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## Preface xi

Sandra L. Wootton-Gorges

## Pediatric Bone Marrow MR Imaging 391

Alvaro Burdiles and Paul S. Babyn

This article provides an overview of the current use of MR imaging in the evaluation of pediatric bone marrow disorders, illustrating their appearance on commonly used MR imaging sequences. Recognition of normal developmental bone marrow changes and variants is important in pediatric MR imaging interpretation, and in selection of appropriate acquisition sequences. This overview should serve as a practical aid in the interpretation of bone marrow lesions in children.

## The Growing Skeleton: MR Imaging Appearances of Developing Cartilage 411

Paritosh C. Khanna and Mahesh M. Thapa

Developing hyaline cartilage at ends of long bones consists of the epiphyseal, physal, and articular cartilage components, each of which has specific imaging characteristics that reflect biochemical and macromolecular composition. Standard MR imaging protocols used in adults do not provide sufficient information when used for children, and MR imaging techniques need to be tailored to the developmental stage of the child. This article presents the biochemical and histologic features of normal hyaline cartilage and its MR imaging characteristics, followed by a practical approach to optimizing imaging protocols for cartilage imaging. Finally, common abnormalities and advanced hyaline cartilage imaging techniques are described.

## Infectious and Inflammatory Disorders 423

Sumit Pruthi and Mahesh M. Thapa

Osteomyelitis and inflammatory arthritis affect many children. In this article, the authors describe clinical, pathophysiologic, and imaging characteristics of common (and a few not-so-common) conditions in these categories. Emphasis is placed on MR imaging characteristics, but the article discusses other imaging modalities and clinical evaluation when appropriate. Having a thorough understanding of the pathophysiology and imaging characteristics of these disease processes helps us choose the best radiologic study to answer the clinical questions.

## MR Imaging of Pediatric Trauma 439

Thomas Ray S. Sanchez, Siddharth P. Jadhav, and Leonard E. Swischuk

Although plain radiography remains the most important and cost-effective imaging for screening and characterizing osseous injuries, it has been well recognized that pediatric fractures can occur without radiographic abnormalities. The superb capability of MR imaging in demonstrating marrow edema, cartilage defects, and soft tissue injuries makes it an essential adjunct in the further evaluation of trauma to the growing skeleton. The key MR imaging findings of growth plate injuries, stress fractures, avulsion injuries, osteochondritis dissecans, transient patellar dislocation, and soft tissue injuries are described in this article.

**MR Imaging of Pediatric Arthritis**

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Heike E. Daldrup-Link and Lynne Steinbach

The role of MR imaging in pediatric arthritis is to detect early manifestations of arthritis, evaluate the extent of disease, and monitor disease activity during treatment. More specifically, MR imaging can characterize the pediatric arthropathy based on typical imaging findings, detect early signs of synovitis and erosions, stage the severity of joint involvement, demonstrate associated internal derangement, monitor disease progression or treatment response, and evaluate for complications. This article discusses MR imaging findings of juvenile idiopathic arthritis, enthesitis-related arthritis, juvenile psoriatic arthritis, and articular findings in collagen vascular diseases, septic arthritis, hemophilia, neuroarthropathy, and pseudoarthritides.

**MR Imaging of Primary Bone Tumors and Tumor-like Conditions in Children**

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Sandra L. Wootton-Gorges

This article provides a review of the MR imaging features of the major primary malignant and benign bone tumors and tumorlike conditions encountered in the pediatric population. Malignant tumors discussed include osteosarcoma, Ewing sarcoma, chondrosarcoma, lymphoma, and malignant fibrous histiocytoma. Benign lesions discussed include simple bone cysts, aneurysmal bone cysts, giant cell tumor, osteochondroma, enchondroma, chondroblastoma, osteoid osteoma, osteoblastoma, nonossifying fibroma, fibrous dysplasia, osteofibrous dysplasia, hemangioma, and histiocytosis. The use of MR imaging in the diagnosis of these lesions is discussed, and the text is enhanced with imaging examples of the lesions.

**MR Imaging of Soft Tissue Masses in Children**

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Rebecca Stein-Wexler

This article discusses the role of MR imaging in the evaluation of musculoskeletal soft tissue masses, reviewing limitations in its ability to establish tissue diagnosis and its critical role in determining lesion extent. It also reviews benign soft tissue masses, such as fibrous lesions, popliteal cysts, lipomatous lesions, and neurofibromatous tumors. Reactive entities, such as abscess, myositis ossificans, and hemangioma, are discussed. Differentiation between high- and low-flow vascular and lymphatic anomalies is reviewed. The article concludes with a discussion of the uncommon malignant musculoskeletal soft tissue tumors, focusing on infantile fibrosarcoma, rhabdomyosarcoma, synovial sarcoma, and granulocytic sarcoma.

**The Hip: MR Imaging of Uniquely Pediatric Disorders**

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Jerry R. Dwek

Many disease processes can affect the hip joints as a child grows, including developmental dysplasia of the hips; Legg-Calvé-Perthes disease; slipped capital femoral epiphysis; and traumatic, infectious, and noninfectious inflammatory causes. MR imaging is uniquely able to provide information about the structure of the hip joint, and information about active disease states for diagnosing, planning, and assessing therapy.

**The Knee: MR Imaging of Uniquely Pediatric Disorders** 521

Ramon Sanchez and Peter J. Strouse

The knee is one of the joints most commonly injured during sport-related activities in the pediatric population. Although physical examination and conventional radiography remain the most important tools for determining the extent of the injury, clinical assessment of the knee may be limited in patients with pain, swelling, and effusion, and conventional radiology may overlook serious injuries. MR imaging is an excellent modality for pediatric knee disorders given its lack of ionizing radiation, multiplanar capabilities, and high resolution, which provides accurate assessment of bone, cartilage, menisci, ligaments, and adjacent soft tissues. This article describes MR imaging findings of unique disorders of the pediatric knee, common traumatic injuries, frequent developmental abnormalities, and benign incidental findings.

**The Foot and Ankle: MR Imaging of Uniquely Pediatric Disorders** 539

Chirag V. Patel

MR imaging of the foot and ankle in children poses unique challenges, not only because of technical issues, but also because of the variations produced by age related changes. However, because of its excellent soft tissue contrast (especially helpful in delineating cartilage related abnormalities), MR imaging offers a distinct advantage over other imaging modalities. This article discusses MR imaging techniques for examining the pediatric foot and ankle, and reviews some common conditions encountered in a child's foot and ankle. This includes lesions such as osteochondritis dissecans; tarsal coalition; soft tissue and bony tumors of the foot and ankle; infection; and clubfoot.

**MR Imaging in Congenital and Acquired Disorders of the Pediatric Upper Extremity** 549

Kathleen H. Emery

Various congenital and acquired disorders can affect the upper extremity in pediatric and adolescent patients. MR imaging can provide unique anatomic and diagnostic information in the evaluation of many of these disorders, including inflammatory, infectious, neoplastic, and arthritic conditions. This article rounds out the issue on pediatric musculoskeletal MR imaging. It focuses on the evaluation of more common congenital disorders, and mainly sports-related injuries of the shoulder, elbow, and wrist in children. MR imaging can be more challenging in diagnosis of some of these disorders. Features of overuse injuries in skeletally immature athletes are a unifying theme throughout the article.

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