

## Additional value of stress testing for evaluation of ventricular arrhythmias in athletes undergoing preparticipation screening

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**Introduction:** The optimal protocol of athletes pre-participation screening is a matter of debate. The aim of this study is to test the additional value of exercise testing (ET) for evaluation of ventricular arrhythmias (VA) in athletes with otherwise normal findings.

**Methods:** The study included 10,975 competitive athletes who underwent preparticipation screening including ECG and stress testing. Athletes with  $\geq 3$  isolated premature ventricular beats or  $\geq 1$  repetitive VA underwent second-line investigations (echocardiography and 24-hour ambulatory ECG monitoring with a training session) and, in case of frequent, complex or exercise-induced VA or echocardiographic abnormalities, also cardiac magnetic resonance (CMR).

**Results:** 451 (4,1%) athletes were excluded for abnormalities at history, physical examination and baseline ECG. Among the remaining 10524 athletes, 524 (5%) showed VA at ET, 87 of whom underwent CMR. Echocardiography identified major cardiac abnormalities in 5 athletes and regional ventricular systolic dysfunction in 7, which were confirmed by CMR in 6. Other 12 patients with normal echocardiography had a positive CMR. In particular, in 16 subjects the CMR showed left ventricular late gadolinium enhancement suggesting myocardial fibrosis with a non-ischemic distribution. At multivariate analysis, VA observed at high work load at ET, the presence of complex VA at ET and the presence of a morphology other than infundibular or fascicular predicted an underlying pathological myocardial substrate while the presence of frequent (>500/24-hour) premature ventricular beats did not.

**Conclusions:** VA at ET may represent the only sign of a pathological myocardial abnormalities, such as the “isolated nonischemic left ventricular scar”, that could be the substrate for life-threatening ventricular arrhythmias. Addition of ET to baseline ECG may increase the sensitivity of PPE of competitive athletes.

### Predictors of underlying pathological myocardial substrate

	Substrate		Univariate		Multivariable	
	YES (n=23)	NO (n=501)	OR (95% IC)	P	OR (95% IC)	P
Age	17 [13-43]	15 [14-17]	1.03 [0.98-1.06]	0.18	–	
Male gender	15 (65%)	184 (37%)	3.2 [1.3-7.7]	<0.001	1.6 [0.7-4.8]	0.28
>500 PVBs/24-hour	7 (30%)	98 (20%)	1.8 [0.7-4.5]	0.21	–	
VA at high work-load	10 (44%)	78 (16%)	4.2 [1.8-9.8]	<0.001	1.6 [1.1-4.7]	0.02
Couplets/NSVT at ET	14 (61%)	117 (23%)	6.2 [2.5-15]	<0.001	8.5 [2.5-29]	0.01
PVBs other than infundibular/fascicular	17 (74%)	118 (24%)	6.1 [2.4-16]	<0.001	3.9 [1.4-11]	0.008