Late Thrombosis Following the Use of Autogenous Fascia and a Cyanoacrylate (Eastman 910 Monomer)* for the Wrapping of an Intracranial Aneurysm

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Various synthetic materials have been evaluated for the wrapping or reinforcement of intracranial aneurysms in instances in which the lesion does not lend itself to clipping. We have had particular difficulty in applying some of the synthetic reinforcing agents because of poor adherence and prolonged setting time. Difficulty has also been experienced in safely exposing the aneurysm sufficiently to allow a total coating with these materials. This has been particularly true when the aneurysm lies adjacent to the motor-stripe or the motor-speech area where resection of brain for exposure is considered inadvisable. Eastman 910 Monomer in combination with other materials has been under evaluation in the laboratory as an improvement upon the reinforcing materials now in use.

In our laboratory, Eastman 910 Monomer has been used successfully to produce adhesion between fascial strips and blood vessels; particularly to the inferomedial surface of such vessels in animals without the necessity of wide exposure. Our initial step has been to slide the piece of autogenous fascia beneath the vessel. A small amount of monomer is then placed on the surface of the vessel with a camel-hair brush, and the material is allowed to flow onto the areas of the vessel not seen clearly and onto the underlying fascia. After waiting approximately 20 to 30 sec., pressure is applied with a siliconized instrument from outside the fascial strip toward the vessel to be reinforced. A good bond has always been observed within a matter of 2 min. without the necessity of obtaining a particularly dry field. Additional strips of fascia have then been applied in the same manner to provide multiple areas of reinforcement, such as would be desirable in dealing with an aneurysm. By brushing generous amounts of the monomer on the vessel and then covering it with the previously placed fascia, the fascia has acted as a protective shield for surrounding tissue during the act of applying the monomer, and should preclude the damaging local effects pointed out by Kline and Hayes.2

The use of this technique on a patient with an intracranial aneurysm is illustrated by the following case, in which the complication of late thrombosis of the major feeding artery and the aneurysm occurred.

Case Report

A 48-year-old married, right-handed, white female was well until December 1961, when she began to have frequent occurrences of left-sided headaches. In February 1963 she lost consciousness while shopping. This episode lasted only a few min. but nausea and vomiting were noted postictally for about 1 day. There was no unusual headache associated with this episode. Two weeks later she experienced a transient episode of motor-apraxia with some associated loss of memory and confusion. On May 20, 1963, the patient suddenly lost consciousness and became deeply comatose. She gradually regained consciousness for a 5-day period and she was admitted to our service.

Examination. Upon admission the patient was moderately cooperative and aware of her surroundings. There was no evidence of motor weakness or aphasia. She had a severe headache and definite nuchal rigidity. Prior to arteriography her conscious state and neurological status had returned entirely to normal.

Left carotid angiography revealed a large aneurysm of the left middle cerebral artery, fusiform in shape (apparently with some formation of thrombus in it) arising at the trifurcation (Fig. 1). No demonstrable aneurysmal neck was seen on the films. Cross-circulation films demonstrated patency of the anterior communicating artery with filling of the contralateral anterior cerebral artery.

Course. It was decided to attempt occlusion of the aneurysm by clipping if a neck could be found at operation. If this was not feasible, the use of one of the synthetic reinforcing materials or possibly reinforcement by the use of autogenous fascia and 910 Monomer was discussed with the patient preoperatively.

Operation. A left frontotemporal craniotomy was performed on June 7, 1963. Careful dissection and retraction of the frontal lobe disclosed a 5×2.5 cm. fusiform aneurysm of the middle cerebral artery lying in the sylvian fissure at the level of the trifurcation (Fig. 2). It was much larger than it had appeared on angiographic films. From palpation, it was evident that the thrombus was in the more posterior portion of the aneurysm, and that the anterior or exposed surface of the aneurysm was the weakened area. A small daughter aneurysm was seen here on the surface. We were not able to find a definite neck to clip. Because of the size and location of the aneurysm it would have been necessary to sacrifice a considerable amount of the adjacent speech area and

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motor area in order to expose the aneurysm sufficiently for the application of one of the synthetic resins or rubbers, so it was decided to utilize reinforcement with autogenous fascia and Eastman 910 Monomer. Temporal fascia was excised and cut into small squares. Squares of fascia were placed along the posterior, superior and inferior walls of the aneurysm. Then small amounts of Eastman 910 Monomer were brushed onto the aneurysmal sac and surrounding fascial squares. The fascial squares were then folded onto the surface of the aneurysm, and held there under pressure with siliconized instruments. A total of 5 pieces of fascia was used to wrap the aneurysm and only in the inferior portion did we feel that the aneurysm was not completely surrounded (Fig. 3). Some of the Eastman 910 Monomer was adherent to the main trunk of the middle cerebral artery following wrapping.

Course. Postoperatively the patient had an uneventful course with no loss of motor power or speech and no elevation of temperature. The patient was discharged 10 days postoperatively.

On July 18, 1963, approximately 5 weeks after operation, the patient experienced sudden onset of an incomplete right hemiparesis and some aphasia. She had no headache and no nuchal rigidity. She was readmitted immediately for evaluation.

Physical examination at that time revealed a rather profound sensory and motor aphasia although she could say simple things and understand simple commands. There was an incomplete right hemiparesis involving the face, arm and leg. Left carotid arteriography 2 days after admission revealed a complete occlusion of the first portion of the left middle cerebral artery. Neither the distal portion of this artery nor the aneu-

![Fig. 1. Preoperative anteroposterior and lateral cerebral angiograms.](image1)

![Fig. 2 (above). Aneurysm before wrapping.](image2)

![Fig. 3 (below). Aneurysm after wrapping.](image3)
The etiology of the thrombosis of the middle cerebral artery (and presumably the aneurysm) is of interest. It is possible that mechanical handling of the aneurysm resulted in further propagation of the clot already present. A temporary Mayfield clip was placed on the middle cerebral artery for 30 sec. during exposure of a portion of the aneurysm. Damage of the intima and spasm of the artery could have followed this placement. We have, however, seen thrombosis of an aneurysm and its major feeding vessel occur only very early in the postoperative course following such mechanical handling.

In the extensive literature concerning the use of Eastman 910 Monomer in small-vessel surgery, thrombosis caused by the use of the material itself has not been reported, nor have we observed this in the laboratory animal. Carton et al. have reported satisfactory results with a fascial patch on the intracranial internal carotid artery. Likewise, Messer et al. utilized this cyanoacrylate successfully in reinforcement of an intracranial aneurysm. We, therefore, do not implicate the material itself in the outcome of this case.

An alternative explanation for this thrombosis could be postoperative shrinking of the mass of monomer and fascia, with resultant occlusion of the aneurysm and the middle cerebral artery. Contracture of autogenous fascia and Eastman 910 Monomer applied to blood vessels in this manner has not been seen by us in the laboratory animal. However, the total bulk of fascia and monomer used to surround this large lesion was much greater than that which was used in experimental situations. The elevation and stretching of the supraclinoid portion of the internal carotid artery as seen in the postoperative angiogram (Fig. 4) would lend some evidence that such a contracture might have taken place, exerting an upward pull on the siphon. However, without post-mortem evidence there is no definite explanation that we can offer for this complication of surgical therapy.

**Summary**

Late postoperative thrombosis of an intracranial aneurysm and its feeding vessel followed wrapping with temporal fascia and Eastman 910 Monomer. Methods of wrapping and possible cause of the thrombosis have been discussed.

**References**