Embolectomy of Middle Cerebral Artery

Report of a Case

Shelley N. Chou, M.D.

Division of Neurosurgery, Department of Surgery, University of Minnesota Medical School, Minneapolis, Minnesota

Recent interest in surgery of cerebrovascular disease, and particularly of obstruction of small blood vessels, prompts the report of a patient who recovered almost completely from hemiplegia caused by an embolus of the middle cerebral artery that was removed surgically.

Case Report

U.H. #609848, M.E.O., a 19-year-old housewife, was admitted to the University Hospitals on March 8, 1962 for surgical correction of severe mitral insufficiency. She was in auricular fibrillation. On March 14, 1962 Dr. Richard Lillehei inserted a Starr valve to replace the contracted and scarred mitral leaflets. She was on the pump-oxygenator during the period of cardiac arrest of 46 min. The postoperative course was uneventful. The auricular fibrillation persisted. About 8:30 A.M. on March 26, 1962, she collapsed suddenly. She became markedly confused and a left hemiplegia developed. On the basis that an embolic episode had occurred, intravenous heparin was given immediately.

Examination. When seen in neurosurgical consultation an hour later she was lethargic and confused but could obey simple commands. Her neck was supple. Her eyes were deviated to the right. The pupils were equal and reacted to light. Fundoscopic findings were normal. There was an obvious left hemiplegia including a left central facial palsy. She was areflexic in the left upper extremity. The left ankle reflex was present. There was a positive left Babinski’s response. She seemed to perceive painful stimuli bilaterally. The clinical impression was an embolic occlusion of either the internal carotid or the middle cerebral artery.

About 5 hours after the injection of heparin the bleeding time had returned to normal. Carotid angiography under local anesthesia revealed a complete occlusion of the right middle cerebral artery (Fig. 1). There was delayed retrograde filling of the middle cerebral group of vessels (Fig. 2). At the time of angiography she was observed to move her left toes, but her left upper extremity remained completely flaccid.

Operation. A right frontotemporal craniotomy under general anesthesia was begun 9 hours after the onset of her cerebrovascular accident. Continuous drainage of cerebrospinal fluid was obtained through an indwelling lumbar subarachnoid catheter. The tip of the temporal lobe was removed and the dissection was carried down through the Sylvian fissure. The middle cerebral artery was exposed from its origin at the carotid bifurcation to the branches of the trifurcation. The main segment of the middle cerebral artery appeared pale and constricted. A Mayfield clip was applied proximally to the middle cerebral artery. A longitudinal arteriotomy, 3 mm. in length, was made about 6 mm. proximal to the trifurcation. The embolus appeared white and felt hard.

It did not dislodge with temporary release of the Mayfield clip. Suction with a 20-cc. syringe did not dislodge the embolus. Consequently, the arteriotomy was extended proximally and now the incision was 7 mm. long. Using a small suction tip, the entire embolus was aspirated. It measured about 1 cm. long and was bifurcated at the distal end which presumably had extended into two branches of the trifurcation. Following the removal of the embolus there was good backflow of blood. Since the wound could be kept clean with suction, no temporary clip was placed distally on the vessel. The exposed wall of the vessel appeared smooth. The arteriotomy was closed with three 6-0 running sutures using conventional instruments. The placing of the last suture resulted in a minute tear of the wall of the vessel as the needle holder was released. To repair that would have compromised the lumen further and therefore a small piece of muscle was tied into the suture and applied firmly to the wall of the vessel. When the Mayfield clip was removed finally, there was no bleeding. The craniotomy was closed. The time elapsed between application and removal of the Mayfield clip at the origin of the middle cerebral artery was approximately 45 min.

Postoperative Course. The patient recovered from anesthesia without difficulty. In the postanesthesia room she could move her left leg at the knee. About 8 hours later she was alert and oriented to time, place and person, but her left arm remained paralyzed. Stellate-ganglion blocks were repeated twice daily for the next 2 days. About 24 hours following operation she moved the second and third fingers on the left. Thereafter, she gradually and steadily improved. On April 1, 1962, 5 days after operation, it was estimated that she had regained about 75 per cent of the function in her extremities. Ten days postoperatively the only neurological abnormality was a mild facial palsy. A right carotid angiogram (Fig. 3) obtained 2 weeks following operation revealed filling of the previously occluded complex of the middle cerebral artery. There was some narrowing at the site of the arteriotomy. She was transferred back to the Cardiac Service because of slight pleural effusion and dyspnea. She was started and has been maintained subsequently on anticoagulant therapy. She was discharged from the hospital on April 15, 1962.

When seen 3 months later she was doing very well. Neurological findings were normal except for a mild facial paresis.

Addendum. The patient is now normal neurologically (9 months postoperative).

Discussion

In a recent review by Jacobson et al.2 regarding surgery of occlusive disease of the middle cerebral artery, the technical difficulties encountered, particularly those of placing the sutures, were outlined. These authors proposed the use of a dissection...
ing microscope, a special needle holder and an ultrafine suture made of monofilament Nylon. If these had been used, the arterial tear in this patient might not have occurred. Undoubtedly, the tear was caused by a jerking action when the needle holder with ringed handles was released. This tear and the subsequent repair with a minute piece of muscle may be responsible for the constriction of the vessel as indicated in the postoperative angiogram (Fig. 3). It must be said, however, that efficient use of the dissecting microscope and special instruments requires constant practice. An occasional, emergency handling of these unfamiliar tools may confront the operator with a great deal of difficulty.

Jacobson et al.² presented a review of 7 cases³-⁴ of occlusion of the middle cerebral artery or of its branches. They added 2 cases of their own, making a total of 9 cases reported in the literature. Some of these patients experienced improvement in
their neurological status even though postoperative angiography revealed recurrent occlusion of the vessel in all but 1 patient. This latter case\(^3\) was that of a 66-year-old man whose vessel remained patent for 8 months. He died 9 months after operation, of coronary thrombosis. Undoubtedly there have been other cases, not reported, in which postoperative angiography failed to show re-establishment of circulation. Dr. Lyle French\(^1\) had such an experience 3 years ago.

The problem of collateral circulation following intracranial vascular occlusion is an intriguing one. That such can be present is demonstrated beyond question by Fig. 2 in this report and by the postoperative angiogram of Case 2 described by Jacobson et al.\(^2\) Whether the presence of excellent collateral circulation alone (Fig. 2) may be sufficient to cause neurological recovery is a matter of speculation. There can be no doubt, however, that such evidence of collateral circulation can be regarded only as a promising prognostic sign. Nevertheless, it was elected to remove the embolus in the present case for two reasons. Firstly, the additional blood supply to the brain subsequent to surgical re-establishment of circulation, even temporary, could contribute only to the recuperative process. Secondly, failure to do so would not be expected to jeopardize the collateral circulation already demonstrated. Undoubtedly the early surgical removal of the embolus in this patient may have helped in her early recovery. On the other hand, surgical intervention would be extremely risky and therefore contra-indicated if infarction is already present.

The use of hypothermia prior to and during operation should theoretically be beneficial provided it can be instituted without delay. To prolong arterial insufficiency in order to obtain hypothermia seems unwise. Experience in this regard is too limited, however, for any definitive statement.

Anticoagulation was not used during and following operation for fear of hemorrhage, the same reason given by Jacobson et al.\(^2\) This therapy has been maintained later, however, because the patient continued to have auricular fibrillation.

The patient reported herein has been, as far as can be ascertained, the only one known to have had successful insertion of a Starr valve and an embolectomy of the middle cerebral artery. The latter resulted in neurological recovery and angiographic evidence of patency of the vessel involved.

**Summary**

A case of successful embolectomy of the middle cerebral artery following insertion of the Starr valve for severe mitral insufficiency has been reported with a brief discussion relative to the management.

**References**

1. French, L. A. Personal communication.