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Role of Temporopolar Artery for the Revascularization of the Upper Part of the Posterior Circulation: An Anatomic Feasibility Study

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Introduction

Non-clippable aneurysms of the posterior circulation may require a bypass to the superior cerebellar (SCA) and/or posterior cerebral (PCA) arteries as a part of their management strategy. Several revascularization options have been proposed but the role of intracranial donors, which entail less invasion and increase surgical efficiency, has not been scrutinized. The temporopolar artery (TPA) is an intracranial donor whose sacrifice has not been reported to be associated with major neurological deficits. This cadaveric surgical simulation study aimed to evaluate the anatomical feasibility of utilizing the TPA for revascularization of the upper part of posterior circulation (UPC).

Methods

An orbitozygomatic craniotomy was performed on fourteen cadaveric specimens. The basal cisterns were opened and the TPA was divided at M3-M4 junction. The TPA was then mobilized to the crural cistern to complete an end-to-side bypass to the SCA and PCA. The diameter of the TPA and the recipient vessels was measured, as well as the length of the recipient artery between its origin and the anastomosis site.

Results

A total of 15 TPAs were assessed (one specimen had two TPAs). Successful anastomosis to the PCA and SCA was performed in 14(93%) of the TPAs. The anastomosis point on PCA was 13.7 mm from its origin on the basilar artery, while that on the SCA was 9.2 mm from its origin. The average diameter of the TPA at its origin was found to be 1.3mm, while that of the SCA and PCA was 1.9mm and 2.7mm, respectively.

Conclusions

The TPA is a promising intracranial donor for revascularization of the UPC. It's use for the proposed bypasses has the following advantages:
(1) efficient exposure of the donor vessel while enroute to the proximal SCA and PCA through the pterional-orbitozygomatic approach;
(2) the option to perform an end-to-side anastomosis, which is less technically challenging;
(3) obviating the need to harvest a graft or perform multiple anastomoses.

Learning Objectives

1. To understand different bypass options available for the revascularization of the upper part of posterior circulation
2. To understand the role of temporopolar artery (TPA) as a donor for end-to-side anastomosis to the PCA and SCA
3. To learn the potential advantages of TPA-PCA and TPA-SCA bypasses over currently existing revascularization options for the management of posterior circulation aneurysms

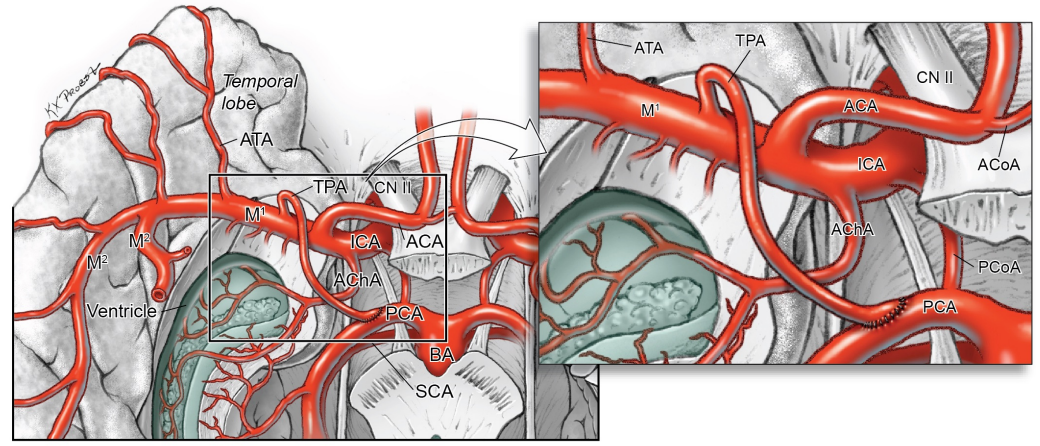

Figure 1. Artist's illustration showing transposition of the TPA to reach the PCA. ACA, anterior cerebral artery; AChA, anterior choroidal artery; BA, basilar artery; ICA, internal carotid artery; PCA, posterior cerebral artery; TPA, temporopolar artery.

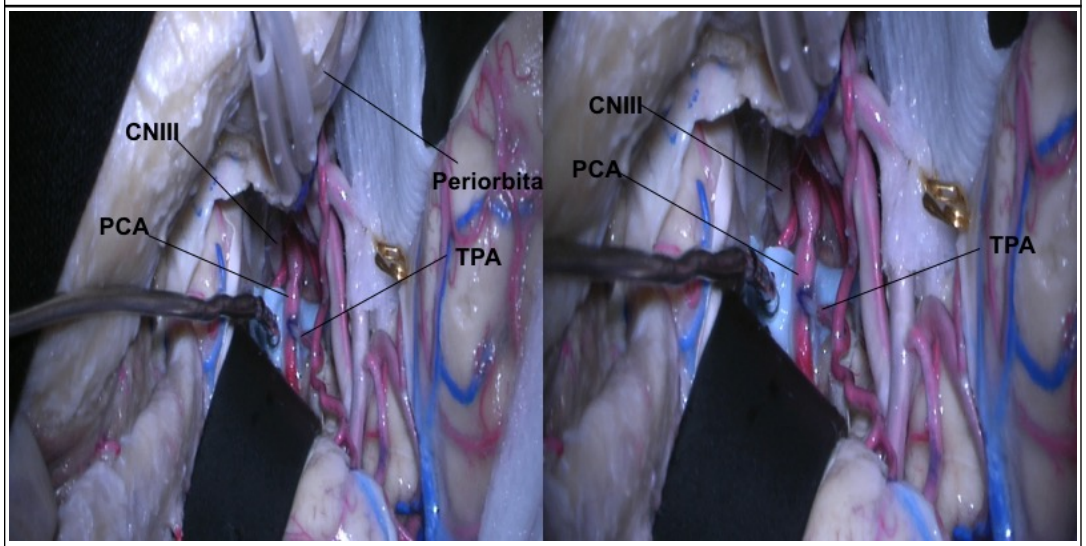

Figure 2. Cadaveric simulation of an end-to-side TPA-PCA bypass, using a left orbitozygomatic approach. TPA, Temporopolar artery; PCA, posterior cerebral artery; CN, cranial nerve.