

Contents

SECTION I CLINICAL APPLICATIONS, 1

1 Before and After the Ultrasound Examination, 1

*Lisa Strohl, Kathryn A. Gill,
and Betty Bates Tempkin*

Before the Ultrasound Examination, 2
After the Ultrasound Examination, 6

2 Ultrasound Instrumentation: "Knobology," Imaging Processing, and Storage, 8

Lisa Strohl

Alphanumeric Keyboard, 8
Primary Imaging Controls, 9
Basic Operations of an Ultrasound System, 14
Image Processing and Storage, 14

3 General Patient Care, 18

Betty Bates Tempkin

Interpersonal Skills, 18
Ultrasound Examination Room, 19
Patient Care During the Ultrasound
Examination, 19
Aseptic Technique, 22

4 Introduction to Ergonomics and Sonographer Safety, 23

Peggy Ann Malzi Bizjak

Ergonomics Defined, 23
Ergonomics in Sonography, 23
Creating a Safe Environment, 25

SECTION II SONOGRAPHIC APPROACH TO UNDERSTANDING ANATOMY, 28

5 Interdependent Body Systems, 28

Betty Bates Tempkin

Nervous System, 34
Endocrine System, 35
Cardiovascular System, 37
Lymphatic System, 39
Musculoskeletal System, 40
Reproductive System, 42
Digestive System, 44
Urinary System, 45
Respiratory System, 46

6 Anatomy Layering and Sectional Anatomy, 48

*Betty Bates Tempkin and
Alexander Lane*

Directional Terminology, 49
Body Divisions, 49
Tissue Layers, 51
Structure Classification, 52
Structure Orientation, 52
Sectional Planes, 52
Body Structure Relationships, 56
Comparison of Cadaver Sections
and Ultrasound Image Sections, 61
Abdominal Layers, 65
Pelvic Layers, 75

7 First Scanning Experience, 81

Betty Bates Tempkin and Kathryn A. Gill

Body Planes, 83
Ultrasound Scanning Planes, 83
Clinical Criteria, 94
Imaging Criteria, 95
Scanning, 95
How to Describe Ultrasound Findings, 110

8 Embryology, 125

*Avian L. Tisdale, Reva Arnez Curry,
and Betty Bates Tempkin*

Embryologic Development, 127
Reference Charts, 140

9 Introduction to Laboratory Values, 141

Tiana V. Curry-McCoy and Reva Arnez Curry

Agency Oversight of Laboratory Testing, 141
Quality Control of Laboratory Values, 142
Laboratory Values, 143
Summary, 156

10 The Abdominal Aorta, 157

*Myka Bussey-Campbell and
Reva Arnez Curry*

Location, 158
Size, 161
Gross Anatomy, 161
Physiology, 161
Sonographic Appearance, 163
Sonographic Applications, 168
Reference Charts, 170

11 The Inferior Vena Cava, 172

Myka Bussey-Campbell and Reva Arnez Curry

- Location, 173
- Size, 174
- Gross Anatomy, 174
- Physiology, 174
- Sonographic Appearance, 174
- Sonographic Applications, 178
- Normal Variants, 179
- Reference Charts, 179

12 The Portal Venous System, 181

Myka Bussey-Campbell, Reva Arnez Curry, and Betty Bates Tempkin

- Location, 181
- Size, 182
- Gross Anatomy, 182
- Physiology, 182
- Sonographic Appearance, 184
- Sonographic Applications, 185
- Normal Variants, 185
- Reference Charts, 190

SECTION III ABDOMINAL SONOGRAPHY, 192

13 Abdominal Vasculature, 192

Marsha M. Neumyer

- The Abdominal Arterial System, 193
- The Abdominal Venous System, 199
- Reference Charts, 205

14 The Liver, 206

Marilyn Dickerson Prince

- Location, 207
- Size, 212
- Gross Anatomy, 212
- Physiology, 219
- Sonographic Appearance, 220
- Sonographic Applications, 223
- Normal Variants, 225
- Reference Charts, 226

15 The Biliary System, 228

Yonella Demars, Reva Arnez Curry, and Betty Bates Tempkin

- Location, 229
- Size, 232
- Gross Anatomy, 236
- Physiology, 238
- Sonographic Appearance, 238
- Sonographic Applications, 245
- Normal Variants, 246
- Reference Charts, 247

16 The Pancreas, 249

Reva Arnez Curry and Betty Bates Tempkin

- Location, 250
- Size, 250
- Gross Anatomy, 251
- Vascular Anatomy, 253
- Physiology, 253
- Sonographic Appearance, 255
- Sonographic Applications, 262
- Normal Variants, 263
- Reference Charts, 264

17 The Urinary and Adrenal Systems, 266

Reva Arnez Curry and Betty Bates Tempkin

- Location, 267
- Size, 271
- Gross Anatomy, 272
- Physiology, 277
- Sonographic Appearance, 281
- Sonographic Applications, 292
- Normal Variants, 293
- Reference Charts, 293

18 The Spleen, 295

Kacey Davis and Reva Arnez Curry

- Location, 296
- Size, 296
- Gross Anatomy, 298
- Physiology, 299
- Sonographic Appearance, 300
- Sonographic Applications, 302
- Normal Variants, 304
- Reference Charts, 306

19 The Gastrointestinal System, 307

Marilyn Dickerson Prince

- Location, 308
- Size, 316
- Gross Anatomy, 317
- Physiology, 319
- Sonographic Appearance, 320
- Sonographic Applications, 325
- Normal Variants, 330
- Reference Charts, 330

SECTION IV PELVIC SONOGRAPHY, 333

20 The Male Pelvis: Prostate Gland and Seminal Vesicles Sonography, 333

Timothy L. Owens, Michael J. Kammermeier, and Zulfikarali H. Lalani

- Location, 334
- Size, 334
- Gross Anatomy, 334
- Physiology, 336

Sonographic Appearance, 336
 Sonographic Applications, 339
 Reference Charts, 339

21 The Female Pelvis, 341

Betty Bates Tempkin and Marilyn Dickerson Prince

Location, 342
 Size, 350
 Gross Anatomy, 350
 Blood Supply, 358
 Physiology, 360
 Sonographic Appearance, 362
 Sonographic Applications, 388
 Normal Variants, 389
 Reference Charts, 391

SECTION V OBSTETRICS, 392

22 First Trimester Obstetrics (0 to 12 Weeks), 392

Betty Bates Tempkin and Robbi R. King

Maternal Physiology and Embryo
 Development, 394
 Development of the Placenta, 397
 Development of Fetal Membranes, 398
 Development of Amniotic Fluid, 399
 Sonographic Appearance of First
 Trimester Anatomy, 400
 Sonographic Determination of Gestational
 Age, 406
 Sonographic Applications, 408
 Normal Variations, 408
 Reference Charts, 409

23 Second and Third Trimester Obstetrics (13 to 42 Weeks), 411

Betty Bates Tempkin and Robbi R. King

The Placenta, 412
 Amniotic Fluid, 415
 Fetal Organ Systems, 416
 Determination of Gestational Age During
 the Second and Third Trimesters, 441
 Sonographic Applications, 444
 Normal Variants, 445
 Reference Charts, 446

24 High-Risk Obstetric Sonography, 448

Betty Bates Tempkin

High-Risk Pregnancies, 448
 Fetal Sonographic Biophysical Profile, 448
 Doppler Ultrasound Evaluation, 449
 Ultrasound-Guided Procedures, 451
 Multifetal Gestations, 452
 The Expanding Role of Ultrasound
 in High-Risk Obstetrics, 454
 Reference Charts, 455

25 Fetal Echocardiography, 456

Jill Beithon

Prenatal Development, 457
 Location, 459
 Size, 460
 Gross Anatomy, 460
 Physiology, 460
 Sonographic Appearance, 460
 Summary, 473
 Sonographic Applications, 473
 Normal Variants, 473
 Reference Charts, 474

SECTION VI INTRODUCTION TO SPECIALTY SONOGRAPHY, 475

26 The Neonatal Brain, 475

*Angie Rish, Betty Bates Tempkin,
and Reva Arnez Curry*

Location, 477
 Size, 477
 Gross Anatomy, 481
 Physiology, 483
 Sonographic Appearance, 484
 Sonographic Applications, 491
 Normal Variants, 492
 Reference Charts, 494

SECTION VII SMALL PARTS SONOGRAPHY, 496

27 The Thyroid and Parathyroid Glands, 496

Wayne C. Leonhardt

THYROID GLAND, 497
 Location, 497
 Size, 498
 Thyroid Volume, 500
 Gross Anatomy, 501
 Physiology, 501
 Blood Supply, 501
 Sonographic Appearance, 501
 Sonographic Applications, 505
 Normal Variants, 507
 PARATHYROID GLANDS, 507
 Location, 507
 Size, 508
 Gross Anatomy, 508
 Physiology, 508
 Blood Supply, 509
 Sonographic Appearance, 509
 Sonographic Applications, 512
 Normal Variants, 512
 Reference Charts, 515

28 Breast Sonography, 519

Lisa Strohl

- Location, 520
- Size, 520
- Gross Anatomy, 521
- Physiology, 521
- Sonographic Appearance, 521
- Sonographic Applications, 523
- Normal Variants, 523
- Advanced Techniques in Breast Imaging, 527
- Breast Self-Examination, 527
- Reference Charts, 528

29 Scrotal and Penile Sonography, 530

*Timothy L. Owens, Michael J. Kammermeier,
and Zulfikarali H. Lalani*

- Location, 531
- Size, 531
- Gross Anatomy, 532
- Physiology, 534
- Sonographic Appearance, 535
- Sonographic Applications, 539
- Normal Variants, 541
- Reference Charts, 541

SECTION VIII SUPERFICIAL SONOGRAPHY, 542

30 Pediatric Echocardiography, 542

Vivie Miller and Vivian G. Dicks

- Prenatal Development, 544
- Location, 551
- Size, 551
- Gross Anatomy, 551
- Physiology, 559
- Sonographic Appearance, 559
- Sonographic Applications, 574
- Normal Variants, 578
- Reference Charts, 578

31 Adult Echocardiography, 580

J. Charles Pope III

- Prenatal Development, 581
- Location, 581
- Size, 581
- Gross Anatomy, 581
- Physiology, 584
- Sonographic Appearance, 588
- Sonographic Applications, 605
- Normal Variants, 605
- Reference Charts, 607

32 Vascular Technology, 609

Marsha M. Neumyer

- Extracranial Cerebrovascular System, 611
- The Intracranial Cerebrovascular System, 616
- The Lower Extremity Arterial System, 619
- The Lower Extremity Venous System, 625
- Quality Assurance in Vascular
Technology, 629
- Summary, 632
- Reference Charts, 632

SECTION IX ADVANCES IN SONOGRAPHY, 634

33 3-D/4-D Sonography, 634

Cheryl A. Vance

- Methods, 635
- Sonographic Applications, 645
- Advanced Features, 647
- Summary, 656

34 Interventional and Intraoperative Ultrasound, 657

Betty Bates Tempkin

- Ultrasound-Guided Intervention, 657
- Intraoperative Ultrasound, 659