Imaging in rheumatology: the evolving role of new imaging techniques and methods to score disease activity

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With novel technical developments, better standardization and scoring systems to monitor therapy, imaging has an ever-increasing role in the diagnosis and management of rheumatological disorders. New imaging techniques allow better characterization of pathogenetic disease mechanisms and earlier diagnosis. This special focus issue of the *International Journal of Clinical Rheumatology* is entitled 'imaging in rheumatology' and provides state-of-the-art review articles and insights into new evolving imaging techniques. Different imaging modalities such as ultrasound, optical imaging, radiographs, computed tomography and MRI are covered and their application to different organ systems, including joints, the brain and lung are reviewed. As guest editors we were impressed with the diversity of new developments in this field; we are fortunate to have assembled a team of international expert authors, who were willing to share their knowledge and research results with us.

One major focus of this issue concerns new imaging modalities, which include molecular imaging techniques, such as optical imaging and quantitative magnetic resonance techniques to assess biochemical composition of the cartilage matrix. Optical imaging refers to imaging modalities, which use light as their primary imaging method and encompasses techniques such as bioluminescence and fluorescence imaging. Golovko *et al.* describe current optical imaging techniques that may be used for rheumatoid arthritis, in particular for therapy monitoring, and may have potential because of their noninvasive, quick and simple nature [1]. High-field MRI at 3.0 T allows improved high-resolution morphological and biochemical imaging of small joints and is reviewed by Welsch *et al.* [2]. The authors discuss the potential role of delayed gadolinium-enhanced MRI of cartilage and T2 mapping to assess proteoglycan content and cartilage integrity; they also provide an update on high-resolution imaging techniques for small joints and the use of MR-based scores for therapy monitoring.

As opposed to these novel imaging techniques ultrasound is an established technique in inflammatory joint diseases and has been used to assess disease activity and to monitor the response to therapy. Ohrndorf *et al.* review musculoskeletal ultrasound scores, which were developed to monitor rheumatoid arthritis disease activity and the therapeutic response to immunosuppressive therapies [3]. Semiquantitative scoring systems allow assessment of the extent of the synovial/tenosynovial and erosive process for each examined joint, whereas ultrasound sum scores with a reduced joint count have the advantage that overall disease activity is obtained in a short examination time. The authors conclude that ultrasound has supplemental importance to clinical examinations, that it is objective and may have a predictive value as a 'biomarker'. Strunk *et al.* discuss the role of Doppler ultrasound in assessing rheumatoid arthritis [4]; they conclude that color and power Doppler ultrasound demonstrate different grades of intra-articular and peritendinous blood flow, which allows an estimation of inflammatory activity and facilitates the differentiation and monitoring of rheumatic diseases during follow-up. Also, the level of the initial amount of Doppler activity is a prognostic factor for the development of subsequent bone damage. The article by De Miguel focuses on new concepts in ultrasound of the enthesis, which is of particular importance in the seronegative spondylarthropathies [5]. In addition, Migliore *et al.* provide insights in ultrasound-guided joint injections in difficult locations, such as the sacroiliac and hip joints in their article [6].

Standard imaging techniques still have a major role in inflammatory arthropathies and scoring systems are critical in monitoring disease

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progress. Gladman *et al.* review imaging modalities used in the assessment of patients with psoriasis and psoriatic arthritis, discuss the controversies associated with their use and recommend future approaches [7]. These authors focus on peripheral joints, the sacroiliac joints as well as the spine and describe the different scoring systems used for psoriatic arthritis. In addition to standard radiographic scores, they also discuss the application of ultrasound and MRI-based grading scores. Peterfy *et al.* focus on rheumatoid arthritis and compare the Genant-modified Sharp and van der Heijde-modified Sharp scoring methods for radiographic assessment of the hands, wrists and feet [8]. These authors describe a strong correlation between the Genant–Sharp score and the van der Heijde–Sharp score with high intra- and inter-reader agreement. They also find that the Genant–Sharp method demonstrates smaller normalized detectable changes than the van der Heijde–Sharp method, but the difference is not statistically significant. The authors conclude that the Genant–Sharp and van der Heijde-modified Sharp methods show relatively similar performance for scoring erosion and joint space narrowing in the hands, wrists and feet of patients with rheumatoid arthritis.

Two of the major differential diagnoses in inflammatory arthropathies are infectious arthritis and osteomyelitis. Pineda *et al.* review imaging of osteomyelitis and provide the typical imaging findings using standard radiographs, ultrasound, MRI and nuclear medicine techniques [9]. They describe the different, complementary roles of the imaging techniques and conclude that osteomyelitis frequently requires more than one imaging technique for an accurate diagnosis.

In addition to joint disorders two of the articles in this issue cover nonmusculoskeletal organ manifestations such as those of the brain and lung. Segal *et al.* focus on cognitive disorders and brain MRI in primary Sjögren's syndrome [10] and Gargani provides their perspective on imaging of lung involvement in systemic sclerosis [11].

In summary this special focus issue of the *International Journal of Clinical Rheumatology* provides a comprehensive and diverse overview of current imaging techniques, scoring systems and future developments in rheumatology. We would like to express our special thanks to Christine Forder and Chris Facey from the *International Journal of Clinical Rheumatology* for the invitation to guest edit this issue and their excellent support throughout this exciting and challenging project. Also, we are sincerely grateful for the time that each of our contributors dedicated to sharing their insights, experience and predictions. We hope that you will agree this special issue extends our knowledge in this important field, helps us in better diagnosing and monitoring inflammatory arthropathies and expands our horizon for the new exciting developments in imaging.

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