Anomalous arrangement of the origins of the anterior choroidal and posterior communicating arteries

Case report

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A case of anomalous origin of the anterior choroidal and posterior communicating arteries in a 36-year-old woman with aneurysmal subarachnoid hemorrhage is presented. Preoperative four-vessel angiography revealed a reverse relationship of these vessels, wherein the anterior choroidal artery origin was proximal to the origin of the posterior communicating artery. This arrangement is extremely rare; the only other reported case was in a patient undergoing angiography prior to acoustic neurinoma resection. It is believed that this is the first case reported in a patient with subarachnoid hemorrhage from rupture of an aneurysm arising from a vessel of such anomalous origin.

KEY WORDS • aneurysm • anterior choroidal artery • subarachnoid hemorrhage • posterior communicating artery • anomaly

The anatomy of the anterior choroidal artery (AChA) and posterior communicating artery (PCoA) has been studied extensively. Despite several detailed anatomical reports, none has disclosed a transposition of the origins of these vessels. Therefore, no estimate of the incidence of this unusual variant exists. Only one other case of this anomaly has so far been reported, this in a patient undergoing angiography prior to resection of an acoustic neurinoma. We report a case of subarachnoid hemorrhage (SAH) secondary to rupture of an aneurysm arising from the PCoA, which in turn originated from the internal carotid artery distal to the point of origin of the AChA.

Case Report

This 36-year-old woman with a history of polycystic kidney disease, multiple sclerosis, and hypertension experienced sudden loss of consciousness.

Examination. A computerized tomography (CT) scan at another hospital revealed SAH with intraventricular extension. Cerebral angiography demonstrated multiple aneurysms, including a large aneurysm arising from near the origin of the left PCoA, a small aneurysm at the level of the left ophthalmic artery, another small aneurysm arising from the left middle cerebral artery bifurcation, and a small right ophthalmic artery aneurysm. This study also disclosed an unusual arrangement of the origins of the left PCoA and AChA, with the AChA arising from the internal carotid artery proximal to the origin of the PCoA artery (Fig. 1). The CT and angiographic results indicated that the aneurysm arising from the left PCoA was the one that had ruptured.

Operation. The patient remained comatose with a left hemiparesis, but improved somewhat after placement of a ventriculoperitoneal shunt. She was transferred to our institute approximately 1 month after her hemorrhage and underwent clipping of the left PCoA and middle cerebral artery aneurysms by a pterional approach.

Postoperative Course. Surgery confirmed that the bleeding source was the PCoA aneurysm. The patient tolerated the surgery well, and has improved to the point of ambulating with assistance.

Discussion

The microvascular anatomy of the AChA and PCoA has been documented in several detailed anatomical studies. These investigations have demonstrated numerous variations in the course, size, segments, branching patterns, and brain regions supplied by these vessels.1-10 However, no study has demonstrated a transposition of the origins of these two arteries as found in the case presented here. Yagargil10 did note one case in his study of the anatomy of the AChA where the PCoA and AChA were seen to arise from the same level of the internal
carotid artery. This is the only variation of the origins of these vessels noted in any microsurgical study to date. There has been one other case, reported by Hara, et al., of an anomalous arrangement of the origins of these vessels similar to the one reported here. This was found during routine angiography performed prior to resection of an acoustic neurinoma. As far as we can ascertain, ours is the first case of SAH resulting from rupture of an aneurysm arising from either the AChA or PCoA whose origins from the internal carotid artery were transposed.

The embryological mechanisms involved in the genesis of this variant are unknown. The cerebral angiograms in both our case and the case reported by Hara, et al., failed to disclose any other anomalous vessels. In both cases, the contralateral PCoA and AChA were of normal origin. The territories supplied by the vessels of atypical origin both in our case and the case previously reported were not affected by this unusual arrangement.

The importance of this anomaly lies in the potential risks it poses during surgery. Aneurysms of the PCoA are typically quite amenable to surgical repair. If, in the process of clipping an aneurysm of this type, the PCoA is either intentionally or inadvertently occluded, serious complications may sometimes be avoided. A good outcome can be expected only if there is adequate backflow from the posterior cerebral artery to the distal PCoA, and any hypothalamic perforating vessels are spared during clip application. An inability to visualize such collateral flow during angiography is not uncommon, and this does not necessarily imply inadequacy of flow from the posterior to the anterior circulations. Lack of blood flow from the carotid artery following occlusion of the PCoA may result in a significantly increased contribution of the posterior cerebral artery to flow within the PCoA and its perforating vessels.

The AChA, on the other hand, is virtually an end arterial system, with no significant collateral flow, despite a potential anastomosis with the posterior choroidal arteries. Occlusion of this vessel will usually cause an infarction, although the size, location, and clinical manifestations of such an infarct will vary, depending upon the site of occlusion relative to the origin of the AChA from the carotid artery and on the patient's own particular vascular anatomy.

Failure to appreciate this anomaly preoperatively could result in a devastating infarct if the AChA is mistaken for the PCoA and subsequently occluded. Careful review of the preoperative angiogram, including the entire course of the vessels of interest, should disclose variants of this type which, although extremely rare, pose an added surgical risk if unrecognized.

References


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