Vascularisation of Internal capsule: Fiber dissection study correlated with MR Tractography and Angiography

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Introduction

The insular cortex is located deep to the frontal, parietal, and temporal operculi in the floor of the sylvian fissure. The internal capsule is the projection fiber bundle which is created by afferent and efferent tracts in the deep part of insula. As the motor and sensorial ways are the connection way between the brain stem and the cerebral cortex, knowing of its supply is very important not only for preventing the post-operative mortality and morbidity in insular surgery but also understanding the ischemic events affecting internal capsule.
METHODS

Six formalin-fixed silicon injected cadaveric human heads, obtained from routine autopsies, were prepared according to Klingler’s protocol. The fiber dissection was performed from lateral to medial, with Klingler method preserving vascular structures.
RESULTS

The internal capsule was a thick layer of white matter consisting of projection fibres passing to and from the cerebral cortex. The internal capsule consisted of 5 parts: the anterior limb, genu, posterior limb, and the retro and sublenticular parts.

It has been revealed in our study that the lateral lenticulostriate artery supplies the most part of putamen, the internal capsule genu and the posterior limb, the globus pallidus and the caudate nucleus. We also have observed that the medial lenticulostriate artery has the extension to especially the anterior part of internal capsule and the genu and also the globus pallidus. We have also seen that
some of its deep and long branches supply the caudate nucleus head. We have also seen that the caudate nucleus and internal capsule ensures the supply of anterior limb in a similar way of Heubner. Also, direct branches coming from ICA attends to supply. We have observed in our study that the direct branches coming from ICA gives some short branches to the internal capsule anterior and caudate in four specimens. We have also observed that there is a mayor branch which enables the internal capsule genus to be fed and is a thick one before bifurcation in M1 superior part in 8 specimens. We called it as the mayor lateral lenticulostriate artery. We have also observed that a slim-short branch attends to the putamen supply from M2 inferior trunk start in 4 specimens. We
have seen that the anterior choroidal artery enables especially the internal capsule posterior and reticular limb and the deep part of globus pallidus to be fed by coming from more posterior part but doesn’t attend to the putamen and caudate nucleus supply. We have also observed that the anterior choroidal artery and the lateral lenticulostriate arteries arrives to the internal capsule by giving some supply branches to the anterior commissure by passing through the anterior commissure inferior of the ones which are on more inferior part.
DISCUSSION

The insular cortex, or “Island of Reil”, is hidden deep within the lateral sulcus of the brain. The insula has a number of disparate functions, serving as the primary gustatory cortex, as well as having important connections to language and visual-vestibular integration. Insula is an island which is approximately 8*2.4 cm and consists of the neocortex elements such as the putamen globus pallidus internal capsule. The fibres of internal capsule are the most important transmitter network between the brain stem and the cerebral cortex for the motor and sensorial relations with the reason of its tracts. The deterioration on the flushing of these parts with different reasons will result in the loss of some important functions and will cause some serious deficits and even death.
SUMMARY POINTS

The main principal in the insular tumours is to protect all arteries as far as possible but if this isn’t possible, it will be safer that the cortical veins are coagulated because we haven’t seen any connection between the cortical insular arteries and lenticulostriate arteries in our study. The limitation of medial resection in the tumour operation is really important for mortality and morbidity. In this respect, especially volume veins should be protected and it should be remembered that the lenticulostriate arteries are regarded from 0.5 cm after the sylvian fissure.