Successful surgical strategy for a cervical hemangioblastoma: Case report

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Received: 24 February 16  Accepted: 04 May 16  Published: 22 September 16

Abstract

**Background:** Hemangioblastomas are hypervascular lesions and hence their surgical management is challenging. In particular, if complete resection is to be attained, all feeding and draining vessels must be occluded. Although most intramedullary spinal cord tumors are treated utilizing a posterior approach, we describe an anterior surgical strategy for resection of an intramedullary cervical hemangioblastoma.

**Case Description:** A 36-year-old female with a spinal hemangioblastoma located in the anterior cervical spinal cord presented with a long-standing history of motor weakness of the right upper extremity. Magnetic resonance imaging revealed a large multilevel extensive syrinx and a focal intramedullary enhanced tumor at the C6 level. Angiography showed that the main feeder to the tumor was the left radicular artery (C8), which originated from the thyrocervical trunk, penetrated the dura mater, and branched both rostrally and caudally into the anterior spinal artery (ASA). Three-dimensional computer graphic images showed the tumor was located in the anterior part of the spinal cord, adjacent to and supplied by the ASA. The planned anterior surgical approach involved a total corpectomy of C6 and partial corpectomies of C5 and C7. The tumor was entirely removed despite multiple adhesions, and was successfully freed from the ASA. Patency of the ASA was confirmed utilizing intraoperative indocyanine green videoangiography. Intraoperatively, no monitoring changes were encountered. The pathological diagnosis was of a hemangioblastoma. No postoperative deficit occurred.

**Conclusions:** An anterior approach for the resection of an anteriorly located intramedullary spinal hemangioblastomas was successfully accomplished in this case.

**Key Words:** Anterior approach, hemangioblastoma, indocyanine green, spinal cord, temporary arterial occlusion, three-dimensional computer graphics

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How to cite this article: Imai H, Ishii K, Chikuda H, Ohya J, Nakagawa D, Kondo T, et al. Successful surgical strategy for a cervical hemangioblastoma: Case report. Surg Neurol Int 2016;7:S660-3.

http://surgicalneurologyint.com/Successful-surgical-strategy-for-a-cervical-hemangioblastoma-Case-report/
INTRODUCTION

Spinal hemangioblastoma is the third most common intrinsic intramedullary tumor, and accounts for approximately 5% of all spinal cord tumors.[1] For spinal lesions, surgical removal is generally recommended.[7] Previously, posterior midline[2] or posterolateral approaches were recommended even for the resection of anterolateral cervical spinal cord hemangioblastomas. However, these approaches can only achieve limited ventromedial exposure of the anterior spinal artery (ASA) required for safe manipulation.[1] Consequently, these approaches are not suitable for all lesions located in the midline of the ventral cord.[6] Here, we describe how an anterolateral cervical intramedullary hemangioblastoma was successfully resected through an anterior approach. Adequate removal of the lesion and confirmation of occlusion of all feeding vessels utilizing three-dimensional (3D) computerized surgical simulation and indocyanine green (ICG) fluorescence videoangiography were achieved.

CASE DESCRIPTION

A 36-year-old female presented with weakness of her right upper extremity of 10 years duration, accompanied by progressive muscle atrophy of the right hand. Recently, she had started experiencing increasing neck pain and numbness in both her upper and lower extremities. Magnetic resonance (MR) imaging of the cervical spine demonstrated an anterolateral enhanced lesion opposite the C6 vertebral body accompanied by a multilevel proximal/distal syrinx extending from the medulla to the T4 level [Figures 1a-c].

MR angiography with gadolinium-diethylene-riaminepenta-acetic acid of the upper body showed that the bone graft was dislodged, and hence it was replaced with a fibular graft, and accompanied by bone plate. One day after the surgery, cervical radiography showed staining corresponding to the tumor, ASA, and surrounding venous drainage through the intact dura mater [Figure 4b]. The dura mater and the arachnoid membrane were then opened [Figure 4c], and ICG injection showed the ASA, tumor, feeder, and draining veins [Figure 4d]. After sharp dissection of the vessels from the arachnoid, a temporary clip with low closing force (Sugita AVM Microclip, Mizuho Medical Co., Ltd., Tokyo, Japan) was applied to the feeding artery of the tumor [Figure 4e]. ICG injection showed reduced blood flow in the feeding artery but intact flow in the ASA [Figure 4f]. Temporary artery occlusion was maintained for 30 minutes, but MEP and SSEP monitoring showed no changes. The feeding arteries were coagulated and the tumor was totally removed [Figure 4g]. The last ICG injection confirmed complete tumor excision and preservation of the ASA [Figure 4h]. The dura mater was closed with 7-0 nylon and fibrin glue. Anterior fusion from C5 to C7 was performed with an iliac bone graft fixed with a titanium plate. One day after the surgery, cervical radiography showed that the bone graft was dislodged, and hence it was replaced with a fibular graft, and accompanied by external fixation with a halo vest.

Postoperatively, the patient remained neurologically unchanged with similar motor function, however, had slight improvement in upper extremity numbness. Her dysphagia was only temporary, resolving over the 1st postoperative month. Postoperative MR imaging confirmed total removal of the tumor and shrinkage of

Figure 1: (a) Preoperative sagittal T2-weighted magnetic resonance (MR) image showing extensive syringobulbia and syringomyelia and a small mass (arrow) in the spinal cord at C6. (b and c) Preoperative sagittal and axial gadolinium (Gd)-enhanced MR images of the cervical spine showing a small enhanced mass in the spinal cord at C6 (b) and in the right anterior quadrant of the spinal cord (c). (d) Gd-enhanced MR angiogram of the upper parts of the body showing tumor staining in the cervical spine.
the associated syrinx. The pathological diagnosis was hemangioblastoma. The halo vest external fixation was removed 2 months after the surgery and replaced with a neck collar until confirmation of adequate bone fusion. Follow-up MR imaging at 1.5 years confirmed total removal of the tumor and shrinkage of the associated syrinx with accompanying atrophy of the spinal cord [Figures 5a-c] and cervical radiographs showed the grafted fibula bone fused to both the caudal and rostral vertebral bones [Figure 5d and e].
DISCUSSION

The standard surgical approach to intramedullary spinal cord tumor is posterior and typically involves laminectomy or laminoplasty. Here, after 3D computer simulation our anterior approach provided adequate and safe access for excision of this intradural intramedullary anterolateral tumor at the C6 level.

In the present case, meticulous microsurgical dissection of proximal portions of the feeding artery allowed temporary arterial occlusion with a Sugita AVM Microclip at the tumor edge [Figure 4e and f]. ICG videoangiography[4] was then combined with temporary artery occlusion[3] to differentiate the feeding artery from those supplying the spinal cord. Continuous ICG videoangiography before and after tumor removal helped confirm complete excision of tumor with adequate preservation of the ASA [Figure 4g and h].

CONCLUSION

This case study demonstrates how anterior resection (e.g., C5-C7 partial/complete corpectomy/plating) of an anterolateral intramedullary C6 hemangioblastoma may be successfully achieved. Planning based on presurgical simulation with 3D computer graphic images and intraoperative ICG videoangiography with temporary artery occlusion under neuromonitoring helped achieve safe gross total excision of this lesion with preservation of the ASA.

Financial support and sponsorship
This work was supported by a Grant-in-Aid for Scientific Research (C) (No. 25462206) to H.I. from the Japan Society for the Promotion of Science.

Conflicts of interest
The authors report no conflicts of interest concerning the materials or methods used in this study or the findings specified in this paper.

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