

Anastomosis of Auricular Appendages in Dogs.* (19211)

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It has been suggested that relief of pulmonary edema in certain instances of mitral stenosis may be accomplished by the establishment of an artificial Lutembacher's syndrome. This suggestion would entail the production of an interatrial septal defect or its equivalent to provide a safety valve for the left auricle during periods of especially high pressure, so that congestion of the lungs would be prevented(1,2). In addition to the use of an interatrial defect, or its equivalent in the above mentioned instance, it has been suggested that its presence in certain congenital cardiac malformations is desirable for prolongation of life(3). The production of this defect, by direct attack on the interatrial septum itself, has met with more failure than success. The reasons for this difficulty have been due to the following: 1. Blind approach necessary. 2. Tendency for defects to close spontaneously.

It occurred to us that a form of interatrial septal defect might be produced that would avoid both of the difficulties mentioned, namely, the direct anastomosis of the auricular appendages. The purpose of this presentation is to test this latter thesis experimentally.

Methods. These experiments were carried out in dogs in 3 series. In each series, the dogs were anesthetized with nembutal and with the use of an intratracheal tube and positive pressure, inflation of the lungs was maintained. Under aseptic conditions the right chest was entered through the fourth interspace. The right lung was carefully packed out of the field and the pericardium entered. The right auricular appendage was then delivered and a Blalock vascular clamp placed around its base. The left auricular appendage was then also delivered by slightly rotating the heart. A similar clamp was then placed

about its base. One of the following 3 procedures was then undertaken:

Series I. *Direct anastomosis of auricular appendages.* The ends of the appendages were resected. Traction was then applied to both clamps and the two open ends of these organs approximated. An everting type of anastomosis with 6-0 arterial silk was then done. Interruption of the continuous suture was accomplished at 3 places, so a purse-stringing effect would be avoided. The clamps were then removed, and only a fair flow of blood was felt going through the anastomosis from left to right. A thrill could be palpated at the site of anastomosis. The chest was then closed in the usual manner. Series II. *Vein or arterial graft between auricular appendages.* Segments of preserved inferior vena cava vein or aorta(4) were inserted between the appendages by means of an everting mattress suture, or by the non-suture technic of Blake-more(5). When the latter technic was used, the necessary cuffs were constructed of finely polished lucite. Series III. *Lucite prosthesis between the two auricular appendages.* Finely polished lucite prostheses were inserted between the two appendages. These tubes were so constructed so as to have a small flange at each end, around which the appendage was tied with a single suture. The sizes of prostheses used were a 3 cm length with 3 mm internal bore, and a 2 cm length with a 2 mm bore. After these tubes were tied in place to both appendages, the pericardium was then sutured together above the area. When the Blalock clamps were removed, arterial blood could be seen coursing through.

Results. Series I. *Direct anastomosis.* Four dogs were used in this series. The animals were sacrificed after a period of 2 months. Post-mortem examination revealed that all but one of the anastomoses had developed stricture and were therefore occluded. In the one animal with a patent opening, the sutures could be seen from within, covered with a lining of epithelium. It appeared as if the

* This work was supported by a research grant from the National Heart Institute of the National Institutes of Health, U. S. Public Health Service, and a grant from the Graduate School of the University of Minnesota.

anastomosis was not carrying a good shunt of blood, but some apparently was coursing through. A point of note in all the animals was that the auricular appendages seemed to be under tension and thus the soft wall of anastomotic area was collapsed.

Series II. *Vessel graft between auricular appendages.* Five dogs were used in this series. In 2 of the animals the non-suture technic was used, and in the remaining 3, suture method was used. After a period of from 1 to 2 months the animals were sacrificed. All of the communications were thrombosed. In the non-suture method, it was noted that though the vessel grafts were intact grossly, a stricture-like effect had occurred at each end of the graft on the adjacent atrial wall. Thrombus blocked the tiny openings that remained. Whether the stricture occurred as a result of an inflammatory reaction to the lucite "cuffs," or of the tendency for the atrial wall to undergo stricture because of its muscular thickness, is not known at this time.

Series III. *Lucite prosthesis.* Four dogs were used in this series. After a period of from 1 to 2 months the animals were sacrificed. Thrombosis had occurred in each of the communications. It was noted that though thrombus was present at each auricular end, the prostheses themselves, contained material (serum?) of a liquid character. The tubes and the appendages were firmly connected and could not be separated except by sharp dissection. A thin layer of smooth, fibrous tissue lay immediately adjacent to each tube.

Comment. It is apparent from these experiments that though the possibility of the crea-

tion of an interatrial communication by the anastomosis of auricular appendage exists, the problem of thrombosis is a major one. However, it must be mentioned that the above experiments were carried out in normal dogs, and in these animals the pressure differential between the left atrium and the right atrium is very small (2-4 mm Hg). Such a small differential is not conducive to a good flow of blood, which in turn, is necessary in vascular anastomoses. It is possible that in mitral stenosis, where a differential of 25-40 mm of Hg is obtained, the anastomoses will remain open. Intubation of the thoracic aorta with lucite has been accomplished successfully in the dog(6) and the success of this would seem to be due to the excellent flow of blood in this vessel, thus preventing stasis and thrombosis.

Summary and conclusions. (1) Methods of producing interatrial communications by anastomosis of the auricular appendages are presented. (2) These methods are technically feasible. (3) Thrombosis has prevented the functioning of these communications for as long as 1 or 2 months.

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Received October 18, 1951. P.S.E.B.M., 1951, v78.