

Editorial

No Overtaking! Take a Safe Trip to Aneurysm

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In the last decade of the previous century, the fast growing endovascular treatments of the aneurysms made any surgical option look unlikely in the near future. However, thanks to the advancements in pre-operative imaging, intra-operative monitoring, and post-operative care the surgical outcome improved to the extent that mortality and major morbidity reached close to zero in most of the recent case series keeping open surgeries still a viable option for treatment of aneurysms.

Checking for the vascular anatomy surrounding the aneurysm before and after surgical clipping has been used by the neurosurgeons for the last couple of decades to reduce the chance of post-operative vascular accidents. Conventional angiographies would take a long time to be positioned during the surgery and the acquired images were sometimes obscure to be interpreted. Introduction of the indocyanine green video angiography (ICG-VA) in 2007 to the neurosurgical procedures, made performing intra-operative angiography a real-time and easy task which is widely used by the neurosurgeons nowadays and has largely replaced conventional angiography in most instances [1]. ICG-VA is performed much faster and without the need to introduce the space occupying angiography units into the surgical field. As it provides real time images, the surgeon can check the vessels around the aneurysm instantly under the microscope and adjust the clip to re-check the results. The main limitation of the ICG-VA in demonstrating the hidden vessels behind the aneurysm can be resolved by the newly designed endoscope-integrated ICG angiography (see below). To check for the distal blood flow, the FLOW 800 software can help the surgeon with measuring the physiologic parameters of the blood flow both before and after clipping and to adjust the clip accordingly in case of any compromise.

In microsurgical aneurysm clipping, the field of view can be obscured by more superficial structures and small perforators medial

to the internal carotid artery or beneath and medial to an aneurysm are not observed directly. Endoscope-assisted microsurgery has resolved this obstacle by allowing the surgeon to look behind the superficial concealing structures. As mentioned above, integration of ICG angiography camera to the endoscopes in recent years allows the surgeon to look into the arterial lumen effectively. In our experience with 175 consecutive unruptured aneurysms operated by the senior surgeon (Y. K.), no mortality was observed and only 6 patients (3.4%) suffered from new permanent neurological deficits post-operatively (unpublished data). We believe that endoscope helps surgeon before clipping to determine the location of the hidden perforators and after clipping to determine the patency of the perforators and total exclusion of the aneurysm neck.

From both ICG-VA and endoscopy the surgeon infers the anatomy of the vessels and aneurysm and checks the patency of the vessels after clipping. However, sometimes despite normal ICG-VA and endoscopy there are post-clipping distal blood flow disturbances that result in loss of function post-operatively. To check the brain function intra-operatively, we advise motor evoked potential (MEP) monitoring at surgery. In our recent review of 27 aneurysms adjacent to motor area perforators, no permanent morbidity was observed after clipping and intra-operative MEP changes were predictive of transient post-operative deficits (unpublished data). Although routine utilization of MEP for all cases might be considered cumbersome by some, we believe that in cases where important perforators to motor areas may be endangered during aneurysm dissection and clipping (e.g. aneurysm of M1 segment of the middle cerebral artery), MEP is a useful adjunct to the surgery that prevents new post-operative deficits.

Multi-modality monitoring of the brain physiology and vascular anatomy makes aneurysm surgeries safer. Though we have heard it again and again, it goes without saying that “a fool with a tool is still a fool”. We still need to train a generation of cerebrovascular surgeons at the highest possible standards to know how to use these technologies besides their technical skills to the benefit of their patients. The combination of a skillful driver and a well-equipped car is a necessity: fasten your seatbelt, switch on the engine, observe the signs, and enjoy your trip!

Reference

1. Balamurugan S, Agrawal A, Kato Y, Sano H. Intra-operative indocyanine green video-angiography in cerebrovascular surgery: an overview with review of literature. *Asian J Neurosurg.* 2011; 6: 88-93.