ENDOVASCULAR TREATMENT OF POSTERIOR CEREBRAL ANEURYSM ASSOCIATED WITH MOYAMOYA DISEASE

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SUMMARY

Purpose: A patient with moyamoya disease associated with a ruptured posterior cerebral artery aneurysm treated by endovascular embolization is presented.

Case report: A 47-year-old woman was admitted with severe headache to our hospital. Computed tomography demonstrated subarachnoid haemorrhage. Cerebral angiography revealed evidence of moyamoya disease and a saccular aneurysm at the P1 segment of the left posterior cerebral artery.

Conclusion: Endovascular embolization was performed using Guglielmi detachable coil (GDC), and the aneurysm was completely occluded with preservation of the parent artery. Endovascular treatment using GDC seems comparatively safe and effective for the treatment of cerebral saccular aneurysms in patients with moyamoya disease.

Key words: cerebral aneurysm, embolization, endovascular therapy, moyamoya disease.

INTRODUCTION

Moyamoya disease is a chronic cerebrovascular disorder characterized by progressive occlusive disease of the major vessels of the intracranial arteries and its branches. This results in compensatory development of abnormal net-like vessels at the base of the brain due to enlargement of the perforating arteries. Moyamoya disease is often associated with intracranial aneurysms in 3-15% [2, 4, 6], and reports of such cases appear to be increasing. We describe a case of ruptured posterior cerebral artery aneurysm associated with moyamoya disease presenting with subarachnoid hemorrhage treated with intraaneurysmal embolization using Guglielmi detachable coil (GDC).

CASE REPORT

A 47-year-old woman presented with severe headache and vomiting for six days. On admission, she was fully conscious without focal signs.

Computed tomography showed subarachnoid blood in the left sylvian fissure and interhemispheric fissure. Carotid angiography revealed severe stenosis of the bilateral internal carotid artery with moyamoya vessels (figure 1). Left vertebral angiography revealed a 3-mm saccular aneurysm at the left P1 segment of the posterior cerebral artery (figure 2). Using the FasTracker-10 microcatheter (Target Therapeutics, Fremont, Calif., U.S.A.) and Transend-10 microguidewire (Target Therapeutics, Fremont, Calif., U.S.A.), the posterior cerebral aneurysm was occluded with one GDC-10 (soft stretch-resistant-2D: 3mm (helical diameter)×30mm (length)) (Target Therapeutics, Fremont, Calif., U.S.A.). Postembolization angiography revealed near complete occlusion of the posterior cerebral aneurysm (figure 2). No change in the patient’s neurological status was noted during or after the procedure.

DISCUSSION

Three types of aneurysms are found in moyamoya disease. The first is the peripheral artery type, mostly periventricular in location and near or within the abnormal fine network of moyamoya vessels. They may have a transient appearance on
follow-up angiography and have been shown histologically by Yuasa et al. to be pseudoaneurysms [20]. The second type is dissecting aneurysm, which is rarely described [19]. The third type is the major artery aneurysm, present on the circle of Willis and representing true saccular aneurysms. About 61% of aneurysms belong to the first and 39% to the third type [16].

Even though saccular aneurysms usually arise more frequently in the anterior circulation, those associated with moyamoya disease occur most frequently in the posterior circulation [7]. The incidence of aneurysms of the posterior circulation was 9.6% in the autopsy series reported by Mc Cormick [11], and 5.3% in the Cooperative study [9]. On the other hand, aneurysms associated with moyamoya disease develop more frequently in the vertebrobasilar system (43.3%) [14]. It has been suggested that the occlusive disease of the internal carotid system may compromise the flow dynamics across the circle of Willis, including increased flow through the basilar and posterior cerebral arteries.

This increased flow leads to turbulence and the increased chance of aneurysm formation and rupture [12].

Posterior fossa aneurysms are frequently associated with moyamoya disease. Surgical treatment of posterior fossa aneurysms is generally difficult, but more so when associated with moyamoya disease [10]. The subtemporal approach [4, 7], pterional approach [6, 12, 14], and orbitozygomatic approach have been used to approach basilar tip aneurysms associated with moyamoya disease. Direct surgery is difficult to perform on aneurysms around the circle of Willis in patients with moyamoya disease, particularly when the pterional approach is selected for an aneurysm in this region [12, 13]. The main problem in direct surgery is the presence of moyamoya vessels around the aneurysm, which provide collateral circulation in the brain with moyamoya disease and cannot be sacrificed. An additional problem is the stiffness of the carotid artery, precluding adequate retraction of this vessel. Another problem of direct surgery is its inability to completely remove the aneurysm, potentially leading to recurrent aneurysms.

FIG. 1. – Carotid angiograms (a: antero-posterior view of the right carotid artery, b: anteroposterior view of the left carotid artery) showing severe stenosis of the bilateral internal carotid artery with moyamoya vessels.

FIG. 1. – Angiographie carotide : artère carotide interne droite, incidence de face (a), artère carotide interne gauche, incidence de face (b). Sténose sévère des deux artères carotides internes. Réseau moyamoya.

FIG. 2. – Left vertebral angiograms (a: preoperative, b: postoperative) showing a 3-mm saccular aneurysm of the P1 segment of the left posterior cerebral artery (arrow) and near complete occlusion of the aneurysm postoperatively (double arrows).

FIG. 2. – Angiographie carotide gauche : avant traitement (a), après traitement (b). Anévrisme sacculaire de 3 mm du segment P1 de l’artère cérébrale postérieure (flèche). Occlusion quasi complète de l’anévrisme (double flèche).
surgery is that innovative preservation of the transdural anastomosis may be needed during craniotomy. Some authors have shown that excessive compression of the perforating vessels around aneurysms of the parent artery during clipping may induce circulatory compromise leading to postoperative hemiplegia or severe brain edema [1]. The brain with moyamoya disease is under chronic hypoperfusion. Excessive brain retraction may cause cerebral blood flow disturbance, resulting in postoperative complications such as cerebral infarction or intracerebral hemorrhage, and may also damage the moyamoya vessels [14].

Due to improvement of technique of anesthesia, patients with moyamoya disease can undergo general anesthesia, but some difficulties still remain [10]. Direct surgery necessitates general anesthesia, which may cause postoperative aggravation of clinical symptoms or cerebral infarction due to hypocapnia induced by intraoperative hyperventilation [18]. On the other hand, hypercapnea is thought to cause cerebral infarction due to the steal phenomenon [8, 17]. Endovascular procedures should also be performed under general anesthesia for safety condition, but they can also be performed under local anesthesia.

Endovascular techniques, such as GDC embolization, would be of great benefit in treating aneurysms associated with moyamoya disease, although long-term angiographic and clinical follow-up are necessary to ascertain the long-term efficacy of this embolization technique [3]. The greatest advantage of the endovascular treatment is the avoidance of direct invasion to the brain such as retraction, and aneurysms can be approached without affecting the moyamoya vessels or brain. Endovascular treatment can be performed under local anesthesia, and hence complications caused by general anesthesia such as circulation disturbance can be prevented [5].

To our knowledge, there have been only eight reported cases of endovascular treatment for cerebral aneurysms associated with moyamoya disease including our case [3, 5, 10, 15]. Four aneurysms were located in the basilar tip, two in P1 segment, one at the junction of the superior cerebellar artery and basilar artery and one in the distal anterior choroidal artery. There were five ruptured aneurysms and three unruptured ones. They were treated with GDCs and Interlocking detachable coil.

CONCLUSION

Endovascular treatment with GDCs appears particularly suitable for cerebral saccular aneurysm in patients with moyamoya disease.

RÉFÉRENCES