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EDITORIAL
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Metabolic syndrome and subclinical left ventricular dysfunction

Síndrome metabólica e disfunção ventricular esquerda subclínica

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ABSTRACT

Recent studies using both conventional and tissue Doppler echocardiography have gathered evidence of myocardial dysfunction in individuals with metabolic syndrome. Recently, two-dimensional speckle-tracking echocardiography (2D-STE) has become a robust method for the detection of subclinical left ventricular dysfunction through quantitative assessment of myocardial deformation. Some studies suggest that metabolic syndrome is associated with longitudinal deformation of the left ventricle and that global longitudinal strain measured by 2D-STE is impaired in individuals with metabolic syndrome. It may be inferred that the early identification of subclinical left ventricular dysfunction and the determination of the role of the components of metabolic syndrome in impaired myocardial contractility can help elucidate and predict the risk of cardiovascular diseases in this syndrome.

KEY WORDS: metabolic syndrome X; ventricular function, left; myocardial contraction; echocardiography.

RESUMO

Estudos recentes usando ecocardiografia convencional e doppler tecidual têm mostrado evidência de disfunção miocárdica em indivíduos com síndrome metabólica. Recentemente, a ecocardiografia bidimensional *speckle-tracking* (2D-STE) emergiu como uma técnica robusta para detectar disfunção ventricular esquerda subclínica por avaliação quantitativa da deformação do miocárdio. Alguns estudos sugerem que a síndrome metabólica está associada com a deformação longitudinal do ventrículo esquerdo e, que o *strain* longitudinal global medido pela 2D-STE está prejudicado em sujeitos com síndrome metabólica. Pode-se inferir que a identificação precoce da disfunção ventricular esquerda e o reconhecimento do papel dos componentes da síndrome metabólica na alteração da contratilidade miocárdica ajudarão na compreensão e predição de risco de doenças cardiovasculares nessa síndrome.

DESCRITORES: síndrome X metabólica; função ventricular esquerda; contração miocárdica; ecocardiografia.

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Abbreviations: CVD, cardiovascular diseases; HF, heart failure; LVD, left ventricular dysfunction; MetS, metabolic syndrome; 2D-STE, two-dimensional speckle-tracking echocardiography.

Chronic non-communicable diseases, mainly cardiovascular diseases (CVD), diabetes, cancer, and chronic respiratory diseases, are the leading causes of death worldwide and are a global public health problem. The demographic and epidemiologic transitions observed in the changes of health-disease processes at a global level in the 20th century, albeit at a different pace, were accompanied by nutritional transition, in which nutritional deficiencies were "replaced" with excess body weight. In this scenario, new public health problems, such as obesity and metabolic syndrome (MetS), have arisen [1].

MetS is characterized as a constellation of cardiovascular risk factors, including abdominal obesity, glucose intolerance, insulin resistance, dyslipidemia, and hypertension [2]. It is estimated that approximately 25% of the world's adult population suffers from MetS, and this condition is associated with increased risk for diabetes, myocardial infarction, and stroke [3].

In the last decade, some studies showed that overweight, obesity, MetS, and diabetes play an important role in the development of cardiovascular morbidity and mortality [4]. Clinical studies indicate that MetS is implicated in the development of risk factors for atherosclerotic vascular disease and also associated with another cardiovascular outcome – heart failure (HF) [5].

HF is a complex clinical syndrome that results from any structural or functional impairment of the ability of ventricles to fill with or eject blood [6]. The HF syndrome has been compared to an iceberg. The visible section represents HF cases established in the community: most of them in the primary healthcare setting. The invisible section "below the waterline" represents cases of undetected HF and those with asymptomatic or subclinical left ventricular dysfunction (LVD) that are prone to develop HF.

With respect to the diagnostic tools in HF, Doppler echocardiography is a quick and useful method for diagnostic confirmation, assessment of etiology, of the pathophysiological and hemodynamic model, of prognosis, and for the suggestion of possible therapeutic alternatives. Left ventricular ejection fraction is the most important parameter for assessment of systolic function.

Recent studies using both conventional and tissue Doppler echocardiography have gathered evidence of myocardial dysfunction in individuals with MetS [7]. However, conventional echocardiographic parameters for verification of systolic function have poor sensitivity for the careful evaluation of myocardial contractility and fail to detect slight changes in contractility or early changes.

Recently, two-dimensional speckle-tracking echocardiography (2D-STE) has become a more robust method for the detection of subclinical LVD through quantitative assessment of myocardial deformation [8,9]. One of the key concepts of speckle-tracking is strain, expressed as percentage (%) and defined as fractional shortening of a myocardial segment, often related to the length of the end diastole. The strain can be assessed in each region of the investigated ventricle (regional strain) and the mean of these values stand for the global strain, representing the global ventricular function. This method allows assessing myocardial fibers in their specific orientation patterns (subendocardial fibers and longitudinal strain, and subepicardial fibers and circumferential and radial strain) [10].

Some previous studies with small samples suggest that MetS is associated with longitudinal deformation of the left ventricle and that global longitudinal strain measured by 2D-STE is impaired in individuals with MetS [10]. Nevertheless, this association remains to be demonstrated in large representative samples.

Based on this body of evidence, it may be inferred that the early identification of subclinical LVD in MetS and the determination of the role of the components of this syndrome in impaired myocardial contractility can help elucidate and predict the risk of CVD in MetS.

REFERENCES

1. Cañon-Montañez W. Strain longitudinal global e síndrome metabólica no ELSA-Brasil: uma análise por ecocardiografia bidimensional speckle-tracking. Porto Alegre. Tese [Doutorado em Epidemiologia] - Universidade Federal do Rio Grande do Sul; 2016. Disponível em: http://hdl.handle.net/10183/139778
2. Grundy SM. Metabolic syndrome: a multiplex cardiovascular risk factor. J Clin Endocrinol Metab. 2007;92(2):399-404. http://dx.doi.org/10.1210/jc.2006-0513
3. Mottillo S, Filion KB, Genest J, Joseph L, Pilote L, Poirier P, Rinfret S, Schiffrin EL, Eisenberg MJ. The metabolic syndrome and cardiovascular risk a systematic review and meta-analysis. J Am Coll Cardiol. 2010;56(14):1113-32. http://dx.doi.org/10.1016/j.jacc.2010.05.034
4. Mensah GA, Mokdad AH, Ford E, Narayan KM, Giles WH, Vinicor F, Deedwania PC. Obesity, metabolic syndrome, and type 2 diabetes: emerging epidemics and their cardiovascular implications. Cardiol Clin. 2004;22(4):485-504. http://dx.doi.org/10.1016/j.ccl.2004.06.005
5. Suzuki T, Katz R, Jenny NS, Zakai NA, LeWinter MM, Barzilay JI, Cushman M. Metabolic syndrome, inflammation, and incident heart failure in the elderly: the cardiovascular health study. Circ Heart Fail. 2008;1(4):242-8. http://dx.doi.org/10.1161/CIRCHEARTFAILURE.108.785485
6. Yancy CW, Jessup M, Bozkurt B, Butler J, Casey DE Jr, Drazner MH, Fonarow GC, Geraci SA, Horwich T, Januzzi JL, Johnson MR, Kasper EK, Levy WC, Masoudi FA, McBride PE, McMurray JJ, Mitchell JE, Peterson PN, Riegel B, Sam F, Stevenson LW, Tang WH, Tsai EJ, Wilkoff BL. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol. 2013;62(16):e147-239. http://dx.doi.org/10.1016/j.jacc.2013.05.019
7. Gong HP, Tan HW, Fang NN, Song T, Li SH, Zhong M, Zhang W, Zhang Y. Impaired left ventricular systolic and diastolic function in patients with metabolic syndrome as assessed by strain and strain rate imaging. Diabetes Res Clin Pract. 2009;83(3):300-7. http://dx.doi.org/10.1016/j.diabres.2008.10.018
8. Shah AM, Solomon SD. Myocardial deformation imaging: current status and future directions. Circulation. 2012;125(2):e244-8. http://dx.doi.org/10.1161/CIRCULATIONAHA.111.086348
9. Voigt JU, Pedrizzetti G, Lysyansky P, Marwick TH, Houle H, Baumann R, Pedri S, Ito Y, Abe Y, Metz S, Song JH, Hamilton J, Sengupta PP, Kolias TJ, d'Hooge J, Aurigemma GP, Thomas JD, Badano LP. Definitions for a common standard for 2D speckle tracking echocardiography: consensus document of the EACVI/ASE/Industry Task Force to standardize deformation imaging. J Am Soc Echocardiogr. 2015;28(2):183-93. http://dx.doi.org/10.1016/j.echo.2014.11.003
10. Cañon-Montañez W, Santos ABS, Foppa M. Strain longitudinal global: un parámetro útil para evaluar disfunción ventricular izquierda subclínica en el síndrome metabólico. Rev Colomb Cardiol. 2016;23(2):112-9. http://dx.doi.org/10.1016/j.rccar.2015.10.008