Editorial

Role of Strain Echocardiography in the Evaluation of Patients with Chagas Disease

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Chagas disease continues to be a significant public health challenge, affecting approximately six million people worldwide.[1] With increasing globalization, *Trypanosoma cruzi* has already been detected in regions that were not previously considered endemic for the transmission vector, thus becoming one of the main neglected parasites.[1] Although a percentage of infected individuals remain asymptomatic in the chronic indeterminate form of the disease, it is estimated that 2% to 3% of all patients annually progress to the cardiac form. Chagas heart disease was the most severe manifestation of Chagas disease, clinically appearing with heart failure, ventricular and supraventricular arrhythmias, conduction disorders, and embolic events.[2]

The echocardiogram is an important propaedeutic method in the evaluation of patients with Chagas disease, especially in the presence of Chagas heart disease. In general, the echocardiogram investigates parameters related to the analysis of segmental contractility and global systolic function,[2] which is essential for the treatment and prognosis of the disease. However, even well-established variables in the literature, such as ejection fraction, face challenges in simulating all the pathological aspects of Chagas disease.[3]

The echocardiogram with speckle-tracking strain (STE) or two-dimensional strain has been increasingly studied in Chagas disease, due to its ability to identify changes in the early stages of cardiac involvement.[4] As well as in cardioncology, in relation to the cardiotoxicity caused by chemotherapy, it is possible that changes in STE values in patients with Chagas disease may well identify the risk of progression to heart disease.

In the context of Chagas disease, the literature shows that STE has an important clinical application, especially in asymptomatic individuals and with no evidence of cardiac involvement by conventional methods (Figure 1). The early detection of changes in segmental contractility can identify patients with the potential for the evolution of the disease, with an impact on clinical management and medical-labor practices. However, as this is a relatively new technique, available only in some equipment, few studies have analyzed STE in Chagas disease.

A previous study by Barbosa et al. evaluated STE in 78 asymptomatic individuals with Chagas disease, who presented normal chest X-rays and electrocardiograms, and compared them with 38 healthy controls, matched by gender and age. Although there was no difference in ejection fraction and diastolic function between groups, a reduction in STE values was observed in different segments of the left ventricle in patients when compared to controls.[5] In another study comparing patients with cardiomyopathies of different etiologies, including 81 patients with Chagas cardiomyopathy and 31 with idiopathic cardiomyopathy, STE proved to be a predictor of adverse events in both groups, adding prognostic value in addition to ejection fraction.[6]

In an analysis of a cohort consisting of 408 individuals with Chagas disease, which underwent follow-up for a mean period of 6.5 ± 2.7 years, Saraiva et al. identified that circumferential and radial two-dimensional strains were independent predictors of mortality. In addition, they observed that the strain, especially the radial strain, was an independent predictor of progression from the indeterminate form to Chagas cardiomyopathy.[7]

In another study conducted by Romano et al., using STE to compare 25 individuals with the indeterminate form, 20 individuals with Chagas cardiomyopathy, and 20 controls, differences in strain values were identified in four specific segments of the left ventricle: basal-inferior, basal-inferoseptal, mid-inferoseptal and mid-inferolateral. Most interestingly, these abnormalities in segmental strain values were detected even in the absence of myocardial fibrosis assessed by magnetic resonance imaging, highlighting the relevance of the method in the early stages of Chagas disease.[8]

In the SaMi-Trop study, which follows a significant number of patients with Chagas disease in an endemic area with 21 municipalities in the northern region of Minas Gerais, Santos-Junior et al. conducted an assessment of a global longitudinal strain in 1,387 patients (14% with ejection fraction < 50%). Surprisingly, the authors identified that STE was altered in 59% of these individuals. When analyzing the independent factors associated with the reduction of STE, they found electrocardiographic abnormalities, such as changes in both the ST segment and the T wave, as well as in the duration of the QRS. Moreover, the left ventricular ejection fraction and the E/e' ratio were also related to the decrease in STE. It is important to note that STE had already showed changes in a significant number of patients, even when the ejection fraction was within the normal range. The study also highlighted the remarkable finding that, in the subgroup with electrocardiographic alterations, but with an ejection fraction that was still normal, STE was already altered.[9]

A recent meta-analysis, which included several studies on the value of STE in Chagas disease with 1,222

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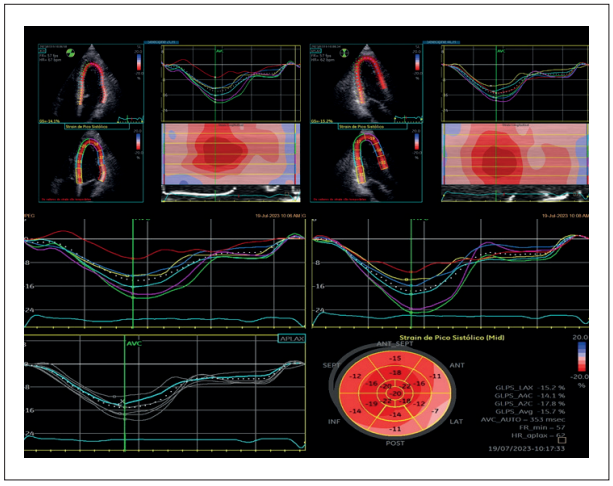

Figure 1 – *Left ventricular longitudinal strain images obtained in apical 4- and 3-chamber views with parametric (color-coded) display of strain in systole and peak values of systolic strain. The colored strain-time curves of each segment are shown at the bottom of the figure with the "bull's eye" image in the lower right quadrant, showing the reduced strain values, especially in the basal segment of the inferolateral wall. SEPT: left ventricular septal segment; ANT-SEPT:left ventricular septal segment; ANT: left ventricular anterior segment; LAT: left ventricular lateral segment; POST: left ventricular posterior segment; INF: left ventricular inferior segment; GLPS: Global longitudinal peak systolic strain; AVC: aortic valve close; FR-MIN: frame rate; HR_aplax: heart rate.*

participants, revealed that STE values were significantly worse in patients with Chagas cardiomyopathy when compared to those with the indeterminate form. However, no significant difference was observed when comparing individuals with the indeterminate form and normal controls without Chagas disease.[10] These results suggest that STE can be a valuable tool in identifying early and subclinical changes in patients with Chagas heart disease, but it may not be as sensitive in detecting changes in the early stages of the disease.

In conclusion, STE represents a promising echocardiographic technique, duly validated for the analysis of myocardial function and with a vast potential for clinical application. Its use is expanding, with several indications in several cardiovascular diseases. The main advantage of the method is the early detection of changes in ventricular contractility, which are not identified in conventional echocardiography. Currently, most devices have this technology, representing a notable contribution to advances in echocardiography, especially because it is a non-invasive, low-cost, angle-independent methodology in relation to Doppler and rarely influenced by load conditions. However, it is important to highlight that there are challenges in using STE in isolation due to the lack of standardization between the reference values of different manufacturers, the diversity of capture and analysis methodologies, among other factors, including the presence of arrhythmias and changes in the STE related to age, sex, and quality of the echocardiographic window. These shortcomings call for caution when considering STE as the sole criterion in clinical decision-making. Therefore, in the context of Chagas disease, further studies are needed to investigate the value of STE in the diagnosis and progression of heart disease in order to establish its main indications.

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