MEDICAL RADIOLOGY
Diagnostic Imaging

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Contrast Media in Ultrasonography
Basic Principles and Clinical Applications

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Foreword by
A. L. Baert

With 310 Figures in 880 Separate Illustrations, 223 in Color and 11 Tables
This book is dedicated to

Lorenza
and Benedetta
The advantages and the diagnostic potential of microbubble-based contrast agents for ultrasonography have become more and more clear in recent years. Numerous large-scale, multicenter clinical studies have proven that the application of these contrast agents in combination with modern ultrasonographic techniques such as harmonic imaging offers substantial advantages for better management of patients. Indeed, contrast-enhanced ultrasonography allows better tumor characterization in various visceral organs and also improves the study of heart kinetics and vessels patency. The use of microbubble-based contrast agents is now firmly established in routine clinical practice.

This volume covers comprehensively the principles and physical basis of contrast-enhanced ultrasonography as well as its actual clinical applications. The eminently readable text is complemented by superb diagrams and illustrations.

The editor, E. Quaia, is a renowned expert who has lectured and published widely on the topic of ultrasonographic contrast agents. The authors of individual chapters were invited to contribute because of their long-standing experience and their major contributions to the radiological literature on the topic.

I would like to thank the editor and the authors most sincerely and congratulate them for the superb efforts that have resulted in this outstanding volume.

This book will be of great interest for general and specialized radiologists who want to increase their familiarity with this exciting new development in imaging. I am confident that it will meet the same success with readers as the previous volumes published in this series.

Leuven

ALBERT L. BAERT
Microbubble-based contrast agents for ultrasound were introduced some time ago, although their clinical application has become widespread only in recent years. Since color and power Doppler reveal overt artifacts after microbubble injection due to the peculiar features of harmonic signals produced by insonation of microbubbles, dedicated contrast-specific modes of US were introduced to optimize the registration of such signals. In the past few years numerous reports have described the effectiveness of microbubble-based agents in many fields of clinical imaging, and the utility of microbubble-based agents in routine clinical practice is now under evaluation. The preliminary results are interesting and it seems that microbubble-based agents deserve an important place in the US field.

The most important obstacle to the widespread employment of microbubble-based agents has been the reluctance of many sonologists to accept this new way of performing US scanning. The preparation and the intravenous injection of microbubbles involve a significant increase in the examination time, which seems to negate the traditional advantages of US, such as the feasibility and the rapidity of the diagnostic procedure. Microbubble-based agents have to be considered as a necessary adjunct to baseline US which allows one to solve many diagnostic problems directly in the US unit, avoiding contrast material-enhanced CT or MR examinations in many clinical situations.

The principal areas of employment of microbubble-based agents are the large vessels, the heart and the parenchymal organs. This is because these agents allow assessment of vessel patency, evaluation of heart chamber kinetics and identification and characterization of tumors. Moreover, many other interesting applications have been identified, including the use of microbubble-based contrast agents in the quantification of organ perfusion and in gene therapy.

The offer of Professor Albert Baert to edit a comprehensive textbook on the physical basis and clinical applications of microbubble-based US contrast agents was a wonderful opportunity to describe these new substances and their capabilities in radiologic and clinical practice. Each chapter was written by well-recognized experts in the field, and the principal effort of the editor was to ensure excellent illustrations and literature revision, besides text quality. After a preliminary introduction to the principles and physical basis, this book provides a comprehensive review of the recognized clinical applications of microbubble-based agents. Special attention was also dedicated to practical aspects, such as the preparation of microbubble-based agents and the correct employment of the different contrast-specific techniques after microbubble injection. As reflected by the authors of the chapters, including radiologists, gastroenterologists and physicists, this book is not exclusively intended for the radiology community but also for clinicians and academics. I hope that this book will help to provide for microbubble-based agents a secure place in the daily clinical practice of US.
I would like to express my sincere thanks to my previous department heads, Professor Ludovico Dalla Palma and Professor Roberto Pozzi Mucelli, and to my present director, Professor Maria Cova, for giving me the opportunity and the resources to work in this field of diagnostic imaging. My heartfelt appreciation also goes to all the authors and co-authors who contributed to the realization of this book and to Daniela Curzio and Marc Engelhardt from Bracco Imaging for essential aid with the illustrations.

My sincere gratitude to Professor Baert and to Ms Ursula Davis of Springer for their continuous support and belief in this work. A note of thanks also to other staff of Springer for the editorial work.

Trieste

Emilio Quaia
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