Tissue Doppler, Speckle Tracking and Strain Imaging

Left ventricular force adaptation and cardiac deformation in the progression of aortic stenosis

Faganello G.[1]; Pagura L.[1]; Croatto E.[1]; Collia D.[2]; Furlotti S.[1]; Paldino A.[1]; Dal Ferro M.[1]; Sinagra G.[1]; Di Lenarda A.[1]; Pedrizzetti G.[2]

[1]Cardiovascular Center ASUGI Trieste, Cardiovascular Department, Trieste, Italy
[2]University of Trieste, Department of Engineering and Architecture, Trieste, Italy

Funding Acknowledgements: Type of funding sources: None.

Introduction. Aortic stenosis (AS) is one of the most common valvular heart diseases; however, the association between left ventricular (LV) myocardial deformation and hemodynamic forces (HDFs) is still mostly unexplored.

Purpose. This study aimed to assess the differences in LV myocardial deformation and HDFs in a large cohort of patients with aortic stenosis retrospectively.

Methods. Two-hundred fifty-four subjects (median age 77 years, 50% women) with preserved LV ejection fraction (LVEF), and mild (n = 87), moderate (n = 92) or severe (n = 75) AS, were included in the study. The 2D LV global longitudinal strain (GLS), circumferential strain (GCS), and HDFs were measured with new software that allowed us to calculate all these values and parameters from the three apical views.

Results. When comparing severe AS to mild AS, LV mass appeared increased while the LV hypertrophy phenotype was concentric (p <0.0001). Along with the progression of the AS, LVEF was decreased. All GLS, GCS, and HDFs parameters were uniformly reduced in severe AS compared to mild AS (p <0.0001), in the same way, LV longitudinal force, LV longitudinal systolic force, and LV impulse have proven to be accurate on ROC curves (AUC 70%, 73% and 73% respectively).

Conclusion. The integrated approach of deformation and cardiac mechanics allows the description of pathophysiological changes during the progression of mild to severe aortic stenosis.

Abstract Figure. Strain parameters and aortic stenosis