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Aortic distensibility as assessed by CMR is independently associated with left ventricle function in patients with aortic valve regurgitation

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Previous works have found that aortic distensibility (AD) is a determinant factor on the pathophysiology of hypertension, coronary artery disease, aortic disease of Marfan, left ventricle failure. In this study we aimed to assess whether in patients with chronic aortic valve regurgitation (AR), AD had influence on left ventricle (LV) volumes and function, as assessed by CMR.

Methods: We studied 63 consecutive patients (aged 47 ± 9 year-old; 54 men) with severe AR based on the presence of regurgitant fraction (RF) $>33\%$ as assessed by CMR. Coronary artery disease was excluded by coronary angiography or cardiac CT. Exclusion criteria: non-sinus rhythm, presence of other significant valve disease, coronary disease.

All patients were submitted to CMR (SSFP, phase contrast velocity coding) using a 3T scanner. LV feature tracking analysis was performed (Circle cvi42). Besides demographics and clinical data, the following variables were assessed: maximal dimension of the ascending aorta (mm); AD of the proximal ascending aorta, calculated as: (Variation between end-systolic and end-diastolic area (cm²)/end-diastolic area (cm²)) / pulse pressure (dynes cm⁻¹; 1 mmHg = 1,332 dynes cm⁻¹); RF (%). LV end-diastolic volume (EDV) (mL), ejection fraction (%) and global longitudinal strain (GLS) (%) by feature tracking analysis, were endpoints as markers of LV function.

Results: Maximal diameter of the ascending aorta was 37 ± 4 mm, AD was 0.63 ± 0.80 dynes cm⁻¹ (0.05-2.2), RF was $38 \pm 3.6\%$, EDV was 120 ± 17 ml/m², EF $62 \pm 8.1\%$ and GLS $16 \pm 3.1\%$. There was no difference on LV volumes, ejection fraction according to gender, presence of symptoms or presence of risk factors, but GLS was lower in the group with symptoms. No correlation was found between blood pressure or maximal ascending aorta diameter and LV volumes, ejection fraction or GLS. We found a significant correlation between RF and EDV ($r = 0.040$, $p = 0.02$), an inverse correlation between age and GLS ($r = -0.38$, $p = 0.05$), and between AD and LV EDV ($r = -0.50$, $p = 0.008$), ejection fraction ($r = -0.59$, $p = 0.002$) and GLS ($r = -0.65$, $p = 0.001$). AD was an independent predictor of reduced GLS.

Conclusion: In patients with significant aortic regurgitation, aortic distensibility was independently associated with LV dysfunction. This may have prognostic and therapeutic implications, namely on the timing for surgical intervention.