Capsule endoscopy has a significantly higher diagnostic yield in patients with suspected and established small-bowel Crohn's disease: a meta-analysis

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CRD summary
This review found that capsule endoscopy has a greater yield than other imaging modalities in the evaluation of patients with established and suspected Crohn's disease. These conclusions were supported by the data, but should be interpreted with some caution due to small sample sizes and substantial heterogeneity for some meta-analyses.

Authors' objectives
To evaluate the diagnostic yield of capsule endoscopy compared with other modalities in patients with suspected and established Crohn's disease.

Searching
MEDLINE, EMBASE and Cochrane Central Register of Controlled Trials (CENTRAL) were searched to May 2009. Search terms were reported. Abstracts of relevant conferences were screened to 2008 and capsule manufacturers were contacted. No language restrictions were applied. The review was restricted to published studies in full or abstract form. Studies included in a previous meta-analysis by the authors were included (see Other Publications of Related Interest).

Study selection
Prospective studies that compared the yield of capsule endoscopy with one or more alternate diagnostic modalities for evaluation of the small bowel in adults with suspected or established Crohn's disease were eligible for inclusion. Studies had to report findings outside the normal extent of oesophagogastroduodenoscopy and colonoscopy (without ileoscopy).

Comparator interventions in the included studies were small-bowel follow-through, computed tomography enterography, colonoscopy with ileoscopy, enteroclysis, push enteroscopy, magnetic resonance enterography and small intestine contrast ultrasonography. The threshold for a positive capsule endoscopy finding was determined by the primary study authors. Studies were conducted in Western Europe, USA, Canada, Israel and Australia.

Two reviewers independently assessed studies for inclusion.

Assessment of study quality
Study quality was not formally assessed.

Data extraction
Data were extracted on the yield of findings consistent with Crohn's disease and were used to estimated the incremental yield (IY) of capsule endoscopy compared to each of the other imaging modalities by subtracting the yield of the alternate imaging technology from that of capsule endoscopy. Data were extracted separately for patients with suspected initial presentation of Crohn's disease and for those with suspected recurrence of established Crohn's disease. Authors were contacted for missing data where necessary.

The authors did not state how many reviewers extracted data.

Methods of synthesis
Weighted incremental yields and 95% confidence intervals (CIs) were estimated for each diagnostic imaging modality compared to capsule endoscopy. Fixed-effect models were used in the absence of heterogeneity; otherwise DerSimonian and Laird random-effects models were used. Heterogeneity was assessed using the Mantel-Haenszel method and the I² statistic. Sensitivity analysis was conducted by restricting the analysis to studies that were blinded
and published as full manuscripts. Subgroup analysis was conducted based on whether patients had suspected or established Crohn's disease. Publication bias was assessed using funnel plots.

**Results of the review**

Nineteen studies were included in the review (n=552, range three to 65). Seventeen studies were available as full manuscripts and two as abstracts. Fourteen studies were blinded, two studies were partially blinded and blinding was not reported in three studies.

The incremental yield of capsule endoscopy was significantly greater than push enteroscopy (IY 0.42, 95% CI 0.31 to 0.53; two studies), small-bowel radiography (IY 0.37, 95% CI 0.29 to 0.45; 12 studies), computed tomography enterography (IY 0.39, 95% CI 0.27 to 0.50; four studies) and colonoscopy with ileoscopy (IY 0.15, 95% CI 0.07 to 0.24; eight studies) for all patients combined.

When results were stratified according to whether patients had suspected or established Crohn's disease, the incremental yield remained significantly greater for capsule endoscopy for both subgroups compared to small bowel radiography and computed tomography enterography. However, there was no significant difference between capsule endoscopy and push enteroscopy in patients with suspected Crohn's disease although the difference remained significantly greater for patients with established Crohn's disease. There was no significant difference between capsule endoscopy and colonoscopy with ileoscopy in patients with established Crohn's disease, although the difference remained significant in patients with suspected disease. There was substantial heterogeneity for some of these comparisons. There was no significant difference in yield of capsule endoscopy compared to magnetic resonance enterography for all patients combined or when results were stratified according to whether patients had suspected or established Crohn's disease.

There was no evidence of publication bias.

**Authors’ conclusions**

Capsule endoscopy was superior to small-bowel radiography, computed tomography enterography and colonoscopy with ileoscopy in the evaluation of patients with suspected Crohn's disease. Capsule endoscopy was a more effective diagnostic tool in patients with established Crohn's disease compared to small-bowel radiography, computed tomography enterography and push enteroscopy.

**CRD commentary**

The review addressed a clear question. Inclusion criteria were defined. The literature search was adequate for published studies, no language restrictions were applied and studies published only as an abstract were eligible. The restriction to published studies meant that there was a possibility of publication bias; this was assessed in the review and no evidence was found. Appropriate steps were taken to minimise bias and errors when selecting studies for inclusion; it was unclear whether such steps were taken when extracting data. Study quality was not formally considered, although data on blinding was presented.

When interpreting the results it should be noted that the studies did not include a gold standard for diagnosis of Crohn's disease and so it was not possible to determine whether positive findings correlated with the presence of disease. The authors acknowledged that incremental yield is only valuable where you can be confident that the improvement in yield is not constituted largely by false positives. It was not possible to determine whether or not this is the case from the studies included in this review.

The authors conclusions regarding incremental yield were supported by the data, but should be interpreted with some caution due to small sample sizes and substantial heterogeneity for some of the meta-analyses. The authors appeared to translate greater yield into greater accuracy, which was not a reasonable assumption as greater yield may reflect a greater proportion of false positive findings. Therefore, it was not possible to draw conclusions regarding effectiveness.

**Implications of the review for practice and research**
Practice: The authors stated that capsule endoscopy was an important first-line diagnostic tool in diagnosis of suspected and established Crohn's disease, particularly when colonoscopy with ileoscopy was unsuccessful or non-diagnostic.

Research: The authors stated that future studies should use a validated scoring system to describe mucosal changes.

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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.