

Case Report

Multimodality Treatment of an Unruptured Duplicated Middle Cerebral Artery Aneurysm: A Case Report and Literature Review

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- Duplication of middle cerebral artery
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- Clipping
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Abstract

A duplicated middle cerebral artery (DMCA) aneurysm is characterized by the presence of an aneurysm at the bifurcation of the original and duplicated middle cerebral arteries. The authors reported a very rare case that had a DMCA aneurysm and underwent multimodality treatment. The patient was 49-year-old male and presented with headache. His examinations revealed an aneurysm at the origin of the DMCA. The aneurysm was treated with surgical clipping under the endoscope-assisted microsurgery-integrated indocyanine green video-angiography. The patient was uneventful and discharged on postoperative day 10. That is the first case reported in the literature having such aneurysms treated with multimodality treatment.

INTRODUCTION

Duplication of the middle cerebral artery (DMCA) is an anomalous artery branching from the internal carotid artery (ICA) between the anterior choroidal artery and the terminal bifurcation of the internal carotid. Both middle cerebral arteries pass into the Sylvian fissure and supply the middle cerebral artery territory. A DMCA aneurysm is characterized by the aneurysm locating at the origin of DMCA. These aneurysms are sporadically reported in the literature [1-13], they are mostly small and have tendency to rupture, and they are treated mainly by surgical clipping and coil embolization [9,13]. However, we described the case of unruptured DMCA aneurysm successfully treated by surgical clipping using the endoscope-assisted microsurgery-integrated indocyanine green video-angiography (mICG-VA), and discussed the characteristics and technical priority associated with the treatment.

CASE PRESENTATION

A forty-nine year-old male presented with complaints of headache. The patient had a family history of aneurysmal rupture. The neurologic examination of the patient was intact. According to the present complaints, cerebral computed

tomography angiography (CTA) was obtained first, 3D-CTA revealed an aneurysm at the origin of the DMCA (Figure 1A), the size was 6 mm. The aneurysm was treated by clipping through the right/left pterional trans-Sylvain approach. The DMCA arose just proximal to the terminal bifurcation of the internal carotid into the middle and anterior cerebral arteries as a "duplication of the MCA" and extended along the medial surface of the anterior part of the temporal lobe (Figure 1B). After clipping the aneurysm rigid endoscope demonstrated the neck remnant (Figure 1C) therefore we readjusted the clip and the endoscope view and microsurgery-integrated indocyanine green video-angiography finally confirmed complete obliteration of the aneurysm (Figure 1D, Figure 1E). The postoperative course was uneventful, and she was discharged with no neurological deficit on postoperative day 10.

DISCUSSION

DMCA is classified into 2 groups. In type A, the DMCA separates at the top of the ICA. In type B, the DMCA arises from the ICA between the anterior choroidal artery and the ICA bifurcation [4]. The DMCA may contribute to the normal cerebral blood flow and may play an important role in supplying collateral flow to

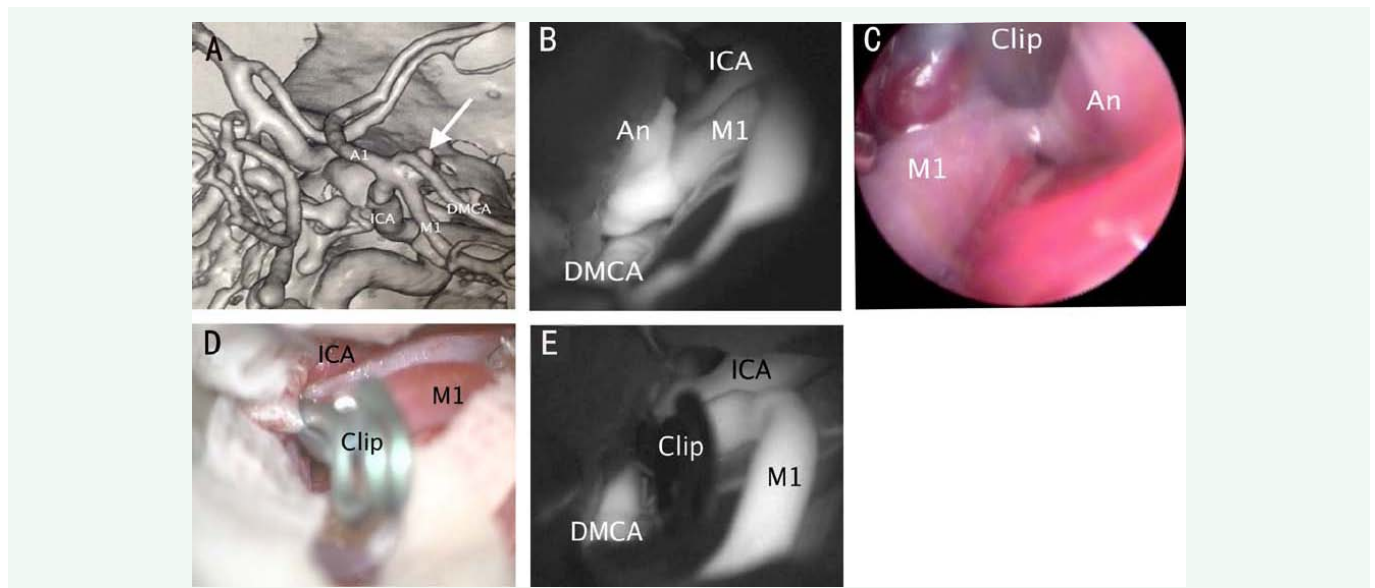


Figure 1 Duplicated middle cerebral artery (DMCA) aneurysm treated with endoscope-assisted microsurgery-integrated indocyanine green video-angiography. Three-dimensional reconstruction of computed tomography shows DMCA aneurysms (Figure 1A). Microscope-integrated indocyanine green video-angiography (mICG-VA) showed the aneurysm (An), the internal carotid artery (ICA), and DMCA (Figure 1B). Intraoperative endoscope view shows the neck remnant after clipping, therefore adjusted clip to obliterate the aneurysm completely (Figure 1C). Intraoperative microscopic view of the aneurysm sac and DMCA after clipping (Figure 1D). Microscope-integrated indocyanine green video-angiography (mICG-VA) showed the aneurysm was clipped and the clip occluded the neck of aneurysm completely (Figure 1E).

the frontal lobe and the basal ganglia through the perforating arteries. Unruptured DMCA aneurysms are rare. Indications for unruptured intracranial aneurysms including DMCA aneurysms still are controversial [14]. In our case, the patient was young, had a family history of aneurysmal rupture and aneurysm size was 6 mm, after considering the high risk of rupture, we then suggested intervention. Surgical clipping and embolization are main intervention ways, and both received acceptable outcomes in previous cases [1-13]. As interventional materials and techniques developing, embolization is becoming popular for unruptured intracranial aneurysms due to low morbidity and mortality in recent years. However, aneurysms located in core areas that are rich in perforating arteries such as aneurysms at terminal of ICA, have more neurological complications [14]. Furthermore, the other important problem for embolization is the high incidence of aneurysm recanalization during follow-up. In our case, considering the aneurysm locating in an area rich in perforating arteries, the aneurysm with wide neck and high incidence of aneurysm recanalization after embolization, we chose clipping the aneurysm. During procedure, it is important not to injure the DMCA during dissection and not to occlude the DMCA during aneurysm clipping surgery especially when the appropriate angle for clipping is difficult to achieve in this limited working space. It is also important to select the shortest possible clip so as not to catch the nearby anterior choroidal artery or medial lenticulostriate perforators in the distal parts of clip-legs [1].

Several reports reviewed and established the yield of the microsurgery-integrated indocyanine green video-angiography to detect an artery remnant and preserve a perforating artery while clipping an aneurysm [15]. However, microsurgery-integrated indocyanine green video-angiography still had the

inability to access the deep area, especially in a hidden corner or behind the aneurysm before clipping. This might cause an injury during clipping and compromise the small perforating arteries. In our case, we chose endoscope-assisted microsurgery resolving this potential morbidity; the patient got a good outcome without neurological complications. The modality treatment had two benefits, for one thing was that it could help completely clipping the aneurysms, if the angiography showed the aneurysm had remnant, the adjusted clipping was needed. The second thing was that it could help protect the perforating arteries around the aneurysms under endoscope and decrease the postoperative ischemic neurological complications.

CONCLUSIONS

Unruptured DMCA aneurysms are rare, for patient with high risk of rupture should be selected for intervention, endoscope-assisted microsurgery-integrated indocyanine green video-angiography may be a useful way for clipping these aneurysms safely and completely.

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