Radiological practice often evolves in small incremental steps rather than by quantum leaps. Old techniques or ideas may be given a new lease of life through novel applications, and anecdotes of these can be drawn from oncological imaging. For example, although positron emitting radionuclear tracers have been in use since the 1950s, it is only in the last decade that the power of positron emission tomography (PET) has been widely harnessed, such that PET-CT imaging is now mainstream and indispensable for the management of a patient with cancer. By comparison, although diffusion-weighted MR imaging (DW-MRI) has been routinely employed for the evaluation of intracranial diseases for two decades, it is only in the last few years that MR technological advances have enabled the technique to be successfully implemented in the body.

DW-MRI is appealing as an imaging technique for several reasons. First, the imaging can be performed relatively quickly and thus has the potential to be widely generalized and adopted. Second, the technique does not require the administration of exogenous contrast medium, which is attractive in the light of potential serious adverse effects of gadolinium-based contrast media. Third, the technique yields both qualitative and quantitative information, the latter being of particular importance as development of quantitative imaging techniques is now acknowledged to be critical to the future of radiology.

DW-MRI yields unique information that reflects microstructural and functional alterations in tissues. Although there are still many challenges ahead, early experience with the technique has shown substantial promise. We hope that this volume will demonstrate the exciting potentials of this technique, discussing the applications of DW-MRI along broad themes of clinical practice rather than by organ systems.

The book is divided into four sections. The first describes the principles, techniques, and interpretation of DW-MRI in the body. The second focuses on reviewing the non-oncological applications of DW-MRI in the body, including the evaluation of organ function. The third and largest section of the book highlights the oncological applications of DW-MRI for disease detection, disease characterization and assessment of tumour response to different therapeutic strategies. Dedicated chapters cover lymph node, bone and whole-body imaging using DW-MRI, as developments in these areas could have substantial impact on future clinical practice. Finally, the promise of multifunctional MR imaging and development of DW-MRI as a biomarker are discussed.

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We hope this book will stimulate, motivate and inspire radiologists working in non-academic as well as in academic institutions, to apply this novel non-invasive MR imaging technique to address critical questions in their clinical practice, making use of the unique information provided by the technique that is beyond morphological imaging.

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