Microsurgical anatomy of the maxillary artery and high flow bypass

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Background
The maxillary artery (MA), the larger of two terminal branches of the external carotid artery, has been described as a good substitute for the cervical carotid artery as the donor in high-flow bypass, but is infrequently used because of the complexity of exposing it in the infratemporal fossa.

Objective
To describe three types of MA extracranial-intracranial (EC-IC) high-flow bypass and related anatomic considerations using a radial artery (RA).

Methods and Materials
The surgical anatomy surrounding the infratemporal fossa was examined in 3 formalin-fixed human cadaveric heads in which the vessels were injected with colored silicone. The three high-flow bypass procedures used were MA to middle cerebral artery (MCA), petrous internal carotid artery (pICA), and supracranial internal carotid artery (siCA). All three bypasses utilized a combination of orbitozygomatic osteotomy followed by frontotemporal craniotomy and laterotemporal fossa craniectomy.

Results
MA-MCA, MA-pICA and MA-siCA bypasses were possible using RA graft. The proximal and distal anastomosis were performed in an end-to-side fashion. The maxillary artery was exposed anatomically in the superior, lateral and inferior views of the infratemporal fossa. The MA was divided into three segments based on the Tanoue’s classification1. Multi-angled microsurgical images show the different types of MA and the adjacent neural and vascular structures in the infratemporal fossa and the three types of bypass. The donor sites of MA were in the pterygopalatine segment.

Discussion
It is said that MA bypass is a difficult and complicated procedure because of the narrow and intricate anatomical location. Abdulrauf2 described a key hole approach for MA bypass but there were some shortcomings such as kinking of the vessel and limited exposure through a narrow corridor. Eller3 and Nossek4 addressed these problems. In our study, we drilled the infratemporal fossa included their craniectomy and exposed the infratemporal fossa widely. The donor site had enough length and thickness for flow bypass procedures used were MA to middle cerebral artery (MCA), petrous internal carotid artery (pICA), and supracranial internal carotid artery (siCA). The MA was divided into three segments based on the Tanoue’s classification1. Multi-angled microsurgical images show the different types of MA and the adjacent neural and vascular structures in the infratemporal fossa and the three types of bypass. The donor sites of MA were in the pterygopalatine segment.

Conclusions
MA to MCA, pICA, and siCA bypass can be completed with a RA graft. It is helpful to practice the technique in a cadaver before it is applied clinically.

References

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