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Aneurysm at a Duplication of the Middle Cerebral Artery

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Summary: Two cases of ruptured aneurysm at the origin of a duplication of the middle cerebral artery are presented and reviewed together with eight documented cases from the literature.

Index terms: Aneurysm, cerebral; Arteries, cerebral, middle (MCA); Arteries, abnormalities and anomalies

In an anatomic study of 374 autopsied brains, Crompton and Lond (1) found that in 3% (10 of 374 cases) there was an artery arising from the internal carotid artery between its terminal bifurcation and the origin of the anterior choroidal artery, which passed into the Sylvian fissure along with the ordinary middle cerebral artery. He termed this vessel an *accessory middle cerebral artery*. In addition, another case with an artery arising from the region of the anterior communicating artery and passing back similarly into the Sylvian fissure was noted. Teal et al (2) established a distinction between these two arteries and called the one originating from the ICA a *duplication of the middle cerebral artery*. He called the other originating from the anterior cerebral artery an accessory middle cerebral artery.

An aneurysm of the duplication of the middle cerebral artery was described by Crompton and Lond (1) and was classified as an internal carotid artery aneurysm, but it is rare. In this paper, two cases of ruptured aneurysm at the origin of the duplication of the middle cerebral artery will be reported and discussed together with eight previously documented cases.

Case Reports

Case 1

A 51-year-old woman was admitted to our clinic after a subarachnoid hemorrhage and bled again the next day.

Left carotid angiography performed 2 days after rebleeding suggested the presence of a left internal carotid artery aneurysm, but details of its site of origin could not be clarified because of vasospasm (Fig 1A). The right carotid angiogram showed a right carotid-ophthalmic saccular aneurysm. Direct operation on these two aneurysms was carried out, and on the left side an arterial branch, nearly the same size as the main middle cerebral artery, was found to arise from the internal carotid artery about 10 mm proximal to the site of its terminal bifurcation and was identified as a duplication of the middle cerebral artery from the fact that it passed into the Sylvian fissure along with the main middle cerebral artery. A ruptured saccular aneurysm was found at its origin and was clipped. Furthermore, another relatively broad arterial branch, the left fetal-type posterior cerebral artery, was also discovered branching posteriorly from the duplication approximately 6 mm distal to the origin of the duplication. The correlation of these arteries was confirmed later by postoperative carotid angiography (Fig 1B). The right carotid-ophthalmic aneurysm was also clipped through a separate right craniotomy. The postoperative course was uneventful.

Case 2

A 54-year-old man was admitted and was diagnosed with computed tomography as having a subarachnoid hemorrhage. On the left carotid angiogram taken on day 2, a duplication of the middle cerebral artery smaller than and proximal to the middle cerebral artery was discovered to arise from the left internal carotid artery. A saccular aneurysm was also delineated between the middle cerebral artery and the duplication at the origin of the latter (Fig 2). Aneurysmal neck clipping was carried out on day 3 and was confirmed by postoperative left carotid angiography performed on day 11. The patient showed residual slight disorientation and gait disturbance caused by postoperative cerebral vasospasms and meningitis.

Discussion

A duplication of the middle cerebral artery aneurysm sometimes may have been classified

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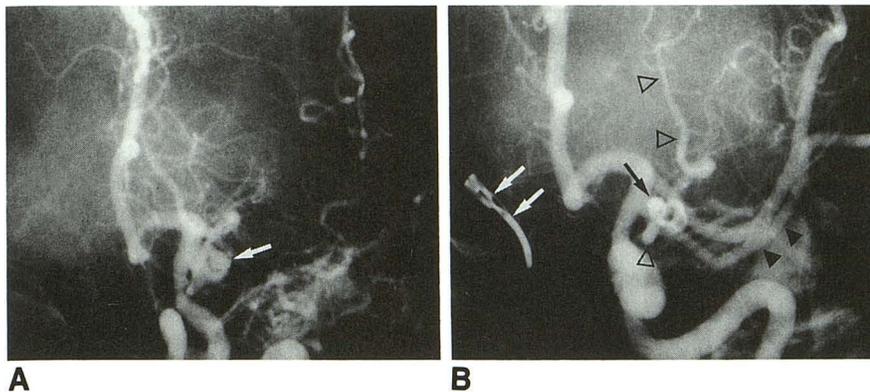


Fig. 1. Case 1. 51-year-old woman with a ruptured aneurysm at the origin of the left duplication of the middle cerebral artery and an unruptured right carotid-ophthalmic aneurysm (not illustrated).

A, Preoperative left carotid angiogram. A saccular aneurysm (*arrow*) is delineated but the details of its neck are unclear because the duplicated middle cerebral artery (*closed arrowheads*, B) arises from the left internal carotid artery proximal to the ordinary middle cerebral artery, and the fetal-type posterior cerebral artery (*open arrowheads*, B) originates from the duplication of the middle cerebral artery.

B, Postoperative left carotid angiogram.

The aneurysm at the origin of the duplication of the middle cerebral artery was well clipped (*black arrow*). Another clip (*white arrows*) used for the right carotid-ophthalmic aneurysm is also visible.

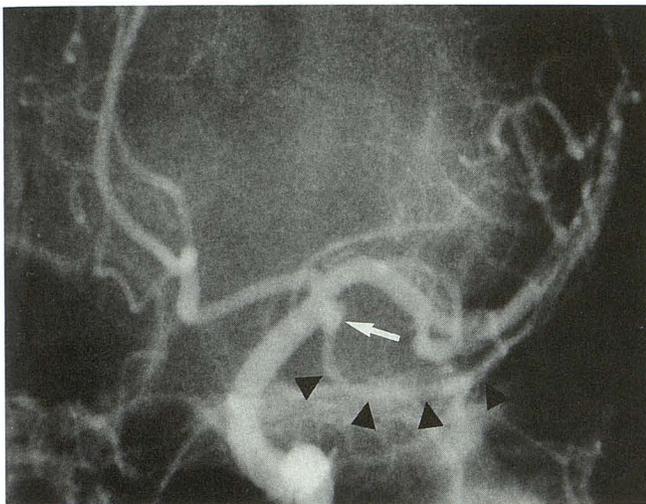


Fig. 2. Case 2. 54-year-old man with a ruptured aneurysm at the origin of the left duplication of the middle cerebral artery, also treated surgically.

Oblique view of preoperative left carotid angiogram. An aneurysm (*arrow*) is delineated at the origin of the left duplication of the middle cerebral artery (*arrowheads*).

as an internal carotid artery aneurysm, as Crompton and Lond (1) did in one case documented in 1962. However, we found only 10 cases including our 2 cases (1, 3, 4). With the exception of 1 case not described in detail (1), the 9 other cases of aneurysm of the duplication of the middle cerebral artery are of 6 women and 3 men 29 to 74 years of age (mean, 47.1 ± 13.9), with aneurysms on the right side in 7 patients and on the left side in 2. Seven patients were treated surgically by aneurysmal neck clipping with or without cerebrospinal fluid shunt operation; outcomes were satisfactory. Therapy was not specified in the other 3 patients. Four of these aneurysms coincided with another unruptured aneurysm. It is of

interest that 8 (80.0%) of the 10 cases are Japanese.

Occurrence of an aneurysm at a duplication of the middle cerebral artery may not be much different from that at other sites because the incidence of duplication is not particularly high. The coincidental presence of the carotid-ophthalmic aneurysm in case 1 is also not particularly significant because multiplicity of cerebral aneurysm in cases of carotid-ophthalmic aneurysm is relatively frequent, with its incidence ranging from 44% to 64% (5, 6).

The fetal-type posterior cerebral artery in our case 1 may be a branch of the duplication of the middle cerebral artery, because it originated from the duplication at a vertical angle to the latter. However, the patient's duplication also could be considered a branch of the fetal-type posterior cerebral artery, because the anterior choroidal artery arose from the internal carotid artery just behind and a little distal to the duplication junction, and because a fetal-type posterior cerebral artery (10% to 30% by Kraysenbühl and Yasargil; 7) is more frequent than a duplication of the middle cerebral artery (1). According to Riggs and Rupp (8), the hypoplastic divisional branch of the basilar artery was regularly associated with the ectopic origin of their secondary branches. It is interesting to note that in our case 1, in which the left posterior cerebral artery arises from the duplication, the P1 segments of the posterior cerebral artery were bilaterally hypoplastic.

Such speculation led us to draw a distinction between a duplication of the middle cerebral artery apparently arising from the internal carotid artery at a more proximal region, as in case 1, and one arising from around the terminal bifurcation, as in case 2. The latter may be regarded

as just a well-developed earlier ramification of the early branch of the middle cerebral artery.

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