

LETTER TO THE EDITOR

Reply: Right ventricular remodeling in athletes and *crista supraventricularis* pattern

To the Editor,

We are more than honored to receive the comments by Martínez-Sellés et al¹ regarding potential implications of the presence of a *crista supraventricularis* pattern in athletes. We do agree that different definitions of incomplete right bundle branch block (RBBB) have historically been applied in the field of athlete's electrocardiogram (ECG), hindering a homogeneous assessment of the benign or pathologic nature of its presence. In fact, many factors contribute to surface ECG expression, such as distance between the chest wall and the heart, race or body fat, among others.² In fact, current international recommendations for ECG interpretation in athletes are not intended to establish diagnosis of cardiac disease; they serve as a screening tool that identifies high-risk patterns that might be carriers or affected individuals of conditions associated with sudden cardiac death.³ However, exercise-induced cardiac remodeling might develop ECG patterns that resemble the mentioned high-risk features, and deserve additional assessment, as explained in our review.⁴

We thank the authors for introducing the concept of *crista supraventricularis* pattern in the sports cardiology field, where it had not been previously addressed. This pattern is characterized by a QRS width ≤ 100 ms with an RSR morphology in lead V1. *Crista supraventricularis* comprises the muscular structure separating anterosuperior tricuspid leaflet from pulmonary valve. It is shown that subendocardial *crista supraventricularis* Purkinje network is closely connected with the large septal network present along the entire septum except at a free zone below ventricular valves.⁵ This explains the ECG pattern described and the diseases that usually develop this trait. Most of them include septal defects or right ventricular hypertrophy. This ECG pattern has been shown to partially resolve after surgical correction of the defect⁶ suggesting that it is directly associated with a disproportional right ventricular overload. This reversibility after correction of the defect hypothesizes the transient nature of electrophysiological alterations; furthermore, it serves as a rationale for deepening into incomplete RBBB in athletes. Although not previously associated with exercise-induced cardiac adaptations or even athlete's heart, the *crista supraventricularis* pattern might play a role for some of the incomplete RBBB described in this population. An excess or unbalanced afterload is the stimulus for excessive right ventricular remodeling in highly trained athletes.⁴

Therefore, the prevalence of *crista supraventricularis* pattern in athletes might be subjected to further research, as it could be a marker of excessive right ventricular remodeling.

Amelia Carro¹

María Sanz-de la Garza² 

Stefano Caselli³

¹Corvilud Institute, Asturias, Spain

²Cardiovascular Institute, Hospital Clínic, IDIBAPS, Barcelona, Spain

³Cardiovascular Center Zürich, Zürich, Switzerland

Correspondence

Amelia Carro, MD, PhD, Instituto Corvilud, Travesía El Calvario, N1,
Bajo, 33430 Candás, Asturias, Spain.
Email: corvilud@gmail.com

ORCID

María Sanz-de la Garza  <https://orcid.org/0000-0003-3199-9577>

REFERENCES

1. Martínez-Sellés M, Díaz-González L, Lucía A. Right ventricular remodeling in athletes and *crista supraventricularis* pattern. *Clin Cardiol* (submitted for publication). 2020.
2. Sia C, Dalakoti M, Tan B, et al. A population-wide study of electrocardiographic (ECG) norms and the effect of demographic and anthropometric factors on selected ECG characteristics in young, Southeast Asian males—results from the Singapore Armed Forces ECG (SAFE) study. *Ann Noninvasive Electrocardiol*. 2019;24(3): e12634.
3. Sharma S, Drezner JA, Baggish A, et al. International recommendations for electrocardiographic interpretation in athletes. *Eur Heart J*. 2018; 39:1466-1480.
4. Sanz-de la Garza M, Carro A, Caselli S. How to interpret right ventricular remodeling in athletes. *Clin Cardiol*. 2020. <https://doi.org/10.1002/clc.23350>.
5. De Almeida MC, Araujo M, Duque M, et al. *Crista supraventricularis* Purkinje network and its relation to intraseptal Purkinje network. *Anat Rec (Hoboken)*. 2017;300(10):1793-1801.
6. Davies D, Pryor R, Blount S. Electrocardiographic changes in atrial septal defect following surgical correction. *Br Heart J*. 1960;22: 274-280.

This is an open access article under the terms of the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2020 The Authors. *Clinical Cardiology* published by Wiley Periodicals, Inc.