Intracranial dissection of the distal middle cerebral artery as an uncommon cause of distal cerebral artery aneurysm

Case report

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An aneurysmal dissection of a right middle cerebral artery (MCA) branch is described in a 56-year-old woman. The abnormality was an incidental finding on computerized tomography and subsequently appeared on magnetic resonance imaging performed to evaluate the patient for subjective pulsatile tinnitus. The intracranial aneurysm was documented to have enlarged on serial angiography over a 6-week interval. Treatment was believed to be necessary because of the unknown etiology of the aneurysm, with the differential diagnosis including mycotic or neoplastic aneurysm with a risk of hemorrhage. The lesion was excised and flow to the distal MCA branch was preserved with an anastomosis of the superficial temporal artery to the MCA. The aneurysm, which developed at the level of the sylvian fissure, proved on pathological study to be related to a focal dissection of the MCA branch. The radiographic appearance and pathological findings are presented. Focal dissection must henceforth be included in the differential diagnosis of peripheral cerebral artery aneurysms.

KEY WORDS • dissecting aneurysm • intracranial aneurysm • middle cerebral artery

Intracranial aneurysms occurring along the distal branches of the cerebral arteries are uncommon compared to saccular aneurysms developing along the proximal trunks of the circle of Willis. When these aneurysms are encountered, the most common etiology is infection due to mycotic emboli with secondary aneurysm formation. Other known etiologies for peripheral cerebral aneurysms include neoplastic emboli, notably involving atrial myxoma and choriocarcinoma, and major cranial trauma. Aneurysms developing secondary to dissection of the intracranial arteries are rare, although they have recently been recognized in the major trunks and proximal branches of the circle of Willis. These aneurysms have a propensity to occur in young people presenting with symptoms such as headache, focal neurological deficit, and intracranial hemorrhage. We report the case of an aneurysm secondary to dissection of a distal middle cerebral artery (MCA) branch, treated through resection and anastomosis of the superficial temporal artery (STA) to the MCA. The case is unique in that it represents the first report of a peripheral aneurysm resulting from intracranial arterial dissection. The case is also unusual in that the aneurysm was incidental to the patient's presenting symptoms and signs, but was observed to enlarge over a relatively short period of time.

Case Report

This 56-year-old woman came to our attention noting a 6-month history of pulsatile tinnitus in her left ear.

Physical Examination. Physical examination disclosed a systolic bruit in the left supraclavicular region, but the neurological examination was entirely normal. There was no history of significant head trauma or cardiac disease. Eighteen months earlier, the patient had noted some mild memory difficulties that had prompted examination with both computerized tomography (CT) and magnetic resonance (MR) imaging, which were completely normal. Because of the symptoms of pulsatile tinnitus over the 6 months before admission, a CT of the head was again obtained and demonstrated a new small hyperdense lesion adjacent to the right sylvian fissure (Fig. 1). Subsequent MR imaging showed an abnormality within the right sylvian fissure; signal characteristics were consistent with a partially throm-
D. G. Piepgras, K. M. McGrail, and H. D. Tazelaar

Fig. 1. Noncontrast-enhanced computerized tomography scan demonstrating a small hyperdense lesion adjacent to the sylvian fissure (arrow).

bosed aneurysm (Fig. 2). Cerebral angiography demonstrated a 4-mm aneurysm arising from a posterior parietal branch of the right MCA at the level of the posterior sylvian fissure (Fig. 3). The rest of the intracranial circulation was normal. The left subclavian artery showed high-grade stenosis with retrograde flow in the left vertebral artery distal to the lesion (subclavian steal). The latter lesion was believed to be the likely cause for the patient’s symptoms of pulsatile tinnitus, but the etiology of the right distal MCA aneurysm was uncertain, the differential diagnosis including mycotic, neoplastic, or traumatic aneurysm. A repeat angiogram obtained 6 weeks later demonstrated clear enlargement of the aneurysm to 8 mm in diameter (Fig. 4).

Operation. Because of the uncertain cause of the aneurysm and the risk of hemorrhage, the patient underwent a right temporoparietal craniotomy. The posterior aspect of the sylvian fissure was opened under the operating microscope, and the aneurysm was visualized arising from the MCA branch just below its emergence from the fissure. The aneurysm was irregular and the MCA branch could be identified entering the aneurysm anteriorly and exiting from its posterior aspect. There was some evidence of hemosiderin staining and arachnoidal thickening adjacent to the aneurysm, consistent with very mild past hemorrhage. To remove the entire

Fig. 2. Magnetic resonance images, axial (left) and coronal (right) views, showing the abnormality within the right sylvian fissure (arrows). The signal characteristics of this lesion were consistent with a partially thrombosed aneurysm.

Fig. 3. Initial right carotid angiograms, anteroposterior (left) and lateral (right) views, revealing a 4-mm sac- cular aneurysm (arrows) arising from a posterior branch of the right middle cerebral artery.

Fig. 4. Repeat right carotid angiogram obtained 6 weeks after the initial examination demonstrated clear enlargement of the aneurysm to 8 mm in diameter (right). The left vertebral and posterior cerebral arteries are also demonstrated (left).
lesion, the posterior division of the right STA was anastomosed end-to-side to the MCA branch distal to the aneurysm. The entering and exiting MCA branches were then clipped and the aneurysm was excised in its entirety.

Postoperative Course. The patient awoke from surgery without neurological deficit and her postoperative course was unremarkable. Postoperative angiography demonstrated a patent STA-MCA anastomosis with good filling of the MCA branch distal to the excised aneurysm (Fig. 5). Eight weeks after excision of the aneurysm, the patient underwent successful endovascular dilatation of the left subclavian stenosis, which was presumed to be of an atherosclerotic etiology. The dilatation restored antegrade left vertebral flow and the patient's pulsatile tinnitus resolved completely.

Pathological Examination. Pathological study revealed that the aneurysm measured 1.5 cm at its greatest diameter. Section and microscopic study showed that it resulted from a dissection, with a false channel located in the outer aspect of the media of the vessel wall. The resulting aneurysmal sac showed evidence of organization, neo-intimal proliferation, and fresh blood within the lumen (Fig. 6). No infection was evident in the aneurysm, and staining for bacteria and fungi was negative.

Discussion

We believe that this case represents the first report of a distal intracranial artery aneurysm secondary to arterial dissection. Most distal intracranial aneurysms occur as a result of bacterial infection, usually associated with endocarditis. They have also been reported in conjunction with disseminated fungal infections. Rare cases of peripheral aneurysms secondary to neoplastic emboli that invade and destroy the arterial wall have also been described, most notably atrial myxoma and choriocarcinoma.

Aneurysms secondary to dissection of the intracranial cerebral arteries tend to occur more proximally,
The aneurysm was observed to have enlarged on serial angiograms obtained 6 weeks apart; this growth was probably due to lysis of the aneurysmal thrombus rather than enlargement of the entire lesion. The preoperative angiograms showed no involvement of the vascular wall proximal or distal to the aneurysm; after excision of the aneurysm, the proximal and distal vascular walls were completely normal.

Because of the peripheral location, a major concern was that this lesion might be of mycotic or neoplastic origin; therefore, excision was deemed advisable. This judgment was reinforced by the finding of aneurysmal enlargement on the second angiogram. Inasmuch as the aneurysm had no definable neck and its etiology was uncertain, it was believed that the entire lesion should be excised and MCA flow distal to the lesion maintained with an end-to-side STA-MCA anastomosis. Kitani, et al., previously reported an STA-MCA bypass for a spontaneous dissection in an 18-year-old man. In their patient, the acute dissection extended from the supraclavicular internal carotid artery to the MCA and the patient had developed progressive ischemia of the right hemisphere. These deficits improved after surgery.

Previous reported cases of intracranial dissection have been associated with profound neurological deficit and hemorrhage, and many have been fatal or were accompanied by major morbidity. In our patient, the distal location of the dissection, its failure to completely occlude the vascular lumen, and the lack of mural disruption and hemorrhage undoubtedly permitted its asymptomatic status.

Our case is noteworthy because it establishes focal dissection as an etiology for the development of a distal cerebral artery aneurysm; this etiology must be considered along with mycotic, neoplastic, and traumatic causes, although obviously the natural history of the lesions and their treatment are different. In most cases, a diagnosis can be made on a clinical basis or according to angiographic signs. When these aneurysms occur as an isolated finding, however, therapeutic decisions are difficult; the two primary alternatives are very close observation with serial head scans and angiography or surgery to excise the aneurysm. Surgery must include provisions for preserving the circulation distal to the aneurysm.

References

Including within the internal carotid artery, basilar artery, MCA, and posterior cerebral artery trunks. These aneurysms have been associated with Marfan's syndrome, cystic medial degeneration, fibromuscular dysplasia, syphilis, and arterial hypertension. In most cases of intracranial arterial dissection no specific cause can be identified, although aneurysmal dissection has been reported after tumor resection, aneurysm clipping, and head trauma. The presentation of these aneurysms is typically acute and dramatic due to subarachnoid hemorrhage or ischemia associated with rupture or occlusion of the vessel.

One pathological study of vessels affected by intracranial dissection revealed longitudinal dissection of the involved artery with blood entering the arterial wall between the internal elastic lamina and media. The MCA is the most commonly involved vessel of the anterior intracranial circulation and most of these cases occur in patients under 40 years of age.

In our patient, the dissecting aneurysm was an incidental finding discovered in the course of an evaluation for pulsatile tinnitus. The patient had undergone CT and MR imaging of the head 1½ years earlier for unrelated symptoms, but those studies showed no evidence of the lesion. Subsequently, CT and MR studies clearly showed an abnormality consistent with a partially thrombosed aneurysm and a small adjacent area of focal edema or infarction. Our patient had no antecedent neurological symptoms, such as those of focal cerebral ischemia or subarachnoid hemorrhage, that could be ascribed to this dissection. The findings at surgery of perianeurysmal hemosiderin staining and arachnoidal thickening were more suggestive of diapedesis of blood through the injured vascular wall than of forceful hemorrhage secondary to mural disruption.

Fig. 6. Photomicrograph of the aneurysm in cross-section showing the black elastica of the arterial media (arrowheads) with its zone of rupture (arrow). The false channel is partially occluded by proliferating neointima (asterisks) and fresh blood. Two additional lumina are represented in the periphery, surrounded by irregular elastic lamellae representing foci of "recanalization" within the false channel. Elastica van Gieson, × 10.8.
Distal MCA dissecting aneurysm


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