

Meltzer & Dunning

TEXTBOOK
OF
CORONARY
CARE

Textbook of Coronary care

Editors:

Lawrence E. Meltzer

Presbyterian-University of Pennsylvania Medical Center,
Philadelphia

Arend J. Dunning

University Department of Medicine,
Binnengasthuis, Amsterdam



The Charles Press Philadelphia
Excerpta Medica Amsterdam

1972

Copyright 1972 Excerpta Medica Amsterdam

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or by any information storage and retrieval system, without permission in writing from the publishers.

ISBN 0 913486 11 6

Library of Congress Catalog Card Number 72-91695

Sole distributors for the United States of America and Canada:

The Charles Press *Publishers Inc.*
236 South 20th Street, Philadelphia, Pa. 19103

Printed in The Netherlands by Hooiberg, Epe
Cover design Jan Roberti

Contributors

Faye G. Abdellah, R.N., Ed.D., LL.D.
 Assistant Surgeon General
 Chief Nurse Officer
 U.S. Public Health Service
 Department of Health, Education, and
 Welfare
 Washington, D.C. 20037
 U.S.A.

Allan G. Adelman, M.D., F.R.C.P. (C)
 Staff Physician
 Toronto General Hospital
 Toronto 2, Ont.
 Canada

Department of Medicine
 University of Toronto

A. A. J. Adgey, M.B., M.R.C.P.
 Physician
 Cardiac Department
 Royal Victoria Hospital
 Grosvenor Road
 Belfast BT12 6BA
 United Kingdom

Edwin L. Alderman, M.D.
 Assistant Professor of Medicine
 Stanford University School of Medicine
 Stanford, Calif. 95305
 U.S.A.

*K. W. G. Brown, M.D., F.R.C.P. (C),
 F.A.C.P., F.A.C.C.*
 Co-Director, Coronary Unit
 Toronto General Hospital
 Toronto 2, Ont.
 Canada
 Associate Professor
 Faculty of Medicine
 University of Toronto

Robert S. Brown, M.D.
 Attending Surgeon
 Midland Hospital
 Midland, Mich. 48640
 U.S.A.

George E. Burch, M.D.
 Henderson Professor of Medicine
 Department of Medicine
 Tulane University School of Medicine
 1430 Tulane Avenue
 New Orleans, La. 70112
 U.S.A.

Physician-in-Chief
 Tulane Medicine Service
 Charity Hospital of Louisiana
 New Orleans, La.

*Alistair J. V. Cameron, M.A., M.D.,
 F.R.C.P. (L), F.R.C.P. (G)*
 Consultant Physician and Cardiologist
 Cardiac Department
 Western Infirmary
 Glasgow, G11 6NT
 United Kingdom

Honorary Lecturer in Cardiology
 University of Glasgow
 Department of Medicine
 Gardiner Institute
 Western Infirmary

Robert G. Carlson, M.D.
 Department of Thoracic and Cardiovascular
 Surgery
 The New York Hospital - Cornell Medical
 Center
 525 East 68th Street
 New York, N.Y. 10021
 U.S.A.

N. H. Cassem, M.D.

Assistant in Psychiatry
Massachusetts General Hospital
Boston, Mass. 02114
U.S.A.

Clinical Instructor in Psychiatry
Harvard Medical School

Herbert E. Cohen, M.D.

Associate Physician
Department of Cardiology and Section of
Clinical Investigation
Presbyterian-University of Pennsylvania
Medical Center
51 North 39th Street
Philadelphia, Pa. 19104
U.S.A.

Keith Cohn, M.D.

Cardiopulmonary Laboratory
Presbyterian Hospital - Pacific Medical
Center
P. O. Box 7999
San Francisco, Calif. 94120
U.S.A.

Assistant Clinical Professor of Medicine
University of California School of Medicine

Eugene L. Coodley, M.D., F.A.C.P., F.A.C.C.

Professor of Medicine
Hahnemann Medical College & Hospital

Chief of Medicine
Hahnemann Medical Division
Philadelphia General Hospital
34th and Civic Center Boulevard
Philadelphia, Pa. 19104
U.S.A.

Leonard S. Dreifus, M.D.

Department of Medicine
Hahnemann Medical College
230 North Broad Street
Philadelphia, Pa. 19102
U.S.A.

Arend J. Dunning, M.D.

Director, Coronary Care Unit
University Department of Medicine
Binnengasthuis
Amsterdam
The Netherlands

James S. Forrester, M.D.

Department of Cardiology
Cedars-Sinai Medical Center
4833 Fountain Avenue
Los Angeles, Calif. 90029
U.S.A.

Peter L. Frommer, M.D.

Chief, Myocardial Infarction Branch
National Heart and Lung Institute
Bethesda, Md. 20014
U.S.A.

Leonard S. Gettes, M.D.

Associate Professor of Medicine
Cardiovascular Division
Department of Medicine
University of Kentucky College of Medicine
Lexington, Ky. 40506
U.S.A.

Thomas D. Giles, M.D.

Assistant Professor of Medicine
Tulane University School of Medicine
1430 Tulane Avenue
New Orleans, La. 70112
U.S.A.

Alan Gilston, M.B., Ch.B., F.F.A.R.C.S.

Consultant Anaesthetist
National Heart Hospital
Westmoreland Street
London, W1M 8BA
United Kingdom

Archer S. Gordon, M.D., Ph.D.

Department of Thoracic Surgery
University of Southern California
School of Medicine
Los Angeles, Calif. 90033
U.S.A.

William J. Grace, M.D.

Director of Medicine
St. Vincent's Hospital and Medical Center
of New York
153 West 11th Street
New York, N.Y. 10011
U.S.A.

Thomas P. Hackett, M.D.

Chief, Psychiatric Consultation Service
Massachusetts General Hospital
Boston, Mass. 02114
U.S.A.

Associate Professor of Psychiatry
Harvard Medical School

Donald C. Harrison, M.D.

Professor of Medicine
Chief of Cardiology
Stanford University School of Medicine
Stanford, Calif. 95305
U.S.A.

Raymond O. Heimbecker, M.A., M.D., M.S., F.R.C.S. (C), F.A.C.S.

Senior Surgeon
Toronto General Hospital
Toronto 2, Ont.
Canada

Assistant Professor of Surgery, University
of Toronto
Senior Research Associate, Ontario Heart
Foundation
Cardiovascular Consultant, Wellesley
Hospital

David Hunt, M.D., M.R.A.C.P., F.A.C.C.

Assistant Director
Cardiac Laboratory
Royal Melbourne Hospital
Victoria 3050
Australia

Thomas N. James, M.D.

Director
Cardiovascular Research and Training Center
School of Medicine
University of Alabama in Birmingham
1919 Seventh Avenue South
Birmingham, Ala. 35233
U.S.A.

Professor of Medicine and Professor of
Pathology
University of Alabama School of Medicine

David E. Jewitt, B.Sc., M.B., M.R.C.P.

Lecturer in Medicine
Royal Postgraduate Medical School
Consultant Cardiac Physician
Hammersmith Hospital
Du Cane Road
London, W.12
United Kingdom

Bengt W. Johansson, M.D.

Associate Professor of Medicine
Heart Laboratory
General Hospital
S-214 01 Malmö
Sweden

Joyce D. Johnson, M.D.

Consultant, Cardiology Division
Intermountain Regional Medical Program
Salt Lake City, Utah
U.S.A.

D. G. Julian, M.D., F.R.C.P., F.R.C.P. (E), F.R.C.A.P.

Consultant Physician
Department of Cardiology
The Royal Infirmary
Edinburgh, EH3 9YW
United Kingdom
Senior Lecturer in Medicine
University of Edinburgh

Adrian Kantrowitz, M.D.

Chairman
Department of Surgery
Sinai Hospital of Detroit
6767 West Outer Drive
Detroit, Mich. 48235
U.S.A.

Professor of Surgery
College of Medicine
Wayne State University

John Hines Kennedy, M.D.

Professor of Surgery
Baylor College of Medicine
Texas Medical Center
Houston, Texas 77025
U.S.A.

Adjunct Professor of Biomedical Engineering
Rice University

Director, Taub Laboratories for Mechanical
Circulatory Support

Thomas Killip, M.D.

Roland Harriman Professor of
Cardiovascular Medicine and
Head, Division of Cardiology
Department of Medicine
The New York Hospital – Cornell Medical
Center
525 East 68th Street
New York, N.Y. 10021
U.S.A.

Brian J. Kirby, M.B., M.R.C.P.

Lecturer in Medicine
University Department of Medicine
The Royal Infirmary
Edinburgh, EH3 9YW
United Kingdom

Bulent Kirmli, M.D.

Associate Professor
Department of Anesthesiology
University of Pittsburgh School of Medicine
Pittsburgh, Pa. 15213
U.S.A.

Chief Anesthesiologist
Veterans Administration Hospital
Pittsburgh, Pa.

J. Roderick Kitchell, M.D., F.A.C.C.

Director of Medicine Services
Abington Memorial Hospital
Abington, Pa.
U.S.A.

C. Walton Lillehei, M.D., Ph.D.

Lewis Atterbury Stimson Professor of
Surgery and of Thoracic and
Cardiovascular Surgery
The New York Hospital – Cornell Medical
Center
525 East 68th Street
New York, N.Y. 10021
U.S.A.

*Richard R. H. Lovell, M.D., F.R.C.P.,
F.R.A.C.P.*

Professor of Medicine
University of Melbourne Department of
Medicine
The Royal Melbourne Hospital
Victoria 3050
Australia

Alastair McDonald, B.Sc., M.B., M.R.C.P.

Senior Lecturer
Cardiac Department
The London Hospital
Whitechapel
London, E1 1BB
United Kingdom

*Lawson McDonald, M.A., M.D., F.R.C.P.,
F.A.C.C.*

Physician to the National Heart Hospital
Westmoreland Street
London W1M 8BA
United Kingdom

Physician to the London Hospital and
Lecturer to the Institute of Cardiology
University of London

*R. L. MacMillan, M.D., F.R.C.P. (C),
M.R.C.P. (L), F.A.C.P.*

Co-Director, Coronary Unit
Toronto General Hospital
Toronto 2, Ont.
Canada

Associate Professor
Faculty of Medicine
University of Toronto

*Martin W. McNicol, M.B., F.R.C.P.,
F.R.C.P. (E), F.R.C.P. (G)*

Consultant Physician
Cardio-thoracic Department
Central Middlesex Hospital
Park Royal
London, NW10 7NT
United Kingdom

Raoul Malmcrona, M.D.

Department of Medicine
Centrallasarettet
451 00 Uddevalla
Sweden

Bruce M. Marmor, M.D.

Division of Cardiology
Department of Medicine
The New York Hospital – Cornell Medical
Center
525 East 68th Street
New York, N.Y. 10021
U.S.A.

George K. Massing, M.D.

Assistant Director
Cardiovascular Research and Training Center
School of Medicine
University of Alabama in Birmingham
1919 Seventh Avenue South
Birmingham, Ala. 35233
U.S.A.

Assistant Professor of Medicine
University of Alabama School of Medicine

Lawrence E. Meltzer, M.D., F.A.C.C.

Director of Clinical Investigation and
Director, Coronary Care Unit
Research Institute
Presbyterian-University of Pennsylvania
Medical Center
51 North 39th Street
Philadelphia, Pa. 19104
U.S.A.

H. C. Miller, M.B., Ch.B., B.Sc., M.R.C.P. (E)

Senior Registrar
Brompton Hospital
Fulham Road
London, SW3 6HP
United Kingdom

**B. Mitra, M.B., Ph.D., F.R.C.P. (E),
D.T.M.H.**

Department of General Medicine
General Hospital
Chester Road
Sunderland
County Durham
United Kingdom

M. F. Oliver, M.D., F.R.C.P.

Consultant Physician
Department of Cardiology
The Royal Infirmary
Edinburgh, EH3 9YW
United Kingdom
Reader in Medicine
University of Edinburgh

**J. F. Pantridge, M.C., M.D., F.R.C.P.,
F.R.C.P. (I), F.A.C.C.**

Physician-in-Charge
Cardiac Department
Royal Victoria Hospital
Grosvenor Road
Belfast, BT12 6BA
United Kingdom

A. A. Fitzgerald Peel, D.M., M.A., F.R.C.P. (G)

Lately Cardiologist and Senior Physician
The Victoria Infirmary
Glasgow, S.2
United Kingdom

Ben Neagh House
Crumlin
County Antrim
United Kingdom

Martin R. Post, M.D.

Fellow, Division of Cardiology
Department of Medicine
The New York Hospital - Cornell Medical
Center
525 East 68th Street
New York, N.Y. 10021
U.S.A.

H. A. Rees, B.Sc., M.B., M.R.C.P. (L)

Consultant Physician
Singleton Hospital
Swansea, SA2 8QA
United Kingdom

Peter Safar, M.D.

Professor and Chairman
Department of Anesthesiology
University of Pittsburgh School of Medicine
Pittsburgh, Pa. 15213
U.S.A.

Co-ordinator, Critical Care Medicine
Program

University of Pittsburgh School of Medicine
Anesthesiologist-in-Chief
Health Center Hospitals

**Leo Schamroth, M.D., D.Sc., F.R.C.P. (E),
F.R.C.P. (G), F.A.C.C.**

Associate Professor of Medicine and
Principal Physician
Baragwanath Hospital and University of
Witwatersrand
Johannesburg
South Africa

*Velva Schrire, M.Sc., Ph.D., F.R.C.P. (E),
F.R.C.P., F.A.C.C.**
Cardiovascular Pulmonary Research Group
Department of Medicine
Cardiac Clinic
Groote Schuur Hospital
Observatory, Cape
South Africa

Arthur Selzer, M.D.
Director
Cardiopulmonary Laboratories
Presbyterian Hospital – Pacific Medical
Center
P. O. Box 7999
San Francisco, Calif. 94120
U.S.A.

Clinical Professor of Medicine
University of California School of Medicine
and Stanford University School of Medicine

Thomas Semple, M.D., B.Sc., F.R.C.P.
Cardiologist and Senior Physician
Department of Medicine
The Victoria Infirmary
Glasgow, S.2
United Kingdom

William C. Shoemaker, M.D.
Chief, Division of Surgical Metabolism, and
Director, Intensive Care Unit
Mount Sinai Hospital
100th Street and Fifth Avenue
New York, N.Y. 10029
U.S.A.

H. Shubin, M.D.
Shock Research Unit
School of Medicine
University of Southern California
1322 North Vermont Avenue
Los Angeles, Calif. 90027
U.S.A.

Bramah N. Singh, M.B., D.Phil., M.R.C.P.
Senior Lecturer in Medicine and Therapeutics
Auckland Hospital
Auckland
New Zealand

*Died 11th February 1972

*J. Graeme Sloman, M.B., B.Sc., F.R.C.P. (E),
F.R.A.C.P., M.R.C.P. (L), F.A.C.C.*
Director, Cardiac Laboratory
Royal Melbourne Hospital
Victoria 3050
Australia

C. Frank Starmer, Ph.D.
Assistant Professor of Medicine and
Assistant Professor of Computer Science
Duke Hospital
Box 3181
Durham, N.Car. 27710
U.S.A.

Borys Surawicz, M.D.
Professor of Medicine and
Director, Cardiovascular Division
Department of Medicine
University of Kentucky College of Medicine
Lexington, Ky. 40506
U.S.A.

H. J. C. Swan, M.D., Ph.D.
Director, Department of Cardiology
Cedars-Sinai Medical Center
4833 Fountain Avenue
Los Angeles, Calif. 90029
U.S.A.

Michael Thomas, M.A., M.D., M.R.C.P.
Consultant Physician
M.R.C. Cardiovascular Unit
Royal Postgraduate Medical School
Hammersmith Hospital
Du Cane Road
London, W.12
United Kingdom

Marc Verstraete, M.D.
Professor of Medicine
Director, Coagulation Laboratory
University of Louvain
Kapucijnenvoer 35
B-3000 Louvain
Belgium

J. Vreeken, M.D.
Professor of Medicine
University of Amsterdam
Wilhelmina Gasthuis
1st Helmerstraat 104
Amsterdam
The Netherlands

Homer R. Warner, M.D., Ph.D.

Professor and Chairman
Department of Biophysics and Bioengineering
The University of Utah
Latter-Day Saints Hospital
325 Eighth Avenue
Salt Lake City, Utah 84103
U.S.A.

James V. Warren, M.D.

Professor and Chairman
Department of Medicine
Ohio State University
410 West 10th Avenue
Columbus, Ohio 43210
U.S.A.

Yoshio Watanabe, M.D.

Division of Cardiology
Hahnemann Medical College and Hospital
230 North Broad Street
Philadelphia, Pa. 19102
U.S.A.

Max Harry Weil, M.D.

Clinical Professor and Director
Shock Research Unit
School of Medicine
University of Southern California
1322 North Vermont Avenue
Los Angeles, Calif. 90027
U.S.A.

Robert E. Whalen, M.D.

Associate Professor of Medicine
Duke Hospital
Box 3393
Durham, N.Car. 27710
U.S.A.

Preface

In the wave of enthusiasm that follows the introduction of an important medical concept, ideas and new practices often flow so swiftly that they tend to inundate the clinician. In many ways this is what has happened with the system of intensive coronary care.

Although just 10 years have elapsed since this new plan of care was first proposed as a possible means of reducing the awesome mortality from acute myocardial infarction, thousands of articles have already been published about every aspect of the program, while the sum of knowledge has increased at a geometric rate: moreover, there is every reason to believe that this pace will continue in the foreseeable future, especially as new technological advances are made. The rapidity of this progress has, however, created a difficult problem for the practicing physician: how to keep abreast with these new developments and how to assess their significance in terms of patient care?

This volume was conceived in an effort not only to summarize the progress that has been achieved in the past decade and to describe the current status of coronary care, but, far more significantly, to serve as a useful reference for the clinician who seeks concise and authoritative information about problems he encounters in the management of patients with acute myocardial infarction.

To achieve this objective, the editors invited a group of renowned authorities from centers throughout the world to critically evaluate available evidence regarding some 50 subjects related to coronary care and to present this information along with their own opinions based on personal experience.

It has been said repeatedly, almost as a litany, that books written by multiple authors are almost inevitably uneven in style, content, length, or quality of material. This inherent trait can hardly be denied, and this book is certainly no exception to the rule. However, unevenness seems to be a small price to pay for the fund of experience and the expertise provided by the 74 contributors to this book whose own work in their respective fields has been fundamental to the very progress being described. In those instances where questions could not be answered definitively (because of the paucity of available evidence), the authors have attempted to present the background and basis of the problem (or controversy) from which the reader will be able to evaluate future information.

Another common criticism of comprehensive books of this type is that some of the material is outdated before publication can be accomplished. Again, this is a valid objection since it does indeed take a long time to collect and edit such a large number of manuscripts and to prepare them for final printing. Being keenly aware of this shortcoming, the editors have taken advantage of the unique abstracting services of our publisher, Excerpta Medica, and have included, at the end of the book, a separate, additional bibliography of the most important articles regarding coronary care that have appeared in the literature during the past

two years, indeed up to the month of publication.

It is readily apparent that this book could not have been prepared without the able assistance of a large number of dedicated people. We are especially indebted to Mr. Kenneth Ellison Davis, Acquisitions Editor of *Excerpta Medica*, for his unwavering effort, perseverance, and thoughtfulness, and to Miss Mary Adolph who labored so diligently in assembling the final manuscript. Above all we are deeply grateful to the contributors not only for their writings but for their wise counsel as well.

L. E. Meltzer, M.D.

A. J. Dunning, M.D.

Contents*

I. INTENSIVE CORONARY CARE

1. The development and current status of coronary care 3 (776)
F. E. MELTZER and J. R. KITCHELL
2. The coronary care unit: physical design and basic instrumentation 26 (776)
P. L. FROMMER
3. The nursing role in the coronary care system 35 (777)
F. G. ABDELLAH
4. The effectiveness of the system of coronary care 52 (777)
K. W. G. BROWN and R. L. MACMILLAN

II. THE DIAGNOSIS OF ACUTE MYOCARDIAL INFARCTION

1. The electrocardiographic diagnosis of acute myocardial infarction 61 (778)
L. SCHAMROTH
2. The diagnosis of myocardial infarction by enzyme analysis 82 (778)
E. L. COODLEY

III. THE CLINICAL COURSE OF ACUTE MYOCARDIAL INFARCTION

1. The pre-hospital phase of acute myocardial infarction 95 (779)
J. F. PANTRIDGE and A. A. J. ADGEY
2. The incidence of arrhythmias associated with acute myocardial infarction 107 (780)
L. E. MELTZER and H. E. COHEN
3. The incidence of left ventricular failure and cardiogenic shock 134 (781)
G. SLOMAN and D. HUNT
4. The incidence of other complications: thromboembolism, ventricular rupture, etc. 145 (784)
J. V. WARREN
5. Immediate prognosis in acute myocardial infarction 152 (785)
A. A. F. PEEL and TH. SEMPLE
6. Long-term prognosis after acute myocardial infarction 173 (785)
R. R. H. LOVELL

*Figures in parentheses refer to the supplemental bibliography.

IV. THE MANAGEMENT OF ARRHYTHMIAS

1. The anatomical basis of arrhythmias 191 (786)
G. K. MASSING and TH. N. JAMES
2. Hypoxemia, alkalosis, and acidosis in the genesis of cardiac arrhythmias 213
W. J. GRACE
3. The metabolic response to acute myocardial infarction 231 (786)
M. F. OLIVER
4. The use of lidocaine and procaine amide in the treatment and prevention of arrhythmias associated with myocardial infarction 242 (787)
D. C. HARRISON and E. L. ALDERMAN
5. Principles of antiarrhythmic therapy in patients with acute myocardial infarction 263 (788)
L. S. GETTES and B. SURAWICZ
6. Beta-adrenergic blockade in acute myocardial infarction 282 (789)
D. E. JEWITT and B. N. SINGH
7. The use of new antiarrhythmic agents in acute myocardial infarction 306
L. S. DREIFUS and Y. WATANABE
8. Polarizing treatment in acute myocardial infarction 316 (790)
B. MITTRA
9. Atrioventricular and bundle branch block in acute myocardial infarction. Natural history and prognosis 328 (790)
B. W. JOHANSSON
10. Application of cardiac pacing to acute myocardial infarction 341 (791)
M. R. POST and TH. KILLIP
- 10A. Technique of subclavian vein puncture 357 (792)
B. M. MARMOR and TH. KILLIP
11. Direct-current shock therapy in acute myocardial infarction 362 (792)
A. SELZER and K. COHN
12. The treatment of ventricular fibrillation 371 (792)
A. J. DUNNING
13. Haemodynamic effects of arrhythmias in acute myocardial infarction 382
H. C. MILLER and D. G. JULIAN

V. RESUSCITATION

1. Technique of cardiopulmonary resuscitation (CPR) and pitfalls in performance 397 (792)
A. S. GORDON
2. The effectiveness of cardiac resuscitation 434 (793)
A. GILSTON
3. Psychological effects of acute coronary care 443 (793)
TH. P. HACKETT and N. H. CASSEM
4. Training methods in cardiopulmonary resuscitation 453
B. KIRIMLI and P. SAFAR

VI. THE MANAGEMENT OF LEFT VENTRICULAR FAILURE AND CARDIOGENIC SHOCK

1. Haemodynamic changes after acute myocardial infarction 481 (793)
M. THOMAS
2. Pulmonary function in myocardial infarction 491 (795)
B. J. KIRBY
3. Acid base disturbance in myocardial infarction 504 (795)
B. J. KIRBY and M. W. MCNICOL
4. The effect of opiates in acute myocardial infarction 512 (795)
H. A. REES
5. Oxygen therapy in myocardial infarction 521 (796)
M. W. MCNICOL and B. J. KIRBY
6. The use of digitalis in the treatment of acute myocardial infarction 531 (796)
R. MALMCRONA
7. Diuretic therapy in the treatment of cardiac failure 547 (796)
L. MCDONALD and A. MCDONALD
8. The use of sympathomimetic amines in the treatment of cardiogenic shock 559 (797)
R. S. BROWN and W. C. SHOEMAKER
9. Hyperbaric oxygen in the management of myocardial infarction 570 (797)
A. J. V. CAMERON
10. Aortic balloon pumping in the management of left ventricular failure and cardiogenic shock 594 (797)
A. KANTROWITZ
11. The use of a pump oxygenator in acute cardiac failure 608 (799)
J. H. KENNEDY
12. The concept of heart transplantation for intractable heart failure after myocardial infarction 626
V. SCHRIRE
13. Metabolic consequences of cardiogenic shock 634 (800)
M. H. WEIL and H. SHUBIN

VII. THE MANAGEMENT OF OTHER COMPLICATIONS OF ACUTE MYOCARDIAL INFARCTION

1. Thrombolytic therapy in recent myocardial infarction 643 (800)
M. VERSTRAETE
2. Anticoagulant therapy in myocardial infarction 660 (800)
J. VREEKEN
3. The surgical treatment of ventricular dyssynergy 670 (801)
R. O. HEIMBECKER and A. G. ADELMAN
4. Left ventricular papillary muscle dysfunction in acute myocardial infarction: diagnosis and management 682 (802)
G. E. BURCH and TH. GILES
5. Surgical treatment of ventricular failure due to coronary artery insufficiency 700 (803)
C. W. LILLEHEI and R. G. CARLSON

VIII. BIO-INSTRUMENTATION IN CORONARY CARE

1. Direct assessment of cardiac function in acute myocardial infarction 733 (804)

J. S. FORRESTER and H. J. C. SWAN

2. Electrical hazards related to instrumentation 744 (805)

R. E. WHALEN and C. F. STARMER

3. Role of the computer in coronary care 763 (805)

J. D. JOHNSON and H. R. WARNER

SUPPLEMENTAL BIBLIOGRAPHY 775

SUBJECT INDEX 807

I. Intensive coronary care