# Contents

## Section 1: Ultrasound Physics and Machines

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Authors</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Scientific Basis of Ultrasonography</td>
<td>AK Debados</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Historical Background</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ultrasound Production</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Echoing Mechanism of Ultrasound</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Types of Images</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What is a Gray Scale?</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Focusing Mechanism of US Beam</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time Gain Control Amplifier</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Types of Transducer/Scanners</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Scientific Basis of Selection of Appropriate Transducer for a Particular Job</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Image Storage System</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Color Flow Imaging</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3D Ultrasound Imaging</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4D Ultrasound Imaging</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Volume Imaging</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ultrasound Contrast Agents</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Artifacts in USG Images and their Physical Basis</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Recent Technical Innovations</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Physics and Machines</td>
<td>Rishabh Bora, Narendra Malhotra</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Requirements of an Obstetrician</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Machines Available</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What to Expect?</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assessment</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Development of Various Types of Transvaginal Probes and the Clinical Evolution</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Color Flow Imaging in Obstetrics: Understanding its Art, Science, and Technology</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Conclusion: Ideal Equipment</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Measurements</td>
<td>Sakshi Tomar</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Measurements in First Trimester</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Measurements in Second and Third Trimesters</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gynecological Measurements</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Doppler Measurements</td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>

## Section 2: Obstetrics

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Authors</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Obstetric Ultrasound When?</td>
<td>R Rajan</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Ovum, Embryo, and Fetus</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prenatal Implications of the Embryo and Fetus</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transvaginal Sonography</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Detection of Fetal Organ Malformations</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Sonoembryology</td>
<td>Rajat Ray</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Gestational Sac</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yolk Sac</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Embryo and Cardiac Activity</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Amnion</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Musculoskeletal System</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Placenta</td>
<td>38</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 6. Problems of First Trimester
BI Patel
- Guidelines for first Trimester: Minimum Standard for the first Trimester 40
- Role of Transvaginal Sonography in Early Pregnancy Loss 41
- Information Provided by First Trimester Ultrasound 41
- Pseudopathology of Embryo 42
- Gestational Sac 44
- Yolk sac 46
- Anembryonic Pregnancy: Blighted Ovum 48
- Missed Abortion 49
- Hydatid Mole: Gestational Trophoblastic Disease 49
- Subchorionic Hematoma 49
- Yolk Sac and Other Biometry Measure for Viability Assessment 52
- Incomplete Abortion 53
- Missed Abortion 56
- Minor Anomalies 56

Chapter 7. 11–14 Weeks Scan
Ashok Khurana
- Statistical Perspective and Natural History of Chromosomal Abnormalities 65
- Parameters for First Trimester Screening 65
- How Screening Protocols Work? 70
- Dysmorphology Diagnosis in the First Trimester 71

Chapter 8. First Trimester Biochemical Screening
PK Shah, Neelima Y Mantri
- Indications 73
- Screening Methods 74
- Biochemical Markers 74
- Nuchal Translucency and Nasal Bone Assessment 75
- Down Syndrome 76
- Advantages of First Trimester Screening 76
- Disadvantages of Biochemical Screening in First Trimester 76
- Various Protocols for First Trimester Screening 76
- Comparison 77
- Conclusion 78
- Newer Trends 78

Chapter 9. Transvaginal Ultrasonography in Ectopic Extrauterine Pregnancy
Jaideep Malhotra, Narendra Malhotra, Neharika Malhotra
- Overview of Sonographic Signs 82
- Color and Pulsed Doppler Sonography for Ectopic Pregnancy 83
- Ultrasound-guided Conservative Management of Ectopic Pregnancy 83

Chapter 10. Prenatal Diagnosis in First Trimester
Raju R Sahetya, Ankesh R Sahetya
- Genetic Counseling 85
- Informed Written Consent and Medical Malpractice 85
- Indications of Prenatal Genetic Diagnosis 86
- Methods of Prenatal Screening and Diagnosis to Determine the Health of the “Unborn” 86
- Typical Screening Sequence 86
- Protocol for Fetal Anatomic Survey with Ultrasound at 11–14 Weeks Gestation 88
- Invasive Techniques 88
- Cytogenetic Chromosomal Studies 90
- Results 91
- Benefits of Prenatal Diagnosis 92
- Ethical and Practical Issues 92

Chapter 11. Doppler in Obstetrics: Basic Principles
Alok Sharma
- Basic Concepts of the Doppler Principle 94
- Doppler Modalities 95
### Contents

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>3D-4D Ultrasound in First Trimester</td>
<td>98</td>
</tr>
<tr>
<td>Sonal Panchal</td>
<td>Technical Aspects 98</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Applications of 3D and 4D US in First Trimester 98</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>3D Ultrasound in Reproductive Medicine</td>
<td>116</td>
</tr>
<tr>
<td>Sonal Panchal</td>
<td>Uterus 116</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adnexa 122</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assessment of Tubal Patency 122</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Infertility 123</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Trophoblastic Diseases</td>
<td>126</td>
</tr>
<tr>
<td>Kazuo Maeda, Asim Kurjak, Gino Varga, Ulrich Honemeyer</td>
<td>Classification, Development, and Pathology 126</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Symptoms of Gestational Trophoblastic Disease 130</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diagnosis of Gestational Trophoblastic Disease 130</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Therapy of Trophoblastic Diseases 139</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Ultrasound Markers of Chromosomal Anomalies in the First Trimester</td>
<td>144</td>
</tr>
<tr>
<td>Ashok Khurana</td>
<td>Statistical Perspective and Natural History of Chromosomal Abnormalities 144</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parameters for First Trimester Screening 144</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overview of Screening Protocols 147</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Second Trimester Biochemical Screening for Chromosomal Anomalies/Aneuploidy</td>
<td>149</td>
</tr>
<tr>
<td>Shantala Vadhiyar</td>
<td>Indications and Algorithms for Second Trimester Screening 149</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Timing of the Test and Markers that are Measured in Maternal Serum 149</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interpretation of Results 150</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Managing Multiple Pregnancy</td>
<td>151</td>
</tr>
<tr>
<td>S Suresh, Uma Ram, Indrani Suresh, Shanthi Sairam</td>
<td>Assessing Chorionicity: Fundamental First Step in Multiple Pregnancy 152</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maternal Problems in Multiple Pregnancy 154</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fetal Growth in Twins 157</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Problems Unique to Monochorionic Diamniotic Twins 158</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Complications and Management of Monochorionic Twins</td>
<td>162</td>
</tr>
<tr>
<td>Akshatha Prabhu Sharma, Anita Kaul</td>
<td>Complications Specific to Monochorionic Twin Pregnanies 162</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Management 170</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Ultrasound Diagnosis of Fetal Growth Restriction</td>
<td>172</td>
</tr>
<tr>
<td>Prashant Acharya, Ashini Acharya</td>
<td>Definition of Intrauterine Growth Restriction/Fetal Growth Restriction 172</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Etiology 173</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Uterine Artery Doppler Measurement 178</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other Fetal Vessels 179</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Placental Evaluation</td>
<td>182</td>
</tr>
<tr>
<td>TLN Praveen, Nozer K Sheriar</td>
<td>Placental Development 182</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Normal Placental Appearance 182</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Placental Maturation and Grading 182</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Placental Localization 184</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Abnormalities of Placentation 185</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Amniotic Fluid Index</td>
<td>188</td>
</tr>
<tr>
<td>Neharika Malhotra, Rishabh Bora</td>
<td>Amniotic Fluid Index 188</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discussion 189</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Admission Test 190</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Management of Fetal Growth Restriction and Fetal Compromise</td>
<td>192</td>
</tr>
<tr>
<td>Narendra Malhotra, Jaideep Malhotra</td>
<td>Etiology 192</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pathophysiology 192</td>
<td></td>
</tr>
</tbody>
</table>
Ultrasound in Obstetrics and Gynecology

- Fetal Growth Rates 193
- Diagnosis of Fetal Growth Restriction 193
- Diagnosis of Fetal Compromise or Jeopardy 193
- Tests For Fetal Well-being 194
- Indications of Fetal Well-being Studies 194
- Markers for Fetal Distress Hypoxia 197
- Fetal Oxygenation 197

Chapter 23. Transvaginal Sonography in Cervical Incompetence 200
PK Shah, Neelima Y Mantri
- Incidence 200
- Etiology 200
- Classification of Cervical Incompetence 201
- Diagnosis 201
- Types of Sonography Procedures 202
- Management of Cervical Incompetence 206

Chapter 24. Hydrops Fetalis 209
Prashant Acharya, Ashini Acharya, Hriday Acharya
- Categories of Hydrops Fetalis 209
- Diagnostic Approach to the Fetus with Hydrops 213
- Neonatal Management of Hydrops Fetalis 214
- Clinical Management 217
- Outcome 220

Chapter 25. Fetal Anomaly Scan Checklist 225
Kuldeep Singh
- Measurement/Methodology 225

Chapter 26. Antenatal Assessment of Fetal Well-being 227
Narendra Malhotra, Jaideep Malhotra, Vanaj Mathur, Sakshi Tomar, Kuldeep Singh
JP Rao, Samiksha Gupta, Neharika Malhotra
- High-risk Patients 228
- Indications for Well-being Tests and Studies 228
- Methods of Fetal Surveillance 228
- Antenatal Fetal Well-being Assessment 235
- Biochemical Tests 239
- Conclusion 239
- Management Protocols for Fetal Growth Restriction 239
- Intrapartum Fetal Monitoring 239

Chapter 27. Doppler Evaluation in Fetal Hypoxia 242
PK Shah, Neelima Y Mantri
- Fetal Hypoxia 242
- Doppler Effect 242

Chapter 28. Use of Three-dimensional/Four-dimensional Ultrasound in Obstetrics 253
Betty Lau, Fang Yang, Teresa Ma, KY Leung
- Basic Three-dimensional Ultrasound Techniques 253
- Techniques of Three Dimensions 255
- Four-dimensional Ultrasound 256
- Roles of 3D/4D US in Obstetrics 256

Chapter 29. Organ-targeted Ultrasound Scanning 261
Kuldeep Singh
- Practical Schematic Analysis for Fetal Abnormalities 262
- Checklist for a Detailed Abnormalities Scan 272
- Things to Remember 272

Chapter 30. Prenatal Diagnosis of Congenital Malformations 274
Kuldeep Singh
- Ultrasound Imaging of Fetal Anomalies 274
- Cisterna Magna 275
- Fetal Face 278
- Fetal Spine 280
- Fetal Thorax 281
- Fetal Abdomen 284
- Esophageal Atresia 284
- Fetal Skeletal System 287
## Contents

### Chapter 31. Ultrasound Markers of Chromosomal Anomalies  
*Jaideep Malhotra, Ashok Khurana*
- Statistical Perspective and Natural History of Chromosomal Abnormalities 289
- Parameters for First Trimester Screening 289
- Overview of Screening Protocols 291

### Chapter 32. Aneuploidy Assessment in Second Trimester Scan—Soft Markers  
*Pooja Lodha, Anita Kaul*
- History 292
- Soft Markers on Genetic Sonogram 293

### Chapter 33. Fetal Echocardiography  
*Sonal Panchal*
- Equipment Settings 298
- Evaluation of the Heart 300
- Study of Internal Cardiac Anatomy 302
- Fetal Circulation 307
- Classification of Cardiac Diseases 308

### Chapter 34. Antenatal Cardiac Diagnosis, Counseling, and Management  
*Vikas Kohli*
- Indications of Fetal Echocardiography 318
- Fetal Cardiac Screening 318
- Timing, Mode, and Place of Delivery 319
- Management of Fetal Arrhythmias 320

### Chapter 35. Color Doppler and 3D and 4D Ultrasound in Screening for Birth Defects  
*Narendra Malhotra, Kuldeep Singh, Sakshi Tomar, Jaideep Malhotra, JP Rao, Neharika Malhotra*
- Screening of Congenital Birth Defects 322
- Role of 3D and 4D Ultrasound 324
- 3D and 4D Ultrasound Equipment and Technique 325

### Chapter 36. Ultrasonography Role in Perinatal Infection  
*Alaa Ebrashy*
- Ultrasound Features in Congenital Infection 331
- Role of Invasive Procedures in the Diagnosis of Intrauterine Infection 334
- Prenatal Management of Specific Congenital Infections Using Ultrasound Markers and Invasive Procedures 334

### Chapter 37. Fetal Behavior Assessed by 4D Sonography  
*Asim Kurjak, Badreeldeen Ahmed, Berivoj Miskovic, Maja Predojevic, Aida Saliagic Kadic*
- Basic Technology of the 4D Sonography in the Assessment of Fetal Behavior 339
- Classification of Movement Patterns 341
- Onset of Specific Fetal Behavioral Patterns Assessed by 3D or 4D Ultrasonography 344
- Fetal Behavior as an Indicator of Disturbed Brain Development 347

### Chapter 38. Three-dimensional Ultrasound in Obstetrics  
*Asim Kurjak, Milan Kos, Nika Kalogjera*
- Modalities of 3D Imaging 363
- Three-dimensional Evaluation of Normal Fetal Anatomy 364
- Volumetry—Organ Volume Measurements 366
- Three-dimensional Assessment of Fetal Malformations 367

### Chapter 39. Prenatal Diagnostic Techniques  
*Prashant Acharya, S Suresh, Deepika Deka, Prathima Radhakrishnan, Anita Kaul, Narendra Malhotra, Jaideep Malhotra, Ashok Khurana, PK Shah, Mandakini Pradhan, Geeta Kolar, Suseela Vavilala, Chander Lulla, Hema Divakar, Gokul Das*
- Training and Registration 376
- The 11–13 + 6 Weeks Scan 376
- The “18–20 Weeks”—Targeted Anomaly Scan 378
- Prenatal Diagnostic Tests 380
- Conclusion 382
- General Principles for Prenatal Diagnosis Programs 382

### Chapter 40. Rh Negative Mother-Antenatal Management  
*Prashant Acharya*

### Chapter 41. Genetics and Pathophysiology of Rhesus Disease  
*Prashant Acharya, Ashini Acharya, Hriday Acharya*
- Genetics of the Rh System 387
- Pathophysiology of Rh Disease 388
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td><strong>Rhesus Alloimmunization Management</strong></td>
<td>390</td>
</tr>
<tr>
<td>Prashant Acharya, Hriday Acharya</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Diagnostic Approach  390</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Clinical Management  392</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Intravascular Transfusion  393</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Intraperitoneal Transfusion  394</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Outcome  395</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td><strong>Labor Room Protocol for Rhesus Negative Mother</strong></td>
<td>397</td>
</tr>
<tr>
<td>Prashant Acharya, Hriday Acharya</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Methods of Assessment for Fetomaternal Hemorrhage  397</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Prophylaxis  398</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td><strong>Fetal Abdominal Wall Defects</strong></td>
<td>401</td>
</tr>
<tr>
<td>Sudheer Gokhale</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Pathogenesis  401</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Sonography of Fetal Abdominal Wall  401</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Gastrochisis  402</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Omphalocele  403</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Thoracoabdominal Syndrome, Pentalogy of Cantrell  404</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Omphalocele–extrophy–Imperforate Anus–spinal Defects Complex  405</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Limb-Body Wall Complex and Amniotic Band Syndrome  407</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td><strong>Sonography of Fetal Chest Anomaly</strong></td>
<td>409</td>
</tr>
<tr>
<td>Sudheer Gokhale</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Pleural Effusion  409</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Congenital Pulmonary Airways Malformation  410</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Congenital High Airways Obstruction  412</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Congenital Diaphragmatic Hernia  413</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td><strong>Diagnosis of Fetal Anemia</strong></td>
<td>416</td>
</tr>
<tr>
<td>Babu S Patel</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Pathophysiology  416</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Diagnosis  416</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td><strong>Fetal Monitoring in Labor: Diagnosing Fetal Distress in the Indian Scenario</strong></td>
<td>420</td>
</tr>
<tr>
<td>Jaideep Malhotra, Ajay S Dhawle, Narendra Malhotra, Neha Malhotra</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fetal Physiology in Labor  420</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Intermittent Auscultation  421</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Continuous Electronic Fetal Monitoring  422</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The Admission Cardiotocograph  425</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fetal Pulse Oximetry  426</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fetal Scalp Blood Sampling  427</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fetal Scalp Lactate  427</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fetal Scalp Stimulation  428</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fetal Electrocardiogram: ST Waveform Analysis  428</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Umbilical Cord Blood Gases  429</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Indian Scenario  429</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td><strong>Prediction of Preeclampsia</strong></td>
<td>432</td>
</tr>
<tr>
<td>Ranjit Akolekar</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Maternal Characteristics and Obstetric History  432</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Biophysical Markers  433</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Biochemical Markers  434</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Screening for Preeclampsia in the First Trimester  435</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td><strong>Prediction of Preterm Labor by Ultrasound Cervical Length</strong></td>
<td>438</td>
</tr>
<tr>
<td>Anu Vij</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Early Diagnosis of Preterm Labor  438</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Evaluation of Cervical Length by Ultrasound  438</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Cervical Length: Multiple Pregnancies  439</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Measurement of Cervical Length  440</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Lower Uterine Segment Contraction  442</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Cervical Funneling: An Independent Predictor of PTD?  442</td>
<td></td>
</tr>
</tbody>
</table>
Section 3: Gynecology

Chapter 50. Normal Pelvic Anatomy and Gynecologic Ultrasound
Amar R, Pratap Kumar, Prashanth Adiga, Ashwini V
- Transabdominal Sonography vs Transvaginal Sonography 449
- Methodology 449
- Orientation and Basic Scanning Maneuvers 450
- Relevant Pelvic Anatomy 451

Chapter 51. Ultrasonography in Gynecology
Narendra Malhotra, Jaideep Malhotra, Sakshi Tomar, Neharika Malhotra, JP Rao, Rohit Jain
- Normal Female Pelvis 456
- Ultrasound of the Uterus 458
- Diseases of Cervix 468
- Vagina 468
- Ovarian Sonography 468
- Gestational Trophoblastic Disorders 477
- Pelvic Kidney 477

Chapter 52. Ultrasound of Cervix
Neharika Malhotra, Amreen Singh
- Cervical Pathology 480
- Measurement of Cervix 483

Chapter 53. Chronic Pelvic Pain
Rohit Jain
- Gynecological Chronic Pelvic Pain 487
- Approach to a Patient with Pelvic Pain 490

Chapter 54. Ultrasonography of the Adnexal Masses
Sakshi Tomar
- Ovaries 494
- Fallopian Tubes 494
- Ovarian Sonography 494

Chapter 55. 3D and 4D Ultrasound of Female Pelvis
Sonal Panchal
- Technical Aspects 503
- Standardization of Image 504
- Uterus 505
- Adnexa and Ovaries 514

Chapter 56. Malignancies of Pelvis
Juan Luis Alcázar
- Endometrial Cancer 523
- Uterine Leiomyomas and Sarcomas 528
- Cervical Cancer 533
- Adnexal Tumors 536

Chapter 57. Ultrasound in the Postmenopause
Martina Ujevic, Biserka Funduk Kurjak, Boris Ujevic
- Challenges of the Postmenopause 548
- Instrumentation 548
- Scanning in the Postmenopause 548
- Postmenopausal Ovary 549
- Postmenopausal Uterus 554
- Postmenopausal Endometrium 557

Chapter 58. Ultrasound of Menopausal Pelvis
Narendra Malhotra, Kuldeep Singh, Jaideep Malhotra, Neharika Malhotra, Rishabh Bora
- Normal Endometrium in Menopause 565
- Postmenopausal Bleeding 566
- Endometrial Fluid Collections 566
- Myometrium in Menopause 566
- Normal Atrophic Ovary 567
- Ovary and Ovarian Cancer Screening 567
Section 4: Infertility

Chapter 59. Evaluation of Female Infertility
Chaitanya Nagori
- Baseline Scan 574
- Ovaries 574
- Uterus 578

Chapter 60. Sonosalpingography
Narendra Malhotra, Jaideep Malhotra, Sakshi Mittal, Neharika Malhotra

Chapter 61. Ultrasound for Cervical Factor Infertility
Shashi Gupta, Sumit Gupta, Pradeep Kumar Gupta
- Cervical Mucus 588
- Postcoital Test or Sims–Huhner Test 588
- Role of Ultrasound 589

Chapter 62. Transvaginal Sonography in Infertility
Narendra Malhotra, Sakshi Tomar, Jaideep Malhotra, JP Rao, Neharika Malhotra, Rishabh Bora, Keshav Malhotra
- Ultrasound Assessment of the Male Partner 595
- Assessment of the Female Reproductive Tract 597
- Ovarian Evaluation by Ultrasound 604
- Role of Transvaginal Color Doppler in Infertility 607
- Role of Transvaginal Color Doppler in Other Conditions Associated with Infertility 607
- Ultrasound-Guided Assisted Reproductive Techniques 608

Chapter 63. Ectopic Pregnancy—No Longer An Enigma
Narendra Malhotra, Jaideep Malhotra, PK Shah
- Investigations 610
- Medical Management 610
- Surgical Management 611
- Future Fertility 611

Chapter 64. Magnetic Resonance Imaging of the Female Pelvic Region
Mary C Olson, Harold V Posniak, Clare M Tempany, Christine M Dudiak
- Technique 613
- Normal Anatomy 613
- Abnormalities of the Female Pelvic Region 615
- Tumor Recurrence Versus Fibrosis 629
- Other Pathologic Conditions 629

Section 5: Interventional Procedures

Chapter 65. Genetics for Obstetricians
Mandakini Pradhan
- What Are Genetic Diseases? 637
- Cell Division and its Importance 638
- Clinical Aspects of Chromosomal Abnormality 638
- Clinical Aspects of Multifactorial Disorder 639

Chapter 66. Risks of Prenatal Diagnostic Procedures: Present Scenario
Dipika Deka, Mrinalini
- Risks of Prenatal Diagnostic Procedures 641
- Pretest Counseling for Prenatal Diagnostic Procedures 642
- Complications of Amniocentesis 642
- Cordocentesis 643
- Chorionic Villus Sampling 644

Chapter 67. Gynecological Interventional Procedures
- 2D and 3D Saline infusion sonography and Hystero-contrast-salpingography 646
  Sanja Kupesic Plavsic, Branko M Plavsac
- Ultrasound Assessment of the Uterus and the Fallopian Tubes 647
- Three-dimensional Hystero-contrast-salpingography 654
- Guided Procedures Using Transvaginal Sonography 658
  Sanja Kupesic Plavsic, Nadah Zafar, Asim Kurjak
- Transvaginal Puncture Procedures 659
- Conservative Management of an Ectopic Pregnancy 663
- Other Applications 665
Section 6: Radiology

Chapter 68. Radiology in Obstetrics and Gynecology
Satish K Bhargava, Sudhanshu Bankata, Shifali Gupta, Mukta Jain, Rishabh Bora
- Obstetrics Radiology: 671
- Fetal Abnormalities: 672
- Pelvimetry: 674
- Radiation Hazard: 677
- Plain Radiographs of the Abdomen: 677
- Role of Plain Radiographs in Specific Gynecological Conditions: 679
- Role of Intravenous Urography in Gynecology: 680
- Role of Cystography: 680
- Barium Enemas: 680
- Lymphangiography: 680
- Angiography: 681
- Vaginography: 681
- Pneumogynecography: 681
- Hysterosalpingography: 682
- Normal Radiological Anatomy: 683
- Hysterosalpingography Appearances: 684

Chapter 69. CT and MRI in Obstetrics and Gynecology
Nitin P Ghonge, Sanchita Dube Ghonge
- Imaging in Obstetrics and Gynecology: An Overview: 691
- Magnetic Resonance Imaging in Obstetrics: 693
- CT and MRI in Gynecology: 702
- Radiation Concerns in Diagnostic Imaging: 719
- Newer Gynecologic Applications of MRI—Diffusion-Weighted MRI: 720

Chapter 70. Endoscopic Ultrasound
Pranay R Shah
- Instrumentation: 725
- Techniques: 726
- Clinical Applications: 726

Chapter 71. Imaging of the Breast
Meeta Kulshreshtha
- Mammography: 727
- Breast Ultrasonography: 732
- Breast Magnetic Resonance Imaging: 734
- Molecular Breast Imaging (Scintimammography): 736
- Positron Emission Tomography: 736
- Electrical Impedance Imaging (T-Scan): 737
- Thermography (Thermal Imaging): 737
- Optical Imaging: 737
- Ductogram (Galactogram): 738

Chapter 72. Magnetic Resonance Imaging: How to Use it During Pregnancy?
Ichiro Kawabata, Yuichiro Takahashi, Shigenori Iwagaki
- Safety of Magnetic Resonance Imaging: 739
- Indication and Procedures for MRI During Pregnancy: 739

Section 7: Miscellaneous

Chapter 73. FOGSI Imaging Science Committee: Training Guidelines
- Guidelines for Recognition of the Center: 751
- Theoretical Training Program: 751
- Practical Training: 753

Chapter 74. Prenatal Diagnostic Techniques Act—Salient Features
RN Goel
- Why this Act: 755
- Prenatal Diagnostic Techniques: 755
- Registration of Genetic Counseling Center, Genetic Laboratory, Ultrasound Clinic, and Genetic Clinic: 759
- Central Supervisory Board: 760
- State Supervisory Board: 760
Chapter 75. Fetal Rights
Reena J Wani, Niraj Mahajan

- Fetal Rights
- Fetal Protection in Law
- Abortion in India
- Drug Use by the Mother
- Behavioral Intervention
- Forced Cesarean Sections
- Forcing Pregnant Women to Do As They are Told: Maternal Versus Fetal Rights
- Research Issues
- Future of Fetal Rights

Chapter 76. Ultrasound and Consumer Forum
Reena J Wani

- Competence
- Disclosure
- Routine Prenatal Screening
- Hazards of Interventional Ultrasound
- Legal Redressal

Chapter 77. Legal Aspects of Obstetric Ultrasound
Narendra Malhotra, Kuldeep Singh, Jaideep Malhotra

- Medical Malpractice
- Legal Actions in Diagnostic Ultrasound
- Medical Malpractice Claim
- Statistics on Malpractice
- Standards of Care
- Training Parameters in Ultrasound in Obstetrics and Gynecology
- Who Can Conduct Obstetrical Ultrasound (Prenatal Diagnostic Test)
- Advanced Antenatal Practice
- Sonography-related Issues
- Countersuit
- What to do if You are Sued?
- Law and Ultrasound and Medical Termination of Pregnancies
- Pre-1971 Laws on Abortion: Section 312–316 of the IPC, 1860
- Suggestions for Better Implementation of the Law

Appendices
1. Language of Ultrasound: Recommended Terminology for Ultrasound
2. History of Ultrasound
3. Performance of Antepartum Obstetrical Ultrasound
4. ACR-ACOG-AIUM-SRU Practice Guideline for the Performance of Obstetrical Ultrasound
5. AIUM Practice Guideline for the Performance of Obstetric Ultrasound Examinations
6. Thomas Jefferson University Protocols for Ultrasound Procedures
7. ICOG Diploma in Obstetric and Gynecological Ultrasound

Index