Visualization of the Left Branch of the Human Atrioventricular Bundle

By HERMAN N. UHLEY, M.D., AND LAURENCE M. RIVKIN, M.D.

Visualization of the atrioventricular node and bundles of His in the human heart has been very difficult in the past, so much so that the very existence of specialized conducting tissue in man has been questioned. The authors present a simplified technic permitting visualization of the left bundle of His that facilitates studies in this area.

THE atrioventricular bundle in the human heart has been extremely difficult to visualize. Methods of dissection have been described, but the procedure is largely limited to the hands of experts. A simple method for visualizing the bundle system would be of invaluable aid to all persons interested in the conduction system. It is the purpose of this paper to demonstrate a technically simple means by which the left branch of the conduction system may be readily visualized in the human heart.

METHODS

The use of Lugol's solution to bring out glycogen in histologic studies is well known and iodine staining to demonstrate the conduction system in dogs has been described. The technic employed consists of swabbing the endocardial surface of the human heart with cotton soaked in aqueous Lugol's iodine solution. The single essential point is that the hearts must be examined shortly after death (within 1½ hours), for the reaction depends upon the glycogen present in the conduction system and glycogen disappears at a very rapid rate after death. Within 2 to 5 minutes after contact with the Lugol's solution the left bundle appears just beneath the endocardial surface of the septum as a series of bluish radiations. Washing with water removes excessive Lugol's solution and the bundle stands out more clearly. The hearts were photographed and then fixed in absolute alcohol.

Sections of the blue-appearing areas were stained with Best's carmine to demonstrate the presence of muscle fibers rich in glycogen.

RESULTS AND DISCUSSION

Figures 1 and 2 are photographs of the septal surface of the left ventricle. Although photographic reproduction fails to produce as much contrast as is apparent on direct visualization, a band of tissue can be distinguished extending downward from the posterior leaf of the aortic valve. About one third of the way down the fibers divide into 2 branches. The anterior branch continues through the trabecular network to the posterior papillary muscle. The left branch lies close to the endothelial surface and during application of the Lugol's solution one notes that a more intense color appears if the endothelium is carefully removed. Since the main bundle and most of the right bundle are deeper structures, they are not visualized with superficial staining. In addition to the time factor, the type of disease process may influence the rate of depletion of the bundle glycogen and consequently the intensity of the stain. The best results were obtained in diseases in which death came suddenly, i.e., myocardial infarctions (not involving the main branches of the conduction system) in contrast to uremia and carcinoma. Perhaps the appearance of bundle-branch block in the electrocardiogram taken during an agonal state may be related to glycogen alteration in the bundles.

From the Harold Brunn Institute and Department of Surgery, Mount Zion Hospital and Medical Center, San Francisco, Calif.

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Fig. 1. Left ventricle of a human heart depicting the stained left branch of the bundle of His and its ramifications.

Fig. 2. Upper portion of the left ventricular septum showing the left bundle as it divides into anterior and posterior branches.
Summary

The direct application of Lugol’s solution to the endocardial surface of a fresh heart (within 1 1/2 hours after death) from a patient who did not have a glycogen-depleting illness, provides an excellent means of grossly identifying the left bundle of the conduction system. The technic has obvious applicability in electrocardiographic and clinical-pathologic correlations.

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Summario in Interlingua

Le application directe de solution de Lugol al superficie endocardial de un corde fresc—intra un hora e medie post morte—ab un patiente non afficite de un morbo a deple- tion de glycogeno provide un medio excel lent pro le identification macroscopic del fasce sinistre in le systema de conduction. Le technica ha obviamente applicationes in es tablir correlationes inter constatationes electrocardiographic e clinico-pathologic.

References

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