



## Case Report

# Cervical meningioma resection including the inner dura through an open-door laminoplasty using hydroxyapatite spacers: A case report

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## ABSTRACT

**Background:** The ideal surgery for spinal cord tumors is complete resection to prevent recurrence. However, it should be accomplished safely/effectively without risking increased morbidity. Here, we report a cervical meningioma that was totally resected, including the inner dura, through a laminoplasty performed with hydroxyapatite (HA) spacers.

**Case Description:** A 61-year-old Asian male presented with a symptomatic intradural extramedullary C4-C6 cervical meningioma. At surgery, this required resection of the inner dural layer through an open-door laminoplasty. Preservation of the outer dural layer facilitated a watertight closure and the avoidance of a postoperative cerebrospinal fluid (CSF) fistula. Notably, the laminoplasty utilized HA spacers which were magnetic resonance (MR) compatible allowing for future follow-up studies to evaluate for tumor recurrence. At 5-year follow-up, the tumor had not recurred, the patient was asymptomatic, and alignment was maintained.

**Conclusion:** Gross total resection of an intradural extramedullary C4-C6 cervical meningioma was performed with removal of just the inner dural layer. Preservation of the outer dural layer allowed for a watertight closure and the avoidance of a postoperative CSF leak. Further, laminoplasty using HA spacers allowed for successful tumor resection, adequate fusion/stabilization, while not interfering with future MR studies (e.g., HA MR compatible).

**Keywords:** Bone union, Cervical spine, Dural layer, Hydroxyapatite spacer, Laminoplasty, Spinal meningioma

## INTRODUCTION

The ideal surgery for a cervical intradural extramedullary meningioma is gross total resection, as this avoids tumor recurrence. It is best to resect just the inner layer of dura, so the outer dural layer may be utilized for a watertight closure, thus decreasing the risk of a postoperative cerebrospinal fluid (CSF) fistula. Some cervical meningiomas, as in this case, can be effectively removed through an open-door laminoplasty using hydroxyapatite (HA) spacers; this prevents short-/long-term instability, while preserving magnetic resonance (MR) compatibility.

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## CASE PRESENTATION

### History and examination

A 61-year-old Asian male presented with a 7-month history of a progressive spastic quadriparesis. The cervical MR imaging demonstrated a large intradural extramedullary anterior tumor at the C4-C6 level that severely compressed the spinal cord [Figure 1a-c]. It homogeneously enhanced with contrast and exhibited the classical dural tail sign [Figure 1d]. Further, the CT showed no calcification within the tumor.

### Operative technique

The operative plan was to resect the tumor along with only the inner dural layer through an open-door laminoplasty using HA spacers. Intraoperative monitoring included the utilization of transcranial electrical stimulation of motor evoked potentials. At surgery, the laminoplasty required complete removal of the lateral laminae from C4 to C6 on the right side and hinging the lateral gutter on the left. The tumor

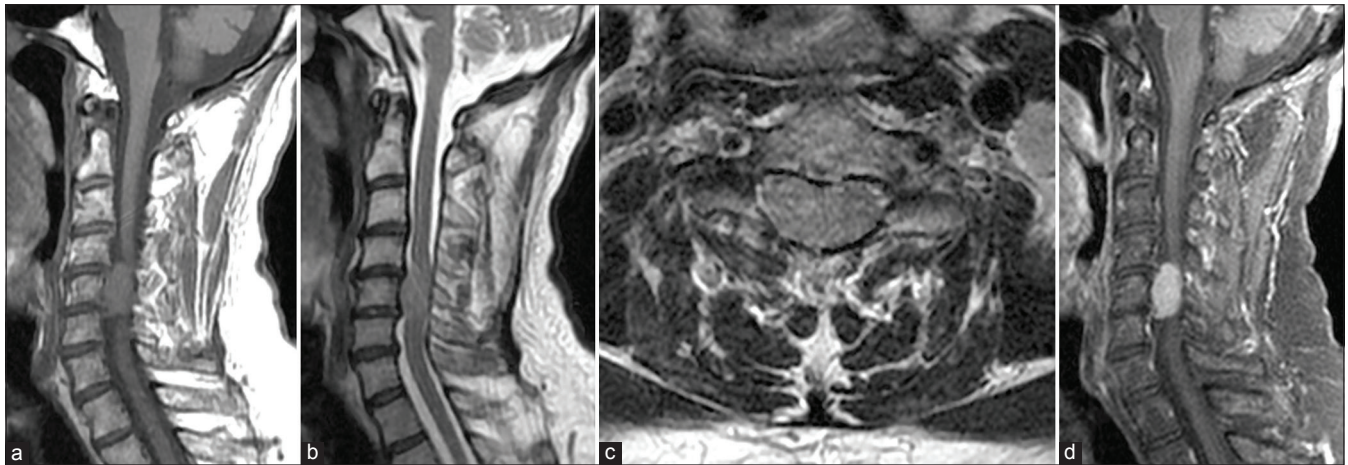
was resected from the right side utilizing the cavitation ultrasonic surgical aspirator [Figure 2a and 2b]. Just the inner dural layer was removed, preserving the outer layer for subsequent watertight dural closure [Figure 2c and 2d]. The laminoplasty was completed utilizing MR compatible HA spacers placed at the C4 and C5 laminar levels; the C6 spacer was not needed.

### Postoperative course

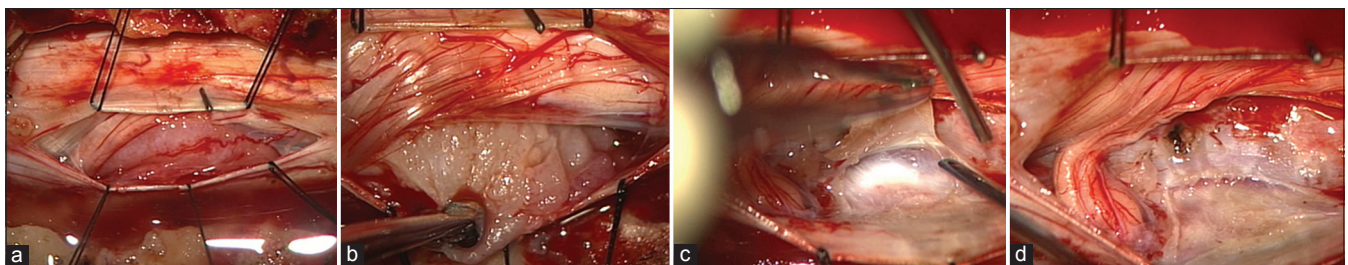
The postoperative course was uneventful; there was no CSF leak, and the patient was asymptomatic within 3 weeks. The 5-year follow-up MR showed no tumor recurrence (HA spacers avoided metal artifact) and stable spinal alignment [Figure 3a and b]. Further, the 5-year postoperative CT confirmed fusion of the HA spacers [Figure 3c and d].

## DISCUSSION

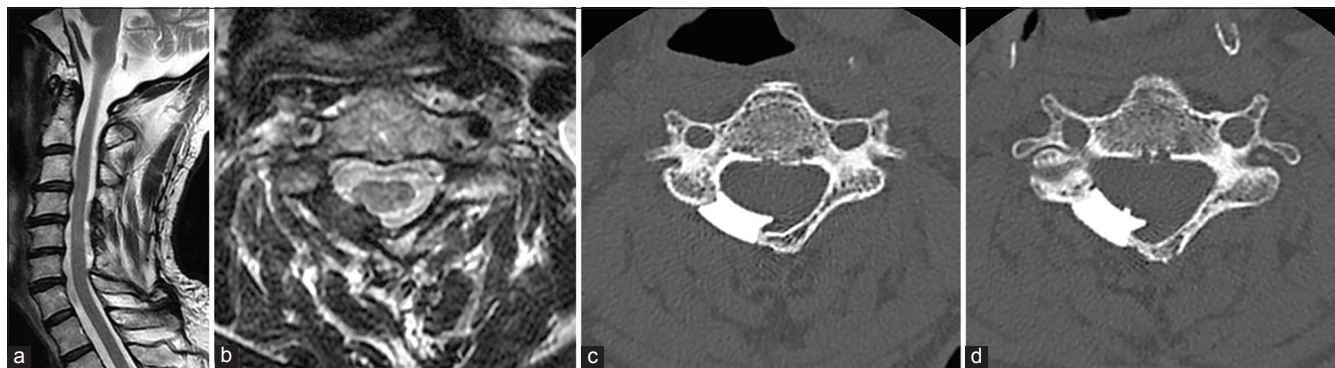
Conventional surgical procedures for the resection of spinal meningiomas include three major options: (1)



**Figure 1:** (a) Sagittal T1-weighted image of preoperative magnetic resonance imaging (MRI) showing the intradural extramedullary spinal cord tumor anterior to the spinal cord, located from the C4 to C6 level, centered on the C5 level. (b) Sagittal T2-weighted image of the tumor. (c) Axial T2-weighted MRI at the C5 level reveals a large tumor filling the spinal canal, and no boundary with the spinal cord is identifiable. (d) Gadolinium-enhanced sagittal MRI demonstrates a homogeneously enhanced tumor with dural tail sign located anterior to the spinal cord.



**Figure 2:** (a) Intraoperative photographs after opening the dura. The tumor is seen anterior to the spinal cord. Right side of photographs = cranial side. (b) The tumor is excised little by little after dissecting two denticulate ligaments. (c) After complete tumor resection, the inner layer of dura as the base of the tumor is peeled away from the outer layer of dura. (d) The inner layer of the dura was resected.



**Figure 3:** (a) Postoperative MRI of the cervical spine obtained at 5 years after surgery. Sagittal T2-weighted MRI shows no tumor recurrence with unchanged normal sagittal alignment. (b) Axial T2-weighted MRI at the C5 level shows no tumor recurrence with good visualization inside the spinal canal. (c) Postoperative axial image of computed tomography (CT) at the C4 level demonstrates a newly created spinal canal with hydroxyapatite spacers bonded to host bone. (d) Axial image of CT at C5 level.

complete dural resection with duroplasty, (2) extensive coagulation of the dura without dural resection, or (3) removal of the inner dural layer with preservation of the outer layer to facilitate watertight dural closure. Saito *et al.* reported three cases of spinal meningioma successfully resected utilizing the third technique; they observed no recurrences with a follow-up duration of 4 months–2 years 10 months.<sup>[7]</sup> Here, we completely removed a cervical meningioma in this case and thoracic meningioma in our previous case report<sup>[3]</sup> also using option #3; there was no postoperative CSF leak or tumor recurrence 5 years postoperatively.

### Choosing a unique laminoplasty approach with HA fusion

Conventional laminectomies are associated with symptomatic epidural scar and/or postlaminectomy kyphosis.<sup>[1,5]</sup> The incidence of postoperative kyphosis after laminectomy ranges from 14 to 47% which is reduced to 5–7% with laminoplasty.<sup>[6]</sup> Here, we performed a C4–C6 laminoplasty (with the HA spacers to “keep the door open.”)<sup>[4]</sup> Notably, the use of HA avoided postoperative metal artifact on MRI and/or CT studies, thus enabling future examinations to confirm no tumor recurrence (e.g., without artifact by mini-plates<sup>[2]</sup>). In addition, CT studies showed fusion of HA spacer without developing kyphosis and instability up to 5 years postoperatively.

### CONCLUSION

Here, we reported a C4–C6 cervical meningioma successfully resected along with the inner dural layer through an open-door laminoplasty using MR compatible HA spacers. Five years postoperatively, the MR/CT studies documented no tumor recurrence and adequate HA incorporation/fusion/stabilization without kyphosis.

### Ethical approval

Informed consent was obtained from the patient in the study. All procedures performed in studies involving human participants were conducted in accordance with the ethical standards of the institutional review board.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

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