ANEURYSMS AT MIDDLE CEREBRAL "TRIFURCATION": TREATMENT WITH ADHERENT PLASTICS*

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Of the various intracranial arterial aneurysms, those of the middle cerebral artery have been among the least suitable for treatment by exclusion from the circulation. In the 13 consecutive cases reported here, each has involved the main trunk of the vessel and one or more of its major branches. In the author's opinion, none of these could have been treated by the placement of a clip or clips which would have excluded the entire sac from the arterial pressure, without sacrifice of one or more significant branches. It goes without saying that "trapping" of aneurysms of the middle cerebral artery rarely can be done without producing cerebral infarction, usually with important neurological deficit. We usually have been content, therefore, to obliterate with clips a portion of the sac, leaving those portions necessary for the maintenance of arterial flow, and wrapping the lot with muscle, fascia or gauze. Reasonable success has been attained by this method, but aneurysms in this location appeared to be ideally suited to treatment by adherent plastics.\(^1,2\) Since this method provides immediate reinforcement, does not compromise the lumen of the artery and appears to eliminate the possibility that a subsequent hemorrhage will produce a false aneurysm, it was decided to treat a series of aneurysms of the middle cerebral artery by the two-coat technique, previously described by Selverstone and Ronis.\(^3\) This technique provides a coat which is intimately adherent to the adventitia of the aneurysm and adjacent vessels, eliminating the possibility that hemorrhage may occur later into a potential dead space between the aneurysm and the reinforcing coat. Thirteen such aneurysms have been so treated by the author, several of which were generously referred by other members of the Harvey Cushing Society. In 6 cases, operations were done at clinics other than his own, and the author is especially grateful to Dr. James Poppen, with whom 3 of the operations were performed.

TECHNIQUE

With the patient's esophageal temperature at approximately 39°C., the aneurysm is explored in routine fashion, through a small anterior temporal craniotomy, ordinarily without preliminary exposure of the internal carotid artery in the neck. The internal carotid artery is identified intracranially, however, as soon as possible, in order that it may be occluded temporarily if necessary, should the aneurysm be ruptured in the course of its exposure. As Poppen has emphasized, however, preservation of the arachnoid overlying the vessel and the aneurysm will provide considerable protection against this complication. Should bleeding occur from the aneurysm, however, as it did in 6 of these cases, it has been relatively easy to repair the sac with one or more Penfield, McKenzie or Olivecrona clips. In so doing, no attempt has been made to accomplish more with clips than the provision of temporary hemostasis.

The vessel then is coated with adherent plastics, incorporating the clips within the plastics. Before coating, also, minute oozing from adventitial vessels on the sac or adjacent arteries has been controlled either with thrombin or with a minute drop of 3 per cent hydrogen peroxide, applied with the tip of a milliner's needle. Using an artist's airbrush with helium as the propellant gas, moisture on the surface is evaporated from the aneurysm and adjacent vessels, and a mist of a dilute microdispersion in water of polyvinylpolyvinylidene chloride copolymer is deposited (Fig. 1). The flow of fluid to the airbrush then is interrupted, and the material is dried in place in a few seconds with a stream of helium.\(^4\) This produces a dry, intimately adherent coat, which is then reinforced with the two-component epoxypolyamide resin previously described (Fig. 2). Poppen has suggested that gelatin foam, mois-


Fig. 1. Aneurysm of middle cerebral artery (Case J.H.), 10 days after hemorrhage. Hemorrhage occurred during dissection. A single Olivecrona clip has been placed on bleeding point. First coat (polyvinyl-polyvinylidene chloride copolymer) has been applied.

Fig. 2. Second coat (epoxy-polyamide) has now been applied. Note that the clip has been included in the coating. The patient is well 2½ years postoperatively.