

# LATERAL VASCULAR ANASTOMOSIS.

AN IMPROVED METHOD.

BY BERTRAM M. BERNHEIM, M.D.,

AND

HARVEY B. STONE, M.D.,

OF BALTIMORE, MD.

(From the Hunterian Laboratory of the Johns Hopkins University.)

IN the course of an experimental study of arteriovenous aneurisms, concerning certain physiological and surgical problems presented by these lesions, the method herein to be described was developed for making lateral anastomoses between blood-vessels. It is published because it seems superior to previous procedures, either for experimental or clinical purposes. A brief description is all that is necessary to supplement the illustrations.

The artery and vein between which the communication is to be established are carefully dissected out, and bull-dog or Crile clamps, rubber-shod, are applied to each vessel at corresponding points. The incision in the artery is made first. A sharp cataract knife, held transverse to the long axis of the vessel, is plunged through the artery in a direction oblique to the horizontal plane in which the vessel lies, so as to form a sector of the lumen with its arc equal to about one-third of the circumference. The knife is thrust in with its cutting edge upward and toward the adjacent vein. The overlying one-third of the artery wall is then divided (Fig. 1). At once the retraction of the longitudinal muscle and elastic fibres causes this transverse incision to gape and become an open ovoid (Fig. 2). Owing to the fact that the knife was entered obliquely and not perpendicularly, this ovoid looks toward the vein and also somewhat upward. The posterior edge of the opening is thus easily accessible for suturing. As soon as the artery is opened all blood is

washed out with salt solution, the adventitia stripped off carefully, and the lumen and other surfaces freely bathed with liquid vaseline. These are precautions common to all vascular surgery—thanks to Carrel—but demand restatement because of their importance. The artery is then protected with vaseline-soaked gauze, and a similar incision, corresponding in size and position, is made in the vein so that it looks toward the artery and upward.

The suture<sup>1</sup> is started by passing the needle through the wall of the artery from without inward, then crossing to the vein and passing here from within outward (Fig. 3).

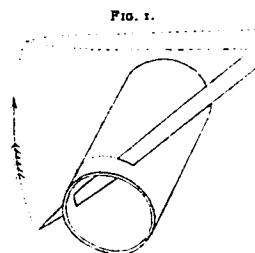


FIG. 1.  
Introduction of knife and direction of incision.



FIG. 2.  
Gaping of transverse incision.

When this suture is tied the knot lies outside the vascular lumen (Fig. 4). From this starting point a simple continuous suture is carried around the openings in the two vessels (Figs. 5 and 6), care being taken to avoid purse-stringing. The operation is completed by tying the last suture to the remaining long end of the first tie. No difficulty is experienced in approximating the edges of the incisions, and there is no more tension on the thread than in an end-to-end anastomosis. After completion of the suture, the clamps are removed first from the vein, as in all vascular

<sup>1</sup>The suture material consists of a straight needle, size 12, ground down, and silk, size .00000, which has been sterilized in vaseline.

surgery. If any marked leakage occurs, the weak spots are reinforced by one or two extra sutures. Then the arterial flow is gradually allowed to go over. During the suturing, intima is not always approximated to intima, but with the establishment of the arterial stream through the anastomosis, the "pull" in opposite directions between the two vessels helps to bring about an accurate approximation.

This method has been employed with great satisfaction a considerable number of times in animals, and was equally simple in execution in the one clinical case in which we have so far had the opportunity to try it. After an interval now of three months, this patient's anastomosis is working splendidly. It is intended to report this case in detail later, with several other clinical cases in which other methods of arteriovenous anastomosis have been used. The rationale of this method has been deduced from a consideration of the cases of arteriovenous aneurism met with in the clinic. Previous laboratory anastomoses have been performed by making longitudinal incisions in the vessels rather than transverse. In the clinical cases following trauma there seems little doubt that the wounds are transverse. A bullet, knife-blade, or other object wounds the adjacent surfaces of artery and vein at the same level. The vessels are held closely together by their investing sheaths, the transverse incisions gape, as illustrated in these sketches, and the gaping lips soon adhere. The method described in this paper is practically a copy of this accidental anastomosis occurring in nature.

We think that this anastomosis, with a ligation of the vein on the cardiac side of the point of union, offers a much easier and safer method for reversal of the circulation than the present procedure of end-to-end anastomosis of artery and vein, with ligation of the proximal stump of the vein and the distal stump of the artery. When the latter method is used a failure of the anastomosis imperils the knee or elbow, owing to the complete division of the arterial trunk: and as a rule the disease process which leads one to do an

FIG. 3.

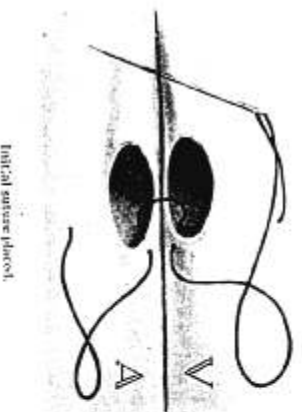


FIG. 4.

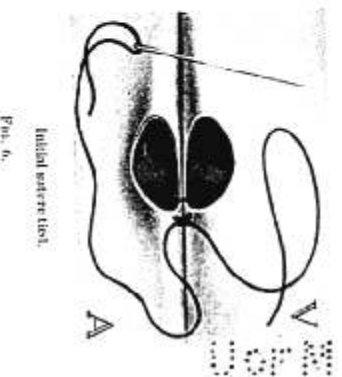
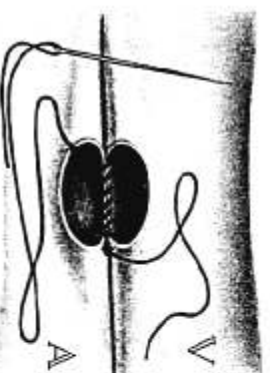
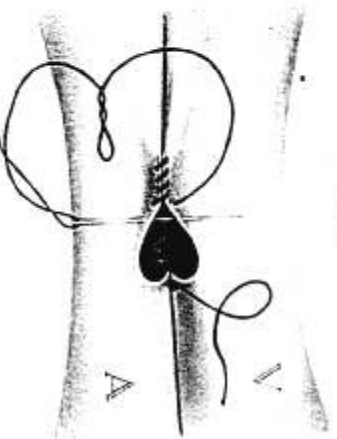


FIG. 5.



Posterior part of suture completed and about half of anterior part placed.



arteriovenous anastomosis is not in itself so advanced as to threaten the larger joints. In the few experiments with the new method in which thrombi developed, they never obliterated the arterial lumen, but were entirely lateral. Moreover, by this procedure, the inflow of blood into a threatened extremity still has whatever arterial channels remain patent, and the venous trunk in addition may be utilized to carry some of the needed excess. It is important to ligate the vein above the anastomosis, to protect the heart from a direct back flow of blood under arterial pressure into its right chamber.

In brief conclusion, this method is presented because of its easy execution, making it superior to the longitudinal incision for experimental work, and because of its safety, making it better than the end-to-end for reversals of the circulation and other clinical conditions.