Automated end-to-side anastomosis to the middle cerebral artery: a feasibility study.

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Abstract

OBJECT:

The treatment of complex cerebrovascular or skull base pathological conditions necessitates a microsurgical blood flow preservation or augmentative revascularization procedure as either an adjunctive safety measure or a definitive treatment. The brain is susceptible to ischemia, and procedure-related risks can be minimized by the reduction of occlusion time or the use of a nonocclusive technique. The authors therefore analyzed the feasibility of an automatic device (C-Port xA, Cardica) designed for constructing an end-to-side anastomosis with or without flow interruption for a middle cerebral artery (MCA) bypass in a human cadaveric model and in an in vivo craniotomy simulation model.

METHODS:

Four Thiel-fixated human head specimens were prepared using 8 standard pterional craniotomies. The sylvian fissure was opened to access the anterior circulation and in particular the MCA. The length of the individual vessel segments was measured. The C-Port xA was tested on each of the 8 exposures. In addition the C-Port xA was deployed in an in vivo craniotomy simulator model in 10 New Zealand rabbits (a total of 20 anastomoses) by using the abdominal aorta jump graft model.

RESULTS:

Short-term patency was assessed by angiography and histological findings. In all 8 sylvian exposures, construction of an MCA anastomosis with the aid of the C-Port xA was feasible. All 20 jump graft anastomoses performed in the in vivo craniotomy simulator were found to be patent.

CONCLUSIONS:

The anatomical studies as well as the in vivo craniotomy simulation studies demonstrated that the dimensions of theautomated end-to-side anastomosis device are suitable for an extracranial-intracranial high-flow bypass on the MCA. Further miniaturization and special adaptation of this device would allow bypass procedures to more proximal intracranial vessels.