

# Clinical Analysis of Primary Thoracic and Lumbar Intraspinal Tumors Misdiagnosed as Lumbar Intervertebral Disc Herniation: Report of 19 Cases

Xiaobin Luo<sup>1</sup>, Fubing Yang<sup>2</sup>, Hui Yu<sup>3</sup>, Lu Liu<sup>4</sup>, Youlin Xu<sup>5</sup>, Shangyi Xu<sup>6</sup>

## ABSTRACT

**Introduction:** Intraspinal tumors were primary and secondary tumors that occurred in the spinal cord, nerve roots, meninges and the tissue of the wall of vertebral canal. Study aimed to analyze the misdiagnosis causes of intraspinal tumors misdiagnosed as lumbar intervertebral disc herniation, and to reduce the rate of clinical misdiagnosis.

**Material and Methods:** Clinical data of 19 patients with intraspinal tumors misdiagnosed as lumbar intervertebral disc herniation were retrospectively analyzed, and the respective characteristics, essentials for diagnosis and differential diagnosis of the two different kinds of diseases were summarized. The misdiagnosis causes were analyzed, and the prevention measures were put forward.

**Results:** All the misdiagnosed patients' data on MRI were collected, and then they received operative treatment. Histological diagnosis results showed that there were 13 cases of schwannomas, 3 cases of meningiomas, 2 cases of ependymomas, and 1 case of angiomyolipoma. In 1~36 months' follow-up, pain of all the patients was alleviated. Eighteen patients were healed, and only one patient still felt numbness at left hip and left leg. No patient reoccurred or died.

**Conclusion:** Though there were similarities in early clinical manifestations between intraspinal tumors and lumbar intervertebral disc herniation, these two different kinds of diseases can be identified by collecting the case history detailedly, performing physical examination carefully, and choosing the imaging examination appropriately to avoid misdiagnosis.

**Keywords:** Lumbar Intraspinal Tumor, Lumbar Intervertebral Disc Herniation, Misdiagnosis, Missed Diagnosis, Intraspinal Tumor.

## INTRODUCTION

The incidence of intraspinal tumor accounted for about 15% of central nervous tumors.<sup>1-2</sup> The intraspinal tumors were predisposed to occur at the age of 40-49 years old, with slightly more females than males, and the pathological types were schwannoma, meningioma, ependymoma and so on.<sup>3</sup> The most common early symptom of spinal cord tumors was radicular pain, which was caused by the compression and traction of dura mater, which resulted in the stimulation of the dorsal root of the spinal nerve, posterior horn cell of spinal cord and then caused pain. The location of the pain was consistent with tumors plane. It was of great significance for tumors localization diagnosis. It was the primary symptom of extramedullary space occupying lesions. When

the sensory fibers were compressed by intraspinal tumors, leading to hypoesthesia and paresthesia, the sensory fibers would be destroyed and sensation would lose. When the anterior nerve roots and the anterior horn of the spinal cord were compressed by intraspinal tumors, it would cause limb movement disorder and reflex abnormalities.<sup>4</sup>

The symptoms of intraspinal tumors compressing nerves were similar to those of lumbar disc herniation (LDH) compressing nerve roots, so how does LDH come about? How does the epidemiological characteristics and clinical manifestations? Prolapse of lumbar intervertebral disc refers to a disease characterized by lumbar and leg pain caused by degenerative changes of lumbar intervertebral disc, partial or total rupture of fibrous ring under external force, protrusion of the nucleus pulposus and cartilage endplate alone or together, stimulation or compressed of sinuvertebral nerves and nerve root. The prolapse of lumbar intervertebral disc was predisposed to occur at the age of 20-50 years, males are more than females, most of the patients have a history of bending down or long-term sitting. LDH was mainly clinical manifestation as low back and leg pain, radiation pain of the affected side be stimulated and compressed, and syndrome of cauda equina even occurs when the cauda equina nerve be compressed.<sup>4</sup>

<sup>1</sup>Graduate Student, Department of Neurosurgery, The Affiliated Hospital of Southwest Medical University, Luzhou, Sichuan Prouince, 646000, China, <sup>2</sup>Professor, Department of Neurosurgery, The Affiliated Hospital of Southwest Medical University, Luzhou, Sichuan Prouince, 646000, China, <sup>3</sup>Graduate student, Department of Neurosurgery, The Affiliated Hospital of Southwest Medical University, Luzhou, Sichuan Prouince, 646000, China, <sup>4</sup>Graduate Student, Department of Neurosurgery, The Affiliated Hospital of Southwest Medical University, Luzhou, Sichuan Prouince, 646000, China, <sup>5</sup>Graduate Student, Department of Neurosurgery, The Affiliated Hospital of Southwest Medical University, Luzhou, Sichuan Prouince, 646000, China, <sup>6</sup>Graduate Student, Department of Neurosurgery, The Affiliated Hospital of Southwest Medical University, Luzhou, Sichuan Prouince, 646000, China

**Corresponding author:** Fubing Yang, Department of Neurosurgery, The Affiliated Hospital of Southwest Medical University, Luzhou, Sichuan Prouince, 646000, China

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When the LDH and intraspinal tumors had obvious symptoms, the obvious imaging changes can be seen by MRI examination. At this time, the tumor has increased significantly, so we need early diagnosis and early to performed MRI examination. The advantages of MRI examination were that there was no ionizing radiation damage to the human body, it can obtain multi-directional images, the soft tissue structure was clearly displayed, and it can provide more abundant image information. Therefore, for the patients that suspected of intraspinal tumors, the earlier to do the MRI examination, the more beneficial to patients.<sup>5</sup>

In conclusion, since the onset of intraspinal tumors was concealed and the clinical symptoms were atypical in early stage and there were no specific symptoms, so this disease was easily misdiagnosed.<sup>6</sup> Intraspinal tumors and LDH were two kinds of diseases. Their pathogeny and pathology were different. Once misdiagnosed, it was easy to delay the treatment and bring adverse consequences. It was reported that there were many cases the intraspinal tumors were misdiagnosed as LDH.<sup>7-9</sup> The rate of misdiagnosis of the disease related to the symptoms of the compressed spinal cord and cauda equina was 29%, of which spinal cord tumors and LDH accounted for 17% respectively.<sup>8</sup> Those patients with neurological dysfunction caused by intraspinal tumors combined with disc herniation were more likely to be ignored. We retrospectively analyzed the diagnosis and treatment of patients with intraspinal tumor misdiagnosed as LDH in department of neurosurgery and spinal surgery from January 2004 to March 2015 and discussed the causes of missed diagnosis and misdiagnosis. It was helpful for early diagnosis and avoidance of misdiagnosis and missed diagnosis of intraspinal tumors in the future.

## MATERIAL AND METHODS

This group of data contained 19 patients, 12 males and 7 females, aged 43.6 years on the average (ranging from 16 to 69). All of them were single lesions. The course of disease ranged from 3 months to 20 years, with an average of 2 years and 7 months.

### Clinical manifestations and imaging characteristics

The primary symptoms were mainly about lumbosacral pain without inducement, progressive aggravation with radiation pain or sensorimotor abnormalities in one or both lower limb extremities. For physical examination, There were 4 cases of thoracolumbar percussion pain, 5 cases of lower back percussion pain, lower back percussion pain with one sided or bilateral lower extremity radiation pain, 7 cases of straight-leg raising test positive, 9 cases of paraspinal muscle limitation of tenderness, 9 cases of perineal skin sensation hypaesthesia, 12 cases of superficial hyposensation of lower leg local skin, 3 cases of hyposensation of both lower limbs skin, and there muscle strength about III-IV grade, 2 cases of hyposensation of medial skin of proximal right thigh, and ipsilateral thumb extension muscle strength were reduced. 19 cases of lumbar intervertebral disc abnormalities were found by lumbar CT examination outside the hospital, there

were 1 case of L1/L2 bulging, 1 case of L2/L3 protrusion, 3 cases of L3/L4 protrusion, 3 cases of bulging, 3 cases of L4/ L5 was prominent, 4 cases of were bulging, 1 case of L5/S1 was prominent. 19 cases underwent lumbar spine MRI examination in outpatient department of our hospital. 18 cases were found intraspinal space occupying lesions, included 3 cases at T10-T12 level epidural, 7 cases at subdural level, 4 cases at T11-L1 level horizontal subdural, 3 cases at L2-S1 level horizontal subdural, 1 case in L4 plane nerve root canal. There was 1 case that subdural space-occupying lesions at the T9 level were not detected by CT imaging, but found by whole spine MRI later.

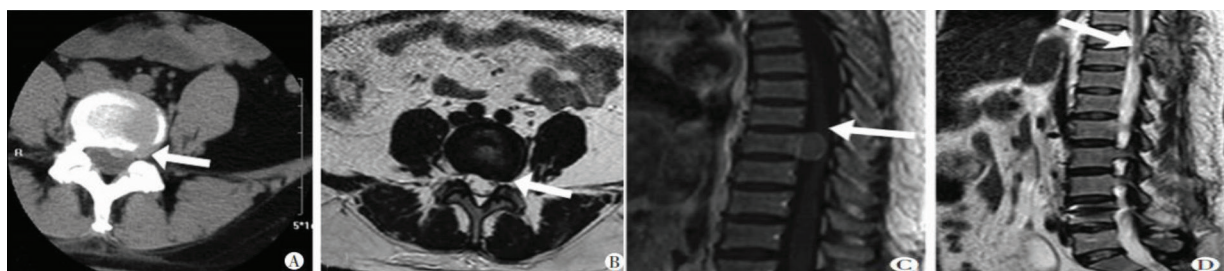
### Treatment

All patients underwent completely whole spine MRI before surgery and the preoperative fluoroscopy localization. The incision was made through posterior median approach, layer by layer, then vertebral plate, spinous process and attached ligaments were exposed, and spinous process and lamina were bit (Some operator were willing to use ultrasound bone knife to open the spinous process and lamina), then depending on the location of the tumor, operator determine whether to open the dura mater to removed tumors. Besides, microscope was used to remove tumors completely. The specimens were sent for pathological examination after operation. In postoperative, anti-inflammatory, analgesic and neurotrophic treatments were performed, and individualized rehabilitation therapy was chosen according to the recovery situation. MRI was reexamine before patient going away hospital.

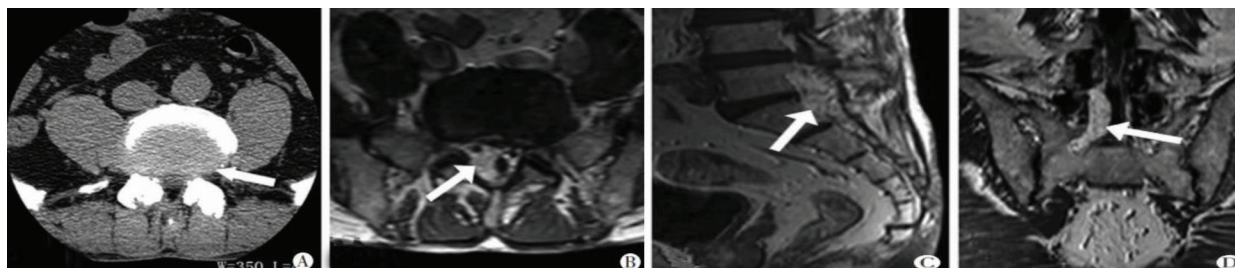
### Typical cases

#### Case report 1

A 44- year-old woman with a 1-years history of lumbosacral pain and left lower limb pain with numbness for 3+ months was admitted to spine surgery department. The patient was without any history of trauma, In the physical examination, patient in L4-L5 spinous process and paraspinal percussion pain, straight-leg raising test was positive on the left side. the metatarsal dorsal extension muscle strength has III grade and the foot dorsal medial sensation decreased in the left lower extremity. L4/L5 disc herniation (Fig. 1A, B) on Lumbar CT and MRI. The tenth day after operation, the patients appearance motor disturbance symptoms of both lower limbs and aggravated progressively, meanwhile her muscle strength of both lower limbs gradually decreased to grade with the umbilical plane and perineal sensation decreased. The bilateral pathological signs were positive in her both lower extremity. By perfecting the whole spine MRI, it was found that T9 vertebral canal occupying lesion of horizontally, lesion be considered a tumors (Fig. 1C). Subsequently, the patient was transferred to neurosurgery and posterior approach small bone window was opened to resect the intraspinal space occupying lesions at T9. Occupying lesions were confirmed by pathology was meningioma. The patient was treated by surgery symptoms of pain and numbness be alleviated (Fig. 1D). The patient muscle strength in lower limb and sensation recovered in



**Figure-1:** CT and MRI findings of meningioma in patients



**Figure-2:** CT and MRI findings of L5, S1 intraspinal angiomyolipoma in patients; A) Axial CT scan image at lumbar vertebrae shows L4/L5 disc herniation (especially left); B-D) MRI axial, sagittal and coronal position shows right spinal canal tumor at the L5-S1 horizontal.

discharge after one month.

A. Axial CT scan image at lumbar vertebrae shows L4/L5 disc herniation (especially left posterior border) with the dural sac be compressed.

B. Axial T1 weighted MRI image of the lumbar vertebrae shows L4/L5 disc herniation in preoperative.

C. Sagittal contrast-enhanced MRI imaging of full spine shows extramedullary subdural space-occupying lesions at the T9 level.

D. Sagittal T2 weighted imaging of full spine shows the tumor be integrity excision.

### Case report 2

A 69-year-old man with a 20-years history of lumbago and right lower limb pain with numbness for more than 2 months was admitted to spine surgery department. Half a year ago, owing to cervical disc herniation, the patient had undergone decompression and internal fixation. In the physical examination, percussion pain was found in the patient's L3-L5 spinous process and paraspinal. The patient muscle strength of limbs was normal. Physical examination found that sensation decreased in the rear of the right thigh, included the posterolateral area of the lower leg and the lateral area of the foot decreased sensation, and symmetrical bilateral knee reflex decreased. By perfecting the lumbar three-dimensional reconstruction, L3/4, L4/L5 disc herniation, L5/S1 disc bulging, L5/S1 disc degeneration were found (Fig. 2A). The department of Spinal Surgery department was scheduled to undergo lumbar discectomy. By perfecting the lumbar MRI, the irregular strip-like high signal on the right side of the L5-S1 horizontal spinal canal, compressed and displacement of adjacent cauda equina and filament terminalis were showed. Abnormal signal shadow was enhanced on T2-weighted MRI, and the boundary was clear (Fig. 2B, C, D). Patient was transferred to neurosurgery department for operation. Postoperative pathology confirmed that L5-S1 spinal angiomyolipoma. Symptoms of the patient

disappeared after the operation.

## RESULTS

### Misdiagnosis and mistreatment results

19 patients underwent non-surgical treatments such as acupuncture, traction and physiotherapy outside the hospital, ranging from one month to six years, with an average of 9.6 months. The lumbago of 15 patients were alleviated, but the limb symptoms did not improve obviously and even aggravated gradually. After non-surgical treatment, six patients underwent discectomy. However, it was confirmed that there was no improvement after operation and one patient had progressive paralysis of both lower limbs after operation.

### Final diagnosis

The resected specimens were confirmed by pathology, 13 cases of schwannoma, 3 cases of meningioma, 2 cases of ependymoma and 1 case of angiomyolipoma. All the 19 patients were followed up for 1 to 36 months. All the patients were obvious relieved with pain. 18 patients were recovered basically, 1 case remained numbness of left buttock and left lateral leg, and no death or recurrence occurred.

## DISCUSSION

Intraspinal canal tumors, most of which were in the thoracic segment, can occur in any segment of the spinal cord, and the patients were quite often in the 20-50 years old. The different age groups of different tumor types were slightly different. LDH was a syndrome of intervertebral disc degeneration, rupture of annulus fibrosus, nucleus pulposus stimulation, compressed of nerve roots and cauda equina, causing recurrent episodes of low back pain and buttock pain.<sup>10</sup> Canale et al considered that disc herniation was a complication of disc degeneration in dysfunction and instability.<sup>11</sup> The initial clinical symptoms of intraspinal tumors were easily confused with the clinical manifestation of LDH. Without

carefully identifying, it would be misdiagnosed and missed diagnosis easily. Foreign literature had reported that the rate of misdiagnosis of the disease related to the symptoms that spinal cord and cauda equina were compressed was 29%, of which spinal cord tumors and LDH accounted for 17% respectively.<sup>8</sup> Many low-grade intraspinal tumors are often misdiagnosed as LDH and even surgically treated incorrectly. Symptoms such as sensory disorders and motor dysfunctions in limbs, and gait, which were similar to the clinical manifestations of disc herniation, were common in cervical spinal canal tumor and Chiari malformation, so it was a reason to make misdiagnosis.<sup>12-13</sup>

In this group of data, 16 cases were missed diagnosis and misdiagnosed in the external hospital, 5 cases were wrong operation in the external hospital, and 3 cases were missed and misdiagnosed in other departments of our hospital, and 1 case was misoperation. The reasons for misdiagnosis were analyzed as follows. Firstly, early symptoms were not typical. In the initial stage of low spinal canal tumors, only lumbar and back pain were found, but nervous system examination was negative. With the tumor growing much larger, the dysfunction of spinal cord and cauda equina were more severe accordingly. Clinical manifestation of cauda equina compressed in central LDH was very similar to symptoms of tumor. LDH was the most common cause of low back pain. Because of the formulaic thinking of clinicians, it was easy to cause missed diagnosis. In this group, 13 patients had only lumbar and dorsal pain at first, and 12 patients had local sensory abnormalities in unilateral lower limbs, which were similar to LDH and easy to be misdiagnosed. Patient in Case 2, orthopedics had connected the patient to the operating room, and is planned to perform discectomy and internal fixation. Neurosurgeon considered that it would be intraspinal tumors after accidentally reading CT graphs in the operating room, and then stopped the operation and transferred the patient to operating room of neurosurgery department for the resection of spinal canal tumors. Secondly, characteristic expression was neglected. Nocturnal resting pain was one of the symptoms of the tumor. When the patients with intraspinal extramedullary tumors were resting or pulling quietly, the physiological curvature of the spinal canal changed and the pressure difference between the upper and lower tumors altered, then the nerve compressed was aggravated, resulting in an increase in pain.<sup>14</sup> The asymmetry of radiation that radiates to the legs at different times is exacerbated by the repose, which was an important clinical feature of extramedullary tumors in the spinal canal. Patient in Case 1 had a history of long-term nocturnal resting pain, and there was a typical sensory plane loss at admission, but it was ignored, resulting in missed diagnosis and mistreatment. Thirdly, the style of diagnostic thinking was rigid. The straight-leg raising test was a common test for the diagnosis of LDH, which was of clinical significance, but the accuracy and the detection rate was low.<sup>15</sup> Young physicians often thought that diagnosis of LDH could be made by the positive result of straight-leg raising test. But without the medical history collecting and physical examination carefully, error

analysis would lead to missed diagnosis. In case 1, only the lumbar spine MRI was reexamined, but the scanning range was insufficient. On the other hand, the nature of pain was not analyzed, the clinical symptoms and signs such as abnormal range of sensation were not accurately collected, the injury of upper motor neuron or lower motor neuron was not distinguished, so the possibility of tumors was neglected, leading to misdiagnosis. It was an important lesson that the whole spine MRI examination should be performed before the progressive paralysis of both lower limbs. Fourthly, with insufficient vigilance and incomplete understanding of the intraspinal tumor, the essence of these disease were confused. The compressed caused by nucleus pulposus protrusion to the posterior longitudinal ligament and adjacent nerve roots, which stimulated the nerve roots to cause radiation pain in the ipsilateral lower limbs, was the main reason of LDH. The pain was persistent while it could be alleviated in supine position and aggravated when activating. Intraspinal canal tumors were mainly nerve roots pain caused by compression of nerve roots and dural sacs. These symptoms, which were atypical, often occurred at night spasmodically and could be alleviated after resting, meanwhile coughing can cause the intraspinal pressure to rise, then induce or aggravate pain. These features were easily overlooked. On the other hand, the intraspinal tumor combined with LDH was common in clinical practice, so we should raise our awareness of attention and identification. Fifthly, inappropriate image selection. When receiving patients with low back pain, only part the inspection of CT be performed was insufficient. Since the lumbar CT only scan the lumbar intervertebral space, and the poor resolution of the intraspinal tissue was poor, the intraspinal space-occupying lesions located on the vertebral plane could be missed easily. Nevertheless, lumbar MRI, which was able to multi-azimuth, multi-plane and multi-parameter imaging, was better to resolute soft tissue. It could clearly show the location, extent, signal characteristics of the tumor and its relationship with adjacent tissues. It had become a reliable technique for the qualitative diagnosis and differential diagnosis of intraspinal lesions.<sup>16</sup> Comprehensive MRI can obtain a more adequate diagnosis basis to avoid misdiagnosis and missed diagnosis, so once the intraspinal tumor was suspected, the MRI scan should be performed early.

## CONCLUSION

Clinical misdiagnosis and missed diagnosis cause great harm to patients, and it was also easy to cause medical disputes. According to the data of this group, the following experiences and avoidance measures were summarized, Firstly, strengthen learning and expand interdisciplinary knowledge and broaden diagnosis ideas. Secondly, attach importance to the collection of medical history. Comprehensive medical history inquiry and detailed physical examination were necessary, and then analyze these materials carefully. All measures we took should be based on medical evidence. Thirdly, pay attention to "Monism", but do not deny "multiple theory". We should not make diagnose

optionally because of typical symptoms, meanwhile, we cannot miss diagnosis because of atypical symptoms. The medical thinking should be flexible and logical. Fourthly, since conditions varied from person to person, we should make diagnosis and treatment plan depending on the disease. Accordingly, the selection of whole spine MRI for patients could not only avoid aggravating the economic burden of patients, but also improve the efficiency of diagnosis and treatment effectively, thus avoiding misdiagnosis and missed diagnosis.

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