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REVIEW

Sudden cardiac death in special circumstances[☆]

Amadeo Pujol-Robinat^{a,b,*}, Manel Salas-Guerrero^a



^a Instituto de Medicina Legal y Ciencias Forenses de Cataluña, Barcelona, Spain

^b Universidad Internacional de Cataluña, Sant Cugat, Barcelona, Spain

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Abstract Sports-related sudden death is an unusual event. It causes a great social impact. The incidence has been heterogeneous, and coronary artery disease is the most frequent cause in subjects over 35 years-old. Cardiomyopathies and congenital coronary artery anomalies are more usual in younger people. The performing of a medicolegal autopsy is necessary in most cases. A detailed death scene investigation has to be performed, along with a full autopsy with toxicological and histopathological investigation. If the autopsy is negative, genetic studies are requested to rule out disease that may cause cardiac arrhythmias. Sudden deaths in custody, including those occurring in a restraint and containment context, have a special interest in Forensic Medicine, for the multifactorial causes as for the circumstances in which they occurred, as well the social media and medicolegal repercussions. This article presents a review, using a practical approach, for the forensic physician.

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PALABRAS CLAVE

Muerte súbita;
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inexplicada;
Muerte en custodia;
Delirio agitado;
Asfixia posicional

Muerte súbita cardíaca en circunstancias especiales

Resumen La muerte súbita del deportista es un acontecimiento infrecuente, pero causa un impacto tremendo en la comunidad. Su incidencia es muy variable, siendo la cardiopatía coronaria la causa más frecuente en sujetos mayores de 35 años. En los jóvenes las más habituales son las miocardiopatías y la anomalía congénita de las arterias coronarias. En muchos casos se realiza la autopsia judicial. Se practicará el levantamiento de cadáver y una autopsia detallada, solicitando análisis toxicológicos e histopatológicos. Si la autopsia es negativa,

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* Corresponding author.

E-mail address: amadeo.pujol@xij.gencat.cat (A. Pujol-Robinat).

se solicitarán análisis genéticos para descartar enfermedades que pueden causar arritmias cardíacas. Las muertes súbitas en custodia, incluyendo las que ocurren en el contexto de la reducción y contención, tienen un especial interés en medicina forense tanto por la pluralidad de causas intervinientes como por las circunstancias en que se producen, así como la repercusión mediática y médico-legal que suponen. Este artículo realiza una revisión desde un enfoque pragmático para el médico forense.

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Introduction

In this paper, we are going to review two types of sudden death which we call sudden death in *special circumstances*. First, we will address sudden death in sport, which is a rare occurrence but is a situation that is normally tragic for the community, because it is difficult to understand how someone who is generally young, normally healthy and who practises sport can die in such an unexpected way, and in such a short space of time. Then we will deal with sudden deaths in custody, which are of great interest in forensic medicine due to their wide range of causes, as well as due to the circumstances in which they occur. Sudden deaths can also attract a great deal of media attention and, therefore, have important legal and medico-legal implications.

Sudden death in sport

We can define sudden death as a natural, unexpected death, which occurs within the first hour from the onset of symptoms in a subject who was previously healthy or who had a disease that was clinically controlled.¹ Sports-related sudden death (SrSD) is an unexpected, tragic situation which has devastating effects on families, on sports teams, where applicable, and on the public in general because it occurs in subjects who are believed to be in a good state of health because they are active. Sudden death is considered to be related to sport when it occurs while doing sport or in the following hour.² As is well known, doing moderate exercise is an established indication for the treatment and prevention of the development of cardiovascular diseases. Doing sport is therefore recommended for the general population.³ However, when exercise is carried out vigorously, it has been shown that this may increase the risk of sudden death during or a short time after exercise, especially in patients with pre-existing heart disease.^{4,5}

In this study, we will carry out a review of the incidence, causes of death and conduct to follow in the event of sudden death in subjects who were taking part in a sporting activity.

Incidence

The incidence of SrSD is low and, as occurs in the general population, its frequency varies notably as it depends on the definition used, the age of the athlete, the population

studied and the possible loss of cases due to the fact that it is not compulsory to report them.² In general, incidence increases with age and is more common in males and in black athletes.⁶ The sports in which sudden death is most likely to occur are basketball, football and cycling, although this varies according to the series and the country.² Furthermore, in general no sport is more dangerous than any other. The risk is determined by the existence of a condition capable of causing SrSD and the intensity of the effort. Therefore, the frequency of SrSD is defined by the number of participants in each sporting activity.⁷

The incidence varies according to the series, but in general it ranges between 0.16 and 3.76 cases/100,000 population/year.⁸ Of the different papers published, we would like to highlight the study by Van Camp et al.⁹ on a national registry in the United States in which the authors estimated a prevalence of SrSD in child and youth athletes of 0.4/100,000 athletes/year. In a study on the prevalence of sudden death due to cardiovascular disease in young competitive athletes in Minnesota aged between 13 and 19 years, Maron et al. demonstrated a prevalence of 0.35/100,000 sports participations and of 0.46/100,000 sports participants/year.¹⁰ Another prospective study conducted in the Italian region of Veneto found an SrSD incidence of 2.3 (2.62 in males and 1.07 in females)/100,000 athletes/year, of all causes, and 2.1/100,000 athletes/year of cardiovascular cause.¹¹

Causes of sudden death in sport

Most young athletes who suffer a SrSD have an unsuspected structural heart disease, forming the substrate for presenting with a ventricular arrhythmia which may lead to a cardiac arrest.¹² Cardiomyopathies are one of the most common causes of sudden death in young athletes, while coronary artery disease is particularly prevalent in individuals aged over 35 years.^{2,8,13} Hypertrophic cardiomyopathy has been found to be the most common cause in more than one third of SrSDs in the USA.¹³ In cases recorded in the Italian region of Veneto, it was possible to prove arrhythmogenic right ventricular dysplasia as the cause of SrSD in around one quarter of the cases.^{12,14} Other heart diseases reported as the cause of SrSD are congenital abnormalities of the coronary arteries, myocarditis, idiopathic left ventricular hypertrophy, dilated cardiomyopathy, mitral valve

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