

Use of In-office MRI in the Evaluation of Patients with Rheumatoid Arthritis on Infliximab Therapy

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Use of In-office MRI in the Evaluation of Patients

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Background

Rheumatoid arthritis (RA) is a chronic disease leading to progressive joint damage and functional decline. Joint damage occurs early in RA, with radiographic progression occurring the most rapidly within the first five years.¹ Therefore, diagnosis and treatment of early RA is crucial in delaying the disease and, consequently preventing the disability associated with it. The most effective new therapies have targeted tumor necrosis factor alpha (TNF α).² Infliximab, an anti-TNF α monoclonal antibody, has proven to be highly effective in the treatment of DMARD resistant, MTX naïve, early RA patients.^{3,4} Treatment with infliximab plus methotrexate has provided clinical benefit while inhibiting the progression of radiographic damage and preserving joint integrity in patients with active RA.^{5,6} Studies have shown magnetic resonance imaging (MRI) may be more sensitive in detecting bone erosions, and thus responsiveness to therapy than standard radiographs in early RA.⁷⁻¹¹ Thereby, making MRI a potential prognosticator and tool for early RA identification and treatment.

Objectives

To assess the performance of an in-office MRI system in the diagnosis of RA, while evaluating the treatment benefit with the anti-TNF α agent infliximab.

Methods

Fourteen patients who satisfied the American College of Rheumatology criteria for the diagnosis of RA were evaluated in a single rheumatology practice with a portable MRI system

- All 14 patients treated with intravenous infliximab
 - 11 patients also received concomitant methotrexate
 - 12 out of 14 patients had both wrists imaged (including all carpal bones and the 2nd and 3rd MCP joints) by T1 and STIR sequences
 - 2 out of 14 patients had only one hand imaged

- Disease duration was < 1 year in 10 patients, < 2 years in 1 patient, and > 2 years in 3 patients
 - Seven patients were treated with infliximab within 2 years of diagnosis
- Median infliximab dose was 4 mg/kg (range: 3-7mg/kg)
- Infusion interval was approximately 7 weeks
- Treatment range was 5 months to 2½ years
- Patients were imaged at baseline and at 6 months
 - MRI results interpreted by board-certified musculoskeletal radiologist (independent of the patient's clinical treatment and outcome)
 - Bone erosions defined as sharply marginated juxta-articular bone defect with extension through the adjacent cortex
 - Signal characteristics for erosion were low signal intensity with respect to marrow fat on T1 weighted images and high signal intensity on STIR images
- MRI system: MagneVu 1000 (Carlsbad, Ca, USA)
 - Self-shielded low field (0.2-Tesla) scanner
 - Operates on standard (USA) 110-volt power supply
 - Occupies ordinary office space
 - Capabilities of the system include:
 - High resolution
 - Thin-section (0.6–1 mm), 3-dimensional multi-echo data acquisition
 - T1 and T2 weighted spin echo
 - Short tau inversion recovery (STIR) sequences

Results

- All 14 patients demonstrated clinical improvement from baseline
- Follow-up MRIs reflected
 - Healing of erosions in 4 patients
- Time from initial diagnosis ranged from 9 months to 7 years
- Range of infliximab infusions was 5 to 14
 - No change in 9 patients
 - Indeterminate result in 1 patient

Figure 1.(A) Hand radiograph MRI of patient A at baseline with marked improvement, and infliximab dose: 4mg/kg

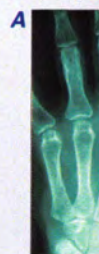
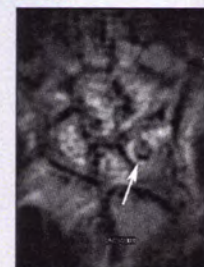


Figure 2. Wrist MRI of patient A 6 months later on 12/08/00, duration <3 months and initially with MTX, but currently monotherapy.



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Figure 2. Wrist MRI of patient A. (B) Finger MRI of patient A and roughly 6 months later. Disease duration ~2 years and infliximab dose: 3mg/kg q8 plus MTX.



Figure 3. Wrist MRI of patient C at 5/23/03 and about 6 months later on 11/13/03 showing healing. Disease duration ~3 years and infliximab dose: 3mg/kg q8 initially on 3mg/kg q8 infliximab plus MTX.



Figure 3. Wrist MRI of patient C at baseline and at 6 months with erosion healing. Disease duration ~5 years and infliximab dose: 7mg/kg q8 plus MTX.

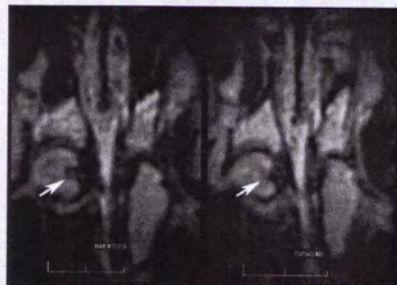


Figure 4. Wrist MRI of patient D on 4/22/03 and then 6 months later on 10/17/03. Disease duration <6 months and infliximab dose: 3mg/kg q8.

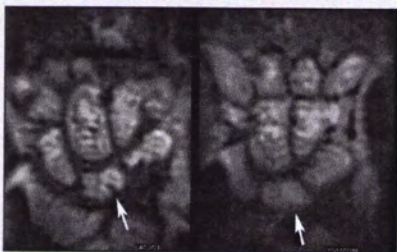


Figure 5. Wrist MRI of patient E at 6/12/03 and 6 months later on 11/13/03. Disease duration ~1 year and infliximab dose: 5mg/kg q8 plus MTX.



Conclusion

All patients showed clinical improvement with infliximab treatment. Results support growing evidence that high-resolution, in-office MRI may be useful in selecting the best biological modifier and optimal dose for each, individual RA patient based on the progression of their erosive disease

- High-resolution in-office MRI is capable of demonstrating subtle changes in erosion morphology in RA patients
- Patients receiving infliximab had no measurable progression in erosive disease
- Some cortical erosions showed reversal of damage
- Results were seen in both early onset and long-standing RA patients

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