Embolism Distal to Stenosis of the Middle Cerebral Artery

HAROLD P. ADAMS, JR., M.D., AND CORDELL E. GROSS, M.D.

SUMMARY Fibrin-platelet microembolism in cortical branches distal to stenosis of the middle cerebral artery was directly visualized in a patient with transient ischemic attacks (TIA) and was histopathologically confirmed. Cerebral microembolism may produce TIA in patients with stenosis of the middle cerebral artery and may influence the success of the extracranial-intracranial bypass operation in treatment of these patients.

Stroke, Vol 12, No 2, March-April 1981

INTEREST in stenosis of the middle cerebral artery has been stimulated by development of the microsurgical extracranial-intracranial bypass operation. Most transient ischemic attacks (TIA) secondary to stenosis of the middle cerebral artery are believed to occur on a hemodynamic basis.1 We report a patient with stenosis of the middle cerebral artery and TIA, who had fibrin-platelet microembolism distal to the stenosis confirmed.

Patient Report

The patient was a 52-year-old, right-handed, insulin-dependent diabetic woman who was in her usual state of health when she spontaneously developed approximately 10 attacks of lightheadedness and difficulty speaking, each lasting a few minutes. Three days later she had a severe temporal-occipital headache. Following a nap, her headache resolved but she had difficulty finding words when trying to speak. She was admitted to a community hospital for treatment of a small stroke and she gradually improved. Eight days following the initial TIA, she developed transient increased difficulty in speaking associated with numbness of the right lower extremity. She was then transferred to the University of Iowa Hospitals.

Her neurological examination was normal except for a slow, deliberate type of speech. She did not have errors in naming, repeating or understanding commands. The remainder of her examination was normal. Complete blood count, platelet count, prothrombin time, partial thromboplastin time, serum cholesterol, blood urea nitrogen, electrocardiogram, echocardiogram, chest roentgenograph and nuclide brain scan were normal. Her blood sugar was 434 mg/dL. Angiography demonstrated a 50% segmental stenosis of the left middle cerebral artery 5 mm distal to its origin (fig. 1). The left internal carotid artery and other cerebral arteries were normal.

She agreed to participate in the Cooperative Study of Extracranial/Intracranial Arterial Anastomosis and was randomized to surgical therapy. On the day after randomization, she had several transient attacks of numbness of the right foot and difficulty finding words. Intravenous heparin therapy was begun. Two weeks after her initial TIA, a superficial temporal artery-middle cerebral artery anastomosis (STA-MCA bypass) was performed. During her operation, after the cortical artery had been dissected free from the arachnoid, blood flow in the artery appeared slow and then stop. Almost simultaneously, a 3 mm long white embolus emerged from the depths of the Sylvian fissure in the isolated artery. The embolus proceeded distally in a staccato fashion with each beat of the heart. Temporary clips were placed on the artery, trapping the embolus in the area of the planned recipient site, and an embolectomy was performed. Microscopic examination of the embolus demonstrated an unorganized fibrin-platelet clot (fig. 2).

Immediately after operation, her neurological ex-
embolism distal to MCA stenosis/Adams and Gross

**FIGURE 1.** An anterio-posterior view of a left carotid arteriogram demonstrates stenosis (arrow) 5 mm distal to the origin of the left middle cerebral artery.

amination was normal. Four hours later, she developed anaphasia, despite postoperative treatment with low molecular weight dextran and adequate control of blood pressure. Twenty-four hours after operation, she had 2 transient attacks of increased aphasia and right sided numbness. Heparin was added to her treatment. She had no further attacks. Ultimately, her

therapy was converted to warfarin and dipyridamole. Her speech recovered to minimal word-finding difficulty and speech hesitancy. A second angiogram was performed 3 months after operation. The STA-MCA bypass was patent and the stenosis of the left middle cerebral artery remained unchanged.

**Discussion**

Approximately 10% of patients considered as candidates for treatment with the STA-MCA bypass have symptomatic stenosis of the middle cerebral artery. It is less frequent cause of TIA than is embolization to the middle cerebral artery or its branches from diseases of the carotid artery. With the development of the STA-MCA bypass for management of patients with TIA, investigation of the prognosis of this lesion, as well as the most effective treatment, has been stimulated. Although stenosis of the middle cerebral artery may have a benign course, complete occlusion of the artery and cerebral infarction do occur. Reduced regional cerebral blood flow in patients studied with symptomatic stenosis of the middle cerebral artery gives some support to the hemodynamic concept. A patient with hemodynamically induced TIA is the ideal candidate for STA-MCA bypass. Peripheral microembolism distal to a stenotic lesion of the middle cerebral artery has been suggested as a possible cause of TIA in some patients. Our patient had identifiable fibrin-platelet embolization distal to stenosis of the middle cerebral artery, visualized at operation and histopathologically confirmed. Our patient demonstrates that distal embolism may be the mechanism of TIA or cerebral infarction in some patients with stenosis of the middle cerebral artery.

The success of anticoagulation therapy in this condition has already been reported. Aspirin has effectively reduced the risk of cerebral infarction in men with TIA, and this may be true among those patients with stenosis of the middle cerebral artery. Whether reconstructive vascular procedures will relieve TIA and prevent cerebral infarction in these patients is yet to be proved. Embolization may explain the failure of this particular operation in some patients even when good restoration of regional cerebral blood flow is achieved.

**References**


**FIGURE 2.** Photomicrograph of a fibrin-platelet embolus removed from a cortical branch of the left middle cerebral artery at the time of STA-MCA bypass. (original magnification × 40)
Embolism distal to stenosis of the middle cerebral artery.

H P Adams, Jr and C E Gross

Stroke. 1981;12:228-229
doi: 10.1161/01.STR.12.2.228

Emboli to the distal cerebral circulation. 

H P Adams, Jr and C E Gross

Stroke. 1981;12:228-229
Stenosis of the middle cerebral artery.

H P Adams, Jr and C E Gross

Stroke. 1981;12:228-229

doi: 10.1161/01.STR.12.2.228

Stroke is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 1981 American Heart Association, Inc. All rights reserved.
Print ISSN: 0039-2499. Online ISSN: 1524-4628

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://stroke.ahajournals.org/content/12/2/228