Ruptured Anterior Cerebral Artery Aneurysm at the Origin of the Accessory Middle Cerebral Artery
—Case Report—

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Abstract
A 36-year-old female patient was admitted to our hospital with a rare case of aneurysm at the origin of the accessory middle cerebral artery (MCA) manifesting as severe headache and vomiting. Neurological examination did not detect any abnormalities or consciousness disturbance. Computed tomography demonstrated diffuse subarachnoid hemorrhage. Magnetic resonance angiography showed an aneurysm in the horizontal portion of the left anterior cerebral artery (A1). Digital subtraction angiography and three-dimensional digital subtraction angiography demonstrated a saccular aneurysm originating at the junction of the left A1 and accessory MCA. Another accessory MCA originated at the proximal portion of the left A2 without an aneurysm. Two accessory MCAs were found on the left. Neck clipping was performed via a left pterional approach. One month after admission, she was discharged without neurological deficits.

Key words: A1 aneurysm, accessory middle cerebral artery, subarachnoid hemorrhage, three-dimensional digital subtraction angiography, anterior cerebral artery

Introduction
Aneurysm at the horizontal portion (A1) of the anterior cerebral artery (ACA) is rare with an incidence ranging from 0.88% to 4.0% of all cerebral aneurysms.7,15,18,19) Most aneurysms at the A1 portion are formed at the origin of perforators.15,19) Aneurysm has also occurred at variations of the ACA, for example, fenestrated A1, accessory middle cerebral artery (MCA), duplicated MCA, and azygos ACA.15,19) Accessory MCA is defined as originating from the ACA and duplicating the MCA that originates from the internal carotid artery (ICA).16) Accessory MCA is rare and is found in 0.3–2.7% of autopsy cases1) and 0.24–0.34% of patients undergoing angiography.20) We encountered a very rare aneurysm at the origin of the accessory MCA in the A1 portion, and discuss the characteristics and therapy for this rare aneurysm.

Case Report
A 36-year-old female patient was admitted to our hospital with severe headache and vomiting. Neurological examination did not detect any abnormalities or consciousness disturbance. Physical examination found no neck stiffness and both Kernig sign and Lasegue sign were negative.
Another accessory MCA originated at the proximal portion of the left A2 without an aneurysm, and two accessory MCAs were found on the left (Fig. 3). No other aneurysm or other vascular anomaly was identified.

Neck clipping was performed via the left pterional approach soon after digital subtraction angiography. The aneurysm was located at the junction of the left A1 and accessory MCA (Fig. 4). The two accessory MCAs could be identified. The dome of the aneurysm adhered to the frontal base (Fig. 4). The aneurysm was clipped using a 6-mm straight clip (Sugita titanium mini clip). Postoperative three-dimensional CT angiography showed no aneurysm and the spared accessory MCA (Fig. 5). The postoperative state was uneventful and no symptomatic vasospasm occurred. One month after admission, she was discharged without neurological deficits.

**Discussion**

Only 11 cases of accessory MCA aneurysm have been reported including our case (Table 1). The 5 male and 6 female patients had a mean age of 45.5 years. Seven cases involved the left side and 4 cases involved the right. The majority of these cases presented with subarachnoid hemorrhage. Only two cases involved non-ruptured aneurysms at presentation. In one case, the aneurysm was incidentally discovered during investigation of chronic subdural hematoma. One case presented with visual disturbance and a large aneurysm was found compressing the right optic nerve.

The formation and growth mechanisms of aneurysm at the junction of A1 and accessory MCA have not yet been clarified. No contributory family history or past history was identified in any of the 11 cases. Congenital anomalies or variations of the intracranial arteries and a defect of the medial layer at the arterial wall may be important factors contributing to aneurysm formation.
Aneurysm of the Accessory MCA Origin

Table 1 Clinical characteristics of patients with accessory middle cerebral artery aneurysm

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Author (Year)</th>
<th>Age (yrs)</th>
<th>Sex</th>
<th>Diagnosis</th>
<th>Side</th>
<th>Size (mm)</th>
<th>Associated aneurysm</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Waga et al. (1977)</td>
<td>51</td>
<td>F</td>
<td>SAH</td>
<td>lt</td>
<td>ND</td>
<td>–</td>
<td>D</td>
</tr>
<tr>
<td>2</td>
<td>Handa et al. (1982)</td>
<td>55</td>
<td>F</td>
<td>SAH</td>
<td>rt</td>
<td>ND</td>
<td>–</td>
<td>GR</td>
</tr>
<tr>
<td>3</td>
<td>Fuwa et al. (1984)</td>
<td>57</td>
<td>M</td>
<td>CSH</td>
<td>lt</td>
<td>ND</td>
<td>+</td>
<td>GR</td>
</tr>
<tr>
<td>4</td>
<td>Miyazaki et al. (1984)</td>
<td>42</td>
<td>M</td>
<td>SAH</td>
<td>lt</td>
<td>ND</td>
<td>–</td>
<td>GR</td>
</tr>
<tr>
<td>5</td>
<td>Kwabara and Naitoh (1990)</td>
<td>73</td>
<td>F</td>
<td>SAH</td>
<td>rt</td>
<td>4 × 6</td>
<td>–</td>
<td>GR</td>
</tr>
<tr>
<td>6</td>
<td>Han et al. (1994)</td>
<td>34</td>
<td>F</td>
<td>SAH</td>
<td>lt</td>
<td>4 × 5</td>
<td>–</td>
<td>GR</td>
</tr>
<tr>
<td>7</td>
<td>Sugita et al. (1995)</td>
<td>53</td>
<td>M</td>
<td>visual disturbance</td>
<td>rt</td>
<td>giant</td>
<td>–</td>
<td>GR</td>
</tr>
<tr>
<td>8</td>
<td>Georgopoulos et al. (1999)</td>
<td>32</td>
<td>F</td>
<td>SAH</td>
<td>lt</td>
<td>ND</td>
<td>–</td>
<td>MD</td>
</tr>
<tr>
<td>9</td>
<td>Fujiwara et al. (2003)</td>
<td>30</td>
<td>M</td>
<td>SAH</td>
<td>rt</td>
<td>3 × 5</td>
<td>–</td>
<td>GR</td>
</tr>
<tr>
<td>10</td>
<td>Kang et al. (2009)</td>
<td>38</td>
<td>M</td>
<td>SAH</td>
<td>lt</td>
<td>4 × 5</td>
<td>–</td>
<td>GR</td>
</tr>
<tr>
<td>11</td>
<td>Present case</td>
<td>36</td>
<td>F</td>
<td>SAH</td>
<td>lt</td>
<td>3 × 6</td>
<td>–</td>
<td>GR</td>
</tr>
</tbody>
</table>


Tightening and careful dissection is necessary at the junction of the A1 and accessory MCA during surgical intervention.2,9) If the aneurysm adheres on the frontal base as in our case, minimum retraction of the frontal lobe is necessary.2)

Three-dimensional digital subtraction angiography was very useful for this complicated aneurysm. Standard digital subtraction angiography could not show the origin of the accessory MCA and the small perforators around the aneurysm in our case. To visualize the complicated courses of accessory MCAs with small aneurysm, both these studies would be preferable. Careful preoperative investigation of the aneurysm will facilitate the avoidance of major complications during surgical interventions.

References

9) Kang DH, Park J, Park SH, Hamm IS: Saccular aneurysm at


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