An Analysis of Cardiac Remodeling in the Elderly Population. EPICARDIAN Study

Ramón Puchades,¹ Juan M. Ruiz-Nodar,² Francisco Blanco,³ Francisco Rodríguez,⁴ Rafael Gabriel,⁵ and Carmen Suáreza

¹Unidad de Hipertensión, Servicio de Medicina Interna, Hospital Universitario de La Princesa, Red RECAVA, Madrid, Spain
²Servicio de Cardiología, Hospital General de Alicante, Alicante, Spain
³Servicio de Medicina Interna, Hospital Carlos III, Madrid, Spain
⁴Agencia Laín Entralgo, Red RECAVA, Madrid, Spain
⁵Unidad de Investigación, Hospital Universitario La Paz, Red RECAVA, Madrid, Spain

The aims of this study were to investigate left ventricular morphology in a sample of elderly Spanish individuals and to assess differences between hypertensives and normotensives. Data were obtained from a subsample (N=242) of participants in the EPICARDIAN study who live in the Lista district of Madrid: they included 191 (78.8%) hypertensives and 51 (21.2%) normotensives. Left ventricular remodeling patterns were classified as: type I (normal), type II (concentric remodeling), type III (concentric hypertrophy) or type IV (eccentric hypertrophy). The overall prevalences were: 74 (30.5%) type I, 62 (25.9%) type II, 53 (21.8%) type III and 53 (21.8%) type IV. A comparison of hypertensives and normotensives showed that the prevalences were: 42 (22.3%) type I, 50 (26.1%) type II, 50 (26.1%) type III and 49 (25.5%) type IV in hypertensives and 31 (60%) type I, 13 (26%) type II, 3 (6%) type III and 4 (8%) type IV in normotensives (P<0.005). Ventricular remodeling without hypertrophy was common in the elderly, an observation that could have prognostic implications.

Key words: Cardiac remodeling. Left ventricular hypertrophy. Elderly.

INTRODUCTION

The aims of this study were to investigate left ventricular morphology in a sample of elderly Spanish individuals and to assess differences in this regard between hypertensive and normotensive subjects. The prevalence of cardiac remodeling increases with age, and is estimated to be 43% to 45% among individuals over age 65.¹,² In this group of patients, the prevalence of left ventricular hypertrophy (LVH) is around 15%.³,⁴ Abnormal left ventricular geometry has been associated with an increased mortality in this patient population³,⁴ and is higher in patients with hypertrophy.

METHODS

Data for this study were obtained from a patient subgroup of the EPICARDIAN study.
The methodology of the EPICARDIAN study was previously described in detail.\textsuperscript{6} The sample was randomly selected from among all patients included in the EPICARDIAN study who live in the Salamanca neighborhood of Madrid, Spain. Of the 371 patients who underwent echocardiography, the measurements required for the study could be obtained in 242 (65.2%), whereas in all others, a poor acoustic window precluded proper measurement.

Echocardiography was performed using a Toshiba 160 system with a 2.5-MHz transthoracic transducer. The echocardiography specialists were blinded to the patient’s hypertensive or normotensive status, and the degree of agreement was studied to determine the interobserver variability. All echocardiographic measurements were based on the American Society of Echocardiography guidelines published by Sahn et al\textsuperscript{7} in 1978 in Circulation and were taken in M mode with color Doppler ultrasound. Left ventricular morphology was analyzed by the left ventricular mass index (LVMI), and relative wall thickness (RWT) was obtained by the formula RWT=2×posterior wall end-diastolic thickness/left ventricular end-diastolic diameter. LVH was considered present when LVMI was >134 g/m\textsuperscript{2} in men and >110 g/m\textsuperscript{2} in women, and RWT was deemed normal when ≤0.44.

According to these values, patients were classified into 4 types: type I (normal left ventricle: normal LVMI and RWT >0.44), type II (concentric remodeling: normal LVMI and RWT ≤0.44), type III (concentric hypertrophy: LVH and RWT >0.44), type IV (eccentric hypertrophy: LVH and RWT ≤0.44). The sample was stratified according to patient sex and age ≥75 and <75 years. Patients who presented atrial fibrillation were excluded from the assessment.

Cardiac remodeling in the 242 patients included was as follows: 74 (30.5%) type I, 62 (25.9%) type II, 53 (21.8%) type III, and 53 (21.8%) type IV. Comparison between hypertensive and normotensive patients (Figure) yielded the following: 42 (22.3%) type I, 50 (26.1%) type II, 50 (26.1%) type III, and 49 (25.5%) type IV in hypertensive patients and 31 (60%) type I, 13 (26%) type II, 3 (6%) type III, and 4 (8%) type IV in normotensive ones (P=.0005).

The sample was stratified according to sex and age. Cardiac remodeling was observed in men as follows: 43 (34.1%) with type I, 31 (25.2%) with type II, 27 (22%) with type III, and 23 (18.7%) with type IV; and among women, 32 (26.7%) type I, 32 (26.7%) type II, 25 (21.6%) type III, and 29 (25%) type IV (P=.5).

In terms of age, patients younger than age 75 showed the following: 54 (35.6%) with type I, 35 (22.6%) with type II, 30 (19.9%) with type III, and 33 (21.9%) with type IV; among those age 75 or older: 21 (22.6%) type I, 28 (31.2%) type II, 22 (24.7%) type III, and 19 (21.5%) type IV (P=.14).

### Statistical Analysis

The categorical variables were described by the distribution frequency, and the continuous variables were expressed as the mean (SD). In order to test the possible association between qualitative variables, we used the \( \chi^2 \) or Fisher exact test. Data were processed and analyzed using SPSS, version 10.

### RESULTS

The baseline characteristics of the initial sample are shown in Table 1. In all, 291 patients (78.6%) were hypertensive and 80 (21.4%) were normotensive. The mean age of the sample was 74 (6) years. Ejection fraction was 66.4% (9.7%) in normotensive and 70% (11.4%) in hypertensive patients (\( P<.14 \)). The prevalence of diabetes was 9.2%. The prevalence of a poor acoustic window was 34.4% in the hypertensive group and 36.7% in the normotensive group (\( P=.7 \)).

Of the 242 patients with a good acoustic window, 191 (78.8%) were hypertensive and 51 (21.4%), normotensive. Distribution by sex was 124 (51.2%) men and 118 (48.8%) women. By age, 152 (62.8%) were <75 years and 90 (37.2%) were ≥75 years.

Cardiac remodeling in the 242 patients included was as follows: 74 (30.5%) type I, 62 (25.9%) type II, 53 (21.8%) type III, and 53 (21.8%) type IV. Comparison between hypertensive and normotensive patients (Figure) yielded the following: 42 (22.3%) type I, 50 (26.1%) type II, 50 (26.1%) type III, and 49 (25.5%) type IV in hypertensive patients and 31 (60%) type I, 13 (26%) type II, 3 (6%) type III, and 4 (8%) type IV in normotensive ones (\( P<.0005 \)).

The sample was stratified according to sex and age. Cardiac remodeling was observed in men as follows: 43 (34.1%) with type I, 31 (25.2%) with type II, 27 (22%) with type III, and 23 (18.7%) with type IV; and among women, 32 (26.7%) type I, 32 (26.7%) type II, 25 (21.6%) type III, and 29 (25%) type IV (\( P=.5 \)).

In terms of age, patients younger than age 75 showed the following: 54 (35.6%) with type I, 35 (22.6%) with type II, 30 (19.9%) with type III, and 33 (21.9%) with type IV; among those age 75 or older: 21 (22.6%) type I, 28 (31.2%) type II, 22 (24.7%) type III, and 19 (21.5%) type IV (\( P=.14 \)).
Limitations

The sample was recruited from the general population census of an area in Madrid with a high socioeconomic level,6 which could explain the low overall incidence of atrial fibrillation compared to other published series. Moreover, the history of ischemic heart disease was not analyzed. These considerations could lead to a lower statistical value.

REFERENCES