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CASE REPORT

Coexistence of anterior communicating artery aneurysm and tuberculum sellae meningioma

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Summary Tuberculum sellae meningioma is a common intracranial tumor. However, its coexistence with an intratumoral aneurysm is rare. Here, we present the case of a 65-year-old woman with progressive vision loss caused by a tuberculum sellae meningioma coexisting with an intratumoral anterior communicating artery aneurysm. Treatment modalities for patients with this rare coexisting pathology were reviewed. When an intracranial tumor is closely related to the major intracranial vessel, preoperative magnetic resonance imaging angiography, a safe and noninvasive imaging study, is suggested for the early diagnosis of a possible coexisting aneurysm and for reducing the risk of intraoperative aneurysm rupture.

1. Introduction

Brain tumors and intracranial aneurysms are commonly encountered in neurosurgical practice. However, the coexistence of an intracranial tumor and an aneurysm is rare, with a reported incidence of 0.3–1%.[1,2] From an anatomic perspective, the middle cranial fossa and the nearby middle

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cerebral artery are the most typical locations for both lesions, and their occurrence at these locations is related to an increased regional blood flow. The association between tuberculum sellae meningioma (TSM) and anterior communicating artery (AComA) aneurysm is extremely rare.[3–5] Here, we report the case of an unruptured AComA aneurysm embedded within a TSM. The importance of the prompt early detection of an intratumoral aneurysm prior to surgery is critical to avoiding intraoperative disaster. Treatment strategies for these two coexistent lesions are also discussed.

2. Case Report

A 65-year-old woman visited our outpatient clinic because of progressive loss of left and right visual acuity, in this order, without any symptoms associated with increased intracranial pressure. The neurological examination revealed no abnormalities, except for an abnormal cranial nerve (CN) II sign. A visual field test showed left blindness with right temporal hemianopsia. On admission, brain computed tomography and magnetic resonance (MR) imaging with MR angiography (MRA) were performed, which revealed one round mass, 2.7 cm × 2.3 cm × 1.8 cm in diameter, with substantial postcontrast enhancement (Figure 1A–C) over-riding the tuberculum sellae. The mass was located amid the chiasm and the two optic nerves, and displaced the pituitary gland downward. The MRA also revealed a 0.5-cm vascular out-pouch arising from the AComA, which was compatible with an AComA aneurysm (Figure 1D).

The patient underwent left frontal craniotomy using a subfrontal approach. A reddish tumor was noted after retraction of the frontal lobe (Figure 2A). After partial tumor removal, a tubular aneurysm enclosed within the tumor was revealed (Figure 2B). The neck of the aneurysm was clipped successfully, and the residual tumor was removed (Figure 2C and D). In addition, agenesis of right A1 was noted, which was consistent with the MRA findings (Figure 1D). The histopathological characteristics of the tumor were compatible with Grade I transitional meningioma, and the postoperative course was uneventful. At a 6-month postoperative visit, the patient exhibited improvement in right hemianopsia; however, left blindness was still observed. A 5-year follow-up MR imaging revealed no evidence of tumor recurrence.

3. Discussion

The association between intracranial tumors and aneurysms was first reported by Arieti[6] in 1944. A review of related literature revealed that the coexistence of tumors with aneurysm is highest for meningioma, followed by glioma, pituitary adenoma, and miscellaneous tumors.[1,2] In most patients with brain tumors, any coexisting aneurysms are located within the same cerebral hemisphere. The characteristic and etiologic causes seem to be unlike those of tumors and aneurysms occurring in different cerebral hemispheres.

The exact pathologic mechanism underlying the coexistence of intracranial tumors and aneurysms remains unknown and has been suggested to be a coincidence.[6] Two common hypotheses have been proposed. First, the

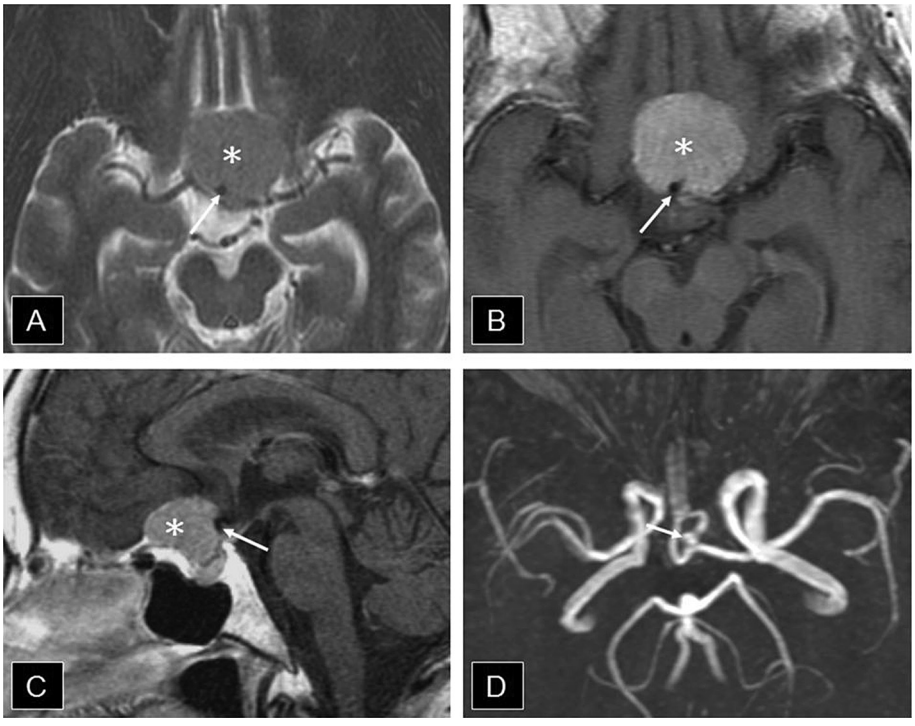

Figure 1 (A) Axial T2-weighted, and (B) axial and (C) sagittal T1-weighted contrast-enhanced images, and (D) magnetic resonance angiography revealed a 2.5-cm homogeneous enhanced mass over the tuberculum sellae (*), with an intratumor vascular pouch from the anterior communicating artery (arrow).

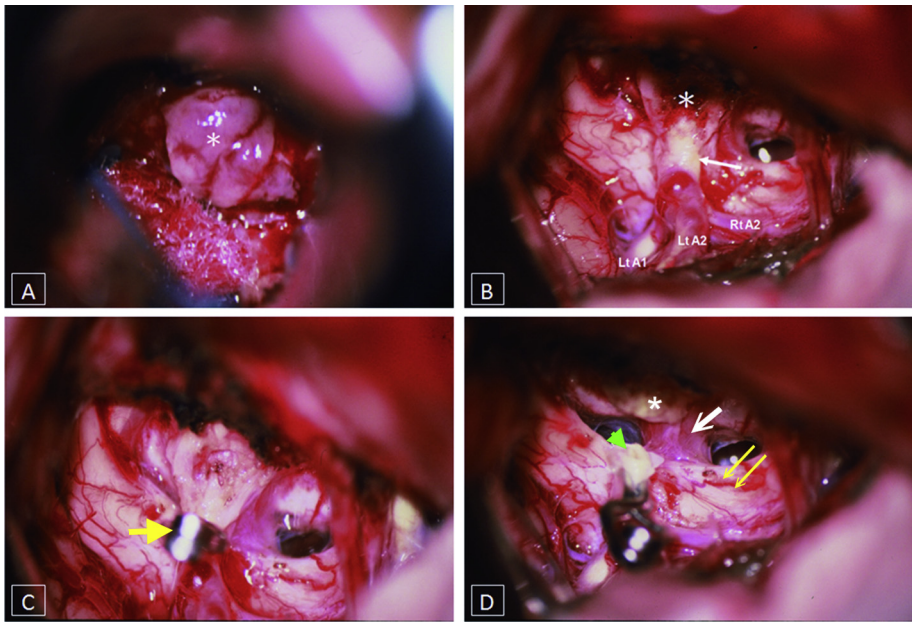

Figure 2 (A) After a left subfrontal approach, the tuberculum sellae meningioma (*) was exposed. (B) After partial tumor removal (*), the anterior communicating artery aneurysm was noted (arrow). (C) The aneurysm was clipped (yellow arrow). (D) The aneurysmal dome was transected (green arrowhead) and the residual tumor resected (*), with the identification of the optic chiasm (yellow double arrow) and pituitary stalk (white arrow).

presence of a brain tumor contributes to the occurrence of an ipsilateral aneurysm because of increased regional vascular flow.[1] This was supported by Tachikawa et al,[7] who reported spontaneous resolution of the aneurysm after tumor removal. Second, direct invasion of the vascular wall by the adjacent tumor may result in aneurysm formation.[2] As the tumor grows, the aneurysm is increasingly embedded within the tumor. In the present case, both proposed mechanisms might have contributed to the formation of the AComA aneurysm; however, the first mechanism was probably the initiator. A midline TSM typically receives blood supply from both posterior ethmoidal arteries, which are fed by ophthalmic arteries from the internal carotid arteries. With the growth of the TSM, the regional blood flow of the AComA is increased because of the enhanced blood flow in both internal carotid arteries. The increased regional blood flow and chronic high intra-arterial pressure in the encasing segment of the AComA were speculated as the pathogenesis of the coexistent AComA aneurysm in the present case. An accurate preoperative diagnosis of such coexisting pathologies is paramount because intraoperative aneurysm rupture may be disasterous.[8] Conventional four-vessel angiography offers high diagnostic accuracy for the existence of intracranial aneurysm; however, it is not a routinely used diagnostic tool for all intracranial tumors. With advances in neuroradiographic techniques and imaging interpretation, preoperative screening using MRA imaging study has the advantages of being noninvasive, and providing adequate and precise information on the coexistence of an aneurysm.[9]

The treatment of an incidental aneurysm accompanying a brain tumor slightly differs from that of an incidental aneurysm. Owing to the presence of an aneurysm, complete removal of the tumor poses a high intraoperative risk, and the long-term risk of aneurysm rupture was estimated to be 10—38%.[2] Thus, curative management for both lesions is an ideal option.

Table 1 Summary of patients with coexistent anterior communicating artery aneurysm and tuberculum sellae meningioma.

Authors	Age/sex	Preoperative symptom/sign	Treatment strategy	Outcome
Ogino et al.[4]	70/F	Sudden-onset headache + left hyposmia	Simultaneously resected tumor + clipped aneurysm	Anosmia + hydrocephalus (s/p VP shunt)
Dolenc et al[5]	50/M	Right blindness	Resected tumor, calcified aneurysm hard to clip and left alone	Well (f/u the aneurysm regularly)
Javadpour et al[11]	61/F	Left blindness + right hemianopsia	Aneurysm embolization first + resected tumor (1 wk later)	Well
Present case	65/F	Left blindness + right hemianopsia	Simultaneously resected tumor + clipped aneurysm	Left blindness as preoperation + improvement of right hemianopsia

F= female; M= male; S/P = status post; VP = ventriculoperitoneal; f/u = follow-up.

Simultaneous surgical management of an intratumoral aneurysm by clipping the aneurysm and tumor excision has been performed successfully.[3] Special considerations should be made. In addition to the hemodynamic change during craniotomy for a brain tumor, the location of the aneurysm close to or residing within the tumor poses an additional risk of aneurysm rupture during tumor resection, as shown in our case. Thus, the aneurysm should be proximally controlled prior to total tumor excision. With advances in endovascular techniques, pre- or intraoperative embolization is a useful option for managing intracranial aneurysm. Successfully staged endovascular coiling followed by complete tumor excision has been reported.[6,10] Treatment strategies for an intracranial tumor with a coexisting aneurysm include direct surgical intervention for both lesions simultaneously or sequentially as preoperative endovascular embolization of the aneurysm followed by surgical removal of the tumor. Table 1 summarized the treatment modalities and outcome in patients with coexistent anterior communicating artery aneurysm and tuberculum sellae meningioma. Definitive treatment should be individualized on the basis of the condition of the patient, experience of the surgeon and neurointerventionist, and facility of the hospital.

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