Composite Eye and Periorbital Allotransplantation Flap: A Cadaveric Study

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INTRODUCTION: Composite tissue allotransplantation(CTA) has become a strong alternative in the last two decades in parallel with the developments in reconstructive surgery. Especially, reconstruction of the orbit and periorbital soft and bony tissue defects that occurs after traumatic avulsions, burn injuries, and cancer ablative operations is still challenging and it is almost impossible to obtain a satisfying result with conventional techniques. Although there are several allotransplantation models of various facial regions, a cadaver model of eyeball and periorbital tissues(EPT) is not described yet. The aim of this study is to describe a CTA model of eyeball and periorbital tissues on cadavers.

MATERIAL AND METHODS: The study was performed on 5 fresh human cadavers. The dissection was begun with anterior neck incision and external carotid artery was found. The facial artery and superficial temporal artery branches of external carotid artery were preserved. The pedicle of the skin island of the flap was included these arteries and external jugular vein. Later, a coronal incision was performed and frontal bone was exposed. Following a frontal osteotomy, the frontal lobe of the brain was reached. Frontal lobe was retracted exposing internal jugular vein and ophthalmic artery which is a branch of internal carotid artery. Ophthalmic, oculomotor and abducens nerves were also dissected and included in the flap. Finaly, a "box osteotomy" was performed to add the cavernous sinus in order to increase venous return from the orbit and the dissection was ended.

RESULTS: The flap can be raised on the vascular pedicle of common carotid artery with jugular veins. An adequate venous return was observed in the flap after dye injection, and excellent perfusion was observed within CTA including eye. Laser-assisted indocyanine green angiography identified well-defined vascular network without presence of dye leakage.

CONCLUSION: In this cadaver study, CTA model including EPT was described for the first time in the literature. The perfusion was confirmed which showed this transplantation is possible in the future. Although harvesting of this flap is difficult to perform, it constitutes a new alternative for reconstruction of periorbital region. We think that dual blood supply may reduce the ischemic process of the retinal ganglion cells. Additional measures should be taken to provide survival of RGC which results in optic nerve regeneration. We think that this model may be a cornerstone for future studies about eyeball transplantation.

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