Detection of Change in Size of Erosions in Inflammatory Arthritis Using High Resolution In-Office MRI

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Purpose:

The purpose of this study is twofold: 1) to quantify the incidence of changes in the size of bone erosions using serial high resolution in-office MRI over a short time interval (8 months average follow-up). 2) to establish in-office MRI as a more sensitive modality compared with plain radiography for monitoring erosions.

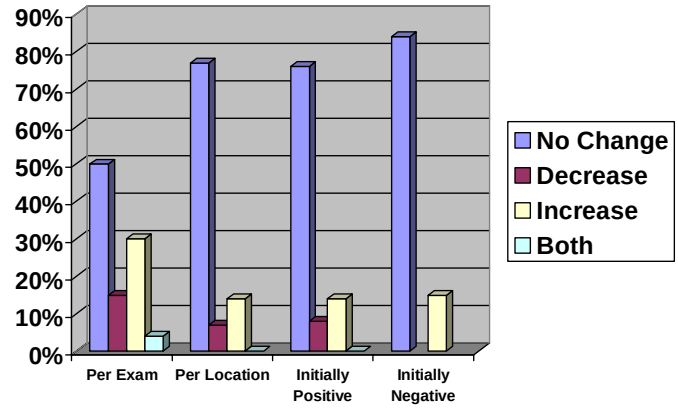
Methods:

MRI examinations were performed using a portable in-office high resolution scanner (Applause, GE Medical Systems). Two sequences (coronal T1 and STIR) were acquired of the 2nd and 3rd metacarpal-phalangeal joints and the wrist. After baseline MRI examinations were obtained in 406 patients undergoing aggressive therapy for inflammatory arthritis. 156 patients had a total of 246 follow-up examinations (in a total of 821 individual locations), which were performed after 1 to 24 months (average 8 months) and compared to the prior examination of the same patient. A change in erosion diameter of 20% was considered significant. Plain radiographs were available to compare with baseline x-ray in 184 follow-up studies.

Results:

No detectable changes were seen in 124 of the 246 (50%) follow-up MRI examinations, at least one erosion increased in size without any erosions decreasing in size in 74 (30%), at least one erosion decreased in size without any erosions increasing in 36 (15%), both increases and decreases in erosions were seen in 11 (4%), and motion artifact obscured images in 1 (0%). When 632 individual locations with erosions were followed, no changes occurred in 481 (76%), increases were seen in 87 (14%), decreases present in 52 (8%), both increases and decreases in 3 (0%), and motion artifact obscured 9 (1%). In 178 locations initially without erosions, 150 (84%) showed no changes and 26 (15%) showed new erosions on follow-up. In the 184 studies with follow-up x-ray comparisons, only 1 exam clearly a showed a new erosion(s) not seen on the prior exam and 1 exam showed an increase in a previously noted erosion(s).

Detection of changes in erosions in the 2nd and 3rd MCP joints and the wrist on MRI in four categories: Overall change per patient examination, change based on individual locations, change in locations that were initially positive for erosions and change in locations that were initially negative for erosions.



Discussion: Prior studies have shown increased sensitivity of MRI over plain radiographs in the detection of focal periarticular bone abnormalities in RA[1-3] and that MRI changes can be precursors to x-ray-detectable erosions.[4] This study attempts to determine several additional properties of MRI in RA: is MRI more sensitive in detecting changes in bone injury over time than x-rays, how frequently is there progression and regression of bone injury in patients treated with DMARD therapy, and in what time frame can MRI detect changes? This study shows that in an average follow-up of 8 months, half of RA patients in a single rheumatologist's practice undergoing aggressive DMARD therapy will show changes in MR findings.

As bone destruction in RA is a major cause of disability, advanced drug therapy has been shown to be effective in limiting bone injury in RA, [5] and x-ray fails to detect many erosions in early RA, it may be advantageous to stage patients with newly diagnosed RA with MRI.[6] Other studies have shown that bone destruction in RA can progress in patients in clinical remission.[7] Consequently, it is recommended that periodic x-rays be used in assessing disease activity.[8] This study shows that MRI is far more sensitive than x-rays in evaluating change in bone injury, suggesting that MRI may be a more effective tool in following RA patients for bone injury than plain radiographs.

Conclusion: This study shows that high-resolution in-office MRI with an average follow-up of 8 months detects changes in bony disease in 49% of patients during aggressive treatment for rheumatoid arthritis in a single rheumatologist's office practice. In contrast, plain radiography is insensitive for detecting changes in bone erosions in this time frame. These data suggest that blinded, controlled, prospective studies will likely confirm that high-resolution MRI is a sensitive tool for following changes in bone erosions over a 6-8 month time frame.

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