Anastomosis of Carotid and Basilar Arteries

Persistent Primitive Trigeminal Artery and Hypoglossal Artery:
Report of Two Cases

KHairy Samra, M.D.,* William B. Scoville, M.D., and M. Yaghmai, M.D.†
Department of Neurologic Surgery, Hartford Hospital, Hartford, Connecticut

In the 3 mm human embryo, the internal carotid artery is seen to anastomose with the basilar artery by the primitive trigeminal, otic, and hypoglossal arteries from above downward.13 These vascular channels are usually obliterated by the time the embryo is 14 mm long. Should any of these primitive channels persist into adult life, the result is referred to as a persistent carotid-basilar anastomosis.

We are reporting one case with a persistent primitive trigeminal artery and another with a persistent hypoglossal artery arising from the external carotid artery.

Case Reports

Case 1. A 75-year-old man was admitted to Hartford Hospital in May, 1966, 4 days after the sudden onset of severe occipital headache, dizziness, and vomiting. Six years earlier, the patient had a left frontotemporal hematoma which was evacuated surgically. Neurological examination revealed right homonymous hemianopsia (residual from his previous surgery) and mild neck stiffness. Spinal tap was bloody with an opening pressure of 200 mm H₂O. X-ray films of the skull were normal, except for the wire mesh over the defect in the left frontal region as a result of his previous surgery. Bilateral carotid angiograms and left brachial angiogram did not demonstrate any abnormality apart from a persistent right trigeminal artery (Figs. 1 and 2); the anomalous vessel connected the infraclinoid portion of the internal carotid artery with the cephalad portion of the basilar artery.

Case 2. A 52-year-old man was admitted in February, 1962, because of progressive bitemporal headache, vomiting, and blurring of vision of 6 months' duration. Neurological examination revealed bilateral papilledema, left homonymous hemianopsia, visual acuity of 20/100 in each eye, and weakness of the right lateral rectus muscle. There was left hemiparesis including the face with increased reflexes and an equivocal Babinski on the left. Speech was slurred. Physical and laboratory data were within normal limits. Plain skull x-ray films revealed some thinning of the dorum sellae.

Right carotid angiography was performed with good visualization of both the internal and external carotid arteries (Fig. 3). The bifurcation of the common carotid artery took place opposite the lower border of C-3. The internal carotid artery was somewhat smaller than the external carotid artery. It measured 5 mm in its proximal portion, whereas the external carotid measured 7 mm. The hypoglossal artery, as big as the internal carotid artery, appeared to arise from the posterior surface of the external carotid artery at the level of the lower border of C-2 and immediately opposite to the lingual branch. It extended rostrally and posteriad behind the internal carotid artery in its cervical portion. After making a loop opposite the atlanto-occipital region, it entered the base of the skull to become the basilar artery. The hypoglossal artery took the origin and the direction of the occipital branch of the external carotid artery. There was good visualization of the basilar artery, superior cerebellar and posterior cerebral arteries. The internal carotid artery was visualized in the petrous portion and appeared somewhat irregular in the supraculloid due to arteriosclerosis. The anterior and middle cerebral arteries were smaller than usual. The Sylvian vessels were elevated, presumably due to a mass in the temporal region.
A right temporal lobe grade I astrocytoma was excised. The postoperative course was smooth, and the patient was discharged on the 12th postoperative day.

**Discussion**

Persistent primitive trigeminal artery is a recognized, although infrequent, intracranial vascular anomaly. There have been at least 123 cases reported, and it is likely that many other instances of this anomaly have been overlooked, or have not been recorded. The incidence reported has varied from 0.001% to 1% to 1.5%. Passerini and De Donato found nine instances in 4000 angiograms (0.2%). Our case was the only instance of primitive trigeminal artery in a series of 1500 cerebral angiograms (0.06%). The anomaly has not been associated with any specific symptomatology or recognized clinical course. It presumably is relatively asymptomatic, and until the advent of angiography, it was an incidental autopsy finding. The first case demonstrated by angiography was reported in 1950, and subsequently other cases have been reported found by this method. Recognition of primitive trigeminal artery on cerebral angiograms is important, since, because of its course, it may be an infrequent cause of tic douloureux; or of paresis of the 3rd, 4th and 6th cranial nerves; or may give rise to an aneurysm. A high incidence of other intracranial vascular anomalies appears to be associated with the persistence of the trigeminal artery, including aneurysms on other vessels, as well as an intracranial arteriovenous malformation. In some instances, spontaneous subarachnoid hemorrhage has occurred, without any other source of bleeding found. Our case may be one of these.

According to a recent review by Scott, seven cases of persistent hypoglossal artery