Compendium of Clinical Cardiology

NEIL D. BERMAN, M.D., FRCPC, FACC

Compendium of Clinical Cardiology

NEIL D. BERMAN, M.D., FRCPC, FACC

Associate Professor of Medicine,
University of Toronto,
Director, Pacemaker Clinic,
Toronto Western Hospital

Macmillan Publishing Company
New York

Collier Macmillan Canada, Inc.
Toronto

Collier Macmillan Publishers
London

Macmillan Publishing Company
866 Third Avenue, New York, New York 10022

Collier Macmillan Canada, Inc.

Collier Macmillan Publishers • London

Library of Congress Cataloging-in-Publication Data

Berman, Neil D., 1945-
Compendium of clinical cardiology.

Includes bibliographies and index.
1. Cardiology—Outlines, syllabi, etc. 2. Heart—Diseases—Outlines, syllabi, etc. I. Title. [DNLM: 1. Cardiology—outlines. WG 18 B516c]
RC681.B49 1987 616.1'2 86-23471
ISBN 0-02-308590-8

Figures 3-6, 5-4, 7-6, 7-9, 7-10, and 7-11 originally appeared in Berman, N. D., *Geriatric Cardiology*. Macmillan Publishing Company, New York, 1983.

Printing 1 2 3 4 5 6 7 8 Year 7 8 9 0 1 2 3 4 5

PREFACE

The science most in need of [aphorisms] is medicine.

Moses Ben Maimon, 1190 A.D.

Beginning with a quotation from Maimonides seems appropriate. Not only did he recognize the need for a terse expression of medical precepts, even 800 years ago, but he was also ahead of his time in his appreciation of circulatory physiology, as suggested by the following excerpts from the same source:*

Arteries in the entire body communicate with veins and interchange some blood and air through these anastamoses which are so narrow as to be invisible to the eye. (I:19)

Consider (arterial blood) as a movement in one direction as the movement of a ball so that the movement . . . makes a complete revolution. (IV:44)

This book is intended for medical students and junior housestaff, those for whom cardiology can occupy only a small portion of their study time, even though it plays a major role in so many of the problems they face clinically. To better serve their needs, I have attempted to present the fundamental aspects of cardiology in a terse, outline format and, wherever possible, to adhere rigidly to a consistent pattern of presentation. In this regard, I must apologize to the purists for having used the term "pathogenesis" to refer to "pathogenesis and/or pathophysiology" as the need arose. This book is not intended to be encyclopedic but rather to provide the basic knowledge required to approach a patient with a cardiac illness. The challenge was always to decide what could be omitted and what needed to be included. It is hoped that the information contained herein will be supplemented by the medical environment of the reader. In addition, at the end of each chapter, I have included a brief list of reference volumes that deal particularly well with the relevant topics of the chapter. The reader is also referred to the standard cardiology textbooks (e.g., those edited by Braunwald, Hurst, etc.), in which can be found additional references to the original literature.

I hope this book will prove useful to medical students and junior housestaff. Should it also be of benefit to other health professionals interested in the care and treatment of cardiac patients, my efforts will have been more than justified.

N.D.B.

**The Medical Aphorisms of Moses Maimonides*. English translation by F. Rosner and S. Munter, Yeshiva University Press, New York, 1970.

ACKNOWLEDGMENTS

Credit must also go to the many others who made this book possible. Doctors P. A. Daly, P. Dorian, F. H. Leenen, S. C. Lenkei, D. J. McNeely, D. Borts, P. S. J. Gladstone, D. Newman, D. Palisaitis, N. J. Petkovich, V. Sluzar, and S. Wilansky critically reviewed portions of the original manuscript and galley proof. The support of Dr. A. Rapoport, Physician-in-Chief, Toronto Western Hospital, and Dr. R. I. Ogilvie, Director of Cardiology, was vital to the completion of this work. Joan C. Zulch, Vice President of Macmillan Publishing Company, provided encouragement and support during uncertain times. An author's thoughts could not become a book in the absence of a dedicated typist. I am indebted to Angela Lanzeroti for painstakingly typing the entire manuscript. Thanks also to Elizabeth Stacey, medical illustrator, and the Department of Medical Photography at Toronto Western Hospital. Finally, I must also acknowledge my debt to the medical students whose desire to learn was the major stimulus for this book.

CONTRIBUTORS

To avoid the potential problem of "tunnel vision," I sought and received draft contributions from three of my colleagues, which they kindly allowed me to edit freely and incorporate into this book. These clinicians are:

Robert J. Burns, M.D., BASc, FRCPC, FACC
Assistant Professor of Medicine
University of Toronto
Director of Nuclear Cardiology
Toronto Western Hospital

Maurice N. Druck, M.D., FRCPC, FACC
Assistant Professor of Medicine
University of Toronto
Director of Nuclear Cardiology
Credit Valley Hospital

Charles Pollick, M.B., FRCPC, FACC
Assistant Professor of Medicine
University of Toronto
Director of Echocardiography
Toronto Western Hospital

CONTENTS

Part A

CARDIAC ASSESSMENT

1. HISTORY

CARDIAC SYMPTOMS

Classification

Heart Disease
- ◊ No pathognomonic symptoms
- ◊ Highly suggestive symptoms
  - ◊ A cardiac origin must be considered
- ◊ Less suggestive symptoms
  - ◊ Heart disease may be responsible
  - ◊ Other conditions equally likely
- ◊ Table 1-1

Specific Symptoms

Chest Pain
- ◊ Often not called *pain* by patient, chest discomfort is better term
- ◊ Features
  1. Quality
  2. Location
  3. Radiation
  4. Duration
  5. Frequency
  6. Precipitating and aggravating factors
  7. Relieving factors
  8. Associated symptoms
- ◊ Classification of severity based on 4 and 5 (Table 1-2)

Table 1-1 SYMPTOMS OF HEART DISEASE

Highly Suggestive Symptoms
Chest pain
Shortness of breath
Palpitation
Syncope
Peripheral edema
Less Suggestive Symptoms
Fatigue
Dizziness
Cough
Hemoptysis
Anorexia
Cyanosis
Nocturia
Sweating
Abdominal pain or bloating
Weight loss
Peripheral embolic events
Visual disturbances

Table 1-2 GRADING OF ANGINA (CANADIAN CARDIOVASCULAR SOCIETY)

GRADE	DEFINITION	EXAMPLES
I	Asymptomatic with ordinary physical activity Angina with strenuous, rapid, or prolonged exertion	Asymptomatic walking, climbing stairs
II	Slight limitation of ordinary activity	Pain walking more than two blocks, walking or climbing stairs rapidly, walking uphill, after meals, in cold, in wind
III	Marked limitation of ordinary physical activity Comfortable at rest	Walking one to two blocks on the level and climbing one flight of stairs in normal conditions and at normal pace
IV	Inability to carry on any physical activity without discomfort Anginal syndrome *may* be present at rest	

◊ Any structure in the thorax, lower neck, or upper abdomen may give rise to chest pain (Table 1-3)

Shortness of Breath (in order of increasing severity)

1. Exertional
2. Orthopnea
3. Paroxysmal nocturnal dyspnea
4. Dyspnea at rest
5. Acute pulmonary edema

◊ Exertional dyspnea may be an "anginal equivalent," i.e., a manifestation of transient ischemia

Table 1-3 CAUSES OF CHEST PAIN

Cardiac
- Coronary artery disease
- Aortic stenosis
- Pericarditis
- Myocarditis
- Obstructive hypertrophic cardiomyopathy
- Pulmonary hypertension
- Mitral valve prolapse

Noncardiac
- Pulmonary
  - Pleuritis
  - Pneumonitis or pneumonia
  - Pulmonary embolus with or without infarction
  - Pneumothorax
- Musculoskeletal
  - Costochondritis
  - Myositis
  - Trauma
  - Herpes zoster
- Gastrointestinal
  - Esophagitis with or without spasm
  - Gastric or duodenal ulcer
  - Gallbladder disease
  - Pancreatitis
- Aortic dissection
- Functional

◊ Orthopnea
◊ Dyspnea of recumbency relieved immediately by sitting
◊ Prevented by using more pillows
◊ Estimate severity by number of pillows required
◊ Most extreme, sleep sitting up
◊ Paroxysmal nocturnal dyspnea (PND)
◊ Acute severe orthopnea with or without wheezing, sweating
◊ Occurs several hours after sleep
◊ Relieved only by sitting or getting up (usually requires about 30 minutes for relief)
◊ Features
1. Duration ◊ Since first occurrence
◊ Of each occurrence, if self-limiting
2. Frequency
3. Precipitating and aggravating factors
4. Relieving factors
5. Associated symptoms

Palpitation ◊ Awareness of heart action
◊ Features
1. Quality ◊ The sensation experienced
◊ Regular or irregular
◊ Continuous or intermittent
2. Duration
3. Frequency
4. Nature of onset and termination
5. Precipitating and aggravating factors
◊ Exertion, caffeine, fatigue, etc.
6. Relieving factors
◊ For example, Valsalva maneuver
7. Associated symptoms ◊ Pain, dyspnea, sweating, dizziness, diuresis, etc.

Syncope ◊ Typical Cardiac Syncope
◊ Sudden
◊ No prodrome
◊ Brief duration
◊ Rapid, complete recovery
◊ No localizing seizure activity
◊ Occurs independent of body position
◊ Exertional syncope almost always cardiac
◊ Palpitations prior to syncope may mimic prodrome
◊ Localized seizure activity may occur, particularly if there is an area of borderline cerebral perfusion
◊ Table 1–4

Peripheral Edema ◊ Many causes for peripheral edema
◊ Not diagnostic of heart failure
◊ Cardiac edema is dependent
◊ Around ankles in ambulatory
◊ Around sacrum in bedridden
◊ Cardiac edema is accompanied by other signs of failure
◊ Third heart sound
◊ Elevated jugular venous pressure

Table 1-4 COMMON CAUSES OF SYNCOPE AND PRESYNCOPE

Decreased cerebral perfusion
Local
- Cerebrovascular disorders
- Transient ischemic attacks
- Subclavian steal syndrome
- Carotid sinus syncope (cerebral type)

Peripheral
- Decreased venous return*
- Vasodepressor (vasovagal) syncope
- Orthostatic hypotension
- Carotid sinus syncope (vasodepressor type)
- Cough syncope
- Postmicturition syncope
- Vasodilating drugs

Decreased cardiac output*
- Acute myocardial injury
- Arrhythmias
  - Bradycardia with or without heart block (Morgagni-Adams-Stokes)
  - Tachycardia
  - Bradycardia-tachycardia syndrome
- Reflex asystole
- Carotid sinus syncope (cardioinhibitory type)

Fixed cardiac output*†
- Left ventricular outflow obstruction (fixed or dynamic)
- Aortic insufficiency
- Left ventricular inflow obstruction
  - Mitral stenosis
  - Ball valve thrombus
  - Myxoma
- Obstruction to pulmonary flow
  - Pulmonary embolus
  - Pulmonary hypertension (primary or secondary)

Psychoneurological
- Seizure disorders
- Vestibular disorders
- Syncopal migraine
- Hysterical syncope

Metabolic
- Hyperventilation
- Hypoglycemia
- Hypoxia

* Multiple mechanisms may be involved in many of these causes, which for convenience have been grouped by their dominant mechanism.
† Typically associated with syncope on effort.

- ◊ Present in evening, absent in morning
  - ◊ Cardiac failure *or* venous insufficiency
- ◊ One extremity only
  - ◊ Venous insufficiency or thrombosis
- ◊ Other causes of edema
  - ◊ Renal diseases
  - ◊ Venous obstruction
  - ◊ Lymphatic obstruction
  - ◊ Angioneurotic edema
  - ◊ Hypoproteinemia
  - ◊ Myxedema (pretibial)

Fatigue ◊ Very nonspecific

Results from low cardiac output
Drug induced
Diuretics
Beta-blockers
Antihypertensives

Dizziness
Light-headedness, faintness
Not vertigo (sensation of spinning)
Causes as for syncope

Cough
Cardiac causes of cough
Pulmonary edema
Pulmonary venous hypertension
Pulmonary infarction
Tracheobronchial compression
Aortic aneurysm
Left atrial enlargement
Usually nonproductive
Pulmonary edema
Frothy, pink tinged
Pulmonary infarction
Blood streaked

Hemoptysis
Cardiac causes
Mild to moderate hemoptysis
Pulmonary edema
Mitral stenosis
Pulmonary infarction
Pulmonary hypertension, especially in Eisenmenger syndrome
Massive hemoptysis
Rupture of pulmonary AV aneurysm
Rupture of aortic aneurysm into tracheobronchial tree
Many noncardiac causes
Including carcinoma, bronchiectasis, tuberculosis, anticoagulants

Anorexia
Also nausea and vomiting, caused by
Venous engorgement of GI tract
Drugs
Particularly digoxin
Diuretics especially spironolactone
Antiarrhythmics

Cyanosis
Bluish discoloration of skin and mucous membranes
Requires 50 gm/L reduced hemoglobin for detection
Central cyanosis
Decreased arterial oxygen saturation
Right to left shunts
Pulmonary insufficiency
Hereditary methemoglobinemia
Peripheral cyanosis
Increased tissue oxygen extraction due to decreased perfusion
Low cardiac output with vasoconstriction
Localized arterial or venous obstruction

Adominal Pain or Bloating
Pain
Abdominal venous engorgement particularly of liver

- Mesenteric artery disease
  - "Abdominal angina"
  - Mesenteric artery embolus
- Bloating
  - May be equivalent of anorexia
  - May refer to ascites
  - Ascites out of proportion to peripheral edema
    - If cardiac suggests
      - Tricuspid incompetence
      - Constrictive pericarditis

Nocturia
- Reduced cardiac output
  - Renal blood flow reduced during activity
- With recumbency less renal vasoconstriction
  - Increased urine formation

Sweating
- Because of increased adrenergic tone to compensate for reduced cardiac output

Weight Loss
- Low cardiac output and anorexia

Peripheral Embolic Events
- From valves
  - Valvular heart disease with or without endocarditis
- From mural thrombus
  - Ischemic heart disease with or without aneurysm
  - Cardiomyopathy
- From left atrium
  - Atrial fibrillation with or without mitral valve disease
- From intracardiac tumor

Visual Disturbances
- Retinal artery embolus
- Transient
  - Amaurosis fugax
    - Platelet emboli
    - Mitral stenosis, prolapse
- Hypertensive retinopathy
- Color distortion
  - Digoxin toxicity
- Blurring
  - Disopyramide

OTHER ASPECTS OF HISTORY

Assessment of Functional Capacity
- Prior to onset of presenting symptoms
- Limitations imposed by presenting symptoms
- Tolerance of pregnancies, previous surgery, etc.
- Exercise tolerance in childhood

Medical History
- Noncardiac Illnesses
  - Pulmonary
  - Collagen-vascular
  - Endocrine
  - Chest trauma
- Coronary Artery Disease Related

- Hypertension
- Diabetes
- Lipid abnormalities
- Valve Disease Related
  - Prior history of murmur
  - Rheumatic fever or symptoms compatible with this diagnosis
- Congenital Heart Disease Related
  - Birth trauma
  - Health of mother during pregnancy
  - "Blue baby"
  - Childhood respiratory infections
- Exposures
  - Smoking
  - Medication
    - including oral contraceptives, illicit drugs
  - Alcohol
  - Industrial
  - Travel
  - Viral infections
  - Dental or operative procedures

Family History
- Heart disease
- Hypertension
- Diabetes
- Sudden death

SUGGESTED FURTHER READING

Braunwald, E.: "The history," in *Heart Disease: Textbook of Cardiovascular Medicine*, 2nd ed., Braunwald, E. (ed.), W.B. Saunders, Philadelphia, 1984.

Constant, J.: *Bedside Cardiology*, 3rd ed., Little, Brown & Co., Boston, 1985.

Fowler, N. D.: "The history in cardiac diagnosis," in *Cardiac Diagnosis and Treatment*, 2nd ed., Fowler, N.D. (ed.), Harper & Row, New York, 1975.