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ORIGINAL RESEARCH ARTICLE

Evaluation of the relationship between cardiovascular risk factors and left ventricular diastolic function parameters in myocardial perfusion scan

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ABSTRACT

Introduction: Heart failure is an important life-threatening problem, with left ventricular diastolic dysfunction as a major initial pathophysiologic process and identification and treatment of related risk factors lead to better prognosis. Gated single-photon emission computed tomography (G-SPECT) myocardial perfusion imaging (MPI) is a feasible tool to evaluate the diastolic function. The aim of this study was to assess the correlation of cardiovascular risk factors with the diastolic function parameters in G-SPECT MPI.

Methods: This is a cross-sectional retrospective study including 274 patients with normal ejection fraction (EF) and no previous history of heart disease. Demographic data and history of cardiovascular risk factors were collected. Correlation of quantitative functional parameters of G-SPECT including diastolic indices (peak filling rate (PFR), time to peak filling rate (TTPF), mean filling rate at the first third of diastolic phase (MFR/3), and second peak filling rate (PFR2)) with cardiovascular factors was studied using SPSS software.

Results: In this study, 274 patients with a mean age of 56 years (with 172 females) were evaluated. There was a significant relationship between age and all diastolic parameters. Diabetic patients had a significantly lower TTPF, and hypertensive patients revealed a significantly lower MFR/3. Hyperlipidemia and chronic kidney disease were not associated with any diastolic parameters. PFR was significantly lower in smokers, and family history had a significant relationship with PFR2.

Conclusion: Most of CAD risk factors, except for CKD and hyperlipidemia, had a significant relationship with at least one parameter of the left ventricular diastolic function in G-SPECT MPI.

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echocardiography. It has been shown that smoking remarkably affects the LV diastolic function by prolonging the relaxation time due to shifting the mitral blood flow from early (E wave) to late (A wave) diastole [9, 10]. Nonetheless, our study found that the most affected parameter in G-SPECT MPI was the PFR. Our data showed that hyperlipidemia did not correlate with diastolic parameters. However, lately, some reports mentioned that hyperlipidemia was associated with impaired relaxation in patients with normal ejection fraction and the absence of heart failure. In heterozygous familial hypercholesterolemia (FH) patients, increased low-density lipoprotein (LDL) cholesterol leads to endothelial dysfunction, adverse changes in vascular morphology, and increased intima-media thickness in the peripheral arteries. In our study, however, there might be heterogenous characteristics of hyperlipidemic patients including those with and without therapy that might influence the result.
Patients with a family history of CAD have been shown to have a significant increase in the LV mass and relaxation time leading to LVDD [21]. In our study, the PFR2 parameter, which is considered as the index of left atrial contribution in diastolic phase, was higher in the patients who had a positive family history of CAD. The heritability of the LV structure and function as determined by echocardiography has been studied in a research conducted in 2013, and it suggested that there is overall moderate to small heritability for the LV structure which was reported to be 48% for systolic function and 25-53% for diastolic function [22]. It can be suggested that genetic pathways involved in CAD may also contribute to expression of other associated features of cardiac diseases such as diastolic dysfunction.
There are also some limitation with the current study. The main limitation is the retrospective design that can interfere with optimal selection of patients and precise evaluation of baseline risk factors. However, considering the selection of all patients who met the inclusion criteria in a specific duration of time (one year), the selection bias could be partly reduced. The small number of patients in some subgroups such as CKD and positive family history may also affect the reliability of results in these groups. Finally, the lack of follow up data for assessing the effect of diastolic dysfunction in different subgroup on prognosis and outcome is another limitation which is recommended to be evaluated in the studies with dedicated prospective design.

CONCLUSION

According to our results, it seems that all cardiovascular risk factors except CKD and hyperlipidemia had a significant relationship with at least one parameter of left ventricular diastolic function in G-SPECTMPI. Aging was the most important risk factor in this study, affecting all diastolic parameters. Involving different diastolic parameters by different risk factors can imply the different pathophysiological mechanism by which they contribute to development of diastolic dysfunction.

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REFERENCES

1. Akincioglu C, Berman DS, Nishina H, Kavanagh PB, Slomka PJ, Abidov A, Hayes S, Friedman JD, Germano G. Assessment of diastolic function using 16-frame 99mTc-sestamibi gated myocardial perfusion SPECT: normal values. J Nucl Med. 2005 Jul;46(7):1102-8.
2. Paulus WJ, Tschöpe C, Sanderson JE, Rusconi C, Flachskampf FA, Rademakers FE, Marino P, Smiseth OA, De Keulenaer G, Leite-Moreira AF, Borbély A, Edes I, Handoko ML, Heymans S, Pezzali N, Pieske B, Dickstein K, Fraser AG, Brutsaert DL. How to diagnose diastolic heart failure: a consensus statement on the diagnosis of heart failure with normal left ventricular ejection fraction by the Heart Failure and Echocardiography Associations of the European Society of Cardiology. Eur Heart J. 2007 Oct;28(20):2539-50.
3. Deswal A. Diastolic dysfunction and diastolic heart failure: mechanisms and epidemiology. Curr Cardiol Rep. 2005 May;7(3):178-83.
4. Gazoti Debessa CR, Mesiano Maifrino LB, Rodrigues de Souza R. Age related changes of the collagen network of the human heart. Mech Ageing Dev. 2001 Jul 31;122(10):1049-58.
5. Hees PS, Fleg JL, Dong SJ, Shapiro EP. MRI and echocardiographic assessment of the diastolic dysfunction of normal aging: altered LV pressure decline or load? Am J Physiol Heart Circ Physiol. 2004 Feb;286(2):H782-8.
6. von Bibra H, St John Sutton M. Diastolic dysfunction in diabetes and the metabolic syndrome: promising potential for diagnosis and prognosis. Diabetologia. 2010 Jun;53(6):1033-45.
7. Korkmaz AN, Caliskan B, Erdem F. Evaluation of diastolic function in patients with normal perfusion and type 2