



ORIGINAL ARTICLE

# Characterization of left atrial dysfunction in hyper eosinophilic syndrome – Insights from the Motion analysis of the heart and great vessels by three-dimensional speckle tracking echocardiography in pathological cases (MAGYAR-Path) Study



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## KEYWORDS

Echocardiography;  
Function;  
Left atrium;  
Three-dimensional;  
Two-dimensional;  
Speckle tracking

## Abstract

**Introduction:** The present study was designed to compare three-dimensional speckle tracking echocardiography (3DSTE)-derived left atrial (LA) volumetric, volume-based functional and strain parameters between patients with hyper eosinophilic syndrome (HES) and matched controls.

**Methods:** A total of 10 HES patients and 19 age- and gender-matched healthy controls were included in the study. Complete two-dimensional Doppler echocardiography and 3DSTE were performed in all HES cases and controls.

**Results:** Significantly increased maximum ( $72.9 \pm 38.8$  ml vs.  $45.6 \pm 15.5$  ml,  $p=0.01$ ) and minimum ( $46.3 \pm 33.3$  ml vs.  $26.0 \pm 15.0$  ml,  $p=0.03$ ) LA volumes and LA volume before atrial contraction ( $62.0 \pm 36.0$  ml vs.  $36.5 \pm 16.6$  ml,  $p=0.01$ ) were found in HES patients compared to controls. Both peak global ( $18.3 \pm 6.7\%$  vs.  $25.6 \pm 9.0\%$ ,  $p=0.03$ ) and mean segmental ( $22.2 \pm 6.0\%$  vs.  $31.0 \pm 12.1\%$ ,  $p=0.04$ ) circumferential strains were significantly reduced in HES patients, suggesting decreased LA reservoir function.

**Conclusion:** Increased LA volumes can be demonstrated in HES patients, accompanied by reduced LA peak circumferential strain as assessed by 3DSTE, suggesting LA remodeling.

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**PALAVRAS-CHAVE**

Ecocardiografia;  
Função;  
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Tridimensional;  
Bidimensional;  
Speckle-tracking

## Caracterização da disfunção auricular esquerda na síndrome hipereosinofílica – visão da análise de movimentos do coração e dos grandes vasos por ecocardiografia tridimensional *speckle tracking* em casos patológicos – estudo MAGYAR-Path

**Resumo**

**Introdução:** O presente estudo foi concebido para comparar parâmetros volumétricos auriculares esquerdos derivados por ecocardiografia tridimensional *speckle tracking*, parâmetros funcionais e *strain* baseados no volume entre doentes com síndrome hipereosinofílica e controlos equiparados.

**Métodos:** Um total de dez doentes HES e de 19 controlos saudáveis, equiparados para idade e género, foram incluídos no estudo. O estudo completo ecocardiográfico bidimensional, *Doppler* e 3DSTE, foi realizado em todos os casos HES e controlos.

**Resultados:** Encontrou-se em doentes com HES, comparativamente com os controlos, um aumento significativo dos volumes auriculares esquerdos ( $72,9 \pm 38,8$  ml versus  $45,6 \pm 15,5$  ml,  $p = 0,01$ ), mínimo ( $46,3 \pm 33,3$  ml versus  $26,0 \pm 15,0$  ml,  $p = 0,03$ ) e volume auricular esquerdo antes da contração auricular ( $62,0 \pm 36,0$  ml versus  $36,5 \pm 16,6$  ml,  $p = 0,01$ ). Ambos *strains* circunferenciais pico, global ( $18,3 \pm 6,7\%$  versus  $25,6 \pm 9,0\%$ ,  $p = 0,03$ ) e segmentar médio ( $22,2 \pm 6,0\%$  versus  $31,0 \pm 12,1\%$ ,  $p = 0,04$ ) eram significativamente reduzidos em doentes HES, sugerindo diminuição de função auricular esquerda de reservatório.

**Conclusão:** O aumento de volumes auriculares esquerdos foi demonstrado nos doentes HES, sendo acompanhado por redução de *strain* circunferencial pico da aurícula esquerda conforme avaliado por 3DSTE, sugerindo remodelagem auricular esquerda.

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**Introduction**

Hypereosinophilic syndrome (HES) is characterized by persistently elevated eosinophil count ( $>1500$  cells/ml) in peripheral blood for at least six months, and single- or multiple end-organ damage attributable to cytotoxic injury by eosinophils.<sup>1</sup> In the literature the overall prevalence of cardiovascular involvement is 40–50% of HES patients.<sup>1–3</sup> The early stage of cardiac involvement consists of eosinophilic infiltration, followed by an intermediate thrombotic stage, and finally a late fibrotic stage. An enlarged atrium with normal-sized left ventricle is a minor criterion for endomyocardial fibrosis.<sup>1</sup> At present little is known about left atrial (LA) function in HES. Three-dimensional (3D) speckle tracking echocardiography (3DSTE) is a new non-invasive clinical tool for volumetric and strain analysis of the left atrium.<sup>4</sup> The present study was designed to compare 3DSTE-derived LA volumetric, volume-based functional and strain parameters between HES patients and matched controls.

**Methods****Subjects**

A total of 10 HES patients were included in the present study. The diagnosis of HES was confirmed in all patients according to the available guidelines.<sup>5</sup> One HES patient had a history of non-ST-elevation myocardial infarction; the others showed no significant cardiac alterations and were asymptomatic at the time of examination. Their results were compared

to 19 age- and gender-matched healthy controls. Complete two-dimensional (2D) Doppler echocardiography and 3DSTE were performed in all HES patients and controls. The present work is a part of the MotionAL Analysis of the heart and Great vessels by three-dimensional speckle-tracking echocardiography in Pathological cases (MAGYAR-Path) Study ('Magyar' means 'Hungarian' in the Hungarian language), carried out at the 2nd Department of Medicine and Cardiology Center, Szeged, Hungary to validate 3DSTE-derived parameters, to examine their diagnostic and prognostic significance and to compare them to other known (patho)physiological variables in pathological cases. The protocol was approved by the institutional review board, conforming to the ethical guidelines of the 1975 Declaration of Helsinki, and each subject provided written informed consent.

**Two-dimensional Doppler and tissue Doppler echocardiography**

Transthoracic imaging was performed by experienced investigators using a 1–5 MHz PST-30SBP phased-array transducer in a Toshiba Artida™ cardiac ultrasound system (Toshiba Medical Systems, Tokyo, Japan). Complete two-dimensional echocardiography was undertaken with the patient in left lateral decubitus position, using both apical and parasternal views in all cases. Ejection fraction was measured in parasternal long-axis view by the Teichholz method.<sup>6</sup> Color Doppler echocardiography was used to visually quantify degree of mitral regurgitation (MR). Tissue Doppler echocardiography was used to calculate the E/E' ratio following pulsed Doppler-derived mitral inflow E/A measurements.

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