Use of Plastic Adhesive for Reinforcement of a Ruptured Intracranial Aneurysm

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During the past decade, the feasibility of treating intracranial aneurysms with synthetic coatings has been investigated. Difficulties have been encountered in finding suitable materials and proper solvents, attaining optimal conditions of the surface, and developing techniques of instrumentation. One of the more promising substances, Eastman 910 monomer, has been under investigation by members of the Neurological Division of the St. Vincent's Hospital of the City of New York.

Eastman 910 monomer (methyl-2-cyanoacrylate) is a sterile, watery substance which requires no solvent. It polymerizes in the presence of moisture and pressure, forming an adherent film. This synthetic will bond securely a muscle patch to a site of arteriotomy capable of withstanding an intraluminal pressure over 300 mm. Hg. Modifications of this material have been used in the repair of blood vessels and other tissues. Carton et al. recorded the successful placement of a dural patch to a defect at the site of an aneurysm which had torn from the intracranial internal carotid artery. Recently the following case was seen by the authors.

Report of Case

A 34-year-old, right-handed, multiparous Negro female entered through the hospital emergency room on Aug. 28, 1962, complaining of severe headache and pain in her neck. This developed suddenly while she was in court that day, obtaining a marriage license for her daughter. With the onset of the pain the patient lost consciousness for an unknown period of time. A vague history of previous headaches and of questionable hypertension was also obtained.

Examination. The patient was an obese Negro female in acute distress, with malar rigidity, displaying a recalcitrant attitude. Her blood pressure of 134/76 mm. Hg at the time of admission to the emergency room rose to 160/100 mm. Hg. She demonstrated anisocoria. The right pupil was larger than the left, both pupils reacting to light directly and consensually. Funduscopie revealed no hemorrhages or papillae. No gross motor weakness was evident. The right knee and biceps jerks were brisker than those on the left. The right plantar response was not of typical flexor pattern.

A diagnosis of subarachnoid hemorrhage was supported by the lumbar-puncture finding of a bloody cerebrospinal fluid at a pressure of 290 mm. of water.

The patient was sedated, and a left carotid angiogram was performed, revealing an aneurysm of the left middle cerebral artery. The patient was uncooperative throughout the procedure and optimal films were not obtained.

Course. The patient was treated with total rest in bed and heavy sedation. The systolic blood pressure varied between 110-178 mm. Hg. On the 10th hospital day a gross right hemiparesis developed. Her speech lost its spontaneous quality, and she became incontinent. She continued to complain of severe headache. A definite dysphasia, principally expressive, was noted on the 14th hospital day and remained unchanged for the next few days. Contact with responsible relatives was made and they gave permission, together with that of the patient, for further study and surgery. Angiography revealed (Fig. 1) a wide-based aneurysm arising just proximal to the trifurcation of the left middle cerebral artery. The problem of managing the lesion with preservation of the vessel became evident. The patient and family were advised of the possible necessity of utilizing Eastman 910 monomer and they consented.

Operation. On Sept. 17, 1962, with Fluothane anesthesia, under hypothermic conditions, with the patient receiving a hypertonic solution of urea (90 gm. Urevert), the aneurysm was approached through a modified left frontal Frazier craniotomy wound. The middle cerebral artery was isolated at its origin from the internal carotid artery. The Sylvian fissure was dissected open, and the course of the vessel was followed. The aneurysm ruptured when approached. Hemorrhage was controlled readily by the surgeon (L.S.) with the application of a Mayfield temporary arterial clip at the origin of the middle cerebral artery. The aneurysm was exposed completely. Ooze from the point of rupture in the dome was stopped by applying a single McKenzie clip. The aneurysm was a thin-walled saccular deformity with a base approximately 5 mm. wide. Clipping appeared inadvisable because of probable encroachment upon the effective lumen of the vessel. Methyl-2-cyanoacrylate was applied to the lesion with a medicine dropper. The watery substance flowed over the lesion and the adjacent segment of vessel. A tampon of autogenous fascia was applied about the lesion (care being exercised in not touching directly the treated surfaces by surgical instruments). After 20 seconds the temporary arterial clip was removed. The vessel pulsed well and no bleeding was encountered. The total time of temporary occlusion was 4 minutes.

Postoperative course was uneventful. The hemiparesis tended to clear together with the dysphasia.

Postoperative angiography (Fig. 2) performed on Sept. 27, 1962 revealed the aneurysmal sac and the patent middle cerebral vessels.

Addendum. The patient last reported on April 4, 1963, and was found to be asymptomatic. She was functioning well, performing her duties as a housewife, and speaking and understanding well. On close examination a mild dysphasia was noted. There was no gross evidence of residual hemiparesis.
Discussion

Synthetics hold great promise in the treatment of intracranial aneurysms which by virtue of site or character do not lend themselves to management by current conventional means. The characteristics of methyl-2-cyanoacrylate appear well adaptable for this work. The material is a single substance without adjuvants; it is self-sterilized; its watery consistency allows it to spread over all exposed surfaces; it can be applied to a moist surface; and polymerizes rapidly for a firm bond. Handling the treated surfaces requires care. Silicconization of instruments (not done in the case presented) inhibits adhesion of the instruments to treated tissues.

A prolonged follow-up is necessary to determine the success of the management of this case. Certainly no untoward effect of the application of the Eastman synthetic is evident at this time. Without the use of adhesives in this case, standard operative techniques probably would have resulted in compromise of the middle cerebral artery on the dominant side.

Summary

A ruptured aneurysm of the left middle cerebral artery, treated with Eastman 910 monomer (methyl-2-cyanoacrylate), because of the emergency of the situation, has been presented.

References

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