ARTERIOGRAPHIC DEMONSTRATION OF SPASM OF THE INTRACRANIAL ARTERIES

WITH SPECIAL REFERENCE TO SACULAR ARTERIAL ANEURISMS*

ARTHUR ECKER, M.D., AND PAUL A. RIEMENSCHNEIDER, M.D.
State University College of Medicine, and the Syracuse Memorial Hospital, Syracuse, New York
(Received for publication June 13, 1951)

The percutaneous method of puncturing the carotid artery allows cerebral angiography to be performed on repeated occasions in the same patient. The cerebral arteries thus visualized with the same technic on different occasions generally are identical but sometimes differ strikingly in caliber. When the artery has the smaller caliber it is said to be in arterial spasm. It is the purpose of this paper to present our observations of such spasm and to indicate its possible significance.

MATERIALS AND METHODS

For this study there were available about 400 groups of angiograms made on 350 patients. The patients were mostly adults and suffered from a variety of medical and surgical neurologic disorders. We have found only 12 instances, among 10 of these cases, which have met our criteria of arteriographically demonstrated spasm. This study is devoted to the intracranial portion of the internal carotid artery, its subdivisions, the anterior and middle cerebral arteries and their main branches. It is concerned only with vessels of at least 1.5 mm. in internal diameter.

Arterial spasm can be definitely recognized arteriographically when a vessel is of larger caliber in a subsequent angiogram than was demonstrated at a previous study made under identical conditions. This study is concerned with spasm of only moderate degree, rather than with maximal spasm or total occlusion of the vessel, which obviously cannot be recognized arteriographically. Minimal spasm, with alterations of caliber of less than 0.5 mm., will not be considered because of the difficulties involved in precise measurement.

Marked spasm slows the blood stream. In such cases arteriograms with routine timing show filling of only the proximal portion of the intracranial arteries. Repeating the arteriogram with delayed timing of the exposure (by \( \frac{1}{2} \) to 5 seconds) will show full arterial filling. When spasm is relieved the velocity of blood flow becomes normal as demonstrated by full arterial filling with routine timing.

Nonfilling of a Length of Artery. During the carotid injection of diodrast®, there is probably a slight increase of intra-arterial pressure. However, the instant the injection is over, the pressure in the carotid artery cephalad from the needle becomes less than normal because of the mere presence of the needle within the arterial wall and its lumen. At this instant blood rushes into the injected vessels from the other carotid and from the basilar artery via the circle of Willis. An exposure made at this moment reveals dye in the proximal part of the injected carotid artery and the distal portions of the anterior and middle cerebral arteries, whereas the circle of Willis and the adjacent portions of these vessels are not visualized. This appearance, due entirely to a slight delay in exposure of the arteriogram, has been called pseudospasm.²

Localized Narrowing of Vessels from Causes other than Spasm. The angiographic appearance of cerebral arteriosclerosis is most often that of unusually wide and tortuous vessels. Nevertheless, localized arterial narrowings may be due to arteriosclerosis. These narrowings may appear not only as obvious plaques with almost rectangular edges, but also as gradual taperings similar to the narrowing of spasm. Furthermore, a given vessel may be congenitally narrow. Accordingly we have required a variation in caliber of

---

**Fig. 1. Case 1.** Aneurism at bifurcation of left internal carotid artery. Spontaneous subarachnoid hemorrhage Sept. 21, 1950. Arteriograms after left carotid injection. Chamberlain-Towne views: (A) On October 2 with spasm of aneurism itself and adjacent arteries at bifurcation of left internal carotid artery. (B) On November 3 without spasm. Left lateral views: C as A; D as B. Arrows point to aneurism, internal carotid and middle cerebral arteries.