



Are We Using Abdominal Radiographs Appropriately in the Management of Pediatric Constipation?

Beate Beinvogl, MD^{1,2}, Sabina Sabharwal, MD, MPH², Maireade McSweeney, MD, MPH², and Samuel Nurko, MD, MPH^{1,2}

Objective To identify the reasons why pediatric gastroenterologists obtain abdominal radiographs in the management of pediatric constipation.

Study design This was a prospective study surveying providers regarding their rationale, interpretation, resultant change, and confidence in their management before and after obtaining KUBs in patients seen for suspected constipation. Demographics and clinical findings were obtained from medical records.

Results A total of 24 providers were surveyed after 72 patient encounters. Reasons for obtaining an abdominal radiograph included evaluation of stool burden (70%), need for a clean out (35%), fecal impaction (27%), cause of abdominal pain (24%), demonstration of stool burden to families (14%), assessment of response to therapy (13%), or encopresis (10%). The plan was changed in 47.6% of cases based on radiographic findings. In cases in which a plan was outlined before obtaining the radiograph (69%), the initial plan was implemented on average in 52.5%. In cases with no plans before obtaining the radiograph, previously unconsidered plans were implemented in 8.7%. Provider confidence in the management plan increased from 2.4 ± 2.7 to 4.1 ± 1.8 ($P < .05$) after the abdominal radiograph.

Conclusion Abdominal radiographs commonly are obtained by pediatric gastroenterologists in the evaluation and management of constipation. The majority used it to make a diagnosis, and nearly one-half changed their management based on the imaging findings. Overall, they reported an improved confidence in their management plan, despite evidence that radiographic findings poorly correlate with clinical severity. This study highlights the need for further provider education regarding the recommendations delineated in existing constipation guidelines. (*J Pediatr* 2017;191:179-83).

Functional constipation, a common problem in children and adolescents, is a clinical diagnosis based on patient history, physical examination, and use of the Rome IV criteria and necessitating no further routine diagnostic testing.¹ However, providers frequently obtain plain abdominal radiographs to assist with the evaluation and/or management of constipation.^{2,3} Current evidence, including multiple prospective studies and systematic reviews, does not support a diagnostic association between clinical symptoms and fecal loading on abdominal radiographs.⁴⁻⁷ More specifically, studies have shown a lack of intra- and interobserver reliability in the interpretation of plain radiographs.^{5,8} Studies also show that relying on an abdominal radiograph for the evaluation of constipation in patients with abdominal pain may lead to the wrong diagnosis or may lead to an overlooking of other diagnoses.^{9,10} Obtaining radiographs further increases cost and poses a significant radiation exposure, especially because children often undergo repeated studies.^{11,12}

Guidelines published by the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition and the European Society for Pediatric Gastroenterology, Hepatology and Nutrition, as well as the Rome IV criteria, clearly recommend that abdominal radiographs should not be used in the routine evaluation of functional constipation, with the only exceptions being an unreliable patient history, psychological factors that make a digital rectal examination (DRE) inappropriate (such as a history of trauma), obesity, or patients with a suspicion of sexual abuse history.^{1,12-14} No studies evaluating provider adherence to these guidelines, specifically with regard to the use of radiographs, or their rationale for obtaining abdominal films, exist. In addition, no data exist on how routine abdominal radiographs may influence provider's clinical management. The aim of this study was to assess how pediatric gastroenterology providers use abdominal radiographs to evaluate and manage constipation. Understanding why subspecialty providers obtain abdominal films against current recommendations may reveal gaps in the provider's knowledge of the current guidelines and provide opportunities for educational intervention.

Methods

This prospective study was conducted at Boston Children's Hospital and was approved by the local institutional review board. Members of the Pediatric Gastroenterology Division (attending physicians, fellows, or nurse practitioners) were

From the ¹Center for Motility and Functional Gastrointestinal Disorders; and ²Division of Pediatric Gastroenterology, Boston Children's Hospital, Boston, MA
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DRE Digital rectal examination

surveyed after any outpatient clinical encounter in which a plain abdominal radiograph was obtained when constipation was known or suspected. A survey was designed and tested with providers. In the final version, providers were asked about their rationale for obtaining a radiograph, what management they were considering before the film, how they interpreted the radiograph (mild, moderate, or large stool burden) and then asked if and how the abdominal imaging changed their management, as well as their level of confidence in their treatment plan before and after obtaining the radiograph. Providers also were asked if they thought the radiograph was useful.

Medical records of the patients who had an abdominal radiograph were reviewed for patient demographics, clinical history, pertinent physical examination findings, as well as radiology reports. No formal scoring system for stool burden was used, given their poor and inconsistent sensitivity and specificity.^{4,6} The primary outcome measure was whether obtaining an abdominal radiograph changed an individual providers' constipation management plan. Secondary endpoints included relative frequencies of providers' reasons for obtaining a radiograph, diagnoses, and management changes made based on the radiograph. Provider's interpretation of abdominal radiographs in relation the expectation based on history and physical examination also was assessed. The confidence in the management plan before and after obtaining an abdominal radiograph (via a modified Likert Scale: 0 = unsure to 5 = very confident) was calculated with the Wilcoxon Rank Sum Test. Data were analyzed with SPSS Statistics 20 (IBM Corp, Armonk, New York).

Results

A total of 24 providers were interviewed after 72 patient encounters in which constipation was either considered as the chief complaint or patients were seen for follow-up of a known diagnosis of constipation. Providers included pediatric gastroenterologists (77.1%), nurse practitioners (18.6%), and fellows (4.3%). The mean patient age was 10.2 ± 6.1 years, and 43.9% were female and 56.1% male. Nearly equal numbers were seen for an initial consultation (47%) vs follow-up visit (53%). The chief complaint(s) of patients sent for an abdominal radiograph were constipation (33.3%), abdominal pain (30.6%), diarrhea or loose stools (16.7%), and fecal soiling (15.2%). Other complaints included feeding difficulties, nausea, heartburn, bloating, or nocturnal enuresis (21.2%). Of all patients, 56.9% had a history of constipation, and 61.1% were on laxatives at the time of presentation. Comorbidities were found in 18.3% of patients and included genetic syndromes with developmental delay ($n = 2$), cerebral palsy ($n = 3$), inflammatory bowel disease ($n = 2$), type 1 diabetes ($n = 2$), celiac disease ($n = 2$), Ehlers-Danlos syndrome ($n = 1$), attention-deficit/hyperactivity disorder ($n = 2$), autism ($n = 1$), and neurogenic bowel ($n = 1$). Surgical history included cecostomy tube placement ($n = 3$), subtotal colon resection for necrotizing enterocolitis ($n = 2$), repaired imperforate anus ($n = 1$), and detethering of a tethered chord ($n = 1$).

Of all patients, 34.7% had a previous abdominal radiograph for evaluation of constipation at the same or another institution. An abnormal abdominal examination was noted in 34.7% of patients, including mild tenderness to palpation (20.6%), palpable stool (17.6%), or distension (10.3%). Only 2.8% of patients had an abnormal finding on perianal examination, including rectal prolapse, skin tag, or fissure. A DRE was performed in only 12 of the 72 patients (16.7%). Of patients who had a DRE, 3 had no palpable stool in the rectum, and their radiograph showed a small amount of stool in 1 case and moderate amounts of stool in 2. A small amount of soft stool was palpated in 5 cases, with the radiograph showing moderate amounts of stool in 4 of these cases and small stool burden in 1 case. All 4 cases described to have large amounts and/or hard stool on the DRE had large colonic and rectal fecal burden on radiograph.

The assessment of stool burden (70%) was the most common reason for obtaining a radiograph, followed by determination for the need of a clean out (35%), presence of fecal impaction (27%), cause of abdominal pain (24%), demonstration of stool burden to families (14%), assessment of response to therapy (13%), to determine presence of encopresis (10%), or to confirm fecal impaction (6%) (Figure).

Stool burden on the abdominal radiograph was as expected (39.7%), worse (39.7%), or less (20.6%) than expected based on history and physical examination. Both the personal and the radiologist read of the abdominal radiograph was used in 63.9%, whereas 33.3% relied on the radiologist's report and 2.8% on their personal interpretation alone. Per radiology report, 18.2% had a normal colonic stool burden, 53% moderate, and 28.8% large stool burden on the radiograph. Minimal or no stool burden in the rectum was found in 80.6% of patients, and 19.4% had moderate-to-large stool burden in the rectum.

Providers found the abdominal radiograph useful in 97.2% of patient encounters to diagnose constipation as reason for abdominal pain (27.6%), diagnose constipation (22.4%), demonstrate stool burden to the family (15.5%), diagnose fecal impaction (10.3%), assess for worsening fecal retention (8.6%), determine whether fecal retention was the reason for incontinence (5.2%), or determine the need for an inpatient clean out (1.7%). Overall, the plan was implemented or changed based on the imaging findings in 47.6% of cases. In cases in which a plan had been outlined before obtaining the radiograph (69%), the initial plan was implemented on average in 52.5% of cases. In patients in whom no or alternate plans had been considered before the radiograph was obtained, previously unconsidered plans were implemented on average in 8.7% of cases. Details of the changes in management plan based on abdominal radiograph findings are shown in the Table. The mean level of confidence in the management plan before obtaining abdominal radiograph was 2.4 ± 2.7 and increased to 4.1 ± 1.8 ($P < .05$) after viewing the radiograph.

Discussion

Evidence-based guidelines clearly suggest that an abdominal radiograph is not necessary for the evaluation of constipa-

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