Chapter 1

Introduction

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Rheumatoid arthritis (RA) is a chronic systemic inflammatory disease that primarily affects synovial joints. It is one of the major chronic diseases in western society and it is an important cause of pain and disability.[1] Major advances have been made in the treatment of RA over the last few decades, first with the introduction of methotrexate and later with the introduction of disease-modifying anti-rheumatic drugs, including the biologicals.[2] There has been an important shift in attention to early disease stages, as it is has been shown that early recognition and treatment results in a better prognosis.[3]

Imaging plays an important role in diagnosis, monitoring and determination of treatment outcome.[4] Nevertheless, imaging in arthritis has seen relatively slow development: even today usually only radiographs of the hand and foot are routinely obtained in clinical practice. More sensitive tools, i.e. ultrasound (US) and Magnetic Resonance Imaging (MRI), are mostly reserved for research settings and are only slowly being adopted in clinical situations. Their primary advantage is in early disease stages when radiographs provide little information as damage is not yet radiographically visible. Whereas radiographs only visualize structural osseous damage (e.g. erosions and joint-space narrowing), both US and MRI can provide direct visualization of the inflammatory processes in the synovium and tenosynovium. On MRI this is visible as synovial thickening with or without enhancement after gadolinium contrast administration depending on whether there is active or chronic disease. In addition, MRI also uniquely visualises bone marrow changes, i.e. bone marrow edema like changes (BME) or osteitis. Limited studies have shown that this reflects bone marrow fat being replaced by an inflammatory infiltrate rather than true edema.[5] BME is visible as ill-defined areas of bone marrow with high signal intensity on T2-weighted sequences. Finally, both US and MRI are more sensitive than radiographs for detection of erosions.[6] For evaluating MRI images as an outcome measure in RA, a well-validated scoring system has been developed, the Outcome Measures in Rheumatology Clinical Trials (OMERACT) Rheumatoid Arthritis Magnetic Resonance Imaging Scoring (RAMRIS) system.[7]

Outline of this thesis

The main aim of this thesis is to determine the role of MR imaging in early rheumatoid arthritis. We set out to improve the MRI protocol and sequences used in arthritis patients, to detect subclinical inflammation in various patient groups and to determine some of the clinical implications of MRI.

The majority of the studies in this thesis are carried out in the population of the early arthritis clinic (EAC), which is part of the outpatient clinic at the rheumatology department of the LUMC. This is an observational cohort in which patients are included who have confirmed arthritis of at least one joint and who have a symptom duration of less than two years. Starting from august 2010 MRI of the hand and foot was performed at initial and follow-up visits in all consenting patients.

Chapter 2 serves as a general introduction of the concept pre-rheumatoid arthritis. The different phases in the development of rheumatoid arthritis and the available knowledge on these specific phases is summarized. In chapters 3-5 we investigate how the MRI protocol

can be optimized. In chapter 3 we assess if omitting gadolinium contrast administration affects synovitis and tenosynovitis scores. In chapter 4 we determine whether bone marrow edema can be adequately assessed on post-contrast T1-weighted images. In chapter 5 we explore the feasibility of using a fast out-of-phase gradient echo MRI sequence for evaluating erosions. In chapters 6-8 imaging of subclinical inflammation is assessed in a variety of patient groups. In chapter 6 the concordance between inflammation at physical examination and on MRI is studied in early arthritis patients. In chapter 7 MRI findings in the hand and foot joints of patients with anticitrullinated peptide antibody (ACPA) positive arthralgia without clinical arthritis are described. In chapter 8 we study subclinical inflammation in hand joints of patients with inflammatory bowel disease and arthralgia. In chapters 9 and 10 some of the clinical implications of using MRI are explored. In chapter 9 we investigate the diagnostic value of MRI in early arthritis patients. In chapter 10 we describe the association of subclinical joint inflammation with radiographic progression of disease.

References

1. Woolf AD, Pfleger B (2003) Burden of major musculoskeletal conditions. Bull World Health Organ 81:646–656.
2. Tayar JH, Suarez-Almazor ME (2010) New understanding and approaches to treatment in rheumatoid arthritis. Br Med Bull 94:201–214.
3. van Nies J a. B, Krabben A, Schoones JW, et al. (2014) What is the evidence for the presence of a therapeutic window of opportunity in rheumatoid arthritis? A systematic literature review. Ann Rheum Dis 73:861–870.
4. Sofka CM (2013) Tracking Rheumatic Disease Through Imaging. Rheum Dis Clin North Am 39:633–644.
5. Schett G (2009) Bone marrow edema. Ann N Y Acad Sci 1154:35–40.
6. Fouque-Aubert A, Chapurlat R, Miossec P, Delmas PD (2010) A comparative review of the different techniques to assess hand bone damage in rheumatoid arthritis. Joint Bone Spine 77:212–217.
7. Østergaard M, Peterfy C, Conaghan P, et al. (2003) OMERACT Rheumatoid Arthritis Magnetic Resonance Imaging Studies. Core set of MRI acquisitions, joint pathology definitions, and the OMERACT RA-MRI scoring system. J Rheumatol 30:1385–1386.