Body MR Imaging at 3 Tesla

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Contents

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Foreword

As the use of 3T systems evolves into the standard of care for body MR imaging, an in-depth understanding of the differences between body imaging at 3T versus 1.5T becomes critical for all diagnostic imagers. Up until now, a thorough knowledge of protocols, physics, and potential pitfalls in 3T MR imaging of the body has been limited to those radiologists with extensive experience at this higher field strength. Fortunately, with the publication of *Body MR Imaging at 3 Tesla* by Drs. Ihab Kamel and Elmar Merkle, this knowledge and insight is now available to a wide audience of diagnostic radiologists and other clinical imaging physicians. Drs. Merkle and Kamel are truly authorities in high-field body MR imaging; in this book, they have gathered additional experts from around the world to lend their own proficiency in MR imaging at 3T. The editors have done an outstanding job of choosing clinicians and scientists involved in the development and early adoption of 3T MR imaging of the body, and have created a compendium that will truly impact the field for years to come. It is a particular pleasure for me to write this introduction, as I have had the honor of working closely with Dr. Merkle for over 12 years and with Dr. Kamel for the past 7 years. Watching them produce this textbook is a pleasure only equaled by the satisfaction of reading its content. To you, the reader, I wish many hours of enjoyment and learning in your reading of this book, and I am certain your future patients will benefit from much that you learn in the process!

Jonathan S. Lewin, MD, FACR

Preface

The intent of *Body MR Imaging at 3 Tesla* is to provide a closer look at various MR applications within the chest, abdomen, and pelvis with specific emphasis on the effects of a higher 3T magnetic field strength.

Since the inception of MR imaging in the 1970s, radiologists have intensively searched for the optimal magnetic field strength, and this quest continues. In the early 1980s, a magnetic field strength of 0.3T was considered optimal. During the 1990s, we saw a shift toward 1T and 1.5T; and over the last ten years, we have seen a substantial trend toward 3T MR imaging. The search for higher field strength has been driven by the desire for an increase in signal-to-noise ratio, which can be kept to improve image quality, or traded for increased spatial resolution, improved temporal resolution, or both. Besides a gain in signal-to-noise ratio, other factors such as safety issues, image artifacts, and efficiency of contrast agents, to name a few, also have to be considered.

For this book, we are fortunate to have the contributions of many colleagues, all of whom were chosen as clinicians and scientists involved in the early adoption of 3T scanners in their practice. In the first chapter of this book, Dr. Kevin Chang and Dr. Ihab Kamel cover the basic concepts of MR physics and safety aspects relevant to the switch from 1.5T to 3T. Following this chapter, Dr. Diego Martin's group discusses novel acquisition techniques that are facilitated by 3T. Dr. Connie Lehman's group contributed the chapter on breast MR imaging, where early results at 3T have been both promising as well as challenging. Two cardiovascular research groups based in Madison/Wisconsin and Mannheim/Germany discuss cardiac as well as thoracoabdominal vascular MR. These chapters are followed by organ-specific contributions that examine in greater detail MR imaging of the liver, biliary system, pancreas, adrenals, kidneys, small bowel, large bowel and rectum. Finally, Dr. Katarzyna Macura and Dr. Susan Ascher's groups provide their insights of the advantages of 3T MR imaging of the male and female pelvis, respectively.

As you read this book, it is our hope that you realize how little is scientifically proven about the advantages of 3T over 1.5T MR imaging. None of the contributors had a wealth of scientific literature to rely on, and there are topics such as renal MR imaging, where not a single comparison study is currently available. This is surprising since the US Food and Drug Administration (FDA) approved 3T MR systems for clinical use in 2002. Thus, despite the mostly marketing-driven hype about 3T, it currently remains unclear whether body MR imaging at 3T is superior to standard 1.5T MR imaging. Notwithstanding radiologists' continued faith in the advantages of 3T, perhaps this book will provide the necessary guidance to make an informed choice between 3T and 1.5T body MR imaging rather than simply following the all-too-common "bigger must be better" approach.