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Carboxy-terminal propeptide of procollagen type I is an independent predictor of abnormal global longitudinal strain in arterial hypertension

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Background: Reduced global longitudinal strain (GLS) is a typical marker of left ventricle (LV) dysfunction in arterial hypertension (AH). However, abnormal GLS is non-specific for hypertensive heart disease only. Factors which determine GLS reduction in AH are still under study. Excessive development of fibrosis is considered to be one of the key morphological features of hypertensive myocardium. Circulating carboxy-terminal propeptide of procollagen type I (PICP) reflects the extent of fibrosis in the myocardium. There is a lack of studies evaluating relationship between markers of collagen turnover with myocardial deformation. The purpose of the study was to investigate the predictive role of PICP among other clinical factors for deterioration of GLS in patients with AH.

Methods: The study enrolled 185 untreated hypertensive males and 40 healthy individuals (mean age 51±8 years). All participants underwent ambulatory blood pressure monitoring, laboratory testing, conventional and 2D speckle tracking echocardiography. PICP was determined by ELISA. GLS was obtained by averaging values of all 16 LV-segments from three apical planes. Abnormal GLS was defined as ≤-13.5% (2 standard deviations below the mean). The logistic binary regression model was used to estimate the predictors of reduced GLS.

Results: 40% of patients with AH demonstrated reduced GLS. The PICP level was significantly higher in hypertensive patients – 132.3 (81.3–216.8) ng/ml vs. 93.2 (64.7–133) ng/ml in healthy individuals (p=0.0065). The patients with abnormal GLS demonstrated elevated PICP levels – 194.1 (104.5–440.2) ng/ml vs. 116.3 (78.7–182,3) ng/ml in patients with preserved GLS. ROC-analysis revealed ≥106,4 ng/ml as optimal cut-off value for PICP to predict pathological GLS. Nocturnal hypertension, 3rd grade of AH, LV hypertrophy, diastolic dysfunction, type 2 diabetes mellitus, glycated hemoglobin ≥5,7% and PICP ≥106,4 ng/ml were associated with reduced GLS by univariate binary logistic regression model. The presence of nocturnal hypertension (odds ratio 2.51; 95% CI 1.003–6.31; p=0.049) and PICP level ≥106,4 ng/ml (odds ratio 4.11; 95% CI 1.86–9.1; p=0.0005) were the only independent predictors of impaired GLS in multivariate analysis.

Conclusion: Myocardial fibrosis is one of the key determinant of left ventricle deformation properties in arterial hypertension. The circulating carboxy-terminal propeptide of procollagen type I predicts pathological reduction of global longitudinal strain in hypertensive patients.