Sports Cardiology Casebook
Antonio Pelliccia
Editor

Sports Cardiology Casebook

Foreword by Barry J. Maron
Sudden death in young athletes engaged in competitive sports is a highly visible, emotionally charged and important public health issue, which has increasingly become part of the consciousness of the general public and practicing sports medicine community. Substantial progress has ensued in this new area of cardiovascular medicine since its inception 25 years ago. Indeed, considerable data are now available from both the U.S. and Europe defining the causes, frequency and demographics of these tragic and counterintuitive events which strike to the core of our sensibilities.

There has been a recent focus (and, in fact, controversy) regarding the most effective and appropriate strategies for mass preparticipation screening for the detection of otherwise unsuspected cardiovascular diseases. Finally, given the identification of a cardiovascular abnormality in a trained athlete, several scientific societies, i.e., American College of Cardiology (ACC), European Society of Cardiology (ESC) and Italian Sports Cardiology Society (SIC Sport) have offered detailed guidelines and consensus recommendations which represent criteria with which clinical decisions regarding management and eligibility/disqualification decisions can be effected.

This multi-authored book, the Sports Cardiology Casebook, edited by Dr. Antonio Pelliccia, a noted international authority on sports medicine, cardiovascular disease in athletes and chair of the ESC guidelines for eligibility/disqualification, is an important contribution to our understanding of this important and growing area of medicine. Dr. Pelliccia has compiled from international experts several case vignettes illustrating some of the dilemmas implicit in reaching the difficult decisions regarding appropriate recommendations in athletes with underlying cardiovascular disease. These are, invariably situations involving individuals greatly invested in sports, often at elite or professional levels with their livelihood dependent on continued eligibility. In drawing the “line in the sand” between eligibility and disqualification, clinicians can rely in large measure on the aforementioned consensus guidelines...but, in the end, a substantial measure of individual clinical acumen is often required. Thus, the Pelliccia book represents a particularly useful
addition to the literature in this field which will facilitate clinical practice related to athletes.

Barry J. Maron, MD
Minneapolis Heart Institute Foundation
Minneapolis, Minnesota
## Contents

1. **A 27-Year-Old Professional Cyclist with Palpitations on Effort**  
   Hein Heidbüchel and Axel J.P. Urhausen  
   1

2. **Impaired Performance in a Master Long-Distance Runner**  
   François Carré  
   9

3. **A 26-Year-Old Cyclist with Syncope on Effort**  
   Nicole M. Panhuyzen-Goedkoop and Joep L.R.M. Smeets  
   15

4. **A 32-Year-Old Female Soccer Player with Unexplained Syncope**  
   23

5. **A 23-Year-Old Top-Level Soccer Player Suffering Syncope on Effort**  
   Nicole M. Panhuyzen-Goedkoop and Joep L.R.M. Smeets  
   35

6. **A 21-Year-Old Female Beach Volleyball Player with Palpitations and Pre-syncope on Effort**  
   Nicole M. Panhuyzen-Goedkoop and Joep L.R.M. Smeets  
   41

7. **A 49-Year-Old Male Marathon Runner with Exercise Induced Prolonged Palpitations**  
   Nicole M. Panhuyzen-Goedkoop and Joep L.R.M. Smeets  
   47

8. **A Female Cyclist with Prolonged Palpitations on Effort**  
   Pietro Delise, Giuseppe Allocca, Nadir Sitta, Leonardo Coro’, and Massimo Bolognesi  
   57

9. **The Girl with Systolic Murmur on the Left Sternal Border**  
   Mats Börjesson and Mikael Dellborg  
   63

10. **Elite Tennis Player with a Complete Atrio-Ventricular Block**  
    Alessandro Biffi, Laura Fiaccarini, and Luisa Verdile  
    69
11 A Young Canoeist with an Abnormal Electrocardiogram .......... 77
Fernando Maria Di Paolo, Filippo M. Quattrini, Cataldo Pisicchio,
Roberto Ciardo, and Antonio Pelliccia

12 ECG Repolarization Abnormalities in an African Descent Athlete:
Pathologic or Physiologic Finding? .............................. 85
John Rawlins, Peter Mills, and Sanjay Sharma

13 A 16-Year-Old Female Runner with Prolonged QT Interval .......... 93
Sandeep Basavarajaiah and Sanjay Sharma

14 Athlete with Variable QTc Interval and Abnormal T Wave Pattern .. 101
Emanuele Guerra, Filippo M. Quattrini, and Antonio Pelliccia

15 Young Triathlete with Unusual ST-Segment Elevation in Precordial
Leads ..........................................................111
Luisa Verdile, Filippo M. Quattrini, Fernando Maria Di Paolo,
and Antonio Pelliccia

16 A 17-Year-Old Competitive Soccer Player with Pre-excitation
Pattern on 12-Lead ECG ........................................119
Hein Heidbüchel

17 A Symptomatic Judoka with Wolff-Parkinson-White Pattern ....... 123
Mohamed Tahmi

18 A 35-Year-Old Competitive Cyclist with Frequent Premature
Ventricular Beats ...........................................129
Hein Heidbüchel

19 An Athlete with Ischemic Pattern on Exercise ECG ............... 137
Elvira DeBlasiis, Fernando Maria Di Paolo, and Antonio Pelliccia

20 A 17-Year-Old National Cyclist with Exercise-Induced Ventricular
Tachycardia ..................................................143
Axel J.P. Urhausen, Charles Delagardelle, Camille Pesch,
and Hein Heidbüchel

21 A 53-Year-Old Recreational Jogger with Atrial Fibrillation .......... 151
Hein Heidbüchel
22 Paroxysmal Atrial Fibrillation in a Professional Cyclist .......... 157
François Carré

23 A Female Soccer Player with Unusual Fatigability and Ventricular Arrhythmia .................................................... 163
Erik Ekker Solberg, Terje Halvorsen, Knut-Haakon Stensaeth, and Finn Hegbom

24 A 38-Year-Old Marathon Runner with Tricuspid Valve Regurgitation 169

25 A Young Rower with an Unusual Left Ventricular Hypertrophy ...... 175
Filippo M. Quattrini, Fernando Maria Di Paolo, Cataldo Pisicchio, Roberto Ciardo, and Antonio Pelliccia

26 An Elite Athlete with Controversial Left Ventricular Hypertrophy . . 183
Barbara Di Giacinto, Fernando Maria Di Paolo, and Antonio Pelliccia

27 A Non-compaction Cardiomyopathy or Innocent LV Trabeculation? 191
Cataldo Pisicchio, Filippo M. Quattrini, Fernando Maria Di Paolo, Roberto Ciardo, and Antonio Pelliccia

28 A 31-Year-Old Male, Recreational Soccer Player with “Low Risk” Hypertrophic Cardiomyopathy ................................. 199
Pietro Delise

29 Competitive Cyclist Suffering from Myocardial Infarction, Willing to Resume Competitive Sport ............................... 205
Mats Börjesson

30 A 32 Year-Old Male Soccer Player with Chest Trauma ............ 211
Deodato Assanelli, Evasio Pasini, Federica Ettori, Silvana Archetti, and Sabrina Arondi

31 Asymptomatic Cyclist with Stenosis of Left Main Coronary Artery .. 215
Deodato Assanelli, Enrico Ballardini, Evasio Pasini, Giancarlo Magri, and Sabrina Arondi

Appendices .......................................................... 221

Index .......................................................................... 237
Contributors

Editor:

Antonio Pelliccia, MD  Institute of Sports Medicine and Science, Italian National Olympic Committee, Department of Medicine, Largo Piero Gabrielli, 00197 Rome, Italy, ant.pelliccia@libero.it

Co-Editors:

Hein Heidbuchel, MD, PhD  Department of Cardiology – Electrophysiology, University Hospital Gasthuisberg, University of Leuven, Leuven, Belgium, hein.heidbuchel@uz.kuleuven.ac.be

Nicole M. Panhuyzen-Goedkoop, MD  Department of Sports Cardiology, Sint Maartenskliniek, Sports Medical Centre Papendal, Radboud University, Hospital Nijmegen, Arnhem, The Netherlands, n.panhuyzen@smcp.nl

Authors:

Giuseppe Allocca, MD  Cardiology Unit, Conegliano Hospital, Conegliano, Treviso, Italy

Silvana Archetti, PhD  Diagnostic Department, A.O. Spedali Civili, Brescia, Italy

Sabrina Arondi, MD  Department of Medicine, University of Brescia, Brescia, Italy

Deodato Assanelli, MD  Chair of Sport Medicine, Department of Surgical and Medical Sciences, University of Brescia, Montichiari Hospital, Brescia, Italy, assanell@med.unibs.it

Enrico Ballardini, MD  Sport Medicine Center, San Pellegrino Hospital, Castiglione delle Stiviere, Mantova, Italy
Sandeep Basavarajaiah, MBBS, MRCP  Essex Cardiothoracic Centre, Department of Cardiology, Basildon, Essex, England

Alessandro Biffi, MD  Institute of Sports Medicine and Science, Italian National Olympic Committee, Department of Medicine, Rome, Italy, alessandro.biffi@coni.it

Massimo Bolognesi, MD  Department of Cardiology, Hospital of Conegliano, Hospital of Santa Maria dei Battuti, Mestre and Conegliano, Italy

Mats Borjesson, MD, PhD  Department of Medicine, Sahlgrenska University Hospital, Östra, Gothenburg, Sweden, mats.brjesson@telia.com

T. Butz, MD  Department of Cardiology, Ruhr University, Bochum, North Rhine-Westphalia, Germany

F. Van Buuren, MHH MD  Heart Center, Department of Cardiology, Bad Oeynhausen, North Rhine-Westphalia, Germany

François Carré, MD, PhD  Department of Physiology, Unité de Biologie.et de Médecine du Sport, Pontchaillou Hospital, Rennes 1 University, INSERM U 642, France, francois.carre@univ-rennes1.fr

Roberto Ciardo, MD  Institute of Sport Medicine and Science, Italian National Olympic Committee, Department of Medicine, Rome, Italy

Leonardo Coro’, MD  Department of Cardiology, Hospital of Conegliano, Hospital of Santa Maria dei Battuti, Mestre and Conegliano, Italy

Elvira DeBlasiis, MD  Institute of Sport Medicine and Science, Italian National Olympic Committee, Department of Medicine, Rome, Italy, elvdebl@tin.it

Charles Delagardelle, MD  Hospital Centre of Luxembourg, Department of Cardiology, Luxembourg

Pietro Delise, MD  Department of Cardiology, Ospedale di Conegliano, Hospital of Santa Maria dei Battuti, Mestre and Conegliano, Italy, pietro.delise@libero.it

Mikael Dellborg, MD, PhD  Department of Medicine, Sahlgrenska University Hospital, Östra, Gothenburg, Sweden

Federica Ettori, MD  Cardiology Division, Spedali Civili, Brescia, Italy

Laura Fiaccarini  Institute of Sports Medicine and Science, Italian National Olympic Committee, Department of Medicine, Rome, Italy

A. Frund  Heart and Diabetes Center, Department of Physiotherapy, Bad Oeynhausen, North Rhine-Westphalia, Germany

Barbara Di Giacinto, MD  Institute of Sport Medicine and Science, Italian National Olympic Committee, Department of Sport Medicine, Rome, Italy, barbara.digiacinto@virgilio.it
Emanuele Guerra, MD  Institute of Sport Medicine and Science, Italian National Olympic Committee, Department of Sport Medicine, Rome, Italy, casaguerra@alice.it

Terje Halvorsen, MD  Norwegian institute of Sports Medicine, Oslo, Norway

Finn Hegbom, MD, PhD  Center for Arrhythmia, Oslo, Norway

Giancarlo Magri, MD  Department of Nuclear Medicine, Spedali Civili, Brescia, Italy

K.-P. Mellwig, MD  Department of Sports Cardiology, Bad Oeynhausen, North Rhine-Westphalia, Germany

Peter Mills, MA, BSc, FRCP  Department of Cardiology, The London Chest Hospital, London, England

E. Oepangat, MD  Heart and Diabetes Centre, Department of Cardiology, Bad Oeynhausen, North Rhine–Westphalia, Germany

O. Oldenburg, MD  Heart and Diabetes Centre, Department of Cardiology, Bad Oeynhausen, North Rhine–Westphalia, Germany

Fernando Maria Di Paolo, MD  Institute of Sport Medicine and Science, Italian National Olympic Committee, Department of Medicine, Rome, Italy, fernando.dipaolo@guest.coni.it

Evasio Pasini, MD  Department of Cardiology, Fondazione S. Maugeri, Lumezzane, Brescia, Italy

Camille Pesch, MD  Hospital Centre of Luxembourg, Department of Cardiology, Luxembourg

Cataldo Pisicchio, MD  Institute of Sport Medicine and Science, Italian National Olympic Committee, Department of Medicine, Rome, Italy, aldopis@gmail.com

Filippo M. Quattrini, MD, PhD  Institute of Sport Medicine and Science, Italian National Olympic Committee, Department of Medicine, Rome, Italy, f.quattrini@guest.coni.it

John Rawlins, BSc, MRCP  Department of Cardiology, King’s College Hospital, London

Sanjay Sharma, BSc (Hons), MB ChB, MD, FRCP (UK), FESC  Department of Cardiology, King’s College Hospital, Denmark Hill, London, UK, ssharma21@hotmail.com

Nadir Sitta, MD  Cardiology Unit, Conegliano Hospital, Conegliano, Italy

Joep L.R.M. Smeets, MD, PhD  Department of Cardiology, University Medical Center, Radboud University, Nijmegen, The Netherlands

Erik Ekker Solberg, MD, PhD, FESC  Diakonhjemmet Hospital, Medical Department, 0319 Oslo, Norway, erik.solberg@diakonsyk.no
Knut-Haakon Stensaeth, MD  Department of Cardiovascular Radiology, Ulleval University Hospital, Oslo, Norway

Mohamed Tahmi, MD, PhD  Department of Cardiology, CHU Tizi Ouzou, Nedir Hospital-Tizi-Ouzou University, Tizi Ouzou, Algeria, mtahmi@hotmail.com

A.W. Treusch, MD  Department of Cardiology, Leopoldina Hospital, Schweinfurt, Germany, atreush@hdz-nrw.de

Axel J.P. Urhausen, MD, PhD  Service de Medecine du Sport et de Prevention, Centre de l’ Appareil Locomoteur, de Medecine du Sport et de Prevention, Centre, Hospitalier de Luxembourg-Clinique d’Eich, Luxembourg, urhausen.axel@chl.lu

Luisa Verdile, MD  Institute of Sports Medicine and Science, Italian National Olympic Committee, Department of Medicine, Rome, Italy, luisa.verdile@coni.it
Introduction

Over recent years, issues related to management of competitive and amateur athletes with cardiovascular disease have (CV) become highly visible and complex medical and public health topics. Particular interest surrounds these issues in consideration that elite and professional athletes represent a special and visible subset of our society, not only for their outstanding physical performances, but also for the substantial economic interests and the intense pressure to which they are exposed by sponsors, sports organizations and media [1–4].

When a cardiovascular disease is found in such athletes, the managing physician is required to solve the compelling issue of appropriate management and recommendations, considering both the impact of sport participation on the course and outcome of cardiac disease and the impact of disqualification on the athlete’s life.

In the last 2 decades participation in a broad spectrum of sport activities (including competitive events) has increased substantially in civilized societies and has become an integral part of the lifestyle of large segments of the population, including very young and senior individuals. In this context, competitive and professional sports have progressively evolved toward globalization, including nowadays not only Western Europe and the U.S., but also large number of East European and African countries, as evident by the changing demographics of elite athletes engaged in professional sports, primarily soccer or basketball.

Due to the unique structure and pressures of competitive sports, athletes with CV disease may not always have adequate knowledge and independent judgment in assessing the risk associated with a competitive sports career. Therefore, the managing physician (and consultant cardiologist) have the ethical, medical and legal
obligation to assess appropriately the overall risk scenario associated with sport lifestyle in an athlete with cardiovascular abnormality and clearly inform the candidate. Indeed, the managing physician is responsible for final recommendations concerning sport participation, with the aim to preserve the innumerable benefits derived from sport (including economic interests in elite/professional athletes) but prevent adverse clinical events and reduce the risk of disease progression.

However, when a disqualification decision is possible, pressure on the managing physician may be intense, and consensus guidelines represent the only legitimate support to the physician’s decision. Under such difficult circumstances, adherence to recommendations released by scientific societies represents the only appropriate defense for the physician, as well as the appropriate manner in which to protect athletes from the unsustainable hazard of sports participation.

Consensus guidelines for eligibility/disqualification decisions in competitive athletes with cardiovascular abnormalities were initially promoted in the U.S. (in 1985 the American College of Cardiology formalized the first Bethesda Conference #16, with subsequent updated #26 and #36 in 1994 and 2005, respectively [5–7]). In Europe, the first consensus document concerning the management and participation in competitive sports of athletes with cardiovascular abnormalities was delivered from the Italian Sports Cardiology Society in 1995 and subsequently updated to 2003 [8], and from the European Society of Cardiology (ESC) in 2005 [9].

The rationale for offering both the American and European expert consensus documents is the widely accepted perception that athletes with clinically silent cardiovascular disease harbor increased risk for disease progression and sudden death by virtue of their commitment to intensive training and competition. Conversely, the removal of athletes from this lifestyle is regarded as a mechanism by which the risk may be substantially reduced [10, 11].

Both the ACC Bethesda Conference #36 and the ESC recommendations provide specific advice with respect to different cardiac abnormalities and sports, based on the available scientific data, as well as on personal experience of the panel participants. These documents represent the most updated attempt to combine the (scarce) evidence-based data with personal experience of the experts.

However, presentation of cardiovascular disease in individual athletes may present a variety of clinical forms and not always correspond to the schemes reported in the documents, making management of the candidate-athlete troublesome. In these instances it is challenging to translate the recommendations dictated by the scientific societies into the clinical practice.

It was our aim to address this problem with the present textbook entitled “Sports Cardiology Casebook”. It was our intention to provide the managing physician with appropriate tools for solving this problem, i.e., examples derived from the clinical practice, which illustrate how to proceed in the management and final recommendations of an athlete with cardiovascular abnormality by applying the current consensus guidelines.

The textbook includes a large selection of clinical cases, which are intended to offer a wide perspective of the most common problems arising in the cardiovascular evaluation of competitive athletes, as viewed by expert European cardiologists. The