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Evaluation of the predictive accuracy of MRI-detected erosions in hand and foot joints in patients with undifferentiated arthritis

Debbie M. Boeters¹, Aleid C. Boer¹, and Annette H.M. van der Helm – van Mil^{1,2}

¹Department of Rheumatology, Leiden University Medical Center, Leiden, the Netherlands

²Department of Rheumatology, Erasmus University Medical Center, Rotterdam, the Netherlands

Keywords

rheumatoid arthritis; magnetic resonance imaging; erosions

Radiographic erosions are a clear hallmark of rheumatoid arthritis (RA). The EULAR definition of radiographic erosive disease has a high specificity and its fulfilment alone is sufficient to classify RA.[1] In recent years, novel imaging techniques, such as magnetic resonance imaging (MRI), have emerged and are recommended by a EULAR imaging taskforce because MRI is more sensitive to detect erosions than radiography.[2] To determine the specificity of MRI-detected erosions, we recently compared hand and foot MRI [3] of patients presenting with RA with those of symptom-free persons and patients presenting with arthritides other than RA.[4] MRI-detected erosions were present in all groups. By evaluating different erosion features a few features were identified as specific for RA; these were severe erosions (grade 2, defined as >10% of bone eroded), erosions in MTP5, and erosions in MTP1 in persons aged <40. A subsequent and clinically relevant question is whether MRI-detected erosions in patients presenting with undifferentiated arthritis (UA) are valuable in predicting future progression to RA. This was explored to a limited extent in our previous study but as the number of UA patients was limited (n=192), the predictive value of the different 'RA specific erosions' could not be studied. In addition, the outcome was fulfilment of classification criteria but start of disease modifying antirheumatic drugs (DMARDs) was not considered while DMARD-treatment might have hampered progression to fulfilment of RA classification criteria. Since the previous study mainly performed cross-sectional comparisons, the predictive accuracy of MRI-detected erosions in UA was not evaluated satisfactorily. Therefore we continued with a larger longitudinal study.

Address for correspondence: D.M. Boeters, Department of Rheumatology, Leiden University Medical Center, P.O. Box 9600, 2300 RC Leiden, the Netherlands, Tel.: +31 71 5265653, Fax: +31 71 5266752, D.M.Boeters@lumc.nl.

Competing Interests

The authors have no conflicts of interests.

Ethical Approval Information

The study on early arthritis patients was approved by the local medical ethics committee, which is named 'Commissie Medische Ethiek'. All patients signed informed consent.

Data Sharing Statement

Data can be requested from the corresponding author.

286 patients with UA (using the 2010-criteria to classify RA) consecutively included in the Leiden EAC between 2010 and 2016 were studied. 94% of the 2010-UA patients was ACPA-negative (Supplementary table), which is in line with other descriptions of the population of 2010-UA patients.[5,6] At baseline 1.5T MRI of the 2nd-5th MCP- and 1st-5th MTP-joints was performed as described.[4] Erosions were scored on a scale 0-10 according to the RAMRIS system.[6] First the presence of any MRI-detected erosions, defined as score 1, was evaluated. Then the presence of RA-specific erosions (either a grade 2 erosion, erosion in MTP5 and/or erosion in MTP1 in persons aged<40) was studied.[4] Patients were followed for 1-year on RA development, defined as fulfilling the 2010-criteria, or the start of DMARDs because of a clinical diagnosis of RA. The latter was added as ACPA-negative patients need >10 involved joints to fulfil the 2010-criteria which could be hampered by DMARD-treatment. 128 (45%) UA-patients developed the outcome of which 111 had a clinical diagnosis of RA and started DMARDs and 17 fulfilled the 2010-criteria.

Any MRI-detected erosion was present in 53% of the 286 UA patients and was not predictive for RA development (OR 1.2, 95%CI 0.7-1.9, PPV 47%, Table). RA-specific erosions were present in only 7% of the 2010-UA patients and were also not associated with development of RA (OR 0.6, 95%CI 0.2-1.5, PPV 33%). Similar findings were obtained for the individual 'RA-specific erosions' (Table). Sensitivity analyses stratified for the outcome (DMARD-start or only 2010-criteria positive) revealed similar results (data not shown).

This is the largest longitudinal dataset on MRI-detected erosions in hand and foot joints in UA to date. In all analyses MRI-detected erosions were not associated with an increased risk on RA. Although MRI is sensitive, the present data suggest that evaluation of MRI-detected erosions in UA is not relevant for the early detection of RA.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Key Message

- MRI-detected erosions have no value in differentiating undifferentiated arthritis patients who will develop RA from those who will not.

Table
Predictive values of MRI-detected erosions within 2010-UA patients for the development of RA

	UA patients with erosion feature n (%)	PPV (95% CI)	NPV (95% CI)	OR (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)
Any MRI-detected erosion	152 (53)	47% (39-55)	57% (49-66)	1.2 (0.7-1.9)	55% (47-64)	49% (41-56)
Any 'RA-specific erosion'	21 (7)	33% (17-55)	54% (48-60)	0.6 (0.2-1.5)	5% (3-11)	91% (86-95)
Grade 2 erosion	5 (2)	40% (12-77)	55% (49-61)	0.8 (0.1-5.0)	2% (0-6)	98% (95-99)
Erosion in MTP5	16 (6)	44% (23-67)	55% (49-61)	1.0 (0.3-2.6)	5% (3-11)	94% (90-97)
Erosion in MTP1 and aged<40	2 (1)	0% (0-66)	55% (49-61)	undefined	0% (0-3)	99% (96-100)

The prior risk for development of RA and/or DMARD-use within 1 year was 45%. Any MRI-detected erosion was defined as score 1 according to the Rheumatoid Arthritis MRI Scoring System. Any RA-specific erosion was defined on MRI as the presence of a grade 2 erosion, an erosion in MTP5 and/or an erosion in MTP1 in the age group <40 years, as described earlier.[4]. RA, rheumatoid arthritis; MRI, magnetic resonance imaging; DMARD, disease-modifying anti-rheumatic drug; PPV, positive predictive value; NPV, negative predictive value; OR, odds ratio; 95% CI, 95% confidence interval.