Minimally Invasive Strategies For Cerebral Aneurysm Surgery

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The minimally invasive surgery (MIS) for cerebral aneurysm has been established for recent era by using the concept of minimal damage to the surrounding brain structure during performing the operation. These procedures are included adequate of preoperative planning, surgical skill, techniques and modern equipment. The meaning of MIS is not only refers to small size of the opening wound or entry site but also along the surgical path should be achieved. For aneurysm surgery, we have to recognize how to approach the clipping surgery under the favor outcome condition especially unruptured patient who presented with a good clinical condition. We have described about our techniques how to deal with aneurysm surgery in generally and special morphology such as atherosclerotic cerebral aneurysm. For the part of general, all patients are discussed prior operation. The planning from 3-dimension compute tomography angiography (3D-CTA) and computational fluid dynamics (CFD) study in some cases are assigned. The benefits of these studies are helpful for making a decision of operation. Minimal approach to the aneurysm can be achieved after having a good planning. A neuroprotective anesthetic technique should be applied and the tractionless technique was applied for exposure of brain parenchyma. Indocyanine green videoangiography (ICG-VA) that compatible with microscopic software is used in all patients before and after clipping to check the anatomical architecture of the aneurysm and associated arteries such as the parent and perforating arteries. The patency of these arteries and the completeness of exclusion of the aneurysmal neck after clipping the aneurysm can be checked with this device. Additional software of this device, color map, and flow intensity were analyzed for blood flow dynamics which included the sequence of blood flow after aneurysm clipping in cases of suspected incomplete exclusion. Endoscope-assist microsurgery is used for anatomical safety to check before and after aneurysm clipping in case the neck or small perforator arteries could not be seen. Doppler ultrasonography was used to determine the characteristics of the blood flow after clipping of the aneurysmal sac and identify unintentional injury to small perforator or parent arteries.

By the way, the atherosclerotic aneurysm is defined as the detection of yellowish plaque located at the dome or neck of an aneurysm. The location of atherosclerotic change might influence the effect of embolic stroke during manipulation or adjustment of the clip force around this area and it is very difficult at that time to judge how to suitably place the clip to prevent emboli migration and obtain maximal exclusion of the aneurysm. Unstable plaque is very weak and easily migrates because of the force of the clip compression or manipulation around the plaque. Furthermore, we confirmed the atherosclerotic changes with ICG-VA application by the filling defect in the atheromatous calcification or the thickening of the aneurysm wall was seen. There is no area for placement of the clip, it necessary to perform a dome clip to decrease the risk of rupture in the future. We should leave some part of yellowish plaque because the risk of aneurysmal growth in this area is very low according to the low wall shear stress theory. This is the strategic treatment of this type of aneurysm with minimally invasive technique and minimal risk of complication.

Multimodality of assisted devices can be helpful during surgeries. The maximal exposure by excessive retraction reaches to aneurysm will be decreased including the effective technique to confirm the missing arteries before and after clipping by ICG-VA, endoscope or Doppler ultrasonography will improve the outcome of treatment and also regarding from the MIS techniques.