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Sudden Cardiovascular Death & Exercise: Considerations on the XXIst Century

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Abstract

Exercise indubitably contributes to human health, life quality and increasing longevity; yet there are situations when it may lead morbidity/mortality, namely Sudden Cardiovascular Death. This short text draws attention to the need of knowing risk factors and pathology able to cause sudden and unexpected death; to the need of promoting preventive, therapeutic and emergency measures, which in the XXIst century may reduce fatal cardiovascular events.

Keywords: Sudden Death, Cardiovascular, Exercise

Introduction

It is an irrefutable fact that “Exercise” has beneficial effects on Human Health. Yet, one must not forget the situations when it may promote morbidity and/or mortality, namely Sudden Cardiovascular Death. Thus, some considerations about this issue will be presented on the article.

Development

“Exercise” may occur in diversified life contexts, from ludic, work, defensive, to sports activities. This diversity may difficult a uniform medical screening analysis of the effects of physical effort on the health of a person/athlete due to exercise. Furthermore, exercise may be practiced by different age groups (young, adults, elderly), gender (males, females, other) or people with comorbidities. Moreover, depending on the exercise context (ludic versus competitive), physical effort may be associated to mental/emotional stress, which may aggravate potential nefarious effects.

“Sudden Death” is an entity defined as death occurring instantly or within 1h after the beginning of symptoms (Priori et al, 2015). If unwitnessed, it may occur whether, in the previous 24h, the deceased did not present pathology to justify the fatal event, nor was evidence of violent interference by a third part (Priori et al, 2015). “Sudden Cardiovascular Death” requires cardiac, vascular, or cardiovascular underlying causes (Priori et al, 2015; Basso et al, 2017; Henriques de Gouveia & Corte Real, 2019).

Focusing on sports practitioners, estimated incidence of Sudden Cardiovascular Death is 1 in 40,000 to 1 in 80,000 athletes/year; generally affecting more males than females; varying with age group, population affinity, sports type, underlying risk factors, as well as other factors (Wasfy et al, 2016; Malik et al, 2023).

Cardiovascular causes may be congenital or acquired; occur in a structurally normal or abnormal heart; or in a heart with electrical anomalies. Pathologic genetic background may or may not exist. Sometimes, there may be overlap among the aforementioned possibilities (Wasfy et al, 2016; Emery & Kovacs, 2018; Han et al, 2023; Carrington et al, 2023). Amidst the previous causal groups, let us point out Coronary Arteries Malformations, Hypertrophic Cardiomyopathy and Ischæmic Cardiopathy. Coronary Arteries Malformations draw attention to congenital entities in a structurally abnormal heart (Gentile et al, 2021; Henriques de Gouveia et al, 2010). Hypertrophic Cardiomyopathy (HCM) stresses the relevance of entities with genetic background and structurally abnormal heart (Carrington et al, 2023; Sheppard et al, 2023). This one also reminds the predisposition of populational affinities for some pathologies, like Afro-Americans and HCM. Ischæmic Cardiopathy accentuates the importance of acquired entities and structurally abnormal heart (Gouveia et al, 2016). This nosologic entity emphasizes the need to search and modify the associated risk factors, namely dietary habits, hypertension, and many others. It also emphasizes the need for a closer follow-up especially of older persons, but also of younger persons (these last, if presenting genetic predisposition, as familiar hypercholesterolemia). All the referred entities may eventually lead to cardiac electrical alterations, which can be (co-)responsible for the *exitus letalis*.

One must not undervalue the fact that sports practitioners and persons whose life activities lead to a cardiac burden, may present heart adaptative changes (“Athlete’s Heart”) (La Gerche et al, 2022), which may aggravate known or unknown pre-existing pathologic entities, facilitate the appearance of new ones, or increase the susceptibility to external aggressions (as, for example, in Covid-19 context) (Maffetone & Laursen, 2022; Lippi et al, 2023), and thus trigger an unexpected fatal event.

The intensity of the exercise and the type of sport are of major relevance. Vigorous exercise should be avoided, or carefully monitored, due to the cardiac functional, electrical, or structural changes/lesions that may cause (Hans et al, 2023). The type of sport, due to the anatomic-

physiological requests to the human body, may not be equally advisable to all the practitioners; especially if they carry underlying pathological genetic predispositions or congenital/acquired structural heart disorders. If so, there may be the need to stop practicing or change modality (Maron et al, 2015).

Final Considerations

To avoid or decrease Unexpected Sudden Cardiovascular Death related to Exercise, diverse measures should be provided. They should include (1) programmed – preventive and therapeutic – measures, (2) emergency interventions, (3) postmortem studies.

Programmed measures should include (1a) medical screening before beginning and regularly during the period of exercise/sports practice, in order not only to prepare the practitioners, but also to disclose possible unknown diseases; (1b) medical therapeutic interventions, both curative (when possible) or palliative/support, depending on the eventual diseases discovered during the screening program or previously known (Emery & Kovacs, 2018; Wasfy et al, 2016).

Emergency interventions should include the preparation and the efficient execution of an Emergency Action Plan, that may guarantee a Chain-of-Survival in cases of Sudden Cardiac Arrest (Malik et al, 2023).

Postmortem studies should include a thorough and complete autopsy, with mandatory anatomic-pathological and toxicological examination, as well as genetic tests (whenever advisable) (Basso et al, 2017; Angelini et al, 2020).

Genetic/Molecular analysis, both *in vivo* and *postmortem*, are fundamental for family counselling (Wasfy et al, 2016; Basso et al, 2017).

Each person/athlete, each community, institution and government is responsible to act.

New mindset, technical-scientific and digital development converge to promote reduction of Exercise-related Sudden Cardiovascular Death during the XXIst century.

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