What does the Cardiologist expect from Echocardiography in Heart Failure with Preserved Ejection Fraction?

O que o Cardiologista Espera do Ecocardiograma na Insuficiência Cardíaca com Fração de Ejeção Preservada?

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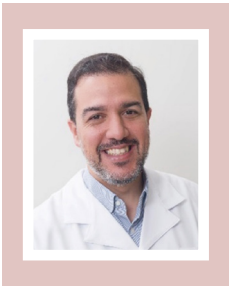

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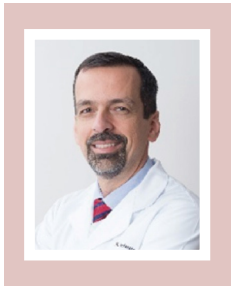

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Heart Failure (HF) with Preserved Ejection Fraction (HFpEF) has become increasingly prevalent, and currently accounts for about half of HF cases.[1] HFpEF is a heterogeneous syndrome characterized by multiple phenotypes, frequent presence of multiple comorbidities, high mortality, and for which no treatment has been shown to be effective in improving survival in randomized controlled trials.[2–6] This is partly due to its difficult diagnosis, for which there is no single biomarker or gold standard.Diagnosis of HFpEF is based on a set of clinical data and complementary tests, in which echocardiography plays a central role.[7,8]

Traditionally, echocardiography allows to classify diastolic dysfunction and to estimate the filling pressures from an integrated analysis of different parameters, where the transvalvular mitral flow pattern (E and A waves) is the main reference. Three patterns of diastolic dysfunction are defined in increasing order of severity: grade I (impaired ventricular relaxation without increased filling pressures), grade II (impaired ventricular relaxation coexisting with increased filling pressures, usually demonstrating "pseudonormal mitral flow pattern") and grade III (very high filling pressures accompanied by restrictive mitral flow pattern).[7]

Although useful, the application of echocardiography in HFpEF is not restricted to the assessment of diastolic function. In a patient with suspected HFpEF, echocardiography should assist in diagnostic management, providing information that corroborates (or not) HFpEF, and identifying the presence of other cardiac causes of exercise intolerance. The Heart Failure Association of the European Society of Cardiology has recently proposed the diagnostic algorithm HPA-PEFF, which involves a four-step approach: Step 1 (P) — "pretest" evaluation, identifying the patient with signs and symptoms suggestive of HF, preserved ejection fraction and ruling out other causes; Step 2 (E) — applying a diagnostic score with echocardiography and natriuretic peptides data; Step 3 (F1) — functional test; and Step 4 (F2) — "final" etiology of HF.[9] This algorithm comprehensively describes the required echocardiographic measurements in patients with suspected HFpEF. Although HFA-PEFF undertakes a full diagnostic approach,[9] including clinical examination and sequential use of other complementary tests, we will only focus on echocardiographic measurements in this editorial.

Firstly, the echocardiogram should report left ventricular ejection fraction (LVEF) measured using a biplanar method, diastolic function, ventricular volumes, left ventricular mass (LV) indexed to body surface area, and left atrial size. Besides, other cardiac causes of exercise intolerance must be ruled out, such as valve disease, pericardial effusion, constrictive pericarditis and pulmonary hypertension. In a patient with signs and symptoms of HF, the presence of LVEF ≥ 50% in an undilated ventricle with hypertrophy or concentric remodeling and enlarged left atrium is highly suggestive of HFpEF.

In patients with suspected HFpEF, the HFA-PEFF algorithm proposes the use of a score that includes biomarkers (serum natriuretic peptide levels) and a more detailed echocardiogram analysis, with functional and morphological criteria evaluated using well-defined cutoff values. These include tissue Doppler-derived parameters (septal and lateral e' velocities, mean E/e' ratio), peak velocity of tricuspid valve regurgitation and/or pulmonary artery systolic pressure estimation, left atrial volume index, left atrial mass (indexed to body surface area) and relative wall thickness. LV global longitudinal strain may also be helpful, if available. These measures define the presence of major and minor criteria, which are incorporated into a scoring system that derives the score. Table 1 describes the echocardiographic criteria that make up the proposed score and their cutoff values.

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Diagnosis of HFpEF is challenging, and proper evaluation of patients with suspected HFpEF relies on a well-performed anamnesis and physical examination, along with rational and integrated use of complementary tests, among which echocardiography is essential.[10] Echocardiography is crucial to confirm the diagnosis of HFpEF, to rule out other causes of exercise intolerance and to suggest a specific etiology. Therefore, the clinician and the echocardiographer should be aligned in order to get the most out of this tool, increasing the accuracy of diagnosis and the chances of successful treatment.

Conflict of interest

The authors declare that there is no conflict of interest regarding this manuscript.

Table 1 - Echocardiographic criteria used in the diagnosis of heart failure with preserved ejection fraction.

Parameter	Major criterion for diagnosis of HFpEF	Comment
LVEF	≥ 50%	Measured by biplanar or three-dimensional method
Left atrial volume	> 34 ml/m² if sinus rhythm (or > 40 ml/m² if AF)	Minor criteria: 29–34 ml/m2 if sinus rhythm or 34–40ml/m2 if AF
LV mass and relative wall thickness	≥ 149 (men) or ≥ 122 (women) g/m² + relative wall thickness > 0.42	Minor criteria: ≥ 115 (men) or ≥ 95 (women) g/m² or septum ≥ 12 mm or relative wall thickness > 0.42 alone
e'	< 7 cm/s (septal) or < 10 cm/s (lateral) if age < 75 years; < 5 cm/s (septal) or < 7 cm/s (lateral) if ≥ 75 years	
Mean E/e' ratio	≥ 15	Minor criteria: 9–14
TR peak speed	> 2.8 m/s	
PASP	> 35 mmHg	
Global longitudinal strain	< 16% (absolute value)	Considered a minor criterion

LVEF - ejection fraction, AF - atrial fibrillation, LV - left ventricle, e' - mitral annulus early diastolic velocity on tissue Doppler; E - mitral flow early diastolic velocity on pulsed Doppler; TR - tricuspid regurgitation, PASP - pulmonary artery systolic pressure.

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