Challenging posterior mediastinal mass resection via a minimally invasive approach with neurological monitoring†

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Abstract

We report a novel surgical strategy for the resection of a rare type of posterior mediastinal tumour in a young patient. A melanotic schwannoma arose from the left thoracic sympathetic chain, adjacent to the origin of the artery of Adamkiewicz. Successful excision of this tumour via a minimally invasive approach without arterial or spinal cord injury was possible with the aid of neurological monitoring using spinal-evoked potentials.

Keywords: Schwannoma • Mediastinum • Minimally invasive surgery • Spinal-evoked potentials

INTRODUCTION

Schwannoma is the most common type of neurogenic tumours of the posterior mediastinum; melanotic schwannoma is an exceptional histological type [1].

During thoracic surgery for mediastinal tumours, distortion of the spinal cord blood supply could lead to paraplegia [2].

We describe the successful excision of a melanotic schwannoma via a minimally invasive approach associated with neurological monitoring using spinal-evoked potentials.

SURGICAL TECHNIQUE

A 19-year old man with no prior illness complained of recurrent left-sided thoracic pain. Physical examination was normal. Chest X-ray and thoracic computed tomography (CT) scan revealed a left posterior mediastinal mass between the eighth and ninth vertebral level (T8 and T9; Fig.1A).

Preoperative assessment included:

(i) Chest and spinal magnetic resonance imaging (MRI) revealed a 6-cm mass in the posterior mediastinum, para-spinal at the T8–T9 vertebral level, outside the intervertebral foramen (Fig. 1B).

(ii) Selective spinal angiography confirmed the origin of the Adamkiewicz artery (AKA) from the left eighth intercostal artery, which gives origin to the AKA (Fig. 1C) and

(iii) CT-guided fine-needle biopsy showed suspected cytology for a melanotic schwannoma tumour with fusiform-pigmented cells of neural origin.

Two questions were raised for consideration:

(i) Is resection indicated?
(ii) If ‘YES’, how best to avoid severe injury of the AKA and postoperative paraplegia?

After weighing the benign histology and significant perioperative risk of paraplegia against the patient’s young age and the risk of slow growth of this symptomatic tumour, we agreed on tumour resection via a minimally invasive approach with neurological monitoring using spinal-evoked potentials.

Videothoracoscopic surgery showed that the tumour arose from the left sympathetic chain. Its upper edge involved the adjacent eighth intercostal artery, which gives origin to the AKA (Fig. 2A).

We performed careful dissection along the left eighth intercostal artery using soft swab sticks and bipolar instruments (Fig. 2B). When the tumour was pulled during dissection, a decrease in amplitude of spinal-evoked potential was observed. Such effects were immediately reversed upon tumour release (Fig. 1D).

The tumour was successfully resected as one piece and was sent for histological examination, which confirmed the diagnosis of melanotic schwannoma. The immunohistochemistry showed reactivity with S-100 and anti-melanoma antibody HMB45, without any malignant behaviour (no nuclear atypia, no frequent mitosis and no necrosis). Surgical margins were sufficient for complete resection.

The patient was discharged on the second postoperative morning without complications.

COMMENTS

Benign schwannomas are the most common type of neurogenic tumours located in the posterior mediastinum [1]. The melanotic
tumour is a rare pigmented form of schwannoma, and it is vital to distinguish it from the standard schwannoma due to its unpredictable behaviour. The melanotic tumour occurs predominantly in the para-spinal region, in the spinal nerve root or in the sympathetic ganglia [3]. Though it is generally benign, the danger is its recurrence after excision, which makes long-term follow-up essential.

Radiological imaging using a thoracic CT scan and MRI of the chest and spine are useful to determine the location of the tumour and the vascular and the spinal invasions. Radiological imaging also helps in excluding the other diagnosis of a posterior mediastinal mass [1].

The diagnosis is confirmed by a histological examination, which can be supported by preoperative cytological findings by fine-needle aspiration [3].

During surgery for posterior mediastinal tumours, distortion of the spinal cord blood supply could lead to paralysis. The incidence of paraplegia after thoracotomy for thoracic surgery is approximately 0.08% [4], while in mediastinal neurogenic tumour resection it can reach 3.2% [5, 6].

In the thorax, the great anterior medullary artery is the dominant blood supplier of the spinal cord. As such, it is essential to identify the intercostal artery from which the AKA originates with the use of either magnetic resonance angiography, or spinal selective angiography [2].
Posterolateral thoracotomy has been the standard treatment for resection of posterior mediastinal tumours with satisfactory outcomes. Although it provides clear exposure, complications such as painful incision and long hospital stays are associated with it. Videothoracoscopic surgery with a minimally invasive approach provides an even better level of exposure, for precise and complete resection with less postoperative complications, shorter hospital stays, less postoperative pain and a better cosmetic appearance [7].

The combined use of AKA demonstration and motor-evoked potentials during repair of descending and thoracoabdominal aorta is known for being useful in preventing spinal cord injury. During aorta clamping and with change in motor-evoked potentials, rapid revascularization of the spinal cord should be performed [8]. To our knowledge, spinal-evoked potential has never been used in mediastinal tumours surgery. In our case, it was very helpful during tumour dissection; it provided an accurate and real-time guide to adjust the pull on the mass during dissection, which ensured vascular spinal cord safety without ischaemic deficit.

**CONCLUSION**

AKA demonstration should be routinely performed before resection of posterior mediastinal tumours. Videothoracoscopic surgery combined with neurological monitoring is both safe and accurate.

**Conflict of interest:** none declared.

**REFERENCES**