What does the Cardiologist Expect from the Echocardiogram in Hypertension?

O que o Cardiologista Espera do Ecocardiograma na Hipertensão Arterial?

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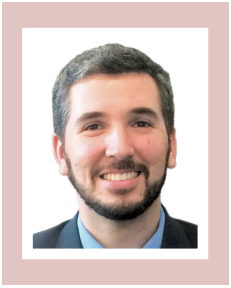

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Cardiovascular diseases are the leading cause of deaths in Brazil and worldwide. Arterial hypertension (AH) is one of the most important risk factors for cardiovascular diseases because of its high prevalence and strong association with cardiovascular outcomes and mortality.[1-3] Studies from the United States revealed that, in 2015, AH affected patients after the onset of acute myocardial infarction (AMI) (69%), as well as patients with stroke (77%), heart failure (HF) (75%), and peripheral arterial disease (PAD) (60%). HA accounts for 45% of deaths related to cardiac events and 51% of stroke-related deaths.[1] Morbidity is due to damage to target organs, including heart, brain, kidneys, and blood vessels, and the level of damage is positively correlated with the duration of AH.[2]

In the heart, AH can impair the structure and function of the ventricular and atrial myocardium, and epicardial and intramural coronary arteries.[1-5] ECHO is not routinely adopted for the initial evaluation of hypertension, but it is commonly used for the complementary assessment of cardiac injury. Emphasis has been provided on increased use of this technique to evaluate hypertension whenever possible, because it provides anatomical and functional information regarding factors with prognostic and therapeutic value, even in asymptomatic patients.

The Seventh Brazilian Guideline for Hypertension recommends using ECHO for diagnosing left ventricular hypertrophy (LVH) in patients suspected of LVH on the electrocardiogram (ECG) (degree of recommendation: I; Level of Evidence: C).[1] ECHO is more sensitive than ECG for such diagnosis. According to this guideline, the presence of LVH or cardiac structural changes from the subclinical phase allows stratification of cardiovascular risk and identification of individuals with high cardiovascular risk. A combination of antihypertensive drugs (renin-angiotensin-aldosterone system inhibitors) and a more rigorous blood pressure target (<130 × 80 mmHg) were recommended in this patient.[1]

The presence of LVH on ECHO is a strong predictor of mortality in hypertensive patients and the general population,[6,7] and the regression of echocardiographic LVH due to hypertension treatment predicts a better prognosis.[6] The continuous monitoring of LV mass (LVM) and long-term LV function parameters indicate the effectiveness of the treatment.[2]

The diagnosis of LVH on ECHO is confirmed when LVM/body surface area is increased.[1] Based on ECHO findings, LV geometry can be classified into four groups, based on the presence or absence of an increase in LVM and relative wall thickness (RWT). Therefore, LV geometry can be normal (both parameters are normal), or there might be an increase in RWT, which characterizes concentric remodeling, or an increase in LVM (LVH) with eccentric (normal ERP) or concentric (increased ERP) geometry (Figure 1).[4,8] The associated cardiovascular risk is elevated in conditions involving changes in LV geometry. The parameters used for assessment of structural changes on ECHO, according to the European guideline for AH, are shown in Table 1.[2]

A recent study[9] proposed following classification of HF in hypertensive patients: stage 0, no cardiac damage; stage 1, damage to the left ventricle; stage 2, damage to the left atrium and mitral valve; and stages 3 and 4, damage to pulmonary vessels, right ventricle, and tricuspid valve. The study found that higher the stage, higher were the rates of total mortality and cardiovascular events, which reinforces the importance of ECHO and the possibility of quantifying the severity of cardiac involvement in AH.[9]

The detection of LVH on ECHO is useful in young adults

Keywords

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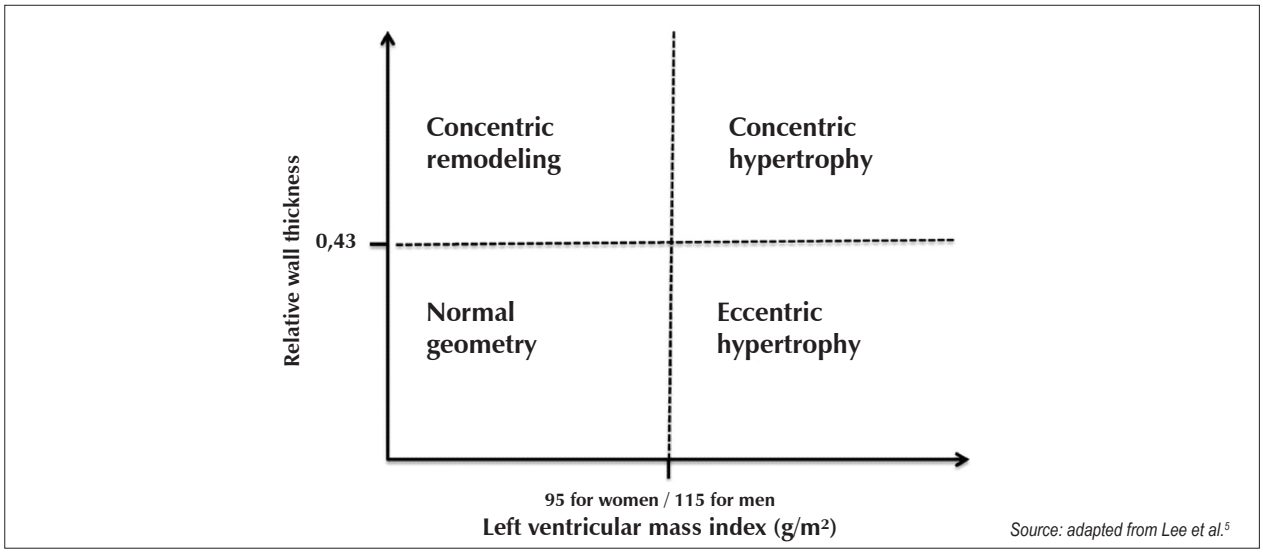

Figure 1 – *Classification of hypertensive individuals according to left ventricular hypertrophy and relative wall thickness.*

Chart 1 - Echocardiographic parameters used for assessing cardiac structural changes according to the 2018 European guideline.[2]

Parameter	Measurement	Cut-off value
LVM	LVM/height$^{2.7}$ (g/m$^{2.7}$)	>50 for men >47 for women
LVM*	LVM/BSA (g/m^2)	>115 for men >95 for women
LV concentric geometry	RWT	≥ 0.43
LV size	LV end-diastolic diameter/ height (cm/m)	>3.4 for men >3.3 for women
LA size (elliptical)	LA volume/height^2 (mL/m^2)	>18.5 for men >16.5 for women

*Source: adapted from Williams et al.[2] *Used in normal-weight patients. LVM, left ventricular mass; BSA, body surface area; LV, left ventricle; RWT, relative wall thickness; LA, left atrium.*

(18 years of age) and individuals with evidence of secondary hypertension, uncontrolled chronic hypertension, or a history of HF symptoms.[3] In contrast, individuals with stage 1 blood pressure (BP) or high normal BP might need more aggressive treatments in cases of changes in LVM, demonstrating the fundamental role of ECHO in the early stages of AH.[2]

Left atrial enlargement (assessed by diameter, area and/or volume) is a common structural change in hypertensive patients and is associated with adverse cardiovascular events, incident atrial fibrillation, and diastolic dysfunction. Its routine evaluation by ECHO and continuous monitoring is clinically important.[2]

AH negatively affects other echocardiographic markers of cardiac structure and function, including aortic root diameter, diastolic function, LV geometry, as well as subclinical markers of LV systolic function, such as myocardial deformation (longitudinal strain).[2,3,8] Nonetheless, the role of these parameters in cardiovascular risk stratification and increase in LV mass and left atrial enlargement is unknown.[2] For this reason, a clinical cardiologist should become familiar with these echocardiographic parameters and monitor the evolution of their use in hypertensive individuals.[5]

It is worth mentioning that AH is the clinical condition most frequently associated with HF with preserved ejection fraction (HFpEF) and is often underdiagnosed. Therefore, in addition to evaluating the cardiac structure, it is crucial to perform tissue Doppler with measurements of the E/e' ratio and septal and lateral e' velocities as relevant criteria for assessing LV diastolic function and characterizing HFpEF. This diagnostic technique, albeit without specific treatment and obvious benefits, identified patients with high cardiovascular risk, and warranted a careful follow-up because of higher risk of progressive loss of LV function and high rates of morbidity and mortality.[2,9,10]

Three-dimensional ECHO is a more reliable method for quantitative analysis of the LVM, ejection volume, and ejection fraction. Furthermore, this technique has superior reproducibility than two-dimensional ECHO and its results are in better agreement with magnetic resonance imaging results. However, it is costlier, is less accessible, and its prognostic value has not been fully validated.[2]

ECHO is a non-invasive and easily accessible tool that is useful in the evaluation of hypertensive individuals. ECHO findings should be interpreted in conjunction with clinical assessment data. The use of ECHO should be promoted because it allows characterizing and monitoring of target organ damage, improving cardiovascular risk stratification, and adopting novel therapeutic strategies.[1-3,5]

Conflict of interest

The authors have declared that they have no conflict of interest.

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