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Anomalous Origin of the Posterior Inferior Cerebellar Artery from the Internal Carotid Artery

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Summary: A rare anomalous origin of the posterior inferior cerebellar artery arising from the internal carotid artery is described. The embryologic explanation postulated is the persistence of a primitive communicating vessel (presegmental artery) between the anterior and posterior circulation.

Index terms: Arteries, cerebellar, posterior inferior (PICA); Arteries, abnormalities and anomalies

The posterior inferior cerebellar artery (PICA) usually originates from the distal intracranial segment of the vertebral artery (1). However, PICA has the most variable origin of the any of arteries of the posterior fossa. Variations in its origin include: origin from a hypoglossal artery, proatlantal artery, posterior meningeal artery, and from the extracranial segment of the vertebral artery (1, 2). A case of PICA arising from an intracranial segment of the internal carotid artery (ICA) has been reported, but no embryologic explanation was suggested (3). This report describes a similar case and puts forth a possible embryologic explanation for this origin.

Case Report

A 68-year-old man was examined because of a left carotid bruit. A Doppler study indicated a critical stenosis of the left ICA. Angiography confirmed a critical stenosis of the left ICA and also demonstrated origin of the left PICA from the cavernous segment of the left ICA (Fig. 1). The anomalous artery had a classical PICA distribution. Bilateral vertebral angiograms demonstrated no other abnormality of the vertebral arteries and a left PICA was not visualized following injection of the left vertebral artery. The right PICA originated normally. The patient subsequently had a left carotid endarterectomy without any complications.

Discussion

The most frequent site of origin of PICA is from the intracranial segment of the vertebral artery. This occurs 61% of the time (1). PICA has also been reported less frequently to have other origins (1, 2). Origin from the ICA is rare (3).

According to Padget (4), in the early 4-mm embryo, the forebrain is supplied by the developing carotid artery system. The basal surface of the hindbrain is supplied by two parallel longitudinal arteries which, in turn, receive their supply from the presegmental arteries. In the 5- to 6-mm embryo, the presegmental arteries connect the ICA to the longitudinal arteries. The intersegmental arteries are thus communicating channels between adjacent presegmental arteries. In the 7- to 12-mm embryo, the ventral and dorsal parts of the presegmental arteries become obliterated, while the intersegmental arteries join to form the vertebral artery. The longitudinal arteries join distal to the vertebral artery to form the basilar artery. The vertebral and basilar arteries communicate with each other through the lateral anastomotic channels ("primitive lateral basillo-vertebral anastomosis" of Padget). PICA, normally, originates from these lateral anastomotic channels (5).

We postulate (Fig. 2) that the proximal segment of the anomalous PICA is derived from persistence of a presegmental artery. The middle segment of the anomalous PICA is a transverse channel that connects the proximal channel from the ICA to the lateral anastomotic channel that gives rise to distal a segment of the anomalous PICA. This would explain the embryologic origin of the anomalous vessel originating from the ICA with the vascular distribution of PICA. The clinical significance of PICA arising from
Fig. 1. Lateral view of cerebral angiogram (A) and anterior-posterior view (B) demonstrate the anomalous origin of the PICA (arrowhead) from the cavernous segment of the left ICA.

Fig. 2. A, Lateral view of a "normal" embryo (5-6 mm) demonstrating the presegmental connection between ICA and the vertebral artery (VA). The lateral anastomotic channels communicate between the vertebral and basilar arteries and also given origin to the PICA.

B, Our postulate (dark line) to explain the anomalous origin of PICA from the ICA.

the ICA is that an "artery-artery" embolus is possible, as has been reported with a persistent trigeminal artery (6). Since PICA supplies the medullar and cerebellar area, an artery to artery embolus could have devastating results. In this case, the patient was at risk of a PICA distribution infarct if the carotid stenosis progressed to complete occlusion.

References