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ORIGINAL ARTICLE

Variability in interpretation of the electrocardiogram in athletes: Another limitation in pre-competitive screening[☆]

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KEYWORDS

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Interpretation;
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Abstract

Introduction: Assessment of the electrocardiogram (ECG) in athletes remains controversial, with lack of standardization and difficulty in applying specific criteria in its interpretation. The purpose of this study was to assess variability in the interpretation of the ECG in athletes.

Methods: Twenty ECGs of competitive athletes were assessed by cardiologists and cardiology residents, 11 of them normal or with isolated physiological changes and nine pathological. Each ECG was classified as normal/physiological or pathological, with or without the use of specific interpretation criteria.

Results: The study presents responses from 58 physicians, 42 (72.4%) of them cardiologists. Sixteen (27.6%) physicians reported that they regularly assessed athletes and 32 (55.2%) did not use specific ECG interpretation criteria, of which the Seattle criteria were the most commonly used (n=13). Each physician interpreted 15±2 ECGs correctly, corresponding to 74% of the total number of ECGs (variation: 45%-100%). Interpretation of pathological ECGs was correct in 68% (variation: 22%-100%) and of normal/physiological in 79% (variation: 55%-100%). There was no significant difference in interpretation between cardiologists and residents (74±10% vs. 75±10%; p=0.724) or between those who regularly assessed athletes and those who did not

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($77\pm 12\%$ vs. $73\pm 9\%$; $p=0.286$), but there was a trend for a higher rate of correct interpretation using specific criteria ($77\pm 10\%$ vs. $72\pm 10\%$; $p=0.092$). The reproducibility of the study was excellent (intraclass correlation coefficient= 0.972 ; $p<0.001$).

Conclusions: A quarter of the ECGs were not correctly assessed and variability in interpretation was high. The use of specific criteria can improve the accuracy of interpretation of athletes' ECGs, which is an important part of pre-competitive screening, but one that is underused.

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PALAVRAS-CHAVE

Eletrocardiograma;
Interpretação;
Variabilidade;
Atletas

Variabilidade na interpretação do eletrocardiograma do atleta: mais uma limitação na avaliação pré-competitiva

Resumo

Introdução: A interpretação do eletrocardiograma (ECG) do atleta permanece controversa, com ausência de standardização e dificuldade na aplicação de critérios específicos na sua interpretação. O objetivo deste trabalho é avaliar a variabilidade na interpretação do ECG de atletas.

Metodologia: Vinte ECG de atletas foram avaliados por cardiologistas e internos de cardiologia, 11 normais ou apenas com alterações fisiológicas e nove patológicos. Cada ECG foi classificado pelos inquiridos em normal/com alterações fisiológicas ou patológico, usando ou não critérios específicos na sua interpretação.

Resultados: Foram incluídas as respostas de 58 médicos, 42 (72,4%) cardiologistas. Dezasseis (27,6%) afirmaram avaliar frequentemente atletas e 32 (55,2%) não usar critérios específicos na interpretação do ECG, sendo os mais usados os critérios de Seattle ($n=13$). Em média, cada médico interpretou corretamente 15 ± 2 ECG, correspondendo a 74% dos traçados (variação: 45-100%). A interpretação dos ECG foi correta em 68% (variação: 22-100%) dos patológicos e em 79% (variação: 55-100%) dos normais/com alterações fisiológicas. Não houve diferença significativa na interpretação entre cardiologistas e internos ($74\pm 10\%$ versus $75\pm 10\%$; $p=0,724$), nem entre os que avaliam frequentemente ou não atletas ($77\pm 12\%$ versus $73\pm 9\%$; $p=0,286$), verificando-se uma tendência para interpretação mais correta com critérios específicos ($77\pm 10\%$ versus $72\pm 10\%$; $p=0,092$). A reprodutibilidade do estudo foi excelente (intraclass correlation coefficient= $0,972$; $p<0,001$).

Conclusão: Na amostra estudada, cerca de um quarto dos ECG foram incorretamente avaliados, havendo uma elevada variabilidade na sua interpretação. O uso de critérios específicos na interpretação do ECG do atleta pode melhorar a acuidade deste exame no *screening* de atletas, mas são ainda subutilizados.

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Introduction

The main purpose of pre-competitive screening of athletes is to enable early (pre-clinical) identification of pathological conditions associated with increased risk of serious clinical events, including sudden death. Data from Italy show an 89% reduction in the incidence of sudden death in competitive athletes following the inclusion of the electrocardiogram (ECG) in pre-competitive screening.¹ In view of this, most European countries currently recommend that pre-competitive screening should include personal and family history, physical examination, and a resting 12-lead ECG.²

Despite this evidence and the many arguments in support of ECG assessment, the inclusion of this exam in pre-competitive screening remains controversial, basically

because of disagreement between Europe and the US, where it is not formally recommended.^{3,4} Of the arguments put forward against ECGs in athletes, the most frequent is the high false-positive rate, which can lead to unnecessary additional diagnostic exams and inappropriate exclusion of healthy individuals from competition. Most false positives result from incorrect interpretation of the ECG, mainly because alterations caused by exercise-induced physiological adaptations of the heart are wrongly classified as pathological.⁵⁻⁷ Thus, the central issue in this controversy is not whether the ECG should be included in pre-participation screening, but rather how the exam should be interpreted.

Various increasingly restrictive criteria have been published with the aim of standardizing interpretation of the ECG in athletes, notably those of the European Society of

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