started at the same point and traveled either along different routes, or at varying rates along the same route.

Complete heart-block without anatomical lesion in the auriculo-ventricular system may possibly be of neurogenic or of circulatory origin, or it may be ascribed to chemical agents, to asphyxia, or to some hindrance to the passage of impulses from the terminal arborizations of the conducting system to the ventricular musculature.

A previous example of possible functional heart-block was reported by Dr. Alfred Cohn.[1] In his case of transient complete dissociation showing constantly varying ventricular complexes, the patient recovered, so that there was no opportunity of determining whether or not there was an organic lesion in the auriculo-ventricular system.

58 (754)

Methods for the production of temporary valvular lesions.

By CARL J. WIGGERS and EUGENE F. DU BOIS.

[*From the Physiological Laboratory, Cornell University Medical College, New York City.*]

Experimental valvular lesions have been induced by a number of investigators—stenoses by tightening of ligatures or clamps about the valvular orifices, insufficiencies by tearing of valves with sounds and glass rods or by cutting with specially constructed valvulotomes. Such experimental stenoses may, if desired, be temporary, and normal circulatory conditions may be subsequently reëstablished. Experimental insufficiencies such as have been described, must, owing to the traumatic nature of the lesion, be permanent. As no method for the production of temporary insufficiencies has apparently been described, the following method, which also permits a study of the intraventricular pressure changes, was devised.

Method.—A curved metal catheter (22 cm. long, internal diameter 6 mm.) having toward the tip one or two openings (6 mm. in diameter) and three centimeters from the tip a longi-

[1] Cohn, PROC. SOC. FOR EXPER. BIOL. AND MED., Vol. IX, No. 2, p. 24, December, 1911.

tudinal slot (6 mm. wide and 25 mm. long) is fitted with a lubricated rubber tube (4 mm. internal diameter) so as to occlude the longitudinal slot. To produce aortic insufficiency, the metal catheter with its rubber obturator is introduced, free from air and without hemorrhage, into the left subclavian artery and aorta. The catheter is so adjusted by palpation that the valves close about it near the middle of the occluded slot in the catheter. The inner rubber tube may now be connected directly with a manometer.[1] Aortic pressure records with Frank's manometer show that a catheter of such size that it can be introduced into the subclavian does not impede the systolic discharge so as to cause stenosis in the physiological sense. By drawing out the obturating rubber tube to such an extent that the slot is opened, a valveless circuit with a minimal resistance is established between aorta and ventricle. The intraventricular pressure may still be recorded.

Upon entirely withdrawing the metal catheter, normal conditions are restored. By inserting the catheter through the auricular appendage, the method may be used to induce mitral regurgitation. Postmortem examination of six hearts showed no damage of the valves.

The advantages of being able to produce temporary valvular insufficiencies are several:

1. It permits the consecutive demonstration of all valvular lesions and their circulatory effects on the same animal. In such a series of demonstrations we produce mitral and tricuspid stenosis by simple invagination of the auricular wall into the auricular ventricular openings with a finger.

2. By subsequently reëstablishing normal conditions, it permits a control of the reflex circulatory and respiratory disturbance incidental to the production of experimental valvular lesions. It is quite possible for such reflex effects to entirely overshadow or complicate the mechanical effect of the lesion and, unless so controlled, the results cannot be considered comparable to clinical lesions.

[1] In the case of Frank's optical manometer, the connection can be made rigid and without elastic connection.