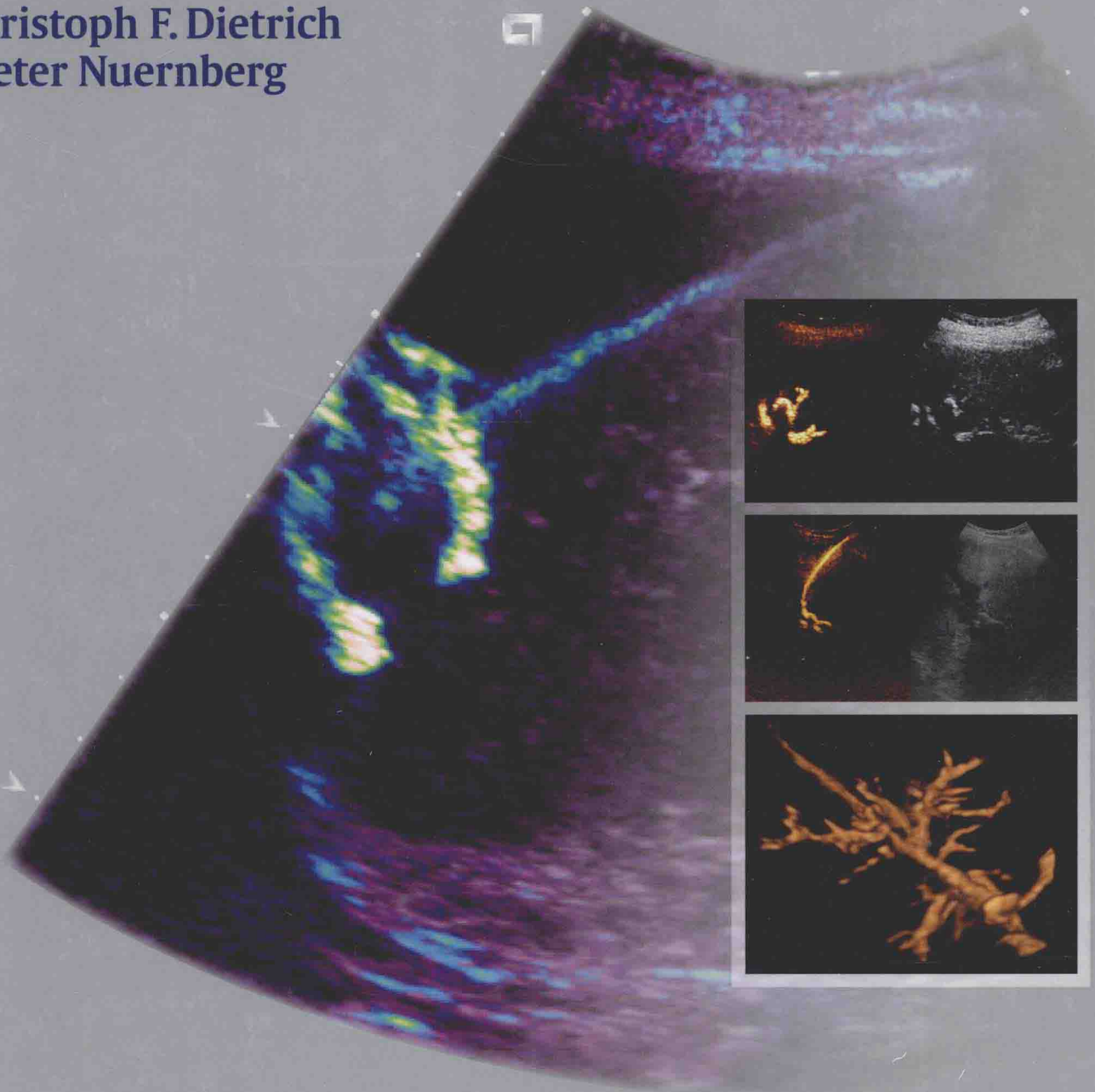


Interventional Ultrasound

A Practical Guide and Atlas

Edited by
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Interventional Ultrasound

A Practical Guide and Atlas

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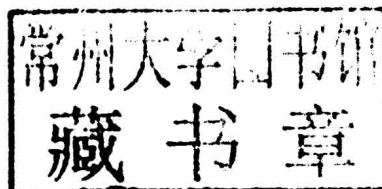
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Foreword

Surprisingly, no comprehensive textbook has been written on the topic of ultrasound guidance of interventional procedures. This may be because ultrasound use in different specialties or subspecialties is so broad and is expanding that it is difficult to complete a comprehensive and timely text on the subject matter. Ultrasound is now used to guide interventional techniques by practitioners in nearly every specialty, including cardiology, radiology, intensive care, anesthesiology, gastroenterology, and others. For this reason it is difficult to collect all of the relevant knowledge and information into a single text. Fortunately, Christoph Dietrich and Dieter Nuernberg have undertaken to do this. Their joint skills as clinicians, teachers, and authors have produced an important textbook of interventional ultrasound. The coauthors of each chapter were carefully chosen to reflect their discipline with expertise in their particular field of interest. Together they have completed a comprehensive text on traditional methods of ultrasound guidance of interventional techniques and have included newer and more advanced use of ultrasound in guiding other techniques. They have also reviewed more recent advances in interventional ultrasound including the use of contrast agents that help identify, guide, and assess the success of different interventional procedures. Certainly ultrasound has been shown to have various advantages over other modalities such as CT in guiding interventional procedures. Ultrasound transducers have been adapted for endoscopic use

and are now routinely used in biopsy of the thorax and the gastrointestinal tract. Many percutaneous biopsy aspiration or drainage techniques are now performed with ultrasound instead of CT because of the real-time capabilities, lack of ionizing radiation, and precision of sonographic needle placement. Furthermore, advanced ablative techniques can be guided by sonography, and the use of modern ultrasound contrast agents allows assessment of the adequacy of tumor ablation after treatment.

The authors first take us back in time with a historical perspective of the use of interventional ultrasound, then deal comprehensively with current technologies, and take us forward to future applications of ultrasound in different subspecialties.

I am very pleased to have been asked to write the foreword for this work because I believe this textbook on interventional ultrasound will be used as a standard reference text in this field. It gives both historical perspectives and up-to-date information on the use of ultrasound in guidance of different interventional techniques. The authors and the editors deserve congratulations for the completion of this important work.

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Preface

Interventional ultrasound procedures have revolutionized clinical practice in recent decades. The advantages of ultrasound-guided interventions include an unsurpassed sharpness of detail and excellent controllability due to the real-time visual display, the wide availability of ultrasound equipment, and a simple and straightforward practical technique. This makes it all the more surprising that a standard textbook of interventional ultrasound has not previously been published.

The editors have accessed a wealth of experience from their expert contributors, who present the subject matter as concretely as possible and offer vivid descriptions of practical techniques. Particular attention is given to clinical significance.

The practice-oriented approach may have caused some instruments to be emphasized over other tested and proven devices, with the result that some reputable companies and their products were not given due attention.

The experience presented here, while proven, is often highly individualized. In future editions, it is intended that the content will be enhanced by input from ultrasound interventionalists who have not contributed to this book so that we may achieve a fuller and more balanced presentation. The advantage of a concrete, detailed chapter format is obvious, and the editors hope to see this work used as a “cookbook” in the everyday practice of interventional ultrasound.

The book consists of two main parts. Part I deals with general aspects of interventional ultrasound, Part II with specific ultrasound-guided procedures. Part I begins with a historical review, which is necessary for the understanding of some current techniques. Next come chapters that present essential basic information on interventional materials, issues of informed consent, equipment requirements, on-site material processing, microbiological aspects, and issues relating to hygiene and management of complications. The importance of assisting personnel is too often overlooked: this is addressed in a separate chapter and under specific subheads. Particularly in oncology, histologic (and/or cytologic) confirmation is essential for planning a highly specialized and differentiated modern treatment strategy. Up-to-date immunohistochemical and immunocytologic staining methods and proliferation indices are essential aids to directing the treatment of gastrointestinal stromal

tumors and other lesions. Lymphomas are classified hematologically as low-grade, aggressive, or highly aggressive lesions, with each type having its own therapeutic implications. The knowledge of contraindications, complication management, and how to weigh risks against benefits forms the basis for the chapters presented.

Part II deals with pulmonary biopsy techniques and thoracic interventions as well as diagnostic and therapeutic interventions involving the thyroid gland, urogenital tract, and musculoskeletal system. Endosonographic interventions are described in detail. Other topics relate to combined radiologic and sonographic interventions as well as critical-care and emergency-room interventions including cardiologic and anesthesiologic procedures. Part II also explores interventions in children and takes a look at new techniques and future perspectives. Symptom-oriented palliative care interventions represent a very topical issue that rounds out the chapter. Therapeutic abscess drainage, interventional tumor ablation techniques, and interventional treatments for parasitic diseases (PAIR [puncture, aspiration, injection, reaspiration] for echinococcosis) enrich our daily practice, as do established therapeutic procedures such as percutaneous transhepatic cholangiography and drainage (PTCD), nephrostomy, and the drainage of pancreatic pseudocysts. In the matter of interventional guidance and approach, it is often necessary to decide between the competing modalities of CT guidance and other imaging techniques, which in some case can and should be used to complement or supplement one another. The role of ultrasound contrast agents in the preparation, support, and guidance of interventional procedures is also addressed.

This book is an expression of interdisciplinary and multiprofessional viewpoints, some of which represent different approaches; this reflects reality in all its diversity. The principle of “do no harm” is expressed in repeated urgings to apply the techniques judiciously in everyday practice and not to become fascinated with technology for its own sake. The decision to proceed with an intervention is always an individual one and should be measured by its benefit for the patient.

Professor Christoph F. Dietrich, MD
Professor Dieter Nuernberg, MD

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Many experts had a hand in the creation of this book. This is evident from the list of distinguished authors. While the chapters were being written all contributions were subject to intense critical discussion by our circle of colleagues who contributed many important and very helpful suggestions and reviews on specific chapters. Some of these colleagues were outside the circle of our authors, and we wish to thank them by name for their extremely valuable feedback and commitment:

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Abbreviations

5-FU	5-fluorouracil
AASLD	American Association for the Study of Liver Diseases
AFP	alpha-fetoprotein
AgNOR	argyrophilic nuclear organizer regions
AGO	Arbeitsgemeinschaft Gynkologische Onkologie
aPTT	activated partial thromboplastin time
ARDMS	American Registry of Diagnostic Medical Sonographers
ASA	acetylsalicylic acid; aspirin
ASA	American Society of Anesthesiologists
ATLS	advanced trauma life support
BCLC	Barcelona Clinic Liver Cancer (staging system)
BP	blood pressure
BW	body weight
CCC	cholangiocellular carcinoma
CDS	color duplex sonography
CEA	carcinoembryonic antigen
CELMIEUS	contrast-enhanced low MI endoscopic ultrasound
CEUS	contrast-enhanced ultrasonography
CIN	cervical intraepithelial neoplasia
CK	cytokeratin
CMV	cytomegalovirus
CNS	central nervous system
COPD	chronic obstructive pulmonary disease
CPB	celiac plexus blockade
CPN	celiac plexus neurolysis
CRP	C-reactive protein
CUP	carcinoma of unknown primary
CVC	central venous catheter
DDAVP	1-deamino-8-d-arginine vasopressin [desmopressin]
DES	drug-eluting stents
DLCL	diffuse large cell lymphomas
DPAM	diffuse peritoneal adenomucinosis
EASL	European Association for the Study of the Liver
EBUS-TBNA	endobronchial ultrasound-guided transbronchial needle aspiration
EBV	Epstein-Barr virus
ECG	electrocardiogram/electrocardiography
ECOG PS	Eastern Cooperative Oncology Group. Performance Status
EDV	end diastolic velocity
EGFR	epithelial growth factor receptor
ELISPOT	enzyme-linked immunospot
EMA	epithelial membrane antigen
ER	estrogen receptor
ERC	endoscopic retrograde cholangiography
ERCP	endoscopic retrograde cholangiopancreatography
ESA	European Society of Anesthesiology
ESBL	extended-spectrum beta-lactamase
ESGE	European Society of Gastrointestinal Endoscopy

ESGENA	European Society of Gastroenterology and Endoscopy Nurses and Associates
ESR	erythrocyte sedimentation rate
EUS	endoscopic ultrasound
EUS-CD	EUS-guided cholangiography and drainage/cholangiodrainage
EUS-CPB	EUS-guided celiac plexus block
EUS-CPN	EUS-guided celiac plexus neurolysis
EUS-FNA	endoscopic ultrasound-guided FNA; endoscopic ultrasonography with fine needle aspiration
EUS-FNB	endoscopic ultrasonography with fine-needle biopsy
EUS-PD	EUS-guided pancreatic duct drainage
EUS-TCB	EUS-guided Trucut biopsy
EVCEUS	extravascular contrast-enhanced ultrasound
FAST	focused assessment with sonography for trauma
FFP	fresh frozen plasma
FISH	fluorescence in situ hybridization
FNA	fine needle aspiration
FNAB	fine needle aspiration biopsy
FNAC	fine needle aspiration cytology
FNB	fine needle biopsy
FNC	fine needle cytology
FNH	focal nodular hyperplasia
fT ₃	free triiodothyronine
fT ₄	free thyroxine
GIST	gastrointestinal stromal tumors
GP	glycoprotein
HAV, HBV, HCV, HDV, HEV	hepatitis A, B, C, D, E virus
HCC	hepatocellular carcinoma
HCG	human chorionic gonadotropin
HDPE	high-density polyethylene
Hep Par 1	hepatocyte paraffin 1
HES	hydroxyethyl starch
HGFR	hormone growth factor receptor
HIFU	high-intensity focused ultrasound
HIPEC	hyperthermic intraperitoneal chemotherapy
HIV	human immunodeficiency virus
HLC	hepatosplenic candidiasis
HMWK	high-molecular weight kininogen
HRPC	hormone-refractory prostate cancer
HU	Hounsfield Unit
HyCoSy	hysterosalpingo-contrast sonography
IGCNU	intratubular germ cell neoplasia, unclassified
IHAT	indirect hemagglutination antibody test
INR	international normalized ratio
IP	intraperitoneal
LCA	leukocyte common antigen
LDH	lactate dehydrogenase
LDPE	low-density polyethylene
LITT	laser-induced thermotherapy
LLD	left lateral decubitus
LLDPE	linear low-density polyethylene

LMWH	low-molecular-weight heparin
MALT	mucosa-associated lymphatic tissue
MCP	metacarpophalangeal
MGG	May-Grünwald-Giemsa
MHEMS	Mobile Hospital Emergency Medical System
MI	mechanical index
MIB-1	monoclonal antibody against Ki-67
MOTT	mycobacteria other than tuberculosis
MRCP	magnetic resonance cholangiopancreatography
MWA	microwave ablation
NAPS	nurse-administered propofol sedation
NASH	nonalcoholic steatohepatitis
NHL	non-Hodgkin lymphoma
NOAC	novel oral anticoagulants
NPV	negative predictive value
NSAID	nonsteroidal anti-inflammatory drug
NSE	neuron-specific enolase
NTM	nontuberculous mycobacteria
PACS	picture archiving and communication system
PAD	percutaneous abscess drainage
PAI	percutaneous acetic acid injection
PAIR	puncture-aspiration-injection of alcohol-reaspiration
PanIN	pancreatic intraepithelial neoplasia
PBC	primary biliary cirrhosis
PCN	percutaneous nephrostomy
PCR	polymerase chain reaction
PCT	palliative care teams
PEG	percutaneous endoscopic gastrostomy
PEI	percutaneous ethanol injection
PFA	platelet function assay
PIN	prostatic intraepithelial neoplasia
PLA	percutaneous laser ablation
PMCA	aggressive peritoneal mucinous carcinomatosis
PNL	percutaneous nephrolitholapaxy
PPD	purified protein derivative [of tuberculin]
PPV	positive predictive value
PRG	percutaneous radiologic gastrostomy
PSA	prostate-specific antigen
PSAP	prostate-specific acid phosphatase
PSC	primary sclerosing cholangitis
PSG	percutaneous sonographic gastrostomy
PSV	peak diastolic velocity
PTA	percutaneous transluminal angioplasty
PTC	percutaneous transhepatic cholangiography
PTCD	percutaneous transhepatic cholangiography and drainage; percutaneous transhepatic cholangiodrainage
PTFE	polytetrafluoroethylene (Teflon)
PTLD	posttransplant lymphoproliferative disease
PTT	partial thromboplastin time
PVP	polyvinylpyrrolidone
RCAP	resistance-controlled automatic power

RCC	renal cell carcinoma
RFA	radiofrequency ablation
RFITT	radiofrequency-induced thermotherapy
RFTA	radiofrequency thermoablation
ROSE	rapid on-site evaluation
SAPV	specialized ambulatory palliative care
SBP	spontaneous bacterial peritonitis
SDMS	Society of Diagnostic Medical Sonography
SIRT	selective internal radiotherapy
SLE	systemic lupus erythematosus
SMA	smooth muscle actin
TACE	transarterial chemoembolization
TB	tuberculosis
THI	tissue harmonic imaging
TIA	transient ischemic attack
TIPS	transjugular intrahepatic portosystemic shunt
TIPSS	transjugular intrahepatic portosystemic stent shunt
TPCD	transpapillary cholangiodrainage
TPHA	Treponema pallidum hemagglutination
TRUS	transrectal ultrasonography
TSH	thyroid-stimulating hormone
TTF-1	thyroid transcription factor 1
TURP	transurethral resection of the prostate
UCA	ultrasound contrast agent
UICC	Union for International Cancer Control/Union Internationale Contre le Cancer
US-FNA	ultrasound-guided FNA
VAH	Association for Applied Hygiene
VaIN	vaginal intraepithelial neoplasia
VDRL	Venereal Disease Research Laboratory [test for syphilis]
VEGFR	vascular endothelial growth factor receptor
VIN	vulval intraepithelial neoplasia
VKA	vitamin K antagonist
VRE	vancomycin-resistant enterococci
VTE	venous thromboembolism
WBC	white blood cell count

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