

Contents

Preface	v
Contributors	xvii
ACC/AHA Guidelines	xxix

SECTION I Introduction: Cardiac Signs and Symptoms, and Selected Noninvasive Diagnostic Methods

1 Anatomy of the Heart <i>L. Maximilian Buja</i>	3
2 The History and Physical Examination <i>Thomas C. Smitherman and James T. Willerson</i>	19
3 Electrocardiography <i>Anton P.M. Gorgels</i>	43
4 Chest X-Ray <i>Mary Ella Round</i>	79
5 Introduction to Echocardiography <i>Raymond F. Stainback</i>	93
6 Nuclear Cardiology <i>Arthur Iain McGhie, K. Lance Gould, and James T. Willerson</i>	137
7 Cardiovascular Magnetic Resonance Imaging <i>Warren J. Manning</i>	161
8 Computed Tomographic Cardiovascular Imaging <i>Matthew J. Budoff</i>	181

SECTION II Congenital Heart Disease in the Adult

9 Normal and Abnormal Anatomy <i>Robert H. Anderson and Anton E. Becker</i>	205
10 Pathophysiology, Clinical Recognition, and Treatment of Congenital Heart Disease <i>Steven R. Neish and Jeffrey A. Towbin</i>	233
11 Echocardiography in the Adult with Congenital Heart Disease <i>Julie A. Kovach</i>	279
12 Congenital Heart Disease in the Adult: Interventional Therapy <i>Charles E. Mullins</i>	311

- 13 Surgical Treatment 341
*Magdi Habib Yacoub, Anselm Uebing,
 Rosemary Radley-Smith, and Michael A. Gatzoulis*

SECTION III Valvular Heart Disease

- 14 Valvular Heart Disease: Anatomic Abnormalities 369
*Hugh A. McAllister, Jr., L. Maximilian Buja, and
 †Victor J. Ferrans*
- 15 Aortic Valve Disease. 381
Blase A. Carabello
- 16 Pulmonary and Tricuspid Valve Disease 393
*Otto M. Hess, Urs Scherrer, Pascal Nicod, and
 Blase A. Carabello*
- 17 Mitral Valve Diseases. 397
Maurice L. Enriquez-Sarano and Robert L. Frye
- 18 Rheumatic Fever 431
Y.S. Chandrashekar and Jagat Narula
- 19 Infective Endocarditis. 443
*Walter R. Wilson and Eddy Barasch (Second Edition),
 revised for The Third Edition by Layne O. Gentry and
 Temple W. Williams, Jr.*
- 20 The Assessment and Therapy of Valvular Heart
 Disease in the Cardiac Catheterization Laboratory 463
Paul Sorajja and Rick A. Nishimura
- 21 Echocardiographic Assessment of Valvular Heart Disease 487
Raymond F. Stainback
- 22 Magnetic Resonance Imaging of Valvular Disease 537
Scott D. Flamm and Raja Muthupillai
- 23 Balloon Dilatation of the Cardiac Valves. 557
Igor F. Palacios and Pedro L. Sánchez
- 24 Valvular Heart Disease: Surgical Treatment 581
William E. Cohn, O.H. Frazier, and Denton A. Cooley

SECTION IV Coronary Artery Disease

- 25 Coronary Artery Disease: Pathologic Anatomy
 and Pathogenesis 593
L. Maximilian Buja and Hugh A. McAllister, Jr.
- 26 Inflammation, C-Reactive Protein, and
 Vulnerable Plaques 611
*Paolo Calabró, James T. Willerson, and
 Edward T.H. Yeh*

†Deceased.

27A	Atherosclerotic Vulnerable Plaques: Pathophysiology, Detection, and Treatment	621
	<i>Mohammad Madjid, Samuel Ward Casscells, and James T. Willerson</i>	
27B	Biomarkers of Inflammation as Surrogate Markers in Detection of Vulnerable Plaques and Vulnerable Patients	641
	<i>Mohammad Madjid, Samuel Ward Casscells, and James T. Willerson</i>	
28	Global Differences in Atherosclerosis	653
	<i>Philip A. Poole-Wilson</i>	
29	Coronary Artery Disease: Regulation of Coronary Blood Flow	659
	<i>Robert J. Bache</i>	
30	Coronary Heart Disease Syndromes: Pathophysiology and Clinical Recognition	667
	<i>James T. Willerson, Attilio Maseri, and Paul W. Armstrong</i>	
31	Silent Ischemia	699
	<i>Matthew B. O’Steen and Neal S. Kleiman</i>	
32	Coronary Disease in Women.	713
	<i>Allen P. Burke, Frank D. Kolodgie, and Renu Virmani</i>	
33	Exercise Testing	729
	<i>Bernard R. Chaitman, Masarrath J. Moinuddin, and Junko Sano</i>	
34	Coronary Angiography	745
	<i>Robert F. Wilson and Carl W. White</i>	
35	Echocardiographic Evaluation of Coronary Artery Disease	811
	<i>Stephanie A. Coulter</i>	
36A	Myocardial Perfusion Imaging Utilizing Single Photon Emission Computed Tomography Techniques.	841
	<i>George A. Beller</i>	
36B	Cardiac Positron Emission Tomography.	855
	<i>K. Lance Gould</i>	
37A	Magnetic Resonance Imaging of the Myocardium	871
	<i>Raymond J. Kim, Igor Klem, and Robert M. Judd</i>	
37B	Magnetic Resonance Angiography and Evaluation of Vulnerable Plaque	897
	<i>Javier Sanz, Marc Sirol, Zahi A. Fayad, and Valentin Fuster</i>	
38	Medical Treatment of Stable Angina	911
	<i>James J. Ferguson III, Dipsu D. Patel, and James T. Willerson</i>	

39	Medical Treatment of Unstable Angina, Acute Non–ST-Elevation Myocardial Infarction, and Coronary Artery Spasm	937
	<i>James T. Willerson and Paul W. Armstrong</i>	
40	Treatment of Acute ST-Elevation Myocardial Infarction	963
	<i>Paul W. Armstrong and James T. Willerson</i>	
41	Kawasaki Disease	979
	<i>Hirohisa Kato</i>	
42	Percutaneous Coronary Intervention and Stable Angina	995
	<i>David R. Holmes, Jr.</i>	
43	Percutaneous Coronary Intervention for Unstable Coronary Artery Disease	1005
	<i>Pim J. de Feyter and Peter P.T. de Jaegere</i>	
44	Percutaneous Coronary Intervention for Acute Myocardial Infarction	1021
	<i>David R. Holmes, Jr.</i>	
45	Drug-Eluting Coronary Stents	1031
	<i>Carey D. Moyer, Peter B. Berger, and Christopher J. White</i>	
46	Surgical Treatment of Coronary Artery Disease	1051
	<i>William E. Cohn, O.H. Frazier, and Denton A. Cooley</i>	
47	Coronary Artery Bypass Surgery and Percutaneous Coronary Revascularization: Impact on Morbidity and Mortality in Patients with Coronary Artery Disease	1073
	<i>James M. Wilson, James J. Ferguson III, and Robert J. Hall</i>	
48	Cardiac Rehabilitation	1113
	<i>Michael X. Pham, Jonathan N. Myers, and Victor F. Froelicher</i>	

SECTION V Basic Aspects of Myocardial Function, Growth, and Development

49	Cardiac Development: Toward a Molecular Basis for Congenital Heart Disease	1135
	<i>Michael D. Schneider and Eric N. Olson</i>	
50	Fueling the Heart: Multiple Roles for Cardiac Metabolism	1157
	<i>Heinrich Taegtmeyer</i>	
51	Cardiac Hypertrophy	1177
	<i>Ali J. Marian and James T. Willerson</i>	
52	Regulation of Cardiac Contraction and Relaxation	1189
	<i>Arnold M. Katz</i>	
53	Pathophysiology and Clinical Impact of Diastolic Heart Failure	1201
	<i>Gilles W. de Keulenaer and Dirk L. Brutsaert</i>	

SECTION VI Myocardial Disease

- 54 Myocardial Disease: Anatomic Abnormalities 1219
*Hugh A. McAllister, Jr., L. Maximilian Buja, and
 †Victor J. Ferrans*
- 55 Dilated Cardiomyopathy 1233
Biykem Bozkurt and Douglas L. Mann
- 56 Hypertrophic Cardiomyopathy 1261
Diane Fatkin, J.G. Seidman, and Christine E. Seidman
- 57 Restrictive Cardiomyopathy 1285
*James T. Willerson, L. Maximilian Buja, and
 †John Goodwin*
- 58 Other Cardiomyopathies 1301
James T. Willerson and L. Maximilian Buja
- 59 Myocarditis 1313
Jay W. Mason, Sanjeev Trehan, and Dale G. Renlund
- 60 Evaluation of Myocardial Disease in the Cardiac
 Catheterization Laboratory 1349
James J. Ferguson III and Tomas Klima
- 61 Echocardiography in the Evaluation of
 the Cardiomyopathies 1359
Stephanie A. Coulter
- 62 Pathophysiology and Clinical Recognition of Heart Failure . . . 1379
Jay N. Cohn
- 63 The Medical Management of Heart Failure. 1397
Jay N. Cohn
- 64 Heart Transplantation: Indications, Outcome, and
 Long-Term Complications 1417
Leslie W. Miller
- 65 Heart Transplantation: Pathogenesis, Immunosuppression,
 Diagnosis, and Treatment of Rejection. 1443
Leslie W. Miller
- 66 Surgical Treatment of Advanced Heart Failure 1461
O.H. Frazier, Igor D. Gregoric, and William E. Cohn

SECTION VII Pericardial Disease

- 67 Pericardial Disease: Anatomic Abnormalities. 1479
*Hugh A. McAllister, Jr., L. Maximilian Buja, and
 †Victor J. Ferrans*
- 68 Pericardial Disease: Etiology, Pathophysiology, Clinical
 Recognition, and Treatment 1483
Ralph Shabetai

†Deceased.

SECTION VIII Vascular Disease

- 69 Molecular and Cellular Physiology of Differentiated
Vascular Smooth Muscle 1511
*Michael Sturek, Eric A. Mokolke, Jürgen R. Sindermann,
Leonard P. Adam, and Keith L. March*
- 70 Cardiovascular Regulation: Basic Considerations 1525
*Giuseppe Mancina, Thomas F. Lüscher, John T. Shepherd,
George Noll, and Guido M. Grassi*
- 71 Vascular Remodeling in Health and Disease. 1541
*Luis G. Melo, Massimiliano Gnecci, Christopher A. Ward,
and Victor J. Dzau*
- 72 Vascular Endothelial Cell Function and Thrombosis 1567
H. Roger Lijnen, Jef M. Arnout, and Désiré Collen
- 73 Atherosclerosis: Pathologic Anatomy and Pathogenesis 1581
L. Maximilian Buja and Hugh A. McAllister, Jr.
- 74 Atherosclerosis: Pathogenesis, Morphology, and
Risk Factors 1593
Antonio M. Gotto, Jr., and John A. Farmer
- 75 Detection of Early Cardiovascular Disease 1615
Daniel A. Duprez and Jay N. Cohn
- 76 Diseases of the Aorta 1623
*James T. Willerson, Joseph S. Coselli, Scott A. LeMaire,
Ross M. Reul, Igor D. Gregoric, George J. Reul, and
Denton A. Cooley*
- 77 Aneurysms of the Peripheral Arteries 1663
Paul W. Wennberg and Henna Kalsi
- 78 Peripheral Arterial Diseases 1681
Alan T. Hirsch, Henna Kalsi, and Thom W. Rooke
- 79 Venous Disease 1705
Samuel Z. Goldhaber
- 80 Angiogenesis 1717
Pinak B. Shah and Douglas W. Losordo
- 81 Carotid Artery Intervention 1741
Christopher J. White
- 82 Endovascular Procedures for the Treatment of Peripheral
Vascular Disease 1755
Kathryn G. Dougherty and Zvonimir Krajcer
- 83 B-Mode Ultrasound: A Noninvasive Method for
Assessing Atherosclerosis 1783
*John R. Crouse, Curt D. Furberg, Mark A. Espeland, and
Ward A. Riley*

84	Intravascular Ultrasound	1797
	<i>Seung-Ho Hur, Yasuhiro Honda, Peter J. Fitzgerald, and Paul G. Yock</i>	
85	Arterial Compliance.	1811
	<i>Gary E. McVeigh, Alan J. Bank, and Jay N. Cohn</i>	
86	Hypertension.	1833
	<i>Bernard Waeber, Hans-Rudolph Brunner, Michel Burnier, and Jay N. Cohn</i>	
87	Shock	1871
	<i>Henry S. Loeb and Jay N. Cohn</i>	
88	Autonomic Dysfunction and Hypotension	1883
	<i>Christopher J. Mathias</i>	
89	Cerebrovascular Disease/Transient Ischemic Attack	1911
	<i>Hashem M. Shaltoni and Frank M. Yatsu</i>	

SECTION IX Electrical Disturbances of the Heart

90	Sinus Node Dysfunction	1925
	<i>David G. Benditt, Scott Sakaguchi, Keith G. Lurie, and Fei Lu</i>	
91	Supraventricular Tachycardias	1943
	<i>Hein J.J. Wellens</i>	
92	Atrial Fibrillation and Flutter	1955
	<i>Peter A. Brady and Bernard J. Gersh</i>	
93	Preexcitation	1979
	<i>Hein J.J. Wellens</i>	
94	Atrioventricular Nodal and Subnodal Conduction Disturbances	1991
	<i>Hein J.J. Wellens</i>	
95	Transesophageal Echocardiography for Patients with Atrial Fibrillation	1999
	<i>Warren J. Manning</i>	
96	Broad QRS Tachycardias	2007
	<i>Hein J.J. Wellens</i>	
97	Syncope	2019
	<i>David G. Benditt and Scott Sakaguchi</i>	
98	Sudden Cardiac Death	2039
	<i>Abdi Rasekh, Mehdi Razavi, and Ali Massumi</i>	
99	Antiarrhythmic Drugs	2085
	<i>Dan M. Roden, Dawood Darbar, and Prince J. Kannankeril</i>	

100	Cardiac Pacemakers	2103
	<i>Sanjay Dixit and Francis E. Marchlinski</i>	
101	The Implantable Cardioverter-Defibrillator	2119
	<i>William H. Sauer and David J. Callans</i>	
102	Catheter Ablation of Supraventricular and Ventricular Arrhythmias	2139
	<i>Luz-Maria Rodriguez, Carl Timmermans, and Hein J.J. Wellens</i>	
103	Surgical Treatment of Arrhythmias	2163
	<i>Spencer J. Melby, James L. Cox, and Ralph J. Damiano, Jr.</i>	

SECTION X Cardiac Effects of Systemic Disorders, Pregnancy, Aging, and Environmental Changes

104	Pulmonary Thromboembolism	2177
	<i>Herbert L. Fred, Shahzad Hashim, and Fady A. Joudah</i>	
105	Pulmonary Arterial Hypertension	2203
	<i>Evangelos D. Michelakis and Stephen L. Archer</i>	
106	Chronic Obstructive Pulmonary Disease	2247
	<i>Rosa Maria Estrada-Y-Martin and Steven D. Brown</i>	
107	Tumors of the Heart	2267
	<i>Raymond F. Stainback, Yasmin S. Hamirani, Denton A. Cooley, and L. Maximilian Buja</i>	
108	Endocrine Disorders and the Heart	2295
	<i>Victor R. Lavis, Michalis K. Picolos, and James T. Willerson</i>	
109	Connective Tissue Diseases and the Heart	2331
	<i>Frank C. Arnett and James T. Willerson</i>	
110	Substance Abuse and the Heart	2357
	<i>Paul A. Grayburn and Eric J. Eichhorn</i>	
111	Cardiovascular Involvement in Acquired Immune Deficiency Syndrome	2371
	<i>Melvin D. Cheitlin, Priscilla Hsue, and Merle A. Sande</i>	
112	Cardiac Involvement in Skeletal Myopathies and Neuromuscular Disorders	2385
	<i>Ali J. Marian and James T. Willerson</i>	
113	Hematologic Disease and Heart Disease	2409
	<i>Martin D. Phillips and James T. Willerson</i>	
114	Hypercoagulable State	2423
	<i>Andrew I. Schafer</i>	

115	Aging and the Cardiovascular System	2439
	<i>Samer S. Najjar, Gary Gerstenblith, and Edward G. Lakatta</i>	

116	Pregnancy and the Heart	2453
	<i>Susan Wilansky, Christina S. Reuss, and James T. Willerson</i>	

SECTION XI Surgery and the Heart

117	Evaluation of Patients for Noncardiac Surgery	2487
	<i>James B. Froehlich and Kim A. Eagle</i>	

118	Anesthesia for Cardiovascular Operations	2501
	<i>N. Martin Giesecke and John R. Cooper, Jr.</i>	

119	Intraoperative Hemodynamic Monitoring	2515
	<i>Rebecca A. Schroeder, Shahar Bar-Yosef, and Jonathan B. Mark</i>	

SECTION XII The Genetic Basis for Cardiovascular Disease

120	Classification of Genetic Disorders	2551
	<i>Dianna M. Milewicz</i>	

121	Inherited Disorders of Connective Tissue	2557
	<i>Dianna M. Milewicz</i>	

122	Muscular Dystrophies Affecting the Heart	2567
	<i>C. Thomas Caskey</i>	

123	Genetic Basis for Cardiac Arrhythmias	2577
	<i>Connie R. Bezzina and Arthur A.M. Wilde</i>	

124	Genetic Aspects of Congenital Heart Disease	2599
	<i>Dianna M. Milewicz</i>	

SECTION XIII Preventive Cardiology

125	Coronary Risk Factors: An Overview	2609
	<i>Donald M. Lloyd-Jones and William B. Kannel</i>	

126	Preventive Cardiology: The Effects of Exercise	2631
	<i>Amit Khera, Jere H. Mitchell, and Benjamin D. Levine</i>	

127	Smoking, Secondhand Smoke, and Cardiovascular Disease	2649
	<i>Joaquin Barnoya and Stanton A. Glantz</i>	

128	Management of Cholesterol Disorders	2667
	<i>Scott M. Grundy</i>	

129	Cardiovascular Complications of Obesity and the Metabolic Syndrome	2693
	<i>Paul Poirier and Robert H. Eckel</i>	
130	Gene Therapy	2721
	<i>Robert D. Simari and Elizabeth G. Nabel</i>	
131	Molecular Biology for the Clinician	2731
	<i>Sara Arab, Liyong Zhang, Yuichiro Maekawa, Urszula Zurawska, and Peter P. Liu</i>	
132	Stem Cell Therapy for Cardiac Diseases	2745
	<i>Emerson C. Perin, Guilherme V. Silva, and James T. Willerson</i>	
133	Cost-Effectiveness Issues	2771
	<i>William S. Weintraub</i>	
134	Erectile Dysfunction and Cardiovascular Disease	2791
	<i>Sanjay Kaul and James S. Forrester</i>	
135	Cardiovascular Disease and Insulin Resistance	2803
	<i>Ramzi A. Ajjan and Peter J. Grant</i>	
136	The Heart and the Kidney	2819
	<i>Martin R. Cowie</i>	
	Index	2839
	Credits	2907