Original Article

Misinterpretation of Indeterminate Diastolic Function: Awareness and Insights from a Survey among Brazilian Cardiologists

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Abstract

Background: Diastolic dysfunction (DD) is highly prevalent and is associated with significant morbidity and mortality. More recent guidelines have introduced the classification of Indeterminate Diastolic Function or Indeterminate Diastolic Dysfunction (IDF or IDD). Nevertheless, both diagnoses are still poorly understood in clinical practice, with variable prevalence.

Objectives: Assess the understanding of IDF and IDD among non-echocardiographer cardiologists in Brazil.

Methods: A nationwide online survey was conducted among non-echocardiography readers cardiologists via mobile messaging platforms. A brief and anonymous questionnaire on knowledge and interpretation of Diastolic Function.

Results: A total of 570 cardiologists from all regions of Brazil participated in the study. Most participants (64.21%) had more than ten years of clinical experience. While 71% correctly identified grades 2 or 3 as indicative of elevated filling pressures, only 34.21% accurately understood the diagnostic criteria for IDF or IDD. Among the mistakes associated with the indeterminate classification, the following stand out: attribution of this status to conditions that interfere with the assessment of diastole (49.12%), technical limitations of the echocardiography equipment (3.33%), and alleged lack of knowledge by echocardiographers (4.91%). In addition, 46.7% reported finding this diagnosis rarely in the reports, 33.5% believed that this classification influenced clinical conduct, and 43.5% considered that the examination could have been better performed.

Conclusion: Despite knowledge about diastolic function, misinterpretation of IDF or IDD is still common among non-echocardiographer cardiologists. Investment in education, sharing these concepts with clinicians, and clear guidelines are essential to optimize the use and diagnostic accuracy of echocardiography.

Keywords: Diastole; Echocardiography; Practice Guidelines as Topic.

Introduction

The analysis of left ventricular (LV) diastolic function is key in an echocardiographic examination and is performed using echocardiography, which has been established as the main imaging tool for this evaluation.[1] Although invasive methods for measuring ventricular relaxation and filling pressures are considered the gold standard, echocardiography is widely preferred due to its high temporal resolution, reproducibility, validation of measurements, and wide availability at the bedside, and because it does not require invasive procedures or does not expose the patient to ionizing radiation.[2]

Left Ventricular Diastolic Dysfunction (LVDD) is highly prevalent, especially among the elderly, and is associated with significant morbidity and mortality. Furthermore, DD may contribute to the development and progression of Heart Failure with preserved Ejection Fraction (HFpEF), a condition characterized by increased LV filling pressures.[3,4]

Ventricular Diastole can be classified as normal or presenting Diastolic Dysfunction (DD) in grades 1, 2, or 3, or even as indeterminate, when it is not possible to establish its presence or severity. The guidelines of the American Society of Echocardiography (ASE) and the European Association of Cardiovascular Imaging (EACVI), published in 2016, sought to simplify this assessment, with clearer and more objective criteria, compared to the previous version.[5]

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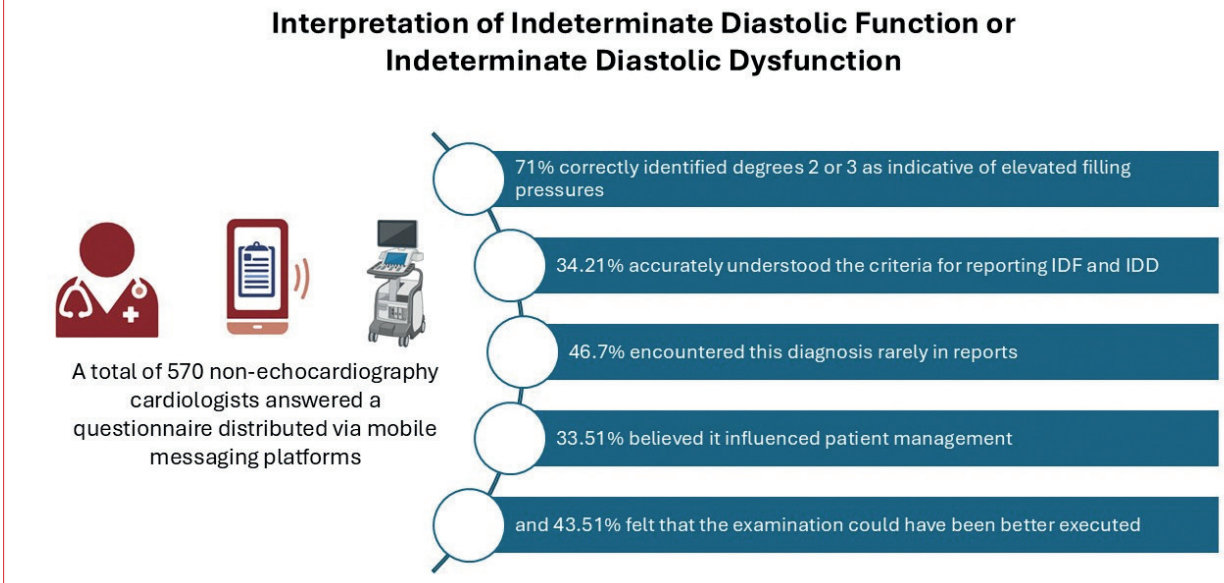
Central Illustration: Misinterpretation of Indeterminate Diastolic Function: Awareness and Insights from a Survey among Brazilian Cardiologists



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IDF: Indeterminate Diastolic Function; IDD: Indeterminate Diastolic Dysfunction.

However, the analysis of Diastolic Function and Left Ventricular Filling Pressures (LVFP) by echocardiography can be challenging, especially in patients with preserved LV ejection fraction, due to the need to evaluate multiple parameters for an accurate diagnosis. Despite all diagnostic efforts, a considerable proportion of patients are still classified as having indeterminate diastolic function (IDF), with prevalence ranging from 10% to 20% of the cases, according to previous studies.[6] This can be frustrating both for the professionals who perform the examination and for clinical cardiologists, who often depend on this diagnosis to define a therapeutic approach for the patient.

Thus, the objective of this study was to evaluate the understanding of the diastolic function or indeterminate diastolic dysfunction (IDD) classification in echocardiography reports by cardiologists not specialized in echocardiography in Brazil and analyze the knowledge these professionals have about diastolic function classification.

Methods

A nationwide, voluntary, online survey applied to cardiologists not specialized in echocardiography was conducted via mobile messaging platforms from June 1 to June 30. A brief online questionnaire was applied using the SurveyMonkey platform, anonymously, with no option for personal identification. There was no financial or material compensation for the participation in the research. The questionnaire consisted of seven questions (https://pt.surveymonkey.com/r/Y8NN97F), which were mandatory to complete, about time since medical training, region of practice, general knowledge about Diastolic Function, and how the result of a report impacts medical practice. The questions were multiple choice, with no possibility of open answers.

The complete questionnaire can be found in "Supplementary Material". Under the recommendation of Resolution 510 of the National Health Council, this questionnaire was not forwarded for evaluation by the CEP/CONEP system, as it is a public opinion survey with unidentified participants. The data obtained were described as categorical variables, with their absolute values, percentages, or proportions.

Results

General data

A total of 570 cardiologists accessed and answered the questionnaire, with the following distribution across the regions of Brazil: Southeast (29.65%), Midwest (23.80%), Northeast (18.77%), South (16.14%), and North (11.58%).

The participants were distributed according to their time since medical training: up to 5 years (23.33%), 6 to 10 years (12.46%), 11 to 20 years (26.14%), and more than 20 years (38.07%).

Knowledge about diastolic function analysis

Regarding diastolic function grading in which the patient has elevated LVEP, 1.75% responded that this would occur when diastole was classified as indeterminate, 22.16% as

grade 1, 70% as grade 2 or 3, and 5.09% did not know how to respond.

Regarding the understanding of what leads an echocardiographer to classify IDF or IDD in the report, the majority (49.12%) chose an inadequate option, which indicated that an indeterminate classification would be caused by pathologies that interfere with the correct assessment (e.g.: pacemaker rhythm, mitral prosthesis). The second most chosen option (34.21%) was the correct answer, which indicated that it was not possible to determine diastolic function due to the absence of sufficient criteria for classification (Figure 1).

Observed frequency of diagnosis in reports and impact on clinical management

Regarding the frequency observed in echocardiography reports, concerning the report of IDF or IDD, 29.30% said they had never seen this phrase in the report, 46.67% said they rarely see it, and 24.04% said they frequently see it.

Regarding the impact of this diagnosis on adequate patient management, 33.51% responded that it had an impact, 21.23% that it did not, 33.86% occasionally, and 11.40% considered the diagnosis to be a source of confusion.

Faced with the diagnosis of IDF or IDD, 45.82% of the participants feel satisfied. However, a significant percentage of cardiologists, 44.51%, suspect that the exam could have been conducted in a more effective way (Figure 2).

Discussion

This study provides important and unprecedented information on the interpretation, understanding, observed frequency, impact on patient management, and the perception of cardiologists when faced with an IDF or IDD diagnosis.

There was good representation among the five regions of Brazil, which contributes to a more balanced assessment of this perception, minimizing the risk of bias associated with the concentration of knowledge in areas with greater access to resources and updates, compared to regions with more limitations in this regard.

Most of the cardiologists surveyed had more than 10 years of training, which reflects good experience in reading essential cardiological exams, such as echocardiography, and in patient management care.

When grading Diastolic Function in which the patient has elevated LV filling pressures, the vast majority confirmed that this occurs in grades 2 and 3 of DD according to the guidelines of the ASE and the EACVI.[5]

These guidelines are the most widely used to analyze Diastolic Function. In the absence of a myocardial disease, four echocardiographic signs are evaluated: the early diastolic tissue velocity of the septal and lateral mitral annulus (e'), the indexed left atrial volume, the ratio between the maximum mitral E velocity (early diastolic) and the mean of the velocities of the septal and lateral e' wave, and the maximum velocity of tricuspid regurgitation. If most available data are within the normal range, LV Diastolic Function is considered normal. Otherwise, DD is observed and LV filling pressure can be estimated. If the criteria are insufficient or there is disagreement in the classification, the diastolic function is considered indeterminate.[4,5,7]

If there is a myocardial disease or DD after the evaluation described above, filling pressures should be estimated and DD classified. The algorithm for assessing LV filling pressure first measures mitral wave velocities. If the mitral E wave velocity is < 0.5 m/s and the E/A ratio is ≤ 0.8, LV filling pressure is likely normal or low, so DD is classified as grade 1, whereas a tall E wave and E/A ≥ 2 indicates elevated

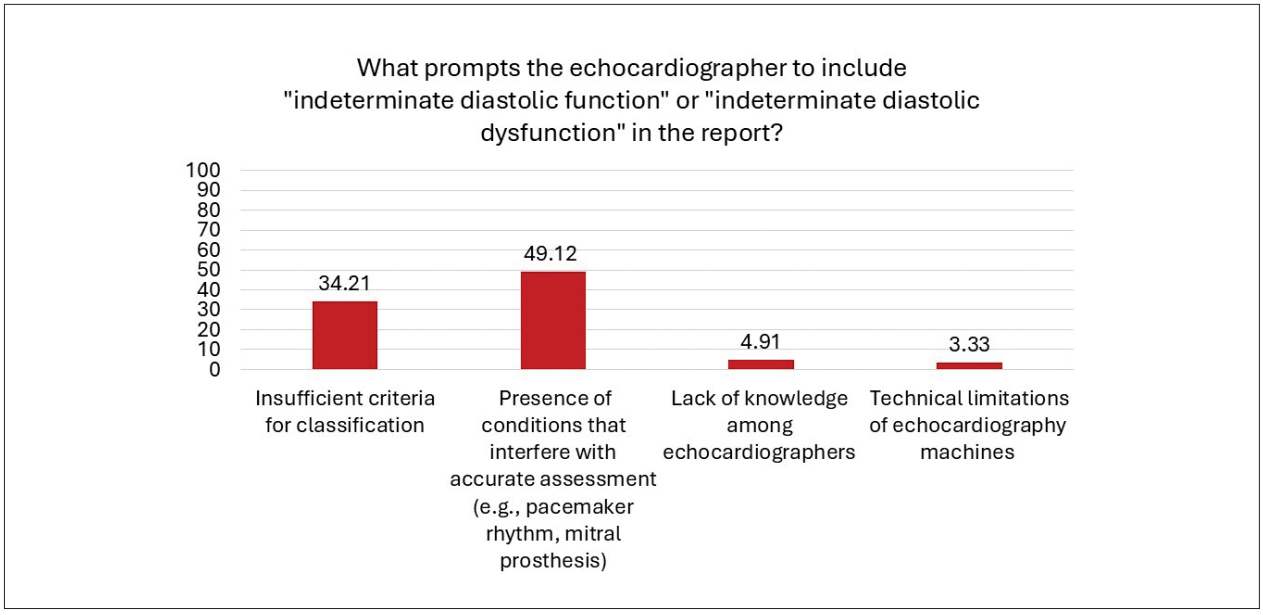

Figure 1 – *The cardiologist's understanding of the echocardiographic criteria used for the report of indeterminate diastolic function or indeterminate diastolic dysfunction.*

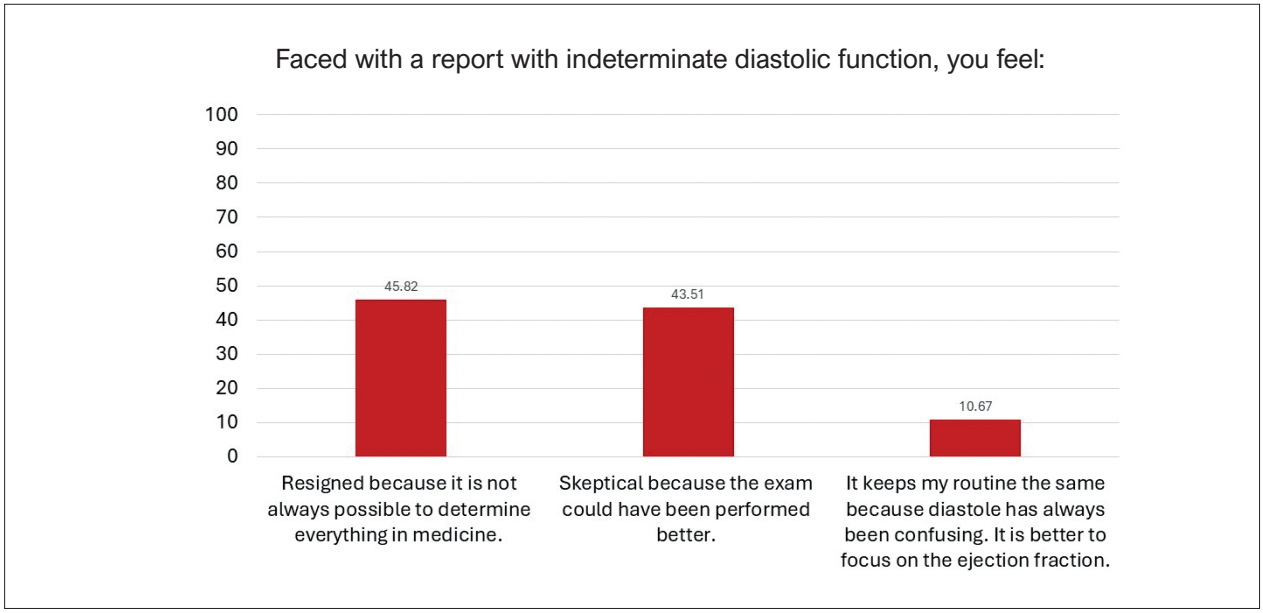

Figure 2 – *How the cardiologist feels about the report of indeterminate diastolic function or indeterminate diastolic dysfunction.*

LV filling pressure and is classified as grade 3 DD. When the mitral E/A ratio is between 0.8 and 2.0, additional criteria are needed to assess LV filling pressure. These include mean E/e' ratio > 14, peak tricuspid regurgitation velocity > 2.8 m/s, and indexed LA volume > 34 mL/m^2. If ≥ 2 of the criteria are above the cutoff value, LV filling pressure is most likely elevated, classifying DD as grade 2. If ≥ 2 of the criteria are below the cutoff value, LV filling pressure is most likely normal and is therefore classified as grade 1. However, if all of these additional measurements, especially tricuspid regurgitation, are not available and there is discordance between the two existing measurements, DD is considered indeterminate.[4,5,7]

The proportion of cases with IDF is reduced when specific Doppler findings are carefully considered, including changes in mitral inflow velocities and E/A ratio with the Valsalva maneuver, flow velocity and duration in the pulmonary veins, including the reversed wave, and the presence of an L wave in mitral inflow with velocity ≥ 50 cm/s.[7]

Therefore, it is clear that the diagnosis of IDF or IDD is associated with the lack of sufficient criteria or discordance between criteria.

However, most cardiologists attribute this diagnosis to conditions that make it impossible to adequately analyze diastolic function, mainly because they interfere with the velocities of the mitral E waves and the tissue waves of the mitral annulus. Among these conditions, the following stand out: pacemaker rhythm, the presence of a mitral valve prosthesis, significant mitral valve diseases (stenosis or insufficiency), and left bundle branch block.[4,5]

The perception of the frequency of this diagnosis in echocardiography reports was low, with almost a third of cardiologists never having observed this description. However, this contrasts with the reported prevalence of this finding in reports, which ranges from 10% to 20%.[3]

Furthermore, there is an important bias: several echocardiographers hesitate to classify diastole as indeterminate for fear that this definition would be misinterpreted by the clinical cardiologist. There is concern that this may create distrust about the examination quality, especially since the diagnosis of IDF or IDD is still not widely understood by cardiologists who do not specialize in echocardiography. This can lead to an underdiagnosis of this pattern of DD, with a tendency to classify the patient differently in a way that does not correspond to their true classification. On the other hand, Left Atrial strain has been suggested as a useful method in reclassifying cases of DD considered indeterminate by the traditional ASE-EACVI algorithm.[1,2,8,9]

This reasoning is in line with the perception of cardiologists when faced with the diagnosis of IDF or IDD. Most of them accept this classification, recognizing that determining all aspects of medicine is not always possible. However, a significant percentage, numerically close to that of the previous response, expresses distrust, suspecting that the exam could have been performed in a more effective way.

Although most people are unaware of the real reason for including this diagnosis in the report, the general perception is that IDF or IDD compromises, even occasionally, effective patient management. This highlights the importance of better interaction and understanding between the echocardiography report, echocardiographers, and clinical cardiologists.

Study limitations

This research involved a relatively small sample of cardiologists, which may limit the generalizability of the results. Furthermore, based on the alternatives chosen, it was not possible to assess regional differences and training time differences, which could offer a more detailed analysis of the results obtained.

Conclusion

Despite general knowledge about Diastolic Function, misinterpretation of IDF or IDD persists among non-echocardiographer cardiologists. Investments in education, sharing these concepts with clinicians, and clear guidelines are essential to optimize the use of the exam and diagnostic accuracy of echocardiography.

Author Contributions

Conception and design of the research and critical revision of the manuscript for intellectual content: Rassi DC, Rassi S, Assef JE, Barberato SH; acquisition of data: Rassi DC, Rassi S, Assef JE, Felix AS, Cruz C, Beck ALS, Barberato SH; analysis and interpretation of the data: Rassi DC, Rassi S, Beck ALS, Barberato SH; statistical analysis and writing of the manuscript: Rassi DC, Rassi S, Barberato SH.

Potential Conflict of Interest

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

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Study Association

This study is not associated with any thesis or dissertation work.

Ethics Approval and Consent to Participate

This article does not contain any studies with human participants or animals performed by any of the authors.

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***Supplemental Materials**

For additional information, please click here.

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