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CASE REPORT

Middle meningeal artery aneurysm associated with meningioma

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Abstract Middle meningeal artery aneurysm associated with meningioma is extremely rare, and only two cases have previously been reported. In our case, a 72-year-old woman with convexity meningioma underwent preoperative cerebral angiography, which revealed a flow-related aneurysm on the middle meningeal artery. Embolization of the aneurysm was performed with N-butycyanoacrylate glue, and complete obliteration was confirmed under craniotomy. In order to eliminate the risk of preoperative rupture resulting in intracranial hemorrhage, endovascular embolization with liquid glue is safe and effective for this kind of aneurysm.

Abbreviations

MMA	middle meningeal artery
MRI	magnetic resonance imaging
NBCA	N-butylcyanoacrylate
NF2	neurofibromatosis type 2

Case report

A 72-year-old woman was admitted to another hospital with a 1-month history of dizziness. During her workup, including magnetic resonance imaging (MRI), an intracranial mass lesion was depicted, and she was referred to our institute. The patient was alert and well-oriented on admission, without marked higher cognitive disorder. Neurological examination confirmed that neither motor weakness nor sensory disturbance was revealed. Contrast-enhanced MRI using gadolinium demonstrated an extra-axial mass lesion with dural enhancement in the left frontal convexity, and meningioma was diagnosed (Fig. 1A). Preoperative embolization was indicated and planned. Left external carotid angiography showed a large tumor stain through the frontal branch of the middle meningeal artery (MMA) (Fig. 1B). A saccular aneurysm was discovered at the bifurcation of the frontal and parietal branches of the MMA. A microcatheter was navigated into the frontal branch of the left MMA. Polyvinyl alcohol particles suspended in contrast medium were injected through this microcatheter. After this tumor embolization, the tip of the microcatheter was repositioned just proximal to the aneurysm, then glue comprising 10% N-butylcyanoacrylate (NBCA) mixture with iodized oil (lipiodol) was injected slowly (Fig. 1C). Fluoroscopy and control angiography confirmed complete obliteration of this aneurysm and complete devascularization of the tumor. Craniotomy and gross total removal of the tumor were performed the next day. The embolized MMA aneurysm was observed under craniotomy, confirming that the lumen of the aneurysm was well obliterated. The patient had a satisfactory postoperative course.

Discussion

MMA aneurysms are uncommon lesions. Trauma is the most frequent cause of MMA aneurysm. Nontraumatic MMA aneurysms are very rare, with only 20 cases reported to date [1–5]. These lesions are associated with Paget's disease, dural arteriovenous malformation, cavernous hemangioma of the skull, cerebral artery occlusion [1], neurofibromatosis type 2 (NF2) [4], Moyamoya disease [2] and meningioma [3, 5].

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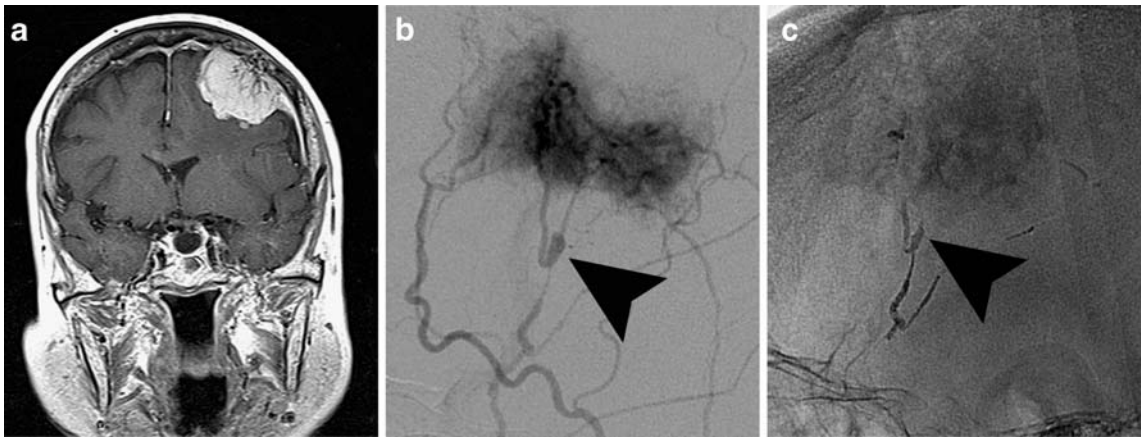

Fig. 1 (**a**) Gadolinium-enhanced T1-weighted imaging revealed a strongly enhancing extra-axial mass lesion on the dura of the left frontal convexity. These findings are consistent with meningioma. (**b**) Left external carotid angiography showed an aneurysm of the MMA (arrowhead), which was on the vascular pedicle of the tumor. Tumor stain showed marked results. (**c**) Postoperative plain skull film. The meningioma and aneurysm were embolized with PVA particles and NBCA, respectively (arrowhead). Fluoroscopy and control angiography confirmed complete obliteration of this flow-related aneurysm on the MMA and complete devascularization of the tumor

The natural course of nontraumatic MMA aneurysms is unclear because of the rarity. Of the 20 reported cases, 9 patients presented with intracranial hemorrhage [1, 2]. Therefore, optimal treatment for this pathology is controversial. Among the 20 cases of nontraumatic MMA aneurysm in the literature, 12 patients underwent craniotomy [1], while 4 were treated using an endovascular procedure [2–5].

As preoperative cerebral angiography becomes more commonly performed, meningeal artery aneurysms associated with meningioma are likely to be increasingly identified. However, only two case reports have described MMA aneurysms associated with meningioma [3, 5]. In both cases, MMA proximal to the aneurysm was occluded with coils. We conducted embolization of the aneurysm and proximal MMA using NBCA glue because liquid embolic materials, such as NBCA, can fill not only the aneurysmal lumen, but also part of the parent artery to prevent recanalization of the lesion. In the case of MMA aneurysm with NF2, the aneurysm was successfully treated using a 20% NBCA mixture with iodized oil [4].

Although some aneurysms on the dural surface can be managed with craniotomy, we suggest that endovascular trapping with application of liquid glue into the MMA aneurysm is a safe and effective method of eliminating the risk of preoperative rupture.

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