Magnetic resonance colonography versus colonoscopy as a diagnostic investigation for colorectal cancer: a meta-analysis

CRD summary
The review assessed the accuracy of magnetic resonance colonography (MRC), compared with conventional colonoscopy, for the detection of colorectal cancer. The authors concluded that MRC is highly discriminative for colorectal cancer, but more research is needed to define its exact diagnostic role. Limitations in the methods of analysis mean that these conclusions should be viewed with caution.

Authors' objectives
To assess the diagnostic accuracy of magnetic resonance colonography (MRC) in comparison with conventional colonoscopy (CC).

Searching
EMBASE, MEDLINE and the Cochrane Library were searched from 1990 to 2004 for all studies on the use of MRC; the keywords were reported. The references of retrieved articles were checked for additional studies. No language restrictions were applied.

Study selection
Study designs of evaluations included in the review
No inclusion criteria for study design were specified. Studies where the outcomes of interest were not reported for both MRC and CC, or where these could not be calculated, were excluded.

Specific interventions included in the review
Studies of the diagnostic accuracy of MRC for the identification of colorectal lesions were eligible for inclusion. Technical parameters for MRC varied between studies and were reported in full in the article.

Reference standard test against which the new test was compared
The included studies were required to use CC as the reference standard investigation. Malignant lesions identified on CC were confirmed by histopathological examination.

Participants included in the review
Studies of healthy volunteers and patients with symptoms suggestive of colorectal cancer (CRC) and benign polyps were eligible for inclusion. All of the reported studies included individuals who were due to undergo colonoscopy, mostly for suspected CRC; lesions of all sizes were included. Patients with other diagnoses (e.g. colonic diverticulosis, inflammatory bowel disease) were excluded from the final analysis. The mean age of the participants in the included studies ranged from 55 to 66 years.

Outcomes assessed in the review
The studies were required to report 'correct patient diagnosis' on MRC compared with CC for all lesions and/or malignant lesions.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
The authors did not explicitly state that they assessed the validity of the studies; the description of the data extraction process included an assessment of verification bias.
The authors did not state how the validity assessment was performed.

**Data extraction**

Two reviewers independently extracted the data from each study; any discrepancies were resolved by consensus. Data were extracted on study and participant characteristics, technical parameters of MRC, details of those conducting the examination, and outcomes including method of confirmation.

**Methods of synthesis**

How were the studies combined?

Pooled estimates of sensitivity and specificity, with 95% confidence intervals (CIs), were calculated using a random-effects method. In addition, summary receiver operating characteristic (sROC) curves (weighted and unweighted) were presented for the detection of all lesions, using all studies, along with the area under the curve (AUC) and diagnostic odds ratio (DOR).

How were differences between studies investigated?

Separate subgroup analyses were conducted for all lesions (more than 50 participants), malignant lesions, studies that did not involve faecal tagging or intravenous contrast, and studies that used a scout film to confirm adequate distension of the bowel.

An investigation of the relationship between sensitivity and specificity (threshold effect) was described, and Q-values (correlation coefficients) and significance were reported.

**Results of the review**

Eight prospective comparative studies, which involved 588 patients (563 examinations), were included in the review.

Verification bias was deemed to be absent as all patients in all studies underwent both MRC and CC, and histology was used for confirmation in all studies that provided data on the detection of CRC.

The pooled sensitivity for all lesions (all studies) was 75% (95% CI: 47, 91), with a corresponding specificity of 96% (95% CI: 86, 98). The summary DOR was 52.82 (95% CI: 9.38, 297.25). Significant correlation between sensitivity and specificity was present.

The pooled sensitivity for malignant lesions (7 studies) was 91% (95% CI: 79, 97), with a corresponding specificity of 98% (95% CI: 96, 99). The summary DOR was 576.41 (95% CI: 135, 2,448.56). No significant correlation between sensitivity and specificity was identified.

The AUC from the weighted sROC curve was 98.4%. From the subgroup analysis, the AUC was 86.4% for studies using intravenous contrast, 88.9% for studies using faecal tagging, 87.9% for studies using scout films, and 88.5% for studies with more than 50 participants.

**Authors’ conclusions**

MRC has high accuracy for the detection of CRC, but further research is needed to define its exact diagnostic role (e.g. populations in which it is applicable) and accuracy in comparison with other imaging technologies (e.g. computed tomography colonography).

**CRD commentary**

The review addressed a clearly stated and clinically relevant research question, and appropriate inclusion criteria were fully defined. An adequate literature search was described and no language restrictions were applied, though no attempt to identify unpublished studies was mentioned. Details of the included studies, including the technical parameters of MRC, were reported in full. Appropriate measures to avoid the introduction of error or bias during the data extraction process were described. However, it was unclear whether these measures were also applied at the study selection stage.
Assessment of the methodological quality of the included studies was limited to verification bias; the methodological quality of the included studies could not, therefore, be adequately assessed.

An estimate of the correlation (Q) between sensitivity and specificity was presented (for all studies and for subgroups). This was described as 'heterogeneity'; it describes one aspect of heterogeneity, namely the threshold effect (variation of sensitivity and specificity with threshold). Where a threshold effect is present (as was the case for the 'all studies, all lesions' data set and for the majority of subgroups) it is generally considered inappropriate to directly pool sensitivities and specificities; the fitting of a sROC model represents a better approach. There was no evidence of a threshold effect for the subgroup of studies reporting data on the detection of CRC. However, no attempt to assess between-study heterogeneity from other sources was reported and individual study data for CRC were not reported, making it difficult to assess the appropriateness of pooling. The authors’ conclusion that more research is needed appears reasonable given the data presented, whereas the conclusion that MRC has high discrimination for CRC follows from the pooled estimates presented, but should be viewed with caution given the limitations outlined.

Implications of the review for practice and research
Practice: MRC is highly discriminatory in the detection of CRC. Ideal candidates for CRC included patients with symptoms suggestive of CRC and those with a high risk of failed CC (e.g. those with a rigid colon following multiple laparotomies). MRC may also be useful in evaluating inoperable lesions for stenting. CC is preferable where a biopsy is considered necessary.

Research: Further evaluations of MRC in comparison with CC and computed tomography colonography are needed. Multicentre, prospective trials should be conducted to determine the usefulness of MRC in identifying small luminal lesions, pre-operative staging, the evaluation of extra-colonic pathologies, and possibly screening. The comparative sensitivities and specificities of dark- and light-lumen techniques should be established.

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