical advantages, but it also has some limitations. It is different from traditional surgical operations, because the scope of visual field is narrow under the microscope, and if the blood vessel ruptures and bleeds, the lens is not clear and the surgical accuracy is affected [11].Microscopic surgery requires operators to undergo standardized systematic learning and master perfect anatomical knowledge, so as to accurately locate, avoid injury, and improve surgical accuracy and clinical healing effect[12].In particular, the treatment of complex cervical disc herniation needs to be carefully handled. Studies have shown that the intraoperative risk of complications of foraminal disc herniation and mixed disc herniation is much higher than that of simple disc herniation[13].Therefore, corresponding surgical adjustments should be made according to the patient's indications in clinical application.

Posterior foraminal resection of the nucleus pulposus is a minimally invasive technique with promising development, with rapid efficacy and efficient operation, which has been unanimously recognized by doctors and patients. However, whether it is clinically applicable to all patients with intervertebral disc herniation and whether its long-term efficacy is reliable needs further investigation and study.

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