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Intraoperative neuromonitoring in thoracoscopic excision of brachial plexus schwannoma

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Abstract

Mediastinal schwannoma arising from brachial plexus are rare, but their surgical treatment could be challenging with a minimally invasive approach, given their position. Furthermore, their proximity to brachial plexus nerve fibres raises the risk for postoperative upper limb deficits. A 72-year-old man presented mediastinal schwannoma arising from the T1 nerve root. Complete surgical excision was achieved via video-assisted thoracic surgery with the aid of intraoperative neuromonitoring, and no postoperative neurological deficit developed after the intervention. Using intraoperative neuromonitoring, radical minimally invasive surgical treatment can be safely achieved for mediastinal schwannoma arising from brachial plexus.

Keywords: VATS • Neuromonitoring • Schwannoma • Brachial plexus

INTRODUCTION

Schwannoma is the most frequent neoplasm of the posterior mediastinum [1]. The preferred treatment is complete surgical excision through video-assisted thoracic surgery (VATS) [1]. Nevertheless, the tumour's anatomical location and proximity to essential structures could represent considerable obstacles, with increased risk of vascular and nervous damage [2]. We report the case of left brachial plexus schwannoma arising from its lower root (T1) protruding into the pleural cavity.

PATIENT AND METHODS

A 72-year-old male with a history of asthma and hypertension presented with a 5.5 cm × 5.4 cm × 5.1 cm paravertebral lesion on chest CT scan (Fig. 1A and B) close to T1 intervertebral foramen. Thorax magnetic resonance imaging scan was performed and revealed a narrow peduncle connecting the lesion with the anterior T1 nerve root, with radiological features suggestive of schwannoma.

After standard preoperative evaluation, surgical excision was planned. Intraoperative neuromonitoring (IONM) was arranged, including somatosensory evoked potentials (SEPs) from the median nerve, transcranial motor evoked potentials (tc-MEPs) from distal arm muscles and electromyography in free-running and triggered fashion. SEPs were set to detect peripheral nerve or brachial plexus conduction failure. On the other hand, tc-MEPs were registered on target muscles after transcranial stimulation (Fig. 1C). Neuromonitoring interpretation was performed by a dedicated neurophysiologist.

Surgery was performed by three-port VATS approach. The lesion was isolated (Fig. 2A) and eventually divided at its root from the brachial plexus (Fig. 2B). During the whole surgical time, IONM showed no pathological findings. The patient was discharged home after 3 days.

Final pathology was mediastinal schwannoma, with negative margins. Follow-up at 32 months was negative for recurrence, and no neurological deficit developed postoperatively.

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

DISCUSSION

VATS excision is considered the standard treatment for most mediastinal lesions [1]. Nevertheless, thoracotomy is still preferred if malignancy is suspected, and intraforaminal extension is present or to achieve better intraoperative control in difficult positions into the chest cavity. Surgical dissection close to subclavian vessels or brachial plexus may lead to significant injuries [1, 2].

Recently, the use of robotic surgery has been advocated to have better surgical control in these troublesome positions [3]. Nevertheless, robotic surgery is not available in every centre, and its costs and logistics are not negligible. In the rare event of mediastinal

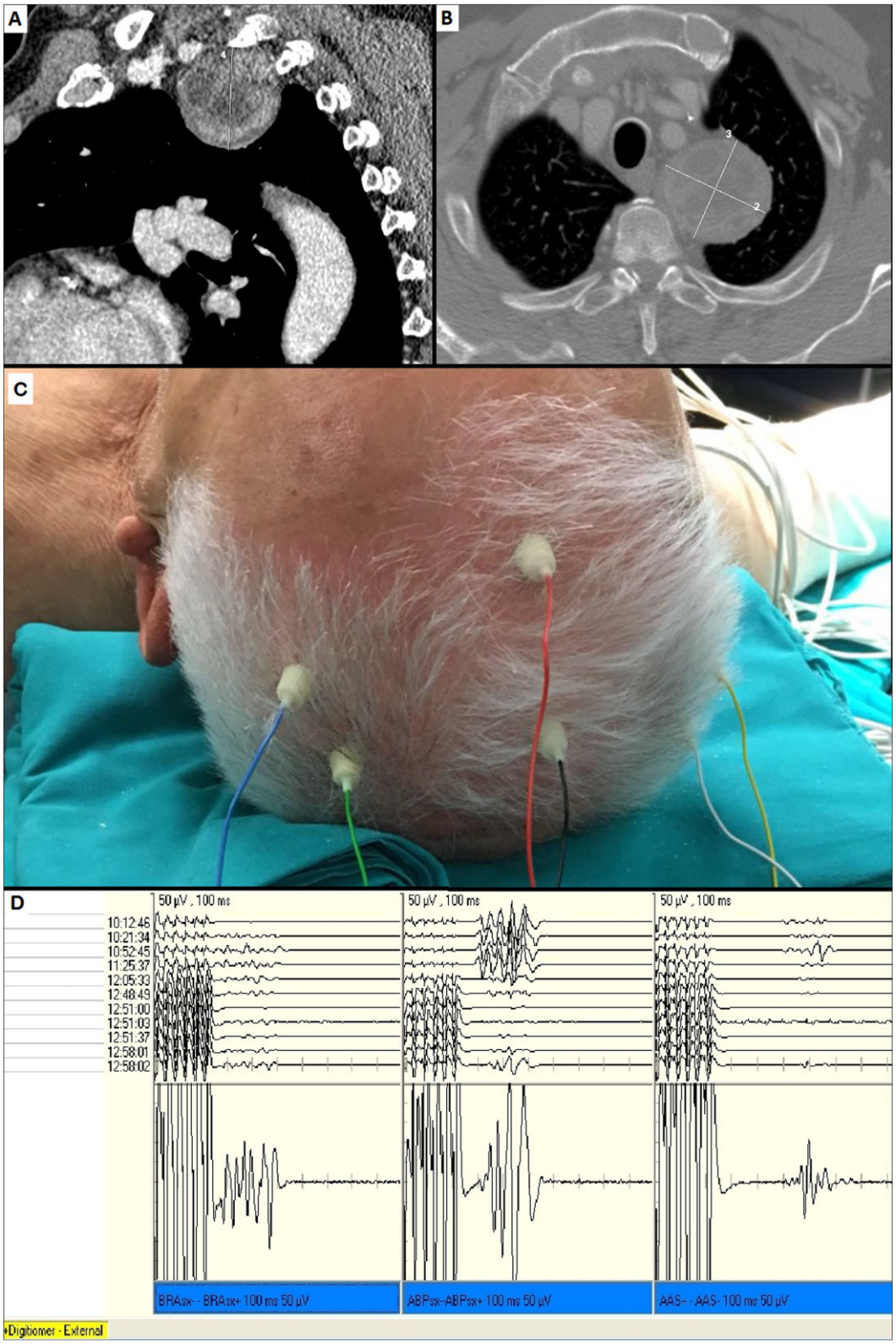

Figure 1: (**A** and **B**) Preoperative CT scan; (**C**) electrodes placement for tc-MEP; and (**D**) graphics showing electrical activity recorded from left brachial muscle (BRAsx), left abductor pollicis brevis (APBsx) and left abductor hallucis muscle (AAS).

schwannomas arising from the brachial plexus, the use of IONM has been reported to avoid damage to nerve fibres [3, 4].

Surgical manipulation can cause compression, traction and ischaemia of nerve fibres. These events show as SEPs and MEPs' reduction [5]. We aimed to detect these findings intraoperatively to minimize nerve injury, with surgical manoeuvres adjustment from real-time neurophysiologist feedback, eventually avoiding permanent deficits. Without IONM, the possible effects on nerve

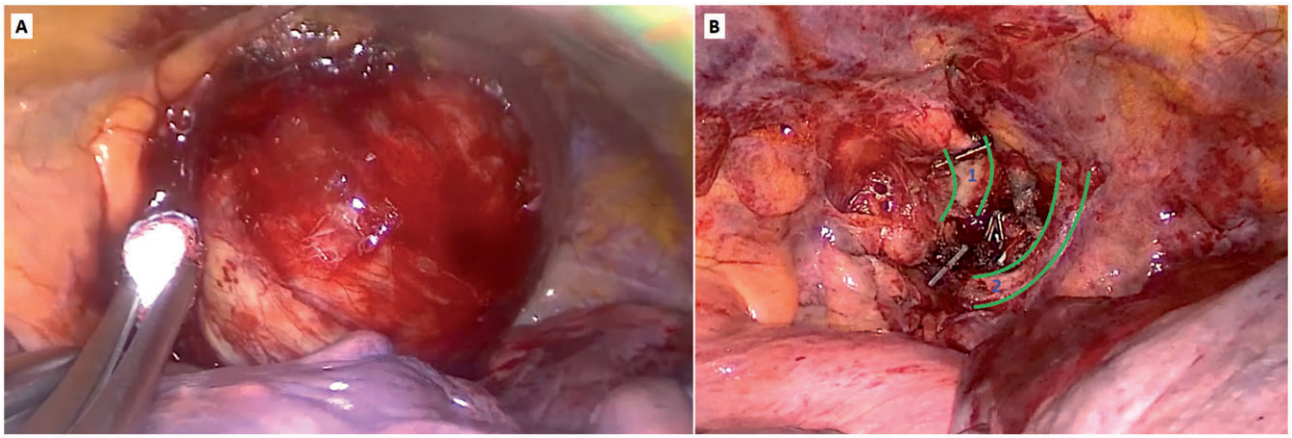

Figure 2: (**A**) Dissection of the lesion. (**B**) Chest wall apex after lesion removal: first (1) and second (2) rib surfaces.

fibres, their entity and prognosis would have been evident only after surgery. Moreover, if IONM findings highly suggest severe nerve harm, this can advise against radical surgery [4]. Indeed, radicality in surgery for mediastinal neurogenic tumours depends on their histology and malignant behaviour. Malignant tumours often require extensive surgery with spine resection to guarantee adequate margins , while benign lesions, such as our case, do not require wide margins when pathology confirms clean excision. The extension of a non-radical surgery for a benign tumour depends on whether symptoms from mass effect are present or not. Since our patient did not have these symptoms, in case of a technically unresectable mass, we would have only performed biopsies to assess any possible malignant behaviour. Given the benignity of mediastinal schwannoma, we would not have suggested any adjuvant treatment alternative to surgery. Considered the rare but possible event of malignant transformation , the radiological follow-up would be a fine strategy in this situation and should be tailored depending on dimensional growth.

To the best of our knowledge, our experience represents the first reported case in which IONM use led to radical excision of brachial plexus schwannoma in VATS without neurological complications.

CONCLUSION

In conclusion, our case report demonstrated that IONM using SEPs and tc-MEPs is a valuable tool to anticipate nerve damage during VATS resection of brachial plexus schwannomas.

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