Left ventricular speckle-tracking-derived mechanical dispersion in patients with transthyretin amyloidosis and their first-degree relatives

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Background: Mechanical dispersion has shown to predict ventricular (LV) arrhythmias and sudden cardiac death in populations with established cardiac diseases, such as cardiomyopathies and heart failure. Transthyretin amyloid (ATTR) cardiomyopathy arises from deposition of misfolded, insoluble transthyretin (TTR) in extracellular matrix. The disease impacts profoundly cardiac tissue architecture and its mechanical properties.

Purpose: The aim of this prospective study was assessment of LV speckle-tracking-derived mechanical dispersion in patients with ATTR cardiomyopathy and their first-degree relatives.

Methods: We present data based on evaluation of 85 patients, including 34 (group 1) index patients with ATTR and 51 (group 2) first-degree relatives who were studied between June 2020 and January 2023. Study protocol included clinical data, free light chain blood immunoglobulins and urine immunofixation, transthoracic echocardiography (TTE) with global longitudinal strain (GLS) analysis, hybrid technique single-photon emission computed tomography and computed tomography (SPECT/CT) with [99mTc] Tc 3,3-dispheno-1,2-propanodicarboxylic acid (DPD), genetic testing by an amplicon-based next-generation TTR sequencing approach, and in selected cases cardiac or soft tissue biopsy. Mechanical dispersion was calculated manually from GLS measurements and defined as the standard deviation (SD) of contraction duration from R on the electrocardiogram (ECG) to peak negative longitudinal strain of all LV segments.

Results: In group 1 patients were older (66.6±11 vs. 50.7±14) and presented with higher New York Heart Association (NYHA) class (2.4±1 vs. 1.1±0.6) (p<0.05). Overall, there were detected following types of TTR variants - Phe53Leu, Ala101Val, Glu112Lys, Glu109Lys, Glu122Lys, Glu82Lys. Compared to group 2, group 1 presented with higher N-terminal (NT)-pro hormone BNP (NT-proBNP) value (5859±7320 vs. 281±990 pg/ml), greater intraventricular septum thickness (19±4 vs. 12±3 mm) and LV mass index values (199±69 vs. 111±42 g/m²), impaired LV ejection fraction (44±13 vs. 59±10 %) and GLS (-12.7±6 vs. -18.7±4 %) (p<0.05). Moreover, patients with ATTR cardiomyopathy had significantly higher value of LV speckle-tracking-derived mechanical dispersion compared to their first-degree relatives (96.2±22.3 vs. 77.9±23.3 ms, p=0.0007).

Conclusions: Patients with ATTR cardiomyopathy present with significantly higher LV mass index value, impaired GLS and higher value of LV speckle-tracking-derived mechanical dispersion compared to their first-degree relatives (p<0.05). Assessment of LV speckle-tracking-derived mechanical dispersion may in future translate into further enhancement of disease evaluation and improving prognosis in the group of patients.