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CASE REPORT

A rare case of dumbbell meningioma of the upper cervical spinal cord

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Introduction

Dumbbell tumors account for 13–18 % [1, 2] of reported spinal cord tumors. Most (71–83 %) dumbbell tumors are neurinomas; dumbbell meningiomas are extremely uncommon, comprising only 2–3.6 %. In approximately two-thirds of the reported cases of dumbbell meningioma, the tumor arose from the thoracic vertebrae. It is very uncommon for a dumbbell meningioma to occur at the level of the cervical vertebrae; our review of the literature revealed only seven such cases. Here, we report a case of dumbbell meningioma arising at the upper cervical level in a 49-year-old woman, who presented with progressive myelopathy.

Case report

A 49-year-old woman complained of gait disturbance and numbness in the upper and lower extremities on both sides for 4 months. After magnetic resonance imaging (MRI) showed a dumbbell tumor at the upper cervical level, she was referred to our clinic. The neurological examination revealed slight muscle weakness of the right upper and lower extremities, sensory deficit below the C5 level on the left side, and hyperexcitability of the deep tendon reflexes in the upper and lower extremities. Bladder, bowel, and sexual dysfunction were also present.

On sagittal MRI, the tumor showed a low-intensity signal at the C2–3 level on the T1-weighted image, a high-intensity signal on the T2-weighted image, and well-demarcated tumors with nearly homogeneous Gd-enhancement and the dural tail sign (Fig. 1). Horizontal MRI revealed that the tumor extended outside the spinal canal through the right intervertebral foramen and fully encircled the vertebral artery.

The tumor was exposed via right hemi-laminectomy of C1–4. First, an intraoperative pathological diagnosis of the extradural tumor revealed meningioma (Fig. 2a). Because the extradural tumor compressed the spinal cord, intralesional decompression was performed with a Cavitron ultrasonic surgical aspirator (CUSA). After securing the working space, the intradural tumor and the dura were excised en bloc followed by dural plasty with artificial dura mater. Then, the intra- and extra-foraminal tumors at the C2/3 level were excised as much as possible by CUSA.

Histopathological examination of the HE-stained specimens revealed aggregated tumor cells with oval uniform nuclei forming lobular structures. These cells were poorly demarcated from each other. A number of psammoma bodies and syncytial alveolar structures were also observed. These findings suggested meningothelial meningioma (Fig. 2b). The MIB-1 index was less than 2 %.

The postoperative course was uneventful, with improvement of the preoperative neurological deficits. Postoperative MRI revealed residual tumor with Gd-enhancement around the vertebral artery (Fig. 3), which was treated with radiotherapy with a total dose of 52 Gy. The patient returned to normal daily life, with MRI follow-up every 6 months. At present, 2.5 years after the operation, no growth of the residual tumor is visible by MRI.

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

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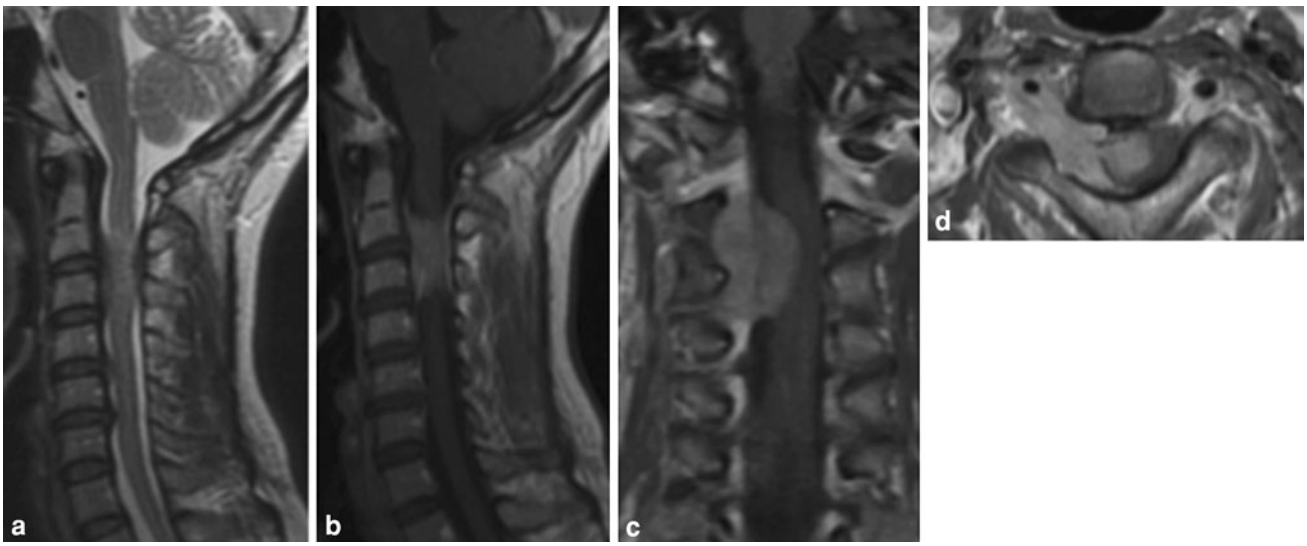

Fig. 1 Preoperative MR images. **a** Sagittal T2-weighted image showing a T2 iso-high intensity area at the C2–3 levels. Axial view of the MRI at the C4/5, C5 vertebral, and C5/6 levels. Sagittal (**b**), coronal (**c**), and axial (**d**) Gd-DTPA enhanced T1-weighted images showing a dumbbell type tumor extending transversely from the right foramen of C2–3 and fully surrounding the circumference of the right vertebral artery

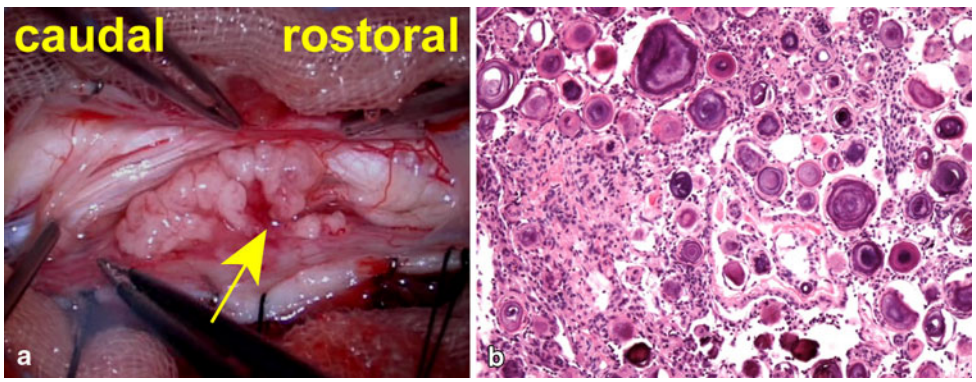

Fig. 2 Intraoperative and pathological findings. **a** Intraoperative magnified view of the tumor from the intradural site. The tumor (*yellow arrow*) extended from the intradural space along with the right C3 nerve root to the extraforaminal space. **b** H&E staining of the tumor. Tumor cells with oval and homogenous nuclei accumulated and formed lobules. The cell boundaries were not clear, and the tumor exhibited a syncytial alveolar structure. These findings were compatible with meningothelial meningioma

Discussion

To our knowledge, based on a search of the literature, there have been only seven case reports of dumbbell meningioma of the cervical cord [2–8]. In particular, involvement of the upper cervical cord is especially uncommon, appearing in only three of the seven cases [4, 6, 8] (Table 1). Total excision of the tumors was difficult in all the reported cases, and all resections were Simpson grade IV [9]. Complete excision in these cases is hard because of the difficulty of using an anterior approach for a tumor outside the intervertebral foramen in the upper cervical cord and because of tumor infiltration into the area surrounding the vertebral artery, among other reasons. To overcome these difficulties, the lateral facet joint must be excised up to a sufficiently lateral area, and an adequate visual field of the ventrally located tumors must be maintained when approaching them. For tumors involving the nerve root and intervertebral foramens, dissection of the nerve root and dural plasty are required to avoid re-operation, because the residual tumors have the potential to grow, and if minimized, can often be treated by radiotherapy. For tumors involving the vertebral artery, it is considered important to minimize the risk of intraoperative vascular injury by excising as much of the tumor as possible with CUSA and providing adequate radiotherapy to treat any residual tumors identified on postoperative MRI.

It is generally believed that the maximum tolerated dose of radiation for the spinal cord is low, i.e., approximately 40–46 Gy, based on comparison to the usual fractionated