Introduction

Craniotomy and surgical clipping is the standard modality of treatment in patients of cerebral aneurysms. However, the surgical clipping of aneurysm may pose serious difficulties in the case of a bilateral carotid artery occlusion. The endovascular treatment has shown promising results in this disease. Methods: A retrospective study of all patients of posterior circulation aneurysms in the background of carotid occlusive disease at our department was performed. The aim of this study was to describe the clinical, radiological characteristics, and the treatment of this rare entity. Results: Four patients were treated from January 2009 to October 2015. The mean age of our patients was 34 years with ages that ranged from 17 to 45 without any gender predominance. The mean period between onset of symptoms and diagnosis was 6 weeks. Angiographic localization of the disease was observed in all patients. All patients were treated by endovascular techniques. The postoperative course has been satisfactory with a complete neurological recovery in all patients. Conclusions: Rupture of posterior circulation aneurysms in the setting of bilateral internal carotid artery occlusion is extremely rare. Treatment is exclusively endovascular intervention. The functional outcome of ruptured posterior circulation aneurysms in setting of bilateral carotid occlusive disease is particularly favorable with good neurological recovery.

Keywords: Basilar apex, carotid occlusion, cerebral aneurysms, Moyamoya disease, posterior cerebral artery
of them had hypertriglyceridemia and the other had hyperhomocysteinemia.

Females had no family history of IHD or habit of tobacco consumption [Table 1]. Figure 1 shows salient findings of cerebral DSA.

Of the four patients, the aneurysms were located at the basilar apex in two cases and PCA in two cases [Figure 1]. All patients were treated by endovascular intervention. Two patients had stent-assisted coiling whereas the other two were treated by coiling alone. The postoperative course has been satisfactory, with a complete recovery of neurological functions in all patients [Table 1].

**Discussion**

Only few sporadic cases of similar aneurysms treated by endovascular methods have been described in the English literature.\(^2\) Bilateral internal carotid artery occlusion leads to abnormally increased blood flow through the posterior circulation. It increases the hemodynamic stress, especially at basilar artery apex and posterior cerebral arteries.\(^4\) The alteration of local hemodynamic is considered to be a causative factor for the occurrence of these aneurysms. Most of these are asymptomatic and are incidentally detected on DSA. However, these are potentially dangerous as a rupture can lead to life-threatening subarachnoid hemorrhage (SAH).\(^5\)

Atherosclerosis, Moyamoya disease, and inflammatory vasculopathies are the leading causes of bilateral internal carotid artery stenosis.\(^2,11-13\) In our series, out of total 4 cases, 2 were due to atherosclerosis and Moyamoya disease each.

These patients may present clinically with features of either ischemia secondary to internal carotid artery

**Table 1: Summary of clinical characteristics, management, and results of our patients**

<table>
<thead>
<tr>
<th>Case</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>39</td>
<td>45</td>
<td>17</td>
<td>35</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>Male</td>
<td>Female</td>
<td>Female</td>
</tr>
<tr>
<td>Symptoms</td>
<td>Headache</td>
<td>Headache, ptosis</td>
<td>Headache</td>
<td>Headache</td>
</tr>
<tr>
<td>Site of aneurysm</td>
<td>Basilar apex</td>
<td>Left PCA (P1 segment)</td>
<td>Right PCA (P1 segment)</td>
<td>Basilar apex</td>
</tr>
<tr>
<td>Treatment</td>
<td>Stent-assisted coiling</td>
<td>Coiling</td>
<td>Coiling</td>
<td>Stent-assisted coiling</td>
</tr>
<tr>
<td>Result</td>
<td>Complete recovery</td>
<td>Complete recovery</td>
<td>Complete recovery</td>
<td>Complete recovery</td>
</tr>
<tr>
<td>Follow-up</td>
<td>6 years</td>
<td>5 years</td>
<td>3 years</td>
<td>1 year and 4 months</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>Hypertriglyceridemia</td>
<td>Hyperhomocysteinemia</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td>Tobacco consumption</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Diabetes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Family history of IHD or ischemic stroke</td>
<td>Early fatal AMI in father</td>
<td>Early AMI in father and grand father</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

IHD – Ischemic heart disease; AMI – Acute myocardial infarct; PCA – Posterior cerebral artery

**Figure 1:** (a) Cerebral digital subtraction angiography showing basilar top aneurysm with good cross flow and filling of entire intracranial circulation from the right vertebral artery. (b) Postprocedure image showing complete obliteration of aneurysm with detachable platinum coils. (c) Cerebral digital subtraction angiography showing left posterior cerebral artery (P1 segment) aneurysm and filling of entire intracranial circulation from right vertebral artery. (d) Complete obliteration of aneurysm using coils with patent distal circulation. (e) Cerebral digital subtraction angiography showing right posterior cerebral artery (P1 segment) aneurysm. Entire intracranial circulation is filling from right vertebral artery. (f) Aneurysm completely obliterated using detachable coils with patent distal circulation. (g) Cerebral digital subtraction angiography showing basilar top aneurysm with filling of whole intracranial circulation from left vertebral artery. (h) Aneurysm completely obliterated by coils with patent distal circulation.
stenosis or with features of hemorrhage secondary to ruptured posterior circulation aneurysms or a combination of both.\[^{11,12}\] Moreover, most of these patients are on antiplatelet therapy, which can make hemorrhage more devastating.

Conservative management for these aneurysms can lead to dismal results.\[^{5,7}\] Conventionally, these aneurysms can be managed by open surgery with craniotomy and clipping. However, there are several shortcomings to this approach. First, their anatomical locations with close vicinity to important neurovascular structures make surgical access difficult, if not impossible. Second, proximal control using temporary clips is virtually not feasible in view of already compromised anterior circulation and vertebrobasilar system being the sole source of blood supply. Third, due to high internal pressure in the vertebrobasilar system, it is dangerous to clip these aneurysms. It highlights the fact that the posterior circulation aneurysms are difficult to clip in the acute stage.\[^{2,3,13}\] Endovascular treatment offers a viable alternative as these shortcomings of craniotomy and surgical clipping are overcome. These are flow-related aneurysms; therefore, endovascular treatment using coils provides excellent results with good intraprocedure obliteration rates and lasting benefits in terms of regrowth or rebleed as seen on follow-up.\[^{2,11}\]

**Conclusions**

Endovascular treatment is safe and effective for treatment of ruptured aneurysms of posterior circulation in patients with bilateral carotid artery occlusion as it overcomes the limitations of traditional surgical clipping.

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Nil.

**Conflicts of interest**

There are no conflicts of interest.

**References**