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Cardiac magnetic resonance characteristics of patients in the grey zone of hypertrophy

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Background: Differentiation between athlete’s heart and hypertrophic cardiomyopathy (HCM) may cause difficulties especially in patients in the grey zone of hypertrophy.

Purpose: We aimed to analyse cardiac magnetic resonance (CMR) characteristics of healthy athletes, sedentary HCM and athletic HCM patients in the grey zone of hypertrophy.

Methods: Male HCM patients with slightly elevated maximal end-diastolic wall thickness (EDWT 13-18 mm) and highly trained healthy athletes (n=34, 20.4±2.3 training hrs/week) were consecutively enrolled. HCM patient group was divided to sedentary (n=35, <7 training hrs/week) and athletic HCM group (n=13; >7 h/week, 13.2±5.0 h training hrs/week). We determined conventional CMR parameters (left ventricular (LV) ejection fraction (EF), BSA-corrected end-diastolic (EDVi) and end-systolic volume (ESVi), mass (Mi)), derived parameters such as EDWT/VEDVi, LVM/VEDV and CMR based strain parameters such as global longitudinal (GLS), radial (GRS) and circumferential strain (GCS), standard deviation of peak LS, RS and CS (SD LS peak, SD RS peak, SD CS peak), standard deviation of time to peak LS, RS and CS (TTP LS, TTP RS, TTP CS) using feature tracking. Presence of late gadolinium enhancement (LGE) was determined on delayed contrast enhanced images. Inter-observer analysis for strain values was performed in a subgroup of 20 patients conducted by two blinded observer.

Results: Healthy athletes showed lower LVEF, GCS and GRS than sedentary and athletic HCM patients, respectively (57.9±5.2 vs 65.3±7.4, 62.7±5.1; -19.7±7.0 vs -24.4±4.6, -22.8±4.8; 61.7±11.2 vs 75.4±21.4, 69.3±19.8). Both healthy athletes and athletes with HCM showed higher LVEDVi, LVESVi, LVSVi and LVMi than sedentary HCM patients. Although sedentary athletes showed higher SD peak strain values and more pronounced intraventricular dyssynchrony than healthy athletes (TTP LS 15.4±4.9 vs 11.7±4.3), none of the global strain values, SD of peak strain values or TTP strain values showed any difference between athletic HCM and healthy athletes. EDWT/VEDVi ratio was significantly lower in healthy athletes than in sedentary and athletic HCM, respectively (0.11±0.02 vs 0.19±0.04; 0.18±0.04). Inter-observer analysis showed good agreement in GLS (r=0.77), GRS (r=0.69) and TTP LS (r=0.74), moderate agreement in GCS (r=0.54), and only fair or poor agreement in SD peak strain, TTP CS and TTP RS values. None of the healthy athletes showed LGE, 62% of athletic HCM and 71% of sedentary HCM patients showed LGE in the hypertrophic segments or in the insertion points.

Conclusions: Based on our results CMR characteristics of sedentary and athletic HCM differs significantly, therefore establishing diagnostic parameters and cut-off values based on comparison between athletic HCM and healthy athletes would be essential. Presence of late gadolinium enhancement and derived parameters may have an important role in the differential diagnosis.
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