Intracerebral Hemorrhage From a Ruptured Pseudoaneurysm After STA-MCA Anastomosis

—Case Report—

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Abstract

A 43-year-old hypertensive male developed a pseudoaneurysm at the site of a superficial temporal artery (STA)-middle cerebral artery (MCA) anastomosis, causing massive intracerebral hemorrhage 5 years after the operation. He first experienced repeated transient ischemic attacks, and cerebral angiography disclosed complete occlusion in the cervical portion of the left internal carotid artery. STA-MCA anastomosis was performed, and the ischemic attacks stopped. Postoperative angiography confirmed patency of the anastomosis and good filling of the cortical branches of the left MCA. Five years after surgery, the patient suffered sudden onset of generalized convulsions and consciousness disturbance. Computed tomography disclosed a massive intracerebral hemorrhage in the left frontoparietal region, and angiography revealed an aneurysmal dilatation at the site of the anastomosis that was not seen before. Emergency evacuation of the hematoma and clipping of the aneurysmal dilatation were performed. The patient recovered well and became ambulatory. Histological examination of the surgical specimen showed collagen tissue, indicating a pseudoaneurysm. Patients who undergo STA-MCA anastomosis, especially hypertensive patients, should be followed up by repeated magnetic resonance angiography to confirm the patency of the anastomosis and cerebral perfusion, and to detect the formation of pseudoaneurysms at the anastomosis site, which can cause fatal bleeding.

Key words: hypertension, intracerebral hemorrhage, pseudoaneurysm, superficial temporal artery-middle cerebral artery anastomosis

Introduction

Microsurgical cerebral revascularization, especially superficial temporal artery (STA)-middle cerebral artery (MCA) anastomosis, for the management of patients with chronic cerebral ischemic lesions has not been clearly established as beneficial, compared with medical treatment, and the surgical indications remain controversial.1–5,9,20–12,14 STA-MCA anastomosis may increase postoperative cerebral blood flow and oxygen extraction fraction.1,5,8,11 The surgical indication of STA-MCA anastomosis is limited to strictly selected patients with reduced cerebral reserve capacity evaluated by single photon emission computed tomography (SPECT) or positron emission tomography.

We describe a case of STA-MCA anastomosis surgery which resulted in a very rare complication of intracerebral hemorrhage from a ruptured pseudoaneurysm at the site of anastomosis 5 years after the operation.

Case Report

A 43-year-old male was first admitted to a local hospital because of periodic, transient right hemiparesis. Cerebral angiography showed severe stenosis of the cervical portion of the left carotid artery. Carotid endarterectomy was recommended, but he chose medical treatment and was managed with ticlopidine hydrochloride. The patient later discontinued the medical treatment because of the absence of neurological symptoms or deficits. Two years later, he again experienced transient right hemiparesis, and complained of blurred vision in his left eye. He consulted the ophthalmologic department of our university hospital and was referred to our department for further work-up.

On admission, his blood pressure was 160/90
mmHg. Laboratory data were within normal limits. Neurological examination found no deficits except for lower temporal visual field defect in the left eye. Computed tomography (CT) and magnetic resonance (MR) imaging failed to detect any ischemic lesions, but left carotid angiography revealed complete occlusion of the cervical portion of the left internal carotid artery (Fig. 1 left). Right carotid angiography showed cross-filling of the left hemisphere via the anterior communicating artery and leptomeningeal anastomosis from the left anterior cerebral artery to the cortical branches of the left MCA in the late arterial phase (Fig. 1 right). Cerebral perfusion study by SPECT with iodine-123-labeled iodoxamadol (123I-IMP) detected no obvious low perfusion area. However, 123I-IMP SPECT with intravenous injection of acetazolamide showed remarkably decreased vascular reserve capacity in the territory of the left MCA.

Based on these studies, left STA-MCA anastomosis was performed to prevent further ischemic attack. The STA was prepared and anastomosed to a suprasylvian cortical branch in end-to-side fashion. After setting two stay sutures, six sutures were placed on each side with 10-0 monofilament nylon (total of 14 sutures). When the temporary clips were loosened, mild bleeding occurred as usual, but was easily controlled. The patient’s postoperative course was uneventful. Cerebral angiography 3 weeks after surgery confirmed the patency of the anastomosis (Fig. 2). Other cortical branches were well visualized. Postoperative 123I-IMP SPECT using acetazolamide showed no remarkable decrease in vascular reserve capacity.

The patient was discharged and subsequently followed up in the outpatient clinic. His blood pressure was controlled with a calcium channel blocker. He did not experience any transient ischemic attacks after surgery, and returned to his previous job, although the visual field defect in his left eye persisted. However, he stopped visiting the hospital one year after the surgery, probably because of no specific problem in his daily life, and so treatment for his hypertension was not continued.

Five years after the operation, the patient experienced sudden onset of generalized convulsions followed by consciousness disturbance, and was brought to our department. On admission, his consciousness was severely disturbed, and his right extremities exhibited decerebrate posture. Emergency CT showed a massive subcortical hemorrhage in the left frontoparietal region (Fig. 3). The hemorrhage was in an unusual location for a hypertensive intracerebral hemorrhage. Cerebral angiography revealed a small aneurysmal dilatation at the site of the STA-MCA anastomosis that was not seen on postoperative angiography (Fig. 4).

Emergency surgery was performed to evacuate the hemorrhage. The anastomotic site was dissected with preservation of the STA-MCA anastomosis, and the aneurysmal dilatation was exposed. The tip of the aneurysm dilatation projected into the
hematoma cavity. The dilatation was clipped with a hemoclip and excised.

The patient's postoperative course was uneventful. He recovered well, and was able to walk with a cane 3 weeks after the surgery. He continued to exhibit mild motor-type aphasia. Three months after surgery, he was transferred to a rehabilitation hospital for further treatment. Postoperative angiography was not performed because agreement was not obtained from the patient and his family.

Histological examination showed that the surgical specimen consisted of collagenous tissue with no muscle or elastic lamina component, with infiltration of abundant inflammatory cells (Fig. 5). The final diagnosis was pseudoaneurysm at the site of the STA-MCA anastomosis.

**Discussion**

Our patient was treated by STA-MCA anastomosis, and developed a pseudoaneurysm at the site of the STA-MCA anastomosis.

*Neurol Med Chir (Tokyo) 40, August, 2000*
anastomosis which resulted in massive intracerebral hemorrhage 5 years after surgery. Such complications usually occur 2 or 3 months after surgery. Formation of a pseudoaneurysm 5 years after STA-MCA anastomosis is extremely rare. Various factors are plausible in the etiology of pseudoaneurysms, i.e., the technique employed, vascular injury by temporary clipping during procedure, excessive adventitial stripping, and the presence of hypertension. An experimental study has shown that the quality of the anastomosis as well as the patency and shape of the anastomotic portion are closely related to the number of sutures at the anastomosis. Twelve to fourteen sutures are considered necessary to obtain an anastomosis with a good shape, and few complications. We used 14 sutures to create the anastomosis in our patient, and no obvious bleeding from the anastomotic site was observed during surgery. Moreover, the interval of 5 years between the STA-MCA anastomosis surgery and the intracerebral hemorrhage suggests that technical failure was not the main cause of pseudoaneurysm formation at the anastomotic site.

Vascular injury by temporary clipping or excessive adventitial stripping cannot be excluded as a causative factor. Hypertension was identified in our patient, but could not be controlled adequately because of absence of compliance by the patient. Although no obvious correlation between formation of postoperative pseudoaneurysm and the presence of hypertension has been found, hypertension might be a factor in the development of pseudoaneurysm after STA-MCA anastomosis. To avoid such serious complications, long-term careful and constant control of blood pressure during the postoperative period is necessary in patients who have undergone STA-MCA anastomosis surgery. In addition, histological examination of the excised lesion showed collagenous tissue with no muscle or elastic lamina component, and infiltration of abundant inflammatory cells. These histological findings suggest that inflammatory reaction might influence the formation of a pseudoaneurysm.

Several cases of the development of a pseudoaneurysm have been reported following STA-MCA anastomosis surgery. One case involved fatal subdural bleeding. Cerebral angiography is rarely performed to identify such complications after confirmation of the patency of the anastomosis following surgery, so the exact incidence of pseudoaneurysm development following STA-MCA anastomosis cannot be determined. Postoperative development of a pseudoaneurysm was an incidental finding during postoperative angiography to confirm the patency in previous cases. MR angiography can now provide clear and precise images of the cerebral vasculature, and can be repeated unlike the invasive cerebral angiography. We consider that repeated MR angiography should be performed in patients who have undergone STA-MCA surgery to confirm the patency of the anastomosis and cerebral perfusion, and to identify serious but previously fairly well-documented complications such as pseudoaneurysm. The incidence of rupture of pseudoaneurysm is thought to be quite high, and so pseudoaneurysm should be isolated from the cerebral circulation to prevent serious hemorrhage.

References

Neurol Med Chir (Tokyo) 40, August, 2000

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