Contents

1. History **1**
Kanu Chatterjee
- *The History 1*
- *References 17*

2. Physical Examination **18**
Kanu Chatterjee
- *General Appearance 18*
- *Measurement of Arterial Pressure 23*
- *Auscultation 40*
- *References 68*

3. Plain Film Imaging of Adult Cardiovascular Disease **71**
Brad H Thompson, Edwin JR van Beek
- *Introduction 71*
- *Chest Film Technique 71*
- *Overview of Cardiomediastinal Anatomy 73*
- *Cardiac Anatomy on Chest Radiographs 75*
- *Cardiac Chamber Enlargement 76*
- *Radiographic Manifestations of Congestive Heart Failure 80*
- *Cardiac Calcifications 86*
- *Acquired Valvular Heart Disease 88*
- *Pericardial Disorders 92*

4. Electrocardiogram **96**
Donald Brown
- *Introduction 96*
- *Basis of Electrocardiography 96*
- *Component Parts of the Electrocardiogram 100*
- *Lead Systems Used to Record the Electrocardiogram 100*
- *Common Electrode Misplacements 103*
- *Other Lead Systems 107*
- *Identification of Atrial Activity 107*
- *Characterization of QRS Complex 121*
- *ST–T Wave Abnormalities 131*
- *"U" Wave 134*
- *QT Interval 134*

5. ECG Exercise Testing **137**
Abhimanyu (Manu) Uberoi, Victor F Froelicher
- *Introduction 137*
- *Before the Test 138*
- *Methodology of Exercise Testing 142*
- *During the Test 147*
- *After the Test 160*
- *Screening 166*

6. Left Ventricle **177**
Rakesh K Mishra, Nelson B Schiller
- *Introduction 177*
- *Systolic Function 178*

- *Contrast-Enhanced Echocardiography 197*
- *Other Echo-Derived Indices of LV Systolic Function 197*
- *Strain-Derived Indices 199*
- *Recognizing the Etiology of Cardiac Dysfunction 199*
- *Dilated Cardiomyopathy 200*
- *Hypertrophic Cardiomyopathy 201*
- *Restrictive Cardiomyopathy 203*
- *Left Ventricular Noncompaction 205*
- *Visual Qualitative Indicators of Systolic Dysfunction 205*
- *Diastolic Function 210*

7. Ventricular Function—Assessment and Clinical Application 233

Kanu Chatterjee, Wassef Karrowni, William Parmley

- *Introduction 233*
- *Determinants of Left Ventricular Performance 233*
- *Left Ventricular Pump Function 240*
- *Heart Rate 247*
- *Diastolic Function 249*
- *Right Ventricular Function 251*

8. Transthoracic Echocardiography 261

Byron F Vandenberg, Richard E Kerber

- *Introduction 261*
- *Chamber Quantitation 261*
- *Doppler Echo 271*
- *Diastolic Function 272*
- *Pulmonary Hypertension 277*
- *Pericardial Disease 279*
- *Valvular Heart Disease 285*
- *Infective Endocarditis 303*
- *Intracardiac Masses 304*
- *Contrast Echocardiography 305*
- *Cardiac Resynchronization Therapy 307*

9 Stress Echocardiography 316

Ellen El Gordon, Richard E Kerber

- *Introduction 316*
- *Using Stress Echocardiography in Clinical Decisions 317*
- *Future of Stress Echo 348*

10. Transesophageal Echocardiography 357

Seyed M Hashemi, Paul Lindower, Richard E Kerber

- *Introduction 357*
- *History 357*
- *Guidelines 358*
- *Performance 358*
- *Safety 359*
- *Views 359*
- *Major Clinical Applications 360*
- *Structural Valve Assessment 366*
- *Acute Aortic Dissection 371*
- *Procedural Adjunct or Intraoperative Transesophageal Echocardiography (TEE) 372*

11. Real-time Three-dimensional Echocardiography 377
Manjula V Burri, Richard E Kerber

- *Introduction 377*
- *Technique 379*
- *Clinical Applications 387*
- *Future Directions 420*
- *Limitations 423*

12. Intravascular Coronary Ultrasound and Beyond 433
Teruyoshi Kume, Yasuhiro Honda, Peter J Fitzgerald

- *Introduction 433*
- *Intravascular Ultrasound 433*
- *Optical Coherence Tomography 464*
- *Angioscopy 475*
- *Spectroscopy 482*

13. Cardiovascular Nuclear Medicine—Nuclear Cardiology 497
Elias H Botvinick

- *Introduction 497*
- *Pathophysiologic Considerations 498*
- *Myocardial Perfusion Imaging 505*
- *Risk Assessment of General and Specific Patient Populations 521*
- *Positron Emission Tomography Perfusion and Metabolism 524*
- *Imaging Myocardial Viability 526*
- *Imaging Perfusion 530*
- *Quantitation of Regional Coronary Flow and Flow Reserve 532*
- *Blood Pool Imaging—Equilibrium Radionuclide Angiography and First Pass Radionuclide Angiography 533*
- *First Pass Curve Analysis 535*
- *Equilibrium Gated Imaging—Erna 538*
- *The Value of Functional Imaging 540*
- *Phase Analysis 545*
- *Imaging Myocardial Sympathetic Innervation 545*
- *Radiation Concerns 547*

14. Cardiac Computed Tomography 557
Isidore C Okere, Gardar Sigurdsson

- *Introduction 557*
- *Technical Aspects 558*
- *Coronary Artery Disease 569*
- *Myocardium and Chambers 575*
- *Pulmonary Veins 578*
- *Cardiac Veins 580*
- *Valvular Disease 580*
- *Pericardium 582*
- *Masses 584*
- *Incidental Findings 587*
- *Future 588*

15. Cardiovascular Magnetic Resonance 602
Robert M Weiss

- *Introduction 602*
- *Diagnosis of Epicardial Coronary Artery Stenosis 603*

- *Assessment of Global and Regional Left Ventricular Function at Rest and During Inotropic Stress 604*
- *Myocardial Perfusion Imaging 605*
- *Cardiovascular Magnetic Resonance Coronary Angiography 606*
- *Unrecognized Myocardial Infarction 607*
- *Dilated Cardiomyopathy 607*
- *Hypertrophic Cardiomyopathy 612*
- *Restrictive Cardiomyopathy 616*
- *Cardiovascular Magnetic Resonance-Guided Therapy 618*
- *Valvular Heart Disease 618*
- *Diseases With Right Ventricular Predominance 620*
- *Miscellaneous Conditions 624*

16. Molecular Imaging of Vascular Disease 637
Eric A Osborn, Jagat Narula, Farouc A Jaffer

- *Introduction 637*
- *Molecular Imaging Fundamentals 637*
- *Molecular Imaging Modalities 643*
- *Molecular Imaging of Vascular Disease Processes 646*

17 Cardiac Hemodynamics and Coronary Physiology 676
Amardeep K Singh, Andrew Boyle, Yerem Yeghiazarians

- *Introduction 676*
- *Cardiac Catheterization—The Basics 676*
- *Catheterization Computations 680*
- *Cardiac Cycle Pressure Waveforms 684*
- *Hemodynamics In Valvular Heart Disease 686*
- *Hemodynamics In Cardiomyopathy 695*
- *Hemodynamics In Pericardial Disease 700*
- *Coronary Hemodynamics 703*
- *References 707*

18. Cardiac Biopsy 709
Vijay U Rao, Teresa De Marco

- *Introduction 709*
- *History and Devices 709*
- *Techniques 711*
- *Safety and Complications 713*
- *Analysis of EMB Tissue 714*
- *Indications 716*
- *Disease States 724*
- *Cardiac Transplantation 737*

19 Swan-Ganz Catheters: Clinical Applications 750
Dipti Gupta, Wassef Karrowni, Kanu Chatterjee

- *Introduction 750*
- *Historical Perspective and Evolution of Catheter Designs 750*
- *Placement of Balloon Flotation Catheters 751*
- *Normal Pressures and Waveforms 754*
- *Abnormal Pressures and Waveforms 758*
- *Clinical Applications 759*
- *Indications for Pulmonary Artery Catheterization 768*
- *Complications 769*

20. Coronary Angiography and Catheter-based Coronary Intervention 776

Elaine M Demetroulis, Mohan Brar

- *Introduction 777*
- *Indications for Coronary Angiography 778*
- *Contraindications for Coronary Angiography 780*
- *Patient Preparation 781*
- *Sites and Techniques of Vascular Access 782*
- *Catheters for Coronary Angiography 786*
- *Catheters for Bypass Grafts 788*
- *Arterial Nomenclature and Extent Of Disease 790*
- *Angiographic Projections 792*
- *Normal Coronary Anatomy 793*
- *Congenital Anomalies of the Coronary Circulation 801*
- *General Principles for Coronary and/or Graft Cannulation 806*
- *The Fluoroscopic Imaging System 814*
- *Characteristics of Contrast Media 816*
- *Contrast-Induced Renal Failure 817*
- *Access Site Hemostasis 819*
- *Complications of Cardiac Catheterization 821*
- *Lesion Quantification 824*
- *Degenerated Saphenous Vein Grafts 828*
- *Lesion Calcification 828*
- *Physiologic Assessment of Angiographically Indeterminate Coronary Lesions 829*
- *Clinical Use of Translesional Physiologic Measurements 830*
- *Non-Atherosclerotic Coronary Artery Disease and Transplant Vasculopathy 831*
- *Potential Errors In Interpretation of the Coronary Angiogram 834*
- *Percutaneous Coronary Intervention 838*
- *Pharmacotherapy for PCI 839*
- *Parenteral Anticoagulant Therapy 846*
- *Equipment for Coronary Interventions 848*
- *Percutaneous Transluminal Coronary Angioplasty 851*
- *Coronary Stents 852*
- *Types of Stents 852*
- *Stent Deployment 853*
- *Adjunctive Coronary Interventional Devices 854*
- *Embolic Protection Devices for Venous Bypass Graft PCI 856*
- *Clinical Outcomes 857*
- *Procedural Success and Complications Related to Coronary Intervention 862*
- *Complications Specific to PCI 862*

Index 881