Intraaneurysmal Pressure Reduction with Carotid Occlusion*
Observations in Three Cases of Middle Cerebral Aneurysms

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Oclusion of the cervical carotid artery has been used in the treatment of intracranial aneurysms for several decades. It has seemed that aneurysms arising from the internal carotid artery have been most successfully managed by this procedure although it has at times been used for aneurysms at other sites. Sweet and Bennett in 1948 were the first to record pressure alterations within the cervical carotid artery in patients undergoing proximal occlusion of the vessel.

No direct measurements of pressure within intracranial aneurysms have been reported. Gallagher, Mullan, et al., and Alksne, et al., have shown recently that fine hairs, wires, and needles can be safely inserted into aneurysms in an attempt to produce thrombosis by newly developed techniques.

We are reporting pressure measurements in three cases of middle cerebral aneurysms treated by direct attack on the lesion. This group was chosen because of the relative ease of exposure of such aneurysms and because their peripheral location would make them more accessible should complicating hemorrhage ensue.

Method

Three patients undergoing craniotomy for direct attack on middle cerebral aneurysms had recordings of intraaneurysmal pressures before and after temporary occlusion of the ipsilateral common carotid artery. These measurements were made with a No. 25 needle inserted directly into the lumen of the aneurysm and cervical carotid artery, and connected to an electromanometer manufactured by the Lexington Instrument Company, Lexington, Massachusetts. It is the practice of the author to expose both common carotid arteries of patients undergoing craniotomy for aneurysm in the event that temporary occlusion is necessary during actual manipulation of the aneurysm. Pressures were also determined in the cervical carotid artery with temporary proximal occlusion. Carotid occlusion was in each case performed under direct vision with a rubber-shod clamp which fully occluded the vessel. The duration of occlusion was between 10 and 20 seconds in each instance, and temporary occlusions were carried out three times for each recording.

Following withdrawal of the needle, a small pledget of oxidized cellulose was held over the needle puncture site for a few minutes until oozing ceased, and then the aneurysm in each case was clipped or coated with synthetic adhesives.

Case Reports

Case 1. A 66-year-old woman was operated on for a right middle cerebral artery aneurysm 15 days after hemorrhage (Fig. 1). Intraaneurysmal pressure of 93/67 mm Hg was reduced to 48/45 mm Hg with temporary occlusion of the right common carotid artery (Fig. 2). Cervical carotid pressure of 100/70 mm Hg fell to 34/25 mm Hg with temporary proximal occlusion.

Case 2. A 51-year-old man was operated for a sacular aneurysm of the middle cerebral artery 10 days after hemorrhage (Fig. 3). Intraaneurysmal pressure of 35/30 mm Hg fell to 25/22 mm Hg with right common carotid occlusion. Distal cervical carotid pressure in this patient fell from 110/75 mm Hg to 68/50 mm Hg.
Case 3. A 54-year-old woman was gravely ill following four subarachnoid hemorrhages in the 4 weeks before admission. Left carotid arteriogram on admission showed a trifurcation aneurysm of the middle cerebral artery (Fig. 4). With vigorous supportive therapy the patient improved so that she could speak short phrases and have fair strength in the right limbs. Craniotomy was performed 12 days after the last hemorrhage.

Discussion

In Cases 2 and 3, the degree of pressure reduction following temporary occlusion of the common carotid artery was within 10% of that recorded in the distal portion of the cervical carotid artery (Fig. 5).

In Case 1, however, there was a significant difference. Following common carotid occlusion, pressure in the cervical internal carotid fell to 34% of its original level, whereas the intraaneurysmal pressure was 52% of its original level. Repeated studies of the angiograms gave no clue as to why the degree of pressure reduction in this patient differed from the others. It is of interest that the intraaneurysmal pressures in Cases 2 and 3 were much lower than the cervical pressure. In Case 1 they were approximately the same. It may be that the very narrow neck of the aneurysm in Case 2 and the intense spasm of the middle cerebral artery proximal to the aneurysm in Case 3 were factors responsible for these findings.