Due to the efforts of Drake and others over the last 25 years, the safety of surgery for vertebrobasilar aneurysms now approaches that for anterior circulation aneurysms. Despite these advances, the treatment of giant posterior fossa aneurysms remains difficult and challenging. Poor results reflect problems with adequate exposure, injury to cranial nerves, and maintenance of vascular integrity. Innovative approaches to giant aneurysms have included Hunterian ligation, vertebral and basilar artery occlusions (both directly and transvascularly with balloons), and thrombosis of the aneurysm (both directly and stereotactically). Reimplantment of branches involved with a fusiform aneurysm at the base of a giant saccular aneurysm has been described for anterior circulation aneurysms. In 1982, Dolenc reported the successful removal of a posterior inferior cerebellar artery (PICA) aneurysm with end-to-end suture of the PICA vessel.

Our report describes an unusual case in which the PICA originated from the waist of a giant vertebral aneurysm. After the aneurysm was trapped, the PICA circulation was reconstructed by anastomosis of the PICA to the opposite PICA circulation.

Case Report

This 38-year-old right-handed man presented with complaints of headache and weakness of the left extremities. He also suffered some occasional poorly defined spasms and/or jerking of the left extremities.

**Examination.** Neurological examination revealed a very mild left hemiparesis involving both the arm and leg. Subsequent workup with computerized tomography (CT) of the head (Fig. 1) and angiography showed a large, partially thrombosed aneurysm of the right vertebral artery at the PICA junction. A CT scan showed the aneurysm lying anterior to the brain stem. The right vertebral artery was slightly larger than the left, and the filled lumen of the aneurysm was thought to be about one-sixth of its total volume as seen by CT. The patient was initially treated elsewhere with balloon occlusion of the right vertebral artery at the C-1 level. He tolerated the vertebral artery occlusion well; unfor-
PICA-PICA anastomosis for vertebral artery aneurysm

Unfortunately, the balloon burst before it could be filled with Silastic, and an open ligature of the right vertebral artery was performed. The patient continued to experience significant headache.

Subsequent angiography showed that the right vertebral artery was thrombosed throughout its cervical course. A left vertebral angiogram demonstrated filling of the distal right vertebral artery with the aneurysm lumen still patent; it appeared that the right PICA arose from the dome of the residual aneurysm. Because of a relatively small anterior inferior cerebellar artery on the right side, there was concern that direct clipping of the aneurysm might occlude the PICA, resulting in ischemic injury. For this reason, the patient was referred to Henry Ford Hospital for possible reconstructive vascular surgery, particularly a PICA-PICA anastomosis after trapping of the aneurysm.

The patient continued to complain of severe occipital headache, some neck spasm, and a progressive left hemiparesis. Repeat angiography disclosed: 1) the right vertebral artery which was not opacified from its upper cervical portion just proximal to the aneurysm; 2) normal left vertebral and basilar arteries; and 3) reflux into the distal right vertebral artery with opacification of a portion of the 2.5-cm aneurysm with the right PICA apparently arising from the dome of the aneurysm (Fig. 2). Due to continued symptomatology, surgery was recommended.

Operation. On May 3, 1985, a right suboccipital craniectomy was performed. The cerebellum was retracted medially, exposing the aneurysm beneath the ninth and 10th cranial nerves. The aneurysm was gently retracted, and a temporary clip was placed on the right vertebral artery just proximal to the vertebral-basilar artery junction. The right PICA was seen to arise from the waist of the aneurysm. The artery was temporarily clipped, and the aneurysm was incised with removal of a clot until the aneurysm size was reduced. A permanent clip was placed on the vertebral artery just distal to the aneurysm neck and the temporary clip was removed from the vertebral-basilar artery junction. A permanent clip was also placed just proximal to the aneurysm on the vertebral artery and the PICA was transected just above its origin from the aneurysm. The left PICA was identified near the midline. Prior to temporary clipping, the patient was given 250 mg thiopental, 100 mg lidocaine, and 12.5 gm mannitol to

Fig. 1. Computerized tomography scans showing a contrast-enhancing mass compressing the brain stem.

Fig. 2. Preoperative left vertebral angiograms showing retrograde filling of the distal right vertebral artery, partial filling of a giant aneurysm, and the posterior inferior cerebellar artery originating from the aneurysm.
reduce brain metabolism, stabilize the cell membranes, and increase cerebral blood flow.12 Temporary Kleinert-Kutz clips were applied to the left PICA, and an ellipse of the vessel wall was removed in preparation for anastomosis of the right PICA. The beveled and fish-mouthed end of the right PICA was anastomosed end-to-side to the left PICA (Fig. 3). The temporary clips were removed, and microvascular Doppler ultrasonography was used to confirm patency of the anastomosis.

Postoperative Course. Repeat angiography revealed nonfilling of the aneurysm and a patent left-to-right PICA-PICA anastomosis (Fig. 4). The patient had a complicated postoperative course. Cerebellar swelling and right-sided dysmetria slowly resolved. Lower cranial nerve dysfunction required a tracheostomy and jejunostomy. The patient's dysphagia cleared over a few months and the jejunostomy was removed. Some months later the patient returned with right-sided headache and some ataxia. A CT scan showed ventriculomegaly, and placement of a ventriculoperitoneal shunt resulted in improvement. His right vocal cord remained weak. Three years later the patient had recovered, and his hoarseness had improved.

Discussion

The treatment of giant vertebral artery aneurysms remains a difficult problem. The intimate association of these lesions with the lower cranial nerves and brain stem makes exposure difficult. This case also posed the unusual problem of a PICA arising from the aneurysm waist. To obliterate the aneurysm and decrease the mass effect, one option would be to sacrifice the PICA. In this case, preservation of the right PICA was accomplished by a PICA-PICA anastomosis using a standard microvascular end-to-side technique. A thorough understanding of the microvascular anatomy of the vertebrobasilar arterial system and its branches is necessary before reconstructive intracranial vascular surgery can be performed. Shrontz, et al.,10 studied the diameter, mobility, and perforators from these branches in unfixed human brains injected with polyester resin to preserve normal dimension of the vessels; they found that the diameter of the PICA was 1.7 ± 0.1 mm (mean ± standard deviation) at its origin and 1.3 ± 0.1 mm at its hemispheric segment. Similar findings for superior cerebellar artery and anterior inferior cerebellar artery were documented. The perforators from the PICA are limited in number near the obex, making this an excellent site for anastomosis in our patient.

Reconstruction of intracranial vessels using end-to-side, side-to-side, and end-to-end grafting techniques has been performed on unfixed brains in the laboratory using the middle cerebral artery2 and anterior cerebral artery.14 Reconstructive intracranial microvascular surgery provides another option for the treatment of giant vertebrobasilar aneurysms. Consideration of individual cases is necessary, based on the location, collateral circulation, and ease and time of performance of the anastomosis.
References


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