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Impairment of Left Ventricular Global Longitudinal Strain in Hypertensive Patients, A Serial of 333 Moroccan Patients

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Abstract

Heart failure with preserved ejection fraction (HFpEF) is a major public health problem. It indicates a primary problem in the ability of the ventricles to relax and fill normally. HFpEF is associated with high morbidity and mortality particularly in hypertensive patients. It is responsible for approximately half of all heart failure hospitalizations, with mean survival similar to those with heart failure with reduced ejection fraction. A strong correlation exists between impaired diastolic function and longitudinal systolic dysfunction. It is due to left ventricle (LV) remodeling and hypertrophy. The Early detection of subclinical LV systolic dysfunction in hypertensive patients is important for the prevention of progression of the disease, and to avoid symptomatic heart failure.

Keywords: impairement; left ventricular; strain; hypertensive patients, patients

Introduction

Heart failure with preserved ejection fraction (HFpEF) is a major public health problem. It indicates a primary problem in the ability of the ventricles to relax and fill normally [1]. HFpEF is associated with high morbidity and mortality particularly in hypertensive patients [2]. It is responsible for approximately half of all heart failure hospitalizations, with mean survival similar to those with heart failure with reduced ejection fraction [3]. A strong correlation exists between impaired diastolic function and longitudinal systolic dysfunction. It is due to left ventricle (LV) remodeling and hypertrophy [4].

Methods

This work results from the analysis of a serie of 333 hypertensive Moroccan patients, aged from 25 to 75 years who were followed up in the department of Cardiology of the University Hopsital of Ibn Rochd. Patients with secondary hypertension, leaky or stenosing valve disease, arrhythmia, and with a history of coronary disease were excluded from this study. All patients were subjected to proper history taking including clinical examination, measurements of heart rate, weight, and height. Body surface area and body mass index (BMI) were calculated. Measurements of blood pressure (BP) were taken according to American Heart Association and American College of Cardiology 2013 guidelines for the management of BP [5]. A complete echocardiographic study, including left ventricle ejection fraction (LVEF) by Simpson's method, the determination of the LV mass, the analysis of the diastolic function with doppler parameters (E/e', LA volume index, and max tricuspid regurgitation velocity) were performed for all patients. The analysis of the LV longitudinal deformation with speckle tracking method (Global Longitudinal Strain) was also assessed with high-quality ECG-gated images from the apical four-chamber, two-chamber, and three-chamber views. All Echocardiograms were interpreted by the clinical cardiologist assigned to the echocardiogram lab at the time of the diagnostic study.

Results

The study population consisted of 333 hypertensive patients. 225 patients (67.5%) had an impaired diastolic function, of which 60 patients (18%) had high filling pressures. 49.39% had a LV hypertrophy. Almost

all of these patients, 60 patients had a low global longitudinal strain (GLS). Results shows a statistically significant relationship between lower GLS and increased left ventricular filling pressures in hypertensive patients. These results suggest that increased filling pressures are closely associated with atrioventricular interaction in patients with hypertension, and a strong correlation with impairment of longitudinal systolic function and diastolic function.

Discussion

HFpEF, previously named "diastolic heart failure", is a complex clinical entity associated with significant morbidity and mortality [3]. It is actually recognized as a systemic syndrome with different pathophysiologic abnormalities above and beyond left ventricular diastolic dysfunction. Myocardial fibrosis, abnormal cardiomyocyte calcium handling, increased passive myocardial stiffness due to altered titin phosphorylation states, impaired cyclic guanosine monophosphate (cGMP)-protein kinase G (PKG) activity, cardiac and extracardiac metabolic derangements, arterial dysfunction, abnormal cardiorenal interactions, and other mechanistic hypotheses have been implicated in HFpEF [6]. The primary pathophysiological mechanisms underlying HFPEF are fibrosis and reduced ventricular compliance [7]. Consequently, LVEF is a poorly sensitive indicator of myocardial contractility and subclinical alterations in LV systolic function are already evident in HFpEF. Hypertension has been shown to be the most significant risk factor for the development of left ventricular diastolic dysfunction [8]. The decline of the longitudinal function index, despite a normal LVEF, is well correlated with the increase of filling pressures in hypertensive patients especially in case of left ventricle hypertrophy. The association between hypertension with left ventricle hypertrophy and the deterioration of asymptomatic diastolic function is also well recognized [9]. A linear relationship is already established between the increase of left ventricular mass, diastolic dysfunction and LV systolic dysfunction [10].

Conclusion

In hypertensive patients, LV systolic function is commonly considered normal if the global EF is normal. However, the EF reflect only the global cardiac contractile function [11]. The above results show that GLS is able to detect subclinical myocardial dysfunction in hypertensive patients, despite normal global systolic parameters by conventional 2D echocardiography. Early detection of subclinical LV systolic dysfunction in hypertensive patients is important for the prevention of progression of hypertensive heart disease, and should impose a therapeutic prevention strategy to avoid symptomatic heart failure.

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Conflict of interest

None declared.

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