

# Longitudinal changes in rheumatoid arthritis after Rituximab assessed by quantitative and dynamic contrast enhanced high-resolution 3-Tesla-MR imaging

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## Purpose

To assess the longitudinal changes of rheumatoid arthritis under Rituximab therapy by use of quantitative and dynamic contrast enhanced high-resolution 3 Tesla magnetic resonance (MR) imaging.

## Material and Methods

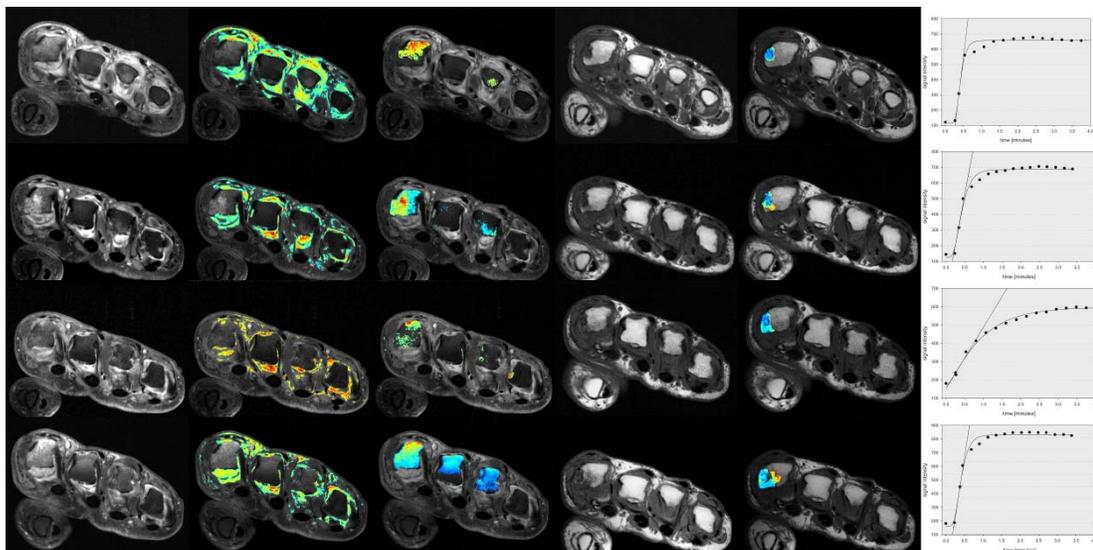
Our institutional review board approved this retrospective study, and waived the requirement for informed consent. A longitudinal MR imaging evaluation of the metacarpophalangeal joints (at baseline, 12, 26 and 52 weeks) of 10 patients with rheumatoid arthritis who had received Rituximab intravenously (2x1000mg (n=5) or 4x375mg/m<sup>2</sup> (n=5) was performed. The 28-joint disease activity score was used to assess clinical response. Quantitative (pixel-based volumetry) and dynamic contrast enhanced MR imaging techniques were used to assess a.) volume of enhancing synovia, b.) early rapid enhancement, c.) volume of enhancing bone marrow and d.) volume of osseous erosive changes. Data analysis included descriptive and comparative statistics. Signed rank test and McNemar test were used to assess associations.

## Results

Sequence of results is baseline, week 12, week 26 and week 52. Asterisk indicates significant difference compared to baseline. Average 28-joint disease activity score significantly decreased from 5.4 (4.1-7.4) to 5.1 (3-6.8), 4.4 (3.5-6.9)\* and 3.9 (2-5.5). Course of volume of enhancing synovia was 15.9 (2.3-29.7) cm<sup>3</sup>, 13.6 (4.1-21.8) cm<sup>3</sup>, 7.8 (1.3-17.1)\* cm<sup>3</sup> and 11.9 (2.4-15.6) cm<sup>3</sup>. Course of early rapid enhancement was 1542 (1140-2179), 1315 (303-1854), 1069 (332-2179)\* and 1188 (872-1667). Course of volume of enhancing bone marrow was 0.90 (0.12-5.71) cm<sup>3</sup>, 0.99 (0.23-6.64) cm<sup>3</sup>, 0.64 (0.12-4.42) cm<sup>3</sup> and 1.27 (0.23-2.58) cm<sup>3</sup>. Course of volume of osseous erosive changes was 0.29 (0.87-1.25) cm<sup>3</sup>, 0.33 (0.19-1.48)\* cm<sup>3</sup>, 0.39 (0.21-1.36) cm<sup>3</sup> and 0.87 (0.21-1.24)\* cm<sup>3</sup>. Trends of 28-joint disease activity score and osseous erosive changes were significantly different (P=0.0075)

## Conclusion

Intravenous Rituximab administration is associated with a significant decrease of the inflammatory activity of synovitis with a minimum at 26 weeks and increasing activity thereafter suggesting recurrence. Intra-osseous inflammation is not significantly influenced. Erosions progressed significantly over time. There appears to be an inverse relationship of the significantly decreasing disease activity score and significantly increasing volume of the erosions, suggesting subclinical disease progression.



**Figure:** Longitudinal quantitative and dynamic high field 3 Tesla MR imaging examinations of the metacarpophalangeal joint in a patient with rheumatoid arthritis following the intravenous administration of Rituximab. MR images show a typical course of changes from baseline (upper row) to week 12 (second row), week 26 (third row) and week 52 (lower row). First column shows contrast enhanced axial T1-weighted spin-echo images with spectral fat saturation. Second and third columns show changes of volume

of enhancing soft synovia (second columns) and changes of volume of enhancing bone marrow (third column) over time assessed by use of computer-based voxel volumetry. Fourth column shows axial T1-weighted 2D spin-echo images. Fifth show changes of volume of osseous erosive changes over time assessed by use of computer-based voxel volumetry. Sixth column shows changes of early rapid enhancement over time by use of dynamic contrast-enhanced MR imaging.