



LETTER TO THE EDITOR

How should we interpret the athlete's electrocardiogram?☆



Como interpretar o eletrocardiograma do atleta?

To the editor:

It was with considerable interest that we read the recent article by Machado and Silva¹ entitled "Benign and pathological electrocardiographic changes in athletes", a comprehensive and pertinent review. Interpretation of the athlete's echocardiogram (ECG) remains the subject of debate, but beyond the ongoing 'transatlantic' discussion on whether the ECG should be included in pre-participation screening, the basic question remains: how should we interpret the athlete's ECG?²

As Machado and Silva point out, the European Society of Cardiology (ESC) criteria are associated with a high false-positive rate, and so there is a need for more restrictive criteria. Among these are the Seattle criteria, which the article states are the latest recommendations for the interpretation of the ECG in athletes. We would like to put forward certain points that in our opinion will add to the discussion.

- (1) The Seattle criteria are a valuable aid to interpreting the athlete's ECG, but it should be borne in mind that they are only a consensus document based on expert opinion, and are not evidence-based.
- (2) After the publication of the Seattle criteria, Sheikh et al.³ proposed the 'refined' criteria. Although these are mentioned in the article by Machado and Vaz Silva, they should, in our opinion, have received greater attention, for three reasons. Firstly, they are based on the analysis of a large sample of elite athletes, and their accuracy was validated in a population of athletes with hypertrophic cardiomyopathy. Secondly, they assume, on the basis of previously published research, that some

isolated ECG findings are probably physiological (such as axis deviation or atrial dilatation). Thirdly, they reduce the number of false positives, even compared to the Seattle criteria.^{3–5} In our experience at the Hospital das Forças Armadas and Hospital da Luz, use of the 'refined' criteria instead of the ESC criteria has reduced the false-positive rate by two-thirds.

- (3) As pointed out in the article, even when more specific criteria are applied, variability in interpretation of the ECG remains high. In a study of Portuguese cardiologists, soon to be published, this was around 25%.
- (4) Another reason for the difficulty in standardizing interpretation of the athlete's ECG is that the same alteration may be defined differently in different criteria. Thus, pathological Q waves are defined as >4 mm deep in any lead except III and aVR in the ESC criteria, >3 mm deep or >40 ms duration in ≥ 2 contiguous leads except III and aVR in the Seattle criteria, and ≥ 40 ms in duration or $\geq 25\%$ of the height of the ensuing R wave in the 'refined' criteria.⁴

This long-standing debate makes it essential to develop specific structures for the assessment of athletes and for sports cardiology in general. This will make it easier to standardize procedures and to develop multicenter projects that could reduce the 'gray zone' that still prevails around this subject, which would have a significant impact at various levels.

Conflicts of interest

The authors have no conflicts of interest to declare.

References

1. Machado M, Vaz Silva M. Alterações eletrocardiográficas benignas e patológicas em atletas. *Rev Port Cardiol.* 2015;34:753–70.
2. Dore H, Freitas A, Malhotra A, et al. The hearts of competitive athletes: an up-to-date overview of exercise-induced cardiac adaptations. *Rev Port Cardiol.* 2015;34:51–64.
3. Sheikh N, Papadakis M, Ghani S, et al. Comparison of electrocardiographic criteria for the detection of cardiac abnormalities in elite black and white athletes. *Circulation.* 2014;129:1637–49.
4. Riding NR, Sheikh N, Adamuz C, et al. Comparison of three current sets of electrocardiographic interpretation criteria for use in screening athletes. *Heart.* 2014;1–7.

DOI of original article:

<http://dx.doi.org/10.1016/j.repce.2016.05.008>

☆ Please cite this article as: Dore H, Cardim N. Como interpretar o eletrocardiograma do atleta? *Rev Port Cardiol.* 2016;35:715–716.

5. Gati S, Sheikh N, Ghani S, et al. Should axis deviation or atrial enlargement be categorised as abnormal in young athletes? The athlete's electrocardiogram: time for re-appraisal of markers of pathology. *Eur Heart J*. 2013;34:3641–8.

Hélder Dores^{a,b,*}, Nuno Cardim^{b,c}

^a *Hospital das Forças Armadas, Lisboa, Portugal*

^b *Centro de Cardiologia Desportiva e Miocardiopatias (CCDM), Hospital da Luz, Lisboa, Portugal*

^c *NOVA Medical School/Faculdade de Ciências Médicas – Universidade Nova de Lisboa, Lisboa, Portugal*

* Corresponding author.

E-mail address: heldores@hotmail.com (H. Dores).