



ORIGINAL ARTICLE

Global longitudinal strain as a potential prognostic marker in patients with chronic heart failure and systolic dysfunction



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KEYWORDS

Heart failure;
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Abstract

Introduction and objective: The prognostic value of myocardium deformation measurements in chronic heart failure (CHF) is still poorly addressed. The purpose of this study was to evaluate the correlation of left ventricular (LV) global longitudinal strain (GLS) with clinical and prognostic indicators in patients with CHF and systolic dysfunction.

Methods: Ambulatory patients with CHF and LV ejection fraction (LVEF) <45% were studied by two-dimensional and Doppler transthoracic echocardiogram with assessment of GLS. An indication of prognostic status was obtained by the Seattle Heart Failure Model (SHFM) prognostic estimates for life expectancy.

Results: We included 54 CHF patients (mean age 55 ± 12 years; 80% male). GLS was significantly correlated with NYHA functional class ($r=0.41$, $p=0.002$), BNP levels ($r=0.47$, $p=0.001$), LVEF ($r=-0.69$, $p<0.001$) and LV end-diastolic pressure, assessed by E/e' ratio ($r=0.35$, $p<0.014$) and left atrial maximal volume index ($r=0.57$, $p<0.001$). A significant correlation was found between GLS and SHFM prognostic estimates for life expectancy ($r=-0.41$, $p=0.002$). The multivariate logistic regression analysis showed that GLS independently predicted an estimated life expectancy <10 years (OR 2.614 [95% CI 1.010–6.763]). The corresponding area under the ROC curve was 0.802 (0.653–0.951) and the best obtained threshold was -9.5 (80% sensitivity, 65% specificity, $p=0.003$).

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PALAVRAS-CHAVE

Insuficiência cardíaca;
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Conclusions: GLS was strongly associated with a higher disease severity status and predicted a lower prognostic estimate for life expectancy.

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Strain longitudinal global como um potencial marcador de prognóstico em doentes com insuficiência cardíaca crónica e disfunção sistólica

Resumo

Introdução e objetivo: O valor prognóstico das medidas de deformação miocárdica na insuficiência cardíaca crónica (ICC) ainda não está bem estabelecido. Este estudo teve por objetivo avaliar a correlação do *strain* longitudinal global (SLG) do ventrículo esquerdo (VE) com indicadores clínicos e prognósticos em doentes com ICC e disfunção sistólica.

Métodos: Doentes ambulatoriais, com ICC e fração de ejeção do VE (FEVE) <45% realizaram ecocardiografia transtorácica bidimensional com Doppler, com avaliação de SLG. O indicador de *status* prognóstico foi baseado na expectativa de vida estimada pelo modelo *Seattle Heart Failure Model* (SHFM).

Resultados: Incluímos 54 doentes com ICC (idade média de 55 ± 12 anos, 80% do sexo masculino). O SLG correlacionou-se significativamente com a classe funcional ($r=0,41$, $p=0,002$), níveis de BNP ($r=0,47$, $p=0,001$), FEVE ($r=-0,69$, $p<0,001$), pressão telediastólica do VE, avaliada pela razão E/e' ($r=0,35$, $p=0,014$) e pelo volume máximo da aurícula esquerda ($r=0,57$, $p<0,001$). Observou-se uma correlação significativa entre o SLG e a expectativa de vida estimada pelo modelo SHFM ($r=-0,41$, $p=0,002$). Perante a análise de regressão logística multivariada, o SLG mostrou ser um preditor independente de uma esperança de vida estimada <10 anos (OR 2,61 [IC 95% 1,01–6,76]). A área sob a curva ROC foi de 0,80 (0,65–0,95) e o melhor ponto de corte obtido foi $-9,5$ (80% de sensibilidade, especificidade de 65%, $p=0,003$).

Conclusões: O SLG encontra-se associado a um estado de doença de maior gravidade e foi preditor de uma esperança de vida estimada mais baixa.

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Introduction

Heart failure (HF) has an overall population prevalence of approximately 1–3%¹ and projections show that by 2030, its prevalence will increase 25% from 2013 estimates.²

Despite advances in the therapeutic management of chronic heart failure (CHF) and consequent improvement in survival over time,³ the death rate remains high, with an averaged overall 5-year mortality rate of 50%.⁴

Left ventricular systolic function (LVSF) is a strong outcome predictor with a major impact on the medical decisions.⁵ Consequently, LVSF should be quantified by a sensitive, accurate and reproducible method. Left ventricular ejection fraction (LVEF) is the most widely used parameter for the global assessment of LVSF. However, its measurement by two-dimensional (2D) echocardiography, has several disadvantages: it is based on geometric assumptions, depends on accurate tracing of endocardial borders and has significant interobserver and intraobserver variability.⁶ On the other hand, left ventricular (LV) global longitudinal strain (GLS) is an accurate and sensitive measure of myocardium deformation, allowing the angle-independent quantification of myocardial function in 2D, based on the LV active

shortening in the longitudinal direction, which is more reproducible than LVEF and does not rely on geometrical assumptions.^{7,8}

Some authors have suggested that GLS is useful in the prediction of cardiovascular (CV) events, in various heart diseases and clinical conditions.^{9–11} Nahum et al.¹⁰ showed that in CHF patients, GLS determined by speckle-tracking is superior to LVEF in identifying patients with poor clinical outcome. However, its ability to assess disease severity in CHF is still poorly addressed.

The Seattle Heart Failure Model Score (SHFM) is a validated multimarker risk assessment tool developed to predict prognosis in patients with CHF, which was derived from a cohort of 1125 HF patients and was prospectively validated in five additional outpatient cohorts including 9942 HF patients. It provides an accurate estimation of 1-, 2-, and 5-year survival, as well as of life expectancy using commonly obtained clinical, laboratory and therapeutic (pharmacologic and device) information.¹²

The purpose of this study was to evaluate the LV GLS association with clinical and prognostic indicators in patients with CHF and systolic dysfunction.

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