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Double Origin of the Posterior Inferior Cerebellar Artery

Walter S. Lesley and Henry J. Dalsania

Summary: Double origin of the posterior inferior cerebellar artery (PICA) has rarely been demonstrated by angiography in the peer-reviewed literature. Of the three previous reports, this PICA variant arose from the left vertebral artery. We report a right-sided, double-origin PICA.

Developmental anomalies of the intracranial arteries are not infrequently encountered during angiography. Fenestrated and duplicated arteries comprise a large component of such variations, and of these, most occur in the vertebrobasilar circulation. Although the posterior inferior cerebellar artery (PICA) commonly has a variable course, caliber, length, and target territory, fenestrations and bifid origins are exceedingly rare. In the peer-reviewed literature, three double origin PICA cases have been documented by angiography and all arose from the left vertebral artery (VA) (1, 2). This report describes a right-sided double origin PICA.

Case Report

A 66-year-old right-handed Caucasian man with emphysema and a medical history of paraplegia secondary to remote motor vehicle accident presented with new onset seizures. Physical examination revealed an awake but intermittently attentive elderly gentleman. Neurologic evaluation revealed left blepharospasm, upper extremity rigidity greater on the right side, bilateral lower extremity weakness, and generalized absent deep tendon reflexes. Left-sided pulmonary crackles were heard on auscultation. Blood cultures and lumbar puncture CSF evaluation were negative. Diffuse periventricular leukoencephalopathy was shown by cranial CT. Mediastinal lymphadenopathy and a 2-cm right lung mass were also discovered with the use of CT. Cerebral MR angiography showed major vessel patency, but the peripheral cerebral vasculature detail was limited. As a result, cerebral conventional angiography was performed to exclude vasculitis as a cause of seizures.

Standard biplane digital subtraction angiography of the bilateral VA and carotid arteries showed a dominant left VA with faint reflux into the distal aspect of a hypoplastic right VA

(Fig 1C). The right PICA was clearly identified as a double origin variant in that both the distal and proximal PICA component vessels originated from the right V4 segment and fused at the midportion of the anterior medullary PICA segment (Fig 1A and B). With the exception of cervical carotid atherosclerosis, the remaining angiographic findings were normal. Before a complete workup could be performed, the patient left the hospital against medical advice and was subsequently lost to follow-up.

Discussion

Developmental variations of the cerebral vasculature are familiar findings in the angiography suite. The most recognizable oddities include the fenestrated, duplicated, and anomalous origin arteries. The double origin PICA might appear to represent, at least initially, a hybrid of all three.

Fenestration and *duplication* are terms that are frequently but mistakenly used interchangeably in the literature (3). Fenestration or “partial duplication” is defined as a division of a vessel lumen, resulting in two distinct endothelium-lined channels that may or may not share an adventitial layer (4, 5). Duplication, on the other hand, requires two distinct arteries with separate origins and no distal arterial convergence. The incidence rate of fenestration is, in general, greater at postmortem examination than at angiographic examination (4, 5). Nevertheless, based on autopsy and angiography series, cerebral arterial fenestration occurs more commonly in the vertebral and basilar arteries than in the middle cerebral, anterior cerebral, and internal carotid arteries (5, 6). The incidence of basilar artery fenestration ranges from 0.04% to 6% (5–7), whereas VA fenestrations are found in 0.3% to 2% of the population (6, 8). Of interest, only one instance of PICA fenestration has been reported (9). In this unique case, the fenestration was located on the anterior medullary segment of the PICA in a patient with nonaneurysmal subarachnoid hemorrhage.

Anomalous and duplicated intracranial arteries are frequently revealed by angiography. These variants, including the duplicated or anomalous posterior cerebral arterial origin of the superior cerebellar artery, present daily in the catheter laboratory. On the contrary, other vascular curiosities such as the duplicated basilar artery are exceedingly rare (10).

The double origin PICA represents a persistent anastomosis of the normal lateral spinal artery (1). Originating lateral to the medulla, the lateral spinal artery, which forms the caudal component of the

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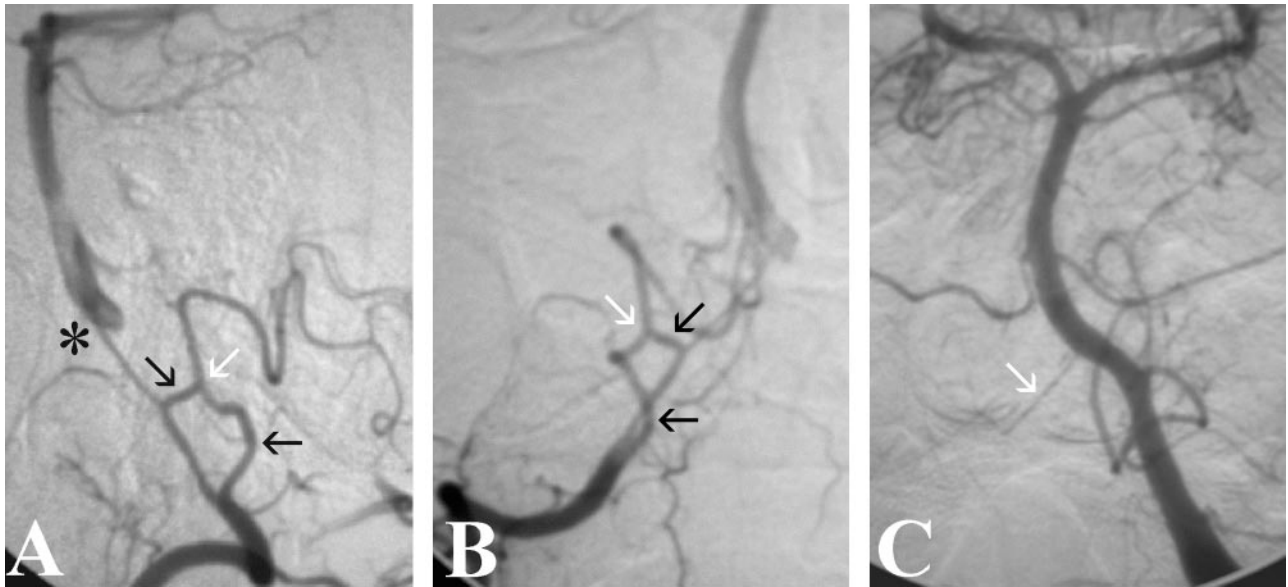


FIG 1. Double origin of the right PICA. Angiograms of the right VA show two separate and distinct PICA vessels (black arrows) arising from the V4 segment. They unite at the midportion of the anterior medullary segment of the PICA (white arrows). The vertebrobasilar junction (asterisk) is opacified at the convergence of the hypoplastic right and the dominant left V5 segments.

A, Lateral projection.

B, Frontal projection.

C, For comparison, the right V5 segment (arrow) is seen filling retrograde on the frontal projection angiogram of the left VA. The left PICA, basilar, and bilateral anterior inferior cerebellar arteries are normal.

double origin PICA, typically arises from either the PICA or the intradural VA. The rostral component of the double origin is the PICA proper, which derives embryologically from a hypertrophied radiculopial artery. The double origin PICA should not be confused with the common anterior inferior cerebellar artery-PICA configuration that Icardo et al (11) refer to as “duplication in the origin” of the PICA.

Of the four known cases, only this one illustrates the double origin PICA's potential for right-sidedness. Taken together, an overall left-sided inclination may exist for this anomaly, which is intriguing in light of the findings of Hasegawa et al (12) who found a nearly double (9:5 ratio) left-sided preponderance in VA duplication. No explanation for such side-preference has been proposed.

Aneurysms infrequently arise from the PICA, accounting for 0.5% to 3% of all intracranial aneurysms (13, 14). However, certain congenital anomalies may predispose to aneurysmal formation. For example, Campos et al (15) reported a 35.5% prevalence of aneurysm within a fenestrated vertebrobasilar junction. Of the angiographically proved double origin PICA cases, one (25% incidence) harbored a 5-mm aneurysm near the convergence of the two proximal PICA segments (2). The preliminary evidence derived from this small cohort suggests a possible association of the double origin PICA with subsequent aneurysmal development.

Conclusion

This case report describes the angiographic documentation of an incidental but rare double origin

PICA. This congenital anomaly can arise from either VA. An increased risk of associated PICA aneurysm may exist for patients with double origin PICA.

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