Association between microvascular dysfunction and impaired myocardial deformation in hypertrophic cardiomyopathy

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Objective: To analyze the relationship between coronary microvascular dysfunction (MCD) and left ventricular (LV) myocardial deformation in hypertrophic cardiomyopathy (HCM).

Methods: Prospectively inclusion of HCM patients (P). MCD was assessed by CMR, during regadenoson-induced hyperemia. For perfusion assessment, the myocardium was divided into 32 subsegments (16 AHA segments subdivided into an endocardial and epicardial layer). Ischemic burden was calculated as the number of involved subsegments, assigning 3% of myocardium to each subsegment. Epicardial coronary artery disease was excluded by computed tomography or invasive coronary angiography.

LV myocardial deformation was evaluated by 2D and 3D speckle-tracking echocardiography (STE), including global longitudinal strain (GLS), peak systolic dispersion (PDS), global circumferential strain (GCS), global radial strain (GRS), area strain, twist and torsion.

Results: 31 P enrolled (51%male,age57.8 ± 15.5years). Asymmetric septal hypertrophy was seen in 55%, apical in 29%, concentric in 16%,maximal wall thickness (MWT) of 20.5 ± 4.9mm; 26% with LVOT obstruction; LV ejection fraction 67.9 ± 7.9%.

In 2DSTE analysis, P with more ischemia (>20%of LV) presented more severe impaired GLS and greater PDS, comparing with patients with ≤20% of ischemia.

Similarly, 3DSTE imaging showed worse LV performance in P with greater ischemic burden, expressed by significant difference in GLS, GRS and area strain. GCS also trended to be worse in the presence of >20% of ischemia.

The stronger correlation was found between 2D GLS and ischemic burden (Pearson correlation factor 0.545; p = 0.002).

Conclusion: In HCM, the severity of ischemia secondary to MCD was associated with impairment in LV myocardial deformation evaluated by 2D and 3D STE.

Table 1.

Echocardiography	Ischemic burden (% of LV)		
2D parameters	≤ 20% (n = 15)	> 20% (n = 16)	p-value
GLS (%)	-15.6 ± 2.7	-12.1 ± 4.7	0.016
PSD (ms)	73.2 ± 25.6	102.1 ± 57.6	0.150
3D parameters			
GLS (%)	-10.3 ± 4.5	-7.3 ± 3.0	0.010
GCS (%)	-12.6 ± 3.0	-10.1 ± 4.5	0.079
GRS (%)	30.8 ± 8.5	22.8 ± 11.4	0.035
Area strain(%)	-20.8 ± 4.9	-15.8 ± 6.3	0.020
Twist (deg)	6.0 ± 4.8	4.1 ± 4.0	0.175
Torsion (deg/cm)	1.2 ± 0.9	0.8 ± 0.7	0.232