Role of extensive diagnostic work-up with 3D electroanatomic mapping and endomyocardial biopsy in young competitive athletes and non-athletes presenting complex ventricular arrhythmias

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Background. Life-threatening ventricular tachyarrhythmias (VAs) represent the first cause of death in young athletes. It is unknown if there are differences in electroanatomic substrate in young athlete and non-athlete populations with complex VAs as first clinical presentation.

Purpose. 1) To investigate with an extensive diagnostic workflow young competitive athletes versus non-athletes affected by complex VAs in order to find differences in electrophysiological substrate. 2) To identify predictors of ventricular arrhythmic burden persistence at follow-up.

Methods. We prospectively enrolled competitive athletes and non-athletes <40 years of age, admitted to our hospital with complex VAs as common arrhythmic presentation. Patients underwent 2D echo, stress test, cardiac magnetic resonance (CMR), coronary angiography, 3D-electroanatomic mapping (3D-EAM) and 3D-EAM guided endomyocardial biopsy (EMB). Clinical follow-up was performed in order to evaluate ventricular arrhythmic burden by 24h ECG Holter monitoring or by ICD/loop recorder interrogation.

Results. We enrolled 33 consecutive patients (20 males), 18 (56%) competitive athletes and 15 (44%) non-athletes (mean age 26 ± 9 years old). Left and right ventricular (LV and RV) findings by 2D echo and CMR did not show evidence of structural disease. Nine (50%) athletes were completely asymptomatic on admission compared to 1 (7%) non-athlete (p<0.05) and presented more frequently with non-sustained ventricular tachycardia and premature ventricular contractions >25% in 24h (p= 0.043). Mean mapped RV volume was significantly larger in athletes than in non-athletes (141.86 ± 44.78 ml vs 104.34 ± 31.08 ml, p= 0.033). Athletes showed a larger RV unipolar scar area than RV bipolar "scar " (18 ± 17 cm2 versus 3 ± 3.8 cm2, p= 0.04), mainly localized in right outflow tract. Diagnostic yield of 3D-EAM guided EMB was 88% in athletes and 80% in non-athletes, respectively. Among the athletes, the final diagnosis based on our extensive diagnostic work-up was: 2 myocarditis, 1 arrhythmogenic ventricular right cardiomyopathy (AVRC) and 1 cardiac fibrosis. Among non-athletes, our diagnostic work up identified 4 cardiac fibrosis. At median follow-up of 18.7 months (range 1-51), Kaplan Meyer curve showed higher persistence of VAs in non-athletes than in detrained athletes (57% versus 7%, p= 0.02).

Conclusions. Our data show the need for an extensive diagnostic workflow in apparently healthy young patients with complex VAs in order to characterize concealed cardiomyopathies and potential arrhythmogenic substrates. Moreover, our data emphasize the importance of detraining in athletes with complex VAs.