Double-barrel STA-MCA bypass for cerebral revascularization after ischemic stroke. Case report

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Abstract

Background: Carotid occlusive disease is a type of progressive disease resulting in ischemic stroke. In selected patients, extracranial-intracranial bypass remains an important treatment for the prevention of stroke. Traditionally, superficial temporal artery-middle cerebral artery (STA-MCA) bypass uses 1 STA branch. We have adopted a "double-barrel" technique in which both branches are joined with MCA recipients in distinct vascular territories.

Case Description: A 67-year-old woman was admitted to the neurosurgery department on the 39th day after an ischemic stroke, with diagnosed carotid occlusive disease and left hemiplegia. After surgical contraindications were excluded, double-barrel STAMCA bypass was performed. In the early postoperative period, there was complete regression of the hemiplegia.

Conclusion: Double-barrel STA-MCA bypass is feasible and potentially advantageous in symptomatic carotid occlusive disease treatment.

INTRODUCTION

Extracranial–intracranial (EC-IC) bypass surgery is commonly used to supplement cerebral blood flow (CBF) for secondary stroke prevention in patients with symptomatic carotid occlusive disease.3,5,7 Nevertheless for patients with symptomatic nonmoyamoya cerebrovascular diseases, especially those caused by steno-occlusive carotid artery, extracranial-intracranial (EC-IC) bypass has offered no more benefits over medical therapy in the international randomized EC-IC study1 and the Carotid Occlusion Surgery Study.6 However, EC-IC bypass still works in certain symptomatic cerebrovascular diseases.4

Traditionally, superficial temporal artery-middle cerebral artery (STA-MCA) bypass uses 1 STA branch. We have adopted a "double-barrel" technique in which both branches are joined with MCA recipients in distinct vascular territories and present incontestable evidence that double-barrel STA-MCA bypass may be effective to treatment patients with symptomatic carotid occlusive disease.

CASE REPORT

A 67-year-old woman was admitted to the neurosurgery department on the 39th day after an ischemic stroke, with diagnosed carotid occlusive disease. She accepted medical therapy in acute period of stroke in the neurological department without alleviation. Neurological examination revealed left hemiplegia. Head CT and brain MRI showed no ischemic pathology.

Diffusion-weighted imaging (DWI) showed no obvious infarct in the bilateral cerebral cortex. CT-perfusion shows hypoperfusion in right brain hemisphere. Digital subtraction angiography (DSA) demonstrated occlusion at the right internal carotid artery (ICA) from the ophthalmic artery origin to the bifurcation. There was no collateral adequate supply via the Anterior...
communicating artery (ACoA) and Posterior communicating artery (PCoA) (Figure 1). Echocardiography was unremarkable.

After surgical contraindications were excluded, double-barrel STA-MCA bypass was performed on the right side under general anesthesia (total intravenous anesthesia). Before surgery we used ultrasound navigation to detect donor arteries - frontal and parietal branches of superficial temporal artery. After craniectomy frontal and temporal branches of MCA are selected as recipients and double anastomosis end-to-side was performed. Both anastomoses were completed with 10 interrupted stitches, which were made with a 10–0 monofilament nylon suture. Systemic blood pressure was elevated prior to and during the operation to maintain sufficient flow in the impaired hemisphere. Anastomoses functioning was verified by intraoperative indocyanine green angiography (ICG) (Figure 2).

Figure 1: Digital subtraction angiography (DSA) results of the patient. A.- Frontal projection, B - Sagital projection demonstrated total occlusion at the right internal carotid artery (ICA) from the ophthalmic artery origin to the bifurcation. C. - vertebral D. - left carotid angiography show absence of collateral blood flow.
The surgical procedure was without complications. Three days after surgery, there was almost complete regression of left-sided hemiparesis. The patient was maintained on aspirin therapy at a dose of 100 mg/day. On the tenth day after surgery, the patient was discharged to outpatient treatment. At his 6-month follow-up, he was found to be neurologically normal with no additional complaints. Control digital DSA shows significant improvement in the flow in the right cerebral hemisphere through both branches of the anastomosis (Figure 3).

**DISCUSSION**

In general, cerebral ischemia may result from distal arterial embolic occlusion or reduced regional cerebral perfusion secondary to proximal arterial occlusion or stenosis. The disappointing results of the Cooperative Study on Extracranial–Intracranial Bypass in 1985, led to the virtual abandonment of this procedure for the treatment of occlusive cerebrovascular disease. Since then, bypass has been reserved largely for the treatment of complex intracranial aneurysms and skull base lesions. Nonetheless,
there are selected patients with ischemic cerebrovascular disease that may benefit from EC–IC bypass.8

The Cooperative Study on Extracranial–Intracranial Bypass failed to demonstrate a clinical benefit from revascularization in group of patients with symptomatic carotid occlusive disease.1 Our case had shown complete regression of the hemiplegia for 3 days after surgery.

Traditionally, superficial temporal artery-middle cerebral artery (STA-MCA) bypass uses 1 STA branch. We have adopted a "double-barrel" technique in which both branches are joined with MCA recipients in distinct vascular territories. The incidence of perioperative ischemic and hemorrhagic complications development can reach 18,2%,2 but our surgical procedure was without complications.

**CONCLUSION**

Our manuscript shows that double-barrel STA-MCA bypass is feasible and potentially advantageous in treatment of symptomatic carotid occlusive disease.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent.
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References