

Gadofluorine M enhanced MR imaging of inflammatory bowel disease: Quantitative analysis and histologic correlation in a rat model

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Purpose: Although desirable MR imaging is currently not regarded as an alternative imaging modality as compared to colonoscopy for the detection and quantification of inflammatory bowel disease (IBD) (1). Aim of this study was to evaluate the contrast enhancement of the colonic wall in a rat model of IBD after i.v.-injection of the macrocyclic Gd-chelate Gadofluorine M in correlation to histology.

Methods and Materials: The study was approved by the Institutional Animal Care and Use Committee (IACUC). IBD was established in 20 male rats by rectal instillation of 2,4-dinitrobenzene-sulfonic-acid 2 and 5 days prior to MR-imaging. Six rats with sodium-chloride application served as controls. T1-weighted spin-echo-sequences (TR msec/ TE msec 680/12.3, voxel size 0.25 x 0.51 x 2 mm) were acquired in a 2.4T small-bore MR-scanner before, immediately and 15, 45, 60, and 90 min after i.v.-injection of Gadofluorine M (0.1 mmol Gd/kg bodyweight). The inflammation was quantified histologically using a 3-point-scale (0=none; 1=mild; 2=severe). Signal-to-noise (S/N) and enhancement (ER) ratios of the colon wall were determined. Data were tested for differences between the different degrees of IBD using the Bonferroni-test.

Results: Gadofluorine M lead to a significant increase of S/N ratios of the bowel wall compared to pre-contrast scans beginning immediately after contrast injection (98 ± 19 vs. 121 ± 27 , $P<0.01$). Within the first 45 min after contrast injection no significant differences in the ER of bowel walls with different degrees of IBD were observed. 60 and 90 min after contrast injection the ER of bowel walls without IBD or with mild IBD were significantly lower than those of bowel walls with severe IBD (No inflammation ER @ 60 and 90 min: 14 and 18 %; Mild inflammation ER @ 60 and 90 min: 35 and 38%; Severe inflammation ER @ 60 and 90 min: 58 and 62 %, $P<0.01$).

Conclusion: Gadofluorine M led to a significant increase in signal intensity of the inflammatory bowel wall and allowed to differentiate different degrees of IBD beginning at 60 min after contrast injection.

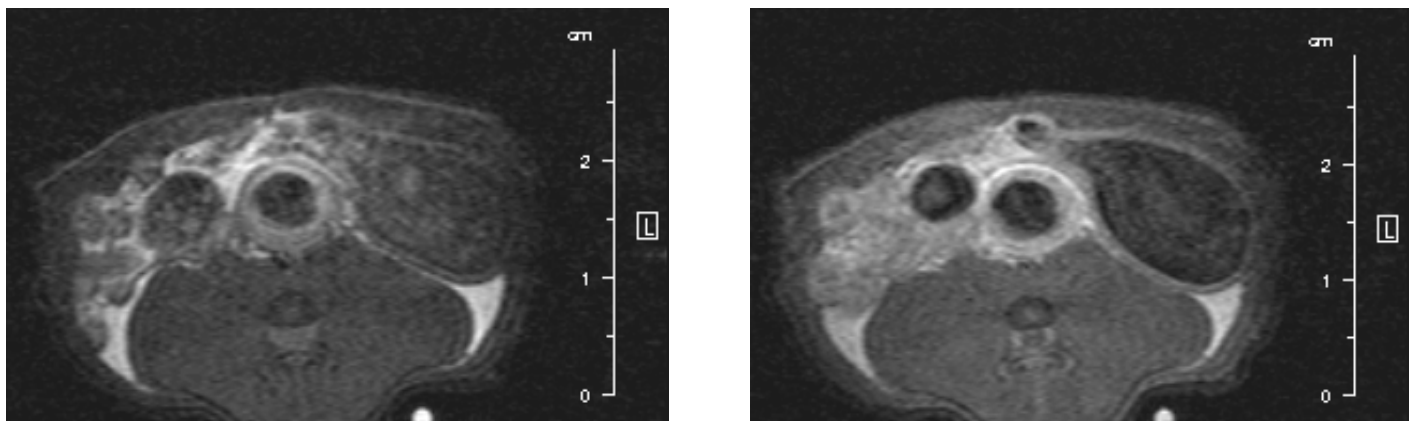


Fig 1: T1-weighted spin-echo-images of a rat with severe colitis prior (a) and 90 min (b) after i.v.-Injection of Gadofluorine M. A strong transmural contrast enhancement is observed.

References:

(1) Schreyer AG, Rath HC, Kikinis R et al., Gut 54 (2), 250-256 (2006).