Transpositions and anastomoses between the posterior cerebral and superior cerebellar arteries

Report of two cases

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Two cases are reported in which anastomotic procedures between the posterior cerebral and superior cerebellar arteries were useful for the management of occlusive and aneurysmal disease of the posterior circulation. Operative procedures such as these may play a role in the future management of vascular problems in this system.

KEY WORDS • cerebral aneurysm • cerebral arteriosclerosis • revascularization • posterior circulation

To date, revascularization techniques for intracranial vascular disease in the posterior circulation have been largely limited to bypass procedures between the occipital artery and the posterior inferior cerebellar arteries. We report here two cases in which reconstructive procedures between the posterior cerebral (PCA) and superior cerebellar arteries (SCA) were successful in the management of vascular problems in this system.

Case Reports

Case 1

This 48-year-old white woman underwent a right subtemporal craniotomy for repair of a giant aneurysm of the right PCA on January 21, 1980. The aneurysm partially filled on preoperative angiograms (Fig. 1). Although no daughter sac was identified, it was presumed to be the source of two verified hemorrhages. At surgery, we found this to be a fusiform lesion with the PCA entering one side of the base of the aneurysm and exiting from another. It was not possible to preserve the parent artery. The PCA was clipped distal to the origin of its major perforators, the aneurysm resected, and the distal artery anastomosed end-to-side to the SCA. The patient awoke from surgery with a fourth nerve palsy but with no

Fig. 1. Preoperative angiogram of a large posterior cerebral artery aneurysm in which the parent vessel is incorporated into the base of the aneurysm. The aneurysm had a thick wall at its base, and it was not possible to clip the aneurysm without having the clip displaced onto the parent vessel.
FIG. 2. Postoperative angiogram demonstrating good filling of the posterior cerebral artery from the point of anastomosis in the superior cerebellar artery. The parent posterior cerebral artery has been occluded with a miniature Mayfield clip just proximal to the origin of the aneurysm. Major perforating vessels to the brain-stem structures arose from the posterior cerebral artery proximal to the site of clipping and were preserved.

other deficits. Her postoperative course was uneventful. She returned 6 months later for postoperative angiograms. The distal PCA filled from the SCA through the site of the anastomosis (Fig. 2). Her visual fields were normal.

Comment

This case illustrates the use of intracranial reconstructive bypass grafts to prevent the occurrence of complications from the major vessel occlusion. The operative procedure is briefly illustrated in Fig. 3. Had the patient been operated on without a bypass graft, we believe a field defect would probably have resulted from excision of the aneurysm. However, Drake has reported that this vessel may be ligated distal to the origin of its major perforating vessels without the creation of a major neurological deficit.

Case 2

This 57-year-old hypertensive, obese, diabetic white man had suffered a myocardial infarction in 1972 and thrombophlebitis with a pulmonary embolism in 1973. However, he had been in reasonably good health thereafter and was fully employed without neurological complaints until mid-1980. At that time, the family noticed a slow change in his personality and memory. While at work on December 8, 1980, the patient had the onset of a right-sided hemiparesis associated with severe slurring of speech. This was accompanied by right-sided headache. The episode persisted for approximately 5 to 10 minutes and then resolved spontaneously. The following day while he was driving, his wife noted that the car tended to veer into the path of oncoming traffic and the patient reported that these vehicles appeared to be doubled. At one point that evening the patient complained of complete loss of vision in both eyes. Thereafter, he was taken to the emergency room.

Stereotypical ischemic events developed on December 9, 1980. These consisted of a burning sensation around the nose and eyes, slurring of speech, right hemiparesis, vertigo, diplopia in all fields of gaze, and obscuration and associated dimness of vision. On that date, the patient had six episodes, and on the following day the nurses recorded 10. Angiograms performed by his referring physician demonstrated tandem lesions in the basilar artery with evidence of diffuse atherosclerosis in that vessel. The left PCA took its origin from the caput of the basilar artery, but the right PCA arose from the right internal carotid artery with no communication between that vessel and the basilar artery.

He was admitted to St. Mary's Hospital on December 12, 1980. He continued to have ischemic episodes, each lasting 30 to 45 minutes, while on a course of heparin. On admission, his blood pressure had been recorded at 150/100 mm Hg. There were no gross neurological deficits, but his speech was slightly slurred.

Through a modified pterional approach, the right PCA was anastomosed side-to-side to the right SCA just distal to the third nerve on December 16, 1980. The patient awoke from the operation with no focal deficit, although he had sustained a rather severe ischemic event with incomplete resolution approximately 1 hour before surgery. The patient remained asymptomatic for 48 hours and then had a grand mal seizure which began in the left hemisphere. A computerized tomogram was normal. The postoperative angiogram demonstrated excellent flow through the site of the anastomosis with filling of the basilar artery.
Throughout the remaining portion of this patient's hospitalization, he remained essentially asymptomatic and was discharged on January 2, 1981. He returned in March, 1981, entirely asymptomatic. Angiograms showed the site of the anastomosis to be patent with good filling of the distal superior cerebellar artery (Fig. 4). The arterial pressure interface (point where pressure gradients from various collateral sources are equalized) had shifted, with a higher flow through the basilar artery at this time than at the time of the initial postoperative angiogram (unfortunately mislaid and unavailable for reproduction).

The patient has been asymptomatic since his discharge from the hospital. The family reports that his cerebration is normal. He has lost 40 lb and is currently normotensive.

Comment

The immediate high flow achieved through this type of anastomosis was sufficient to prevent the impending brain-stem infarction. Seemingly, with time the pressure gradients shifted and the demands through the site of the anastomosis became less. The marked alteration in this patient's symptomatology was perhaps more impressive than the angiographic findings. The operative procedure is illustrated in Fig. 5.

Discussion

Aneurysms and occlusive lesions in the posterior circulation pose special problems because of their length or size, inaccessible location, and proximity to vital perforating vessels. These differences make it necessary that variety of approaches be in our armamentarium for the successful treatment of these illnesses.

Thus far, we have been disappointed in the volumes of flow achieved from bypass procedures between superficial temporal artery (STA) pedicles and the proximal superior cerebellar artery (SCA) or the anterior temporal branch of the posterior cerebral artery (PCA). Although we have been able to maintain patency in four out of five cases, none of these, in contrast to the exciting case recently reported by Ausman, et al., have carried flows comparable to those achieved between the STA pedicles and the major branches of the middle cerebral artery (MCA) or between the occipital artery and the proximal posterior inferior cerebellar artery. In spite of securing a wide pedicle of tissue with the artery (equal in diameter to recipient vessels of the MCA) the quality of the pulse over its site of entrance into the intracranial space has progressively declined during the period of close observation in the week following the operative procedure. Our postoperative angiograms have demonstrated a very small lumen in the STA in these cases. This has prompted us to explore other approaches for reconstructive procedures, and led to the cases reported here.

The quantities of flow delivered were sufficient to prevent infarction from occlusion of the PCA in one case and to arrest ischemic symptomatology from a high-grade basilar artery stenosis in the other. Indications for these types of operations will probably be quite limited. Nevertheless, this concept and approach may give us some direction for the future. In combination with transluminal angioplastic procedures for focal basilar artery stenosis, STA to SCA bypass pedicles, and external carotid artery to proximal PCA interposition saphenous vein grafts, neurosurgeons may be able to offer some hope to that select group of patients with advanced occlusive disease or large aneurysms of the distal posterior circulation, lesions which have, to date, not been approachable by standard surgical techniques.
References


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