

Preface

From years of being both student and teacher, I've found that the best way to learn a new field is one-on-one, with an interested student, a willing teacher, and a pad of paper between them. As a result, the tone of this book is not that of a didactic classroom lecture, but an informal exchange between two colleagues. When you read each chapter, imagine that we are sitting side-by-side and that I am doing my best to explain the basics of magnetic resonance imaging (MRI) and the essentials of breast MRI to you. The figures and the occasional formula illustrate the essential concepts on the pad of paper between us.

An informal, one-on-one approach affords the opportunity to include a little history and provide a personal emphasis that is often difficult to communicate in the classroom. Therefore, do not be surprised by the occasional historical aside about developments in basic physics related to MRI, to the development of MRI, and breast MRI.

When I told Dr. Dan Kopans that I was writing a book to convey the basics of MRI to breast imagers, he had three words of advice: "keep it simple". I have tried to do that. Of course, Dan never keeps advice to just three words. He went on to say that the MRI physics explanations had to be simple enough that even he could understand them. At that point, I enlisted Dan, and a number of other practicing radiologists, to serve as reviewers of this book, to make sure the level and content are appropriate. In addition to Dr. Dan Kopans, I want to thank Dr. Jean R. Paquelet, Dr. Lora Barke, Dr. Eric Berns, and Dr. Richard Pacini for reading and commenting on each of the chapters in this book. Their efforts have made the task easier for you. Special thanks go to Dr. Frank Shellock for reviewing Chapter 12 on MRI safety and for providing the patient and personnel screening forms that are reprinted in the Appendix.

The one thing I ask of you as you start this book is that you give the story a chance to unfold. MRI is not a one-act play. It requires learning a number of fundamentals and then putting them all together before you can experience the breakthrough of understanding how MRI really works. I will try to minimize the unnecessary, extraneous facts, and will try to focus on the essentials that prepare you for that breakthrough.

One of the essentials of learning MRI is to equip yourself with models that convey a better intuitive feeling for how MRI actually works. This is certainly done in

other texts, but this book places special emphasis on giving you pictorial models for the essential aspects of MRI. Hence, there will be more pictures and graphs that you probably want to take the time to look at, but each picture will be helpful in putting it all together to understand how MRI and breast MRI work.

My goal for this book is that when you finish the fundamentals, Chapters 1–7, you will understand how MRI works. At that point, you should have a clear understanding of why T2-weighted pulse sequences make cystic lesions bright without contrast and why T1-weighted imaging makes lesions bright with contrast. Moreover, you should be beginning to arm yourself with the tools you need to understand the intricacies of MR pulse sequences. If you already know all this, then skip to Chapter 8 for the start of breast MRI. My goal with the second part of the book is that by the time you get to Chapter 11, you will have a good idea of how breast MRI works and how you can best perform breast MRI in your own practice, including the selection of breast protocols. By the end of Chapter 11, you should know the differences between good and bad breast MRI and how you can maximize image quality with your current equipment.

Chapter 12 is on MR safety, with an emphasis on breast imaging. Chapter 13 focuses on newer techniques that may help improve the sensitivity and specificity of breast MRI. This section describes some of the new techniques being developed that might make breast MRI (and possibly MRS) that rare examination that has both high sensitivity and high specificity for breast cancer.

Finally, I would appreciate your feedback on this book. I'm sure that even after careful review and editing, it won't be free of errors or perfectly clear to everyone who reads it. If you see ways that I can correct or improve the book, please let me know by e-mail at: edward.hendrick@gmail.com. If you like certain aspects of the book, I would appreciate hearing about that, too. Both forms of feedback complete the one-on-one student-teacher relationship, where neither person is entirely student or entirely teacher, and both benefit from the experience. I sincerely hope that you do.

Chicago, Illinois

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Breast MRI

Fundamentals and Technical Aspects

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