



# Contents

## PART I FUNDAMENTALS OF CARDIOVASCULAR DISEASE

- 1 Global Burden of Cardiovascular Disease, 1**  
THOMAS A. GAZIANO, DORAIRAJ PRABHAKARAN,  
AND J. MICHAEL GAZIANO
- 2 Ethics in Cardiovascular Medicine, 19**  
SAVITRI E. FEDSON AND LAURENCE B. MCCULLOUGH
- 3 Clinical Decision Making in Cardiology, 25**  
JOHN E. BRUSH JR AND HARLAN M. KRUMHOLZ
- 4 Measuring and Improving Quality of Care:  
Relevance to Cardiovascular Clinical  
Practice, 33**  
FREDERICK A. MASOUDI AND JOHN S. RUMSFELD
- 5 Critical Evaluation of Clinical Trials, 39**  
ELLIOTT M. ANTMAN

## PART II GENETICS AND PERSONALIZED MEDICINE

- 6 Personalized and Precision Cardiovascular  
Medicine, 47**  
CALUM A. MACRAE
- 7 Principles of Cardiovascular Genetics, 53**  
KIRAN MUSUNURU AND SEKAR KATHIRESAN
- 8 Drug Therapeutics and Personalized  
Medicine, 64**  
DAN M. RODEN
- 9 Biomarkers and Use in Precision  
Medicine, 73**  
PETER LIBBY, ROBERT E. GERSZTEN, AND PAUL M. RIDKER

## PART III EVALUATION OF THE PATIENT

- 10 History and Physical Examination: An  
Evidence-Based Approach, 83**  
JAMES C. FANG AND PATRICK T. O'GARA
- 11 Anesthesia and Noncardiac Surgery in  
Patients with Heart Disease, 102**  
LEE A. FLEISHER AND JOSHUA A. BECKMAN

## 12 Electrocardiography, 117

DAVID M. MIRVIS AND ARY L. GOLDBERGER

### Guidelines: Electrocardiography, 151

DAVID M. MIRVIS AND ARY L. GOLDBERGER

## 13 Exercise Electrocardiographic Testing, 154

GARY J. BALADY AND ANTHONY P. MORISE

## 14 Echocardiography\*, 174

SCOTT D. SOLOMON, JUSTINA C. WU, AND LINDA GILLAM

### Appropriate Use Criteria: Echocardiography, 244

SCOTT D. SOLOMON AND ROBERT O. BONOW

## 15 The Chest Radiograph in Cardiovascular Disease, 252

CYLEN JAVIDAN-NEJAD AND SANJEEV BHALLA

## 16 Nuclear Cardiology\*, 261

JAMES E. UDELSON, VASKEN DILSIZIAN, AND ROBERT O. BONOW

## 17 Cardiovascular Magnetic Resonance Imaging\*, 301

RAYMOND Y. KWONG

## 18 Cardiac Computed Tomography\*, 321

JAMES K. MIN

### \*Appropriate Use Criteria: Multimodality Imaging in Stable Ischemic Heart Disease and Heart Failure, 343

JAMES E. UDELSON, VASKEN DILSIZIAN, AND ROBERT O. BONOW

## 19 Cardiac Catheterization, 348

JOERG HERRMANN

## 20 Coronary Angiography and Intravascular Imaging, 374

ROXANA MEHRAN AND GEORGE D. DANGAS

## PART IV HEART FAILURE

## 21 Approach to the Patient with Heart Failure, 403

JAMES L. JANUZZI JR AND DOUGLAS L. MANN

### Guidelines: Initial Evaluation of the Patient with Heart Failure, 414

JAMES L. JANUZZI JR AND DOUGLAS L. MANN

- 22 Mechanisms of Cardiac Contraction and Relaxation, 418**  
DONALD M. BERS AND BARRY A. BORLAUG
- 23 Pathophysiology of Heart Failure, 442**  
GERD HASENFUSS AND DOUGLAS L. MANN
- 24 Diagnosis and Management of Acute Heart Failure, 462**  
G. MICHAEL FELKER AND JOHN R. TEERLINK  
**Guidelines: The Hospitalized Patient, 488**  
G. MICHAEL FELKER AND JOHN R. TEERLINK
- 25 Management of Heart Failure Patients with Reduced Ejection Fraction, 490**  
DOUGLAS L. MANN  
**Guidelines: Management of Heart Failure with a Reduced Ejection Fraction, 516**  
DOUGLAS L. MANN
- 26 Heart Failure with a Preserved Ejection Fraction, 523**  
MICHAEL R. ZILE AND SHELDON E. LITWIN  
**Guidelines: Heart Failure with a Preserved Ejection Fraction, 542**  
MICHAEL R. ZILE AND SHELDON E. LITWIN
- 27 Devices for Monitoring and Managing Heart Failure, 543**  
WILLIAM T. ABRAHAM  
**Guidelines: Cardiac Resynchronization and Implantable Cardioverter-Defibrillators in Heart Failure with a Reduced Ejection Fraction, 551**  
WILLIAM T. ABRAHAM
- 28 Surgical Management of Heart Failure, 553**  
MARIELL JESSUP, PAVAN ATLURI, AND MICHAEL A. ACKER
- 29 Mechanical Circulatory Support, 568**  
KEITH D. AARONSON AND FRANCIS D. PAGANI
- 30 Cardiovascular Regeneration and Repair, 580**  
KIRAN MUSUNURU AND JOSEPH C. WU
- 31 Management of Patients with Cardiovascular Disease Approaching End of Life, 589**  
LARRY A. ALLEN AND LYNNE WARNER STEVENSON
- PART V ARRHYTHMIAS, SUDDEN DEATH, AND SYNCOPE**
- 32 Approach to the Patient with Cardiac Arrhythmias, 597**  
GORDON F. TOMASELLI AND DOUGLAS P. ZIPES
- 33 Genetics of Cardiac Arrhythmias, 604**  
DAVID J. TESTER AND MICHAEL J. ACKERMAN
- 34 Mechanisms of Cardiac Arrhythmias, 619**  
GORDON F. TOMASELLI, MICHAEL RUBART, AND DOUGLAS P. ZIPES
- 35 Diagnosis of Cardiac Arrhythmias, 648**  
JOHN M. MILLER, GORDON F. TOMASELLI, AND DOUGLAS P. ZIPES  
**Guidelines: Ambulatory Electrocardiographic and Electrophysiologic Testing, 663**  
JOHN M. MILLER, GORDON F. TOMASELLI, AND DOUGLAS P. ZIPES
- 36 Therapy for Cardiac Arrhythmias, 670**  
JOHN M. MILLER, GORDON F. TOMASELLI, AND DOUGLAS P. ZIPES
- 37 Supraventricular Arrhythmias, 706**  
JEFFREY E. OLGIN AND DOUGLAS P. ZIPES
- 38 Atrial Fibrillation: Clinical Features, Mechanisms, and Management, 730**  
FRED MORADY AND DOUGLAS P. ZIPES  
**Guidelines: Atrial Fibrillation, 746**  
FRED MORADY AND DOUGLAS P. ZIPES
- 39 Ventricular Arrhythmias, 753**  
JEFFREY E. OLGIN, GORDON F. TOMASELLI, AND DOUGLAS P. ZIPES
- 40 Bradyarrhythmias and Atrioventricular Block, 772**  
JEFFREY E. OLGIN AND DOUGLAS P. ZIPES
- 41 Pacemakers and Implantable Cardioverter-Defibrillators, 780**  
CHARLES D. SWERDLOW, PAUL J. WANG, AND DOUGLAS P. ZIPES  
**Guidelines: Cardiac Pacemakers and Cardioverter-Defibrillators, 800**  
CHARLES D. SWERDLOW, PAUL J. WANG, AND DOUGLAS P. ZIPES
- 42 Cardiac Arrest and Sudden Cardiac Death, 807**  
ROBERT J. MYERBURG AND JEFFREY J. GOLDBERGER
- 43 Hypotension and Syncope, 848**  
HUGH CALKINS AND DOUGLAS P. ZIPES
- PART VI PREVENTIVE CARDIOLOGY**
- 44 The Vascular Biology of Atherosclerosis, 859**  
PETER LIBBY
- 45 Risk Markers and the Primary Prevention of Cardiovascular Disease, 876**  
PAUL M. RIDKER, PETER LIBBY, AND JULIE E. BURING

- 46 Systemic Hypertension: Mechanisms and Diagnosis, 910**  
RONALD G. VICTOR
- 47 Systemic Hypertension: Management, 928**  
RONALD G. VICTOR AND PETER LIBBY
- Guidelines: Treatment of Hypertension, 956**  
RONALD G. VICTOR AND PETER LIBBY
- 48 Lipoprotein Disorders and Cardiovascular Disease, 960**  
JACQUES GENEST AND PETER LIBBY
- Guidelines: Lipid Management, 979**  
JACQUES GENEST AND PETER LIBBY
- 49 Nutrition and Cardiovascular and Metabolic Diseases, 983**  
DARIUSH MOZAFFARIAN
- 50 Obesity and Cardiometabolic Disease, 998**  
JEAN-PIERRE DESPRÉS, ERIC LAROSE, AND PAUL POIRIER
- 51 Diabetes and the Cardiovascular System, 1007**  
DARREN K. MCGUIRE, SILVIO E. INZUCCHI, AND NIKOLAUS MARX
- Guidelines: Diabetes and Heart Disease, 1027**  
DARREN K. MCGUIRE, SILVIO E. INZUCCHI, AND NIKOLAUS MARX
- 52 Air Pollution and Cardiovascular Disease, 1032**  
ARUNI BHATNAGAR
- 53 Exercise and Sports Cardiology, 1038**  
PAUL D. THOMPSON AND AARON L. BAGGISH
- 54 Exercise-Based, Comprehensive Cardiac Rehabilitation, 1046**  
PAUL D. THOMPSON AND PHILIP A. ADES
- 55 Integrative Approaches to the Management of Patients with Heart Disease, 1052**  
STEPHEN DEVRIES
- PART VII ATHEROSCLEROTIC CARDIOVASCULAR DISEASE**
- 56 Approach to the Patient with Chest Pain, 1059**  
MARC P. BONACA AND MARC S. SABATINE
- 57 Coronary Blood Flow and Myocardial Ischemia, 1069**  
DIRK J. DUNCKER AND JOHN M. CANTY JR
- 58 ST-Elevation Myocardial Infarction: Pathophysiology and Clinical Evolution, 1095**  
BENJAMIN M. SCIRICA, PETER LIBBY, AND DAVID A. MORROW
- 59 ST-Elevation Myocardial Infarction: Management, 1123**  
ERIN A. BOHULA AND DAVID A. MORROW
- Guidelines: Management of Patients with ST-Elevation Myocardial Infarction, 1172**  
STEPHEN D. WIVIOTT
- 60 Non-ST Elevation Acute Coronary Syndromes, 1181**  
ROBERT P. GIUGLIANO AND EUGENE BRAUNWALD
- Guidelines: Non-ST Elevation Acute Coronary Syndromes, 1202**  
ROBERT P. GIUGLIANO AND EUGENE BRAUNWALD
- 61 Stable Ischemic Heart Disease, 1209**  
DAVID A. MORROW AND JAMES A. DE LEMOS
- Guidelines: Stable Ischemic Heart Disease, 1258**  
DAVID A. MORROW AND JAMES A. DE LEMOS
- 62 Percutaneous Coronary Intervention, 1271**  
LAURA MAURI AND DEEPAK L. BHATT
- Guidelines: Percutaneous Coronary Intervention, 1287**  
LAURA MAURI AND DEEPAK L. BHATT
- 63 Diseases of the Aorta, 1295**  
ALAN C. BRAVERMAN AND MARC SCHERMERHORN
- Guidelines: Diseases of the Aorta, 1325**  
ALAN C. BRAVERMAN AND MARC SCHERMERHORN
- 64 Peripheral Artery Diseases, 1328**  
MARC P. BONACA AND MARK A. CREAGER
- Guidelines: Peripheral Artery Diseases, 1347**  
MARC P. BONACA AND MARK A. CREAGER
- 65 Prevention and Management of Ischemic Stroke, 1352**  
LARRY B. GOLDSTEIN
- 66 Treatment of Noncoronary Obstructive Vascular Disease, 1365**  
SCOTT KINLAY AND DEEPAK L. BHATT
- PART VIII DISEASES OF THE HEART VALVES**
- 67 Approach to the Patient with Valvular Heart Disease, 1383**  
CATHERINE M. OTTO AND ROBERT O. BONOW

- 68 Aortic Valve Disease, 1389**  
BRIAN R. LINDMAN, ROBERT O. BONOW, AND CATHERINE M. OTTO
- 69 Mitral Valve Disease, 1415**  
JAMES D. THOMAS AND ROBERT O. BONOW
- 70 Tricuspid, Pulmonic, and Multivalvular Disease, 1445**  
PATRICIA A. PELLIKKA
- 71 Prosthetic Heart Valves, 1455**  
PHILIPPE PIBAROT AND PATRICK T. O'GARA
- 72 Transcatheter Therapies for Valvular Heart Disease, 1464**  
HOWARD C. HERRMANN AND MICHAEL J. MACK
- Guidelines: Management of Valvular Heart Disease, 1473**  
ROBERT O. BONOW AND CATHERINE M. OTTO
- 73 Cardiovascular Infections, 1483**  
LARRY M. BADDOUR, WILLIAM K. FREEMAN, RAKESH M. SURI, AND WALTER R. WILSON
- Guidelines: Infective Endocarditis, 1507**  
LARRY M. BADDOUR, WILLIAM K. FREEMAN, RAKESH M. SURI, WALTER R. WILSON, AND ROBERT O. BONOW
- 74 Rheumatic Fever, 1510**  
BONGANI M. MAYOSI
- PART IX DISEASES OF THE MYOCARDIUM, PERICARDIUM, AND PULMONARY VASCULATURE BED**
- 75 Congenital Heart Disease in the Adult and Pediatric Patient, 1519**  
GARY D. WEBB, JEFFREY F. SMALLHORN, JUDITH THERRIEN, AND ANDREW N. REDINGTON
- 76 Catheter-Based Treatment of Congenital Heart Disease in Adults, 1574**  
JOHN M. LASALA AND DAVID T. BALZER
- 77 The Dilated, Restrictive, and Infiltrative Cardiomyopathies, 1580**  
RODNEY H. FALK AND RAY E. HERSHBERGER
- 78 Hypertrophic Cardiomyopathy, 1602**  
BARRY J. MARON, MARTIN S. MARON, AND IACOPO OLIVOTTO
- 79 Myocarditis, 1617**  
LESLIE T. COOPER JR AND KIRK U. KNOWLTON
- 80 Cardiomyopathies Induced by Drugs or Toxins, 1631**  
RICHARD A. LANGE AND L. DAVID HILLIS
- 81 Cardio-Oncology, 1641**  
BONNIE KY
- 82 Cardiovascular Abnormalities in HIV-Infected Individuals, 1651**  
PRISCILLA Y. HSUE AND DAVID D. WATERS
- 83 Pericardial Diseases, 1662**  
MARTIN M. LEWINTER AND MASSIMO IMAZIO
- 84 Pulmonary Embolism, 1681**  
SAMUEL Z. GOLDBERGER
- 85 Pulmonary Hypertension, 1699**  
VALLERIE V. MCLAUGHLIN AND MARC HUMBERT
- 86 Chronic Lung Diseases and Cardiovascular Disease, 1720**  
SURYA P. BHATT AND MARK T. DRANSFIELD
- 87 Sleep-Disordered Breathing and Cardiac Disease, 1726**  
SUSAN REDLINE
- PART X CARDIOVASCULAR DISEASE IN SPECIAL POPULATIONS**
- 88 Cardiovascular Disease in the Elderly, 1735**  
DANIEL E. FORMAN, JEROME L. FLEG, AND NANETTE KASS WENGER
- 89 Cardiovascular Disease in Women, 1767**  
MARTHA GULATI AND C. NOEL BAIREY MERZ
- 90 Pregnancy and Heart Disease, 1780**  
CANDICE K. SILVERSIDES AND CAROLE A. WARNES
- Guidelines: Pregnancy and Heart Disease, 1794**  
CANDICE K. SILVERSIDES AND CAROLE A. WARNES
- 91 Cardiovascular Disease in Heterogeneous Populations, 1799**  
MICHELLE A. ALBERT AND MERCEDES R. CARNETHON
- 16 Nuclear Cardiology, 261**
- PART XI CARDIOVASCULAR DISEASE AND DISORDERS OF OTHER ORGANS**
- 92 Endocrine Disorders and Cardiovascular Disease, 1807**  
IRWIN KLEIN AND BERNADETTE BIONDI
- 93 Hemostasis, Thrombosis, Fibrinolysis, and Cardiovascular Disease, 1822**  
JEFFREY I. WEITZ
- 94 Rheumatic Diseases and the Cardiovascular System, 1847**  
JUSTIN C. MASON

**95 Tumors Affecting the Cardiovascular System, 1866**  
DANIEL J. LENIHAN, SYED WAMIQUE YUSUF, AND ASHISH SHAH

**96 Psychiatric and Behavioral Aspects of Cardiovascular Disease, 1879**  
VIOLA VACCARINO AND J. DOUGLAS BREMNER

**97 Neurologic Disorders and Cardiovascular Disease, 1890**  
WILLIAM J. GROH, GORDON F. TOMASELLI, AND DOUGLAS P. ZIPES

**98 Pulmonary Hypertension, 1899**  
JACQUES GENEST AND PETER LIBBY

**99 Chronic Lung Disease and Cardiovascular Disease, 1920**  
JACQUES GENEST AND PETER LIBBY

**100 Sleep-Disordered Breathing and Cardiovascular Disease, 1926**  
SURYA P. BHATT AND MARK T. DRANSKY

**101 Obesity and Cardiometabolic Disease, 1926**  
JEAN-PIERRE DESPRÉS, ERIC LAROSE, AND SUZANNE RECHUMÉ

**102 Diabetes and the Cardiovascular System, 1927**  
NIKOLAUS MARX

**103 Cardiovascular Disease in the Elderly, 1935**  
DANIEL E. FOKMAN, JEROME L. FLEG, AND NINETTE KASS

**104 Cardiovascular Disease in Women, 1937**  
MARTHA GULATI AND C. NOEL BAIREY MERZ

**105 Pregnancy and Heart Disease, 1980**  
CANDICE K. SILVERSIDES AND CAROL A. WARNES

**106 Exercise-Based, Comprehensive Cardiac Rehabilitation in Heterogeneous Populations, 1999**  
PAUL D. THOMPSON AND PHILIP D. WASSERMAN

**107 Integrative Approaches to the Management of Patients with Heart Disease, 2001**  
MICHELLE A. ALBERT AND MERCEDES B. CARNETHON

**PART XI CARDIOVASCULAR DISEASE AND DISORDERS OF OTHER ORGANS**

**108 Endocrine Disorders and Cardiovascular Disease, 1807**  
IRWIN KLEIN AND BERNADETTE BIONDI

**109 Hemostatic Disorders, Fibrinolysis, and Cardiovascular Disease, 1822**  
JEFFREY I. WEITZ

**110 Rheumatic Disease and the Cardiovascular System, 1847**  
DIRK J. DUNCKER AND JOHN M. CANTY

**98 Interface Between Renal Disease and Cardiovascular Illness, 1910**  
PETER A. MCCULLOUGH

**99 Cardiovascular Manifestations of Autonomic Disorders, 1930**  
DAVID ROBERTSON AND ROSE MARIE ROBERTSON

**100 Non-ST Elevation Acute Coronary Syndromes, 1977**  
HOWARD C. HERMANIN AND MICHAEL J. MACK

**101 Stable Ischemic Heart Disease, 1977**  
ROBERT P. GIUGLIANO AND EUGENE BRAUNFELD

**102 Cardiovascular Infections, 1983**  
LARRY M. BADDOUR, WILLIAM K. FREEMAN, RAKESH M. SURI, AND WALTER R. WILSON

**103 Infective Endocarditis, 1907**  
LARRY M. BADDOUR, WILLIAM K. FREEMAN, RAKESH M. SURI, AND WALTER R. WILSON

**104 Percutaneous Coronary Intervention, 1287**  
LAURA MAURI AND DEEPAK L. SHATT

**105 Rheumatic Fever, 1210**  
BONGANI M. MALHOTRA

**PART IX DISEASES OF THE MYOCARDIUM, PERICARDIUM, AND PULMONARY VASCULATURE BED**

**106 Congenital Heart Disease in the Adult and Pediatric Patient, 1219**  
GARY D. WEBB, TERESA M. WOOD, MURRAY H. WOOD, AND ANDREW INKROW

**107 Coronary Artery Disease, 1255**  
MARC P. BONACA AND MARRAM T. BAIZER

**108 Coronary Artery Disease: Treatment of Congenital Heart Disease in Adults, 1274**  
JOHN M. LASALA AND DAVID T. BAIZER

**109 Prevention and Management of Myocardial Infarction, 1280**  
RODNEY H. FAJL AND RAY E. HERSHBERGER

**110 Treatment of Noncoronary Obstructive Hypertrophic Cardiomyopathy, 1282**  
BARRY J. MARON, MARTIN S. MARON, AND SCOTT KINLAY

**111 Myocarditis, 1217**  
RICHARD A. JANDA AND JOHN W. HANCOCK

**PART VIII DISEASES OF THE HEART INVOLVED BY TOXINS**

**112 Cardiac Toxins Induced by Drugs, 1281**  
CATHERINE A. JANDA AND JOHN W. HANCOCK

# Video Contents

## 10 History and Physical Examination: An Evidence-Based Approach, 83

- 10.1 V wave
- 10.2 Kussmaul sign
- 10.3 Precordial diastolic gallop

## 14 Echocardiography, 174

- 14.1 Mirror artifact
- 14.2 Four-dimensional transesophageal echocardiogram of aortic and mitral valves
- 14.3 Echo contrast demonstrating pseudoaneurysm at left ventricular apex
- 14.4 Left anterior descending artery infarct
- 14.5 Right ventricle and inferior myocardial infarction
- 14.6 Flail anterior mitral valve
- 14.7 Flail anterior mitral valve with color Doppler showing severe mitral regurgitation
- 14.8 Anteroseptal ventricular septal defect
- 14.9 Inferoseptal ventricular septal defect
- 14.10 Left ventricular pseudoaneurysm
- 14.11 Hemopericardium
- 14.12 Giant left ventricular aneurysm
- 14.13 Takotsubo cardiomyopathy with left ventricular thrombus
- 14.14 Sarcoidosis
- 14.15 Ischemic cardiomyopathy with mitral regurgitation
- 14.16 Functional mitral regurgitation as shown from the left atrial aspect
- 14.17 Hypertrophic obstructive cardiomyopathy
- 14.18 Hypertrophic obstructive cardiomyopathy
- 14.19 Apical hypertrophic cardiomyopathy with apical aneurysm
- 14.20 Left ventricular noncompaction
- 14.21 Arrhythmogenic cardiomyopathy
- 14.22 Amyloid heart
- 14.23 Löffler endocarditis
- 14.24 Positive stress echocardiogram for left anterior descending artery ischemia
- 14.25 Positive stress echocardiogram for inferior ischemia and ischemic mitral regurgitation
- 14.26 Normal mitral valve, by 4D transesophageal echocardiography
- 14.27 Rheumatic mitral stenosis
- 14.28 Rheumatic mitral stenosis viewed from left ventricular aspect, by 3D transesophageal echocardiography
- 14.29 Bileaflet mitral valve prolapse
- 14.30 Bicuspid aortic valve, short-axis view
- 14.31 Bicuspid aortic valve, long-axis view
- 14.32 Unicuspid aortic valve

- 14.33 Quadricuspid aortic valve
- 14.34 Tricuspid stenosis
- 14.35 Carcinoid tricuspid valve
- 14.36 Pulmonic stenosis
- 14.37 Normal bileaflet mechanical mitral prosthesis, by 4D transesophageal echocardiography
- 14.38 Rocking aortic valve bioprosthesis
- 14.39 Thrombosed bileaflet mechanical mitral prosthesis
- 14.40 Tamponade with right atrial inversion
- 14.41 Tamponade with right ventricular outflow tract inversion
- 14.42 Constriction with respirophasic septal shift
- 14.43 Aortic dissection in a Marfan patient
- 14.44 Aortic dissection and severe aortic regurgitation in a Marfan patient
- 14.45 Aortic dissection with flap prolapsing back through aortic valve on transesophageal echocardiography
- 14.46 Aortic dissection showing site of perforation on transesophageal echocardiography
- 14.47 Deep venous thrombus in transit through right atrium
- 14.48 McConnell sign of pulmonary embolus
- 14.49 Vegetation on a rheumatic mitral valve
- 14.50 Abscess around a bicuspid aortic valve
- 14.51 Left atrial myxoma
- 14.52 Papillary fibroelastoma on aortic valve
- 14.53 Spontaneous echo contrast ("smoke") in left atrial appendage on transesophageal echocardiography
- 14.54 Left atrial thrombus and spontaneous echo contrast s/p MV repair
- 14.55 Patent foramen ovale bubble study and interatrial septal aneurysm
- 14.56 MitraClip, as viewed on 4D transesophageal echocardiography

## 16 Nuclear Cardiology, 261

- 16.1 Rubidium PET imaging
- 16.2 FDG PET imaging

## 17 Cardiovascular Magnetic Resonance Imaging, 301

- 17.1 Cine CMR imaging of myocardial infarction complications
- 17.2 CMR imaging of ischemia and infarct extent
- 17.3 Quantitation of myocardial iron content
- 17.4 Myocardial rupture after acute inferior myocardial infarction
- 17.5 Severe left anterior descending arterial stenosis
- 17.6 Mitral valve anomaly in hypertrophic cardiomyopathy

- 17.7 Microvascular dysfunction in a patient with hypertrophic cardiomyopathy
- 17.8 Ventricular tachycardia and syncope
- 17.9 Takotsubo cardiomyopathy
- 17.10 Chronic constrictive pericarditis with pericardial adhesions post radiation
- 17.11 Atrial septal defect
- 17.12 Vector flow lines in the normal aorta
- 17.13 Abnormal flow patterns
- 17.14 Cine imaging of large mass attached to mitral valve
- 17.15 Myocardial infarction and coronary stenosis
- 19 Cardiac Catheterization, 348**
- 19.1 Radial artery catheterization using Seldinger technique
- 19.2 Right heart catheterization via 7F sheath in right internal jugular vein
- 19.3 Left ventriculogram of extensive regional wall motion abnormalities
- 19.4 Left ventriculogram of mild-moderate mitral regurgitation (grade I-II)
- 19.5 Left ventriculogram of ventricular septal defect
- 19.6 Aortogram of moderate aortic regurgitation, Sellers grade II
- 19.7 Aortogram of De Bakey type II dissection of the ascending aorta
- 19.8 Right ventriculogram of patient with pulmonary valve stenosis
- 34 Mechanisms of Cardiac Arrhythmias, 619**
- 34.1 Simulation of anterograde conduction through the atrioventricular node
- 34.2 Simulation of fast-slow reentry using an electroanatomical model
- 34.3 Posterior left atrial activation during atrial fibrillation
- 34.4 Ventricular fibrillation spiral wave activity
- 35 Diagnosis of Cardiac Arrhythmias, 648**
- 35.1 Focal atrial tachycardia
- 35.2 Macroreentrant right atrial tachycardia following atriotomy for repair of atrial septal defect
- 36 Therapy for Cardiac Arrhythmias, 670**
- 36.1 Macroreentrant left atrial tachycardia after pulmonary vein isolation
- 36.2 Macroreentrant left atrial tachycardia after pulmonary vein isolation
- 62 Percutaneous Coronary Intervention, 1271**
- 62.1 Air injected down the right coronary artery
- 62.2 Three coronary arteries off the right coronary cusp
- 63 Diseases of the Aorta, 1295**
- 63.1 Echocardiogram of a patient with Marfan syndrome
- 63.2 Transesophageal echocardiogram of bicuspid aortic valve and dissection flap
- 63.3 Acute type A aortic dissection complicating a massive aortic root aneurysm
- 63.4 Transthoracic echocardiogram of the root phenotype of a bicuspid aortic valve
- 63.5 Transesophageal echocardiogram of dilated aortic root
- 63.6 Acute type A aortic dissection complicated by severe aortic regurgitation
- 63.7 Transesophageal echocardiogram of acute type A aortic dissection
- 63.8 Color flow Doppler of acute type A aortic dissection
- 63.9 Transesophageal echocardiogram of acute type A aortic dissection with prolapse of dissection flap
- 63.10 Color flow transesophageal echocardiogram of severe aortic regurgitation due to acute type A aortic dissection
- 63.11 Color flow transesophageal echocardiogram of severe aortic regurgitation due to massive aortic root aneurysm
- 63.12 Transthoracic echocardiogram of type A aortic dissection
- 63.13 Transthoracic echocardiogram of patient presenting with severe chest pain and near syncope
- 63.14 Transthoracic echocardiogram (subcostal view) of patient with chest pain demonstrating acute aortic dissection
- 63.15 Transesophageal echocardiogram of highly mobile dissection flap
- 63.16 Transesophageal echocardiogram of acute type A aortic dissection
- 63.17 Transesophageal echocardiogram of acute type A aortic dissection
- 63.18 Acute type A aortic dissection
- 63.19 Type A aortic dissection with dissection flap originating in the aortic root
- 63.20 Transesophageal echocardiogram of type A intramural hematoma of the aorta
- 63.21 Transesophageal echocardiogram of an intramural hematoma of the aorta
- 66 Treatment of Noncoronary Obstructive Vascular Disease, 1365**
- 66.1 Diagnostic angiography
- 66.2 Distal superficial femoral artery
- 66.3 Wire advancement through superficial femoral artery
- 66.4 Percutaneous transluminal angioplasty of the superficial femoral artery
- 66.5 Angiography following percutaneous transluminal angioplasty
- 66.6 Angiography following first stent insertion
- 66.7 Angiography of the more proximal lesion
- 66.8 Angiography following second stent insertion
- 66.9 Post-stent dilation angiography
- 66.10 Post-stent angiography
- 68 Aortic Valve Disease, 1389**
- 68.1 Level of outflow obstruction
- 68.2 Left ventricular dilation and increased sphericity with chronic severe aortic regurgitation
- 68.3 Mild aortic regurgitation

- 68.4** Vena contracta measurements
- 68.5** Imaging findings in severe aortic regurgitation
- 68.6** Severe aortic regurgitation
- 68.7** Transesophageal echocardiography of a stenotic bicuspid aortic valve
- 68.8** Bicuspid aortic valve
- 69 Mitral Valve Disease, 1415**
- 69.1** Mild rheumatic mitral stenosis
- 69.2** Planimetry of mitral valve area
- 69.3** Mitral stenosis jet on color-flow Doppler imaging
- 69.4** Three-dimensional transesophageal echocardiography of mitral stenosis
- 69.5** Three-dimensional visualization of rheumatic mitral stenosis
- 69.6** Spontaneous left atrial contrast
- 69.7** Transesophageal echocardiography-guided balloon mitral commissurotomy
- 69.8** Mitral valve morphology
- 69.9** Normal degree of mitral regurgitation
- 69.10** Mitral valve prolapse
- 69.11** Flail mitral valve leaflet
- 69.12** Mitral leaflet flail
- 69.13** Functional mitral regurgitation
- 69.14** Anteriorly directed mitral regurgitation on transesophageal echocardiography
- 69.15** Posteriorly directed mitral regurgitation on transesophageal echocardiography
- 69.16** Bileaflet prolapse and late systolic mitral regurgitation
- 69.17** Multiple mitral regurgitation jets on transesophageal echocardiography
- 69.18** Three-dimensional image of a mitral valve
- 69.19** Radiation-induced aortic and mitral stenosis
- 69.20** Secondary mitral regurgitation
- 69.21** Proximal isovelocity surface area imaging
- 70 Tricuspid, Pulmonic, and Multivalvular Disease, 1445**
- 70.1** Cafergot-induced tricuspid valve disease
- 70.2** Tricuspid stenosis
- 71 Prosthetic Heart Valves, 1455**
- 71.1** Transesophageal echocardiographic view of obstructed mitral bileaflet mechanical valve
- 71.2** Transthoracic echocardiographic parasternal long-axis view of stented bioprosthetic valve
- 71.3** Transthoracic color Doppler echocardiographic parasternal long-axis view of obstructive valve thrombosis in balloon transcatheter aortic valve
- 71.4** Transthoracic color Doppler echocardiographic apical three-chamber view of two paravalvular regurgitant jets in a transcatheter aortic valve
- 75 Congenital Heart Disease in the Adult and Pediatric Patient, 1519**
- 75.1** Anomalous origin of left coronary artery from pulmonary artery
- 75.2** Anomalous origin of left coronary artery from pulmonary artery
- 75.3** Anomalous left coronary artery originating from right pulmonary artery
- 75.4** Scimitar syndrome
- 75.5** Scimitar syndrome
- 75.6** Parachute mitral valve
- 75.7** Tricuspid atresia and dextrocardia
- 75.8** Normal heart
- 75.9** Atrioventricular discordance
- 75.10** Atrioventricular and ventriculoarterial discordance
- 75.11** Double-inlet left ventricle
- 75.12** Double-inlet left ventricle
- 75.13** Double-inlet left ventricle
- 75.14** Double-inlet left ventricle
- 75.15** Double-inlet left ventricle
- 75.16** Double-inlet left ventricle
- 75.17** Double-inlet left ventricle
- 75.18** Double-inlet ventricle with common atrium and common atrioventricular valve
- 75.19** Hypoplastic posterior left ventricle
- 75.20** Superior-inferior ventricles and crisscross heart
- 75.21** Ventricular inversion with common atrioventricular valve and ostium prima defect
- 75.22** Tricuspid atresia
- 75.23** Tricuspid atresia
- 75.24** Hypoplastic right ventricle
- 75.25** Hypoplastic left heart syndrome
- 75.26** Repaired common atrioventricular valve
- 75.27** Repaired common atrioventricular valve
- 75.28** Three-dimensional echocardiography of tricuspid valve, with a hypoplastic mitral valve
- 75.29** Coronary sinus defect
- 75.30** Coronary sinus defect
- 75.31** Anomalous pulmonary venous drainage
- 75.32** Sinus venosus defect
- 75.33** Sinus venosus defect
- 75.34** Amplatzer closure of secundum atrial septal defect
- 75.35** Cause and treatment of platypnea/orthodoxia syndrome
- 75.36** Three-dimensional echocardiography of cleft mitral leaflet
- 75.37** Primum atrial defect
- 75.38** Primum atrial defect
- 75.39** Regurgitant left atrioventricular valve in a primum atrial defect
- 75.40** Unbalanced atrioventricular septal defect
- 75.41** Unbalanced atrioventricular septal defect
- 75.42** Unbalanced atrioventricular septal defect
- 75.43** Doubly committed subarterial ventricular septal defect
- 75.44** Doubly committed subarterial ventricular septal defect
- 75.45** Doubly committed subarterial ventricular septal defect
- 75.46** Perimembranous inlet ventricular septal defect
- 75.47** Perimembranous inlet ventricular septal defect



- 75.48** Perimembranous ventricular septal defect with right ventricular muscle bundles and a small subaortic ridge
- 75.49** Perimembranous ventricular septal defect with right ventricular muscle bundles and small subaortic ridge
- 75.50** Perimembranous ventricular septal defect with right ventricular muscle bundles and small subarterial ridge
- 75.51** Perimembranous ventricular septal defect with right ventricular muscle bundles
- 75.52** Perimembranous ventricular septal defect with right ventricular muscle bundles and small subaortic ridge
- 75.53** Stenotic homograft conduit with stent therapy
- 75.54** Radiofrequency-assisted balloon dilation of atretic pulmonary valve
- 75.55** Calcified homograft conduit with potential coronary compression
- 75.56** Melody valve placement in stenotic homograft conduit
- 75.57** Catheter management of troubled Fontan circulation
- 75.58** Interventional and thrombolytic management of thrombosis in Fontan patient
- 75.59** Catheter management of stenotic left pulmonary artery in Fontan patient
- 75.60** Stent management of kinked Fontan connection
- 75.61** Postoperative view of a palliative Senning procedure
- 75.62** Postoperative view of palliative Senning procedure
- 75.63** Postoperative view of palliative Senning procedure
- 75.64** Postoperative view of palliative Senning procedure
- 75.65** Systemic tricuspid valve coaptation after Senning procedure
- 75.66** Postoperative view of Rastelli procedure
- 75.67** Postoperative view of Rastelli procedure
- 75.68** Rastelli repair of tricuspid valve regurgitation shows moderate tricuspid regurgitation
- 75.69** Moderate systemic tricuspid regurgitation after Senning procedure
- 75.70** Systemic tricuspid regurgitation after Senning procedure
- 75.71** Three-dimensional echocardiography of systemic tricuspid valve after Senning procedure
- 75.72** Interventional therapy of Mustard baffle stenosis and leakage
- 75.73** Poor tricuspid leaflet coaptation
- 75.74** Three-dimensional echocardiography of tricuspid regurgitation
- 75.75** Transesophageal echocardiography of tricuspid regurgitation
- 75.76** Abnormal systemic tricuspid valve in congenitally corrected transposition of the great arteries
- 75.77** Abnormal tricuspid valve in congenitally corrected transposition of the great arteries
- 75.78** Three-dimensional echocardiography of abnormal tricuspid valve in congenitally corrected transposition of the great arteries
- 75.79** Three-dimensional echocardiography of abnormal tricuspid valve in congenitally corrected transposition of the great arteries
- 75.80** Three-dimensional echocardiography of tricuspid regurgitation in congenitally corrected transposition of the great arteries
- 75.81** Stent management of hypoplastic aortic arch
- 75.82** Stent management of adult aortic coarctation
- 75.83** Stent management of complex coarctation repair
- 75.84** Stent management of aortic coarctation
- 75.85** Balloon dilation of critical neonatal aortic stenosis
- 75.86** Fibromuscular subaortic stenosis
- 75.87** Tunnel subaortic stenosis
- 75.88** Three-dimensional echocardiography of fibromuscular subaortic stenosis
- 75.89** Transesophageal echocardiography of congenital mitral stenosis
- 75.90** Transesophageal echocardiography of congenital mitral stenosis and fibromuscular subaortic stenosis
- 75.91** Isolated cleft of the mitral valve
- 75.92** Isolated cleft of the mitral valve
- 75.93** Three-dimensional echocardiography of isolated mitral cleft
- 75.94** Muscular inlet ventricular septal defect
- 75.95** Double-orifice mitral valve
- 75.96** Three-dimensional echocardiography of double-orifice mitral valve
- 75.97** Severe tricuspid regurgitation in congenitally corrected transposition of the great arteries
- 75.98** Ebstein malformation of tricuspid valve
- 75.99** Ebstein malformation of tricuspid valve
- 75.100** Ebstein malformation of tricuspid valve
- 75.101** Valvular pulmonary stenosis
- 75.102** Valvular pulmonary stenosis
- 75.103** Dysplastic pulmonary valve stenosis
- 75.104** Catheter management of neonatal pulmonary atresia with intact ventricular septum
- 75.105** Cor triatriatum
- 75.106** Cor triatriatum
- 75.107** Cor triatriatum
- 75.108** Catheter management of large circumflex artery fistula to left ventricle
- 83 Pericardial Diseases, 1662**
- 83.1** Cine loops of two-dimensional echocardiogram from a patient with cardiac tamponade
- 83.2** Cine MR images in a patient with pericardial effusion and underlying pulmonary hypertension
- 83.3** Cine MR images in a patient with both pericardial and pleural effusions
- 83.4** Cine MR images illustrating septal "bounce" in a patient with constrictive pericarditis
- 83.5** Cine MR images of a patient with constrictive pericarditis before pericardiectomy
- 83.6** Cine MR images of a patient with constrictive pericarditis after pericardiectomy illustrating relief of exaggerated ventricular interaction