Diagnostic value of abdominal radiography in constipated children: a systematic review
Reuchlin-Vroklage L M, Bierma-Zeinstra S, Benninga M A, Berger M Y

CRD summary
This review examined the relationship between a clinical diagnosis of constipation and faecal loading on abdominal plain radiograph in children. The authors concluded that the limited evidence was conflicting and that further research is required. Although the literature search was somewhat limited, the review was generally well conducted and the authors' conclusions were appropriate.

Authors' objectives
To assess the evidence, from observational controlled studies, on the association between abdominal radiography and symptoms and signs of constipation in children.

Searching
MEDLINE was searched from inception to April 2004; the search terms were reported. The reference lists of review articles and included studies were checked for further relevant articles. Experts in the field were contacted and asked to identify further published and unpublished studies. No language restrictions were applied.

Study selection
Study designs of evaluations included in the review
Controlled, observational studies were eligible for inclusion.

Specific interventions included in the review
Studies of the relationship between faecal loading on plain abdominal radiography using a predefined scoring system and a clinical diagnosis of constipation based on symptoms and signs were eligible for inclusion. Studies could treat either test as the index test. The included studies used three different scoring systems for evaluating abdominal radiography. All of the included studies were conducted in hospital settings.

Reference standard test against which the new test was compared
Studies of the relationship between faecal loading on plain abdominal radiography using a predefined scoring system and a clinical diagnosis of constipation based on symptoms and signs were eligible for inclusion. Studies could treat either test as the reference standard. Three studies used a clinical diagnosis of constipation as the reference test.

Participants included in the review
Studies of otherwise healthy children, between the ages of 1 and 18 years, with signs and symptoms related to constipation, were eligible for inclusion. Some of the primary studies included children with soiling or encopresis; other studies excluded these groups.

Outcomes assessed in the review
The included studies had to report sufficient data to enable the calculation of indicators of diagnostic performance: sensitivity, specificity, likelihood ratio (LR), or accuracy. The review also assessed the inter-observer reliability for the scoring of abdominal radiographs.

How were decisions on the relevance of primary studies made?
Two reviewers independently screened the titles and abstracts of studies identified by the searches for eligibility. All potentially relevant studies were retrieved as full papers and independently screened by two reviewers. Any disagreements were resolved by consensus or through consultation with a third reviewer.

Assessment of study quality
The methodological quality of the included studies was assessed using the Quality Assessment of Diagnostic Accuracy Studies (QUADAS) tool (see Other Publications of Related Interest). An overall methodological quality value was assigned to studies by calculating the number of positive scores (maximum value 14). Studies with scores of nine or higher were arbitrarily regarded as being of 'high' methodological quality. Two reviewers independently assessed the methodological quality of the included studies. Any disagreements were resolved by consensus or through consultation with a third reviewer.

### Data extraction

Two reviewers independently extracted the data. Any disagreements were resolved by consensus. Data were extracted on participant demographics, definition of disease and absence of disease from the reference standard, descriptions of the reference standard and index tests, and outcome measures. Where possible, the sensitivity, specificity and LRs were calculated with 95% confidence intervals (CIs).

### Methods of synthesis

**How were the studies combined?**

The studies were combined in a narrative, with grading according to a hierarchy of evidence based on study quality scores. The results of the individual included studies were tabulated.

**How were differences between studies investigated?**

Differences between the studies were discussed in the text. The results for two high-quality and two low-quality studies were plotted on a receiver operating characteristic (ROC) curve.

### Results of the review

Six studies were included in the review: three case series, two case-control studies, and one retrospective study of abdominal radiographs. The total number of participants could not be determined from the data presented.

The total scores for methodological quality ranged from 5 to 11 (mean 8.3) out of 14. The least fulfilled criteria related to disease progression bias (one study fulfilled this criterion) clinical review bias (two studies fulfilled this criterion) and the reporting of intermediate test results (no studies fulfilled this criterion). Inter-observer reliability, for the rating of plain radiographs, was evaluated in three studies, and ranged from moderate (k=0.52) to excellent (k=0.85). All six studies were conducted in hospital settings.

One study presented a logistic regression model, where clinical symptoms of constipation were the independent variables and radiographic constipation the dependent variable. The model defined a clinical diagnosis of constipation. This diagnosis was present 1.2 times as often in children with radiographic constipation as in those without (positive LR 1.2, 95% CI: 1.0, 1.4).

Four studies assessed the ability of abdominal radiography to distinguish between children with and without clinical constipation. Only one study reported a statistically significant discriminatory value, a positive LR of 3.0 (95% CI: 1.6, 4.3). One further study reported only accuracy as a measure of discriminatory value (accuracy 80%, 95% CI: 50, 100). The authors reported that 'low quality' studies generally reported higher diagnostic value than 'high quality' studies (observation derived from visual examination of the results plotted in ROC space).

Two studies presented data on the diagnostic value of individual symptoms in relation to faecal impaction on abdominal radiography. One low-quality study found a significant positive LR for a history of hard stools (LR 1.2, 95% CI: 1.0, 1.4). The other high-quality study found a significant positive LR for rebound tenderness (LR 1.1, 95% CI: 1.0, 1.2). The two studies reported conflicting data on the value of rectal examination; the high-quality study found a statistically significant association (LR 1.6, 95% CI: 1.2, 2.0) and the low-quality study found no significant association (LR 1.5, 95% CI: 0.8, 2.3).

### Authors' conclusions
The limited available data showed conflicting evidence on the association between clinical symptoms of constipation and faecal loading on abdominal radiographs in children. The recommendation to perform a plain radiograph in case of doubt of the presence of constipation in children cannot be supported. Further good-quality research is needed.

**CRD commentary**

The review addressed a clearly stated research question that was defined in terms of the participants, reference and index tests, and outcomes, and broadly defined in terms of study design. The limitation of the search to a single bibliographic database plus references could have resulted in the omission of relevant data. However, additional attempts to identify further published and unpublished articles were reported, thus minimising the potential for publication bias. The review methodology was clearly reported and appropriate measures were taken to minimise reviewer errors and bias. An appropriate tool was used to assess the quality of the included studies. However, the reporting of the quality assessment was limited to overall quality scores (not recommended by the authors of the tool), which may obscure relevant information about individual aspects of the quality of the included studies. The authors’ use of a narrative synthesis was appropriate for the nature of the data presented, as was their recommendation for further research.

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

Practice: The authors stated that constipation can be diagnosed by a detailed medical history and thorough physical examination including a digital rectal examination. They further stated that the recommendation of the North American Society for Pediatric Gastroenterology and Nutrition, to take a plain radiograph in cases where the diagnosis of constipation is in doubt, is not supported by the results of their review. All studies were hospital based and the authors stated that their results cannot be generalised to general practice.

Research: The authors stated that there is a need for further adequately powered, high-quality studies to find the best method of diagnosing constipation in children. They also stated that, in the absence of an adequate reference standard, follow-up studies (preferably randomised) are needed to determine the combined effects of diagnostic tests and correctly administered treatments on patient outcome.

**Bibliographic details**


PubMedID

15997002

DOI

10.1001/archpedi.159.7.671

Original Paper URL

http://archpedi.ama-assn.org

Other publications of related interest


**Indexing Status**

Subject indexing assigned by NLM

MeSH

Child; Child, Preschool; Constipation /radiography; Humans; Radiography, Abdominal
AccessionNumber
12005000998

Date bibliographic record published
30/09/2006

Date abstract record published
30/09/2006

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.