PATHOLOGICAL BASIS OF CONCEPT OF LEFT HEMIBLOCK

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I. INTRODUCTION

The electrocardiographic manifestations of conduction blockade within the atrio-ventricular junction and along the main stems of the right and left bundle branches have long been recognized and accepted by cardiologists. The concept of fascicular or divisional blocks involving only part of the left bundle branch fibers was first mentioned by Rothberger and Winterberg in 1917 (702). It was not until the late sixties that Rosenbaum et al. introduced this concept into clinical electrocardiography (686). These authors described the left branch as divided into two fascicles along which the transmission of impulse could be blocked separately. In their terminology, conduction delay along the left anterior or posterior subbranches are referred to as anterior or posterior hemiblock. These abnormalities can easily be diagnosed by the dramatic frontal axis shifts which they produce.

In recent years, the concept of left hemiblocks has given rise to some controversy. Different authors have questioned the bifascicular nature of the left branch (353, 700, 849, 871). In support of their opinion, they quoted older and more recent publications written mostly by anatomists who described the left bundle branch as a fanlike structure (871) or as composed of three, rather than two main radiations (49, 200, 658, 702, 748).

In addition, several histopathologists have insisted that they were unable to confirm the specific location of the left bundle branch lesions responsible for left anterior hemiblock (78, 700).

The purpose of the present report is to review these criticisms and to discuss them on the basis of data gathered in our Institution relating to the normal anatomy of the left bundle branch and the pathological significance of left hemiblocks.

II. NORMAL ANATOMY OF THE LEFT BRANCH

a. Techniques and results

The anatomy of the left branch was studied in 26 canine and 49 human hearts. In the dog, detailed pictures of the peripheral conducting system may be obtained with relative ease by means of iodine staining of the specific fibers (848). In the pictures which we obtained by this method, (fig. 1), the origin of the left bundle branch always appeared as a ribbon which quickly broadened out to form a wide open angle limited by the anterior and posterior radiations. These two subbranches headed towards the corresponding...
Fig. 1. Photographs of the left bundle branch, stained by iodine, in four canine hearts. The anterior (A) and posterior (B) subdivisions are easily identified in each case. These two ramifications travel towards the corresponding anterior (apm) or posterior (ppm) papillary muscle. In the first instances (left upper corner), the midseptal area (S) is covered by a complicated network of interconnected fasciculi emerging from the two external subbranches. In the other 3 cases, a third central ramification is observed. It is formed by the meeting of rami given off by the anterior and posterior radiations. In the 3rd example (left lower corner), the contribution of the anterior fasciculus seems to be predominant. In the last instance, the midseptal ramification comes mainly from the posterior offshoot. Ao = aortic valve.

papillary muscle; they frequently gave rise to false tendons, and continued, across the papillary muscles, onto the left ventricular free wall. Individual variations were observed as regards the distribution of the septal fibers running inside the angle formed by the two external radiations. In 11 cases, the septum was covered by a complicated network of highly interconnected fasciculi emerging from both the anterior and posterior ramifications. In the 15 remaining hearts, the anterior and posterior fascicles gave off, more or less distally, one or several fairly large rami which joined over the midseptal surface to form a third central subdivision. The latter produced in its turn numerous small strands covering the septum. In seven of these cases, the contribution of the posterior subbranch to the midseptal fascicle was clearly predominant. Extensive anastomoses between the various structures were consistently observed at the periphery.

In the human, it is unfortunately almost impossible to perform similar staining of the conducting tissue and one has to resort to the method of serial histological studies (774,847). In our laboratory, the septum is sectioned serially in a plane parallel to the atrio-ventricular ring (188). Such an angle of cutting provides transverse sections of the peripheral