Multi-modality imaging in hypertrophic cardiomyopathy: intermodal discrepancies in key prognostic parameters

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Background/Introduction: Multi-modality imaging is crucial for confirming diagnosis and assessing prognosis in patients with hypertrophic cardiomyopathy (HCM). However, inter-modality discrepancies in key parameters are commonly reported.

Purpose: To assess real-world inter-modal reporting discrepancies between transthoracic echocardiography (TTE) and cardiac magnetic resonance (CMR) imaging in the measurement of four key parameters in HCM patients.

Methods: Consecutive HCM patients with TTE and CMR performed within 6 months of each other at a tertiary centre were retrospectively assessed for reported maximum wall thickness (MWT), left atrial diameter (LAd), left ventricular ejection fraction (LVEF) and presence of left ventricular apical aneurysm (LVAA). The CMR report was considered gold standard. Data are reported as mean ± standard deviation (SD) or median and interquartile range (IQR) as appropriate.

Results: 353 consecutive HCM patients (72% male, median age 60.9 years, IQR 49.8–71.6 years) with TTE and CMR within 6 months (median difference 1.7 months, IQR 1.1–3.4 months) were assessed between 4th January 2018 and 9th April 2019. Of 284 patients with paired MWT data, median difference was 0.0 mm (IQR –1.0 to 3.0 mm, p=0.02), likely representing a difference in distributions of MWT. TTE both over and underestimated MWT (in 36% and 46% cases respectively).

Of the 94 patients with paired LAd data, mean difference was 0.4±5.7 mm (95% CI –0.8010 to 1.546, p=0.5).

N=320 patients with paired LVEF data (after excluding patients with atrial fibrillation (n=20)). Median difference in LVEF was 12% (IQR 5–19% p<0.0001). TTE underestimated LVEF in 88% of cases. CMR and TTE both identified 14 (5%) patients as having LVEF <50%. There were however 8 cases of disagreement in classification of LVEF <50%, due to over (n=4) or underestimation (n=4) by TTE.

LVAA was accurately identified by TTE in only 9/30 (30%) of those patients with demonstrable LVAA by CMR (p=0.0008). TTE evidence of a discreet apical chamber (paradoxical jet on spectral or colour Doppler) was present in 16/21 (76%) cases where TTE failed to overtly identify LVAA. However, apical or mid-cavity obliteration was reported in 15/21 (71%) cases where TTE failed to identify LVAA.

Conclusion(s): Echocardiography and CMR measurements are often used interchangeably in clinical practice but inter-modality discrepancies can affect diagnosis and sudden cardiac death (SCD) risk assessment. This is particularly important for binary risk factors such as LVEF<50% or LVAA which are considered major SCD risk factors in the latest American Heart Association guidelines. 25 (7%) patients in our cohort had major risk factors identified by CMR that were not identified on TTE. CMR is an important, recommended tool where TTE imaging is suboptimal, but attention to more subtle elements of abnormal intracavity blood flow may be able to increase LVAA detection during TTE.

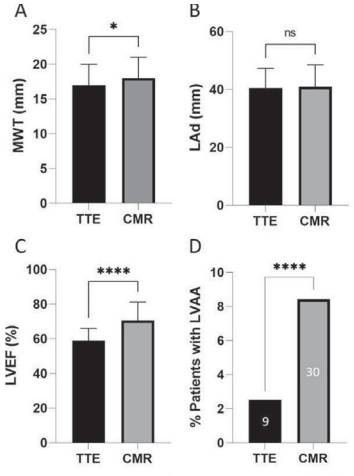

Figure 1: Differences between TTE and CMR in MWT (A), LAd (B), LVEF (C) and LVAA (D). ns, non-significant. Numbers of patients with LVAA are shown in the middle of the bars in D.

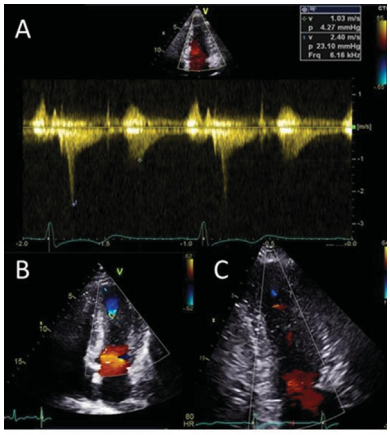

Figure 2: Low velocity systolic and diastolic jets on spectral Doppler at the LV apex (A), and paradoxical movement of blood on colour flow mapping (B&C) should increase the suspicion of LVAA even in the context of poor endocardial definition.