Duplicated middle cerebral artery aneurysm

Duplication of the middle cerebral artery (DMCA) is an anomalous vessel arising from the internal carotid artery (ICA).

An aneurysm at the DMCA origin was initially reported by Crompton and Lond in 1962 [1].

Aneurysms at the origin of a DMCA have been reported; however, most have been treated with clipping surgery.

Case series

Four patients with internal carotid artery-DMCA aneurysms are presented, and 24 previously published cases are reviewed.

Of the 28 internal carotid artery-DMCA aneurysms, 17 were ruptured, and 11 were unruptured. The aneurysms were equally distributed on the right and left sides and were small in size (≤6 mm) except for two that were of medium size. All aneurysms were treated surgically except for two very small aneurysms, which have been managed conservatively and followed for 9 years.

Although all previously published clinical cases of internal carotid artery-DMCA aneurysms were treated surgically, conservative management with follow-up is a viable option in very small unruptured aneurysms [2].

Case reports

Fujimoto et al. described two cases of aneurysms at the origin of a DMCA treated with coil embolization.

Case 1: A seventy-three-year-old man presented with a severe headache and was diagnosed with subarachnoid hemorrhage (SAH). Digital subtraction angiography (DSA) and 3-dimensional (3-D) DSA showed an aneurysm arising from a DMCA. Coil embolization was performed with DMCA patency. The patient had an uneventful postoperative course.

Case 2: A 44-year-old woman presented with a history of clipping for an IC-anterior choroidal artery (AchA) aneurysm 8 years prior. Magnetic resonance imaging (MRI) showed regrowth of the aneurysm. 3-D DSA showed an IC-DMCA aneurysm located laterally and distal to the AchA. The DMCA arose from the bottom of the aneurysm. Coil embolization was performed without DMCA occlusion and showed no postoperative ischemic changes.

Duplication of the middle cerebral artery aneurysm is rare and may be misdiagnosed as an anterior choroidal artery aneurysm. Clinicians should perform a 3D-DSA evaluation if the aneurysm arises from the lateral wall of the internal carotid artery to obtain a precise diagnosis and to preserve the DMCA during coil embolization [3].

2016

A case of duplicated right middle cerebral artery that arose from the origin of the right hyperplastic anterior choroidal artery diagnosed by magnetic resonance angiography. This is the first case of such a variation reported with magnetic resonance angiographic images. The internal carotid artery-hyperplastic anterior choroidal artery-duplicated middle cerebral artery junction was dilated and mimicking aneurysm. Partial maximum intensity projection images and volume-rendering images showed that it was not a saccular aneurysm but an infundibular dilatation. Careful observation of magnetic resonance angiographic images including its source images is important for detecting rare arterial variations. To identify an anomalous artery on magnetic resonance angiography, creation of partial maximum intensity projection images and volume-rendering images is valuable [4)].

A case of aphasia after neck clipping of a ruptured aneurysm at the origin of the duplicated middle cerebral artery(DMCA). A 60-year-old woman had a sudden onset of headache and nausea. A computed tomography(CT)scan revealed diffuse subarachnoid hemorrhage. Head three-dimensional CT angiography(3D-CTA)showed a left DMCA with a saccular aneurysm at the origin. She became aphasic on the third day after aneurysmal neck clipping. A CT scan revealed a low-density area in the anterior portion of the left temporal lobe, which is perfused by the DMCA. The DMCA was patent on 3D-CTA, but the angle between the ICA and the DMCA changed steep. It is suspected that the clip changed the branching angle at the DMCA origin, which may have led to decreased blood flow in the DMCA. She received linguistic rehabilitation for dysnomia and was discharged with slight difficulty in naming objects. Six months later, she recovered from the aphasia. One year later, the DMCA was patent on 3D-CTA. We should pay attention to ischemic complications in clipping because DMCAs are easily deformed [5)].

2015

Cerebral angiography in a 61-year-old female demonstrated a small (about 3 mm) saccular aneurysm located at the origin of the DMCA in the anterior direction. Considering the unusual location, the lesion was treated, regardless of the size. Aneurysmal characteristics of a broad neck and small size limited the endovascular approach, necessitating open surgery. Her postoperative course was uneventful and postoperative angiography showed complete obliteration of the aneurysm. The patient was discharged without neurologic deficit [6)].

Iida et al. report 2 cases of aneurysms at the origin of DMCA accompanied by aneurysms at different sites. Each case of ruptured and unruptured aneurysm at the DMCA origin was associated with an unruptured aneurysm at the ipsilateral internal carotid artery and a ruptured one at the ipsilateral MCA, respectively. The aneurysms were clipped successfully in both patients.

In cases of DMCA aneurysm associated with an aneurysm at another site, either aneurysm has a high risk of rupture. In such a case, radical treatment is necessary [7)].

2010

A 60-year-old woman presented with a rare unruptured aneurysm of duplication of the middle cerebral artery (DMCA) identified at examination for headache. Preoperative cerebral angiography revealed the DMCA and a small aneurysm at its origin. Surgical clipping was performed successfully via the trans-sylvian approach. DMCA aneurysms have a tendency to bleed even if small, but the anatomical configuration causes some technical difficulties [8)].

2009

Case 1: On magnetic resonance (MR) angiography, a 56-year-old woman was diagnosed as having an unruptured right middle cerebral artery (MCA) bifurcation aneurysm. Right carotid angiography disclosed a duplicated MCA and four unruptured saccular aneurysms, including the origin of the duplicated MCA. Case 2: A 58-year-old man had a sudden onset of vertigo, and underwent MR imaging. The MR angiography detected a right internal carotid artery (ICA) aneurysm, and the subsequent angiography demonstrated duplication of the right MCA and two intracranial aneurysms; one at the origin of the posterior communicating artery (PcomA), the other at the origin of the duplicated MCA. Each aneurysm was successfully clipped through the transsylvian approach. The postoperative courses were uneventful and both patients were discharged in good condition. [9)].

2006

A 63-year-old woman, preoperative angiography and 3-dimensional computed tomography angiography revealed an aneurysm at the origin of the DMCA. The aneurysm was clipped and superficial temporal artery-DMCA anastomosis was performed. She was discharged with no neurologic deficits. Duplication of the middle cerebral artery can be divided into 2 types based on whether the site of separation from the ICA is at the top of the ICA (type A) or between the ICA top and the anterior choroidal artery (type B). The diameter of type A DMCA is comparable with that of the main middle cerebral artery trunk; in type B, it is smaller. In all 18 previously reported cases, the aneurysm was associated with type B DMCA.

For appropriate treatment planning, it is necessary to determine the DMCA type and the anatomic relationship between the aneurysm and the DMCA. In patients with type B DMCA, the possibility of aneurysm formation should be considered [10)].

2002

A 34-year-old female suffered from severe headache and was admitted to our hospital. CT scan revealed diffuse subarachnoid hemorrhage and angiography revealed duplication of the right middle cerebral artery and dilatation at its origin. We could not identify it as an aneurysm by angiography, so we performed 3D-CTA. 3D-CTA was able to demonstrate clearly the aneurysm at the origin of the duplicated middle cerebral artery and we performed neck clipping of the ruptured aneurysm. To our knowledge, previously there have been only 14 cases which reported such an aneurysm at the origin of a duplicated middle cerebral artery. We reviewed the 15 cases including ours and found that, in 4 cases, the aneurysm could not be detected by the initial angiography. We suspected that most of these aneurysms were small, so the detection of the aneurysms by angiography was difficult. We

conclude that 3D-CTA is useful for diagnosing aneurysms at the origin of the duplicated middle cerebral artery even when thy can't be detected by angiography [11].

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