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Beyond the ECG: prevalence of cardiac structural abnormalities in 30 109 consecutive athletes by pre-participation screening

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Background: Systematic pre-participation screening (PPS) of all subjects embarking in sports activity has the potential to reduce mortality. However, the modalities of PPS in athletes are controversial.

Aim: To evaluate the prevalence of cardiac abnormalities and the usefulness of echocardiography in a large cohort of athletes during PPS.

Methods: The study population consisted of competitive and recreational sports participants undergoing a PPS between 2011-2017 in a community-based sports medicine center in Tuscany. The PPS included personal and family history, physical examination and a 12-lead resting ECG. ECGs were analyzed according to the original ESC and refined Seattle Criteria as: 1) normal 2) training-related changes 3) abnormal. Patients with abnormal ECG, symptoms/signs of cardiovascular diseases (CVD), CVD risk factors or family history of juvenile/genetic cardiac disease underwent echocardiographic evaluation.

Results: Among a total of 30,109 athletes evaluated, (21 [15;31] years, range 6-85, 70% males, 99% caucasians), the majority were <18 years (24,543, 81%), 4,442 (15%) were 18-50 years and 1,124 (4%) were >50 years. A total of 2,569 (9%) athletes were selected for echocardiography: 993 (36%) due to ECG abnormalities (748/24,543 (3%) aged <18 ys, 216/4,442 (5%) aged 18-50 ys, 29/1,124 (3%) aged >50ys; p=0.53), 818 (33%) due to cardiac symptoms/abnormal physical examination (562/24,543 (2%) aged <18 ys, 162/4,442 (4%) aged 18-50 ys, 94/1,124 (8%) aged >50ys; p<0.01), 758 (31%) due to abnormal personal or family history (384/24,543 (1%) aged <18 ys, 205/4,442 (7%) aged 18-50 ys, 169/1,124 (15%) aged >50 ys; p<0.01). Referral rates increased significantly with age, from 1,694/24,543 (7%) <18 years, to 583/4,442 (15%) in those 18-50 years and 292/1,124 (32%) in those >50 years (p<0.01). Cardiac structural abnormalities were found in 284/30109 (0.8%) athletes. Abnormalities included aortic ectasia (102, 36%) and hypertensive heart disease (58, 20%) Subclinical structural abnormalities identified by Echo were common in athletes aged>50 (133/1,124, 11%), but rare in athletes aged 18-50 (96/4,442, 2%) and very rare <18 (55/24,543, 0.2%) (p for trend <0.01). Sixty-eight athletes (0.2%, 7 aged<18 years, 0.5%, 22 aged 18-50 and 3.5%, 39 aged>50 years, p<0.01) were disqualified because of the structural alterations identified.

Conclusions. Our community-based PPS strategy including ECG showed to have an age-dependent yield, with a 3-fold increase in referral to further testing in athletes >50 years compared to <18 years. Subclinical structural abnormalities alterations were common >50 years, but ultimately led to non-eligibility only in a small minority of patients (0.2%).