Impact of global and segmental hypertrophy on 2D and 3D strain in hypertrophic cardiomyopathy: comparison with healthy subjects

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Objectives We studied the impact of hypertrophy on global and regional 2D and 3D strain in primary hypertrophy cardiomyopathy (HCM) as compared with controls.

Methods A comprehensive resting 2D and 3D echocardiography was performed in 40 HCM and in 53 controls with a comparable distribution of age, gender, and left ventricular ejection fraction (LVEF). LV global (G) and segmental (S) measurements of all 2D and 3D peak strain components (longitudinal: GLS, SLS, circumferential: GCS, SCS, radial: GRS, SRS and area: GAS, SAS) and 3D indexed LV end-diastolic myocardial mass (3D LVED mass) were obtained from all patients. LV wall thickness (LVWT) was assessed in short-axis views and classified in 4 quartiles (<10.5mm, 10.5-13.0mm, 13.0-16.5mm and >16.5mm).

Results For global and regional 2D and 3D strain analysis results were consistent. However, reproducibility of 3D strain was similar or greater and more consistent for all strain components as compared to 2D strain analysis. There was a significant correlation between 3D LVED mass and all 3D strains components (from r=0.71 for 3DGLS to r=0.63 for 3DGCS, all p<0.05). 3D GCS had the strongest association with 3DLVEF (r=0.50, p=0.001). For segmental deformation, as compared to controls, HCM patients had lower 3D longitudinal function whatever the LVWT (controls: –20±5.7 vs. 1st quartile: –16.9±6.8, p<0.05) whereas circumferential was increased in none- and poorly hypertrophied segments (controls: –19.2±6.0 vs. 1st: –21.2±6.0 and 2nd quartile: –20.8±6.5, both p<0.05).

Conclusion 3D strain is a reliable technique to assess myocardial deformation. Myocardial mass is related with 3D strain components in HCM patients. Circumferential deformation, as compared to longitudinal, seems to be the main determinant of the systolic function in HCM patients.