Magnetic resonance imaging for evaluation of disease activity in Crohn's disease: a systematic review

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CRD summary
This review concluded that magnetic resonance imaging (MRI) correctly diagnosed most patients with Crohn's disease who had frank disease. This was generally a well-conducted review, but the authors' conclusions did not appear to consider the fact that 21% of patients with mild disease and 7% of patients in remission would be also graded as frank based on MRI.

Authors' objectives
To determine the accuracy of magnetic resonance imaging (MRI) for grading disease activity in Crohn's disease.

Searching
MEDLINE, EMBASE, CINAHL and The Cochrane Library were searched from 1990 to April 2007. Search terms were reported. Reference lists of retrieved articles and relevant reviews were screened. No language restrictions were applied. Only data reported as full text articles were eligible.

Study selection
Studies in which MRI was used to evaluate disease activity in Crohn's disease compared to the reference standard of histopathology, colonoscopy and/or intraoperative findings were eligible for inclusion. Studies had to provide details on how a positive MRI scan was defined, use an MRI scanner of at least 1.0 Tesla, and report sufficient data to create cross-tabulation of results.

The time interval between the MRI scan and the reference standard ranged from the same day to two weeks. Reference standards used in the included studies were histopathology, colonoscopy and intrasurgical findings, alone or in combination. Included studies evaluated patients with suspected or known inflammatory bowel disease (IBD) or Crohn's disease; only data that related to Crohn's disease contributed to the review. Two studies included children; all others were restricted to adults. Imaging criteria used to stage Crohn's disease varied across studies, as did reference standard criteria.

One reviewer screened the results of the searches; two reviewers independently assessed full text studies for inclusion. Disagreements were resolved through consensus.

Assessment of study quality
Two reviewers independently assessed study quality using a modified version of QUADAS that assessed the following: patient spectrum; reporting of selection criteria; time between index MRI and reference standard; partial verification bias; reporting of MRI and reference standard details; independent interpretation of MRI and reference standard results; and interpretation of MRI independent of clinical data. Disagreements were resolved through consensus.

Data extraction
Two reviewers independently extracted data as 3x3 (Crohn's disease categorised as remission, mild, frank) or 4x4 (Crohn's disease categorised as remission, mild, moderate, severe) tables that showed the agreement in staging between MRI and the reference standard. For the primary analysis, 4x4 tables were reconstructed to produce 3x3 tables by grouping moderate and severe to form the frank category. If studies reported data for multiple observers, data that led to the lowest Aikaike information criterion was used. Data were analysed on a per-patient basis. If results were reported on a per-segment basis they were grouped to give per-patient data with only bowel segments that were inspected endoscopically or surgically included; the most severe segmental score was used. Disagreements were resolved through consensus.

Methods of synthesis
A multivariate random-effects approach was used to pool data from 3x3 tables using a Bayesian algorithm to give estimates of the proportion of patients in each category correctly staged, overstaged and understaged, together with 95% confidence intervals (CI).

**Results of the review**

Seven studies were included (n=213). All studies included an appropriate patient spectrum. All but one study provided details on selection criteria. Verification was complete in all studies. Five studies provided sufficient details on MRI execution. Six studies provided sufficient details on the reference test. Five studies reported that MRI was interpreted blind to the reference standard. Clinical information was blinded to the person interpreting the MRI in two studies. Information was not reported on whether the reference test was reported blind to MRI results.

Based on data from all studies, MRI correctly staged frank disease in 91% (95% CI 84% to 96%) of patients, mild disease in 62% (95% CI 44% to 79%) of patients and remission in 62% (95% CI 38% to 84%) of patients. MRI overstaged disease activity in 37% of patient in remission, mostly as mild disease (31%, 95% CI 12% to 55%). Mild disease was overstaged as frank disease in 21% and understaged as remission in 17% of patients.

**Authors' conclusions**

MRI can be used for staging disease activity in Crohn's disease. As with MRI, most patients with frank disease are correctly diagnosed. In patients with disease in remission and mild disease, correct staging was limited.

**CRD commentary**

The review addressed a focused question supported by clearly defined inclusion criteria. The literature search was adequate, but the restriction to full text articles meant there was a possibility of publication bias. Appropriate steps were taken to minimise bias and errors for most stages of the review; the exception was the initial selection of studies based on titles and abstracts. Study quality was assessed with appropriate criteria and the results clearly presented. Methods used to pool data appeared appropriate, but heterogeneity was not formally assessed and so it was unclear whether pooling was appropriate. The authors' conclusion that most patients with frank disease were correctly diagnosed by MRI was supported by the results. However, the authors did not appear to consider the possibility of an MRI suggesting a frank result in patients who did not have frank disease: 21% of patients with mild disease and 7% of patients in remission would be graded as frank based on MRI (based on the summary estimates reported in the review). Therefore, the recommendation that MRI can be used to stage disease activity in Crohn's disease appears questionable.

**Implications of the review for practice and research**

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that more research was needed on the reproducibility of MRI of the small bowel and colon and to determine which imaging criteria were consistent with the different stages of Crohn's disease. Future research should focus on standardisation of preparation, imaging technique and uniform imaging criteria used for diagnosis of disease and include a larger number of patients.

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.