



Case report

Dumbbell-shaped meningioma of Meckel's cave mimicking trigeminal schwannoma: A case report

Chun-Pi Chang^{a,g}, Cheng-Siu Chang^{b,c}, Meng-Yin Yang^{a,d,e,f}, Chiung-Chyi Shen^{a,h,i,*}^a Department of Neurosurgery, Neurological Institute, Taichung Veterans General Hospital, Taichung, Taiwan, ROC^b Department of Neurosurgery, Chung-Shan Medical University Hospital School of Medicine, Taichung, Taiwan, ROC^c Institute of Medicine, Chung-Shan Medical University, Taichung, Taiwan, ROC^d Department of Neurosurgery, Tri-Service General Hospital, National Defense Medical Center, Taipei, Taiwan, ROC^e Department of Neurosurgery, Jan-Ai General Hospital, Taichung 412, Taiwan, ROC^f College of Nursing, Central Taiwan University of Science and Technology, Taichung 406, Taiwan, ROC^g Institute of Biomedical Sciences, National Chung Hsing University, Taichung, Taiwan, ROC^h Department of Physical Therapy, Hung kuang University, Taichung, Taiwan, ROCⁱ Basic Medical Education, Central Taiwan University of Science and Technology, Taichung, Taiwan, ROC

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ABSTRACT

Introduction and importance: Several meningioma cases arising through Meckel's cave (MC) at the middle and posterior fossa have been reported. However, few relevant meningiomas have been observed with a dumbbell shape.

Presentation of case: We report a rare case of a 36-year-old woman with a meningioma of MC with a typical dumbbell-shaped, schwannoma-like presentation on magnetic resonance imaging (MRI), resulting in a misleading differential diagnosis.

Clinical discussion: In this case report, we discuss the characteristics of meningioma of MC observed on MRI and our surgical approach to this condition.

Conclusion: This tumor was able to mimic a trigeminal schwannoma both clinically and radiographically. This case report has been reported in line with the SCARE 2020 criteria [1].

1. Introduction

The MC is a dural recess extending from the posterior fossa into the middle fossa, allowing access from the middle fossa to the posterior fossa. MC tumors are common and can be diagnosed as trigeminal schwannoma, meningioma, pituitary macroadenoma, metastases, epidermoid cyst, lipoma, and skull-based tumors. Trigeminal schwannoma is the most common type of MC tumor. Nerve sheath tumors, or more rarely meningeal tumors, result in nerve, meningioma, and foraminal enlargement, resulting in the appearance of a narrowed area at the constricting foramina and extension from the posterior fossa into the middle fossa, presenting as a dumbbell-shaped tumor. Trigeminal schwannomas are rare, accounting for only 0.07%–0.3% of all intracranial tumors and 0.8%–5% of all intracranial schwannomas [2–4]. Meningiomas of MC are also uncommon, accounting for only approximately 1% of all intracranial meningiomas [5].

2. Presentation of case

A 36-year-old woman presented with progressive right-hand numbness, left facial numbness, and tongue and mouth numbness for longer than 1 year, in addition to involuntary coughing, laughing, and frequent choking for 8 months; urinary incontinence and unsteady gait for 5 months; and slurred speech and occasional mild drooling for 2 months. No obvious facial palsy, hearing impairment, tinnitus, or tongue deviation was observed. Comorbidities included a history of uterine myoma treated by myomectomy 1 year prior. No history of systemic disease was reported. A neurological examination revealed normal extraocular motion, full muscle power in all four limbs, and an equivocal finger-to-nose test.

* Corresponding author at: Neurological Institute, Department of Neurosurgery, Taichung Veterans General Hospital, 1650, Taiwan Boulevard Section 4, Taichung 407, Taiwan, ROC.

E-mail address: cshen@vghtc.gov.tw (C.-C. Shen).

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Fig. 1. Preoperative T1-weighted axial MR magnetic resonance imaging (MRI) image showing an isointense mass abutting the lateral wall of the cavernous sinus (left). T2-weighted MR image MRI showing a heterogeneously enhanced lesion in the middle and posterior cranial fossa (middle). Gadolinium-enhanced T1-weighted MRI image showing a dumbbell-shaped mass originating from the left side of Meckel's Meckel's cave, medial to the temporal lobe, and extending caudally through Meckel's Meckel's cave to compress the brain stem (right).

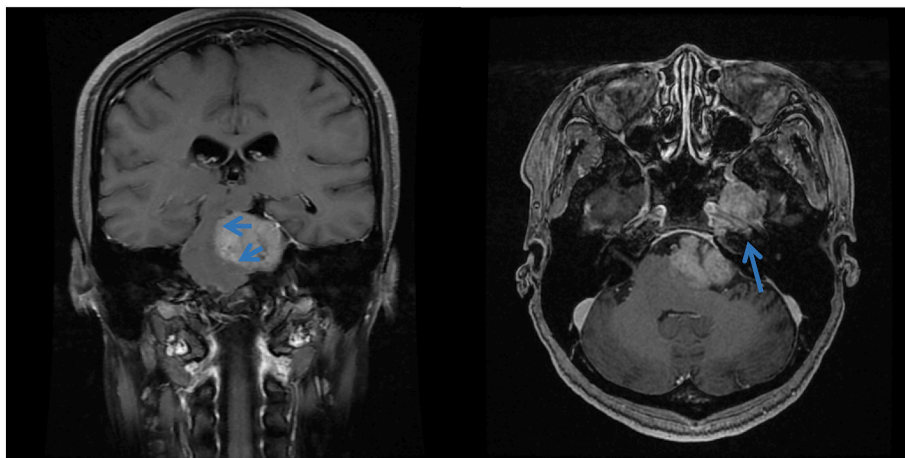


Fig. 2. Tumor with brain stem compression (left) and partial internal carotid artery encasement (right).

3. Radiology and pathology

Magnetic resonance imaging (MRI) revealed a dumbbell-shaped tumor approximately $5.3 \times 3.3 \times 5.8$ cm (width, height, and anteroposterior diameter, respectively) with heterogeneous enhancement and mixed solid and cystic components, involving the left cavernous sinus, Meckel's cave (MC), and the prepontine and cerebellopontine angle cisterns, with compression observed on the left medial temporal lobe, midbrain, pons, and brachium pontis, along with a partial left internal carotid artery encasement, suggestive of a schwannoma (trigeminal neuroma) (Figs. 1 and 2). The final pathological diagnosis was

meningioma, clear-cell type (WHO grade II). An ancillary diagnosis was revealed by immunohistochemistry IHC stains for EMA (+), glial fibrillary acidic protein (GFAP, -), and Ki-67 (labeling index up to 5%) [6–9] (Figs. A and B).

4. Discussion

In our case, the patient's radiological features were consistent with a trigeminal schwannoma, particularly the dumbbell shape and heterogeneous enhancement of the tumor. However, according to the pathology report together with preoperative image, the final diagnosis is a

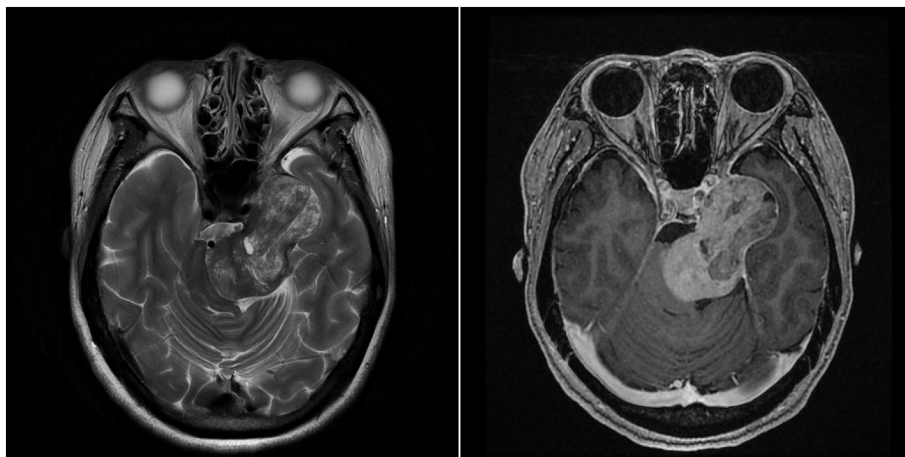


Fig. 3. T2-weighted magnetic resonance imaging showing the heterogeneously enhanced tumor. (left) gadolinium-enhanced T1-weighted MRI showing a tumor that appears hyperintense with central necrosis. (right).

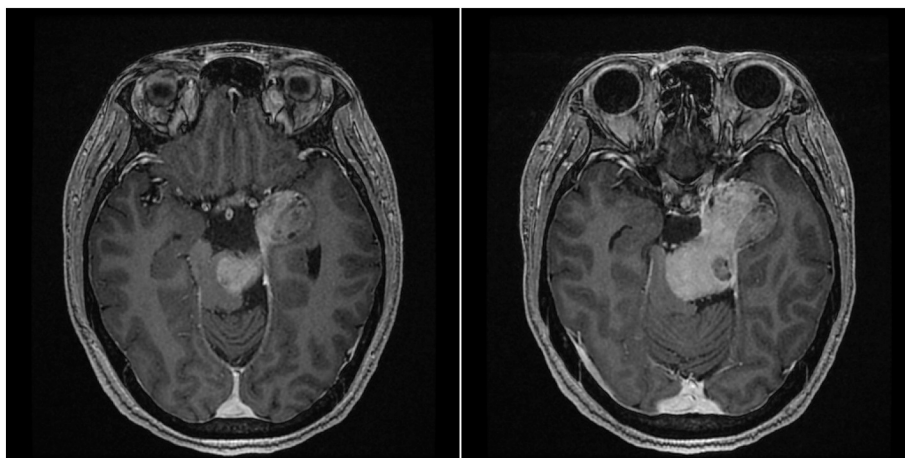


Fig. 4. Dural tail observed on gadolinium-enhanced T1-weighted magnetic resonance image.

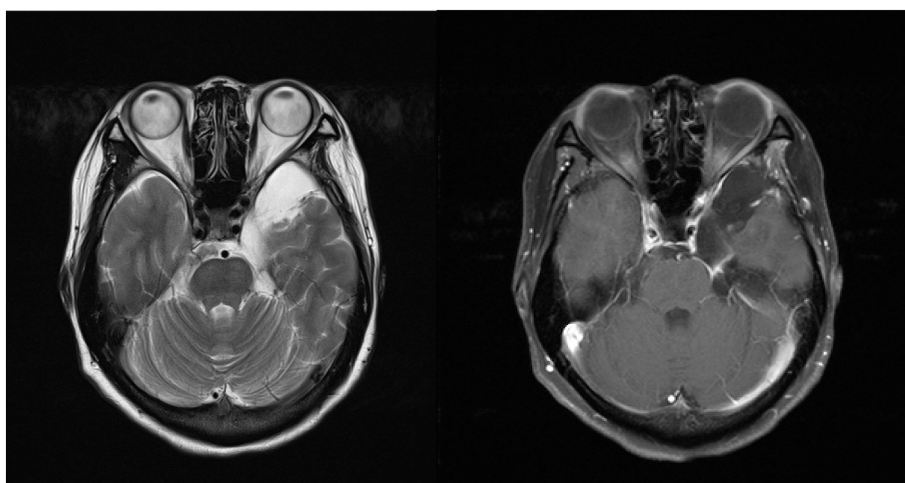


Fig. 5. Post-operation magnetic resonance imaging (MRI) 10 months after treatment. (T2-weighted MRI (left) and gadolinium-enhanced T1-weighted MRI (right) showed total removal of the tumor and no tumor recurrence.

meningioma, clear-cell type (WHO grade II) of Meckel's Cave.

A dumbbell-shaped mass in MC is traditionally considered to be characteristic of a trigeminal schwannoma, and few dumbbell-shaped meningiomas mimicking schwannoma have been reported; however,

those that have been reported are typically diagnosed as spinal dumbbell meningiomas [10–17]. Although meningioma of MC has previously been reported, these reports focused on the surgical management of these tumors rather than the radiographic features of the dumbbell

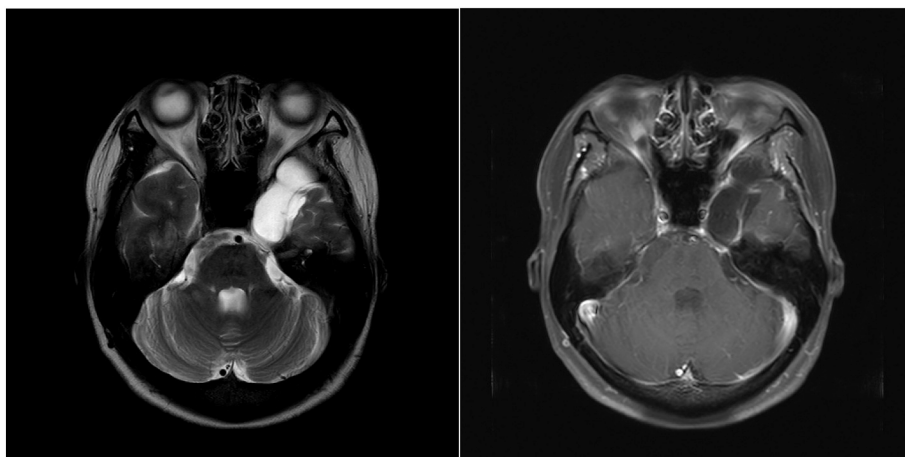


Fig. 6. Magnetic resonance imaging (MRI) a half year after surgery. T2-weighted MRI (left) and gadolinium-enhanced T1-weighted MRI (right) showed total removal of the tumor and no tumor recurrence.

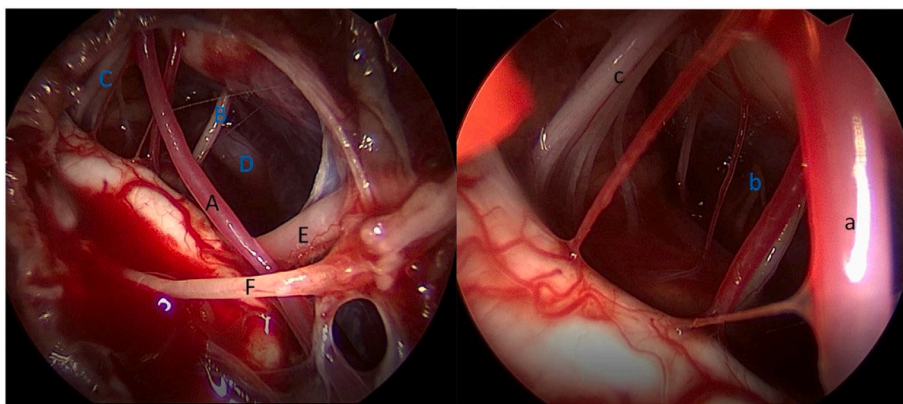


Fig. 7. The endoscopic image on the left shows A. Anterior inferior cerebellar artery; B. cranial nerve VI; C. cranial nerves IX, X, and XI; D. the vertebral artery; E. cranial nerve VII; and F. cranial nerve VIII. The endoscopic image on the right shows A. the anterior inferior cerebellar artery; B. cranial nerves IX, X, and XI of the contralateral side; and C. cranial nerves IX, X, and XI.

appearance. To our knowledge, our case is the first report of a huge meningioma with a very typical dumbbell appearance.

Meningiomas typically appear as isointense or hypointense on T1-weighted images and hyperintense on T2-weighted images, with strong enhancement after contrast injection. Occasionally, the lesion appears with mixed solid–cystic or predominantly cystic components on imaging. Trigeminal schwannomas typically present with a dumbbell-shaped appearance when they extend into both the cisternal and cavernous sinus.

The radiographic characteristics of this case were interpreted as being consistent with trigeminal schwannoma due to its location and its dumbbell shape. (Fig. 3) Retrospectively, a dural tail (Fig. 4) was observed on the initial MRI, but a dural tail sign is not pathognomonic of meningioma, and various intracranial, extracranial, and spinal pathologies, can present with a dural tail sign on contrast-enhanced T1 MRI [18].

The patient underwent a minipterional craniotomy to achieve a Simpson's grade II resection. An endoscope-assisted keyhole approach to the skull base is a more promising approach due to the improved visualization with a small incision. An endoscope was used to confirm all structures, including the anterior inferior cerebellar artery, vertebral artery, and cranial nerves VI, VII, VIII, IX, X, and XI (Fig. 7). This approach was ideally suited for this case because it provided access to the tumor located within MC. Six months after surgery, no evidence of recurrence was observed; left facial hypoesthesia, drooling, and diplopia remained, but the patient was otherwise healthy (Figs. 5 and 6).

5. Conclusion

This report documents a dumbbell-shaped meningioma of MC, a presentation that is traditionally characteristic of trigeminal schwannoma. This tumor was able to mimic a trigeminal schwannoma both clinically and radiographically. Despite a misleading differential diagnosis, the patient was successfully treated through surgery, with no postoperative recurrence postoperatively after six months. Clear-cell type meningioma has a high recurrence rate; therefore, close and prolonged follow-up remains necessary.

CRedit authorship contribution statement

Chun-Pi Chang, resident, first Author, writing the paper
Meng-Yin Yang, surgeon, background research, edit the manuscript.
Cheng-Siu Chang, literature review
CC Shen, supervision

Consent

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

Ethical approval

Not applicable.

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Declaration of competing interest

All authors declare that they have no competing interests.

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