
Preface

The muscular system is one of the largest organ systems of the human body. In almost every MR image, skeletal muscles are also displayed. Although muscular diseases encompass a huge and heterogeneous group of both hereditary and acquired disorders, in most cases of progressive disease, myopathy presents with focal or general muscle weakness, which is, however, an unspecific symptom. Since the clinical presentation of these disorders may be quite similar, there is a need for ancillary testing. Therefore, in principle, imaging techniques that offer differential diagnostic clues are urgently needed. The ancillary testing in cases of suspected myopathy has traditionally included, besides clinical data, electrodiagnostic, histopathologic, and genetic information, whereas imaging of the peripheral nerves and skeletal muscles was in the past not routinely included in this integrated approach to diagnosis and treatment.

There is increasing evidence, however, that MRI has many advantages for imaging the skeletal muscle, e.g., it can image both superficial and deep structures with equal efficacy (better than ultrasonography), and it can image large areas of the body and is thus ideal for describing patterns of muscle involvement. Moreover, MRI provides excellent differentiation between the skeletal muscle, fat, and adjacent tissues, including bones and tendons. Quantitative MRI measures are valuable for monitoring disease progression. Thus, by virtue of the excellent contrast that it offers between healthy and diseased tissues, MRI is currently the most sensitive imaging modality for displaying the skeletal muscle and its pathologic changes. To date, nevertheless, MRI has often been assigned a subsidiary role in the diagnostic work-up of muscular diseases since routine MRI protocols frequently reveal no pathognomonic findings. This is because morphologic alterations such as edema-like or lipomatous changes are sensitive indicators of disease but are not very disease specific and do not visualize the underlying (patho) physiologic changes.

Now, however, exciting new advances in modern MRI technology make possible the acquisition of functional images that provide deeper insights into the muscle metabolism and even allow for dynamic assessment of the muscular motion. Surrogate patho-physiologic parameters, such as muscular microcirculation, sodium homeostasis, energy and lipid metabolism, and muscle fiber architecture, can now be investigated using these functional MR techniques. Therefore, a much higher level of acceptance and also demand by clinicians are to be expected for these new techniques in the near future, and radiologists will have to face up to the increasing value of MRI in imaging the skeletal musculature.

In order to help in meeting these demands, this book provides a comprehensive overview of the potential of MRI of the skeletal musculature. Recognized authors from all around the world present their experiences regarding the current role of MRI in imaging the skeletal musculature and the diagnostic work-up of myopathies.

The book starts with three chapters on the role of MRI in imaging the skeletal musculature, with a focus on clinical needs, the correlation of imaging to anatomy, and when to use MRI and when to use ultrasonography.

The next six chapters present cutting-edge research findings obtained using modern morphologic and functional MRI techniques for assessment of the skeletal musculature and give some examples of the added value offered by these techniques in the evaluation of muscular diseases. A wide range of topics are covered, from whole-body MRI for evaluation of the entire muscular system to the insights into muscle cell metabolism provided by spectroscopic imaging. Furthermore, promising techniques for the skeletal muscle that have already been introduced in other organ systems, such as diffusion and perfusion imaging and dynamic MRI techniques, are thoroughly discussed.

The last part of the book describes the value of MRI in the diagnostic work-up of different pathologies of the skeletal musculature. In detail, the role of MRI is elucidated in muscle injuries, in neurogenic myopathies, and in establishing the cause of muscle denervation. Of course, the MRI findings in the large fields of muscle dystrophies, inflammatory myopathies, and autoimmune-mediated myositis, as well as muscle channelopathies, are presented and the added value provided by MRI in relation to clinical examination is described. Moreover, the role of MRI alongside electrodiagnostic and genetic testing in the diagnostic work-up is discussed. The MRI characteristics of tumors of the muscle and their sheaths are discussed in detail in the final chapter.

To sum up, “Magnetic Resonance Imaging of the Skeletal Musculature” addresses the increasingly rapid advances in modern MR techniques for imaging of the skeletal musculature and gives a comprehensive overview of the cutting-edge value of MRI for the assessment of normal and diseased skeletal muscle, as well as helpful guidance on the role of alternative imaging techniques, such as ultrasonography. I hope that this book will be a useful and an insightful tool for all physicians with an interest in muscular diseases and that it will aid them in their clinical practice and patient care.

I very much thank the series’ editor, Prof. Maximilian F. Reiser, for inviting me to edit this issue and for his valuable suggestions, and my academic teacher, Prof. Hans-Ulrich Kauczor, for his continuous support and encouragement. Moreover, I am especially grateful to all contributing authors, who are internationally known experts in their field, and I would like to acknowledge their great efforts and their outstanding contributions. I am also very grateful for the constant support and encouragement of Springer, especially Mrs. Corinna Schäfer for all her useful advice and untiring efforts in helping me to collect and edit the book chapters, which deserves special recognition. Last, but not least, a special word of thanks goes to my family for their unstinting encouragement and loving support.

Finally, I hope that readers will share my enthusiasm for the interesting and rapidly developing role of MRI in visualizing the skeletal musculature and will enjoy this textbook.

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Marc-André Weber



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Weber, M.-A. (Ed.)

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