Carotid-Choroidal Aneurysms

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It is not commonly recognized that aneurysms may arise from the carotid artery at or adjacent to the origin of the choroidal artery, well separated from the origin of the posterior communicating artery (Fig. 1). This intimate relationship to the choroidal artery has surgical significance, for inadvertent injury to this vessel may have disastrous consequences. It has been shown that, in patients with Parkinson's disease, deliberate ligation of the choroidal artery was followed frequently by stupor and in 20% of the cases by hemiplegia or death. Carotid-choroidal aneurysms present symptoms in much the same fashion as those at the carotid-communicating junction, even to direct involvement of the oculomotor nerve.

Incidence

The only figures available are those of the Cooperative Study where 121 carotid-choroidal aneurysms were reported in the series of 2672 single aneurysms, an incidence of 4.5%. In common with carotid-ophthalmic aneurysms (see preceding article), the incidence of multiple aneurysms in this series is high (2 of 7 cases). It is important to realize that when another aneurysm was present it arose just below the first, at the origin of the posterior communicating artery, the necks of the two aneurysms tending to obscure each other, or even appearing as one aneurysm (Cases 1 and 4).

Signs and Symptoms

There were no features distinguishing carotid-choroidal from carotid-communicating aneurysms. Two patients had third nerve palsies (Cases 1 and 3), but in Case 1, the paralysis was undoubtedly due to the subjacent and larger carotid-communicating aneurysm. In two patients (Cases 1 and 4) the carotid-choroidal aneurysm was small and intact, the hemorrhage being caused by the carotid-communicating aneurysm below. The severe diabetes insipidus in Case 4 was probably not a unique feature of bleeding from this aneurysm.

Technical Aspects

The operation approach is subfrontal and along the sphenoid ridge, as for carotid-communicating aneurysms. This allows the neck of the aneurysm to be exposed and dissected free for occlusion without disturbing the fundus. Because of the danger of infarction in the basal ganglia, every effort must be made to spare the choroidal artery. This should

Fig. 1. Tracings of carotid-choroidal aneurysms. The choroidal artery is shaded.

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not be difficult, since in these cases the aneurysm tended to project laterally while the anterior choroidal artery curved medially before entering the choroidal fissure, leaving a reasonable angle of separation. Unless the clip applied projects too far beyond the neck, the choroidal artery should not be injured. In each of the three patients having postoperative angiography, the choroidal artery was seen to be intact.

As mentioned previously, there is a tendency for coexistent choroidal and communicating aneurysms to obscure their respective origins. Because of their proximity, in two cases the presence of the other aneurysm was not appreciated until operation. Case 4 is an example.

Case Report

Examination. This 29-year-old woman was admitted in a stuporous state following a single subarachnoid hemorrhage. Angiography revealed what appeared to be bilateral carotid-communicating aneurysms. The larger one was on the right and although its broad, ill-defined neck was commented upon, its significance was not recognized preoperatively (Fig. 2 left). The patient recovered quickly but operation was delayed for 14 days to control a severe diabetes insipidus, presumably related to the hemorrhage.

Operation. As the thickened arachnoid was removed, it became apparent that another smaller aneurysm lay directly above and was adherent to the carotid communicating aneurysm, explaining the rather unusual angiographic appearance. Even under hypotension (40 mm Hg), it was with some difficulty that the bases of the two aneurysms were separated, so that a Mayfield clip could be applied across the neck of the lower and larger sac. After several awkward, unsuccessful attempts were made to clip the carotid-choroidal aneurysm which was small and in clear view, it was encased in plastic. It took only a few minutes to clip the left carotid-communicating aneurysm.

Postoperative Course. The patient made an uneventful recovery, and postoperative angiography showed very clearly the position of the carotid-choroidal aneurysm with the overlying shadow of the carotid-communicating aneurysm removed (Fig. 2 right).

Results

The results in the seven cases of carotid-choroidal aneurysm are shown in Table 1.

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Fig. 2. Case 4. Preoperative oblique view (left) shows overlapping shadows of carotid-choroidal and carotid-communicating aneurysms simulating a single broad-based aneurysm. Postoperative angiogram (right) shows the clip applied to the neck of the carotid-communicating aneurysm which allows the outline of the small carotid choroidal aneurysm to be seen clearly (arrow).
TABLE 1

**Carotid-choroidal aneurysms**

<table>
<thead>
<tr>
<th>Case</th>
<th>Sex</th>
<th>Age</th>
<th>Side</th>
<th>Times Bled</th>
<th>Other Aneurysms</th>
<th>Grade</th>
<th>Interval (days)</th>
<th>Operation</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>43</td>
<td>R</td>
<td>1</td>
<td>(R) carotid-communicating</td>
<td>2</td>
<td>5</td>
<td>Hypothermia. Clip (R) carotid-communicating. Carotid-choroidal aneurysm tore, was clipped. Hypothermia. Mayfield clip.</td>
<td>Died same day. Infarcted (R) temporal lobe</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>48</td>
<td>L</td>
<td>1</td>
<td>none</td>
<td>3</td>
<td>18; residual spasm, (R) field defect</td>
<td>Hypothermia. Mayfield clip.</td>
<td>Emotionally labile but working full-time.</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>58</td>
<td>R</td>
<td>3</td>
<td>none</td>
<td>3</td>
<td>5</td>
<td>Hypothermia. McKenzie clip.</td>
<td>(?) Progressive bulbar palsy. Emaciated. Mentally alert, with slight improvement of pre-operative (L) hemiparesis and (R) 3rd nerve palsy.</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>59</td>
<td>L</td>
<td>3</td>
<td>none</td>
<td>3</td>
<td>1</td>
<td>Abandoned; sac burst as dura opened.</td>
<td>Died 12 hours.</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>59</td>
<td>R</td>
<td>1</td>
<td>none</td>
<td>1</td>
<td>11</td>
<td>Deep hypotension. Ligation.</td>
<td></td>
</tr>
</tbody>
</table>

One patient (Case 6) was not operated on. She remained drowsy, and on the sixth day developed a severe surgical parotitis on the same side. While this was being treated urgently on the ninth day a fatal recurrent bleeding of the aneurysm occurred (Fig. 3). The remaining six cases came to operation.

In view of their multiplicity, the aneurysms may be grouped similarly to the carotid-ophthalmic aneurysms (see preceding article). In Cases 1 and 4, the aneurysm was small and intact, and operation was incidental to obliteration of the ruptured aneurysm immediately below. The patient already described (Case 4) remains well. Case 1 was in deep coma and decerebrate (Grade 5). A useless attempt at salvage surgery was made. The carotid-communicating aneurysm was clipped without difficulty, but the intact carotid-choroidal aneurysm was torn during its dissection. A clip applied across the neck of the aneurysm stopped the bleeding, but the patient died the same day.

![Fig. 3. Case 6. Isolated circle of Willis shows origin of carotid-choroidal aneurysm from posterior aspect of internal carotid artery just above origin of choroidal artery (CHOR A).](image-url)
In four patients, the carotid-choroidal aneurysm had ruptured, and had produced serious preoperative deficits in three (Cases 2, 3, and 5). Three patients survived clipping of the aneurysm. One of the poor risk cases is able to work; the other is severely disabled by the persisting preoperative deficit. The only good risk patient (Case 7) did well in spite of the large size of the aneurysm (Figs. 4 and 5).

In Case 5, the aneurysm burst as the dura was being opened. The operation was abandoned when the brain literally squirted out of the opening. The patient died in a few hours.

While the results of surgical treatment are...
not impressive, they are clearly related to the serious preoperative state of the patient. The only two patients who were well at the time of operation had excellent results, and even the other two survivors improved postoperatively, one to the point of full-time work.

When the patient is a good risk, surgical treatment of these aneurysms should be considered.

Conclusions

1. Seven patients with carotid aneurysms arising in the region of origin of the choroidal artery have been presented. Two had multiple aneurysms, and in each, the other aneurysm lay immediately below at the origin of the posterior-communicating artery. This proximity created some difficulty in the angiographic diagnosis and surgical treatment. There was no specific clinical picture.

2. These aneurysms can be exposed in the same fashion as those on the posterior communicating artery. Because of the angle of separation, it is not difficult to apply a clip to the neck of the aneurysm, avoiding the anterior choroidal artery, whose integrity must be respected.

3. Results: One patient died before an operation could be performed. The remaining six were operated on, with two deaths. Of the four survivors, two are excellent results, one is good, and the other disabled, the outcome being clearly related to the preoperative state of the patient.

References