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WHY THE ECG SCREENING TO PREVENT SUDDEN CARDIAC DEATH IN ATHLETES?

¿PORQUÉ LA ELECCIÓN DEL ECG PARA PREVENIR LA MUERTE SÚBITA EN DEPORTISTAS?

EDITORIAL

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INTRODUCTION

Since 2005, the European Society of Cardiology supported implementation of the ECG-based screening strategy in competitive athletes, and similar statement was endorsed by the International Olympic Committee[1,2]. These position statements have raised large interest in the scientific and lay public and fueled the current debate regarding the efficacy of ECG-based preparticipation screening (PPS) to reduce CV mortality in young athletes.

The strongest evidence comes from the long term experience in Italy[3]. In a 25-year period of implementation of PPS in the Veneto region of Italy, a sharp decrease in sudden cardiac deaths rate was observed (3.6 to 0.4 x100,000 person-year, or 90%) among screened athletes. Reduction in mortality was associated with a concomitant increase (4.4% to 9.4%) in the number of athletes identified with cardiomyopathies (i.e., HCM, arrhythmogenic right ventricular cardiomyopathy and dilated cardiomyopathy). Instead, there was no change in mortality in non-screened individuals, suggesting that the substantial and selective decrease in death rate among athletes was largely attributable to the PPS[3].

Despite the fact that this study was not a randomized clinical trial, but a preventive medical program implemented in the real world, the evidence for a cause-effect relationship between ECG-based PPS and reduction of mortality is supported by the following evidence: 1) a coincident timing between decline in deaths of young athletes and implementation of the screening in Italy; 2) the incidence of SCD did not change during the study period among the unscreened, nonathletic population of the same region and same age range; 3) the reduced incidence of SCDs was mostly due to fewer deaths from cardiomyopathies (namely, HCM and ARVC), and was paralleled by the increase of young athletes identified with these cardiomyopathies, and disqualified from competition, during the same time interval.

Moreover, the strength of the Italian study was the reliability of pathologic data, because the heart of each SD victim was collected and examined by a team of experienced cardiovascular pathologists, according to a standard morphologic protocol[3].

NOVEL SCIENTIFIC EVIDENCE

Recently, two papers brought new support to the efficacy of PPS: the Baggish's *"Cardiovascular screening in college athletes with and without electrocardiography"* designed specifically to test the efficacy of the AHA vs. ESC screening recommendations in a large cohort of US athletes[4]. This study proves that screening without ECG did not identified any athlete with cardiomyopathy. Adding the ECG led to the identification of athletes with cardiomyopathies who eventually required sport restriction, improving the PPS sensitivity to 90.9% and negative predictive value to 99.8%[4].

In the article *"Cost-effectiveness of preparticipation screening for prevention of sudden cardiac death in young athletes"* Wheeler, *et al.*[5], applied a theoretical model to project the costs and survival rates of US high-school and college athletes undergoing PPS. Adding ECG to history and physical examination saved 2.1 life-years per 1,000 athletes screened. The incremental cost-effectiveness ratio of adding ECG to history and physical examination was $ 42,000 per life-year saved. A probabilistic

analysis with several thousand iterations of the model confirmed that ECG was incrementally life-saving compared to history and physical examination in more than 99.8% of simulations[5]. Despite the complexity of the analysis, the result is simple: the PPS is more cost-effective with than without the ECG.

CLINICAL CONSEQUENCES

These observation add new data supporting the efficacy of the EC-based G PPS, originated in the US and consistent with previous reports derived from the Italian experience[6,7]. In summary, the published papers consistently prove the efficacy of the ECG-based PPS to identify (or raise suspicion for) most of the cardiac diseases at risk (sensitivity up to 90%;)[3,4,8]. In addition, the negative predictive value of the ECG-based PPS is >99%[3,7,8], meaning that a normal ECG and clinical findings justify reassurance for the absence of cardiac diseases at risk.

Moreover, the ECG-based PPS is cost-efficient and, consequently, economic reasons should be in favor of the ECG implementation. In conclusion, the current scientific evidence suggests that PPS with ECG represents the best clinical practice for screening young athletes to prevent (or reduce) risk of sudden cardiac death.

As a consequence, we believe that the competitive athletes (and families) should be fully informed regarding the limitations of history and physical examination, and the additional value of the ECG, and should not be deprived of the opportunity to be screened by the ECG, if they choose to do it. We also believe that High Schools and Colleges and International Sport Federations share the implicit ethical and legal obligation to ensure that their young affiliates should be screened according to the current best clinical practice[9].

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