ECHOCARDIOGRAPHIC HAEMODYNAMIC PREDICTORS OF OUTCOME IN PATIENTS UNDERGOING AORTIC VALVE REPLACEMENT

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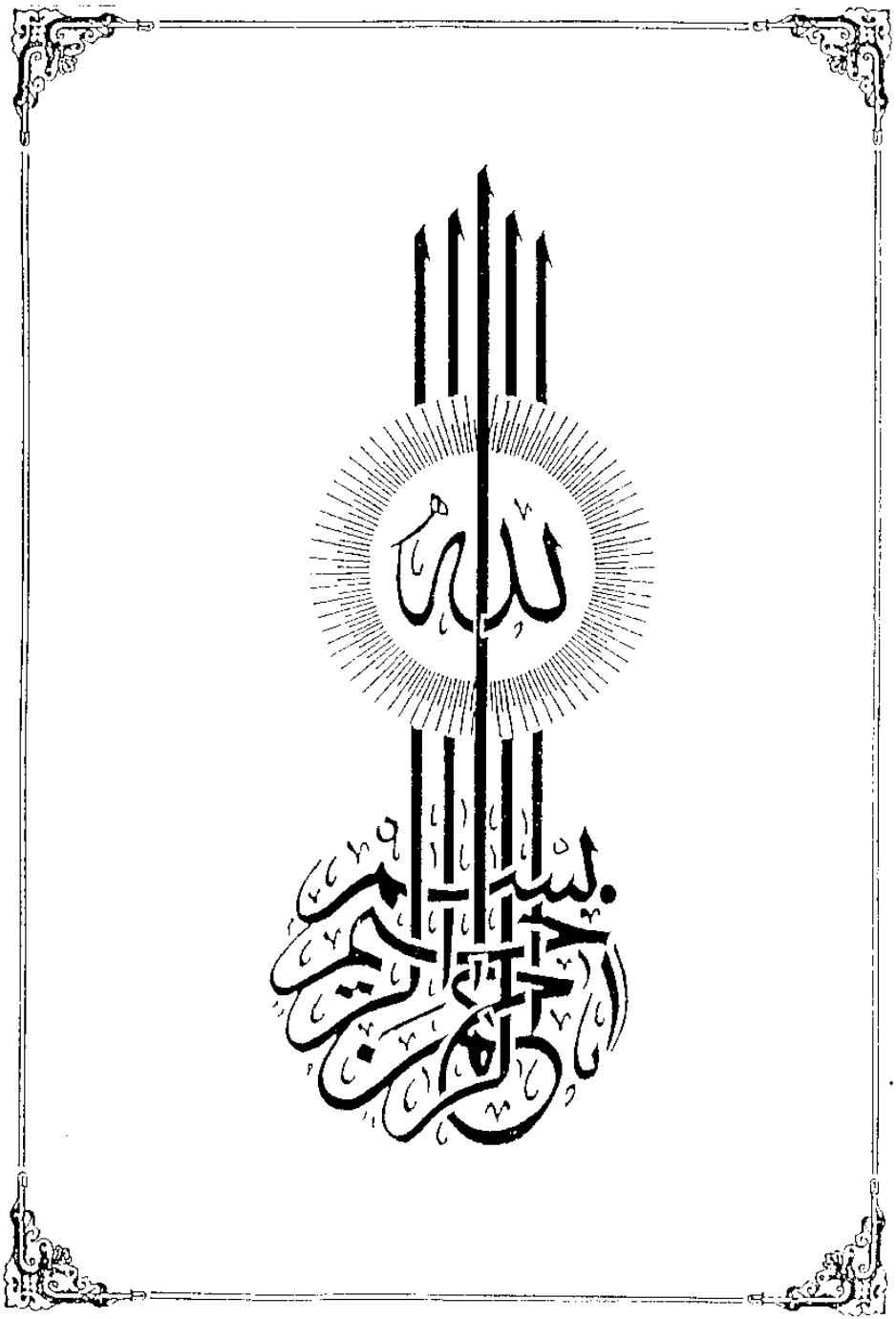

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Introduction

ECHOCARDIOGRAPHIC HAEMODYNAMIC PREDICTORS OF OUTCOME IN PATIENTS UNDERGOING AORTIC VALVE REPLACEMENT

Introduction

The optimal management of patients with severe aortic regurgitation is still a matter of challenge, especially in asymptomatic or minimally symptomatic patients. Aortic valve replacement provides considerable symptomatic improvement and decrease in mortality when performed in properly selected patients with chronic aortic regugitation. Unfortunately suboptimal results may occur in patients who have preoperative evidence of myocardial dysfunction and because these patients may present increased surgical risk, it would seem important to identify them beforehand (Fioretti et al 1983 and Gaasch et al 1983).

There is little question that symptomatic patients will benefit from aortic valve replacement unless there is very severe depression of cardiac function. The problem however does not involve the symptomatic patients with isolated aortic regurgitation, it is the management of the asymptomatic or minimally symptomatic patients that is difficult.

It is well recognised that the chronically volume overloaded ventricle can develop irreversible structural and functional changes, even if the patient does not experience important symptoms, such myocardial changes could preclude a good surgical result and for this reason, early aortic valve replacement may be recommended for some patients in an attempt to prevent the development of left ventricular dysfunction. However premature valve replacement must be avoided because of the known complications of prosthetic heart valves. The decision to replace the aortic valve in patients with chronic aortic regurgitation is in fact a decision to exchange one disease (chronic aortic regurgitation) to another (prosthetic valve diseases) (Gaasch et al 1983).

If it were possible to identify reliable and specific clues that point to irreversible left ventricular dysfunction, these data could be used to define limits beyond which one might not expect a satisfactory surgical result. With this knowledge, patients with chronic aortic regurgitation could be followed up closely and if serial studies of left ventricular size and function indicate progression towards these limits, it would seem reasonable ro proceed with aortic valve replacement even in the absence of important symptoms. It is concievable that information from a single test or measurement might

prove sufficient to identify the optimal time of surgery or predict the surgical outcome. So accurate assessment of left ventricular function is important in preoperative evaluation.

Aim of the Work

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The aim of this work is to study the value of various preoperative echocardiographic parameters derived from M-mode, two dimensional echocardiography and Doppler in predicting the surgical outcome in patients undergoing aortic valve replacement for chronic aortic regurgitation and to assess the serial changes which occurred after aortic valve replacement.

Review of Literature

ETIOLOGY AND PATHOLOGY OF CHRONIC AORTIC REGURGITATION

Chronic aortic regurgitation (AR) can result from or associated with any of the following: (Rackley et al 1990).

(1) Rheumatic Fever.

(2) Syphilis.

(3) Aortitis (Takayasu), and Giant cell arteritis.

(4) Heritable disorders of connective tissue as:

- (a) Marfan's syndrome.
- (b) Ehler Danlos syndrome.
- (c) Osteogenesis imperfecta.

(5) Congenital heart disease as:

- (a) Bicuspid aortic valve.
- (b) Interventricular septal defect.
- (c) Sinus of valsalva aneurysm.

(6) Arthritic diseases as:

- () Ankylosing spondylitis.
- (b) Rheumatoid arthritis.
- (c) Lupus erythematosus.
- (d) Reiter's syndrome.
- (e) Psoriatic arthritis.
- (f) Arthritis associated with ulcerative colitis.

(7) Annulo aortic ectasia.

(8) Hypertension.

(9) Arterio sclerosis.

(10) Myxomatous degeneration of the valve.

(11) Trauma.

(12) Following prosthetic valve surgery and aortic balloon valvuloplasty.

Incidence and Prevalence:

Although aortic regurgitation (AR) has been long recognized valvular mechanism for disturbed cardiac function, a greater change has occurred in the incidence of diseases that affect the competence of aortic valve. In decades past, rheumatic fever and syphilis were major causes of AR, but the incidence of these diseases has diminished in recent years especially the syphilis (Angloff et al 1972). With the decline of these two infectious disorders, connective tissue diseases and anatomic abnormality of the aortic valve have increased. Marfan's syndrome can produce aortic dilatation with incompetence of the valve and myxomatous transformation of the aortic valve may be a predisposing abnormality (Read et al 1965).

Osteogenesis imperfecta, ankylosing spondylitis, Reiter's syndrome and even rheumatoid arthritis can produce AR (Robert's et al 1974). A congenital defect in the ventricular septum with a sinus of valsalva aneurysm can result in AR (Tatsuno et al 1973). Chronic vascular disorders such as hypertension and arteriosclerosis can create mild incompetence of the valve. (Waller et al 1982, Mok et al 1988). Olsen et al in 1984 found that among

patients with pure AR coming for aortic valve replacement (AVR), the percentage of arotic root disease has been increasing steadily during the past few decades and accounting for more than one third of the patients. In a study done by De Pace et al in 1984 on 43 patients with predominant aortic regurgitation and the causes of it were determined at surgery or necropsy ,they found that rheumatic aortic valve disease was found in 17 patients (40%), Infective endocarditis in 13 patients (30%), aortic root diseases in 8 patients (19%) and bicuspid aortic valve in 5 patients (11%).

Mechanisms of chronic AR: (Braunwald et al 1988, Rackley et al, 1990).

chronic AR can be due to:

(1) Primary intrinsic disease of the aortic valve: as in rheumatic fever, and infective endocarditis OR:

(2) Aortic root disease which may be caused by either **dilatation** of the aortic root as in annulo aortic ectasia, Takayasu's aortitis or Marfan's syndrome or **laceration** as in hypertension, cystic medial necrosis or trauma of the aorta or:

(3) Diseases that cause both aortic root disease and valvular abnormalities as in syphilis, arthritic diseases or Marfan syndrome.

HAEMODYNAMICS OF CHRONIC AORTIC REGURGITATION

The haemodynamic changes in chronic AR depends on two main factors. (1) **The regurgitant flow :** its volume and chronicity and (2) **Left ventricular compensatory mechanisms.**

The Regurgitant aortic flow:

The diastolic flow (aortic regurgitation) across the incompetent aortic valve increases filling of the left ventricle and imposes a volume overload on the myocardium (Greenberg et al 1987).

The most important determinants of regurgitant volume are the size of the valvular defect, the diastolic pressure gradient and the duration of diastole (Baumgranter et al 1988).

1 -Size of the valvular defect:

The size of the regurgitant aperture may be as large as 1 cm^2. But regurgitation is generally severe when it is more than 0.5 cm^2 (Grossman and Dexter 1980).

However, even a small incompetent area of the valve can eventually lead to significant aortic regurgitation over a period of time (Morrow et al 1965).