

Chapter 18

Forensic Assessment of Natural Unexpected Cardiovascular Death

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ABSTRACT

In the United States, sudden unexpected deaths attributable to diseases of the cardiovascular system account for almost 50% of all natural deaths with up to 600,000 deaths per year. Over the past decade, substantial developments have been made to provide definitive determinations in the diagnosis of cardiac death for adjudication in the criminal justice system and closure for decedent's families. In order to make postmortem diagnostic determinations, coordinated multidisciplinary efforts include collaboration between clinical and forensic pathologists. Forensic protocols include examination of the heart, histological sampling, toxicology testing, and molecular analyses. Lack of alternative diagnoses generally prompts pathologists to report sudden cardiac arrest as the main cause of death in many cases even though the accuracy of this finding might be in question; therefore, a forensic pathologist should examine unexplained cases of death in more depth to avoid this possible misdiagnosis.

INTRODUCTION

Sudden cardiac death (SCD) is unexpected natural death that results within one hour of onset of known or unknown heart pathologies with or without prior complaints. According to data published by the Centers for Disease Control and Prevention (CDC), sudden cardiac death is a major health concern, constituting approximately 20% of total mortality in the United States, and affecting over 600,000 patients annually. Each year the incidence of SCD in the United States is approximately 250 to 400 thousand cases, a rate associated with advanced age and male gender (Lee et al., 2008).

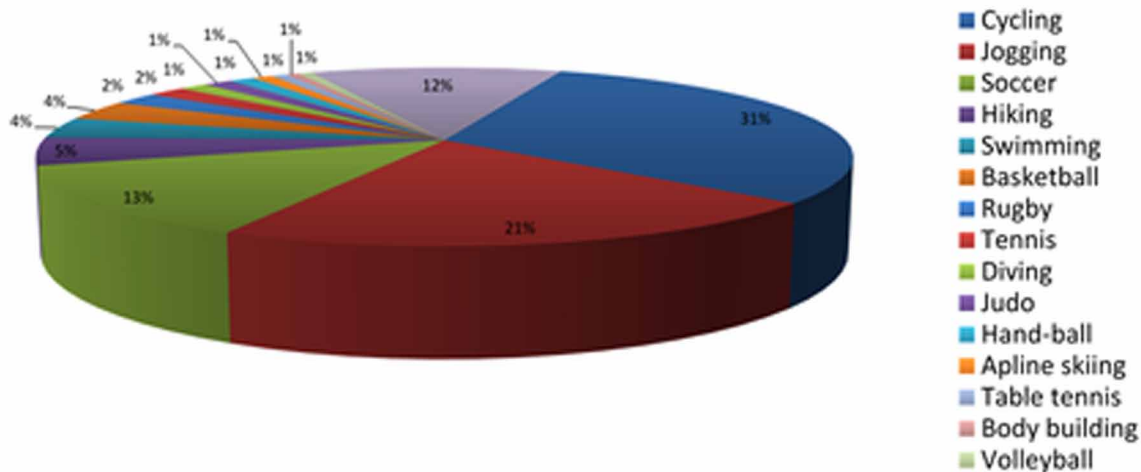
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Figure 1. Number of death SCD per sport participation of 820 students

Adopted from American Heart Association Inc, 2011 data

For a more accurate representation of this figure, please see the electronic version.



Most studies show that there is an inverse relationship between an increase in regular physical activity and sudden cardiac death. However, recent studies point to a moderate level of exercise as beneficial activity. Despite a conclusion by most studies that prove the beneficial effects of exercise on general health, there are evidences that show a direct relationship between sudden cardiac deaths and higher than normal frequency of vigorous exercise (Deo et al., 2012). Figure 1 depicts the relationship between various sports and the number of deaths associated with each one.

Pathologists are responsible for determining the cause of death in cases of sudden unexpected death. Autopsy is essential to reveal the cause of death in sudden death cases. Despite macroscopic, histological and toxicological examinations of sudden death cases, in 1-5% of these cases the cause of death cannot be explained. This phenomenon is referred to as “negative autopsy” (Koponen et al., 2003; Di Maio et al., 2001; Dowling et al., 2005).

It is important to obtain information related to the case before an autopsy in sudden death cases. This information includes some or all of the following: person’s age, sex, profession, lifestyle (e.g., smoking, alcohol consumption), physical activity status, whether there was an eyewitness or not, time of death if known, place of death, medical history, and medications (Basso et al., 2008).

FORENSIC PATHOLOGY

Forensic pathology plays a crucial role in diagnosing natural cardiovascular death as the cause of death in forensic investigations. There are five terms used to clinically describe the cause of death: natural (as in sudden, unexpected cardiac deaths), accident, suicide, homicide, or undetermined (Yu et al., 2014). In the United States, postmortem examinations are performed according to practical guidelines established by the College of American Pathologists (Hutchins et al., 1999). Coroners, forensic pathologists, and criminal investigators synergistically process all available ante-, peri-, and postmortem evidence pertaining to the corpse and the death scene. The goal is to determine the precise organ system(s) involved and

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