



Case Report

Ring enhanced aneurysm due to vasa vasorum of aneurysm wall mimicking a metastatic brain tumor

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ABSTRACT

Background: A spherical intracranial mass can be occasionally misdiagnosed due to the lack of typical radiographic features. Completely thrombosed intracranial aneurysms (CTIA) are uncommon, but a possible differential diagnosis must be considered to guarantee the best surgical approach for these lesions.

Case Description: Here, we report an extremely rare case of a right frontal mass mimicking a brain tumor, in which the surgery unveiled a CTIA of the right middle cerebral artery (MCA). A 56-year-old woman presented with right hemiparesis and mild headache. Magnetic resonance imaging (MRI) revealed a right frontal mass with peripheral edema. The lesion enhanced on initial and follow-up MRI of the brain. Subsequent vascular studies and metastatic workup were negative. A temporal craniotomy with neuronavigation (Brain Lab AG, Germany) was performed and an intraoperative diagnosis of a thrombosed aneurysm along the branch of the MCA was established. The aneurysm was successfully trapped and resected. The patient did not exhibit any postoperative neurological deficits.

Conclusion: This is the rare report of a ring enhanced completely thrombosed aneurysm due to vasa vasorum which is misdiagnosed as metastatic brain tumor. In case of an intracranial ring enhanced mass with signs of intralesional hemorrhage and peripheral edema, CTIA should be considered as a possible differential diagnosis.

Keywords: Metastatic brain tumor, Ring enhance, Thrombosis, Vasa vasorum

INTRODUCTION

A thrombosed aneurysm is an aneurysm that exhibits an intraluminal thrombus, which is diagnosed based on preoperative imaging and intraoperative findings. Thrombosed aneurysms have been classified into the following six types: concentric, eccentric, lobulated, canalized, coiled, and complete.^[9] The incidence of intraluminal thrombosis ranges between 10 and 30%; however, a completely thrombosed aneurysm is extremely rare.^[2,4]

There have been rare case reports of completely thrombosed aneurysms imitating tumor based on the initial presentation and imaging.^[8,16]

Although up to 40% of cerebral aneurysms involve the middle cerebral artery (MCA), few cases have been reported along the MCA.^[3] Here, we describe a patient with headache, whose serial contrast-enhanced magnetic resonance imaging (MRI) brain studies demonstrated a persistent rim-enhancing lesion with surrounding fluid-attenuated inversion recovery (FLAIR)

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signal, indicating the probability of a neoplastic process. Preoperative magnetic resonance angiography was negative for aneurysm. In this case report, we present an unusual case of a completely thrombosed aneurysm of the right MCA that was preoperatively misdiagnosed because of the lack of typical radiographic features.

CASE PRESENTATION

A 56-year-old woman presented to the emergency department with headache and right hemiparesis. Blood screening did not indicate any signs of infection, but she had the history of ovarian tumor resection. A computed tomography (CT) scan revealed a hyperdense mass in the right frontal lobe [Figure 1]. MRI showed a nodular mass, with maximum diameter of 11 mm that was hypointense on FLAIR with perifocal edema. After gadolinium administration, the mass showed a ring enhancement [Figure 2a-d]. Magnetic resonance angiography showed regular blood flow in the intracranial arteries. Because of the ring enhancement and surrounding FLAIR high signal, there was a significant probability of a metastatic brain tumor. We performed right temporal craniotomy with neuronavigation (BrainLab AG, Germany). Dissection was performed through the inferior frontal gyrus down to the level of the lesion. The preparation showed a hard spherical lesion with vasa vasorum at the lesion wall. Further, the lesion wall was grayish black and was found to be a thrombosed aneurysm originating from the distal temporal branch of the right MCA (M3 segment). Distal vessels exiting the aneurysm were seen, which were draped under the surface of the aneurysm, these were freed from the aneurysm dome [Figure 3a]. It was observed that they were not supplying the distal territory of MCA. At this time, a 4 mm permanent clip was placed across the distal vessel of the aneurysm. The proximal portion of the aneurysm and the parent vessel were identified and



Figure 1: Computed tomography scan of the brain. A well-defined mass sized 11 mm in diameter with surrounding edema shows high density, located in the right frontal lobe.

coagulated. We also clipped the proximal vessel [Figure 3b]. The aneurysm was fusiform in appearance. The aneurysm was then resected using micro scissors, cutting the proximal portion away from the permanent aneurysm clips, and then removing the distal portion of the aneurysm [Figure 3c]. The intraoperative indocyanine green angiography demonstrated absence of blood flow in the aneurysm [Figure 3d]. It was observed that they were not supplying the distal territory of MCA. Histopathological findings confirmed the thrombosed aneurysm and reveals remarkable angiogenesis of vasa vasorum [Figure 4].

Postoperatively, the patient was stable and had no neurological deficits. A collateral circulation from the MCA and posterior circulation was detected. After 1-month of follow-up, the patient recovered from the surgery and could walk without assistance.

DISCUSSION

Spontaneous thrombosis of MCA aneurysm is known to occur in approximately 16% of giant aneurysms and

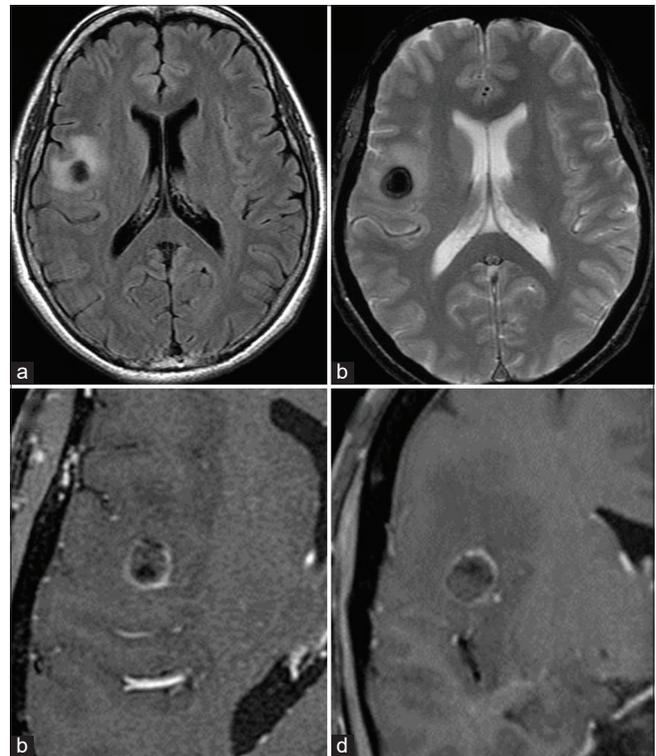


Figure 2: (a) Fluid-attenuated inversion recovery axial magnetic resonance imaging (MRI). (b) T2-weighted axial MRI. (c) Gadolinium-enhanced T1-weighted axial MRI. (d) Gadolinium-enhanced T1-weighted coronal MRI. A round mass with surrounding edema is noted in the right frontal lobe. T2-weighted image shows dark signal intensity due to hematoma. Gadolinium-enhanced T1-weighted images show ring enhancement, suggesting intra-axial neoplasm as a differential diagnosis.

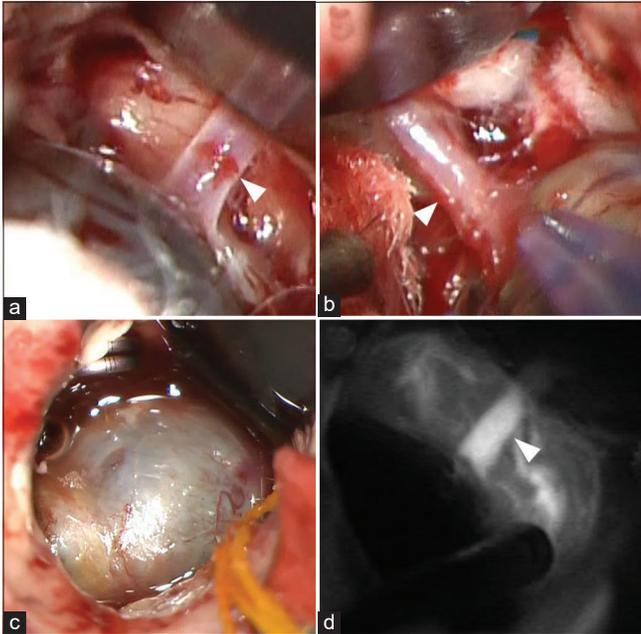


Figure 3: (a) Small artery (white arrow) connected to the distal end of the mass revealed under the mass. It seems to be a branch of the middle cerebral artery. Vascular clip is applied at the parent artery and the distal end is resected. (b) Small artery (white arrow) connected to the proximal end of the mass. Vascular clip is applied and the artery is resected. (c) The grayish black mass is completely excised and there was no other complication at the surgical site. (d) The intraoperative indocyanine green angiography demonstrated absence of blood flow in the aneurysm.

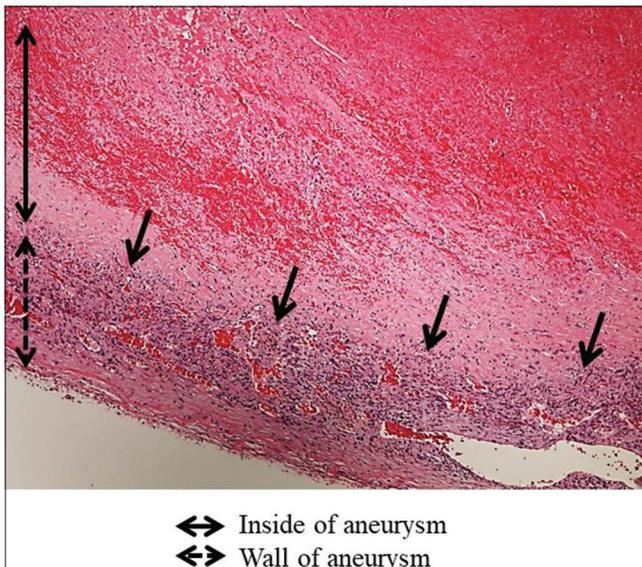


Figure 4: Inside of the aneurysm is completely thrombosed. Histopathological findings. (Hematoxylin-eosin staining) reveals angiogenesis of vasa vasorum (black arrow). Vasa vasorum is ring enhanced and many lymphocytes and neutrophils are infiltrating around the vessels wall (Scale bar: 200 μ m).

only 2–3% are completely thrombosed aneurysms.^[1] This phenomenon is explained by endothelial damage because of hemodynamic stress on the aneurysmal wall.^[2] Complete thrombosis of the non-giant (<25 mm) MCA aneurysms is rare and of medium-size aneurysms is extremely rare.

The mechanism of the spontaneous thrombosis of an aneurysm and its parent artery is unknown. Theories of local stretching, compression, and distortion could explain the occurrence of this complication in intracranial aneurysms, due to the presence of dural folds and bony structures at this location.^[15] In our case, the two possible mechanisms of this complication are as follows: compression of the parent vessel by a growing partially thrombosed aneurysm, or retrograde propagation of the thrombus, and leading to an acute parent artery thrombosis and subsequently, to a complete thrombosis of the aneurysm.^[18]

The CT and MRI findings in thrombotic aneurysm include peripheral ring enhancement, curvilinear mural calcification, mixed high-density attenuation in the aneurysmal lumen, the presence of “target sign,” and perianeurysmal edema on the FLAIR images.^[11] When thrombosis is complete, the diagnosis is difficult and the angiography could be negative.

Recently, the pathogenesis of thrombosed aneurysm was proposed to originate in structural vessel wall disease. The vessel wall was injured by hypercholesterolemia, atherosclerosis, and chronic inflammation.^[6,12]

The endothelial cell junctions are responsible for maintaining vessel wall integrity and preventing the leakage of intravascular components to the extravascular space. As angiogenic processes are initiated vessel permeability increases, enabling the deposition of serum proteins, triggering inflammatory cell adhesion of neutrophils, and lymphocytes. Both local and systemic inflammation results in increased permeability of the endothelial cell junctions.^[6]

Our patient showed ring enhancement and perianeurysmal edema on MRI; hence, she was misdiagnosed with neoplasm. The histopathological findings revealed the vasa vasorum on the aneurysm wall and many lymphocytes and neutrophils infiltrated in the vessel wall. The vasa vasorum could be involved in ring enhancement.

Misdiagnosis of a thrombosed aneurysm as a brain tumor is not rare in clinical field; however, completely thrombosed aneurysms mimicking intracranial neoplasms have been reported only in nine cases previously [Table 1]. Furthermore, most of the cases involved the posterior circulation; whereas, only other three cases involved the MCA. The symptoms appear to be related to the mass effect of the thrombosed aneurysm; six of ten cases presented with headache, including our case. There were no obvious clinical signs or imaging features indicating aneurysmal subarachnoid hemorrhage.

Table 1: Previous reported cases of completely thrombosed aneurysm mimicking intracranial mass.

Author/Year	Age/Sex	Location	Size (mm)	Symptoms	Imaging	Treatment	Misdiagnosis	Outcome
Spallone <i>et al.</i> ^[16]	51/Male	Left VA	-	Hemiparesis	CT, Angiography	Removal of aneurysm	Neoplasm	Good recovery
Lim <i>et al.</i> ^[10]	64/Female	Left PICA	25	Headache	CT, MRI, Angiography	Removal of aneurysm	Cavernous angioma	Good recovery
Pasler <i>et al.</i> ^[14]	22/Female	Left AICA	-	Hearing loss	MRI, Angiography	Removal of aneurysm and restore AICA	Vestibular schwannoma	Good recovery
Fifi <i>et al.</i> ^[5]	37/Female	Left ACA	10	Headache	MRI, Angiography	Removal of aneurysm	Dermoid cyst	Good recovery
Lan <i>et al.</i> ^[8]	9/Male	Right PICA	45	Headache	CT, MRI, Angiography	Removal of aneurysm	Epidermoid cyst	Good recovery
Woo <i>et al.</i> ^[19]	79/Female	Left PICA	30	Hemiparesis	CT, MRI, Angiography	Clipping	Ependymoma	Good recovery
Kim ^[7]	54/Male	Right MCA	19	Headache	CT, MRI	Removal of aneurysm	Neoplasm	Good recovery
Nguyen ^[13]	43/Female	Right MCA	11	Seizure	CT, MRI, Angiography	Removal of aneurysm	Neoplasm	Good recovery
Trungu ^[17]	53/Male	Left MCA	11	Headache	CT, MRI, Angiography	Removal of aneurysm	Cavernous angioma	Good recovery
Present case	56/Female	Right MCA	12	Headache	CT, MRI, Angiography	Removal of aneurysm	Metastatic brain tumor	Good recovery

CT: Computed tomography, MRI: Magnetic resonance imaging, MCA: Middle cerebral artery, AICA: Anterior inferior cerebellar artery

When a patient presents with an intracranial lesion lying on the course of major cerebral arteries or even on the course of distal cerebral arteries, it is important to consider thrombosed aneurysm as one of the differential diagnosis.

In the literature, nine of ten cases underwent aneurysm trapping and removal of the aneurysm.^[5,7,10,13,14,17,19] In these cases of thrombosed aneurysms, though there was a low possibility of rupture because they were fully thrombosed, the parent artery could be completely controlled by trapping and removal of the aneurysm to prevent bleeding and reduce the mass effect.

CONCLUSION

CTIA is a rare lesion that could be misdiagnosed as metastatic brain tumor. Thus, in case of an intracranial ring enhanced mass with intralesional hemorrhage, presence of a CTIA should be considered as a possible differential diagnosis. This is the rare report of a ring enhanced completely thrombosed aneurysm due to vasa vasorum of wall which is misdiagnosed as metastatic brain tumor.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

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