Int J Heart Fail. 2020 Apr;2(2):115-117
https://doi.org/10.36628/ijhf.2020.0012
pISSN 2636-154X·eISSN 2636-1558

International Journal of Heart Failure IJHF

Editorial

Diastolic Function Assessment in Atrial Fibrillation Conundrum

Grace Casaclang-Verzosa, MD, RDCS, FASE

Division of Cardiology, West Virginia University Heart & Vascular Institute, Morgantown, WV, USA

▸ See the article "Assessment of the Left Ventricular Diastolic Function and Its Association with the Left Atrial Pressure in Patients with Atrial Fibrillation" in volume 2 on page 55.

Received: Mar 19, 2020
Accepted: Mar 19, 2020

Correspondence to
Grace Casaclang-Verzosa, MD, RDCS, FASE
Division of Cardiology, West Virginia University Heart & Vascular Institute, 1 Medical Center Drive, Morgantown, WV 26506, USA.
E-mail: grace.verzosa@hsc.wvu.edu

ORCID iDs
Grace Casaclang-Verzosa
https://orcid.org/0000-0003-1639-6110

Conflict of Interest
No potential conflict of interest relevant to this article was reported.

The authors of "Assessment of the left ventricular diastolic function and its association with the left atrial pressure in patients with atrial fibrillation" examined the usefulness of the American Society of Echocardiography (ASE) guidelines for the evaluation of diastolic function in estimating left atrial pressure (LAP).[1] LAP may be used as a surrogate to left ventricular end-diastolic pressure (LVEDP) and pulmonary capillary wedge pressure (PCWP) in the absence of mitral valve disease.[2-6] Elevated LVEDP negatively impacts left ventricular (LV) filling especially in the early period of diastole. In Doppler echocardiography, E/A ratio, the medial and lateral mitral annulus tissue velocities (e′) and the E/e′ highly correlate with LAP and LVEDP in the presence of sinus rhythm.[7-9]

Atrial fibrillation (AF) presents a challenging problem in the assessment of LV diastolic function using Doppler echocardiography. Several studies have shown the validity of Doppler parameters, yet contrasting at times, especially in the reliability of E/e′ in estimating LAP.[7,13] Could the etiology of AF explain the variances?

The left atrium undergoes structural, metabolic, neurohumoral, and electrical changes in response to chronic external stressors.[14] Animal experiments have shown that the mechanism for LA remodeling is different between atrial tachycardia-induced LA remodeling and LV pressure/volume overload-induced AF. While myolysis is the dominant structural change in atrial tachycardia, fibrosis is the underlying structural change in heart failure. Additionally, mechanism for AF development in tachycardia-induced atrial myopathy is multiple wavelet re-entry; while delayed afterdepolarization is the underlying mechanism for AF development in heart failure.[14] The disparity in mechanisms of development of AF may partly explain the authors' findings as they correlate echo-Doppler parameters with LAP.

A direct assessment of LAP can provide a more complex and self-contained assessment of the LA condition.[15] LAP is an important measure to detect early stages of LA structural and functional remodeling.[4] An increase in LAP ≥15 mmHg denotes LA hypertension, a final common pathway of cardiac diseases producing AF.[16,17]

Tissue Doppler velocities of the medial and septal annulus reflect the combined "pull and push" forces of the LA and LV during diastole. As the LVEDP increases, the LA pressure must increase to effectively fill the LV. As the pressure difference between these two chambers decrease, the tissue velocities decrease while blood flow velocity across the mitral valve may remain preserved with shortened deceleration time. The combined consequential effects to E and e′ velocities support the elevated E/e′ in diastolic dysfunction.

Doppler echocardiography has its own challenges and limitations in assessing LV diastolic function in the presence of AF by the variability in cycle length, the absence of organized atrial activity, and the frequent occurrence of LA enlargement regardless of filling pressures.[18] It is critical to adhere to ASE recommendations regarding imaging and measurement of both E and e′ if they were to reliably evaluate diastolic function and estimate LAP.[18]

The study by Kim et al.[1] poses an important question. Do the ASE recommended guidelines in assessing diastolic function reliably depict LAP in the presence of AF? ASE prefaced its guidelines with a definition of LV filling pressure.[18] The guidelines distinguished LAP, PCWP and LVEDP to refer to LV filling pressure and also pointed out the correlations of these pressures with known echo-Doppler parameters of diastolic function. Their study aptly addresses this issue.[1]

REFERENCES

1. Kim MN, Park SM, Kim HD, et al. Assessment of the left ventricular diastolic function and its association with the left atrial pressure in patients with atrial fibrillation. Int J Heart Fail 2020;2:55-65.
CROSSREF
2. Rahimtoola SH. Left ventricular end-diastolic and filling pressures in assessment of ventricular function. Chest 1973;63:858-60.
PUBMED | CROSSREF
3. Bouchard RJ, Gault JH, Ross J Jr. Evaluation of pulmonary arterial end-diastolic pressure as an estimate of left ventricular end-diastolic pressure in patients with normal and abnormal left ventricular performance. Circulation 1971;44:1072-9.
PUBMED | CROSSREF
4. Tsang TS, Barnes ME, Gersh BJ, Bailey KR, Seward JB. Left atrial volume as a morphophysiologic expression of left ventricular diastolic dysfunction and relation to cardiovascular risk burden. Am J Cardiol 2002;90:1284-9.
PUBMED | CROSSREF
5. Hoit BD. Left atrial size and function: role in prognosis. J Am Coll Cardiol 2014;63:493-505.
PUBMED | CROSSREF
6. Luchsinger PC, Seipp HW Jr, Patel DJ. Relationship of pulmonary artery-wedge pressure to left atrial pressure in man. Circ Res 1962;11:315-8.
PUBMED | CROSSREF
7. Nagueh SF, Kopelen HA, Quiñones MA. Assessment of left ventricular filling pressures by Doppler in the presence of atrial fibrillation. Circulation 1996;94:2138-45.
PUBMED | CROSSREF
8. Nagueh SF, Abraham TP, Aurigemma GP, et al. Interobserver variability in applying American Society of Echocardiography/European Association of Cardiovascular Imaging 2016 guidelines for estimation of left ventricular filling pressure. Circ Cardiovasc Imaging 2019;12:e008122.
PUBMED | CROSSREF
9. Sohn DW, Chai IH, Lee DJ, et al. Assessment of mitral annulus velocity by Doppler tissue imaging in the evaluation of left ventricular diastolic function. J Am Coll Cardiol 1997;30:474-80.
PUBMED | CROSSREF

10. Kasner M, Westermann D, Steendijk P, et al. Utility of Doppler echocardiography and tissue Doppler imaging in the estimation of diastolic function in heart failure with normal ejection fraction: a comparative Doppler-conductance catheterization study. Circulation 2007;116:637-47.
PUBMED | CROSSREF
11. Sohn DW, Song JM, Zo JH, et al. Mitral annulus velocity in the evaluation of left ventricular diastolic function in atrial fibrillation. J Am Soc Echocardiogr 1999;12:927-31.
PUBMED | CROSSREF
12. Kohári M, Okada DR, Gaztanaga L, et al. Echocardiographic diastolic function assessment is of modest utility in patients with persistent and longstanding persistent atrial fibrillation. Int J Cardiol Heart Vasc 2015;9:89-94.
PUBMED | CROSSREF
13. Chen F, Sun Q, Li H, et al. Value of dual Doppler echocardiography for prediction of atrial fibrillation recurrence after radiofrequency catheter ablation. BMC Cardiovasc Disord 2019;19:257.
PUBMED | CROSSREF
14. Casaclang-Verzosa G, Gersh BJ, Tsang TS. Structural and functional remodeling of the left atrium: clinical and therapeutic implications for atrial fibrillation. J Am Coll Cardiol 2008;51:1-11.
PUBMED | CROSSREF
15. Sramko M, Wichterle D, Melenovsky V, et al. Resting and exercise-induced left atrial hypertension in patients with atrial fibrillation: the causes and implications for catheter ablation. JACC Clin Electrophysiol 2017;3:461-9.
PUBMED | CROSSREF
16. Park J, Joung B, Uhm JS, et al. High left atrial pressures are associated with advanced electroanatomical remodeling of left atrium and independent predictors for clinical recurrence of atrial fibrillation after catheter ablation. Heart Rhythm 2014;11:953-60.
PUBMED | CROSSREF
17. Nattel S, Harada M. Atrial remodeling and atrial fibrillation: recent advances and translational perspectives. J Am Coll Cardiol 2014;63:2335-45.
PUBMED | CROSSREF
18. Nagueh SF, Smiseth OA, Appleton CP, et al. Recommendations for the evaluation of left ventricular diastolic function by echocardiography: an update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging. Eur Heart J Cardiovasc Imaging 2016;17:1321-60.
PUBMED | CROSSREF