Retrograde Back-Coiling Technique for a Ruptured Aneurysm of a Double-Origin Posterior Inferior Cerebellar Artery

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ABSTRACT

The double origin of the posterior inferior cerebellar artery (PICA) is a variant anastomosis of a residual lateral spinal artery and native intracranial PICA that has been associated with intracranial aneurysm formation. Because of this anastomosis, both origins of the PICA serve as aneurysmal-feeding vessels. We describe a novel technique of coiling with intracranial stent assistance to treat such a lesion that has not been described previously to our review.

Keywords: coiling, subarachnoid hemorrhage, aneurysm, posterior inferior cerebellar artery, anatomic variant

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Introduction

Anatomic variation is not uncommon in studies of the posterior inferior cerebellar artery (PICA). Known variants include a common trunk with the anterior inferior cerebellar artery and an extradural origin. Also the PICA can have a double origin, which is seen in 2% of anatomic series.[1] These variations can be associated with intracranial aneurysm formation and can pose challenges for treatment in the setting of subarachnoid hemorrhage. We report a novel technique of coiling with stent assistance for a ruptured aneurysm arising from the junction of a PICA with bifid origins.

Case Report

A 57-year-old man presented Hunt and Hess Grade 3, with blood prominently seen in the prepontine and interpeduncular cisterns on unenhanced computed tomography (CT). Right vertebral injection during cerebral angiography revealed a 4-mm aneurysm arising from the anastomosis of dual intracranial PICA origins (Fig 1).

A decision was made to treat this aneurysm via an endovascular approach. We feared perforation from direct catheterization of the distal PICA origin, and so an attempt was made to occlude this origin using coils and a Neuroform stent (Boston Scientific, Natick, MA), particularly due to our center and operator experience with stent-assisted coil embolization. The initial strategy was to deploy a Neuroform stent in the vertebral artery and then align jailed, detachable coils through a jailed microcatheter between the stent and luminal wall in order to occlude the distal PICA origin.

A 6-French sheath was placed in the right femoral artery. The right vertebral artery was catheterized with a 6-French guide catheter. A microcatheter was placed in the basilar artery with the use of a .014" microwire. The microcatheter was exchanged for a 4.5 mm × 15-mm Neuroform stent delivery microcatheter. A second .010" Echelon (eV3 Neurovascular, Irvine, CA) microcatheter was then advanced to the level of the distal PICA origin. The Neuroform stent was then deployed, hence jailing the Echelon catheter between the outer wall of the stent and vertebral artery luminal wall. Two 2-mm diameter detachable Nexus coils (eV3 Neurovascular) were deployed hoping to cover the distal PICA ostium. These coils, however, were deployed along a different axis of the luminal wall behind the Neuroform stent and failed to cover the artery's ostium.

At this point, we coiled the aneurysm via catheterization of the proximal PICA origin. Using road-mapping guidance, a Rapid Transit microcatheter (Cordis Neurovascular, Miami Lakes, FL) and a gold-tip glidewire (Terumo Medical Corporation, Somerset, NJ) were passed into the proximal PICA origin. Superselective runs of the PICA allowed localization of the branch feeding the aneurysm, which also anastomosed with the distal PICA origin. Again with road-mapping guidance, a 0.014" X-pedion microwire (eV3 Neurovascular) was advanced from the proximal PICA, past the aneurysm, and into the right vertebral artery (Fig 2). The microcatheter was advanced over the microwire into the distal PICA origin until it rested against the Neuroform stent that had been placed in the vertebral artery. The previously placed Neuroform stent served as protection from coil displacement into the vertebral artery. The distal PICA origin, aneurysm, and PICA branch just proximal to the aneurysm were embolized with 2-mm Nexus coils, leading to aneurysm occlusion (Fig 3). The patient awoke from anesthesia without new clinical deficits and without new hypodensity or hemorrhage on follow-up CT.

Fig 1. Anterio-posterior view of a right vertebral artery injection demonstrates the aneurysm (A) and double origins of the PICA (the long arrow represents the proximal origin and the short arrow denotes the distal origin).

Discussion

We report this endovascular coiling technique as a unique method for approaching aneurysms with variant anatomy. The double-origin or bifid PICA develops from an anastomosis between a persistent lateral spinal artery and the proper intracranial PICA.[2] Like other cerebrovascular variations, the double-origin PICA has been associated with intracranial aneurysms. To our review, this variation has been reported in the literature

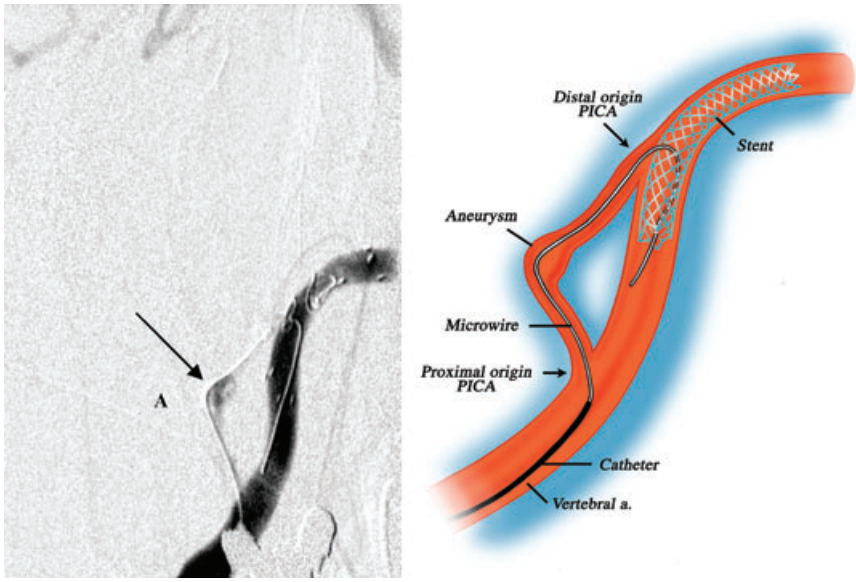

Fig 2. A microwire (arrow) is passed via the proximal PICA, past the aneurysm (A), and back into the proximal right vertebral artery.

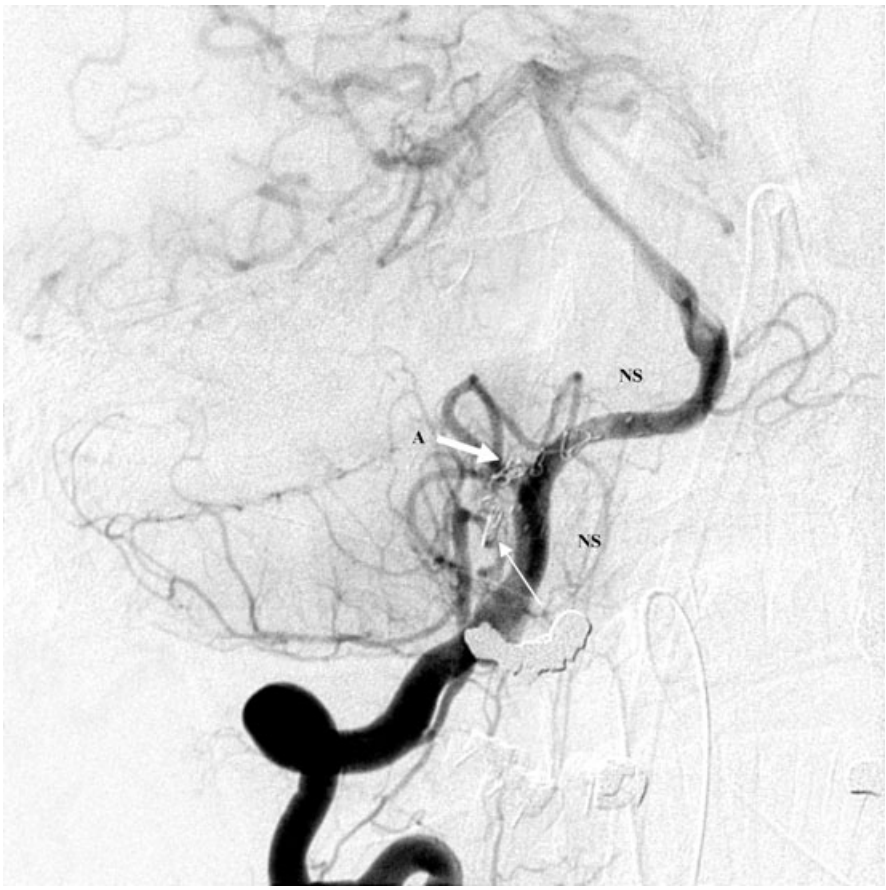

Fig 3. A final angiographic injection of the right vertebral artery demonstrates coil obliteration of the aneurysm (A) and distal PICA origin (bold, white arrow). These coils abut the Neuroform stent (NS) in the right vertebral artery (proximal and distal markers of the stent are marked.). The aneurysm-communicating branch from the proximal PICA origin has also been occluded with coils (simple, white arrow). The PICA is otherwise seen filling in its entirety.

four times previously with two cases, including our index patient, harboring an aneurysm along the dual PICA complex.[3]

Endovascular treatment of a double-origin PICA aneurysm has been previously described. In one case, the aneurysm was catheterized via the distal PICA origin and embolized with glue, but did result in a stroke within the lateral medulla.[4] In this current case, selective injections of the right vertebral artery and proximal PICA demonstrated that the aneurysm was fed from both PICA origins, necessitating obliteration of both sources of aneurysm inflow.

We achieved aneurysm occlusion traversing both PICA origins via the aneurysm, and then deploying detachable coils to occlude the distal PICA origin, aneurysm, and distal segment of the proximal PICA, respectively. This resulted in angiographic obliteration of the aneurysm with no radiographic or clinical suggestion of infarct or hemorrhage. Initially, we feared intraprocedure perforation of the aneurysm or the distal PICA with direct catheterization of the proximal or distal origins, respectively. Hence, we attempted coiling the right vertebral wall at the level of the distal PICA with stent assistance, but this strategy failed. Fortunately, we experienced no complications from direct catheterization, and the previously deployed Neuroform stent gave additional assurance that the parent vertebral artery was protected from coil prolapse or herniation. Possibly, stent assistance was not necessary as coil embolization alone would have been successful. Also balloon remodeling has been used to assist in retrograde embolizations across collateral channels in the Circle of Willis at experienced centers.[5] Nonetheless, our technique highlights the importance in defining afferent arteries for intracranial aneurysms and presents a method for treating these lesions across anatomic variations.

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