

## Commotio Cordis at Athletes – Under Recognized Problem

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Commotio cordis (CC) is blunt, nonpenetrating trauma to the chest resulting in irregular heart rhythm and often leading to sudden death [1]. Commotio cordis is a primary arrhythmic event that occurs when the mechanical energy generated by a blow is confined to a small area of the precordium and profoundly alters the electrical stability of the myocardium, resulting in ventricular fibrillation [2]. It is most commonly associated with a sports-related injury, wherein, there is a high-velocity impact between a projectile and the precordium. By virtue of this impact, malignant arrhythmias consequently develop leading to the individual's immediate demise, accompanied by a relatively normal post-mortem analysis [3]. The timing of the blow causes a CC is also important, which must occur during an electrically vulnerable period within a narrow window of 10 to 20msec on the upstroke of the T wave, just before its peak (accounting for only 1% of the cardiac cycle) [4]. Baseball, softball, hockey and football a four most often sport activities competitive as well recreational in which CC appears [4]. According to Marijon only 2% of sudden cardiac death (SCD) in sport is caused in mechanism of commotio cordic [5,6].

Palacio and Link in an excellent review analyzed all available papers published in international journals until 2009 and found more than 190 reported cases of commotio cordis in the United States. A similar analysis was carried out in Asia by Halabchi [6]. In contrary to Marijon observation, Palacio emphasized that CC is the second most common cause of sudden cardiac deaths in US athletes and the number of reported cases is rising [3,7]. Forty seven percent of reported cases occurred during athletic participation, mostly during baseball, softball, hockey, football, soccer, lacrosse, karate and rugby. The victims were mostly young males aged 10-18, however the age range of the victims is from 7 to 42 years. Occurrence of CC is most common in the USA in baseball, where 25% of reported cases of CC in youth baseball were from a pitch that averaged 30 to 50mph. Common projectiles responsible for CC cases include hockey pucks, softballs, soccer balls and extremities during martial arts competition. Cases demonstrate no structural damage to myocardial tissue at autopsy and the victims are typically young and healthy. Ventricular fibrillation (VF) is the most common arrhythmia, with early defibrillation improving survival rates [8]. The total survival rate from CC is approximately only 15%. Based on experimental studies in a swine model as well as on the grounds of human cases analysis, early defibrillation is critical for surviving CC. In human cases, resuscitation within 3 minutes resulted in a survival rate of 25%. When resuscitation was prolonged beyond 3 minutes, the survival rates dropped to 3% [7].

According to Halabchi, there are some special considerations in Asia, entirely different from North America or Europe, which warrant more comprehensive research on epidemiology and etiology of commotio cordis in young Asian athletes. This is connecting too with different ratio of popular sports (more contact combat sports in Asia like karate, kickboxing). Every country should introduce little bit different preventive strategies in decreasing the risk of sudden cardiac death (SCD) as a result of commotio cordis. In China most causes of commotio cordis were caused by violent attacks and related to criminal processes and no relation to sporting competitions [9]. Solberg in the article argues that CC probably is under recognized in Europe and cautions that the mounting intensity and speed inherent in modern sports possibly increase the likeliness of CC in the future [10]. Information from north Africa are minor. Studies on larger samples and using standardized autopsy protocols are needed [11]. The importance of an autopsy after CC remains paramount to exclude other causes of sudden

death. With increasing awareness and reporting, survival rates are beginning to improve; however, prevention of the development of this condition remains the best approach for survival [3]. The commotio cordis literature has largely focused on events occurring in the United States. With enhanced public awareness, CC has been increasingly recognized internationally as a cause of cardiac arrest and sudden death due to blunt nonpenetrating chest blows [12].

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