Bypass for complex middle cerebral artery aneurysm

In selected cases, direct clipping of complex middle cerebral artery aneurysms (CMCAAs) without blood flow impairment may pose a technical challenge by virtue of the complex angioarchitecture. In such cases, they require bypasses as part of a curative treatment strategy with deliberate occlusion.

Various bypass techniques are available, but an algorithmic approach to classifying these lesions and determining the optimal bypass strategy has not been developed.

The objective of a study of Tayebi Meybodi et al., was to propose a comprehensive and flexible algorithm based on MCA aneurysm location for selecting the best of multiple bypass options.

Aneurysms of the MCA that required bypass as part of treatment were identified from a large prospectively maintained database of vascular neurosurgeries. According to its location relative to the bifurcation, each aneurysm was classified as a prebifurcation, bifurcation, or postbifurcation aneurysm.

Between 1998 and 2015, 30 patients were treated for 30 complex MCA aneurysms in 8 (27%) prebifurcation, 5 (17%) bifurcation, and 17 (56%) postbifurcation locations. Bypasses included 8 superficial temporal artery-MCA bypasses, 4 high-flow Extra intracranial bypass surgerys (EC-IC), 13 IC-IC bypasses (6 reanastomoses, 3 reimplantations, 3 interpositional grafts, and 1 in situ bypass), and 5 combination bypasses. The bypass strategy for prebifurcation aneurysms was determined by the involvement of lenticulostriate arteries, whereas the bypass strategy for bifurcation aneurysms was determined by rupture status. The location of the MCA aneurysm in the candelabra (Sylvian, insular, or opercular) determined the bypass strategy for postbifurcation aneurysms. No deaths that resulted from surgery were found, bypass patency was 90%, and the condition of 90% of the patients was improved or unchanged at the most recent follow-up.

The bypass strategy used for an MCA aneurysm depends on the aneurysm location, lenticulostriate anatomy, and rupture status. A uniform bypass strategy for all MCA aneurysms does not exist, but the algorithm proposed here might guide selection of the optimal EC-IC or IC-IC bypass technique [1)].

Kivipelto et al., reported 24 patients (mean age 46 years) who were treated with bypass and parent artery occlusion. The aneurysms were located in the M1 segment in 7 patients, MCA bifurcation in 8, and more distally in 9. The mean aneurysm diameter was 30 mm (range 7-60 mm, median 26 mm). There were 8 saccular and 16 fusiform aneurysms. Twenty-one extracranial-intracranial and 4 intracranial-intracranial bypasses were performed. Partial or total trapping (only) of the parent artery was performed in 17 cases, trapping with resection of aneurysm in 3, and aneurysm clipping with sacrifice of an M2 branch in 4. The mean follow-up period was 27 months. The aneurysm obliteration rate was 100%. No recanalization of the aneurysms was detected during follow-up. There was 1 perioperative death (4% mortality rate) and 6 cerebrovascular accidents, causing permanent morbidity in 5 patients. The median modified Rankin Scale score of patients with an M1 aneurysm increased from 0 preoperatively to 2 at latest follow-up, while the score was unchanged in other patients. Most of the permanent deficits were associated with M1 aneurysms. Twenty-one patients

(88%) had good outcome as defined by a Glasgow Outcome Scale score of 4 or 5.

Bypass in combination with parent vessel occlusion is a useful technique with acceptable frequencies of morbidity and mortality for complex MCA aneurysms when conventional surgical or endovascular techniques are not feasible. The location of the aneurysm should be considered when planning the type of bypass and the site of vessel occlusion. Flow alteration by partial trapping may be preferable to total trapping for the M1 aneurysms [2)].

Internal maxillary artery to middle cerebral artery bypass

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1)
Tayebi Meybodi A, Huang W, Benet A, Kola O, Lawton MT. Bypass surgery for complex middle cerebral artery aneurysms: an algorithmic approach to revascularization. J Neurosurg. 2017 Sep;127(3):463-479. doi: 10.3171/2016.7.JNS16772. Epub 2016 Nov 4. PubMed PMID: 27813463.
2)
Kivipelto L, Niemelä M, Meling T, Lehecka M, Lehto H, Hernesniemi J. Bypass surgery for complex middle cerebral artery aneurysms: impact of the exact location in the MCA tree. J Neurosurg. 2014 Feb;120(2):398-408. doi: 10.3171/2013.10.JNS13738. Epub 2013 Nov 29. PubMed PMID: 24286147.