INCIDENCE OF HEMIBLOCKS IN RECENT CARDIAC INFARCTION

THESIS

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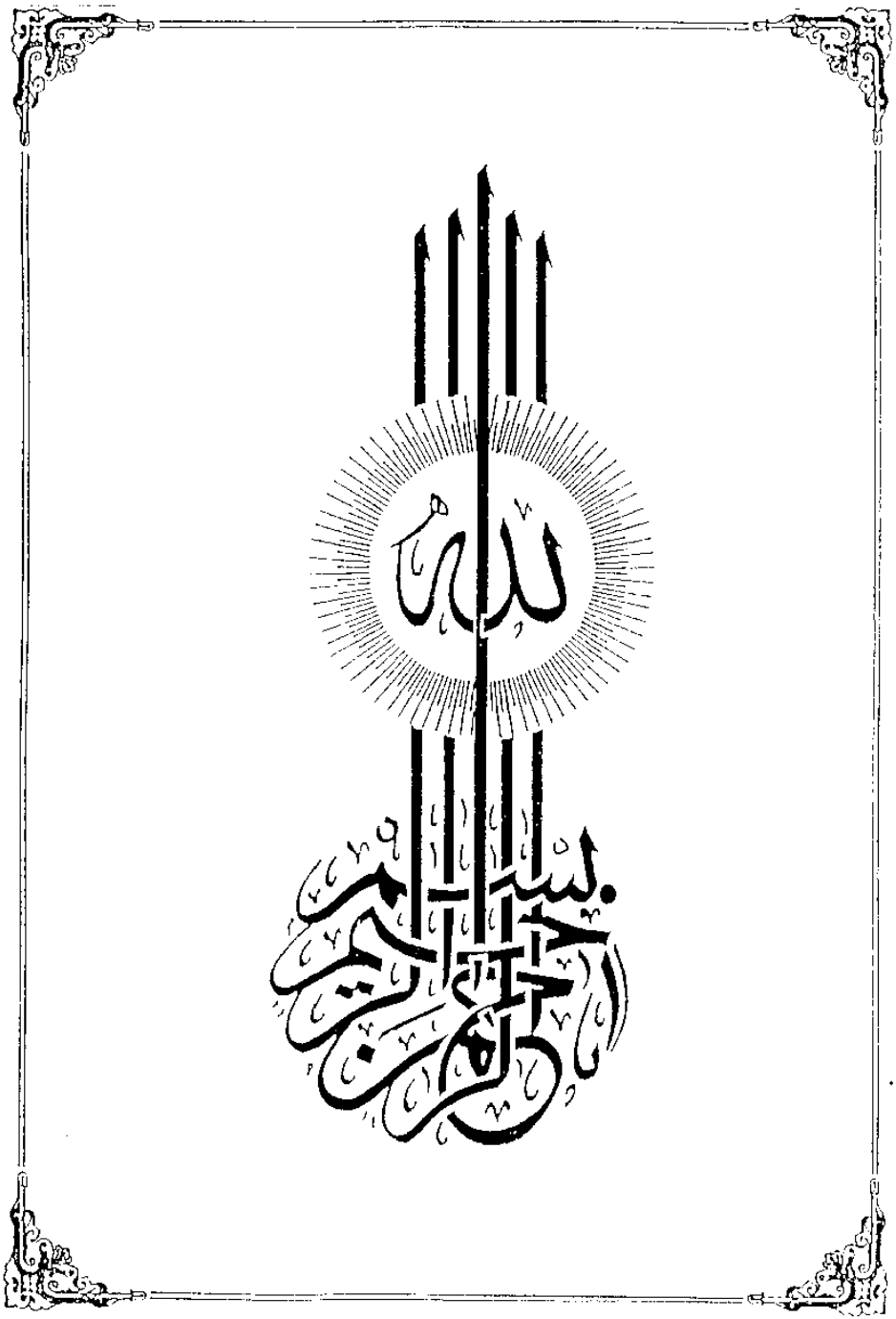

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I- INTRODUCTION

The large number of publications which in recent years have dealt with the "Hemiblocks" is a proof of the wide spread interest that they have created. Interest in the changes produced by lesions in the major fascicles of the left bundle branch is not new, since early investigators in 1917 such as Rothberger, Winterberg had been concerned about them. However, for many years, results from animal experiments did not greatly help in understanding the clinical patterns that could be attributed to blocks in the major fascicles of the left branch. This was mainly due to anatomic and electrical differences existing between canine and human hearts. Only in the last decade has it been properly assessed that in anesthetized primates and dogs (in which the heart was artificially repositioned to resemble that of adult individuals) "blind" sections of the major fascicles result in characteristic axis shifts, which (when seen in clinical electrocardiogram) can be attributed to lesions in the major fascicles of the bundle branch.

For some, the "hemiblocks" concept offered a reasonable explanation of various well-known electro - cardiographic patterns which had been interpreted in different ways. Others have been concerned with their clinical significance. Most important in this respect

are the implications regarding the prognostic value of "hemiblocks" co-existing, or preceding, bundle branch blocks, as precursors of more severe symptomatic atrio-ventricular conduction disturbances, early recognition of which could theoretically lead to prophylactic electrical treatment of life-threatening situations.

AIM OF THE WORK

The aim of this work is to find the incidence of hemiblocks in patients with recent cardiac infarction admitted to the Ein Shams coronary care unit since its establishment, the prognostic significance in relation to the nature of hemiblocks in those patients and whether hemiblocks in recent infarction need a special management.

II- REVIEW OF THE LITERATURE

ANATOMY OF THE CONDUCTION SYSTEM

The Sinus Node:

The sinus node (Figure 1)is a remnant of the right horn of the sinus venosus. In postnatal life, it is situated on the antero-lateral margin of the junction between the superior vena cava and the right atrial appendage.

It is a tapering cylindrical structure, about 15 x 3 x 2 mm in size and surrounds the sinus node artery, located above the crista terminalis, less than 1 mm beneath the epicardium.

Microscopically, the node itself is made up of dense connective tissue stroma formed of arranged collagen and elastin framework, which surrounds, and is adherent to the sinus node artery. Embeded in the connective tissue stroma are two types of specialized muscle cells, the P or pale staining cell and the T or transitional cell.

The P cells are centrally located and connected with one another and with the transitional cells. They

are thought to be the source of the cardiac impulse under normal circumstances. They are ovoid or stellate, have sparse and primitive intercellular connections, and are the smallest of the heart cells (5-10 mm in diameter).

Electronmicroscopic studies have shown that the cytoplasm is relatively empty, the nuclei are about the same size as in contracting cells, so that the nuclei are prominent. The myofibrils are short and sparse, consistent with the view that the P cells have no contractile function.

P cells attach only to P or T cells, never to contractile atrial cells. The sparseness of the intercellular connections between P cells or between P and T cells explains the slow conduction in the sinus node which is 0.05 meter /sec.

T cells, which are found in great abundance in the mammalian sinus node, are intermediate in size , structure and cellular organization between P cells and contracting myocardium.

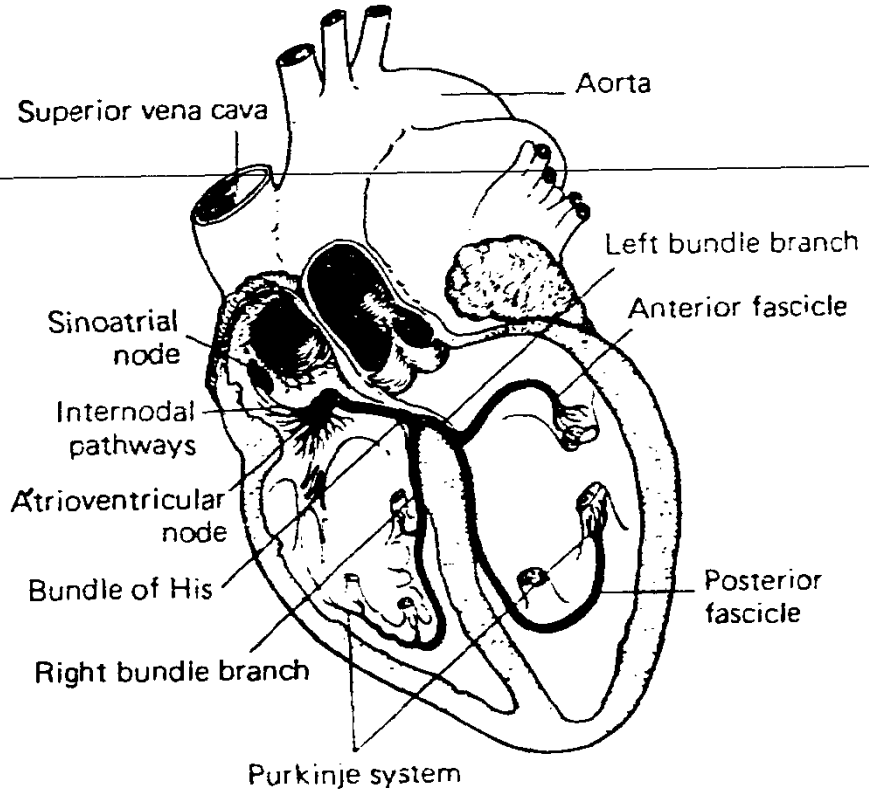

Figure 1. Conducting system of the heart.

They are more elongated and larger than the P cells. The myofibrils are more plentiful in T than in P cells. T cells may attach either to P cells or to contracting myocardial cells. T cells connect directly to the internodal tracts.

The Internodal Tracts :

The presence and function of internodal tracts[2] have been the subject of debate for many years. The weight of evidence now strongly favours the existence of three internodal pathways that preferentially and rapidly distribute the cardiac impulse from the sinus node to the atrio-ventricular (AV) node. These tracts are the anterior, the middle (Wenckebach), and the posterior (Thorel) tracts.

The anterior internodal tract :

Emerges from the anterior rim of the sinus node and courses around the anterior margin of the superior vena cava to enter the interatrial bundle of Bachmann, it then turns inferiorly, near the anterior extremity of the interatrial septum, and courses posteriorly and inferiorly within the septum to enter the superior margin of the atrio-ventricular node.

The middle internodal tract:

Emerges from the superior position of the sinus node, courses around the posterior aspect of the superior vena cava, crosses the sinus intercavarum, and enters the interatrial septum. The middle tract then traverses the mid interatrial septum to enter the superior aspect of the atrio-ventricular node.

The posterior internodal tract:

Emerges from the posterior border of the sinus node, courses posterior to the superior vena cava and down the crista terminalis to the Eustachian ridge , enters the interatrial septum superior to the coronary sinus, and finally terminates in the posterior aspect of the atrio-ventricular node.

In the mid portion of their course, the three internodal tracts are widely separated in the interatrial septum. However, as the tracts begin to converge, they extensively interconnect above and behind the atrio-ventricular node. In man, the anterior and posterior internodal tract seem to be the most constant and prominent ones.

Histologically, the internodal tracts contain large, elongated, and pale-staining cells that resemble

purkinje cells in the ventricles, and are interspaced with contracting atrial cells. One of the most impressive functional attributes of the internodal tracts is their resistance to high extracellular K^+ concentration , property that they share with P and T cells in the sinus node.

Interatrial Connections :

Bachmann's bundle, is a large muscle bundle connecting the right and left atria. It is joined by the anterior internodal tract soon after it leaves the sinus node. Specialized fibers course superficially in the interatrial band, anterior to the aorta to reach the left atrium. The interatrial bundle serves to distribute the cardiac impulse rapidly from its origin in the sinus node to the left atrium. The middle and posterior internodal tracts may also give off fibers to the left atrium, but little is known about their anatomy and physiological role.

The Atrio-ventricular (AV) Node :

The atrio-ventricular node (Fig. 1) lies just beneath the endocardium of the right atrium on the annulus of the mitral valve, above the origin of the septal leaflet of the tricuspid valve, and immediately anterior

to the ostium of the coronary sinus.

It has a bent discoid shape, its concave surface resting against the mitral valve annulus and its convex surface against the right atrial endocardium. The internodal tracts terminate along its superior and posterior margins.

In the central portion of the atrio-ventricular node, the cells form tangled swirls with ample interconnections.

Superficially the individual cells in the atrio-ventricular node tend to resemble sinus node T cells , but are some what shorter and wider. The cells in the mid portion of the atrio-ventricular node are considerably shorter and much more slender than are the contracting myocardial cells. P cells are fewer in number.

The atrio-ventricular node is abundantly supplied by autonomic nerves.

The His Bundle :

The atrio-ventricular bundle[1] (bundle of His) emerges from the anteroinferior border of the atrio - ventricular node just below the right atrial endocardium. Almost immediately after emerging from the atrio-

ventricular node the bundle of His penetrates the central fibrous body and courses inferiorly along the membranous inter-ventricular septum to the top of the muscular inter-ventricular septum. From its origin to its bifuraction, the bundle of His is about 15 mm in length. On cross section, the atrio-ventricular bundle sits astride the muscular inter-ventricular septum and has a triangular appearance. The apex of the triangle points upward toward the membranous interventricular septum. The base of the triangle rests on top of the muscular septum, with each corner giving rise to a bundle branch.

The atrio-ventricular bundle is the only normal route for conduction of the cardiac impulse between the atria and the ventricles.

The bundle of His is a thick cable-like structure, in which the muscle fibers show a prominent linear orientation in the long axis. The individual fibers are considerably larger than are the cells in the atrio-ventricular node itself. Delicate connective tissue septae divide the fibers of the His bundle into small bundles of a few fibers each.