ECHODOPPLER DIAGNOSIS OF LEFT VENTRICULAR OUTFLOW TRACT OBSTRUCTION

Thesis
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BY

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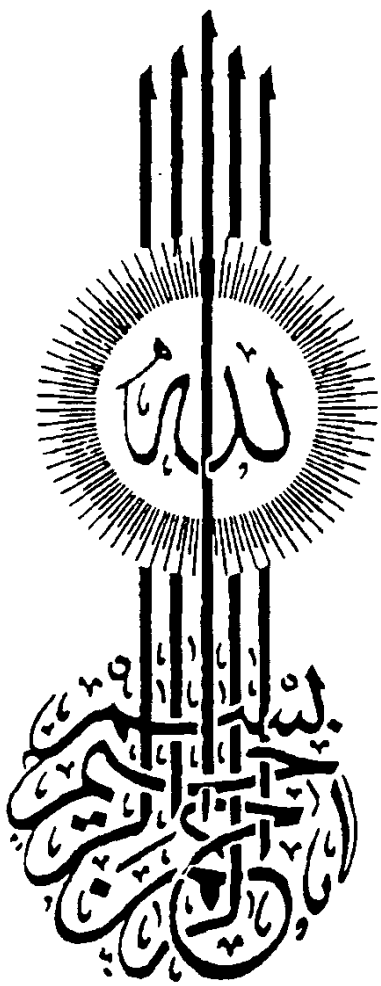

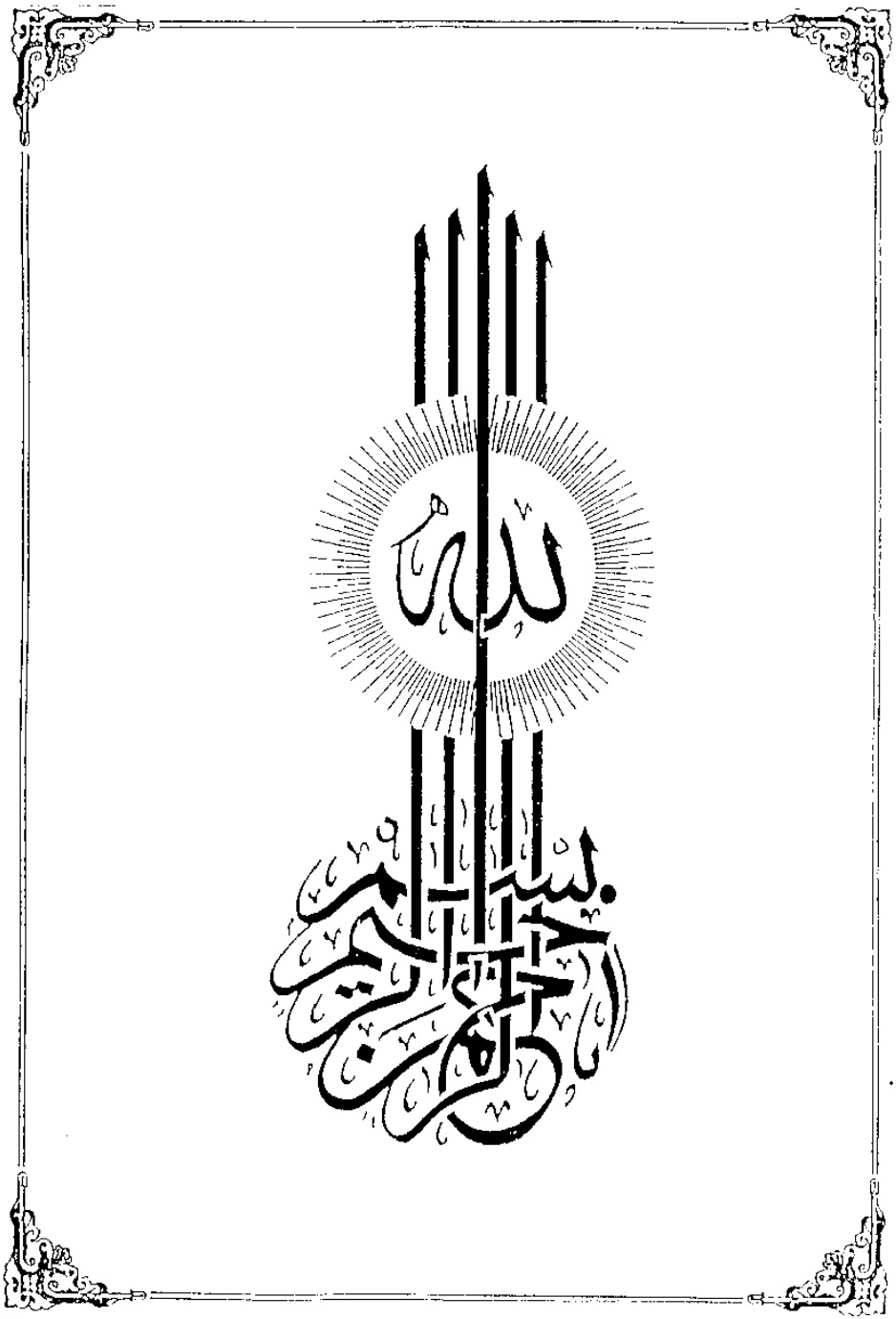

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Every body who gave me a hand throughout my life, particularly my mother and my father, who are doing that since my birth until now.

To my wife, my daughter (Fatima Zahraa) and my Son (Salama)

To

My brother

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INTRODUCTION

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The clinical diagnosis of heamodynamically significant left ventricular outflow tract obstruction is based on the detection of a late-peaking, systolic ejection murmur radiating to the neck, associated with delayed A_2 component and S_3 gallop *(Wood P. 1958, Perlof J.K. 1968 and Cauldfield W.H. et al, 1971).*

However, these classic signs are often absent or altered, especially in elderly patients *(Burns and Der Hauwaert, L.G. 1958, and Finnegan R.E., 1969).*

This is particularly true in those whom the quality, location of the murmur and the character of the carotid pulse may yield misleading information *(Robert W.E. et al, 1971 and Fohler R.H. et al, 1981).* The presence of left ventricular dysfunction and the co-existence of other valvular lesions are additional factors that may cause difficulty in estimating the degree of left ventricular outflow obstruction *(Eddleman E.E., 1973 and Morgan and Hall, 1979).*

Non-invasive studies utilizing the electrocardiography, phonocardiography and external carotid pulse recording may provide useful information and can usually differentiate normal tract from obstruction *(Schwartz A. et al, 1978 and Weyman A..E. et al, 1975).*

Standard M-mode and two-dimensional echocardiographic examinations of the aortic valve motion and pattern, left ventricular size, wall motion and dimensions do provide valuable and useful information to assess the severity of left ventricular enlargement and hypertrophy as well as valve deformities,

In addition they can provide valuable information by identifying any associated structural changes or congenital anomalies, but still, there can be considerable difficulty in assessing the degree of obstruction *(Currie P.J. et al, 1986)*. Recently, the development and application of pulsed and continuous wave Doppler ultrasound have demonstrated the value of Doppler echocardiography for non-evasive assessment of aortic valve disease and other causes of left ventricular outflow tract obstruction *(Hatle L. and Angelsen B, 1985)*.

Overlying colour-coded Doppler velocity information on a two-dimensional image provides a spatially accurate flow map. Color flow imaging provides the following information;

1. *Direction of flow.*
2. *Spatial map of mean velocities.*
3. *Distinction between laminar and turbulent flow.*
4. *Ability to visualize relative volume of flow through an orafice. (Bifoy K et al 1986).*

This latest step in the evolution of cardiovascular ultrasound is the logical combination of anatomical information provided by two-dimentional echocardiographic imaging, and information of blood flow provided by Doppler techniques *(Michael R. et. al, 1987)*.

Combination of Doppler and imaging echocardiography, Doppler Ultrasound, however, have made it possible to determine the pressure gradient across a stenotic aortic valve and to estimate the aortic valve area with results that compare well measurements at cardiac catheterization *(Michael R. et. al, 1987)*.

An accurate non-invasive assessment of these patients could obviate the need for catheterization in those without critical lesions and in those with critical aortic stenosis, in the non-coronary age group. It also could alert the physician to the presence of significant aortic stenosis in patients undergoing cardiac cathetereization in anticipation of aortic valve replacement *(Arther S Agatston 1986).*

AIM OF THE WORK

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This study was undertaken to assess the reliability of echodoppler ultrasound as a non-invasive method in the diagnosis and assessment of left ventricular outflow tract obstruction.

REVIEW
OF
LITERATURE

ANATOMY OF THE LEFT VENTRICLE

The anterior leaflet of the mitral valve separates the left ventricle into two portions; the inflow portion, lying posteriorly to the leaflet, and the outflow portion, lying anteriorly to the leaflet.

The left ventricle is conical, thick and smooth-walled. Fine trabeculations may be present, but the septum is nearly smooth. The left ventricular outflow tract is formed by the anterior leaflet of the mitral valve on one side and by the ventricular septum on the other three sides. The subaortic area lies behind the outflow area of the right ventricle, as these two outflow tracts cross at nearly right angles.

The right ventricular outflow area is partly wrapped around the subaortic area. The curved ventricular septum separates the left from the right ventricle. The septum has a muscular and membraneous portion. The membranous ventricular septum is small diamond-shape area located in the angle between the posterior and the right aortic cusps.

On the right side of the heart, most of the membranous septum lies in the atrial septum immediately above the tricuspid annulus, while a small portion lies beneath the tricuspid valve in the ventricular septum. Thus the tricuspid annulus is slightly lower than the mitral annulus.

ANATOMY OF THE AORTIC VALVE

The normal aortic valve usually has three leaflets, although rarely a quadricuspid aortic valve is seen. This normal variant has no haemodynamic consequences. The three cusps are called the posterior *(non-coronary),* the right and the left. Although in situ, the right coronary cusp is a true anterior cusp, whereas the left cusp is a left posterior cusp.

The cusps are made up of a layer of fibrous tissue covered on both atrial and ventricular aspect by a layer of endocardium. The fibrous layer is much thicker at the free margin, as well as at the site of cusp attachment to the annulus. The characteristic nodule occupies the centre of each free margin of the cusp. when blood is forced back toward the heart in diastole, filing the cusps, the edges meet, the nodule of each cusp comes into precise opposition and thus regurgitation is prevented.

The aortic root has three bulbous swellings the sinuses of valsalva. The upper margin of the sinus is a plane drawn through the free margin of the closed aortic valve cusps. The transition between the bulbous and the tubular portion of the aorta is called the sinotubular ridge and lies above the sinuses of valsalva *(Fig. 1* a,b)

The coronary arteries do not arise from the sinuses but rather from the aorta immediately above the sinuses and immediately below the sinotubular ridge.