Radiological assessment of constipation

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Abstract

A scoring system for faecal loading was constructed by two experienced observers using the abdominal radiographs of 20 children. Four other observers independently graded the radiographs using this system and there was a high degree of agreement between all six observers ($p < 0.001$), suggesting that radiological assessment of constipation can be standardised.

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Constipation is a common and frequently underestimated problem in children, which may cause abdominal pain or contribute towards urinary tract disorders such as vesicoureteric reflux and enuresis,¹ as well as considerable distress to the child and family. Although the clinical diagnosis may be obvious, this is not always the case and various radiological and manometric diagnostic methods have been described.² The use of radio-opaque markers often requires several abdominal radiographs and manometry may be uncomfortable for the child. We devised a study to determine whether the degree of faecal loading could be reliable and reproducible when assessed by different observers using a single abdominal radiograph, thus providing an objective record of bowel content suitable for clinical practice and research. This method has the additional advantage that it can be used retrospectively.

Methods

Abdominal radiographs of 20 children (aged 5-14 years) were performed for a variety of clinical indications including constipation, urinary tract infection, and haematuria. Two experienced observers, one a consultant radiologist with an interest in paediatric gastroenterology (A) and the other a consultant paediatric gastroenterologist (B), independently viewed the 20 radiographs and divided them into four grades of increasing faecal loading (0-3). After discussion between A and B, a diagram was constructed showing the typical appearance of each grade (figure).

The 20 abdominal radiographs were then given to four observers (C-F) (all experienced radiologists but without a special interest in paediatrics) and, using the chart, they graded the films independently. The results of the experienced radiologist (A) were used as a 'gold standard' for comparison with the other five observers. Interobserver variation between

the six observers was established using weighted κ and Spearman's rank correlation.

Detailed information regarding bowel function was available from the notes in 15 of the 20 children. A clinical grading system for bowel frequency (0-3) was then also constructed based on previous 'normal' data in childhood³ with bowel frequency seven times per week = 0, 3-6 = 1, 1-2 = 2, and <1 = 3.

Results

Using the radiological scoring system, the experienced observers A and B then studied the 20 abdominal radiographs again and independently agreed on a score. There was complete agreement between them in 18 cases and there was one category disagreement in two cases. A weighted κ score of 0.9537 ($p < 0.001$) confirmed a highly significant agreement between the two observers.

When the scores of observers B-F were compared with A, out of 100 possible agreements, there was complete agreement in 78, one category disagreement in 20, and two category disagreement in two giving a weighted κ of 0.8662 ($p < 0.001$) indicating low inter-observer variation. The results obtained by C-F (the less experienced observers) were compared with A and, out of a possible 80 agreements, there was complete agreement in 60 with 18 one category disagreements and two category disagreements (weighted $\kappa = 0.8434$, $p < 0.001$).

When the clinical assessment of constipation, based on bowel frequency, was plotted in the 15 patients against their radiographic evidence of faecal loading there was exact correspondence in 12 patients (that is, the same clinical and radiological score) with one category disagreement in three cases.

Discussion

The diagnosis of constipation in childhood may be difficult because of a poor history, usually due to embarrassment on the child's part. Examination may be unhelpful and rectal examination distressing for the child. Various methods have been used to assess constipation, including rectal examination after defaecation, rectal manometric pressure with balloon insufflation,¹ and anal sphincter electromyography,⁴ but all of these are invasive. Furthermore it is often difficult to obtain retrospective evidence of constipation. In these circumstances an objective semiquantitative assessment may be helpful.

The aim of our study was to devise a simple reproducible system for grading faecal loading using an abdominal radiograph, and we have shown that it can provide an objective and

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Four grades of faecal loading.

reproducible assessment of faecal content and that there is a reasonably good correlation with a carefully taken clinical history of constipation. A previous report from North America suggested a scoring system for stool retention based on abdominal radiographs.⁵ The authors used a more complex scoring system than ours, based upon the quantity and apparent quality of stool, and we feel that our method is simpler and more reproducible. However, we agree with the authors of the previous report that we would certainly not advocate the use of an abdominal radiograph to diagnose most cases of constipation but, in certain circumstances it may be useful, occasionally when it is difficult to tell clinically whether constipation is present

and, more especially, to obtain retrospective evidence of faecal loading. The degree of faecal loading is not routinely reported in many units, even when severe constipation is present.

Studies using radio-opaque markers may be used to further characterise constipation in childhood. Thus it is known that there is a prolonged mouth to anus transit time in children with constipation⁶ and it has been suggested that severe constipation is usually due to major faecal retention occurring distally in the descending colon and rectum.⁷ The data in adults with constipation are conflicting, however, and the study from Chaussade *et al* did not support the suggestion that patients with constipation can be simply categorised into those with delayed transit throughout the whole colon and those with left sided delay.⁸ Overall we therefore feel that assessment based on one radiograph is helpful. If most children with constipation initially present with distal obstruction of the rectum, this would still be graded in our classification and although the use of radio-opaque markers may help to show in which areas of the colon hold-up is greatest, this is of little practical and clinical consequence to the child or the doctor managing the problem.

Thus our study shows that a high degree of agreement between observers can be achieved, even by those who have little paediatric experience. The grading system is easy to use and is reproducible. In circumstances in which the diagnosis of constipation is considered but cannot be substantiated, an abdominal radiograph may provide a simple solution at the cost of a low radiation dose.

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