

Inhalt

Preface to the 2nd edition — VII

Technical ultrasound terms — IX

Part I: Basics of 3D Sonography

1 Basics of 3D and 4D Volume Acquisition — 3

- 1.1 Introduction — 3
- 1.2 Preparing volume acquisition — 3
 - 1.2.1 Optimizing a 2D image before volume acquisition — 4
 - 1.2.2 Choice of the best starting plane at volume acquisition — 5
 - 1.2.3 The acquisition box or volume box — 5
 - 1.2.4 Acquisition angle — 6
 - 1.2.5 Acquisition quality — 8
- 1.3 Transducers for 3D/4D acquisition — 11
 - 1.3.1 Mechanical transducers — 11
 - 1.3.2 Electronic or matrix array transducers — 11
- 1.4 Types of volume acquisition — 12
 - 1.4.1 Static 3D acquisition — 12
 - 1.4.2 Spatio-Temporal Image Correlation (STIC) acquisition — 13
 - 1.4.3 Real-time 4D with a mechanical or an electronic transducer — 13
- 1.5 Display of a volume data set — 14
- 1.6 Conclusions — 15

2 Orientation and Navigation within a Volume Data set — 17

- 2.1 Introduction — 17
- 2.2 Storing and exporting volume data sets — 17
- 2.3 Orientation in the three orthogonal planes — 18
- 2.4 Navigation within the orthogonal planes — 19
- 2.5 Artifacts in the multiplanar mode — 26
- 2.6 Conclusions — 28

Part II: 3D Display Methods

3 3D Rendering and the Rendering Modes — 31

- 3.1 Introduction — 31
- 3.2 The render box and the orientation within a 3D volume — 31
- 3.3 Artifacts in 3D rendering — 36
- 3.4 Different rendering modes and mixture of modes — 37

- 3.4.1 Surface mode rendering — 38
- 3.4.2 Transparency mode rendering — 40
- 3.5 Special effects in 3D: dynamic depth rendering and light source — 42
- 3.6 Threshold, transparency, brightness, and color scales — 46
- 3.7 Magicut, the electronic scalpel — 47
- 3.8 SonoRender live — 52
- 3.9 Conclusions — 52

4 Volume Contrast Imaging (VCI) — 53

- 4.1 Introduction — 53
- 4.2 Principle of VCI — 53
- 4.3 Static VCI — 55
- 4.4 VCI with color Doppler — 59
- 4.5 4D with VCI-Omniview — 61
- 4.6 4D with VCI-A — 63
- 4.7 Conclusions — 65

5 Multiplanar Display I: Orthogonal Mode and Omniview Planes — 67

- 5.1 Principle — 67
- 5.2 Multiplanar reconstruction and different displays of cross-sectional images — 67
- 5.3 Practical approach in orthogonal mode — 68
- 5.4 Practical approach in obtaining an “anyplane” using Omniview mode — 73
- 5.5 Typical applications of the Omniview mode — 74
- 5.6 Conclusions — 81

6 Multiplanar Display II: The Tomography Mode — 83

- 6.1 Principle — 83
- 6.2 Practical approach — 83
- 6.3 Typical applications of the tomography mode — 89
- 6.4 Conclusions — 99

7 The Surface Mode — 101

- 7.1 Principle — 101
- 7.2 Practical approach — 101
- 7.3 Typical applications of the surface mode — 107
- 7.4 Conclusions — 117

8 The Maximum Mode — 119

- 8.1 Principle — 119
- 8.2 Practical approach — 121
- 8.3 Typical applications for bones’ visualization — 126
- 8.4 Conclusions — 132

9 The Minimum Mode — 133

- 9.1 Principle — 133
- 9.2 Practical approach — 133
- 9.3 Typical applications of the minimum mode — 135
- 9.4 Conclusions — 140

10 The Inversion Mode — 141

- 10.1 Principle — 141
- 10.2 Practical approach — 142
- 10.3 Typical applications of the inversion mode — 143
- 10.4 Conclusions — 149

11 The Silhouette Mode — 151

- 11.1 Principle — 151
- 11.2 Practical approach — 152
- 11.3 Typical applications of the silhouette mode — 154
- 11.4 Conclusions — 168

12 The Glass-Body Mode — 169

- 12.1 Principle — 169
- 12.2 Practical approach — 169
- 12.3 Typical applications of the glass-body mode — 172
- 12.4 Conclusions — 184

13 Calculation of 3D Volumes — 185

- 13.1 Principle — 185
- 13.2 Practical approach — 185
- 13.2.1 Virtual Organ Computer-aided Analysis (VOCAL) Software — 185
- 13.2.2 Sonographic Automatic Volume Calculation (Sono-AVC) — 188
- 13.3 Typical applications of volume calculations — 190
- 13.4 Conclusions — 191

14 The Electronic Matrix Transducer — 193

- 14.1 Principle — 193
- 14.2 Biplane display — 194
- 14.2.1 Practical approach — 194
- 14.2.2 Typical applications of the biplane display — 194
- 14.3 Volume Contrast Imaging of the A-plane (VCI-A) — 201
- 14.3.1 Practical approach — 201
- 14.3.2 Typical applications of the VCI-A display — 201
- 14.4 The new tool VCI-2D — 207
- 14.5 Conclusions — 208

Part III: Clinical Applications in Prenatal Diagnosis

15 The Fetal Face in 3D — 211

- 15.1 Examination of the face in 2D and 3D ultrasound — 211
- 15.2 The normal face in 3D surface mode — 212
 - 15.2.1 2D image before 3D acquisition — 212
 - 15.2.2 The insonation angle — 212
 - 15.2.3 3D presets before acquisition — 213
 - 15.2.4 Post processing 3D rendering and volume manipulation — 214
- 15.3 The normal face in 4D surface mode — 217
- 15.4 The normal face at different gestational ages — 218
- 15.5 The abnormal face in 3D/4D — 222
- 15.6 The normal and abnormal ear — 225
- 15.7 The face in multiplanar display — 226
- 15.8 Conclusions — 231

16 3D Fetal Neurosonography — 233

- 16.1 Introduction — 233
- 16.2 Transabdominal 3D examination of the brain and multiplanar reconstruction — 233
 - 16.2.1 3D acquisition of a brain volume — 236
 - 16.2.2 Multiplanar reconstruction and display — 237
- 16.3 Transvaginal 3D examination of the brain and multiplanar reconstruction — 244
- 16.4 Fetal brain visualized with 3D volume rendering — 248
- 16.5 The intracerebral vascular system in 3D glass-body mode — 251
- 16.6 3D of the fetal brain before 14 gestational weeks — 253
- 16.7 Conclusions — 259

17 3D of Skull, Spine, and Limbs — 261

- 17.1 Examination of the fetal skeleton with 2D ultrasound — 261
- 17.2 3D imaging of the facial and cranial bones — 261
- 17.3 3D imaging of the fetal spine and ribs — 265
- 17.4 3D imaging of the fetal limbs — 272
- 17.5 Conclusions — 279

18 3D of Intrathoracic and Abdominal Organs — 281

- 18.1 Introduction — 281
- 18.2 The intrathoracic organs — 282
- 18.3 The gastrointestinal organs — 285
- 18.4 The urogenital system — 290
- 18.5 Conclusions — 295

19 Fetal Echocardiography in 3D and STIC — 297

- 19.1 Fetal cardiac scanning in grayscale and color Doppler — 297
- 19.2 Different acquisitions of cardiac volume data sets — 297
- 19.2.1 Static 3D acquisition — 297
- 19.2.2 STIC/eSTIC volume acquisition — 298
- 19.2.3 Real-time 4D acquisition with an electronic matrix transducer — 300
- 19.3 Fetal heart in 3D and STIC with multiplanar reconstruction — 301
- 19.4 Fetal heart in grayscale STIC with rendering — 309
- 19.5 Fetal heart in color Doppler STIC with glass-body rendering — 314
- 19.6 Automated cardiac volume evaluation and Sono-VCAD — 318
- 19.7 Other applications of 3D/4D fetal heart examination — 319
- 19.8 Conclusions — 319

20 3D in Early Pregnancy — 321

- 20.1 Introduction — 321
- 20.2 3D volume rendering in early gestation — 322
- 20.3 Multiplanar display in early gestation — 333
- 20.4 3D Color Doppler in early gestation — 339
- 20.5 Conclusions — 342

21 Further literature references and sources — 343

Register — 349