EVALUATION OF LEFT VENTRICULAR FUNCTION IN CHRONIC
REGURGITATION BEFORE AND AFTER VALVE REPLACEMENT

M. G. Modena, A. Benassi and G. Mattioli
Cattedra di Malattie Cardiovascolari
Università di Modena, Modena, Italy

INTRODUCTION

Controversy continues regarding the appropriate timing of operative intervention in patients with chronic aortic regurgitation (CAR) [1,2,3,4]. Once symptoms develop, surgical replacement of the aortic valve is recommended because continued medical therapy is associated with progressive clinical deterioration. However, if surgery is delayed until the occurrence of symptoms and marked cardiomegaly, some patients have left ventricular dysfunction and do not improve symptomatically postoperatively.

Different indexes have been proposed to identify the optimal time for surgical treatment before a definitive myocardium damage[5,6,7]. We studied left ventricular contractility, pump function, and wall stress in CAR using echocardiography to determine the clinical utility of some indexes, to examine the relation with post-operative persistent left ventricular dilatation, and clinical status.

METHODS

The study population consisted of 52 patients 34 men and 8 woman with isolated CAR. The mean age was 48±14.4, 20 were in class III of the New York Heart Association, 18 in class II and 14 in class I. 20 of these patients (18 men + 2 women mean age 44.1±14.3 years) underwent aortic valve replacement.

Aortic insufficiency was defined as dense opacification of the left ventricle after power injection of contrast medium into the ascending aorta. All patients had normal coronary arteries, and there were no associated valve lesions.
Patients with an aortic valve gradient more than 10 mm Hg were excluded. The post-operative study was carried out 30 or more days after surgery, 30 normal subjects were used as a control group. Echocardiograms were performed in the left lateral decubitus position. All left ventricular measurements were obtained with the ultrasonic beam directed just below the level of the mitral valve with the transducer placed at the "standard interspace" as proposed by Popp et al.[8].

All studies were of good diagnostic quality. The following indexes were calculated from the previous measurements:

1) End diastolic diameter (EDD).
2) End systolic diameter (ESD).
3) Shortening fraction (FS) derived as (EDD-ESD)/EDD.
4) Mean velocity of circumferential fiber shortening (Vcf) derived as (EDD-ESD)/EDD x ejection time).
5) Ejection Fraction as (End diastolic volume - End systolic volume/End diastolic volume).
6) End-diastolic radius/thickness ratio derived as EDD/2/Thd, where Thd represents the average of the end diastolic posterior wall and septal thicknesses.
7) End systolic Pressure/Diameter ratio (P/D) [9].
8) End systolic stress (ESS) derived as ESS = (PxESD)/4 Ths (1 + Ths/ESD) where P is the systolic pressure and Ths is the average of the end systolic posterior wall and septal thicknesses[10].

The last three indexes were derived by combining systolic blood pressure (obtained by cuff) with echocardiographic measurement.

RESULTS

In Table 1 the values of some indexes in the different classes NYHA are summarized.

In relation to the ventricular dimensions, we noted as the diameters, especially ESD, resulted significantly modified already in patients in Class I but as there was significant overlapping of values (Figure 1) mainly in patients in Classes I and II.

Nevertheless it was clear that the ESD result was useful in discriminating patients in Class III and when greater than 5 cm it was a good index of the status of myocardial damage. The EDD appeared to be of less value, because of the wide range of variability (Figure 2).

The classical indexes of ejection phase (FS, VCF, EF) did not give a result of great interest in our experience since, as shown in