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Meeting abstract

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2030 Established cmr methods for left ventricular quantification differ based on variable exclusion of papillary/trabecular volumes: increased diagnostic impact among patients with left ventricular hypertrophy

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Objective

To assess the contribution of papillary muscles and trabeculae (PMT) to left ventricular (LV) quantification in patients with and without LV hypertrophy.

Background

Accurate assessment of left ventricular mass (LVM) and ejection fraction (EF) is of diagnostic importance for patients with LV hypertrophy (LVH). Cardiac magnetic resonance imaging (CMR) has been proposed as a standard for these indices. However, prior CMR studies have variably included papillary muscles/trabeculae (PMT) in intracavitary or myocardial volume. The relative impact of this methodologic variability on LVH patients is unknown.

Methods

Patients with established concentric (CLVH) or eccentric hypertrophy (ELVH) independently verified by echocardiography were studied by CMR (1.5 T) and compared to a group of 20 low risk patients with normal LVM and geometry (NL). In all patients, short axis SSFP images were acquired contiguously through the LV (typical parameters: TR 3.5 msec, TE 1.6 msec, flip angle 60°, 6 mm slice thickness/4 mm gap). LV volumes were determined by two established methods: method 1 included PMT in myocardial volume, method 2 included PMT in intracavitary volume. Both methods were used for each patient with tracings superimposed to isolate PMT and ensure endocardial and epicardial contour consistency. Each method was applied blinded to results of the other technique.

Results

In the 60 total patients (40 LVH/20 NL), PMT accounted for 10.5% of total LVM, with over a 2-fold difference between LVH and NL pts (12.6 vs 6.2%, $p < 0.001$). LV mass quantification with PMT exclusion (method 2) produced a 37% reduction ($p < 0.001$) in patients meeting gender-specific LVH criteria using previously established CMR definitions based on PMT inclusion (method 1). PMT correlated with LV wall mass ($r = 0.67$) and end diastolic volume (EDV) ($r = 0.68$; $p < 0.001$). Method variability yielded differences in LVEF, EDV, and LVM within all groups (Table 1), but differences were greater in LVH patients: ΔLVM index was > 3-fold greater in CLVH and > 6-fold greater in ELVH vs. NL ($p < 0.001$). ΔEF was > 2-fold higher in CLVH vs. NL ($p < 0.001$). In multivariable analysis, ΔEF was independently related to PMT mass, LV wall mass, and EDV ($R^2 = 0.56$, $p < 0.001$).

Table 1: Methodological variance in LV volumetric and functional parameters

	Normal	p	Eccentric LVH	p	Concentric LVH	p
Myocardial Mass Index (g/m2) (method 1)	52.4 ± 8.9		134.6 ± 29.7		123.6 ± 17.7	
Myocardial Mass Index (g/m2) (method 2)	49.4 ± 9.0		113.7 ± 26.0		111.6 ± 15.2	
Δ Myocardial Mass Index (g/m2)	3.1 ± 0.7	< 0.001	20.9 ± 8.9	< 0.001	12.0 ± 4.3	< 0.001
Ejection Fraction (%) (method 1)	68.2 ± 6.4		21.8 ± 9.2		59.8 ± 15.1	
Ejection Fraction (%) (method 2)	64.8 ± 6.2		19.4 ± 8.4		52.7 ± 13.4	
Δ Ejection Fraction (%)	3.4 ± 1.0	< 0.001	2.4 ± 1.3	< 0.001	7.1 ± 13.4	< 0.001
End Diastolic Volume (cc) (method 1)	134.8 ± 39.9		282.5 ± 60.1		137.9 ± 27.8	
End Diastolic Volume (cc) (method 2)	140.4 ± 40.6		320.5 ± 70.6		160.1 ± 27.8	
Δ End Diastolic Volume (cc)	5.6 ± 1.7	< 0.001	37.9 ± 17.3	< 0.001	22.2 ± 7.4	< 0.001

Conclusion

Established CMR methods can yield differences in LV quantification due to variable exclusion of PMT from myocardium. Impact of PMT exclusion on calculated LVM and EF is increased in patients with hypertrophy-associated LV remodeling.