

## Sudden Death in Young Competitive Athletes Clinical, Demographic, and Pathological Profiles

Barry J. Maron, MD; Jamshid Shirani, MD; Liviu C. Poliac, MD; Robert Mathenge, MD;  
William C. Roberts, MD; Frederick O. Mueller, PhD

JAMA. 1996;276(3):199-204.

### Abstract

#### Objective.

—To develop clinical, demographic, and pathological profiles of young competitive athletes who died suddenly.

#### Design.

—Systematic evaluation of clinical information and circumstances associated with sudden deaths; interviews with family members, witnesses, and coaches; and analyses of postmortem anatomic, microscopic, and toxicologic data.

#### Participants and Setting.

—A total of 158 sudden deaths that occurred in trained athletes throughout the United States from 1985 through 1995 were analyzed.

#### Main Outcome Measures.

—Characteristics and probable cause of death.

#### Results.

—Of 158 sudden deaths among athletes, 24 (15%) were explained by noncardiovascular causes. Among the 134 athletes who had cardiovascular causes of sudden death, the median age was 17 years (range, 12-40 years), 120 (90%) were male, 70 (52%) were white, and 59 (44%) were black. The most common competitive sports involved were basketball (47 cases) and football (45 cases), together accounting for 68% of sudden deaths. A total of 121 athletes (90%) collapsed during or immediately after a training session (78 cases) or a formal athletic contest (43 cases), with 80 deaths (63%) occurring between 3 PM and 9 PM. The most common structural cardiovascular diseases identified at autopsy as the primary cause of death were hypertrophic cardiomyopathy (48 athletes [36%]), which was disproportionately prevalent in black athletes compared with white athletes (48% vs 26% of deaths;  $P=.01$ ), and malformations involving anomalous coronary artery origin (17 athletes [13%]). Of 115 athletes who had a standard preparticipation medical evaluation, only 4 (3%) were suspected of having cardiovascular

disease, and the cardiovascular abnormality responsible for sudden death was correctly identified in only 1 athlete (0.9%).

#### Conclusions.

—Sudden death in young competitive athletes usually is precipitated by physical activity and may be due to a heterogeneous spectrum of cardiovascular disease, most commonly hypertrophic cardiomyopathy. Preparticipation screening appeared to be of limited value in identification of underlying cardiovascular abnormalities.

#### Author Affiliations

From the Division of Cardiovascular Research, Minneapolis Heart Institute Foundation, Minneapolis, Minn (Drs Maron, Poliac, and Mathenge); Albert Einstein College of Medicine, Bronx, NY (Dr Shirani); the National Center for Catastrophic Sports Injury Research and the University of North Carolina, Chapel Hill (Dr Mueller); and Baylor University Medical Center, Dallas, Tex (Dr Roberts).

#### Footnotes

Reprints: Barry J. Maron, MD, Minneapolis Heart Institute Foundation, 920 E 28th St, Suite 40, Minneapolis, MN 55407.

---

© 1996 American Medical Association. All Rights Reserved.