

Contents

Part 1

General Principles

Chapter 1. Principles of Ultrasonography and Types of Ultrasound Imaging	3
Principles of Ultrasound Laminagraphy ...	3
Static Scanning (Contact)	5
Dynamic Real-Time Imaging	8
Mechanical Scanners	8
Arrays (Linear, Curved, Phased)	8
Contact Scanning and Real-Time Scanning .	12
Interventional Sonology	12
Spatial Resolution	12
Contrast Resolution	16
Three-Dimensional Imaging	18
Doppler Imaging	
(Pulsed Doppler, Duplex-Doppler)	19
Color Doppler Scanning	21
Color Coding Without Doppler	21
Expected Improvements in	
Doppler Imaging	21
References and Further Reading	22

Chapter 2. Types of Tissue Echo Pattern and Artifacts	23
Contour Images	23
Tissue Images	23
Liquid and Solid Regions	23
Semisolid (or "Complex") Echotexture ..	26
Tissue Identification or Characterization with Contrast Agents.....	27
Tubular Images	28
Artifacts	28
Acoustic Shadowing	30
Other Artifacts	33
Artifacts in Doppler	37
References and Further Reading	39

Chapter 3. Examination Methods

and Positioning	41
Preparation of the Patient	41
Positions and Scanning Planes	41
Ultrasonically Guided Biopsy and Drainage	42
Choice of Ultrasound Equipment	44
Documentation	44
Who Should Conduct the Examination? ...	45
References and Further Reading	45

Chapter 4. An Anatomic Guide in the Examination of the Upper Abdomen: Echoangiography

.....	47
The Aorta	47
Branches of the Aorta	51
The Vena Cava	60
Branches of the Vena Cava	67
The Portal System	71
References and Further Reading	79

Part 2

The Liver

Chapter 5. Examination Techniques	83
Choice of Techniques	83
Failures	83
Views and Patient Positions	83
Preparation of the Patient	90
Doppler Examination	90
Perendoscopic and	
Laparoscopic Ultrasound	90
Ultrasonographically Guided Biopsy	90
References and Further Reading	91

Chapter 6. Sonoanatomy of the Liver	93	Chapter 9. Primary Tumors of the Liver and Ultrasonographic Follow-up of Liver Transplantation	157
General Shape and Contours	93	<i>Section 1. Primary Tumors of the Liver</i>	157
Contours	93	Malignant Tumors	157
Size	106	Hepatocellular Carcinomas and Fibrolamellar Hepatocarcinomas	157
Hepatic Parenchyma	107	Pathology	157
Tubular Structures	107	Diagnosis of Spread and Screening	163
Sectorial and Segmental Anatomy	110	Rare Malignant Tumors	166
Ultrasonographic Anatomic Relations	117	Interventional Sonology and Radiology in Hepatocarcinoma	166
Conclusion	117	Benign Tumors	166
References and Further Reading	118	Adenoma	167
Chapter 7. Hepatomegaly and Diffuse Liver Diseases	119	Focal Nodular Hyperplasia	170
The Criteria for Hepatomegaly	119	Hamartomas	171
Relations of the Liver to the Costal Margin; Angle and Tangent Signs	119	Cystadenomas	171
Nonspecific Hepatomegaly	121	Lipomas and Angiomyolipomas	171
Cardiac Liver	121	Vascular Tumors	172
Hepatitis	124	<i>Section 2. Ultrasonographic Follow-up of Transplanted Livers</i>	178
Congenital Fibrosis	125	Morphologic Evaluation	179
Other Nonspecific Hepatomegalies	126	Parenchyma and Bile Ducts	179
Storage Diseases	126	Vessels	182
References and Further Reading	129	References and Further Reading	186
Chapter 8. Metastases	131	Chapter 10. Cirrhosis and Portal Hypertension	191
Technical Data	131	<i>Section 1. Morphologic Changes of Cirrhosis and Portal Hypertension</i>	191
Elementary Signs	131	Morphologic Appearances of Cirrhosis	191
Contour Abnormalities	131	Hepatomegaly and the Bright Liver	191
Changes in Echotexture	133	Steatosis, Fibrosis, and Hepatic Retraction	192
Nodules	133	Associated Abnormalities	201
Ductal Abnormalities	142	Splenomegaly	201
Discussion of the Elementary Signs	142	Ascites	201
The Bump Sign	142	Jaundice	201
The Margin Sign	142	Hepatocarcinoma	203
Hypoechoic Regions	142	Portal Hypertension	203
Hyperechoic Regions	144	Etiologic Factors in Portal Thrombosis	206
Global Ultrasound Features of Hepatic Metastases	146	Budd-Chiari-Syndrome and Veno-Occlusive Disease	206
Solitary Nodules	146	Differential Diagnosis	208
Multiple Nodules	147		
Histologic Correlations	148		
Lymphomas	149		
Hepatic Signs	149		
Associated Signs	149		
Metastases and Chemotherapy	152		
Interventional Sonology	152		
Differential Diagnosis	152		
Reliability of Ultrasound – Association with Other Procedures	153		
References and Further Reading	154		

Section 2. Doppler Ultrasound and the Portal Venous System (M. Lafortune)	208	Chapter 13. The Postoperative Liver	269
Introduction	208	References and Further Reading	275
Anatomy of the Portal Venous System	208	Chapter 14. Juxtahepatic Liquid Collections and Ascites; Sonoanatomy of the Peritoneum	277
Physiology of the Portal Circulation	209	Juxtahepatic Collections	277
Portal Hypertension	210	Subcapsular Collections	277
Definition	210	Subdiaphragmatic Collections	279
Pathophysiology	210	Supradiaphragmatic Collections	284
Technique of Doppler Examination	211	Peritoneal Effusions	284
Doppler Flow Volume Measurements ...	214	Small Effusions and the Anatomy of the Ligaments and Peritoneal Recesses ..	284
Normal Doppler Patterns	214	Peritoneal Anatomy: Comparison of Ultrasound and Computed Tomography	305
Doppler in Portal Hypertension	214	Abundant Ascites	305
Prehepatic Portal Hypertension	214	Rare (and Less Rare) Types of Ascites ...	312
Portal Hypertension of Hepatic Origin ..	217	Pneumoperitoneum	312
Posthepatic Portal Hypertension	219	Other Autonomous Peritoneal Diseases ..	313
Surgical Portosystemic Shunts	219	References and Further Reading	314
Nonsurgical Portosystemic Shunts	221	Part 3 The Bile Ducts	
References and Further Reading	222	Chapter 15. The Bile Ducts: Examination Techniques and Sonoanatomy	319
Chapter 11. Abscesses, Cysts, and Parasitoses	227	Examination Techniques	319
Abscesses	227	Gallbladder	319
Bacterial Abscesses	227	Main Bile Duct	320
Amebic Abscesses	233	Intrahepatic Bile Ducts	320
Mycotic (Aspergillic) Abscesses	233	Interventional Sonology	321
Tuberculous Abscesses	235	Perendoscopic Ultrasonography (PERUS) ..	321
Congenital Cysts and Biliary Cysts	235	Sonoanatomy	321
Parasitic Cysts	243	Gallbladder	321
The Common Hydatid Cyst	243	Main Bile Duct	335
Multilocular Echinococcosis	251	Biliary Convergence and Intrahepatic Bile Ducts	337
Other Parasitoses of the Liver	256	References and Further Reading	338
References and Further Reading	257	Chapter 16. Biliary Lithiasis and Cholecystitis	341
Chapter 12. Differential Diagnosis	259	Gallstones	341
Confusing Juxtahepatic Images	259	Direct Sign	341
Hypoechoic Images	259	Indirect Sign	351
Hyperechoic Images	259	Differential Diagnosis and Pitfalls	352
Confusing Anatomic Intrahepatic Images ..	259		
Hypoechoic Anatomic Images	259		
Hyperechoic Anatomic Images	262		
Contour Images	263		
Diagnosis of Liver Diseases	263		
Characterization of a Hepatic Mass (M. Lafortune)	265		
Benign Lesions	266		
Malignant Tumors	266		
References and Further Reading	267		

Specific Diseases of the Gallbladder	356	Chapter 19. Sonoanatomy of the Pancreas ..	409
Lithiasis of the Common Bile Duct	356	Position	409
Intrahepatic Calculi	361	Anatomic Landmarks	413
Cholecystitis	361	Superior Mesenteric Vessels	413
Acute Cholecystitis	361	Splenic Vein	414
Diagnosis of Acute Cholecystitis	367	Left Renal Vessels	417
Chronic Cholecystitis	370	Topography	418
General Reliability		Shape	418
of Biliary Ultrasonography	370	Size	420
Interventional Sonology	371	Echotexture of the Normal Pancreas	421
References and Further Reading	371	Status of Adjacent Vessels	424
		Pitfalls	424
		Variations and Congenital Anomalies	427
		References and Further Reading	429
Chapter 17. Rare Abnormalities			
of the Bile Ducts, Congenital Anomalies,		Chapter 20. Acute Pancreatitis	431
and Tumors	377	Special Examination Techniques	431
Cysts of the Bile Ducts	377	Pancreatic Swelling	431
Caroli's Syndrome		Contours	438
(Ectasia of the Intrahepatic Bile Ducts)	378	Echotexture	438
Aerobilia	379	Liquid Collections	443
Primary Sclerosing Cholangitis, Secondary		Evolution	445
(Pyogenic) Sclerosing Cholangitis	382	Abscesses	446
Tumors of the Gallbladder	382	Postoperative Complications	446
Benign Tumors	382	The Transplanted Pancreas	449
Malignant Tumors	385	Diagnostic Strategy	449
Metastases	386	References and Further Reading	450
Differential Diagnosis	391		
Tumors of the Bile Ducts	392	Chapter 21. Fluid Collections	
Extrahepatic	392	of Pancreatic Origin and Pseudocysts	453
Intrahepatic	392	Definition	453
Clonorchiasis	392	Collections in Situ	453
Trauma of the Gallbladder	392	Spontaneous Evolution of Pseudocysts	456
The Shell Sign	392	Migrating Collections	459
References and Further Reading	394	Pancreatic Trauma	465
		Diagnostic Strategy and	
		Other Diagnostic Methods	465
		References and Further Reading	467
Part 4			
The Pancreas and Retroperitoneal Space		Chapter 22. Chronic Pancreatitis	469
Chapter 18. Examination of the Pancreas:		Echotexture	469
Techniques	399	Contours	470
Review of Anatomy	399	Size	475
Views and Sectional Planes	403	Acute and Subacute Pancreatitis	
Endoscopic, Endoluminal,		Developing on Chronic Pancreatitis	475
and Intraoperative Ultrasonography	406	Tubular Structures	475
References and Further Reading	407		

Associated Signs	478	Pancreatic Differential Diagnosis:	
Conclusions	478	Pitfalls Other than Tumors	526
Reliability of Ultrasonography and		Liquid Images	526
Relations to Other Diagnostic Methods ..	479	Small Bowel	527
References and Further Reading	479		
Chapter 23. Pancreatic Tumors		<i>Section 2. Sonography of Small Bowel,</i>	
and Overview of Pancreatic Disease	481	<i>Appendix, and Colon</i>	
		(G. R. Schmutz, A. Benko, and F. Chapuis) ..	528
<i>Section 1. Pancreatic Tumors</i>	<i>481</i>	Sonographic Technique and	
General Ultrasonographic Signs	481	Normal Small Bowel	529
Tumefaction	483	Bowel Neoplasms	530
Contours	483	Adenocarcinoma	530
Echotexture	486	Lymphoma	531
Associated Signs and Spread	486	Metastatic Bowel Tumors	532
Endocrine Tumors – Nesidioblastomas and		Rare Bowel Neoplasms	533
Apudomas (Insulinomas, Gastrinomas) ..	490	Inflammatory and	
Cystic Tumors – Cystadenomas and		Infectious Bowel Diseases	534
Cystadenocarcinomas	491	Crohn's Disease	534
Rare Tumors	496	Ulcerative Colitis	536
Pancreatic Metastases and Lymphomas ..	496	Pseudomembranous Colitis	536
Relation of Ultrasonography		Neutropenic Colitis (Typhlitis)	536
to Other Diagnostic Methods	496	Infectious Enteritis	537
Reliability	496	Infectious Colitis	537
Strategy	499	Acute Bowel Disease	538
Guided Therapeutic Puncture	500	Acute Appendicitis	538
		Acute Diverticulitis	539
<i>Section 2. Pancreatic Disease:</i>		Bowel Obstruction	541
<i>Overview, Differential Diagnosis,</i>		Intussusception	543
<i>and Diagnostic Strategy</i>	<i>500</i>	Ischemic Bowel Disease	543
References and Further Reading	504	Bowel Wall Hematomas	544
		Miscellaneous Bowel Abnormalities	545
Part 5		Diffuse Diseases of the Small Bowel	545
Humps, Lumps, and Sumps:		Pneumatosis Intestinalis	547
Digestive Tract, Retroperitoneal Masses,		Bezoars and Intraluminal Foreign Bodies	547
Jaundice, and Perendoscopic Ultrasound		Appendiceal Mucocele	547
		Meckel's Diverticulum	548
		Duplication Cysts	548
		Conclusion	549
		References and Further Reading	550
Chapter 24. The Digestive Tract	511	Chapter 25. Other Nonpancreatic Masses,	
<i>Section 1. The Stomach and Duodenum ...</i>	<i>511</i>	Mainly Retroperitoneal	553
Normal Duodenum and Stomach	511	Aneurysms of the Aorta	553
Duodenum	511	Mesenteric Cysts and Varices	553
Stomach	512	Nonpancreatic Retroperitoneal Tumors ...	557
Esophagogastric Junction	515	Adenopathy	557
Confusing Images		The Inframediastinal Compartment	568
Arising from the Normal Colon	518	Other Retroperitoneal Tumors	573
Fecalomas	520	Summary	574
Gastric and Duodenal Tumors	521	References and Further Reading	575

Chapter 26. Jaundice	577	Villous Tumors	628
Examination Technique	577	Submucosal Tumors	628
Diagnosis of Dilatation of the Biliary Tree ..	577	Inflammatory Processes	628
Gallbladder	577	Anal Incontinence	629
Intra- and Extrahepatic Bile Ducts –		Biliopancreatic Pathology	629
The Shotgun Sign	579	The Biliary Tract	629
Intrahepatic Bile Ducts	592	Choledochal Lithiasis	629
Diagnosis of the Level of Obstruction	593	Biliary Tumors	629
Etiologic Diagnosis	594	Cholangitis	630
Lithiasis	594	Pancreatic Lesions	630
Pancreatic and Ampullary Obstructions –		Pancreatic Carcinoma	631
Infiltration of the Distal Common		Endocrine Tumors	633
Bile Duct	598	Cystic Tumors	633
Suprapancreatic Obstruction	603	Ampullar Lesions	635
Hilar and Intrahepatic Obstructions	605	Ampullar Tumors	635
Congenital Anomalies	608	Nontumoral Ampullar Pathology	635
Postoperative Jaundice	608	Diagnosis of Inconclusive Obstructive	
Hepatitis-Induced Intrahepatic		Jaundice	635
Cholestasis	608	References and Further Reading	636
Reliability and Radiologic Strategy	611		
References and Further Reading	612		
 Chapter 27. Perendoscopic Ultrasound (PERUS)		Part 6	
(P.J. Valette with the collaboration		Spleen, Acute Abdomen, and AIDS	
of O. Kerouven-Souget and B. Napoléon) ..	615		
Technique	615	Chapter 28. The Spleen	641
Examination Technique	615	<i>Section 1. Examination Techniques and</i>	
Endosonographic Anatomy	616	<i>Sonoanatomy</i>	641
Digestive Wall	616	Examination Techniques	641
Lymph Nodes	617	Without Splenomegaly	641
Mediastinum	617	Splenomegaly	641
Pancreas and Biliary Tract	619	Sonoanatomy	643
Pelvis	620	General Shape and Contours	643
Digestive Pathology	620	Echotexture	647
Digestive Carcinomas	620	Accessory Spleen, Wandering Spleen,	
Wall Infiltration	620	and Polysplenia	647
Lymph Node Involvement	621	Anatomic Relations	650
Submucosal Tumors	621	Specific Appearances	651
Esophagus	622	Size Criteria	651
Carcinoma	622	<i>Section 2. The Pathologic Spleen</i>	652
Esophageal Submucosal Tumors	623	Nonspecific Splenomegaly	652
Gastric Lesions	624	Splenic Lesions of Lymphomas and	
Carcinoma of the Stomach and		Other Tumors	654
Esophagogastric Junction	624	Lymphomas	654
Gastropathies with Large Rugae		Other Tumors	654
Pattern	624	Cysts	658
Submucosal Gastric Tumors	626	Infarcts, Spontaneous Hematomas, and	
Other Gastric Lesions	627	Abscesses	660
Rectum and Anal Lesions	627	Infarcts and Hematomas	660
Rectal Carcinoma	627		

Abscesses	662	Traumatic Lesions of the Liver	700
Spontaneous Ruptures and		Traumatic Lesions of the Spleen	707
Traumatic Lesions	662	Pancreatic Trauma	714
Calcifications	662	Intestinal Contusion and Perforation ...	714
Aneurysms	663	Other Lesions	716
Differential Diagnosis	663	Interventional Sonology	716
Reliability and Diagnostic Strategy	665	Reliability of Ultrasonography –	
References and Further Reading	665	Comparison with Other Procedures	716
		Conclusion	717
		References and Further Reading	717
Chapter 29. The Acute Abdomen –		Chapter 30. Abdominal Ultrasound	
Abscesses, Hematomas,		in AIDS Patients	
and Postoperative Collections	667	(Y. Menu and J.-P. Laissy)	721
Special Techniques	667	Clinical and Epidemiologic Data	721
Abscesses	667	Hepatic Lesions	721
General Characteristics	667	Kaposi's Sarcoma	721
Topography	671	Lymphoma	722
Postoperative Collections	672	Infection	722
Abscesses	672	Other Hepatic Lesions	723
Other Collections	674	Biliary Lesions	723
Foreign Bodies	675	Other Abnormalities	724
Evolution	675	Conclusion	725
Hematomas	676	References and Further Reading	725
General Characteristics	676		
Topography	677	Chapter 31. Some Practical Advice, or,	
Evolution	682	How to Do Better than We Did	727
The Acute Abdomen Proper	682	Choice of Ultrasonographic Apparatus	728
Acute Painful Right Upper Quadrant ...	684	Sophisticated, Specialized, Automated,	
Acute Painful Left Upper Quadrant	686	and Basic Apparatus	731
Painful Syndromes with Shock	686	Practical Training	731
Acute Appendicitis	696		
Syndromes of Intestinal Obstruction ...	697	Subject Index	733
Intussusception	699		
Biliary Perforation and Septic Processes .	699		
Hernias	700		
Abdominal Trauma	700		