High Flow Bypass and Trapping of the Fusiform Aneurysm of Right Middle Cerebral Artery Using Y Graft: A Noble Surrogate

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ABSTRACT

Fusiform aneurysms of the middle cerebral artery (MCA) are a very demanding vascular pathology for the neurosurgeons rendering to its complexity and perplexing to execute adequate clipping. On that account, trapping is a virtuous alternative for these lesions accompanied by vascular reconstruction.
A 21-year-old gentleman presented with the chief complaints of headache and weakness of left side of upper and lower extremities with facial deviation toward left side and slurring of the speech since 4 months. Cerebral CT angiography showed fusiform dilatation involving the vessel in the right M1 segment of the MCA. After construction of high flow bypass (ECA-MCA) on superior and inferior trunk of the MCA using long saphenous vein graft in the form of Y shaped design, fusiform aneurysm was trapped. He was discharged on 12th post-operative day with mRS 1. High flow bypass and trapping is one of alternatives for the treatment of large fusiform shaped aneurysm in the MCA.

Keywords: Fusiform aneurysm; High flow bypass; Long saphenous graft; Y graft.

INTRODUCTION

Fusiform aneurysms involving the intracranial vessels are exquisite representing about 3%-13% of all intracranial aneurysms.[2] Studies have revealed that they usually involve the vertebrobasilar system.[3,4] To the contrary, fusiform aneurysms in the anterior circulation remain rare and occur mostly in the middle cerebral artery and internal carotid artery.[5] Trapping or resection with vascular reconstruction for MCA is a level-headed surrogate to exclude the pathological wall from the parent circulation. Nonetheless, the proximal part of the MCA has numerous perforators contributing to thalamus that might ensue severe ischemic complication, leading to poor prognosis if they had been sacrificed. In another instance, the wrap-clipping technique is another surgical option for fusiform aneurysms with a dissecting nature, which have the advantage of patency in antegrade normal flow. We herein describe a case of a large fusiform aneurysm in the MCA with tendency for growing. In this case, after construction of high flow bypass (ECA-MCA) on superior and inferior trunk of the MCA using long saphenous vein graft in a Y configuration, trapping of the fusiform aneurysm was executed.

CASE REPORT

A 21-year-old man presented with headache and weakness of left side of upper and lower extremities with facial deviation toward left side followed by slurring of the speech for 4 months. He was initially evaluated at another hospital where he received rehabilitative therapy with some symptomatic improvement. Computed tomography (CT) of head performed had showed large vascular lesion in the right MCA territory; the patient was then referred to our institution for further evaluation and definitive management. On arrival to our institute, his general condition was fair. Three-dimensional CT angiography showed fusiform vessel

in the right M1 segment of the MCA. The patient was diagnosed with a fusiform aneurysm of right MCA and surgical treatment option was given as moral course of action. Taking into considerations of the neuro-radiological findings, the trapping of fusiform aneurysm with high flow bypass using LSV graft was opted to be the elite surgical intervention in this case. While the standard right frontotemporal craniotomy was created, the bifurcation of cervical carotid artery was exposed in the neck. From left leg, LSV of length of 25 cm was harvested as a venous graft simultaneously. Firstly, the proximal end of the LSV graft was anastomosed with the proximal side of external carotid artery (ECA) and then the distal end was anastomosed with superior and inferior trunk of M2 segment of MCA following dissection of distal sylvian fissure. High flow bypass (ECA-MCA) on superior and inferior trunk of the MCA was constructed using long saphenous vein graft in a Y configuration. Proximal end of the fusiform aneurysm was meticulously dissected from anterior temporal artery and lenticulostriate arteries. Finally, the aneurysm was trapped. Postoperative course was uneventful and the patient improved with no neurological deficits. The patient was discharged and reinstated in his former position.

Figure 1: Three dimensional CT angiography (3DCTA) showed a fusiform vessel in the right M1 segment of the MCA. The superior and inferior trunk of the MCA seemed to origin from the dome of the aneurysm.

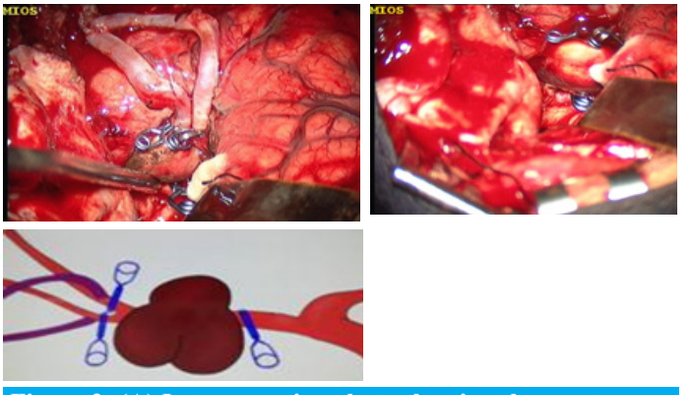

Figure 2: (A) Intraoperative photo showing the construction of high flow bypass (ECA-MCA) on superior and inferior trunk of the MCA using long saphenous vein graft in the form of Y-shaped design. (B) Illustrative drawing

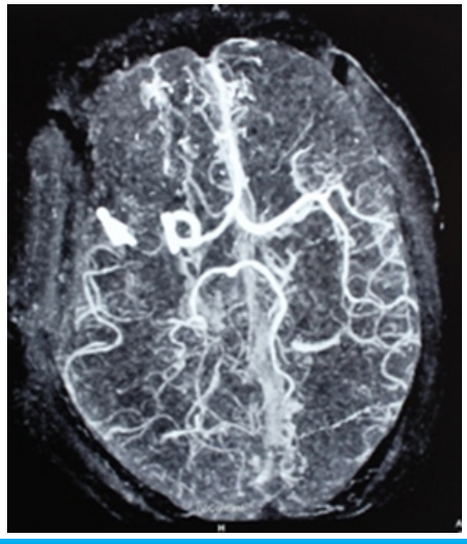

Figure 2: Post operative CT angiography demonstrated disappearance of the aneurysm and patency of high flow bypass in the saphenous vein graft.

DISCUSSION

Fusiform aneurysms, simply put are non-saccular dilatations engrossing the entire vessel wall for a short distance. This variant of aneurysm usually occur in alliance with dissection or atherosclerosis,[5] by inherent disorders of collagen and elastin metabolism, by infections and seldom with neoplastic invasion of the arterial wall. The context of these fusiform aneurysms have contrasting underlying pathologies, hemodynamics, anatomical distributions, natural histories and treatments than do the saccular variety.[6] The patient often present with symptoms and signs of occlusion, arterial rupture, or a mass effect.

Various study reports have disclosed that spontaneous fusiform aneurysms are more often found in younger patients[2,4,6] with male sex preponderence.[5,7]

The clinical attributes of fusiform aneurysms are categorized morphologically. They can set up from a small focal dilatation or vessel narrowing, to a relatively thick-walled, tortuous dilatation and elongation of the artery. In addition, they can be incidental or asymptomatic, unveiled during workup for unrelated symptoms. Clinical manifestation as a nonspecific headache without hemorrhage or other neurological hallmarks as ischemia, transient ischemic attack, or complete stroke, as mass effect with or without seizure, or as hemorrhage, subarachnoid or intra-parenchymal lesions. Despite its rarity, a long haul in the study of these lesions, the experts proposed that dissection is the main underlying cause of fusiform aneurysms and most prevalently involves the

posterior circulation, especially vertebral and basilar arteries.[1,3] However, typical cases of dissecting aneurysm in the posterior circulation were excluded in this study. The dissecting variant of aneurysms can originate in any regions of the anterior circulation, such as the ICA1, MCA[2,4,5] and the ACA3. The MCA is the most common.[5] Day et al.5 reviewed 102 cases of spontaneous fusiform middle cerebral artery aneurysms. They found that 69% of the aneurysms originated proximal to the MCA genu (M1 segment), 21% were insular (M2 segment) and 10% were distal (M3 or M4 branches). The treatment of fusiform aneurysms should be guided by the presence and type of symptoms, the architecture and venue of the lesion not losing sight of the fact of the implicit risks accompanying the intervention. Day et al. have postulated guidelines in dealing with patients with dissecting aneurysms of the MCA.[5] They recommend that most small and some large focal dilatations, especially those that are asymptomatic, should be treated conservatively but not if serial neuroimaging assessment indicates notable enlargement over time. Yet, the appearance of symptoms warrants an aggressive intervention. Clipping using encircling clips for focally dilated dissecting aneurysms if they are found during surgery for another symptomatic aneurysm, and aggressive surgical treatment for fusiform aneurysms which are not caused by dissection because of the possibility they will progress. Numerous techniques for the treatment of fusiform aneurysm are available such as proximal occlusion or trapping with or without resection combined with end-to-end anastomosis or EC-IC bypass, the Sundt clip, by partial clipping followed by wrapping if the aneurysm is not ruptured case, and by occlusion of the aneurysm and parent vessel with packing of the coils by an endovascular method. Kurino et al. reported a patient with a dissecting aneurysm in the MCA who presented with ischemic symptoms and who showed a poor outcome after conservative treatment.[8] They recommend surgical revascularization distal to the compromised artery. We too concur with the obligation for revascularization after trapping of the fusiform aneurysm.

SVG graft has been established as acceptable approach in high flow bypass surgery after trapping of giant and complex aneurysm owing to its accessibility, sufficient length and ease of use. The use of SVG in a Y configuration has also been employed in cardiac surgery such as CABG.[9] However, the use of SVG in a Y configuration for the high flow bypass surgery for revascularization is infrequent. The composite Y-graft with the SV bring forth an adequate reperfusion, with minimal resistance to maximal flow and an even distribution of flow.[10]

CONCLUSION

High flow bypass and trapping is in a class by itself and hence engaged as an approved delegate in the treatment of large fusiform shaped aneurysm arising from MCA.

REFERENCES

1. Adams HP, Aschenbrener CA, Kassell NF, Ansbacher L, Cornell SH: Intracranial Hemorrhage Produced by Spontaneous Dissecting Intracranial Aneurysm. Arch Neurol39:773–776, 1982.

2. Al-Yamany M, Ross IB: Giant fusiform aneurysm of the middle cerebral artery: Successful Hunterian ligation without distal bypass. Br J Neurosurg12:572–575, 1998.

3. Amagasaki K, Yagishita T, Yagi S, Kuroda K, Nishigaya K, Nukui H: Serial angiography and endovascular treatment of dissecting aneurysms of the anterior cerebral and vertebral arteries. Case report. J Neurosurg91:682–686, 1999.

4. Ceylan S, Karakuş A, Duru S, Baykal S, Ilbay K: Reconstruction of the middle cerebral artery after excision of a giant fusiform aneurysm. Neurosurg Rev21:189–193, 1998.

5. Day AL, Gaposchkin CG, Yu CJ, Rivet DJ, Dacey RG: Spontaneous fusiform middle cerebral artery aneurysms: characteristics and a proposed mechanism of formation. J Neurosurg99:228–240, 2003.

6. Selviaridis P, Spiliotopoulos A, Antoniadis C, Kontopoulos V, Foroglou G: Fusiform aneurysm of the posterior cerebral artery: Report of two cases. Acta Neurochir (Wien)144:295–299, 2002.

7. Horie N, Takahashi N, Furuichi S, Mori K, Onizuka M, Tsutsumi K, et al: Giant fusiform aneurysms in the middle cerebral artery presenting with hemorrhages of different origins. J Neurosurg99:391–396, 2003.

8. Kurino M, Yoshioka S, Ushio Y: Spontaneous dissecting aneurysms of anterior and middle cerebral artery associated with brain infarction: A case report and review of the literature. Surg Neurol57:428–436, 2002.

9. Wi JH, Joo HC, Youn YN, Song SW, Kim TH, Yoo KJ: Comparison of radial artery and saphenous vein composite y grafts during off-pump coronary artery bypass. Korean J Thorac Cardiovasc Surg46:265–273, 2013.

10. Hayward PAR, Hare DL, Gordon I, Buxton BF: Effect of radial artery or saphenous vein conduit for the second graft on 6-year clinical outcome after coronary artery bypass grafting. Results of a randomised trial. Eur J Cardio-thoracic Surg34:113–117, 2008.