

*Case  
Report*

## Preferred Surgical Approach for Dumbbell-shaped Tumors in the Posterior Mediastinum

Sumiko Maeda, MD, PhD,<sup>1,2</sup> Satomi Takahashi, MD, PhD,<sup>1</sup> Kaoru Koike, MD, PhD,<sup>1</sup> and Masami Sato, MD, PhD<sup>1</sup>

We present the case of a 67-year-old male smoker with a posterior mediastinal hemangioma. Radiological findings revealed a dumbbell-shaped tumor with a neuroforaminal extension in the right paravertebral space. Under the preoperative diagnosis of a neurogenic tumor, surgery was performed using a combined anterior and posterior approach. During the thoracotomy, the tumor was found to be a hemangioma. We ligated the involved vessels before performing laminectomy, thus ensuring that complete tumor resection was achieved without massive bleeding in the spinal canal. Dumbbell-shaped hemangiomas are rare, and preoperative confirmation of the diagnosis is challenging. Thoracotomy before laminectomy is optimal for the resection of dumbbell-shaped tumors of the mediastinum, especially with marked vascularity, given that the initial thoracotomy procedures facilitate the subsequent laminectomy procedures.

**Key words:** dumbbell-shaped tumor, mediastinal hemangioma, thoracotomy

### Introduction

The location of a posterior mediastinal tumor is the key to selecting the surgical approach. When neuroforaminal extension is suspected, a combination of anterior and posterior approaches should be considered for tumor resection. Thoracotomy has been the standard choice for the anterior approach, although thoracoscopic surgery has recently become an option. The order in which the anterior (thoracotomy or thoracoscopic surgery) and posterior (laminectomy) approaches are performed usually depends on the operator's preference<sup>1</sup>; however, based on

our experience we recommend thoracotomy before laminectomy.

### Case Presentation

A 67-year-old male smoker was referred to our hospital for further investigation after an abnormal shadow was found in a chest roentgenogram during an annual screening. His history was unremarkable, and he was asymptomatic neurologically and physically.

The results of the physical examination and blood tests were normal. A chest roentgenogram revealed an egg-sized mass in the right apical lung field. Chest computed tomography (CT) revealed a well-defined oval mass in the right paravertebral space at the level between T2 and T3. The tumor was heterogeneously enhanced with contrast media and had caused scalloping of the vertebral body (**Fig. 1A** and **1B**). Magnetic resonance imaging (MRI) revealed a dumbbell-shaped tumor with a neuroforaminal extension, which had widened the intervertebral foramen (**Fig. 2A** and **2B**). The epidural lesion occupied the right half of the spinal canal, shifting the spinal cord to the left. Based on these radiological findings, the

<sup>1</sup>Department of Thoracic Surgery, Miyagi Cancer Center, Natori, Miyagi, Japan

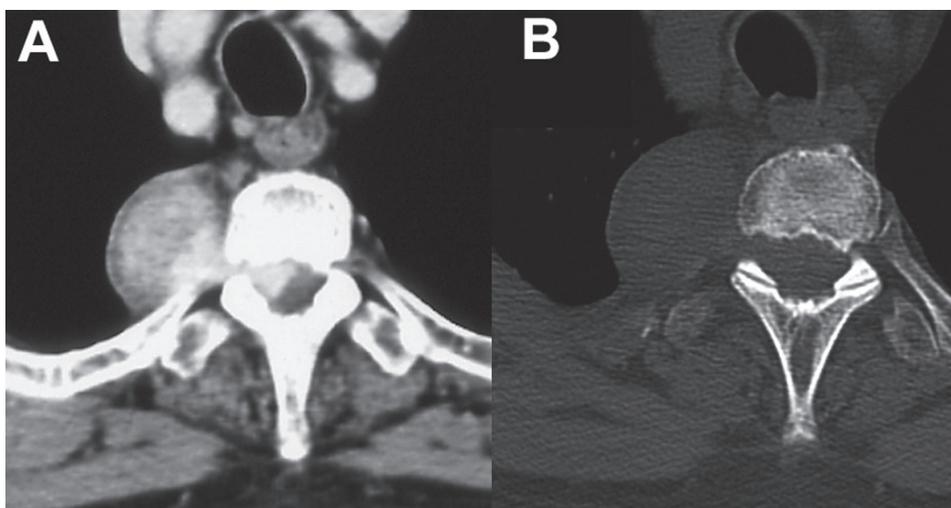
<sup>2</sup>Department of Thoracic Surgery, Tohoku University Hospital, Sendai, Miyagi, Japan

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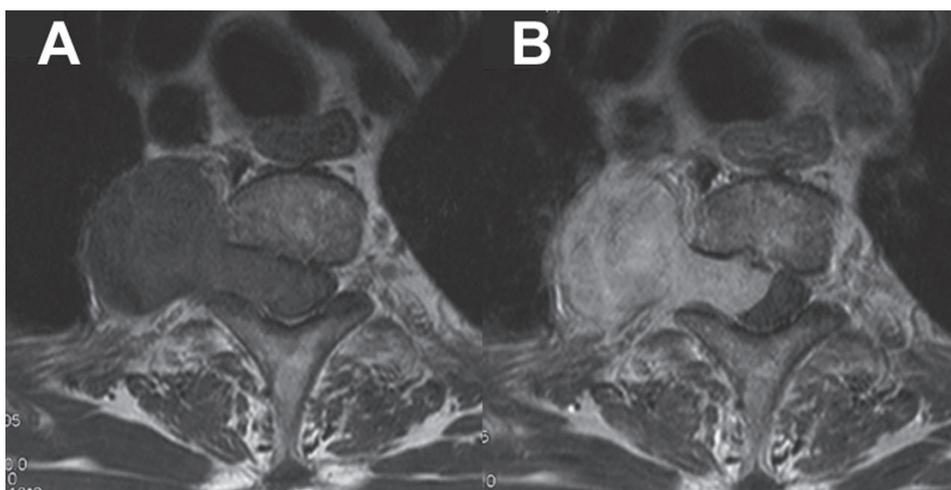
Corresponding author: Sumiko Maeda, MD, PhD. Department of Thoracic Surgery, Tohoku University Hospital, 4-1 Seiryomachi, Aoba-ku, Sendai, Miyagi 980-8575, Japan

Email: [sumaeda-ths@umin.ac.jp](mailto:sumaeda-ths@umin.ac.jp)

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**Fig. 1** Chest computed tomography scans showing a well-delineated mass in the right paravertebral space. The tumor was intensely and heterogeneously enhanced on administration of intravenous contrast medium (A). The tumor caused scalloping of the posterior margin of the vertebral body (B).



**Fig. 2** Magnetic resonance images showing a tumor with neuroforaminal extension causing widening of the intervertebral foramen. Relative to the spinal cord, the tumor was isointense in T1-weighted images (A) and hyperintense in T2-weighted images (B).

tumor was presumptively diagnosed as a dumbbell-shaped neurogenic tumor in the right posterior mediastinum.

Single-stage surgery was performed using a combination of thoracic and neurosurgical approaches. First, a right thoracotomy was used to reveal a round, smooth, richly vascular, dark red tumor in the thoracic apex. The involved intercostal arteries and veins were ligated, and the intrathoracic part of the tumor was excised. Part of the sixth costal bone was resected for later spinal stabili-

zation. The frozen section diagnosis was hemangioma. After thoracotomy, neurosurgeons performed laminectomy and facetectomy. The tumor involved the right T2 proximal root and adhered broadly to the dura at the T2 level. The T2 root was sacrificed, and the tumor was completely removed. Spinal stabilization was performed utilizing the costal bone autograft. The patient recovered without any major functional impairment. No sign of recurrence was detected during the 18 months after surgery.

## Discussion

What we learned from this case is that an evaluation of tumor vascularity is essential to decide on a surgical approach for dumbbell-shaped posterior mediastinal tumors. Especially when the tumor shows contrast-enhancement on CT images, it is likely to show marked vascularity. The greatest advantage of performing thoracotomy before laminectomy is to allow us to ligate the involved arteries while the tumor is clearly exposed. Ligation of associated arteries is the most important procedure to achieve complete resection of the tumor without massive bleeding. In addition, since the blood supply to the spinal canal comes from the posterior branches of the intercostal arteries, ligation of the involved arteries facilitates the laminectomy procedure. Massive bleeding in the spinal canal is the most frequent reason for permanent cord injury and incomplete resection of tumors involving the spinal canal.<sup>1, 2)</sup> Thoracoscopic surgery is far less suitable than a thoracotomy for managing hemorrhagic tumors. In this case, we first ligated the feeding arteries of the tumor via a thoracotomy, so we were able to complete the tumor resection without major complications. Another advantage of this method is that costal bone can be resected from the same operative site as an autograft, when spinal stabilization is required. Furthermore, there are some limited occasions when the tumor can be resected safely via a thoracotomy without the need for a laminectomy.<sup>1)</sup>

Mediastinal hemangiomas are extremely uncommon; they account for no more than 0.5% of all mediastinal tumors,<sup>3)</sup> and are very rarely found in the posterior mediastinum.<sup>4)</sup> Rather, tumors of the posterior mediastinum tend to be neurogenic,<sup>5)</sup> as are most dumbbell-shaped mediastinal tumors.<sup>1)</sup> Moreover, it is sometimes difficult to distinguish a hemangioma from a neurogenic tumor, based on the radiological findings. Typical CT findings for hemangioma are reportedly lobulation, heterogeneous enhancement with contrast media, multiple ring-like calcifications and an intact intervertebral foramen when the tumor extends to the spinal canal; however, these findings are not always observed.<sup>4, 6)</sup> MRI yields no definitive findings: both neurogenic tumors and hemangiomas are iso- to hypointense in T1 images and homogeneously hyperintense in T2 images.<sup>2, 7)</sup> Hemangioma should always be considered in the differential diagnosis of a

dumbbell-shaped posterior mediastinal tumor, even though it is a very rare entity.

Endovascular embolization has been recently used to remove a hemangioma, successfully minimizing blood loss during the operation.<sup>8)</sup> In a limited occasion, angiography and subsequent endovascular embolization might be appropriate if a tumor is strongly enhanced with contrast media on CT images. However, we should be aware that this management approach is not safe because of the risk of a spinal infarction, especially for a posterior mediastinal tumor locating at the lower level of thoracic vertebrae or extending to the intervertebral foramen.

In conclusion, we suggest that a thoracotomy before a laminectomy is the preferred surgical approach for dumbbell-shaped posterior mediastinal tumors with marked vascularity. Careful radiological evaluation and appropriate preparation to preclude profound bleeding in the spinal canal are necessary to ensure a good surgical course.

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