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Bilateral Anomalous Anterior Cerebral Artery and Infraoptic Aneurysm

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Preoperative recognition of the variants of the circle of Willis is important for aneurysm surgery. An example of a bilateral anomalous anterior cerebral artery (ACA) associated with an ACA aneurysm below the optic nerve is described.

Case Report

History

A 43-year-old woman with previous history of hypertension and migraines presented with subarachnoid hemorrhage. She had no papilledema and the rest of her physical and neurologic examination was normal.

Radiologic Findings

A CT scan demonstrated a subarachnoid hemorrhage. A follow-up four-vessel cerebral angiogram demonstrated bilateral anomalous ACAs, with the origin at the level of the ophthalmic artery proximal to the posterior communicating and anterior choroidal arteries. The proximal portion of each ectopic proximal segment was horizontal, suggesting that both ACAs coursed below the optic nerves (Figs. 1A and 2A). In addition, there was a broad-based saccular aneurysm off the proximal segment of the right ACA, pointing anteriorly and inferiorly below the optic nerve (Fig. 1B). The anterior communicating artery (ACoA) was slightly high and posterior in location, and there was a saccular ACoA aneurysm pointing upward (Fig. 2B).

Surgical Findings

At the time of microsurgical craniotomy, the proximal segment of the right ACA was noted to pass underneath the optic nerve and extend to the midline, where it curved and headed toward the interhemispheric fissure. A similar anatomic pattern appeared to exist with the left ACA when viewed under the microscope, although extensive arachnoidal dissection on that side was not performed. An aneurysm off the proximal segment of the right ACA extended underneath the right optic nerve. There was no evidence of prior bleeding from this aneurysm. No adherence to the right optic nerve

was present. Further microsurgical dissection, through the subpial surface of the gyrus rectus on the right, exposed an ACoA aneurysm that projected upward in the midline. There was evidence of previous subarachnoid hemorrhage in this area. The neck of the ACoA aneurysm was dissected free and clipped. Afterward, the neck of the aneurysm off the proximal segment of the right ACA was clipped uneventfully. Patency of all major vessels of the ACoA complex as well as the right ACA was maintained. The patient had an essentially benign postoperative course with no increase in neurologic deficits.

Discussion

There have been several reports of rare anomalies of the anterior cerebral artery, including the infraoptic course of an anomalous ACA [1–4]. The infraoptic ACA is occasionally associated with an ACoA aneurysm [5], and patients with this condition usually present with subarachnoid hemorrhage, as did the patient in our case report. Our patient is unusual because she had both an ACoA and an infraoptic ACA aneurysm. Awareness of this anomaly and its angiographic appearance is important because it changes the surgical approach and prevents needless dissection near the optic nerve.

Other reported associations with the infraoptic course of the ACA include (1) an ACoA aneurysm [5], as occurred in this patient; (2) an aneurysm at the site where the normal ACA would have originated [2]; (3) an additional hypoplastic ACA at its usual location [3]; and (4) a unilateral ACA [4]. Visual-field disturbance related to compression of the optic nerve by the anomalous ACA has also been reported [6].

The embryogenesis of this anomalous ACA is not clear. One explanation is a variant of Dawson's theory of prechiasmal arterial "anastomotic loops" with persistence of a vessel that subsequently forms the ACA beneath the optic nerve [2, 7, 8]. A second theory suggests an error in development of the ophthalmic artery with a complicated and late emergence of the definitive ophthalmic artery, causing the infraoptic course of the ACA [2, 5, 8].

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Fig. 1.—A, Right common carotid arteriogram shows horizontal course of anomalous proximal anterior cerebral artery (ACA) segment (*long arrow*). Infraoptic ACA aneurysm is opacified (*short arrow*).

B, Oblique view during right common carotid arteriogram confirms infraoptic ACA aneurysm (*arrow*).

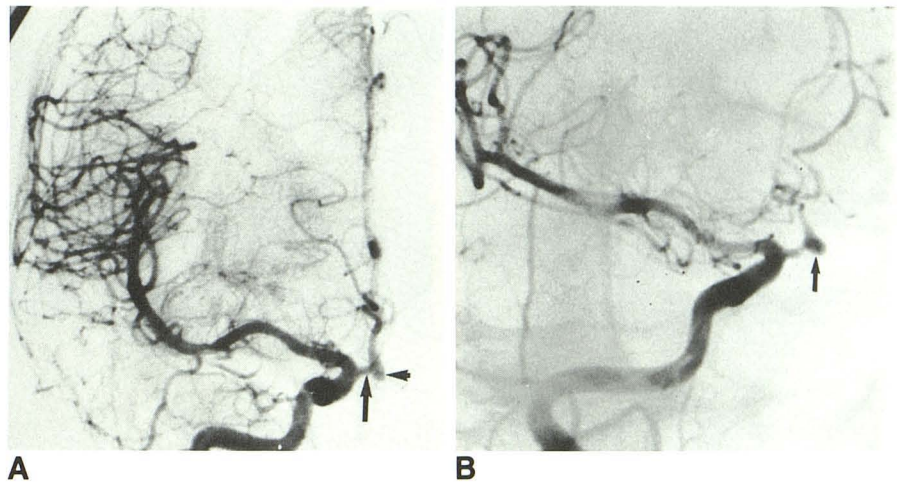
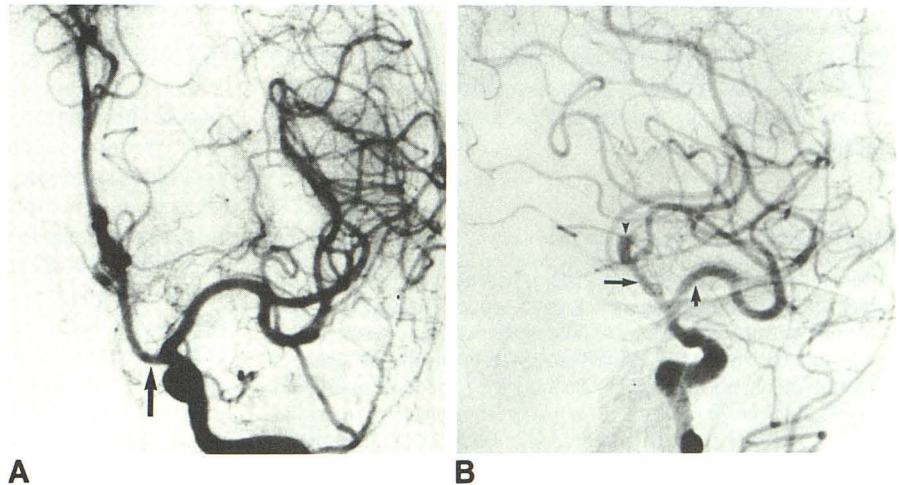


Fig. 2.—A, Left common carotid arteriogram shows anomalous proximal anterior cerebral artery (ACA) segment (*arrow*). Anterior communicating artery (ACoA) aneurysm cannot be appreciated on this routine anteroposterior view.

B, Oblique view during left common carotid arteriogram shows ACoA aneurysm (*arrow-head*). Well shown are proximal segments of left ACA (*long arrow*) and left middle cerebral artery (*short arrow*).



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