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Original Research Paper

Cardiology

EPICARDIAL FAT THICKNESS IS ASSOCIATED WITH DIASTOLIC DYSFUNCTION IN OBESE HYPERTENSIVE PATIENTS

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ABSTRACT Diastolic dysfunction is characterized by alterations in left ventricle diastolic filling and is a predictor of cardiovascular events. Several risk factors, including hypertension, obesity, and increased visceral fat, are implicated in the development of left ventricle diastolic dysfunction (LVDD). Epicardial adipose tissue is true visceral fat. The presence and severity of diastolic dysfunction is commonly evaluated by echocardiography, also, transthoracic echocardiography provides a reliable measurement of epicardial fat thickness. The aim of this work was to evaluate if epicardial fat has a role in the development of LVDD in obese hypertensive patients. **Methods.** We included 70 hypertensive obese patients who underwent echocardiography with an Aloka Alfa 6 equipment (Japan) using a 3.5 MHz transducer, by 2 cardiologists who were unaware of the clinical data. Epicardial fat thickness was measured as described by Iacobellis. To assess diastolic dysfunction, the E/A ratio, the deceleration time, and the e'/a' ratio were used according to the Nagueh criteria. Statistical analysis was performed with the fisher test. **Results.** We found LVDD in 56 obese hypertensive patients. When we evaluated the risk for LVDD inobese hypertensive patients with an EFT ≥ 4 mm, we found a statistically significant association ($p<0.01$), Interestingly, only one patient with an EFT < 4 mm shown LVDD. **Conclusion:** We found that Epicardial fat thickness > 4mm is associated with LVDD in obese hypertensive subjects. The measurement of EFT whereas non-invasive and useful, should be part of the cardiovascular risk evaluation in obese hypertensive patients.

KEYWORDS :

Diastolic dysfunction is characterized by alterations in left ventricle diastolic relaxation and filling and is a predictor of cardiovascular events. Several risk factors, including hypertension, obesity, and increased visceral fat, are implicated in the development of left ventricle diastolic dysfunction (LVDD), Diastolic dysfunction is a precursor condition to the development of heart failure with preserved ejection fraction (HFpEF), in fact LVDD and HFpEF are considered as an extension of cardiometabolic syndrome. [1]

Epicardial adipose tissue is true visceral fat, it is deposited between the myocardium and the visceral layer of the pericardium. As epicardial fat and myocardium share the same microcirculation, and due also to the absence of fascia between them, adipokines secreted from epicardial fat diffuse directly into myocardium and modulate cardiac function. We have found that an epicardial fat thickness ≥ 4 mm is associated with atherosclerosis, even more than intra-abdominal visceral fat. [2]

The presence and severity of diastolic dysfunction is commonly evaluated by echocardiography, also, transthoracic echocardiography provides a reliable measurement of epicardial fat thickness. [1,2]

The aim of this work is to evaluate if epicardial fat has a role in the development of LVDD in obese hypertensive patients.

METHODS

We included 70 hypertensive obese patients, referred from primary care clinics, without previous drug therapy, who underwent echocardiography with an Aloka Alfa 6 equipment (Japan) using a 3.5 MHz transducer, by 2 cardiologists who were unaware of the clinical data.

Epicardial fat thickness (EFT) was identified as the echo-free space between the outer wall of the myocardium and the visceral layer of the pericardium. It was measured on the free wall of the right ventricle perpendicularly at end-systole from the parasternal long-axis views of 3 cardiac cycles by standard transthoracic 2D echocardiography as described by Iacobellis. [3]

To assess diastolic dysfunction, wave e, wave a, the e/a ratio, the deceleration time, and the e'/a' ratio were used according to the Nagueh criteria. [4]

In all patients, serum glucose (glucose oxidase), creatinine (JAFFE), lipid profile (CHODPAP) and triglycerides (Triglyceride-pap) were measured. All venous samples were collected in the morning, after 12 hours overnight fast.

Patients with any of the following diagnoses were excluded from the study: decompensated Diabetes mellitus (glucose ≥ 250 mg/ml), hepatic, or renal failure, evidence of valvular heart disease, heart block or cardiac arrhythmia, acute coronary syndrome or cerebrovascular disease six months before the baseline of the study. There also were excluded subjects with autoimmune disease, pregnancy, malignancy and alcohol or psychotropic drugs abuse.

The study was conducted with the approval of the Research and Ethics Committee of our hospital. The register number is 208/010/014/18. Participants gave written informed consent before their inclusion in the study protocol.

Data are presented as the mean ± SD. Statistical analysis was performed with the fisher test. a $P < 0.05$ was considered significant.

RESULTS

Basal characteristics of patients are shown in table # 1

We found LVDD in 56 obese hypertensive patients (80%).

When we evaluated the risk for LVDD in obese hypertensive patients with an EFT ≥ 4 mm, we found a statistically significant association ($p<0.01$), Interestingly, only one patient with an EFT < 4 mm shown LVDD.

DISCUSSION

In this study we found a high prevalence of LVDD in obese hypertensive patients, and that an EFT > 4 mm is significantly associated with LVDD, a pre-development phase on HFpEF.

Several studies have shown the relation between metabolic conditions and LVDD, by different pathways, as activation of both, sympathetic and renin-angiotensin systems, inflammation, endothelial dysfunction and oxidative stress [1,5], visceral fat has also been related with the development of LVDD, and epicardial fat is visceral fat, in this study we found that patients with increased epicardial fat thickness, obesity and hypertension have a greater prevalence of LVDD.

The prevalence of LVDD in hypertensive patients has been reported in a range between 14 and 84% [6], we found LVDD in 80% of our hypertensive obese patients, interestingly, the age of our patients was lower than those reported by other authors. [6]

Hypertension impairs relaxation and reduces filling rates, and leads to left ventricular hypertrophy, myocardial stiffness and fibrosis, all those factors contribute to impaired ventricular relaxation, and elevated pressure during filling [6]. Besides, renin angiotensin aldosterone system stimulates accumulation of extracellular matrix in the heart and cardiac fibrosis, that contributes to LVDD. [6]

The increase of EFT is associated with the release of proinflammatory, proatherogenic and profibrotic cytokines that impact directly into myocardium and promotes fibrosis, in addition to the above, a mechanical effect of increased epicardial fat thickness may limit the distensibility of the heart, and explain why LVDD was a common feature in those patients with an EFT >4 mm.

Sidhu et als, found that EFT was significantly higher in patients with HFpEF when compared with patients with heart failure with reduced ejection fraction, they suggest that EFT may act as a constraint to cardiac function, however, they included normotensive and hypertensive patients 70 years and older [7]. And Cavalcante et als found that epicardial fat volume, measured by cardiac computed tomography, is a predictor of impaired diastolic function in healthy overweight subjects. [8]

Our findings may have therapeutical implications, since glucagon-like peptide-1 (GLP-1) receptor agonist, as semaglutide, have shown to produce weight loss, reduction in epicardial fat thickness, and may prevent HFpEF development, in obese hypertensive patients, this fact requires further research. [9]

CONCLUSION

We found that Epicardial fat thickness > 4mm is associated with LVDD in obese hypertensive subjects.

The measurement of EFT whereas non-invasive and useful, should be part of the cardiovascular risk evaluation in obese hypertensive patients.

Table 1: Basal Characteristics of Patients

AGE (YEARS)	51.4 ± 7.27
SEX (M/F)	21/49
BODY MASS INDEX	36.2 ± 4.6
WAIST CIRCUMPHERENCE (CM)	108.3 ± 9.1
BLOOD PRESSURE (mm Hg)	162 ± 14 / 94 ± 8
EPICARDIAL FAT THICKNESS (mm)	5.3 ± 1.4
GLUCEMIA mmol/L	7.52 ± 2.0
TRYGLICERIDES mmol/L (mg/dl)	3.94 ± 2.3
HIGH DENSITY LIPOPROTEINS mmol/L	1.04 ± 0.25
LOW DENSITY LIPOPROTEINS mmol/L	3.32 ± 0.9

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