Spontaneous thrombosis of giant dissecting fusiform middle cerebral aneurysm following double-barrel superficial temporal artery-middle cerebral artery bypass

A case report of decision-making in limited resource environment

Trong D Huynh MD¹, Daniel R Felbaum MD³,⁵, Walter C Jean MD⁴,⁵, Hung M Ngo MD²

¹Department of Neurosurgery, Rutgers Robert Wood Johnson Medical School, NJ, USA
²Department of Neurosurgery, Viet Duc Hospital, Hanoi, Vietnam
³Department of Neurosurgery, Georgetown University Hospital, Washington DC, USA
⁴Department of Neurosurgery, George Washington University, Washington DC, USA
⁵Global Brainsurgery Initiative, Washington DC, USA
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INTRODUCTION

• Giant aneurysms in middle cerebral artery pose a unique challenge due to their association with end-vessel anatomy.

• Extracranial-intracranial (EC-IC) bypass revascularization technique remains a valuable tool to address the aneurysm and the vasculature at risk.

• At VietDuc hospital in Hanoi, Vietnam, patients with giant aneurysm often present in extremis due to limited diagnostic resources in outlying areas.

• We report a ruptured giant MCA aneurysm that was treated with EC-IC bypass, resulting in spontaneous of complete thrombosis of the aneurysm.

• We highlight our decision-making while operating under constrained resources in a low-middle-income country.
CASE DESCRIPTION

• Patient is a 32-year-old male, presented with coma, hemiparesis, and subarachnoid hemorrhage.

• Imaging confirmed a ruptured fusiform giant aneurysm in left M1 with two M2 branches incorporated. (Figure 1)

• Patient was taken for emergent surgery with operative plan was to create a double-barrel superficial temporal-middle cerebral artery (STA-MCA) bypass and possible trapping the rupture aneurysm.

Figure 1
• We performed a double-barrel STA-MCA bypass: the frontal STA branch was anastomosed to a frontal M2 branch and parietal STA branch to a temporal M3 branch. (Figure 2)

• After completed the bypass, as we attempted to temporary clip the proximal M1, both recipient vessels significant decreased in their caliber.

• Without formal flow studies, this observation led us to believe completely trapping or proximal M1 occlusion would lead to a large and devastating infarct.

• We decided to leave the aneurysm, performed second-staged operation for partial trapping following days to weeks. However, the postoperative clinical course had changed dramatically treatment plan.
• Postoperatively, patient improved mental status and muscle strength. CT angiography confirmed bypass patency and blood flow to the left MCA territory, with noticeable reduced in size of the aneurysm. (Figure 3)

• After a month, the aneurysm had completely thrombosed. Multiple vascular anastomoses from the medial lenticulostriates provided supply to the lateral lenticulostriates (arrows heads), and the proximal left M1 segment (arrow) was still patent providing small perforator supply. The bypass was patent with good visualization of blood vessels in the expected MCA territory.

• After a year, the patient was free symptoms. DSA showed the aneurysm remained occluded with continued patency of the bypass.
## REVIEW LITERATURE

### Reports

<table>
<thead>
<tr>
<th>Reports</th>
<th>Age (years)/ Gender</th>
<th>Symptoms/signs</th>
<th>Location</th>
<th>Size (mm)</th>
<th>Thrombosis</th>
<th>Bypass</th>
<th>Graft</th>
<th>Time from bypass to occlusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benashvili GM et al 1992</td>
<td>27/M</td>
<td>Hemiparesis, aphasia</td>
<td>Left M1</td>
<td>30</td>
<td>Partial</td>
<td>STA-MCA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Yeh HS, Tomsick TA 1997</td>
<td>71/F</td>
<td>Hemiparesis, dysarthria</td>
<td>Right ICA terminus</td>
<td>25</td>
<td>No</td>
<td>ECA-M2</td>
<td>Saphenous vein</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Cantore G et al 1999</td>
<td>22/M</td>
<td>Headache, hemiparesis</td>
<td>ICA supraclinoid</td>
<td>NA</td>
<td>Partial</td>
<td>ECA-M2</td>
<td>Saphenous vein</td>
<td>5 days</td>
</tr>
<tr>
<td>Haque R et al 2009</td>
<td>27/F</td>
<td>Headache</td>
<td>Left M1</td>
<td>40</td>
<td>50%</td>
<td>ECA-M2</td>
<td>Saphenous vein</td>
<td>6 months</td>
</tr>
<tr>
<td></td>
<td>31/F</td>
<td>Aphasia, hemianopsia</td>
<td>Left MCA trifurcation</td>
<td>NA</td>
<td>Partial</td>
<td>STA-MCA</td>
<td>2 days</td>
<td></td>
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### Aneurysm

<table>
<thead>
<tr>
<th>Time from bypass to occlusion</th>
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### Table 1: Summary of literature reports on thrombosis of aneurysm after bypass creation

<table>
<thead>
<tr>
<th>Reports</th>
<th>Age (years)/ Gender</th>
<th>Symptoms/signs</th>
<th>Location</th>
<th>Size (mm)</th>
<th>Thrombosis</th>
<th>Bypass</th>
<th>Graft</th>
<th>Time from bypass to rupture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hopkins LN and Grand W 1979</td>
<td>40/F</td>
<td>Hemiparesis</td>
<td>Left ICA supraclinoid</td>
<td>70</td>
<td>NA</td>
<td>STA-MCA</td>
<td>8 days</td>
<td></td>
</tr>
<tr>
<td>Scott RM et al 1982</td>
<td>60/M</td>
<td>Tremor</td>
<td>Right MCA</td>
<td>NA</td>
<td>NA</td>
<td>STA-MCA</td>
<td>13 days</td>
<td></td>
</tr>
<tr>
<td>Heros RC and Ameri AM 1984</td>
<td>57/F</td>
<td>Swallowing difficulty, spasticity, diplopia, ataxia</td>
<td>Basilar artery</td>
<td>NA</td>
<td>No</td>
<td>ECA-PCA</td>
<td>Saphenous vein</td>
<td>36 hours</td>
</tr>
<tr>
<td>Haque R et al 2009</td>
<td>One patient in clinical series died due to rupture of aneurysm during the interval between bypass creation and planned parent artery occlusion.</td>
<td>STA-MCA</td>
<td>30 days</td>
<td></td>
<td></td>
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### Table 2: Summary of literature reports on rupture of aneurysm after bypass creation without immediate aneurysm ligation
• Controversial raises with the decision of leaving the aneurysm without trapping.
• Without intraoperative flow assessment such as DSA/ICG or Doppler, we were caught between giving the patient a massive stroke by trapping versus leaving the aneurysm un-trapped. And we adhered with “first do no harm”.
• The retrograde flow of the bypass reduces stress in “inflow zone”, would provide a semblance of protection from re-bleeding while maintaining perfusion to perforators or distal branches.\(^{16,29,30}\)
• A progressive change in flow pattern would allow collaterals to develop and the bypass to mature enough to bear the hemodynamic load. With that, a second-stage operation might be feasible in the ensuing days-to-weeks for complete trapping of the aneurysm.
• In rare occasion, as in this case, no further need for intervention.\(^{1,2,3,4}\)
• Existent risks of aneurysm rupture following bypass creation without immediate treatment of aneurysm.\(^{5,6,7,8}\) Stanndalone EC-IC bypass would never be the sole and routine treatment of giant fusiform MCA aneurysms.
• However, when multiple anatomical complications exist, the strategy of EC-IC bypass followed by close observation of the aneurysm may reveal, on follow-up, an anatomic morphology more amendable to a second-stage intervention.
The decision-making in management of complex fusiform MCA aneurysm is challenging and even more difficult in income-limit countries where absence of preoperative or intraoperative evaluation of cerebral blood flow.

The strategy with EC-IC bypass without trapping can be considered as a salvage option in ruptured cases, follow by expectant management of patient condition and aneurysm morphology that may reveal evolving anatomy amendable to second-stage procedure, or continued aneurysm thrombosis as demonstrated in this report.

References: