Vascular anomalies involving the anterior portion of the circle of Willis are common.\textsuperscript{1-3} Fenestration\textsuperscript{4,5} or duplication\textsuperscript{1,3,4} of the anterior cerebral artery (ACA) is a frequent incidental finding in cerebral angiograms. Aplasia and hypoplasia of the A1 segment also are reported frequently.\textsuperscript{1,3} However, internal carotid artery (ICA) anastomosis with the contralateral ACA is unusual. We encountered an extremely rare variant of such an anastomosis.

CASE REPORT

A 30-year-old man with disturbance of consciousness after a traffic accident was admitted to our department. Computed tomography performed on admission revealed a subdural hematoma and subarachnoid hemorrhage in the interhemispheric fissure. Since no craniofacial injury was apparent, we performed conventional angiography to identify a source of hemorrhage. No aneurysm or arteriovenous malformation was detected by angiography, so we concluded that the bleeding was of traumatic origin. Anomalous origin of the ACA was disclosed incidentally, with both A1 segments arising from the right internal carotid artery; no normal A1 segment of the left ACA was visualized. We treated the intracranial hematoma conservatively, and the patient was discharged with no neurologic deficit.

DISCUSSION

The A1 segment of the ACA is the most frequent site of anatomic variation in the circle of Willis.\textsuperscript{1-6} Variations within the anterior communicating artery with complexes including duplication,\textsuperscript{2,6-8} azygos ACA,\textsuperscript{2,4,8} or accessory ACA are extremely common;\textsuperscript{2,8} with some degree of asymmetry between the two A1 segments being identifiable in approximately 80% of patients undergoing arteriography.\textsuperscript{2} Several different

From the Department of Neurosurgery and Critical Care Medicine (YM, HS, YY, AT), Nippon Medical School, Tokyo, Japan; Department of Neurosurgery (YI), Hachioji Medical Center of Tokyo Medical University, Toyko, Japan

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Reprint requests to: Yasuo Murai, Department of Neurosurgery, Nippon Medical School, 1-1-5 Sendagi, Bunkyo-ku, Toyko 113-8603, Japan.
combinations of anomalies have been observed, including hypoplastic or aplastic arteries, and fenestration of the A1 segments. Proposed embryologic events resulting in these anomalies remain matters of controversy. In some less common anomalous vessels, such as infra-optic course of ACA, supra-optic duplication, periotic duplication, or accessory middle cerebral artery, branches receive blood from the ipsilateral artery. In distinction, we demonstrated a contralateral ICA-to-ACA anastomosis by cerebral angiography, which we believe to be the first reported case identified in this manner. This general type of anomaly first was described in postmortem dissections by Baptista in 1963, whose descriptions indicated that our case would represent a “bihemispheric ACA” or a “crossed-branch type” of anomaly. Baptista suggested that during embryonic development one of three arteries (either ACA or the median artery of the corpus callosum) had developed insufficiently, while another hypertrophied to result in a constant blood supply. Considering anomalies of the anterior cerebral artery, detected in examinations of 381 brains, Baptista found no case where both A1 segments originated directly from one ICA, while noting 13 instances of bihemispheric ACA where branches of one ACA anastomosed with branches of the other. In our case, contralateral anastomosis between one ICA and ACA branches was present, and the A1 segment contralateral to the supplying ICA was not visualized. Whether an anatomically normal left A1 segment and the anterior communicating artery did not form (aplasia) or were fully formed but later occluded is not completely certain, since we recognized this component of the anomaly only from lack of filling on the angiogram. We hypothesize that either agenesis or flow impairment involving the contralateral normally situated A1 segment resulted in persistence of an embryonal A1 segment to supply the territory of the contralateral ACA. In this manner, ICA-to-ACA anastomoses may result from persistence of embryonal A1 segment arteries.

REFERENCES


Figure: Cerebral angiogram performed via the right common carotid artery, including anteroposterior (A), left oblique (B), and lateral (C) projections. The branches of the left anterior cerebral artery originate from the right internal carotid artery (arrowheads).