STUDY OF SENSITIVITY AND SPECIFICITY OF COMMONLY USED ELECTROCARDIOGRAPHIC CRITERIA FOR LEFT ATRIAL ENLARGEMENT DETERMINED BY ECHOCARDIOGRAPHY AND ANGIOCARDIOGRAPHY

Thesis Submitted in Partial Fulfilment of The Master's Degree in Cardiology

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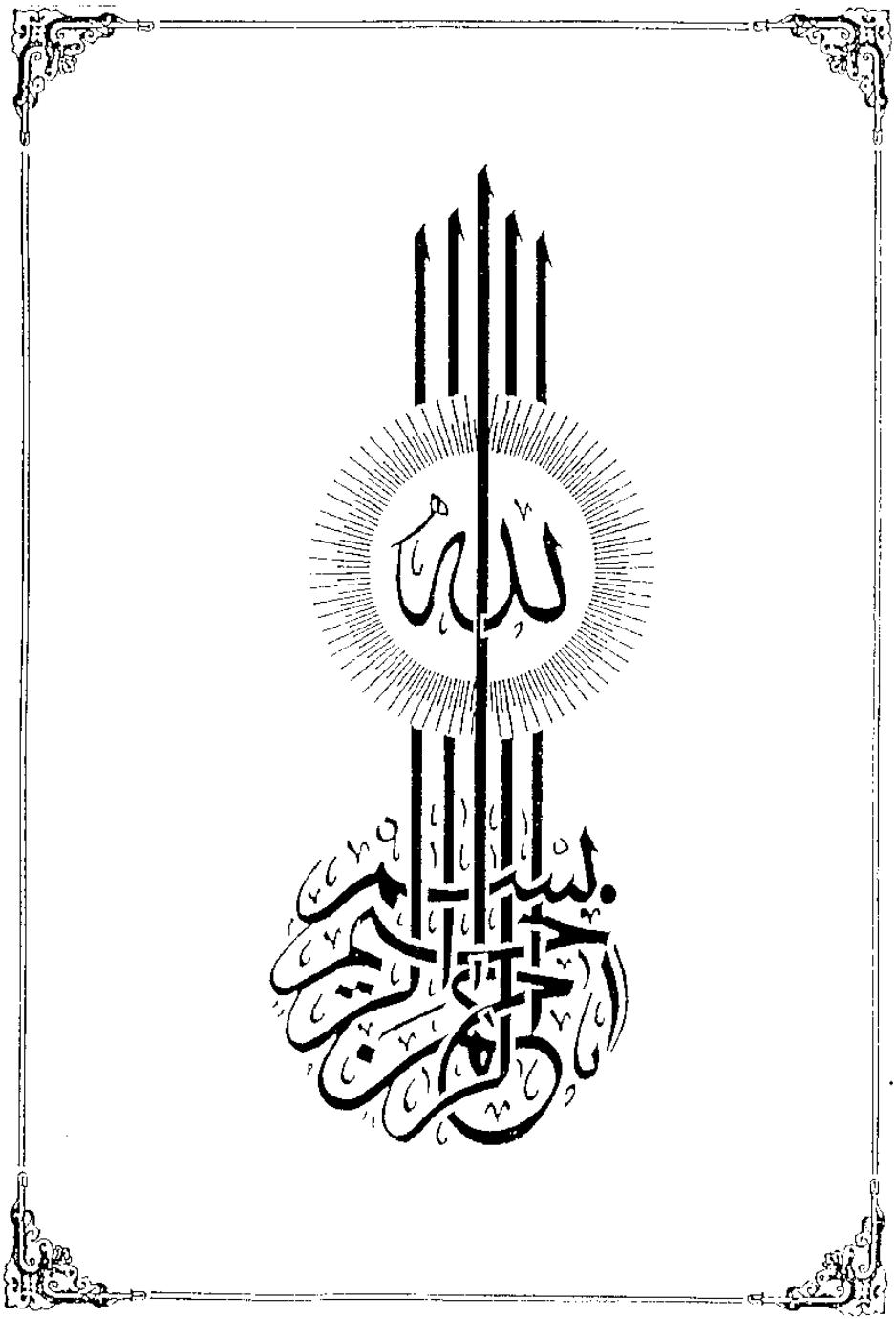
This Work is Dedicated
To
My Father and the Soul of my Mother



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INTRODUCTION
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INTRODUCTION

The electrocardiogram , an established non-invasive technique has long been employed to detect alterations of cardiac anatomy and physiology. Although the electrocardiogram displays only the temporal and spatial relation of cardiac electrical activity transmitted to the chest wall, years of experience with clinical and anatomical correlations have allowed inferences to be made from the electrocardiogram about heart size, wall thickness, and pressure or volume overload states.

The electrocardiographic pattern often attributed to left atrial enlargement may result from dilatation of that chamber, but may also be caused by left atrial pressure overload or impaired atrial conduction. **(Josephson, 1977; Dibianco, 1979; Probst, 1973).**

Many previous studies exploring the accuracy of various electrocardiographic criteria for left atrial enlargement used populations that were small or lacking in appropriately matched controls. These studies focused on 1,2 or, at most 3 electrocardiographic critera and many used diagnostic standards of left atrial enlargement that were themselves of uncertain accuracy.

The validity of these assumptions in the estimation of left atrial size has been tested against direct observations at the time of surgery, measurements from various radiological views of the heart, and from postmortem studies. These techniques, however, have significant drawbacks, namely, that x-ray studies measure only gross

changes in the atria, and postmortem studies are non-physiological , static measurements.

By cine angiography, however, a better demonstration of left atrial contour has permitted more accurate measurements to be made. But in view of the invasive nature and complexity of this procedure its utility in evaluating a large population is limited.

Echocardiography now provides a simple, noninvasive, reproducible means of assessing left atrial size; it has been shown to provide a good measure of the left atrium when compared with careful angiographic studies hence providing us with an accurate non-invasive technique for obtaining anatomical measurements.

For this reason, recent studies evaluating electrocardiographic criteria for left atrial enlargement have used echocardiographic left atrial dimension as their diagnostic standard. **(Waggoner, 1976; Termini, 1975; Chirife, 1975).**

Six electrocardiographic signs of left atrial enlargement have been frequently used in the clinical sitting. **(Munuswamy, 1984).**

This study was designed to assess the sensitivity and specificity of these electrocardiographic criteria for left atrial enlargement using echocardiographic left atrial dimension and angiographic left atrial volume as their diagnostic standard.

PART I
REVIEW OF LITERATURE

ANATOMY OF THE

LEFT ATRIUM

ANATOMY OF LEFT ATRIUM

Position, Shape and Relations :

The left atrium is the most posterior cardiac chamber, it is cuboidal in shape and extends to the right behind the right atrium, from which it is separated by interatrial septum **(Glenn, 1983)**.

The left atrium is smaller than the right atrium but its walls are thicker, measuring about 3 mm. **(Schlant, 1986)**.

A small, somewhat conical pauch, termed the auricle, projects forwards from the upper left corner. It is somewhat constricted at its junction with the atrium. The left auricle is longer, narrower and more curved than that of the right atrium and its margins are more deeply indented. It is directed forwards on the left side of pulmonary trunk, and overlaps the commencement of this vessel.

The left atrium is located superiorly, in the midline, and posterior to the other cardiac chambers. As a consequence of this posterior postion, the left atrium is not normally seen in the frontal roentgenogram (Fig. 1).

Anteriorly and to the left, it is concealed by the ascending aorta and the root of the pulmonary trunk. Seperated from them by the transverse sinus of the pericardium (Fig. 2).

The right atrium is to the right and anterior. The left ventricle is to the left, anterior and inferior. Posteriorly, it lies infront of the

descending thoracic aorta and the oesophogus, separated from them by the oblique sinus of the pericardium (Fig 3).

The interior of the left atrium presents several features for examination :

The pulmonary veins, four in number, open into the upper part of the posterior surface of the left atrium, two on each side of its midline, their orifices are not provided with valves, the two left veins frequently end by a common opening.

The foramina venarum minimarum are the orifices of minute veins (Venae cordis minimae) which return blood from the muscular substance of the heart. The musculi pectinate are paralled muscular ridges which are fewer and smaller than those of right atrium and are confined to the inner surface of the auricle.

On the atrial septum a lunate impression may be seen, bounded below by a crescentic ridge, the concavity of which is directed upwards, the depression coincides with the fossa ovalis of right atrium.

The orifice of the mitral valve provides a cone shaped funnel extending into the recess of the left ventricular cavity.

The wall of the left atrium contains three anatomically distinct layers :

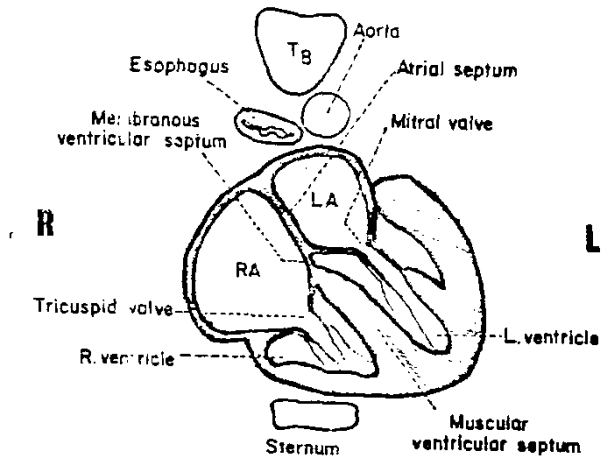

Fig. (1) : Diagram of a transverse section through the heart at approximately the level of the eighth thoracic vertebra. The plane of the atrial and ventricular septa slants approximately 45° to the left of the midline. RA = right atrium; LA = Left atrium.

(Fig. 1)

(From J.W.Hurst in "The Heart"; 1986)

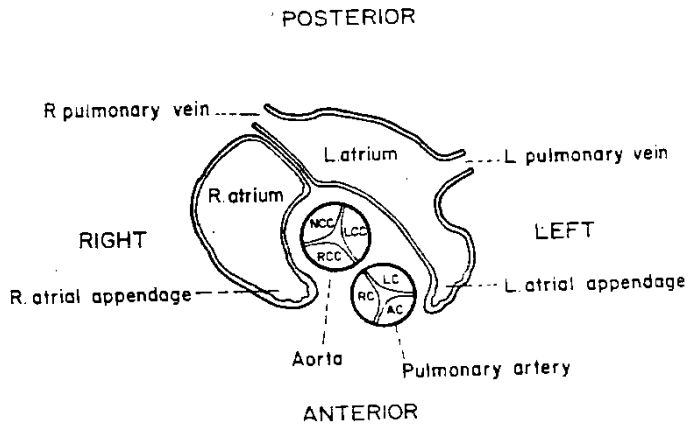

Figure (2) : Schematic transverse section through the heart at approximately the level of the second intercostal space. The relation between the left and right atria and the interatrial septum is illustrated. The relative positions of the aortic and pulmonary valves and their cusps are shown. AC = anterior cusp Rc = right cusp; LC = Left cusp of plumonary artery; LCC = Left coronary cusp; Rc = right coronary cusp; NCC = non coronary cusp of the aortic valve.

(Fig. 2)

(From J. W. Hurst in "The Heart"; 1986)

1- **The outer Epicardium** :

The epicardium is continuous with the outer covering of the ventricles and is composed of mesosthelium, connective tissue and some fat. It also contains small nerve branches and the main coronary blood vesseles.

2- **The inner endocardium** :

The endocardium of the left atrium is smooth and slightly opaque. It consisted of endothelium and a layer of fibroelastic connective tissue.

3- **The muscular myocardium** :

The left atrial wall consists of fibres which are transversly and longitudinally striated and presents in two layers :

(a) The superficial fibres :

A superficial layer that encircles both atria, it fans out over the surface from their origin in the anterior part of the septum and the base of the superior vena cava, most of these fibers insert in the anulus fibrosus.

A prominent group of superficial fibres, the interatrial band, arises neer the base of the superior vena cava and passes on the anterior surface of the atria to the left atrium, where it devides and encincles the left atrial appendage. This band has been suggested as a direct patch for conduction of the excitatory process to the left atrium (Little R.C., 1985).