Preserved distal flow in a proximally occluded internal carotid artery due to a persistent proatlantal artery

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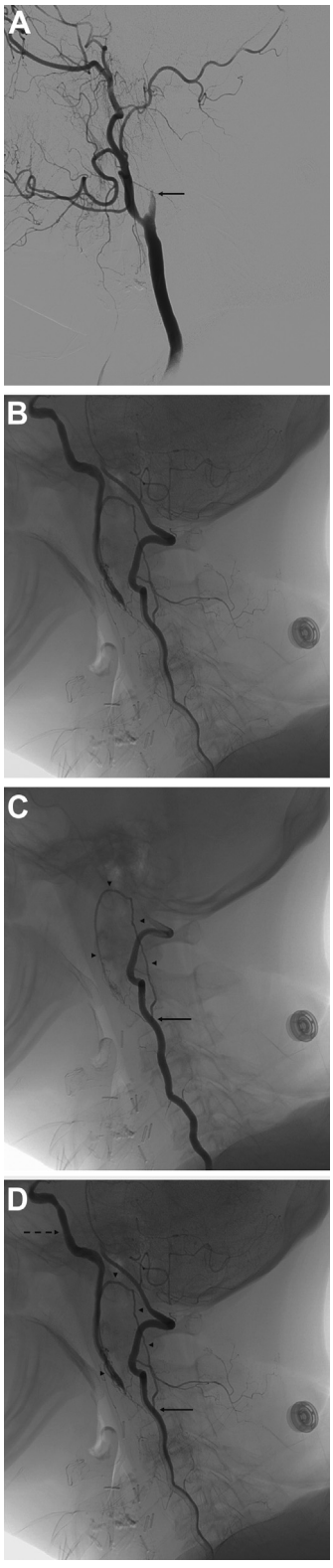
A 63-year-old woman presented with pain and visual impairment of the right eye, which was considered to be of ischemic origin. Duplex ultrasound scanning revealed a complete occlusion of the right internal carotid artery (ICA), >70% stenosis of the left ICA, and anterograde flow direction in both vertebral arteries (VAs). Computed tomographic angiography performed to confirm these findings showed a proximal occlusion of the right ICA of approximately 3 cm. The ICA appeared to be normal and patent more distally. Computed tomographic angiography also confirmed the 70% stenosis of the left ICA. Because patency of the distal ICA in combination with a complete proximal occlusion is an uncommon finding and the patient presented with symptoms of the ipsilateral eye, conventional angiography was performed to exclude a proximal carotid string sign. Interestingly, angiography confirmed the proximal occlusion of the right ICA (*arrow* in *A*, and *B*) but surprisingly revealed a collateral (*arrowheads* in *C* and *D*) originating from the right VA (*arrow* in *C* and *D*) supplying the ipsilateral ICA just distal to the occlusion (*dashed arrow* in *D*).



The collateral revealed by angiography originates from the V_3 segment of the VA and extends to the foramen magnum, which it traverses horizontally parallel to the horizontal part of the ipsilateral VA and subsequently descends prevertebrally to join the right ICA just distal from the occlusion (*B-D*). This course is typical for a persistent type I proatlantal artery, which normally involutes during early embryologic development.[1]

During the early stages of embryologic development, the brain is supplied via the carotid system and the paired longitudinal neural arteries, which communicate via four arterial anastomoses, namely, the trigeminal, otic, hypoglossal, and proatlantal artery.[1] When the distal ICA merges with the longitudinal neural artery distally to form the future posterior communicating artery, the preexistent anastomoses gradually regress and obliterate. In rare cases, these intersegmental anastomoses persist into adult life.[1] In case of the persisting proatlantal artery, two subtypes are distinguished. The type I proatlantal artery originates from the ICA and runs upward and dorsolaterally to course horizontally above the atlas through the foramen magnum, subsequently giving rise to or joining the ipsilateral VA. The type II proatlantal artery arises from the external carotid artery and joins the ipsilateral VA below the first cervical vertebra. Sometimes, the persistence of the proatlantal artery is associated with additional intracranial vascular anomalies, such as aneurysms, hypoplasia, and agenesia of particular parts of the intracranial arteries.[2] No other intracranial anomalies were present in our patient.

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