Parent Artery Occlusion for Posterior Cerebral Artery Aneurysms

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Summary

We review four cases of posterior cerebral artery (PCA) aneurysm, of which three showed intolerance of parent artery occlusion. In two, balloon test occlusion (BTO) indicated poor opacification of the PCA branches from the anastomoses, and therefore, permanent occlusion was not attempted.

Introduction

Aneurysms of the posterior cerebral artery (PCA) are rare, accounting for approximately 1% of all intracranial aneurysms¹. Many of PCA aneurysms are of a large and dissecting type². In such cases, surgery for proximal occlusion of the PCA is often performed, and the rich anastomotic network of the PCA territory usually prevents the development of a clinical syndrome^{2,3}. However, a number of other studies have reported successful outcomes with endovascular parent artery occlusion using coil embolization for the PCA aneurysm, which does not involve open surgery and has fewer potential side effects^{1,4,5,6}. Here we review four cases of PCA aneurysm and discuss the use of endovascular parent artery occlusion as treatment.

Case Report

Case 1. A 62-year-old man presented with a Grade IV (Hunt and Hess grading) subarach-

noid haemorrhage (SAH), resulting from a fusiform aneurysm at the right P2A segment⁷. Coil embolization of the aneurysm was used to occlude the PCA, but no balloon test occlusion (BTO) was performed prior to this procedure. Two days after embolization, infarction in the ipsilateral occipital lobe and thalamus occurred.

Case 2. A 32-year-old woman presented with a grade I SAH. An angiogram showed a giant saccular aneurysm at the right P2 segment. We performed BTO at the P2 segment. The distal part of the balloon was placed in the aneurismal neck in order to avoid occlusion of perforating arteries. Carotid angiography during BTO showed poor opacification of the PCA territory from the anastomoses, and the patient showed left homonymous hemianopsia and left hemiparesis. We abandoned coil embolization, and instead isolated and clipped the neck of the PCA aneurysm.

Case 3. A 23-year-old man presented with a severe headache and a subsequent MRI study revealed the presence of a giant partially thrombosed aneurysm at the right P2-P3 segment. We performed BTO at the P2 segment and carotid arteriography. The PCA territory was poorly visualized. Trapping and excision of the aneurysm and superficial temporal artery-PCA anastomosis was performed.

Figure 1 Case 1. A) Vertebral angiography showed a fusiform aneurysm at the right P2A segment. B) CT scan revealed infarction in the ipsilateral occipital lobe and thalamus two days after embolization of the aneurysm and the parent artery.

The by-pass later thrombosed and infarction occurred in the occipital lobe.

Case 4. A 53-year-old woman presented with a grade II SAH. Diagnostic angiography showed a dilatation of the left PCA from the P2P segment and the distal aneurysmal sac, which were compatible with a dissecting aneurysm. The aneurysmal sac to the P2P segment was coiled. BTO was not performed prior to this procedure. A postoperative angiography showed visualization of the PCA branches from anastomoses distal to the coils. The patient had no neurological deficits.

Discussion

When isolation and clipping of the neck of the PCA aneurysm is not feasible, proximal occlusion and trapping of the aneurysm using clips or ligation above and below the lesion can be used^{3,8,9}. For the purpose of parent artery occlusion, embolization using detachable coils is a feasible approach. Since embolization does not require open surgery, it has several advantages over craniotomy and retraction of the brain, which may result in neurological damage.

Previous studies have demonstrated that the PCA has a rich collateral system, and anatomi-

Figure 2 Case 2. A) An angiogram showed a giant saccular aneurysm at the right P2 segment. B) Carotid angiography during BTO showed poor opacification of the PCA territory from the anastomoses.

Figure 3 Case 3. A) Vertebral angiography showed a partially thrombosed aneurysm at the right P2-P3 segment. B) Carotid arteriography showed that the PCA territory was poorly visualized during BTO.

cal and clinical studies have indicated that occlusion of the parental artery is generally a safe procedure^{3,7,8}. Hallacq et Al. reviewed the use of parent artery occlusion using the endovascular technique in nine patients with a P2 aneurysm⁴. Occlusion of the PCA was well tolerated in all nine patients, and none suffered brain infarction. There have, however, been some reports documenting patients who suffered infarction after sacrificing the parent artery, although the incidence of this happening is low^{1,3,6}. In the small study presented here, three of four cases showed ischemic intoler-

ance. Because of the potential risk of infarction, we propose that BTO should be performed, especially when treating unruptured aneurysms showing no neurological deficits. Hallacq and colleagues performed BTO in five cases, and in four of these they estimated ischemic tolerance by observing the collateral blood supply from the carotid artery on angiograms⁴. We abandoned PCA occlusion in cases 2 and 3 reviewed here, because the branches of the PCA were poorly visualized with carotid angiography during BTO.

Neurological testing of the awoken patients

Figure 4 Case 4. A) Diagnostic angiography showed a dilatation of the left PCA from the P2P segment and the distal aneurysmal sac. B) Postoperative carotid angiography showed visualization of the PCA branches from anastomoses distal to the coils.

during BTO is used to determine how the patient is likely to respond to permanent PCA occlusion. If the patient develops neurological disturbances during BTO, this indicates that permanent PCA occlusion is not feasible. However, interpretation of neurological symptoms experienced by the patient during BTO can be difficult⁹.

For example, in Case 2, reported in the present study, we could not ascertain whether the balloon only occluded the orifice of a thalamogeniculate artery, or whether it was also obstructing vessels supplying the occipital lobe. To ensure the accuracy of BTO, the placement of the balloon should be as close as possible to the proposed site of coil deployment.

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