

## Case Report

# A Dumbbell-Shaped Meningioma Mimicking a Schwannoma in the Thoracic Spine

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A 50-year-old man presented bilateral hypesthesia on and below the T6 dermatome and paresthesia. Magnetic resonance imaging (MRI) showed an intraspinal extradural tumor, which located from the 6th thoracic vertebral body to the upper margin of the 7th vertebral body, continuing dumbbell-like through the intervertebral foramen into the right middle thorax suggesting a neurogenic tumor (neurofibroma or neurilemmoma). With the patient in a prone position, we exposed and excised the tumor via a one stage posterior approach through a hemi-laminectomy of T6. Histologic examination showed a grade 1 meningothelial meningioma, according to the World Health Organization classification. Initially, we assumed the mass was a schwannoma because of its location and dumbbell shape. However, the tumor was actually a meningioma. Postoperatively, hypesthesia resolved completely and motor power of the leg gradually full recovered. A postoperative MRI revealed no evidence of residual tumor.

**Key Words :** Meningioma · Schwannoma · Dumbbell · Spinal neoplasms.

## INTRODUCTION

Spinal dumbbell tumors were defined by Heuer<sup>9)</sup> as a group of tumors arising along the spine. They are constricted at the point they penetrate the intervertebral foramina or dura mater, assuming an hourglass (dumbbell) shape. Currently, however, the term “dumbbell tumors” does not refer to the hourglass shape but stands as a conceptual term, meaning separate tumors that connect and comprise two or more separate regions, such as the intradural space, epidural space, and locations outside the paravertebral space<sup>19)</sup>.

Schwannoma and meningioma are the two most common intraspinal tumors<sup>7,18,20,25,26,28)</sup>. Intraspinal schwannomas may occur in the spinal canal or may sometimes extend along the root to the extravertebral space through the intervertebral foramen, becoming dumbbell tumors<sup>17)</sup>. In contrast, intraspinal meningiomas usually occur in the spinal canal and do not extend through the intervertebral foramen<sup>7,16,28)</sup>. Therefore, the schwannoma commonly appears as a spinal dumbbell tumor<sup>17)</sup>; however, in rare cases, the meningioma appears as a spinal dumbbell tumor. In the literature, only few reports mention the spinal dumbbell me-

ningioma<sup>1,8,14,15,17,24,28,29)</sup>. We present a case report of a dumbbell-shaped meningioma in the thoracic spine.

## CASE REPORT

A 50-year-old man was admitted to the hospital with a 6-month history of progressive, bilateral leg weakness and numbness. For several months, he had also experienced bilateral hypesthesia on and below the T6 dermatome and paraparesis. Magnetic resonance imaging (MRI) showed an intraspinal, extradural tumor suggestive of a neurogenic tumor (a neurofibroma or schwannoma). It had grown into the thoracic spinal cord and displaced it into the right portion of the spinal canal. The tumor extended from the 6th thoracic vertebral body to the upper margin of the 7th vertebral body, continuing dumbbell-like through the intervertebral foramen into the right middle thorax (Fig. 1).

A hemi-laminectomy of T6 exposed the tumor, revealing it, with the opening of the dura, as whitish and well-encapsulated. We microsurgically dissected and removed the tumor from the spinal cord. The intraspinal portion underwent complete resection. During the operation, we performed a T5-7 transpedicular screw fixation, with posterolateral fusion because of right T6 facet and pedicle was removed partially (Fig. 3).

Histologic examination revealed a grade 1 meningothelial meningioma, per the World Health Organization classification system. Histologic section revealed sheets of meningothelial cells, with oval nuclei arranged in short fascicles (Fig. 2).

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The patient's abnormal sensation and motor function in the legs rapidly improved, and we observed no neurologic deterioration after the surgery. A postoperative MRI revealed no evidence of residual tumor (Fig. 4).

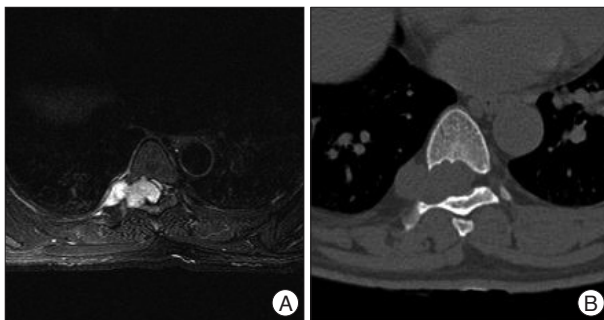
## DISCUSSION

McCormick<sup>17)</sup> reported dumbbell-shaped tumors with significant intraspinal and paravertebral involvement and also classified them into four types, based on the location of tumor : intramedullary, intradural extramedullary, epidural, and dumbbell. Differential localized tumors, such as dumbbell tumors, particularly need surgical procedures differing from those for transitional intradural extramedullary and epidural tumors.

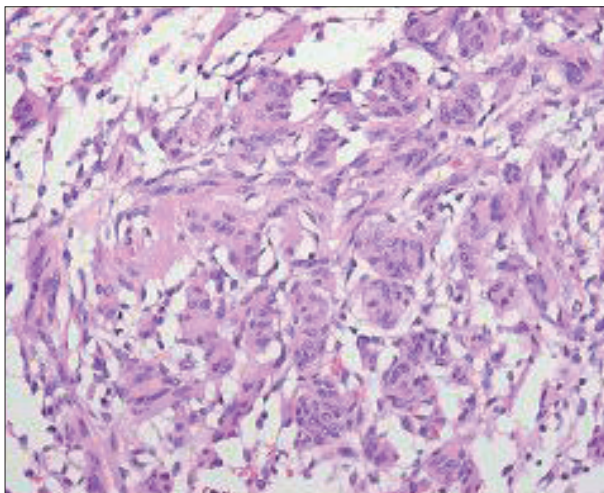
From the view point of surgical treatment, "dumbbell tumor" also means a tumor of both a distinctive shape and a location connecting two or more regions. Eden<sup>5)</sup> and Nitter<sup>12)</sup> reported the dumbbell tumor's incidence in spinal cord tumors as 13.7% and 14.2%, respectively. The rates for all spinal cord tumors were higher at the thoracic and lumbar levels than at the cervical level. However, dumbbell tumors at the cervical level ac-

counted for 44% of all dumbbell tumors<sup>19)</sup>, because the most common types of dumbbell tumors, such as the schwannoma, derive frequently from the upper cervical nerve roots and less frequently from the thoracic nerve roots<sup>6,27)</sup>. Researchers usually classify spinal schwannomas as intradural, extradural, intradural-extradural (i.e., dumbbell-shaped), and intramedullary, and they can occur at any level of the spinal column<sup>4,12,13,21-23)</sup>. However, subtle differences exist in the literature regarding the occurrence of spinal schwannomas along the spine's longitudinal axis<sup>4,12,13,21-23)</sup>. Spinal dumbbell-shaped schwannomas seem quite common, running to 10-15% of all spinal schwannomas<sup>28)</sup>. In contrast, dumbbell-shaped meningioma is rare<sup>16,17,28)</sup>. The reason why we have first decided to conclude this as schwannoma in our study is when there is dumbbell shape, schwannoma has a high incidence. Also, no sign of dural tail was shown on MRI and enhancement pattern was heterogenous.

Because researchers consider the dumbbell tumor as a typical shape for spinal schwannoma<sup>17,28)</sup>, we initially assumed the presented patient's thoracic tumor was a schwannoma. However, it was actually a meningioma. Spinal schwannomas generally arise from the Schwann cells of the dorsal nerve roots; thus, they



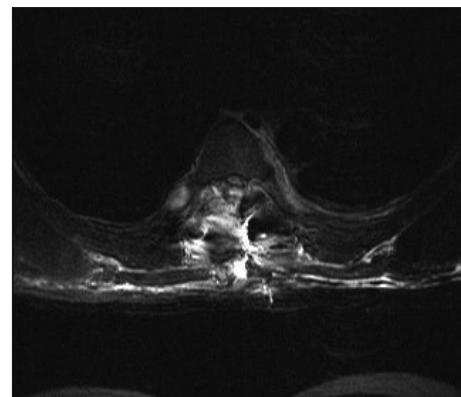
**Fig. 1.** A : T1-weighted magnetic resonance image with gadolinium contrast shows a high-intensity 3.5×3.0 cm sized dumbbell shape mass on T6-7 vertebra level. B : Computed tomogram demonstrates enlargement of neural foramen, composed thecal sac by the tumor and erosive change of vertebral body, pedicle and lamina.



**Fig. 2.** Histologic section reveals sheets of meningeothelial cells with oval nuclei arranged in short fascicles (×400, mitosis <1/10 HPF, HPS stain).



**Fig. 3.** Lateral radiogram of the thoracic spine on postoperation shows transpedicular screw fixation with posterolateral fusion, from T5 to T7.



**Fig. 4.** Postoperative axial MR image reveals no evidence of residual tumor. MR : magnetic resonance.

commonly form dumbbell tumors along the nerve root<sup>28</sup>). In contrast, spinal meningiomas often appear as globular tumors, because they originate from the arachnoid membrane, and approximately 90% are located intradurally<sup>5,28</sup>). Occasionally, meningiomas present as extradural or intradural/extradural tumors and exhibit extravertebral extension<sup>2,10</sup>). The meningioma's extravertebral extension could occur tumor growth through the intervertebral foramina, but usually to a minor extent<sup>1-3,10,11,16</sup>). However, rarely, and as seen in this patient, the extravertebral component may enlarge and make the meningioma appear as a dumbbell<sup>5,16,17</sup>). The dumbbell meningioma probably originates from the arachnoid villi at the nerve root exits<sup>5,16,17</sup>). Because there is little intraspinal space for tumor growth, a meningioma at this location is prone to grow through the dura and, subsequently, to the extradural/extravertebral space<sup>2,16</sup>). We also considered the tumor might have arisen from the arachnoid villi at the nerve root exits, because it was adhered tightly to the intervertebral foramen's posterior wall (posterior wall of intervertebral foramen).

In a considerable number of cases, surgeons excise dumbbell tumors by means of a hemilaminectomy and a facetectomy. However, postoperative instability can occur after resection of a large spinal tumor and may require surgical stabilization. After removing meningioma, we were concerned about spinal instability and thus, performed fixation.

## CONCLUSION

Differential diagnosis of intraspinal schwannoma and meningioma can be difficult because some meningiomas may present as dumbbell shape tumors on imaging study. Moreover, treatment strategies for spinal dumbbell schwannoma are widely known to researchers and clinicians while spinal dumbbell meningioma is less known for its specific surgical procedures. Therefore, surgery for a dumbbell meningioma deserves special consideration. We presented a rare case with a thoracic, dumbbell-shaped meningioma, which was excised via a one-stage posterior approach (i.e., hemi-laminectomy and transpedicular screw fixation with posterolateral fusion), because this was easier approach to the tumor and created less adhesion with the surrounding dura.

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