Distal Internal Carotid Thrombo-Embolectomy Using a Fogarty Catheter in Total Occlusion

Technical Note

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Invaluable information concerning the problems of carotid occlusive disease has been published.1-3,6,7,9,12,13,15-17,20 Yet, in general, the results of surgical treatment of total occlusions of the cerebral internal carotid artery have been disappointing. Surgical intervention has rarely produced neurological benefits either in the presence or absence of neurological deficit. We are reporting the use of a special intravascular catheter which has facilitated the extraction of distal thrombi in patients with totally occluded carotid arteries.

Some of the uncertainties associated with this lesion relate to the duration of occlusion, peripheral embolization to the cerebral vessels, proximal and distal propagation of the thrombus from the site of occlusion, and stenotic lesions in the region of the carotid siphon. Fisher reported a 45% incidence of severe neurological deficit in a series of 45 autopsies in which total occlusion of a carotid artery was present. In 31% of the cases with deficit, there was extension or emboli to vessels beyond the circle of Willis. This incidence of cerebral propagation corresponds to a 35% and 46% incidence reported by Lueschenho14 and Hultquist15 respectively.

Murphey and Maccubin reported that 80 of 194 patients operated on for carotid occlusive disease had totally occluded vessels; arterial back flow and circulation were restored in 35 of these cases. These authors found an indirect correlation between the duration of the occlusion and the number of arteries in which flow could be re-established. From 0–2 days, 90% of the arteries could be opened; in 3–7 days, 56%; in 8–11 days, 27%; and in 12–14 days, 4%. They concluded from their study that “the results suggest that there is probably little to be gained by operating on an occluded artery, even in patients without severe deficit when the contralateral vessel is not significantly stenosed. However, until this matter is settled by further experience, we shall no doubt continue to operate upon these individuals without profound deficit when the occlusion is thought to be of recent onset.” They also advocated surgical intervention in those patients with bilateral carotid occlusions.

Techniques for the extraction of thrombi from the distal internal carotid artery, such as the insertion of small sucker tips and rubber catheters, have met with varying results, usually unfavorable. Among these have been the retrograde “milking technique” of Keeley and Rooney,19 retrograde flushing of the artery as described by Lerman, et al.,21 and the use of various endarterectomy instruments and guides such as a cork screw device advocated by Shaw.19 None of these techniques is applicable to the extraction of thrombi in the distal portion of the internal carotid artery.

In 1963, Fogarty described a special intravascular catheter with an inflatable balloon applied to the tip for extraction of thrombi in peripheral arteries (Fig. 1). The catheter is made of pliable rubber, 80 cm in length, and is available in several diameters from 1 to 3 mm. The catheter is threaded into the artery to pass through a soft thrombus or between the thrombus and the arterial wall to a point distal to the thrombus. The balloon is inflated with fluid and the catheter gently and firmly withdrawn, extracting the thrombus or embolus ahead of the balloon.

The rubber inflatable balloon is 1 cm long and constructed as a small jacket so that maximal inflation occurs in the middle of the jacket. Increased resistance encountered by small alterations in the intraluminal dia-
unsuccessful in October, 1964, and further study was refused at that time. Twelve days before admission, he developed pneumonia and a right hemiparesis.

**Examination.** The patient was mute and did not respond to commands. There was conjugate gaze of the eyes with the pupils equal and reactive, and a right hemiplegia with a spastic paralysis of the left leg. A retrograde right arteriogram revealed bilateral internal carotid artery occlusions with good filling of both vertebral arteries (Fig. 2). There was very minimal delayed retrograde filling of the left middle cerebral and left anterior cerebral arteries, by way of the posterior circulation.

**Operation.** A left carotid endarterectomy was undertaken, even though the prognosis was poor. Arteriotomy was performed over the carotid bifurcation revealing total occlusion of the left internal carotid artery by thick, yellowish, ulcerating, hard atheromatous plaque. There was no soft thrombus and no “back or retrograde bleeding” from the internal carotid.

A Fogarty catheter (No. 4, 1 mm) was inserted into the proximal internal carotid as far as possible (13 cm) from the carotid bifurcation. The balloon was filled with 1 cc of 50% Hypaque, and a semifluid skull film was obtained, showing the distal catheter to be within the carotid siphon (Fig. 3 A).

The catheter was withdrawn without back bleeding, and a lateral x-ray was obtained during injection of 5 cc of Hypaque into the common carotid artery. There was filling of the internal carotid artery to the suprachinoid level without filling of the intracranial cerebral arteries (Fig. 3 B). However, there was filling of the cavernous sinus and internal jugular vein almost immediately, indicating that a traumatic carotid cavernous fistula had formed (Fig. 3 B).

The patient’s condition deteriorated immediately, and he died 18 hours after surgery.

**Postmortem examination.** Attempts to inject the carotid and vertebral arteries at their origin indicated no flow (intracranially) from either the carotid arteries or the left vertebral artery. The carotid arteries were removed, and examination revealed total occlusion of both internal carotids by an old, completely fibrous, thrombotic process. The