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A Successful Case of Endovascular Treatment (EVT) of Anterior Communicating Artery Aneurysm Associated with Moyamoya Disease

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ABSTRACT

Saccular aneurysms associated with moyamoya disease are commonly located in the vertebrobasilar circulation. Anterior circulation aneurysm associated with moyamoya disease is uncommon and is usually treated by neurosurgical clipping. **Objective:** We report a succesful treatment using the endovascular approach in a case of ruptured anterior communicating artery aneurysm in unilateral moyamoya disease. **Clinical Presentation:** A 23 year old man presented with a 5 day history of headache, diplopia and fever. Computed Tomography (CT) scan and cerebral angiogram showed a bilobed anterior comunicating artery aneurysm. There was also severe M1 segment stenosis of the left middle cerebral artery with multiple collaterals, representing moyamoya vessels. **Intervention:** Treatment was done under general anesthesia and followed the standard practice for endovascular treatment. The aneurysm was occluded with three detachable platinum microcoils (Microplex®, Microvention®). **Conclusion:** Endovascular treatment can be a treatment option for ruptured anterior circulation saccular aneurysms associated with moyamoya disease.

Keywords: Anterior communicating artery, aneurysm, endovascular treatment, Moyamoya disease

INTRODUCTION

Moyamoya disease is a rare progressive cerebrovascular disease characterised by progressive occlusion of the supraclinoid internal carotid arteries (ICA) and its main branches within the circle of Willis [1]. This occlusion results in the formation of fine vascular network formation in the base of the brain termed as moyamoya vessels [1]. Saccular aneurysms associated with moyamoya disease are commonly located in the vertebrobasilar circulation [2, 3, 4].

Anterior circulation aneurysm associated with moyamoya disease is usually treated by neurosurgical clipping [5]. However with improvements in endovascular treatment (EVT) techniques and devices, EVT offers an alternative. We report a case of ruptured anterior communicating artery aneurysm in a patient with a left middle cerebral artery moyamoya disease treated by EVT. To the best of our knowledge, anterior circulation aneurysm associated with moyamoya disease treated with EVT has not been previously reported in the literature.

CASE REPORT

A 23 year old gentleman presented with a five day history of headache, diplopia and fever but no neurological deficit. CT scan of the brain showed a large left frontal intraparenchymal haemorrhage associated with subarachnoid and intraventricular haemorrhages *[Figure 1]*. A reconstructed 3D rotational angiogram (3DRA) of the cerebral circulation showed a bilobed anterior comunicating artery aneurysm measuring 7.2 x 3.9 mm pointing anteroinferiorly with the neck measuring 2.5 mm *[Figure 2]*. There was also severe M1 segment stenosis of the left middle cerebral artery with multiple collaterals in keeping with moyamoya vessels *[Figure 2]*. The 3D images showed a better view of the anterior communicating artery aneurysm and the moyamoya vessels, which enabled us to get a good working projection for EVT *[Figure 3]*. EVT was then chosen as the treatment option.

The procedure was done under general anaesthesia. Right femoral access was obtained with 5F guiding catheters (Envoy; Cordis, Miami Lakes, FL). Full heparinasation (5000 IU bolus, followed by continuous infusion [2000-3000 IU/hour]) was achieved and the activated clotting time was maintained between 200 - 300 seconds. Excelsior SL-10 microcatheter (Boston Scientific®) and Transcend 0.014" microguidewire (Boston Scientific®) was used to cannulate the aneurysm and embolisation was done with three detachable platinum microcoils (Microplex®, Microvention®). Post embolisation angiogram showed a 10% residual slow filling of the aneurysm's neck and sac *[Figure 4]*.

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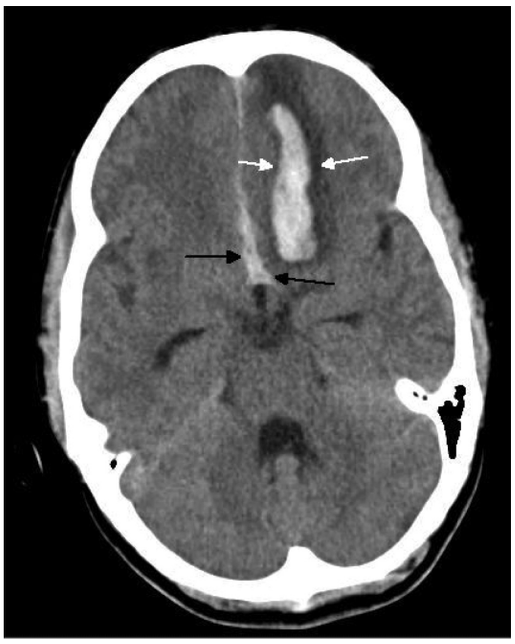
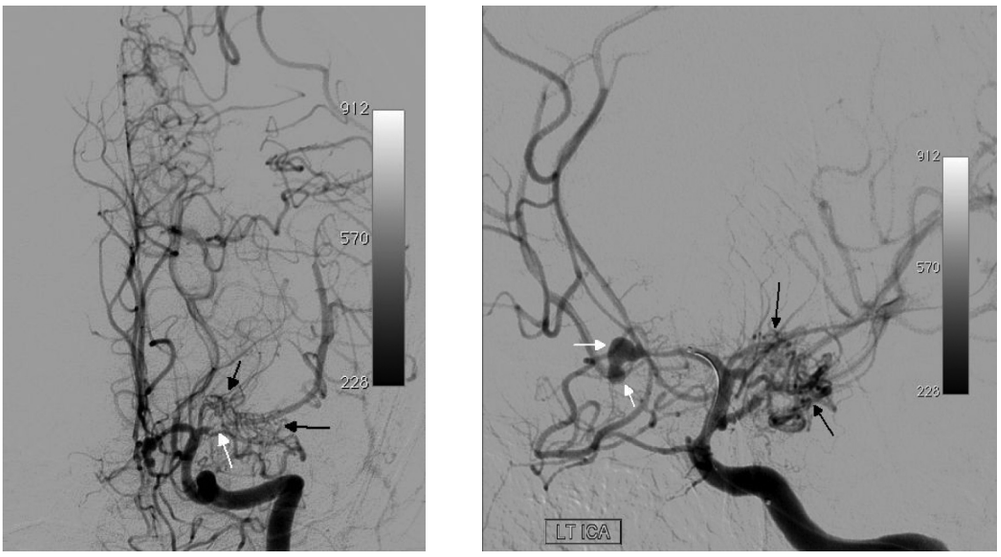


Figure 1. Axial plain CT scan of the brain showing a large left frontal intraparenchymal haemorrhage with perifocal oedema (white arrows). There are also associated subarachnoid haemorrhage (black arrows) and intraventricular haemorrhage



(a) (b)

Figure 2. (a) Towne view of the left internal carotid angiogram showing stenosis of the M1 segment of the left middle cerebral artery (white arrow) with moyamoya vessels forming the M2 and M3 segment of the left middle cerebral artery (black arrows). (b) Frontal oblique view of the left internal carotid angiogram showing an anterior communicating artery aneurysm (white arrows) during coiling. There is also stenosis of the A1 segment of the left anterior cerebral artery in keeping with vasospasm. The moyamoya vessels are better shown in this view (black arrows)

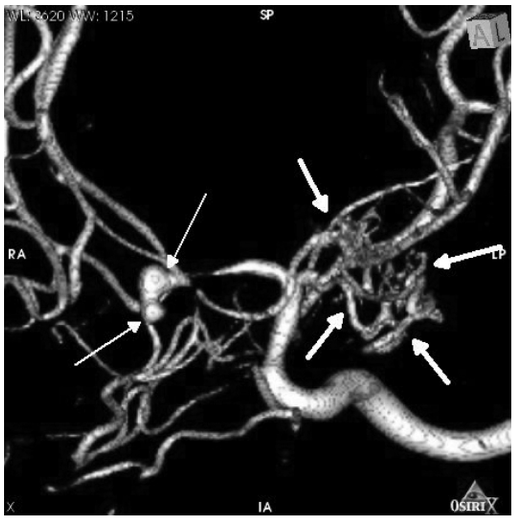
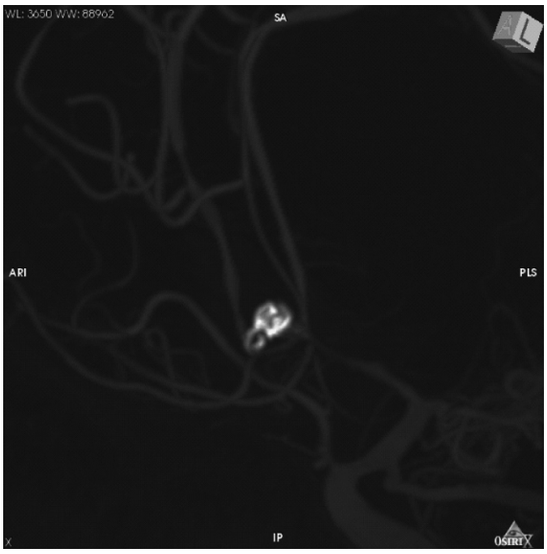
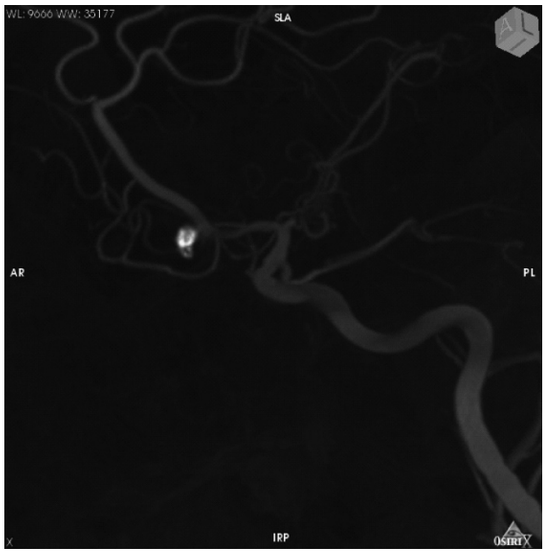


Table 3. 3DRA of the left internal carotid artery showing the anterior communicating artery aneurysm in the working projection (thin white arrows). The moyamoya vessels are also better shown in the 3DRA images (thick white arrows)



(b)



(b)

Figure 4. (a) Frontal oblique view of the 3D reconstruction image post coiling showing small neck residual of the aneurysm. (b) The 3D reconstruction image of the one month follow up angiogram showing minimal neck residual

Irregularities in the anterior cerebral arteries and left middle cerebral artery were noted, in keeping with vasospasms. However intraarterial papavarine or vasodilators was not given. Twelve hours post procedure, the patient developed sudden right sided weakness but improved after Triple-H therapy for vasospasm. He was transferred out of the intensive care unit on day three and was discharged on day twelve with residual right sided weakness. A repeat angiogram done about one month post embolisation showed 'dog-ear', as described by Raymond *et al*. [6], of less than 5% residual neck of the anterior communicating artery. There was no change in the distribution of the moyamoya vessels. During the follow up, there was improvement in the neurological deficit, with motor power of 4/5.

DISCUSSION

Moyamoya, which means "puff of smoke" in Japanese, is used to describe the appearance of the vascular network seen on angiogram in patients with moyamoya disease [1]. The incidence of moyamoya disease is high in East Asian in countries such as Japan and Korea. It has an annual prevalence and incidence of 3.16 and 0.35 per 100,000 respectively in Japan [1].

Saccular aneurysm associated with moyamoya disease has been reported in the literature since the 1970s [2]. There are two general types of cerebral aneurysms associated with moyamoya disease. The first type originate from the collateral circulation which forms the moyamoya vessels and is located in the periphery of the anterior and posterior choroidal arteries, and is shown histologically to be pseudoaneurysms. The second type, which originate from the circle of Willis, represents true saccular aneurysms and is commonly located in the posterior circulation [3, 4].

The treatment strategy for these saccular aneurysms can be either by neurosurgical clipping (NSC) or EVT, which both has its own advantages and disadvantages. Iwama *et al.* was successful in performing direct surgery for seven major artery aneurysms in five patients with Moyamoya disease [5]. Three aneurysms in the anterior circulation were successfully clipped via the pterional or interhemispheric approach. The four posterior circulation aneurysms were clipped via pterional or subtemporal approach. However, the operative field via the pterional approach was noted to be interfered by abundant fragile collateral vessels and it was difficult to reach the distal portion of the basilar artery. Due to these potential problems, EVT was advocated for posterior circulation aneurysms associated with moyamoya disease [3, 4]. Arita *et al.* had reported the efficacy and safety of EVT of basilar tip aneurysms in five patients, in which four had an angiographic obliteration of more than 95% [3].

In our case, a ruptured anterior communicating artery aneurysm in a patient with unilateral moyamoya disease was successfully treated with EVT. We feel EVT is a good option not only for posterior circulation aneurysms, but also for aneurysm in other locations, in moyamoya disease.

CONCLUSION

Saccular aneuryms associated with moyamoya disease are commonly located in the vertebrobasilar circulation. Anterior circulation aneurysm associated with moyamoya disease is uncommon and is usually treated by neurosurgical clipping. In this case report, the anterior circulation aneurysm was successfully treated by EVT. Thus, EVT should be considered as a treatment option for ruptured anterior circulation saccular aneurysms associated with moyamoya disease.

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