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Case report

Cisterna magna meningiomas without dural attachment: Report of two cases

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ABSTRACT

Meningiomas within the cisterna magna without dural attachment are extremely rare. To the best of our knowledge, only three cases of meningiomas within the cisterna magna have been reported in the literature. The authors present two cases of patient with the cisterna magna meningioma without dural attachment. (Case 1) A 36-year-old female presented with a 10-month history of numbness in the left hand. Magnetic resonance imaging (MRI) disclosed the presence of a contrast-enhanced tumor in the posterior fossa. A suboccipital craniectomy was performed, and the tumor located within the cisterna magna with no attachment to the dura. Diagnosis is made as clear cell meningioma. The postoperative course was uneventful, and a recurrence has not been observed for three years. (Case 2) A 58-year-old man presented with a well-circumscribed mass in the posterior fossa. At surgery, the tumor located within the cisterna magna with a connection to the right tenia. The tumor was totally removed without neurological deficits. At a 7-year follow-up, no evidence of a recurrence was observed. It is quite difficult to preoperatively diagnose as a cisterna magna meningioma without dural attachment. However, complete removal of the tumor should be achieved.

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1. Introduction

Meningiomas in the posterior fossa without dural attachment are extremely rare. Abraham and Chandy classified posterior fossa meningiomas without dural attachment into three types: (1) meningiomas that originate from the choroid plexus and develop within the fourth ventricle (2) meningiomas that

originate from the inferior tela choroidea located in the fourth ventricle, the cerebellar hemisphere, or the vermis, (3) meningiomas located within the cisterna magna with no attachment to the dura [1]. This type (3) meningioma within the cisterna magna without dural attachment is extremely rare, and to the best of our knowledge, only three cases have been reported in the literature [2–4]. It is difficult to obtain a preoperative diagnosis of a meningioma without dural

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attachment and its subtype. We describe two cases of the cisterna magna meningiomas without dural attachment.

2. Case report

2.1. Case 1

A 36-year-old female presented with a 10-month history of numbness in the left hand, which did not improve despite medical care. Two months before admission, the patient noticed a gait disturbance. A neurological examination revealed mild dysphagia, lower extremity-dominant mild spastic tetraparesis, and left side-dominant adiadochokinesis. Computed tomography (CT) showed a well-demarcated, slightly high-density mass in the posterior fossa with hydrocephalus. Magnetic resonance imaging (MRI) disclosed the presence of a contrast-enhanced tumor in the posterior fossa, which produced severe compression of the brainstem and obstructive hydrocephalus. No dural tail sign was observed (Fig. 1a-b). Six-vessel angiography revealed that the basilar artery was compressed and shifted to the right side of the midline. No tumor stain was observed.

A suboccipital craniectomy with removal of the posterior arch of the atlas was performed. After opening the dura mater, a pinkish tumor was identified inferior to the cerebellar hemisphere. Dural attachment was not found (Fig. 2a). The tumor had tightly attached to the posterior surface of the medulla oblongata (Fig. 2b). The tumor was completely removed (Fig. 1c). A histological examination of hematoxylin and eosin (H&E) stains indicated sheets of polygonal cells with clear cytoplasm and interstitial collagenization (Fig. 2c). Cytoplasmic glycogen content was demonstrated by periodic acid-Schiff (PAS) staining (Fig. 2d). Immunohistochemistry was positive for vimentin and epithelial membrane antigen (EMA) (Fig. 2e) and negative for glial fibrillary acidic protein. The Ki-67 labeling index was approximately 5% (Fig. 2f). These findings were consistent with a diagnosis of a clear cell meningioma (CCM) (WHO grade II). The postoperative course

of the patient was uneventful. No adjuvant therapy was required, and a recurrence was not observed three years after the surgery.

2.2. Case 2

A 58-year-old man presented with a 2-month history of nausea. CT revealed an intracranial mass in the posterior fossa. On admission, a neurological examination revealed a tandem gait disturbance. MRI demonstrated a well-circumscribed mass in the posterior fossa (Fig. 3a). Six-vessel angiography showed that the tumor was fed by the right posterior inferior cerebellar artery (Fig. 3b). The patient had no history of cancer, and chest and abdominal CT revealed no evidence of cancer. However, slightly increased levels of serum squamous cell carcinoma antigen (SCC-Ag) were detected (16.4 ng/ml). The preoperative impression was a metastatic tumor. The patient underwent suboccipital craniectomy and C1 laminectomy. The incision of the dura mater exposed a subarachnoidal mass inferior to the right cerebellar hemisphere. No dural attachment was found (Fig. 3d), and the choroid plexus of the 4th ventricle was not related to the tumor. Because the tumor adhered to and connected to the right tenia, the tumor may have arisen from this region. The tumor was completely removed (Fig. 3c). The histological diagnosis was a meningothelial meningioma (Fig. 3e). The serum SCC-Ag level promptly decreased to 0.9 ng/ml after the surgery. The patient was discharged without neurological deficits. At a 7-year follow-up, postoperative MRI revealed no evidence of a recurrence.

3. Discussion

Meningiomas originate from arachnoid cap or meningothelial cells in the meningeal arachnoid layer and in the stroma of the choroid plexus, tela choroidea and pia mater [5]. Meningiomas without dural attachment occur mainly in the supratentorial region and have been reported to arise from arachnoid cap

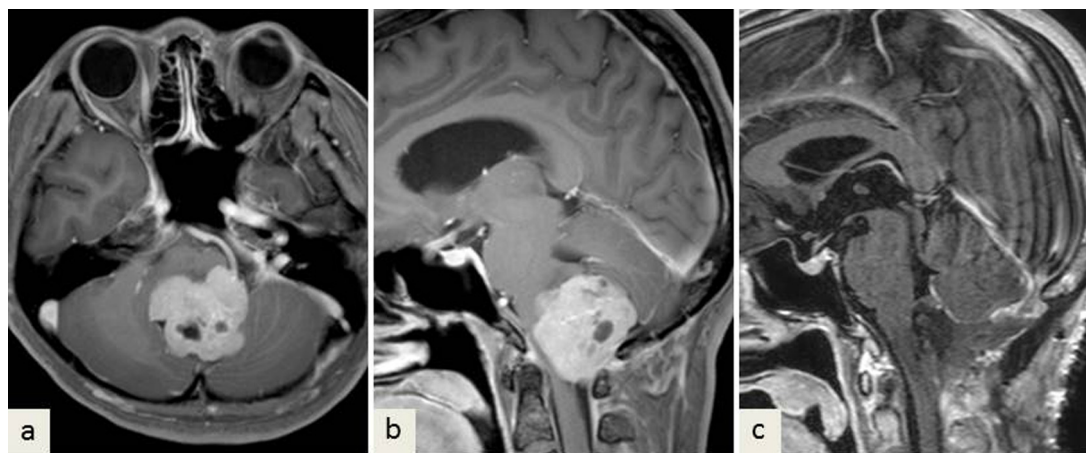


Fig. 1 – Preoperative axial (a) and sagittal (b) T1-weighted MRI with gadolinium shows a well-circumscribed, strongly enhanced mass with small cysts in the cisterna magna that extends to the C1 level. (c) Postoperative gadolinium-enhanced sagittal T1-weighted MRI demonstrates no residual tumor.

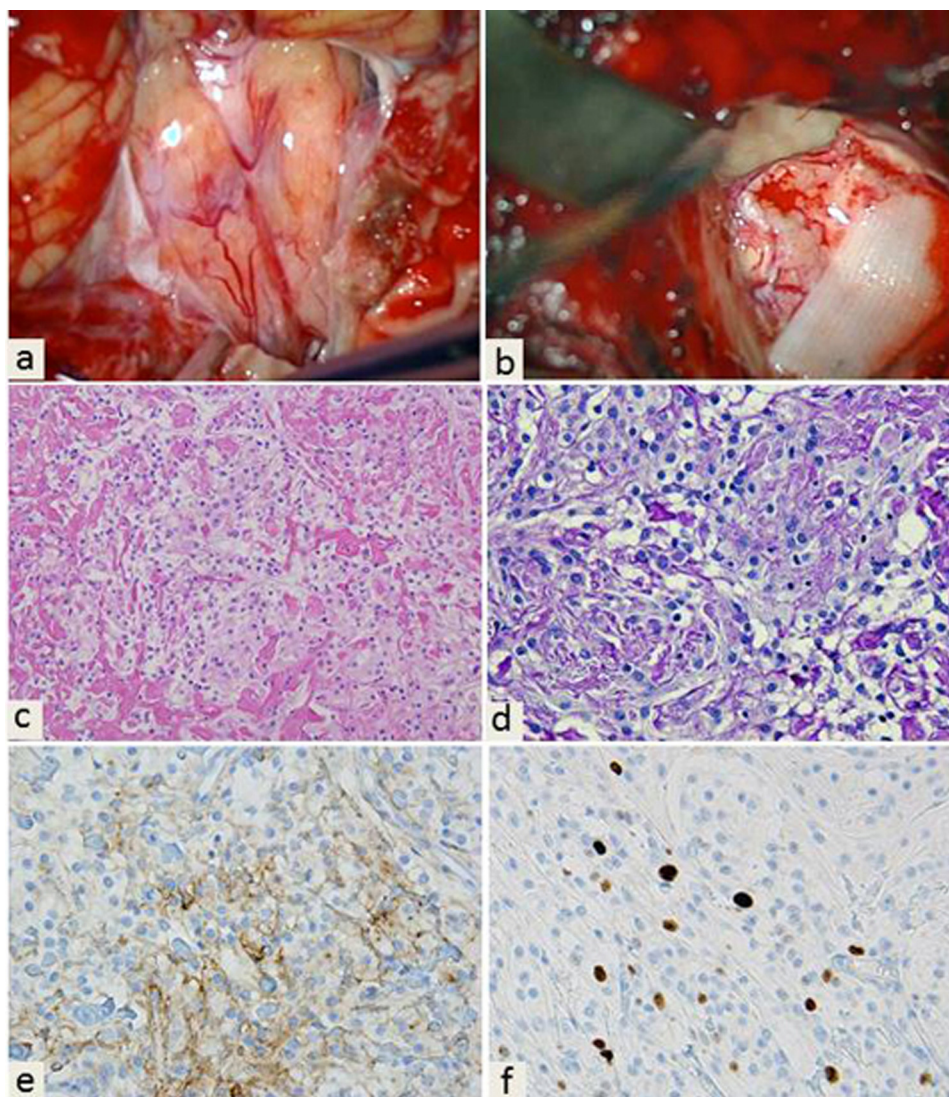


Fig. 2 – (a) After an incision of the arachnoid membrane, a tumor without dural attachment is revealed. (b) After the removal of the tumor, adhesion to the posterior surface of the medulla oblongata inferior to the fourth ventricle is shown. (c) Sheets of polygonal cells with clear cytoplasm and interstitial collagenization (H&E, original magnification 100×), (d) cytoplasmic accumulation of glycogen (periodic acid-Schiff, original magnification 200×). (e) Immunostaining for epithelial membrane antigen (original magnification 200×) and (f) Ki-67 staining (original magnification 200×).

cells in ectopic locations distant from the dural layer [6]. Posterior fossa meningiomas without dural attachment are rare [1-4,7-13]. Abraham and Chandy classified posterior fossa meningiomas without dural attachment into the following three categories: (1) meningiomas that originate from the choroid plexus of the fourth ventricle and develop solely within the ventricle; (2) meningiomas of the inferior tela choroidea that develop partly in the fourth ventricle and partly in the cerebellar hemisphere and the vermis; and (3) meningiomas located within the cisterna magna with no attachment to the dura [1]. Moreover, three other categories of meningiomas have been reported, which include meningiomas that arise from the choroid plexus and develop in the lateral cerebellomedullary cistern [7], meningiomas that arise from the arachnoid tissue near the foramen Luschka and

develop in the lateral cerebellomedullary cistern [8], and intraparenchymal brainstem meningioma. [13] Intraparenchymal meningioma is considered as one type of subcortical meningioma, which locates in brain parenchyma without dural attachment, although they can reach the surface of the brain [14]. To our knowledge, 41 cases of meningiomas of the posterior fossa without dural attachment have been reported in the English literature [1-4,7-13]. Among these 41 cases only three meningiomas located within the cisterna magna without dural attachment, which were categorized as Abraham and Chandy's classification type 3.

In our two cases, the tumors were not located within the fourth ventricle but in the cisterna magna, and there was no connection between the tumors and the choroid plexus of the fourth ventricle. Only five cases of cisterna magna meningio-

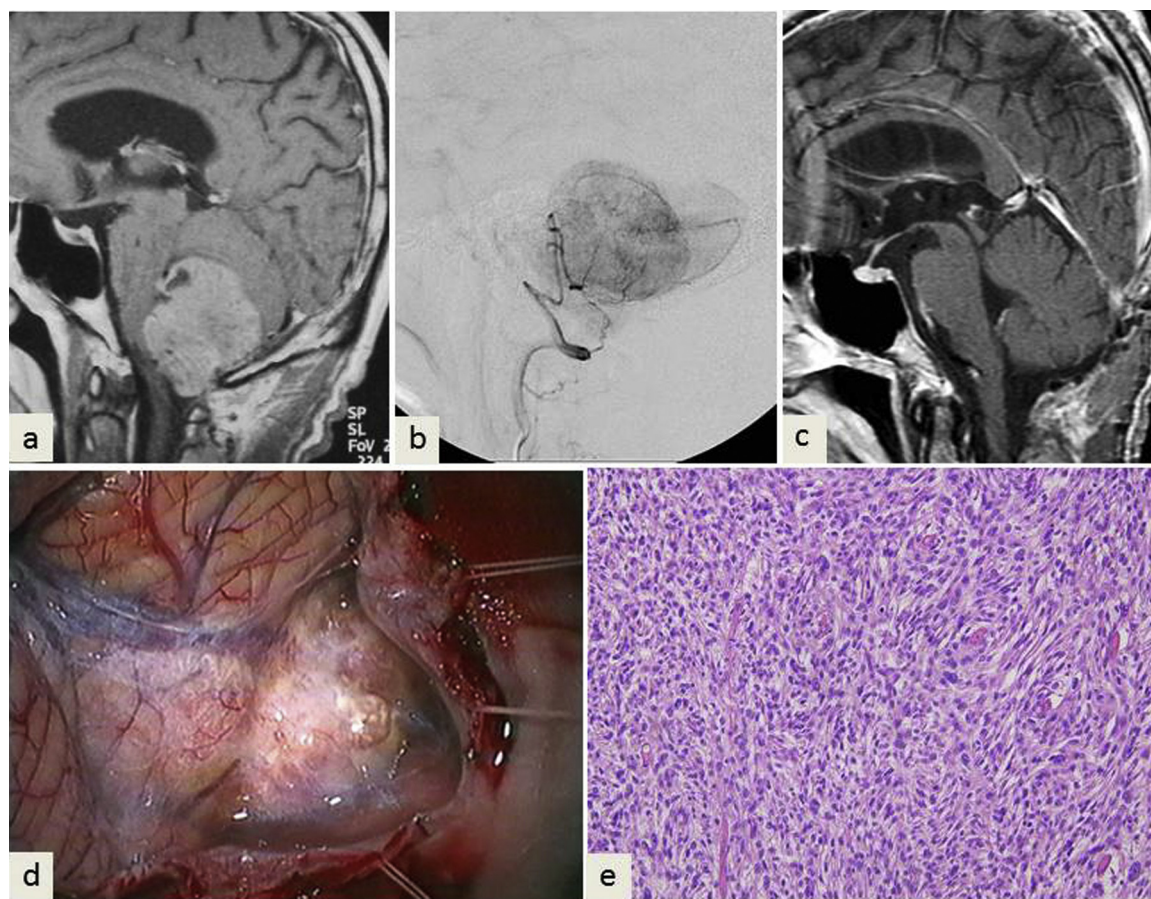


Fig. 3 – (a) Preoperative sagittal T1-weighted MRI with gadolinium reveals a mass with enhancement in the cisterna magna. (b) Rt. vertebral angiography shows the tumor blush fed by the rt. posterior inferior cerebellar artery (PICA). (c) Postoperative MRI demonstrates no residual tumor. (d) Intraoperative photographs after an incision of the dura mater reveal a subarachnoidal tumor without dural attachment. (e) A tumor section shows the meningotheelial meningioma (hematoxylin and eosin, original magnification 100×).

mas without dural attachment, including our two cases, have been reported. The clinical features of these five cases are summarized in Table 1. One case was an incidental autopsy finding. Among the 5 cases, three were in males and two were

in females. The average age of the patients was 41.6 years, and the ages ranged from 16 to 58 years. Patients with a meningioma in the cisterna magna without dural attachment present with the clinical features of intracranial hypertension,

Table 1 – Reported cases of cisterna magna meningiomas.

Author	Year	Age/sex	Initial symptom	Duration time	Other symptoms	Attachment	Pathology
Martin	1923	45/M	Dysesthesia in third, fourth and fifth fingers of lt. hand	3 y	Paralysis of both arms and both legs	NA	Fibrous (autopsy)
Spurling	1938	16/F	Cerebellar sign?	NA	NA	NA	NA
Nicoletti	2001	53/M	Occipital headache, diplopia, gait disturbance, vomiting	4 w	Rt. Hemiparesis, mild nuchal stiffness, lt. 6th nerve palsy, lt. F-N test dist., lt. adiadohokinesia,	NA	Meningoethelial
Our case1	2013	36/F	Numbness of lt. hand	1 y 5 m	Hoarseness, dysphagia, quadriparesis, lower limbs spasticity, apnea	Posterior surface of the medulla oblongata	Clear cell
Our case2	2013	58/M	Vomit	2 m	Tandem gait disturbance	The arachnoid tissue close to rt. tenia	Meningoethelial

F, female; M, male; NA, not available; y, year; m, month; w, week; rt, right; lt, left; F-N, finger-nose.

which include obstructive hydrocephalus, cerebellar dysfunction, and long-tract signs. The duration of symptoms ranges from 4 weeks to 3 years. In previous cases, the attachment of the meningioma has not been clearly described. In case 1, the tumor was connected only to the arachnoid tissue of the posterior surface of the medulla oblongata. In contrast, the tumor was connected to the arachnoid tissue close to the tenia in case 2. The histological analyses of previous cases indicated that 2 cases were meningothelial meningiomas, 1 case was a fibrous meningioma, and 1 case was a CCM. In one case, there was no description of the histology. Case 1 is the first case of a CCM in the cisterna magna without dural attachment.

The differential diagnoses for similarly located lesions on MRI include a choroid plexus papilloma (CPP), an ependymoma, a medulloblastoma, and a metastatic tumor. A CPP is difficult to differentiate from a meningioma. CPPs typically arise from the intraventricular region and have increased vascularity. However, a CPP with extraventricular extension presents with a milder enhancement than an intraventricular CPP because extraventricular CPPs do not share the same rich blood supply as intraventricular CPPs [15]. Ependymomas commonly arise during childhood and usually have irregular margins with surrounding edema [15,16]. Medulloblastomas are occasionally detected in adults. Medulloblastomas in adults are poorly defined hemispheric tumors with cystic and necrotic degeneration, which present with less enhancement than medulloblastomas in children [17]. Metastasis appears as a heterogenous or ring-enhanced mass with perifocal edema and a mass effect. Moreover, metastasis is usually associated with additional brain metastasis and meningeal involvement [15]. In both of our cases, MRI showed a well-demarcated and contrast-enhanced tumor without peritumoral edema in the posterior fossa. These findings suggest that a meningioma is a likely diagnosis; however, this type of tumor could not be completely differentiated from other tumors. In our both two cases, non-dural attachment was recognized intraoperatively, and recurrence was not observed after the surgery. Thus, careful total removal of a cisterna magna meningioma without dural attachment would result in good outcome.

4. Conclusion

Meningiomas in the cisterna magna without dural attachment are extremely rare and it is quite difficult to preoperatively diagnose them. However, total removal of the tumor should be achieved.

Conflict of interest

None declared.

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None declared.

Ethics

The work described in this article has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans; Uniform Requirements for manuscripts submitted to Biomedical journals.

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