

# Mobile Schwannoma of the Cauda Equina for Which Intraoperative Myelography Was Useful in Locating

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## Abstract

We report on a case of a mobile schwannoma of the cauda equina. The patient was a 24-year-old woman who visited our hospital with the chief complaints of low back pain and numbness of the right leg. A tumor was noted from the L2 midbody level to the L3 upper endplate on preoperative MRI and myelogram. During the surgery, a right L2 hemilaminectomy was performed, and the dura was incised, but no tumor was founded in the surgical field, and this was noted as a missing tumor. Intraoperative myelography showed that the tumor had moved to the adjacent vertebra on the caudal side. Myelography applied again to the caudal side of the mobile tumor. Then, the tumor had moved upward, and could be excised without an additional laminectomy.

## Keywords

Mobile Tumor, Schwannoma, Intraoperative Myelography, Cauda Equina

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## 1. Introduction

The spinal schwannoma is the most common intradural extramedullary neurogenic tumor. It arises from nerve root sheath that is relatively well marginated with little attachment or adhesion to surrounding tissue. Schwannoma with abnormal mobility is rare, and only 43 cases have been reported including our patient [1]-[17]. However, these reports were limited to cases confirmed on preoperative examination, and many tumors may have been excised without noticing that they were mobile.

A clinical problem is a missing tumor on excision. Previous papers have re-

ported that additional laminectomies or resurgery have been required to remove the mobile tumor [1] [2] [3] [6] [7] [8] [11] [13] [14] [18]. We treated a patient for whom intraoperative myelography was applied, to search for a missing tumor that was not observed after dural incision during surgery. The tumor was then found and could be excised without an additional laminectomy.

## 2. Case Report

Patient: A 24-year-old woman.

Chief complaints: Low back pain and numbness of the right leg.

History of present illness: Low back pain and numbness of the right leg appeared 8 months before, and had worsened gradually. The patient was referred to our hospital.

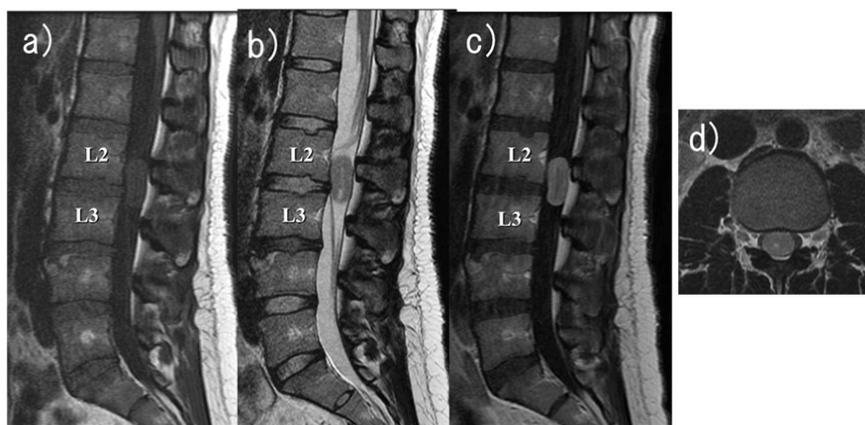
Physical findings on admission: The tendon reflexes and muscle strength were normal in both legs. Hypesthesia was noted on the posterior surface of the right thigh. There was no pain at night.

Imaging findings: No significant finding, such as calcification, was observed on plain X-ray radiography. A  $2.5 \times 1.5 \times 1.0$ -cm tumor with enhanced contrast and a clear boundary was present at the center of the L2 vertebra over the upper margin of the L3 vertebra on magnetic resonance imaging (MRI). T1-weighted imaging showed isointensity, and T2-weighted imaging showed low intensity (**Figure 1**).

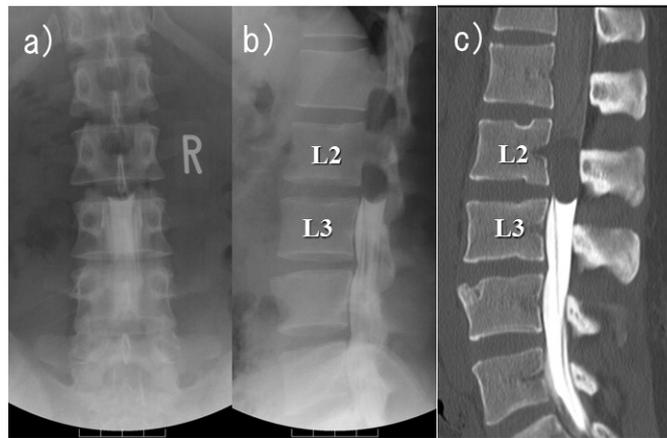
Myelogram: A saddle-shaped shadowless region rising sharply from the dura at the upper margin of the L3 vertebral body was noted (**Figure 2**).

Based on the above findings, the patient was diagnosed with schwannoma of the center of the L2 vertebra over the upper margin of the L3 vertebra. Low back pain was exacerbated after a change in sitting position on the day after myelography, which was the day before surgery.

Intraoperative findings: Based on the preoperative imaging findings, a right hemilaminectomy of L2 was performed. The dura was incised, but the tumor



**Figure 1.** Preoperative MRI. A tumor with enhanced contrast with a clear boundary was present at the center of the L2 vertebra over the upper margin of the L3 vertebra: a) Sagittal T1-weighted image; b) Sagittal T2-weighted image; c) Gadolinium-enhanced sagittal T1-weighted image.



**Figure 2.** Preoperative myelogram and subsequent computed tomography (CT). A saddle-shaped shadowless region was noted at the upper margin of the L3 vertebra on myelography through L4-5: a) Frontal image; b) Lateral image; c) Lateral CT image after myelography.

was absent in the surgical field. Thus, intraoperative myelography was performed urgently through the incised dura. The cranial end of the tumor was present at the center of the L3 vertebra because it had moved to the lower adjacent vertebra from the position observed on the preoperative MRI and myelogram (**Figure 3**). Irrigation was applied, but the tumor still did not appear in the surgical field, and excision would have been difficult unless a laminectomy was applied. Suspecting further downward movement of the tumor, we applied myelography through the region between L4 and L5. The tumor moved slowly upward and appeared in the incised dural region with infusion of contrast medium, and the tumor was excised (**Figure 4**).

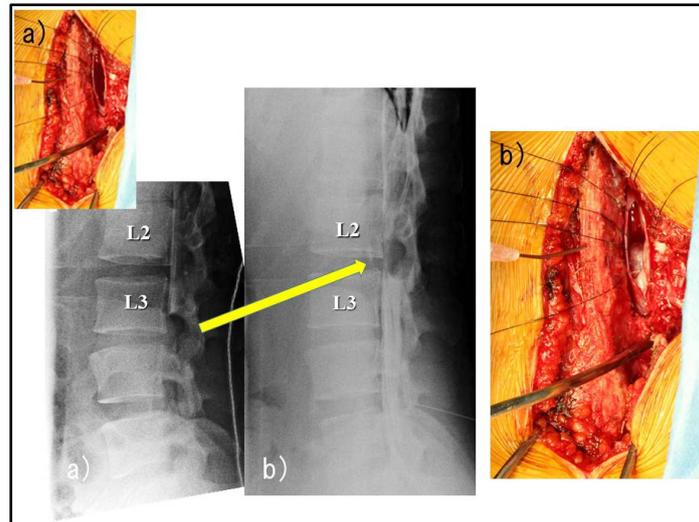
Pathologically, the tumor was diagnosed as a schwannoma (**Figure 5**). One year after surgery, mild hypesthesia was noted on the posterior surface of the right thigh, but the low back pain had resolved and the patient's recovery was uneventful.

### 3. Discussion

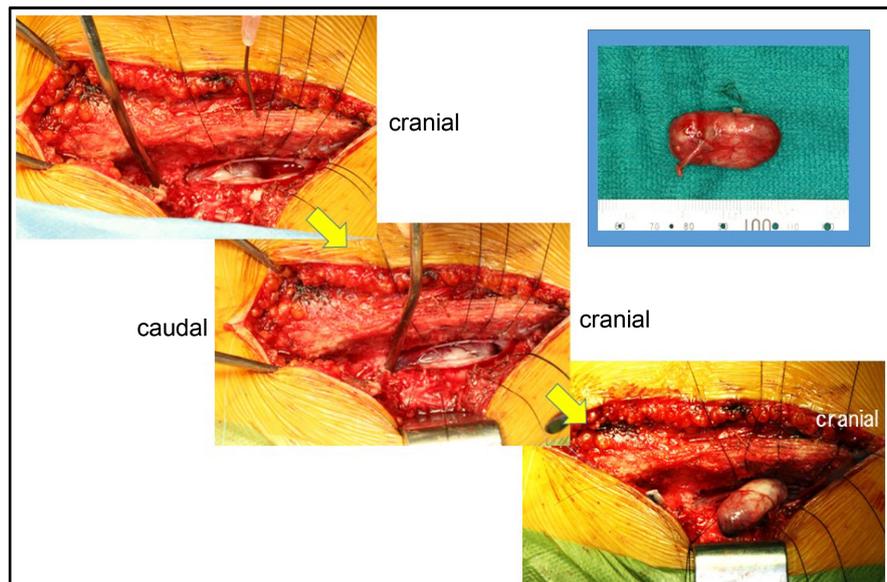
The incidence of schwannoma is high among tumors developing in the cauda equina, and mobile tumors have been reported. There are several possible mechanisms to explain such mobility: 1) tumor development from a redundant nerve; 2) expansion of the subarachnoid space by the spinal cord deformed by the tumor; 3) changes in cerebrospinal fluid pressure caused by postural changes, respiration, jumping, coughing, or straining; and 4) changes in cerebrospinal fluid pressure after removal of cerebrospinal fluid by lumbar puncture or infusion of contrast medium in myelography.

When excising a tumor showing abnormal mobility, laminectomy of multiple vertebrae corresponding to the mobile range of the tumor identified on preoperative examination has been reported [10] [15] [17].

In cases of an intraoperative missing tumor, Tavy *et al.* [13], Fujiwara *et al.* [2]



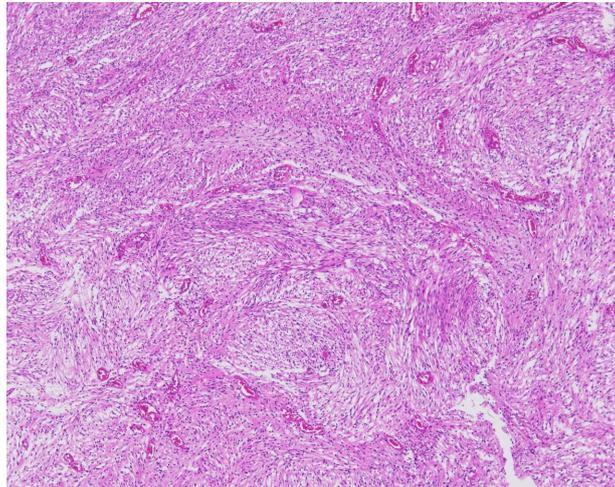
**Figure 3.** Intraoperative myelogram and photographs: a) Myelography through the incised dura. The cranial end of the tumor was present at the center of the L3 vertebra; b) Ascending myelography through L4/5. The caudal end of the tumor was present at the upper margin of the L3 vertebra.



**Figure 4.** Intraoperative photograph. The tumor had moved upward gradually with the infusion of contrast medium and appeared in the incised dural region.

and Khan *et al.* [6] performed resurgery, Hollin *et al.* [3] applied laminectomy to T12 through L5, and Murai *et al.* [18] performed laminectomy over an extended region. Friedman *et al.* [1], Marin-Sababria *et al.* [8], Kim *et al.* [7], and Terada *et al.* [14] recently reported that an additional laminectomy was required inevitably.

To prevent missing tumors, reexamination by preoperative MRI [4] [5] [9] [14], an intraoperative ultrasonography [1] [11] [14] [16], and an intraoperative myelography [2] [4] [7] [10] [11] [12] [18] are recommended. However, each



**Figure 5.** Photomicrograph. The surgical specimen showing a schwannoma of Antoni type A tissue. H & E,  $\times 40$ .

procedure has some problems. Routine application of MRI a second time is costly, intraoperative ultrasonography must be performed after laminectomy, and the tumor may move after infusion of contrast medium and postural change during the intraoperative myelography.

We performed a hemilaminectomy of L2 in this patient based on the preoperative imaging diagnosis, but the tumor was absent in the surgical field, and was noted as a missing tumor. The tumor was localized by urgent intraoperative myelography, which showed that it had moved upward during the myelography applied on the caudal side. This allowed us to excise the tumor without needing an additional laminectomy. However, we should have performed a reexamination by MRI when the symptoms had changed, and suggested mobility of the tumor before surgery [4] [9].

Except for meningiomas, most cauda equina tumors are mobile, and the mobile range is a single vertebra in many cases. Thus, when a part of the tumor becomes visible in the surgical field after irrigation or postural change, it can be scooped out and excised without the need for an additional laminectomy. In this patient, the tumor may have become incarcerated and concealed in the surgical field after dural incision because of a difference in the cerebrospinal fluid pressure between the cranial and caudal sides of the tumor.

To minimize the invasiveness of excision and to avoid a missing tumor, the surgeon must confirm whether the tumor is mobile by placing the patient in the Trendelenburg position or by using MRI and myelography applied after straining during the preoperative diagnosis. It is important to identify the mobile range accurately for cases involving a mobile tumor.

#### 4. Conclusion

We treated a patient in whom a missing tumor was identified and excised using myelography during surgery. Because many cauda equina tumors are mobile, it is important to make an accurate diagnosis which includes identifying the mo-

bile range during the preoperative examination.

### Competing Interests

None.

### Patient Consent

Obtained.

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