Meta-analysis shows colon capsule endoscopy is effective in detecting colorectal polyps


CRD summary
This review found that colon cancer endoscopy diagnostic sensitivity for polyps and clinically significant findings compared favourably to other non invasive colorectal cancer screening strategies. However, other non invasive colorectal cancer screening strategies were not assessed in the review, so the reliability of these conclusions is unclear.

Authors’ objectives
To assess the accuracy of colon capsule endoscopy in detecting colorectal polyps.

Searching
MEDLINE, EMBASE and SCOPUS were searched from 2006 to October 2009. Search terms were reported. Relevant conference proceedings and reference lists of relevant review articles and included studies were screened. No language restrictions were applied.

Study selection
Studies that evaluated colon capsule endoscopy (index test) compared with complete colonoscopy (reference standard) for the detection of colorectal polyps (irrespective of histological findings) in patients at average or increased risk of colorectal cancer were eligible for inclusion. Studies had to report sufficient data to construct a 2x2 table of test performance and include at least 10 patients. Studies without details of polyps and their verification were excluded.

Primary outcomes were the sensitivity and specificity of colon capsule endoscopy for the detection of polyps of any size and the detection of clinically significant findings. Secondary outcomes were the sensitivity and specificity of colon capsule endoscopy for the detection of colorectal cancer, rate of capsule excretion, level of excellent/good bowel preparation for colon capsule endoscopy, and the safety profile of colon capsule endoscopy.

The median age of included patients was 57.5 years (range 54 to 60 years). All patients underwent a colon capsule endoscopy-dedicated bowel preparation. The median colonic transit time of colon capsule endoscopy (where reported) was 135 minutes (range 128 to 189 minutes); the median total colon capsule endoscopy transit time (mouth to anus) was 276 minutes (range 275 to 291 minutes). Two studies included solely asymptomatic patients; the other enrolled an enriched-disease population.

Two reviewers independently selected studies for inclusion.

Assessment of study quality
Study quality was assessed using the QUADAS (Quality Assessment of Diagnostic Accuracy Studies) criteria including 14 items.

The authors did not state how many reviewers performed the quality assessment.

Data extraction
Two reviewers independently extracted data to populate 2x2 tables of test performance. Data were extracted on a per patient basis for the detection of polyps of any size and for clinically significant findings. Clinically significant findings were defined as polyps at least 6mm in size or at least three polyps, irrespective of size. Sensitivity and specificity, together with 95% confidence intervals (CIs), were calculated for each set of 2x2 data. If readings were reported for multiple observers, data were extracted for the initial reader. Disagreements were resolved through referral to a third reviewer. Study authors were contacted for further information, where necessary.

Methods of synthesis
Summary sensitivity and specificity, with 95% confidence intervals, were calculated using a random-effects model.
Heterogeneity was assessed using the I\(^2\) statistic. Heterogeneity was investigated using meta-regression analysis.

**Results of the review**

Eight prospective diagnostic cohort studies were included in the review (n=837 patients). The reference standard (colonoscopy) was interpreted blind to the colon capsule endoscopy results in all but one study. Only one study enrolled consecutive patients and was judged to have included an appropriate patient spectrum and provided adequate details of withdrawals. All studies fulfilled all other QUADAS criteria.

**Detection of polyps of any size** (seven studies): Summary diagnostic sensitivity of colon capsule endoscopy was 71\% (95\% CI 66\% to 76\%) and specificity was 75\% (95\% CI 66\% to 83\%). Heterogeneity was low for sensitivity (I\(^2\)=13\%) and moderate for specificity (I\(^2\)=53\%). After excluding the screening study, heterogeneity in specificity was low (I\(^2\)=26\%) and summary specificity was reduced slightly to 72\% (95\% CI 65\% to 78\%). Meta-regression did not explain any of the remaining heterogeneity.

**Detection of clinically significant findings** (seven studies): Summary diagnostic sensitivity of colon capsule endoscopy was 68\% (95\% CI 56\% to 79\%) and specificity was 82\% (95\% CI 77\% to 85\%). Heterogeneity was moderate for sensitivity (I\(^2\)=61\%) and low for specificity (I\(^2\)=9\%). After excluding the unblinded study, heterogeneity was removed (I\(^2\)=0\%) and summary sensitivity was reduced slightly to 62\% (95\% CI 54\% to 69\%).

**Detection of cancer** (eight studies): Cancer was only found in patients in three of the included studies. Of the 21 carcinomas detected at colonoscopy, 16 were identified with colon capsule endoscopy, which corresponded to a sensitivity of 76\% (95\% CI 58\% to 94\%). Data on specificity were not reported.

**Side effects** (seven studies): The overall rate of side effects was 4.1\% (95\% CI 2.6\% to 5.6\%). All appeared to be mild to moderate except for one case of postpolypectomy peritonitis which was likely to have been caused by operative colonoscopy rather than the colon capsule endoscopy.

**Authors’ conclusions**

Colon capsule endoscopy diagnostic sensitivity for polyps and significant findings compared favourably with other non invasive colorectal cancer screening strategies. Colon capsule endoscopy diagnostic specificity was likely to be underestimated because the reference colonoscopy examination results were blinded.

**CRD commentary**

The review addressed a clear question and inclusion criteria were defined. The literature search appeared adequate, but only covered a three year period; the reasons for this were unclear. Although no language restrictions were applied, specific attempts were not made to locate unpublished studies, so there was a possibility of publication bias. This was assessed in the review, but methods used were not appropriate for diagnostic accuracy data. Appropriate steps were taken to minimise bias when selecting studies and extracting data, but it was unclear whether such steps were also taken when assessing study quality.

Study quality was assessed using appropriate criteria and the results were clearly presented. Methods used to pool data were adequate and included assessment and investigation of heterogeneity.

The authors’ conclusions compared colon capsule endoscopy with other non invasive colorectal cancer screening strategies, but the accuracy of other non invasive strategies was not assessed in the review. Therefore, the reliability of these conclusions is unclear.

One author disclosed financial links with Given Imaging (manufacturers of capsule endoscopy technology).

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

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

**Research:** The authors stated that future studies should elaborate a more rigorous polyp-matching algorithm between
colon capsule endoscopy and colonoscopy to avoid incorrect classification of colon capsule endoscopy results.

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