Embolectomy of Internal Carotid, Middle and Anterior Cerebral Arteries
Report of a Case

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The pioneering work of Jacobson et al. has stimulated interest in this field, and their technique was applied in the treatment of the patient reported in this paper.

Case Report

Mrs. B. K., aged 42 years, presented herself to the Cardiology Department for further investigation of a left ventricular cardiomyopathy of undetermined etiology. There was no history of rheumatic fever. She had had recurrent chronic cough with occasional purulent sputum. When she was in her 20s in Poland during the war, she had had attacks of paroxysmal regular tachycardia, which could be stopped by carotid pressure. In 1948 she came to Canada and these attacks continued. In 1958 she began taking Quinidine for the attacks. Early in 1962 she suffered from attacks of palpitation, which were irregular and associated with shortness of breath and weakness. Her longest attack was 45 hours. Early in 1963 atrial fibrillation developed, and she had at least one systemic embolus, which prompted her admission to hospital.

Examination. She had a loud, snapping first heart sound, an extra heart sound after the second sound, which may have been the result of opening of the mitral valve, an enlarged left atrium on fluoroscopy and prior electrocardiographic evidence of notching of the P-wave.

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A roentgenogram of the chest showed findings typical of mitral stenosis.

On April 9, 1963, during a cardiac catheterization, she became unconscious and a profound left hemiplegia and hemianesthesia developed. Forty minutes after this episode she was drowsy but conscious, her eyes were conjugately deviated and fixed to the right, there was a complete left homonymous hemianopsia, a left parietal sensory deficit and the left plantar response was extensor. One hour following the initial episode she could still be aroused but was sufficiently obtunded so that the sensory examination could not be carried out adequately. Her other findings remained the same.

One and a half hours later she was unconscious, reacting only to painful stimuli. Her breathing was irregular and both plantar responses were extensor. There were still movements of withdrawal to pain on the right side.

Carotid arteriograms showed an obstruction in the right internal carotid artery, just distal to the posterior communicating artery. There was no filling of the middle cerebral or anterior cerebral arteries (Figs. 1 and 2).

Operation. The patient was intubated, placed on a ventilator and given mannitol. A right frontotemporal craniotomy was performed, and when the bone flap had been turned, the dura mater was found to be very slack. The dura mater was opened and the frontal lobe was retracted using a Cloward self-retaining retractor. Exposure of the internal carotid, anterior cerebral and middle cerebral arteries was obtained without any difficulty because of the extreme slackness of the brain. The veins on the cortical surface and those draining into the

Figs. 1 and 2. Lateral arteriogram and anteroposterior views showing complete occlusion by embolus of the internal carotid artery, distal to the posterior communicating artery.

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Fig. 3. Insert demonstrates both optic nerves and chiasm; the internal carotid artery proximal to the embolus is demonstrated in red, with the origin of the posterior communicating artery filling with arterial blood. Distal to this the artery is demonstrated in blue, indicating the extension of the embolus into the anterior and middle cerebral arteries. (Copyright, The Governors of the University of Toronto)

sinus appeared darker than normal in colour and the flow of blood in these veins appeared sluggish. The general colour of the brain was perhaps somewhat paler than normal but the blood in the small cortical arteries appeared to be well oxygenated.

The embolus could be seen easily through the wall of the carotid artery. The internal carotid artery proximal to the embolus was bright red in colour but the internal carotid at the site of the embolus and distal to this point was a dark blue (Fig. 3). The middle cerebral artery similarly was filled with a clot for 2 cm. in the sylvian fissure and the anterior cerebral artery contained clot as far as the anterior communicating artery.

Utilizing the Zeiss operating microscope, an incision was made in the internal carotid artery at its bifurcation. Mayfield clips were applied to the internal carotid artery proximally and to the anterior and middle cerebral arteries. Some of the embolus was teased out of the artery with a sucker. The remainder of the embolus was delivered easily by temporarily releasing the Mayfield clips. When this had been completed, the wound in the artery was closed with three interrupted 8-0 monofilament Nylon sutures.* When the wound had been closed, the Mayfield clips were removed. There was an excellent flow of blood in the middle and anterior cerebral arteries. The arteriotomy took 40 minutes.

* Made by Ethicon Co.

**Postoperative Course.** The patient recovered from her operation quickly, but in view of the hazard of brain swelling, she was kept on a ventilator. Immediately after operation the right plantar response had become flexor and her level of consciousness was improved. Twelve hours later some movement returned to the left thigh and within 24 hours she obeyed commands, was able to move the left leg but not against gravity, and there was some movement at the left shoulder. Thirty-six hours after operation she was able to perform weak movements at the left elbow and wrist, was able to grasp an object in her hand to command, and could hold the left leg off the bed. During this postoperative period her temperature was kept at 32°C.

At the end of 48 hours she was taken off the ventilator and her level of consciousness deteriorated; she would not obey commands so well and was drowsier. She was put back on the ventilator immediately and remained on it for a period of 4 days. Examination at the end of 1 week revealed the patient to be bright, cooperative and fully orientated. Her visual field defect had completely cleared, there was a slight left facial weakness and a mild left hemiparesis. She was able to carry out movements of individual fingers without any difficulty. She had a parietal sensory deficit, more marked in the left arm than in the leg. She could, however, identify objects in the left hand but two-point discrimination and sense of position were carried out poorly. Pain, temperature
and touch were appreciated on the left side but were reduced.

Six weeks postoperatively there was still a slight left facial weakness; power in her arm and leg was normal, coordination was normal, and there was still a defect to two-point discrimination in the left hand, with sense of position absent in the little and ring fingers and only fair in the index finger and thumb. Touch, pain and temperature were slightly altered in the left hand and normal elsewhere.

Discussion

We found no difficulty in obtaining an excellent exposure and the Cloward self-retaining retractor and dissecting microscope made this very easy. Jacobson et al. have pioneered the use of these instruments, as well as the fine monofilament Nylon suture, and there is no doubt that this technique is essential in achieving a patent artery. The monofilament Nylon suture is somewhat difficult to handle in tying the knots. This part of the technique might be improved by placing all the stitches in position and leaving the ends of the suture long, so that the knots might be tied following the placement of the sutures.

Recently, Chou has reported a dramatic case, which in many respects is similar to the one reported here.

No postoperative arteriogram has been carried out on our patient because of the fact that hemiplegia had developed as a result of an investigative procedure, and we felt that we could not ask her to accept a similar hazard. It may be argued that the carotid artery has re-thrombosed or that she might have made this recovery as a result of her collateral circulation, as pointed out by Jacobson et al. However, the extent to which the embolus had spread along the middle and anterior cerebral arteries would suggest that if this had not been removed it would have interfered severely with the collateral circulation.

Summary

A case of embolectomy has been reported in which the embolus had lodged in the internal carotid, middle and anterior cerebral arteries. The mannitol and the ventilator appeared to play an important part in obtaining a good exposure. In the postoperative phase the use of the ventilator, we believe, helped this patient because, when an attempt was made to remove her from it, she deteriorated on her 3rd postoperative day.

References