Echocardiographic Assessment of Centenary Patients

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Abstract

Background: Echocardiography is a diagnostic tool capable of detecting different parameters with the potential to assist the cardiologists in patients management. Being aware of these parameters in centenary patients may lead to greater understanding of the health/disease process in this population.

Objectives: To evaluate echocardiographic parameters in centenary patients, since no study covering such data in that group was found in the literature.

Methods: Sixteen centenary patients with low state of dependence and weakness and no history of heart disease were assessed by transthoracic echocardiography.

Results: Diameters, areas, volumes and indexed left atrial volumes were found to be increased by 31.25%, 50%, 68.75% and 87.5% of patients, respectively. Absolute and indexed left ventricular diastolic diameters were found to be increased by 6.25% and 68.75%, respectively. Absolute and indexed left ventricular mass was increased by 37.5% and 75% of elderly patients. The study found that 62.5% of individuals presented a pattern of eccentric hypertrophy. Deficit of segmental contractility occurred in 31.25% of the sample. Pulmonary arterial systolic pressure above 40 mm Hg occurred in 61.5% of patients.

Conclusion: Increased dimensions of left chambers and left ventricular mass especially when quantified by body surface point out to the need for indexing the values in these individuals. The presence of segmental deficit in 31.25% of patients suggests that silent ischemia is relatively common in centenarians. Pulmonary hypertension in 61.5% of patients without elevated pulmonary capillary pressure leads to suspected undiagnosed lung disease. (Arq Bras Cardiol: Imagem cardiovasc. 2015; 28(1):25-29)

Keywords: Aged, 80 and Over/Physiology; Echocardiography/Utilization; Longevity; Life Expectancy/Trends.

Introduction

Centenarian individuals have been considered the best example of successful aging of the cardiovascular system[1]. It is believed that this success is due to the ability to prevent, delay or limit the damage caused by cardiovascular disease (CVD). Population studies show a low prevalence of major cardiovascular risk factors (CRF) in this population, which would be one of the reasons that justifies the longevity of these individuals[2]. Despite the cardioprotective factors, these individuals have a non-negligible prevalence of cardiovascular diseases, especially coronary artery disease, heart failure and atrial fibrillation[3]. However, knowledge about the state of cardiovascular health of individuals older than one hundred years is scarce.

Epidemiological data have shown a linear increase in life expectancy at a rate of 2.5 years per decade in the last 150 years. Maintaining that pace, life expectancy will reach one hundred years later in this century[4]. These forecasts should alert the scientific community to seek greater understanding of the health/disease of the elderly in order to obtain information that is sufficiently clear and reliable for the good practice of medicine in this population.

This study aimed to evaluate the echocardiographic parameters in centenarians, since no study covering such data in that group was found in the literature.

Methods

From June 2010 to August 2013, 16 patients older than one hundred years (100.9 years on average, 68.75% female, weighing 48,200 g, height 149 cm, body surface area 1.40 m^2) were assessed by transthoracic echocardiography. Inclusion criteria comprised centenarians with low state of dependence and fragility, without obvious indication for performing echocardiography upon referral and no history of previous heart disease. They were referred by the attending or family physician.

Diameter, area, volume and left atrial volume indexed by body surface, right atrial area, absolute diastolic diameters and diastolic diameters indexed by left ventricular body

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surface, right ventricular diastolic diameter, calculation of absolute mass and mass indexed by left ventricular body surface and left ventricular geometry pattern were analyzed (normal, concentric remodeling, concentric hypertrophy and eccentric hypertrophy), global systolic function by calculating the ejection fraction from the Teichholz method or modified Simpson rule in situations of left ventricular segmental deficit, right ventricular systolic function by visual analysis and tricuspid annular plane systolic excursion (TAPSE), diastolic left ventricular function assessed by the pattern of mitral flow and tissue Doppler imaging of the mitral annulus and the E/e' ratio, calculation of systolic pressure in the pulmonary artery, valve assessment quantifying the presence and severity of regurgitant flow and stenotic lesions and research and pericardial effusion. All calculations were performed following the main guidelines available[5-11].

Results

Left atrial diameters, areas, volumes and indexed volumes are increased by 31.25% 50%, 68.75% and 87.5% of patients, respectively. The right atrium was dilated in 18.25% of cases. Absolute and indexed left ventricular diastolic diameters were found to be increased by 6.25% and 68.75%, respectively. In 12.5% of patients, the right ventricular diameter was increased; Absolute and indexed left ventricular mass was found to be increased in 37.5% and 75% of elderly patients. The geometry was considered normal in 12.5% of cases, concentric hypertrophy in 18.75% and eccentric hypertrophy in 62.5% of individuals. In only 6.25% of the sample there was a concentric remodeling pattern.

Ejection fraction was greater than 50% in 87.5% of cases. A deficit of left ventricular segmental contractility was observed in 31.25% of individuals. There were no cases of right ventricular systolic dysfunction, with TAPSE greater than 16 mm in all cases and consistent with the visual analysis. The left ventricular diastolic function pattern was normal, diastolic dysfunction grade I, diastolic dysfunction grade II, not analyzable due to the presence of atrial fibrillation in 6.25%, 68.75%, 12.5% and 12.5% of the cases, respectively. The E/e' ratio was smaller than 8, between 8 and 16 and greater than 16 in 12.5%, 62.5%, 12.5%, respectively, not analyzed in 12.5% of patients.

Of the 13 patients who had a pulmonary artery systolic pressure quantified, 61.5% had values above 40 mmHg. Moderate or severe mitral regurgitation occurred in 25% and 12.5%, respectively; while moderate or severe tricuspid regurgitation occurred in 37.5% and 12.5% of patients, respectively. Moderate aortic regurgitation affected 12.5% of patients and aortic valve sclerosis affected only 6.25%. Pericardial effusion was found in 12.5% of patients, all in small quantities and without hemodynamic repercussion.

Discussion

In this study, dimensions of the left chambers and left ventricular mass were increased in a large proportion of patients, especially when quantified according to the body surface, which points out to the need for indexing parameters in these individuals (Figure 1). Eccentric hypertrophy was the most common pattern of remodeling in this group (Figure 2). Unlike our findings, previous electrocardiogram studies conducted with centenarians showed signs of left ventricular hypertrophy of 0 to 3%[12,13]. One of the reasons for the discrepancy between electrocardiographic and echocardiographic findings may be the decline of ECG voltage with age, which would reduce the accuracy of this method in the diagnosis of left ventricular hypertrophy[14]. This finding in individuals without severe aortic valve and/or mitral regurgitation suggests that very old individuals may present an uncommon remodeling mechanism in the younger ones. Another hypothesis would be that the reference values, despite indexed by body surface area, would not apply in this group.

Despite the global ejection fraction preserved in 87.5% of cases, there was a segmental deficit in 31.25% of patients without any prior diagnosis of heart disease, which suggests that silent ischemic coronary artery disease is relatively common in centenarians, or symptoms are underestimated by the elderly themselves, their families or the attending physician. A study conducted in Denmark involving 207 centenarians indicated a prevalence of CAD in 28% of individuals[15].

In our study, the pattern of grade I left ventricular diastolic dysfunction was predominant. The E/e' ratio was normal in 12.5% of cases and high in 12.5% of the studies. Although the analysis of diastolic function in elderly patients through echocardiography has some limitations[16,17], and is not yet studied in the population of centenarians, our findings indicate that this group follows the same trend as that of younger patients.

Pulmonary artery systolic pressure greater than 40 mmHg was found in over half of patients without any echocardiographic signs suggesting significant elevation of pulmonary capillary pressure associated and may indicate undiagnosed lung disease or lung disorders related to senescence[18].

Although aortic stenosis is the most frequent valvular lesion found in elderly patients[19], in our series there was no case of serious injury. However, 100% of tests revealed aortic calcification worthy of note. Cases of moderate and severe mitral regurgitation secondary to mitral valve degeneration and calcification of the valve ring occurred in asymptomatic patients. These fibrocalcific changes are frequent in the elderly population and these findings in centenarians would be expected.

The echocardiographic findings presented in this study indicate the need for future research on the cardiovascular and pulmonary health of centenarian patients, preferably with larger samples, clinical follow-up started at an earlier stage and etiological investigation, since with the increase of life expectancy they will be increasingly present in medical practice.

Conclusion

The knowledge of the cardiovascular system in centenarians is at an early stage and is challenging due to the complexity of biological (senescence) and pathological (senility) interactions

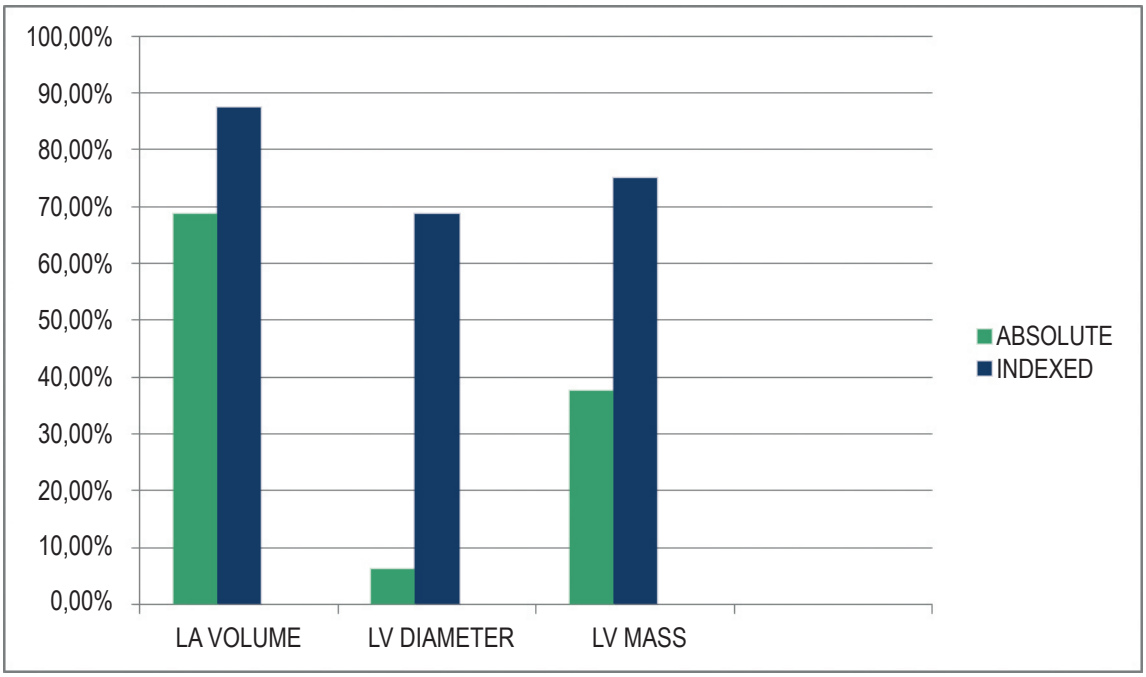

Figure 1 – *Comparison between absolute and indexed values of Left Atrial (LA) volume, Left Ventricular (LV) diameter and LV mass.*

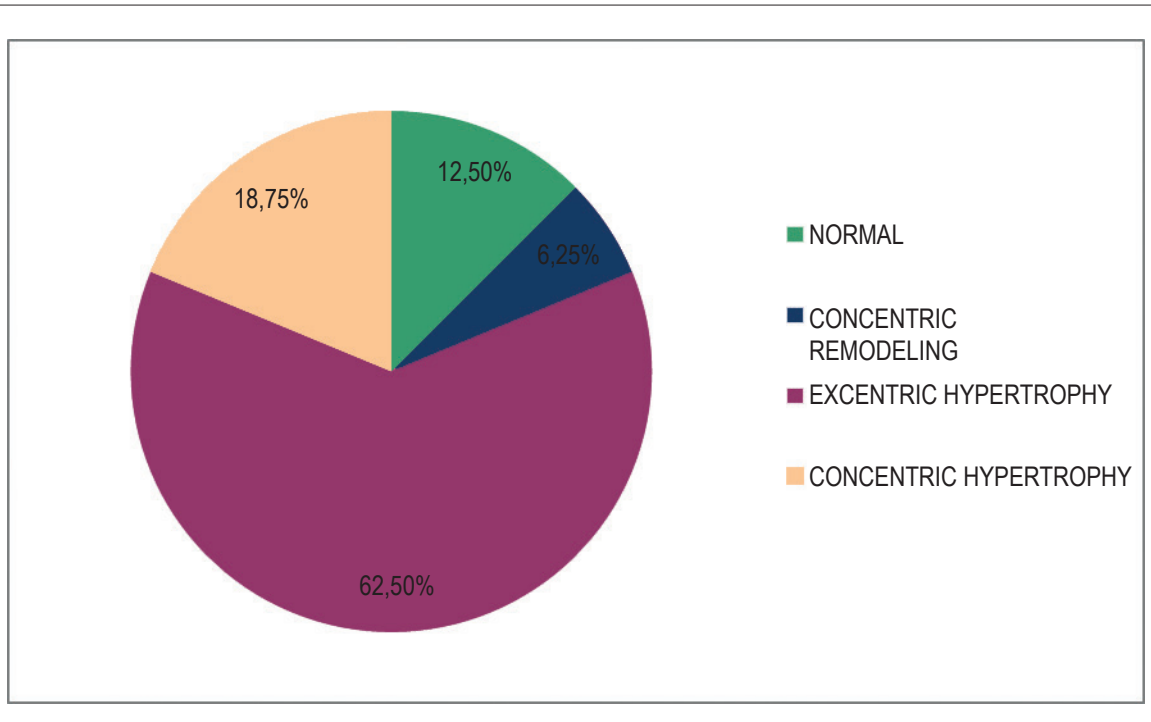

Figure 2 – *Left ventricular geometry pattern.*

of aging. Echocardiographic findings may contribute to better understand the real state of cardiovascular health in this population, as well as to open prospects for seeking the best treatment strategies. These preliminary data indicate that some diseases, such as CAD and pulmonary arterial hypertension may be more prevalent and not manifest the classic way, so the cardiologist and/or geriatrician must pay attention to potential implications on the quality of life of centenarians. Future studies with larger numbers of centenarians can provide clearer answers to our questions.

Authors' contribution

Research creation and design: Santana GF; Data acquisition: Santana GF, Leite DC; Data analysis and interpretation: Santana GF, Leite DC, Andrade NL, Amaral PC; Drafting of the manuscript: Santana GF; Critical revision of the manuscript as for important intellectual content: Santana GF, Leite DC, Andrade NL, Amaral PC.

Potential Conflicts of Interest

No relevant conflicts of interest.

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Academic Association

This study is not associated with any graduate programs.

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