Contents

Section 1

General Considerations 1

Chapter 1. Introduction and History of Cardiac Anesthesia 3

Manjula Sudeep Sarkar, Madhavi Buddhi

- *Early Developments—Anesthesia for Thoracic Surgery 4*
- *Early Cardiac Anesthesia 5*
- *Anesthesia for Early Cardiac Surgery Using Cardiopulmonary Bypass 7*
- *Anesthesia for Coronary Artery Surgery 10*
- *Transesophageal Echocardiography 12*
- *Cardiac Anesthesia as a Subspecialty 13*
- *Achievements of KEM Hospital, Mumbai 13*

Chapter 2. Preoperative Evaluation of Patients with Cardiovascular Disease 15

Manali Nadkarni

- *History 15*
- *Physical Examination 16*
- *Investigations 17*
- *Diagnostic Tests or Procedures 17*
- *Assessment of Cardiac Risk 18*

Chapter 3. Cardiovascular Monitoring 24

Manjula Sudeep Sarkar, Pallavi Waghalkar

- *ASA Monitoring Guidelines 24*
- *ECG Monitoring 25*
- *Noninvasive Blood Pressure Monitoring 27*
- *Invasive Blood Pressure Monitoring 29*
- *Central Venous Pressure Monitoring 33*
- *Pulmonary Artery Catheter Monitoring 35*
- *Cardiac Output Monitoring 38*
- *Transesophageal Echocardiography 41*
- *Coagulation Monitoring 45*
- *Arterial Blood Gas (ABG) Monitoring 47*
- *Temperature Monitoring 50*

Chapter 4. Cardiopulmonary Bypass 53

Manjula Sudeep Sarkar, Shraddha Mathkar

- *Components of Cardiopulmonary Bypass 53*
- *Conduct of Cardiopulmonary Bypass 59*
- *Concerns During Bypass 62*
- *Methods of Myocardial Preservation 65*
- *Post Bypass 67*
- *Sequence of Events for Bypass 69*
- *Complications of CPB 70*
- *Pediatric Cardiopulmonary Bypass 72*

Chapter 5. Cardiovascular Drugs **75**
Manjula Sudeep Sarkar, Neeraj Barnwal

Inotropes and Vasopressors 75
- *Dopamine 75*
- *Dobutamine 76*
- *Epinephrine 78*
- *Norepinephrine 79*
- *Isoprenaline 80*
- *Phenylephrine 82*
- *Milrinone 83*

Antiarrhythmic Drugs 85
- *Clinical Classification of Antiarrhythmic Drugs 85*
- *Amiodarone 86*
- *Diltiazem 88*
- *Lignocaine 90*
- *Esmolol 91*
- *Nitroglycerin 93*
- *Heparin 95*
- *Protamine 98*

Section 2

Cardiac Anesthesia **101**

Chapter 6. Congenital Heart Disease **103**
Manjula Sudeep Sarkar, Neeraj Barnwal, Shraddha Mathkar, Sachin Vaishnav

Acyanotic Congenital Heart Disease 103
Manjula Sudeep Sarkar, Neeraj Barnwal

- *General Anesthetic Considerations in Pediatric Open Heart Surgery 104*
- *Atrial Septal Defect 105*
- *Ventricular Septal Defect 112*
- *Patent Ductus Arteriosus 119*

Anesthesia for Cyanotic Congenital Heart Diseases 124
Manjula Sudeep Sarkar, Shraddha Mathkar, Sachin Vaishnav

- *Tetralogy of Fallot 124*

Total Anomalous Pulmonary Venous Connection 134
Manjula Sudeep Sarkar, Shraddha Mathkar

Chapter 7. Valvular Heart Disease **140**
Manjula Sudeep Sarkar, Pushkar Desai

- *Mitral Stenosis 140*
- *Aortic Stenosis 149*
- *Hypertrophic Cardiomyopathy 155*
- *Mitral Regurgitation 158*
- *Pulmonary Stenosis 165*
- *Tricuspid Stenosis 165*
- *Tricuspid Regurgitation 166*
- *Mixed Valve Lesions 166*
- *Infective Endocarditis (IE) 166*

Chapter 8. Anesthesia for Coronary Artery Bypass Grafting **169**
Manjula Sudeep Sarkar, Pushkar Desai

- *Anesthesia for On-pump Coronary Artery Bypass Grafting 169*
- *Anesthesia for Off-pump Coronary Artery Bypass 178*
- *Anesthesia for Minimally Invasive Cardiac Surgery: MID-CAB 183*
- *Anesthesia for Awake CABG 185*
- *Anesthesia for Transmyocardial Laser Revascularization 186*

Chapter 9. Anesthesia for Vascular Surgery **187**
Sanjeeta Umbarkar, Manish Kela

- *Preanesthetic Evaluation 187*
- *Perioperative Medical Therapy 189*
- *Lower Extremity Revascularization 190*
- *Carotid Artery Revascularization 192*
- *Aortic Reconstruction 194*
- *Thoracoabdominal Aortic Aneurysm (TAAA) 200*
- *Special considerations 201*
- *Endovascular Surgeries 203*

Chapter 10. Anesthesia for Pericardiectomy **208**
Manjula Sudeep Sarkar, Mehul Mange, Pushkar Desai

- *Anesthetic Considerations 210*
- *Intraoperative 210*

Chapter 11. Anesthesia for Cardiac Catheterization: Laboratory Procedures **212**
Sanjeeta Umbarkar, Pushkar Desai

- *Why is an Anesthesiologist Needed in the Laboratory? 212*
- *Anesthesia Challenges 213*
- *Diagnostic Procedures 214*
- *Interventional Procedures 214*
- *Preoperative Evaluation 214*
- *Procedures 215*
- *Anesthetic Implications of Pacemaker 224*
- *Anesthesia Considerations 227*
- *Monitoring 227*
- *Specific Procedures and Effect of Pacemaker 229*
- *Diagnostic Catheterization 230*

Chapter 12. Pregnancy and Cardiac Surgery **233**
Manjula Sudeep Sarkar, Pushkar Desai

- *General Considerations in Pregnant Patients 233*
- *BMV in Pregnancy 234*
- *Open Heart Surgery in Pregnancy 235*
- *Normal Findings in Pregnant Patients 236*
- *Timing of Cardiac Surgery in Pregnancy 236*
- *Cardiopulmonary Bypass and Pregnancy 236*
- *Fetal Heart Rate (FHR) Monitoring 238*
- *Uterine Monitoring 238*
- *Anesthetic Drugs 238*
- *Pregnancy and Myocardial Infarction 239*
- *Pregnancy and Heart Transplant 239*

Section 3

Thoracic Anesthesia **241**

Chapter 13. Anesthesia for Thoracic Surgery **243**
Sunil Gvalani, Nandini Dave, Amit Padvi

- *Preoperative Considerations 243*
- *Intraoperative Management 246*

Section 4

Cardiac Patients for Noncardiac Surgery **255**

Chapter 14. Anesthesia for Cardiac Patients for Noncardiac Surgery **257**
Madhulata Garasia, Sunil Gvalani, Manish Kela, Sunil Chaphane, Priyanka Karnik

Management of Patients with Congenital Heart Disease for Noncardiac Surgery 257
Madhulata Garasia, Priyanka Karnik

- *Recent Advances 260*

Management of Patients with Ischemic Heart Disease for Noncardiac Surgery 261
Sunil Gvalani, Manish Kela

- *Preoperative Evaluation and Identification of Risk Factors 261*
- *Intraoperative Management 261*
- *Regional Anesthesia and IHD 262*
- *Monitoring 262*
- *Induction 262*
- *Maintenance of Anesthesia 263*
- *Intraoperative Ischemia 263*
- *Postoperative Management 263*

Management of Valvular Heart Disease for Noncardiac Surgery 264
Sunil Gvalani, Sunil Chaphane

- *Mitral Stenosis 264*
- *Mitral Regurgitation 266*
- *Mitral Valve Prolapse 267*
- *Aortic Stenosis 268*
- *Aortic Regurgitation 269*

Section 5

Specialty-based Management of a Cardiac Patient **271**

Chapter 15. Cardiovascular Concerns in Neurosurgical Procedures **273**
Anita Shetty, Shrikanta Oak, Viraj Shah, Swarada Pardeshi

- *Cardiovascular Concerns During Management of Raised Intracranial Pressure 273*
- *Cardiovascular Concerns During Prevention of Cerebral Injury 274*
- *Cardiovascular Concerns in Intracranial Pathology 275*
- *Cardiac Emergencies During Neurosurgical Procedures 276*
- *Neuropharmacological Interventions and Cardiovascular Concerns 278*
- *Management of Bradycardia and Asystole During Neurosurgery 278*

Chapter 16. Cardiovascular Concerns in Urosurgical Procedures **280**
Aarti Kulkarni, Nalini Jadhav
- *General 280*
- *Nephrectomy/Pyeloplasty 280*
- *Radical Nephrectomy 280*
- *Radical Cystectomy and Ileal Conduit 280*
- *Transurethral Resection of Prostate (TURP) 281*
- *Extracorporeal Shock Wave Lithotripsy (ESWL) 281*
- *Renal Transplant 281*

Chapter 17. Cardiovascular Concerns in Major Orthopedic Surgeries **282**
Yogita Patil, Navin Pajai
- *Choice of Anesthesia 282*

Chapter 18. Cardiovascular Concerns in Plastic Surgeries **283**
Shweta Salgaonkar, Sanjeevani Zadkar
- *Liposuction and Abdominoplasty 284*
- *Burns 284*

Chapter 19. Cardiac Disease and Liver Surgery **286**
Prerana Nirav Shah
- *Congenital Cardiac Disease 287*
- *Valvular Heart Disease 287*
- *Ischemic Heart Disease 288*
- *Liver Transplant 288*

Chapter 20. Cardiovascular Concerns During Liver Transplantation **290**
Manjula Sudeep Sarkar
- *Preoperative Cardiac Investigations 290*
- *Pathophysiological Changes in the Cardiovascular System Related to Liver Failure 290*

Chapter 21. Cardiovascular Concerns in General and Emergency Abdominal Surgery **292**
Manish Kela, Priti Pednekar
- *Pacemaker and Anesthesia Management 292*
- *Anesthetic Management 296*
- *Postoperative Pain Management 298*
- *Interesting Case 298*

Section 6

Pain Management in Cardiac Surgical Patient **301**

Chapter 22. Postoperative Analgesia for Cardiac Surgical Patient **303**
Sunil Gvalani, Shamala Yashod
- *Pathophysiology of Cardiac Surgical Pain 303*
- *Beneficial Effects of Adequate Postoperative Analgesia 303*
- *Modalities for Postoperative Analgesia 304*

Index *309*