

# Intraspinal schwannoma: a case report

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**Abstract:** Intraspinal schwannomas are the most common benign tumors in the spinal canal, accounting for about half of the benign tumors in the spinal canal. They originate from the sheath of nerve roots, and most of them are located in the extramedullary subdural space. Most of them originate from the posterior root of the spinal nerve, and the affected nerve is fusiform and usually solitary. Clinically, once diagnosed, surgery should be performed. The posterior approach laminectomy is the most common surgical method. In this paper, a case of spinal schwannoma underwent surgical treatment. It was found that the preoperative MRI examination was inconsistent with the actual location of the tumor during the operation. The report is as follows.

**Keywords:** Schwannoma, Surgical treatment, the lumbar spine, case report

## 1. Introduction

Schwannomas originate from schwann cells in the nerve sheath and account for about 29% of intravertebral canal tumors [1]. Its property belongs to benign tumor, appear rarely evil change commonly, and give priority to with single hair. Lesions are usually concentrated in soft tissues, but rarely occur in bones [2]. Schwannoma intra-spinal canal is also known as schwann cell tumor, early onset of the disease, the clinical symptom is not obvious, as the illness in delay, tumor volume increasing, oppression and local spinal cord blood vessels, patients may appear along the nerve to walk line parts radioactive pain, or the nerve distribution sensorimotor function obstacle, moreover the onset of paralysis. MRI provides diagnostic basis before diagnosis, and pathological examination is the gold standard for the definite diagnosis of spinal schwannoma. At present, surgical resection is still the main treatment for the spinal schwannoma. After reviewing the literature in the past 10 years, the author found that reports on intraspinal schwannoma were rare. One case of intraspinal schwannoma was diagnosed and treated in our hospital on December 21, 2020, and the report is as follows.

## 2. General information

A 69-year-old male retiree was admitted to the hospital for "lumbar discomfort accompanied by pain in the left lower extremity for 3 years and aggravation for 1 week". The patient developed lumbar discomfort without obvious inducement 3 years ago, accompanied by pain in the left lower extremity, which was slightly relieved after rest. The patient and his family members did not pay attention to it without any treatment, and the recent pain was significantly aggravated, accompanied by movement disorder in the left lower extremity. Then the lumbar spine was shown by DR in another hospital: "(1) Hyperosteo-geny of the lumbar spine; (2) Mild scoliosis of the spine." As shown in figure 1. In order to seek further treatment, the patient came to my department to see a doctor, and the outpatient department was called "(1) Lumbar degenerative disease." Income my department. Symptoms of admission: My mind was clear, my spirit was good, my waist was uncomfortable, my left lower limb had pain when walking, no headache and dizziness, no nausea and vomiting, my diet and night rest were OK, my defecation was normal. Past health. Physical examination: Mild scoliosis of the spine, tenderness and percussion pain (++) near the left spinous process in L2 and L3/4, pain radiating from the left buttocks to the lateral leg, and slightly reduced sensation in the front and medial sides of the left lower limb. No obvious abnormality was observed in muscle strength and muscle tone of limbs. Bilateral straight leg raising test (+), heel-knee shin test (-), 4-word test (-), bilateral Babinski sign

(-).Lumbar MRI was performed: "(1) Placement of multiple blood supply and mixed signals in the spinal canal at the lumbar level 2 was considered, and ependyma was considered;(2) lumbar 1/2, lumbar 2/3, lumbar 3/4, lumbar 4/5 intervertebral disc herniation, lumbar 3-sacral level ligamentum flavum hypertrophy, secondary spinal canal stenosis; (3) Hyperostosis of the lumbar vertebrae and deformity of some vertebral endplates." As shown in figure 2. Diagnosis: (1). Ependymoma? (2) Multiple lumbar disc herniation with spinal stenosis. Based on the pursuit of quality of life, patients and their families have a strong desire for surgery. After discussion in the department, it was believed that the disease was in line with the surgical indications. After communication with the patient and his family members, the patient required surgical treatment, active preoperative preparation, and selected a posterior median approach of hemilaminectomy + intravertebral canal occupancy resection.



Figure 1 shows anteroposterior and lateral radiographs of the lumbar spine

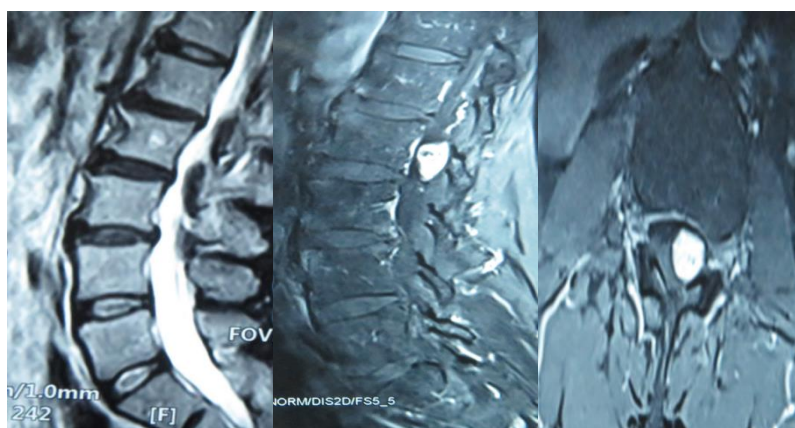


Figure 2 shows the enhanced MRI scan of the lumbar spine

### 3. Surgical procedure

After the general anesthesia of tracheal intubation took effect, the patient was placed in a prone position, with the second lumbar spine as the center, from the upper to the first lumbar spine, and from the lower to the fourth lumbar spine, with a length of about 10cm. Routine disinfection was performed in the operative area, the skin and subcutaneous fascia were cut layer by layer, and the electrosurgical knife was separated along the posterior midline to fully expose the lumbar lamina, spinous process and articular process. With rongeur biting except the lesion of vertebral lamina and yellow ligament, retain the lateral articular process, the medial basal parts to the spine, remove fat outside the catheter, previously cut, see a lot of clear cerebrospinal fluid flow, the second lumbar plane under visible float pink tumors, tumor texture soft, blood vessels supplying the merge with horsetail nerve is buckling, and surrounding the tumor, stripping the tumor and spinal cord, nerves, blood vessels, adhesion, use the tumor removal of tumor, complete resection of the tumor is about 1.5 \* 2 \* 2.5 cm, specimens sent disease inspection, carefully separate mutual confluence blood vessels and horsetail nerve, after the bipolar electric coagulation of blood vessels, cut off blood vessels, rinsed repeatedly, There was no active bleeding, the dura was sutured tightly, and the defect of the dura was repaired by artificial dura. The drainage tube was punctured extradural and the muscle, subcutaneous and skin were sutured tightly in layers. Postoperative pathological examination of the lesion tissue indicated intraspinal

schwannoma accompanied by hemorrhage, as shown in Figure 3.

Postoperative management: closely observe the signs of the nervous system, give nutrition nerve, anti-infection, improve circulation treatment, and pay attention to prevent complications such as pressure sores. The dressing of the incision was changed regularly and the stitches were removed two weeks after the operation.

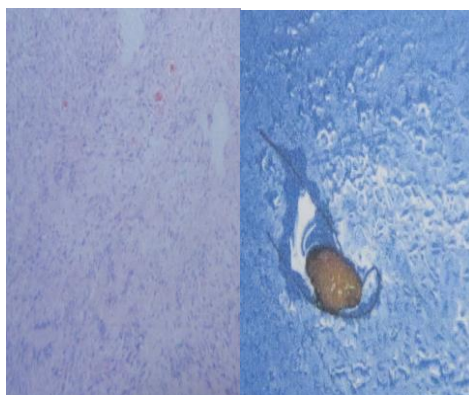


Figure 3 shows an intraspinal schwannoma with hemorrhage on histological examination of the lesion.

#### 4. Discuss

Intraspinal schwannoma is one of the common types of spinal cord tumors, accounting for about 50% of benign spinal cord tumors. It can occur in all spinal canal segments, most of which are single [3], and the sheath of nerve root is its origin, most of which are located in the extramedullary subdural space [4]. The disease can occur in any age group, but the age at which it is most likely to occur is between 20 and 50 years old, and the incidence has no obvious relationship with gender [1]. The etiology of spinal schwannoma remains unclear, and its pathogenesis may be related to the lack of NF1 mutation, which is associated with neurofibromatosis type I [5]. The lesions are usually located in the surrounding soft tissues, spinal cord and nerve roots, showing expansionary growth. The periphery is wrapped by a thin film, which is a discrete, well-defined round to oval lesion with a clear boundary and soft texture, rarely invading to the adjacent tissues [6]. Under the microscope, Schwann cells can be arranged in bundles or palisades, with wavy cytoplasmic projections and obvious vascular images [7].

The initial stage of this disease is relatively insipid, with no significant specific clinical symptoms and signs. The first symptom is sensory disturbance, especially pain at night, which may be caused by the tumor movement driven by the fluctuation of cerebrospinal fluid when lying supine, leading to tumor stimulation of sensory nerve roots [8]. With the development of the disease and the aggravation of the disease, spinal canal stenosis or lumbar disc herniation appeared after the compression of the huge tumor on the spinal cord and nerves [9]. According to different lesions, the corresponding clinical symptoms are also different. If the lesions occur in the neck, there will be neck pain accompanied by bilateral upper limb numbness, pain and fatigue. If the lesion occurs in the thoracic segment, the patient will have numbness, pain and fatigue in unilateral or bilateral lower extremities. Patients with lesions in the lumbar segment will have unilateral lower limb numbness and fatigue; Patients with lesions in the sacral segment generally have no obvious clinical symptoms [10].

Magnetic resonance imaging (MRI) is the first choice for the preliminary diagnosis of spinal schwannoma, because the working principle of MRI is to rely on magnetic field and radio frequency pulse to stimulate the hydrogen atoms in human water molecules (H+) to generate the Nutation to generate radio frequency signals [11], which can well develop the situation of soft tissue, spinal cord, nerve root and tumor [12]. Intraspinal schwannomas showed equal or slightly lower signal intensity under T1WI window, and slightly higher signal intensity under T2WI window. If cystic necrosis occurs in the tumor, T1WI signal is lower and T2WI signal is higher than before. If the tumor is accompanied by hemorrhage, both T1WI and T2WI show high signal development [13], but this type of tumor generally hemorrhages, so calcification almost does not occur. Enhanced scanning showed uniform enhancement in the parenchyma of the tumor, no enhancement in the cystic necrosis area, but circular or lacy cystic wall enhancement. In addition, due to the contralateral displacement of the spinal cord by tumor compression, the space between the subarachnoid space on both sides is not equal, and the typical "subdural sign" appears [13]. Therefore, MRI can preliminarily determine the nature and

prognosis of the tumor by plain scanning and enhancement of the pathological tissue. More importantly, the lesion site can be accurately positioned to determine the range of surgical resection for the next step. Fang Yuan et al. [14] collected 56 patients with spinal canal tumors as clinical research objects and performed MRI plain scan + enhancement, confirming that MRI plain scan + enhancement can accurately locate the location of spinal canal tumors and to a certain extent determine the nature of tumors, which has high clinical diagnostic value for spinal canal tumors.

In terms of treatment, surgical resection is still the preferred treatment at present. Spinal canal occupying resection can eliminate the compression of the spinal cord nerve by tumor and restore the nerve function. At the same time, during tumor resection, the influence on the biomechanics and stability of the spine should be minimized, especially for the vertebrae with large load such as the lower thoracic vertebra and lumbar vertebrae segments [6]. Therefore, for different levels of spinal canal tumors, there are certain differences in the selection of surgical methods. Cervical spinal canal schwannomas at different levels are usually treated by posterior cervical laminectomy. For spinal schwannomas in thoracic, lumbar and sacral segments, half laminectomy or total laminectomy through posterior median approach is often selected according to the different positions of the lesion tissue in the spinal canal, and spinal internal fixation or bone graft fusion is feasible according to the specific segment. In this case, hemilaminectomy was performed with a posterior midline approach, which preserved the integrity of the lateral facet and capsule of the spine, minimized the impact on the biomechanics and stability of the spine, and also reduced intraoperative bleeding and complications.

Due to the similar clinical symptoms of spinal canal tumors, it is easy to be misdiagnosed clinically, so it needs to be differentiated from the following diseases: (1) Neurofibroma: originated from neuroblasts, the cell rehearsal close, hard texture, rarely cyst necrosis, and most of the multiple, very rare single, the tumor was spindle-shaped, and no envelope was wrapped, easy to invade the surrounding tissue. The most common hair area is located in the cerviothoracic region, and rarely in the lumbar region [15]. MRI showed that the tumor signal was relatively uniform with obvious central enhancement. Due to the difference of tissue composition in different parts of the tumor, the peripheral area showed slightly high signal and the middle area showed low signal, showing a typical "target sign". Meningioma: originated from arachnoid endothelial cells or dural fibroblasts, the cell rehearsal is dense, the tumor texture is hard, cystic necrosis is rare, was round or round, and small volume. The disease can occur at any age, but the most easily induced age is 30-60 years old, and the incidence of female is higher than that of male, and the lesion site is mostly concentrated in the upper thoracic segment. MRI showed punctate irregular low signal in the tumor, which may be caused by calcification of the tumor. The broad base of a meningioma is adhered to the dura, presenting a typical "dural tail sign". (3) Ependymoma: is the most common type of spinal cord tumor, originated from the ependymal cells, the tumor is mostly fusiform or round, the edge is clear, there is extrusion on the surrounding tissue rather than invasion, most of the single lesions, combined with multiple lesions is rare. Imaging findings: isointensity or slightly hypointensity under T1WI, isointensity or slightly hyperintensity under T2WI; In addition, the tumor is prone to bleeding, resulting in the accumulation of hemosiderin, showing extremely low signal shadow under T2WI, which is a typical "cap sign". And the tumor is prone to cystic degeneration and necrosis, resulting in secondary syringomyelia. In the case of enhancement, homogeneous enhancement can be observed, and occasionally uneven enhancement may occur due to tumor hemorrhage or cystic necrosis, but there is no cystic wall enhancement, which forms the key point of differentiation from the cystic wall enhancement of schwannoma.

In summary, spinal schwannoma is a benign spinal cord tumor, which tends to occur in soft tissues such as the spinal cord. The initial stage of the disease is relatively insipid, without significant specific clinical symptoms and signs. With the continuation of the disease, a series of spinal nerve compression symptoms will appear. Pathological examination is the gold standard for the definite diagnosis of this disease, and MRI can provide the diagnostic basis for the definite diagnosis. Surgical resection is the preferred treatment after diagnosis of the disease. The disease is easy to be misdiagnosed and missed in clinical practice, so clinicians should improve their understanding of the disease in work.

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