PARTIAL OCCLUSION OF THE PULMONARY AORTA AND INFERIOR VENA CAVA WITH THE METALLIC BAND. OBSERVATIONS ON CHANGES IN THE VESSEL WALL AND IN THE HEART.

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PLATE 10.

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In 1916, some results of the application of metallic bands to the aorta of dogs were reported.1 Later in the fall of the same year, constricting bands were applied to the common pulmonary artery, and, a year afterwards, marked constriction of the inferior vena cava was produced. The purpose of the present paper is to report the results of applying bands to the pulmonary artery and vena cava.

Under ether anesthesia constricting bands were placed on the common pulmonary artery of five dogs. Four of them died within a month as a result of distemper, intussusception, or injuries from fighting. No death was attributable to the effect of the constricting band. One dog (A 19 operated upon November 29, 1916) lived and was kept under observation for a period of 30½ months. In no way did its general health appear to be affected.

At operation the diameter of the pulmonary artery at the site of application of the band was 13½ mm.; the external diameter of the band, the ends of which overlapped markedly, was 10 mm.; the width of the band was 5 mm.

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Frequent x-rays of the heart did not give any evidence of an increase in size of the cardiac shadow. June 18, 1917. The electrocardiographic report was: “Marked sinus arrhythmia, otherwise a normal mechanism. P-R interval measures 0.10 second. P wave of normal amplitude, measuring 1.6 mm. T wave of large amplitude in Leads II and III, measuring 5 mm. No evidence of right or left ventricular preponderance.” A second report, October 10, 1917, was: “Abnormal form of T wave. Sinus arrhythmia.” A loud systolic bruit could be heard over the entire chest immediately following the operation and this remained present until the animal was sacrificed. No murmur could be heard previous to operation.

June 19, 1919. Under ether anesthesia, the femoral arterial blood pressure measured 107 mm. of mercury; the femoral venous pressure, 6 cm. of water. The animal was sacrificed. The heart weighed 137 gm., which is heavier than normal for a dog weighing only 12½ pounds. The right ventricular wall measured 1 cm., the left 1½ cm. Grossly and histologically, both ventricular walls looked very much alike. The hypertrophy of the right ventricle was apparently unassociated with any cardiac dilatation (Fig. 1). The valves of the heart were normal.

The band had produced a marked constriction in the lumen of the artery (Fig. 1). Proximal to the band the artery was large (diameter 15 mm.) and its wall was definitely thickened; distal it was of normal size (diameter 10 mm.) but the vessel wall appeared thin. The band had cut through the pulmonary artery on the side next to the thoracic aorta. A strong repair of the wall had occurred outside the band. The arterial wall surrounded by the band was in surprisingly good condition when we consider that the band had been present for 2½ years; for it is our experience that in the case of the thoracic or abdominal aorta, the wall would long before have died. Histological sections showed normal elastic tissue crossing under the band. The elastic tissue in the proximal portion of the artery was markedly increased, while distal to the band, it seemed much reduced (Fig. 2).

In many animals we placed constricting bands around the vena cava. When after several months these bands were removed there had not occurred any demonstrable gross or histological changes in the vessel wall. The folds of the intima even had not become adherent.
SUMMARY.

In dogs a constricting metallic band does not affect the integrity of the wall of the vena cava, whereas it leads to a rapid death of the wall of the aorta, and, as evidenced by a single instance studied, to a much slower death of the pulmonary artery. In the instance, just mentioned, constriction of the common pulmonary artery by an aluminum band for a period of 2½ years led to a right ventricular hypertrophy.

EXPLANATION OF PLATE 10.

Fig. 1. Result, after 2½ years, of constricting band on the pulmonary artery. Observe the marked constriction caused by the band (A) and the enlargement of the right ventricle.

Fig. 2. A longitudinal section of the pulmonary artery through the site of the band. Note the hypertrophy of the elastic wall proximal, and its atrophy distal to the band. Weigert's elastic tissue stain.
FIG. 1.

FIG. 2.

(Reid: Partial occlusion of pulmonary aorta.)