

mal group. It was also observed that the colon of the rachitic group was of the atonic type, often markedly distended and lowly situated.

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Further Observations on Experimentally Produced Arteriovenous Aneurysm.*

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Arteriovenous aneurysm studies which we have been pursuing have yielded findings, difficult of immediate interpretation. We found¹ the cardiac shadow uniformly enlarged on immediate post-operative fluoroscopic examination and confirmed this with roentgenograms. These dogs had been completely anesthetized with large doses of sodium barbital, and apparently as a result the postoperative pulse rates were slower. Later we found the heart size actually decreased immediately after opening of an A-V fistula. These latter dogs had been anesthetized with ether, and their heart rates were high. Ten dogs submitted to general anesthesia for abdominal operations for the production of intestinal adhesions, with gauze and iodine, were studied before and after the induction of anesthesia and operation. There was usually a decrease in the cardiac size, especially in the region of the right ventricle. The decrease was related to the height of the rise in the heart rate. In a few of these dogs in which the heart rate remained low there was little or no decrease in heart size.

In order to study the mechanism of the thrill and the effects of the lesions, 3 types of arteriovenous aneurysms have been produced. The original type I, commonly made and observed clinically, is the side to side anastomosis with a fistula between artery and vein. The second type II consisted in suturing of the proximal end of the artery into the side of the vein, thus adding the total arterial output of the specific artery to the venous return volume of the specific vein. The third type III was produced by suturing the proximal end

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¹ Gage, I. M., and Herrmann, George, *Proc. Soc. Exp. Biol. and Med.*, 1928, **xxv**, 765, 767.

of the artery to the proximal end of the vein, ligating the distal segment of the vein as well as that of the artery.

These types of A-V aneurysms were made in the accessible peripheral arteries, in the carotid arteries and jugular veins, femoral arteries and veins. The side to side anastomoses were also made between the aorta and the inferior vena cava. The thrill was most uniformly prominent and propagated most widely in the side to side anastomoses in the carotid-jugular fistulae and usually also fairly widely in the femoral fistulae. One femoral side to side anastomosis presented no thrill, and in this instance the affected leg became gangrenous. In 3 side to side unions between the aorta and inferior vena cava, a thrill was never elicited immediately after the anastomosis was completed but developed later.

A rapid oscillation of the vein segments was studied in the various types of A-V fistulae by placing upon the vessel segment a minute cone of oiled cotton drawn out at its tip to fine fibrils to act as an indicator. The fine vibrations were detectable along both arterial and venous segments. In the first type in both systole and diastole, in the other 2 types only in systole. Clamping the proximal vein caused the disappearance of the oscillatory movement in the distal vein, while clamping the distal vein decreased slightly, but did not remove the vibratory movement of the vessel wall.

In the end to side (type II) and in the end to end (type III) anastomoses, the thrill and bruit were for the most part confined to systole with very slight if any continuation into diastole. In some of the type III unions it was not detectable at all. In the type III of end to end anastomoses between the carotid and jugular, the collapse of the latter venous segment was noted during inspiration. The changes in the heart shadow, immediately and later, were not extensive enough to be considered definite and not at all comparable to those described for the other types.

Complete pericardiectomy preceding the production of arteriovenous aneurysms of the various types has thus far not presented any evident changes in the clinical manifestation of experimental arteriovenous aneurysms.