Positive guaiac and bloody stool are poor predictors of intussusception☆,☆☆

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ABSTRACT

Background: Currant jelly stool is a late manifestation of intussusception and is rarely seen in clinical practice. Other forms of GI bleeding have not been thoroughly studied and little is known about their respective diagnostic values.
Objective: To assess the predictive value of GI bleeding (positive guaiac test, bloody stool and rectal bleeding in evaluation of intussusception.
Methods: We performed a retrospective cross-sectional study cohort of all children, ages 1 month-6 years of age, who had an abdominal ultrasound obtained evaluating for intussusception over 5 year period. We identified intussusception if diagnosed by ultrasound, air-contrast enema or surgery. Univariate and a multivariate logistic regression analysis were performed.
Results: During the study period 1258 cases met the study criteria; median age was 1.7 years (IQR 0.8, 2.9) and 37% were females. Overall 176 children had intussusception; 153 (87%) were ileo-colic and 23 were ileo-ileal. Univariate risk ratio and adjusted Odds ratio were 1.3 (95% CI, 0.8, 2.0) and 1.3 (0.7, 2.4) for positive guaiac test, 1.1 (0.6, 2.1) and 0.9 (0.3, 3.0) for bloody stool, and 1.7 (1.02, 2.8) and 1.3 (0.5, 3.1) for rectal bleeding .
Conclusion: Blood in stool, whether visible or tested by guaiac test has poor diagnostic performance in the evaluation of intussusception and is not independently predictive of intussusception. If the sole purpose of a rectal exam in these patients is for guaiac testing it should be reconsidered.

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1. Introduction

Intussusception is the most common cause of bowel obstruction in infants and young children [1,2], and if diagnosis is delayed may lead to bowel necrosis and perforation [3,4]. Classic signs and symptoms of intermittent abdominal pain, a palpable 'sausage' mass in the abdomen and bloody (or "currant jelly") stool occur as a triad in the minority of patients, likely because the latter two are late signs [5,6]. With currant jelly stool being a rare findings in children evaluated early in their course, clinicians may consider other forms of GI bleeding to be features that precede currant jelly. Some GI bleed symptoms were included in validated prediction models [2,6-9], while others were not consistently found to be predictive. The presence of rectal bleed was found to be predictive in one prediction model [7] but not in others [6]; guaiac positive stool was found to be predictive in some models [8], and finally, bloody diarrhea as a symptom has not been thoroughly investigated. Diarrhea per se was found to be a negative predictor in one study [6], but it is unclear whether the presence of blood with diarrhea would alter the test characteristics. The sources of inconsistency between prediction models are likely multifactorial. Authors have suggested differences in study design, mode of diagnosis [ultrasound [5,10] vs. a diagnostic air contrast enema [5-7]] and the time to diagnosis [11] as possible explanations of inconsistent results. The objective of this study was to assess the diagnostic value of a positive guaiac test, rectal bleeding, and bloody diarrhea for intussusception.

2. Materials and methods

2.1. Study design

We performed a cross-sectional study of all children aged one month to 6 years evaluated for intussusception in a single urban, tertiary care pediatric ED over a 5 year period. The study protocol was approved by the institutional review board.

2.2. Patient identification

Case identification was conducted in two phases. We screened ED records that included an abdominal ultrasound order for the evaluation of intussusception.. We also screened ED documentation for patients evaluated for intussusception using a computer-assisted key word screening tool [12-14] using regular-expression matching. This technique provides a more comprehensive and inclusive search than keyword searching by including misspelled and mistyped variations. Manual medical record review of the identified records was then conducted.

2.3. Patient population

We included children who had an abdominal ultrasound obtained for the evaluation of intussusception within 24 h of ED arrival. We excluded children with cystic fibrosis, gastro-jejunal or gastric tube, prior intussusception, or Henoch Schonlein purpura.

2.4. Data collection and variable definition

The complete medical records from the index ED visit and any subsequent encounters over the following seven days of all study patients were reviewed by one of two study investigators (PH, AK). The following factors were abstracted: patient demographics, clinical features, laboratory and imaging results and clinical outcome (see below). We defined *fever* as temperature > 38 °C measured at home or in the ED. When attending and trainee medical records differed, the data was abstracted from the attending documentation. *Age* was collected as a continuous variable, however we dichotomized age at 24 months based on prior work suggesting this cutoff as a predictor of intussusception [7], as well as an age where children may be verbal enough to describe symptoms. We defined *rectal bleeding* as bright red blood per rectum, whether visualized by parents at home or by medical personnel in the clinic/ED, or if the document contained the term "rectal bleeding". *Peritoneal signs* were defined as findings consistent or peritoneal irritation such as guarding or rebound pain. We dichotomized *abdominal radiograph* results to normal radiograph vs. any abnormality including dilated bowel loops, air fluid levels, paucity of gas, target or crescent sign. Historical variables were included whether reported by parents or the patient. Findings were considered present if they were documented either by any physician and missing if not documented. Data elements missing from ED physician documentation were abstracted from available physician notes including surgical consultation or discharge summaries.

2.5. Outcome measure

Our primary outcome was either intussusception reduced by air contrast enema, surgically resected, or ileo-ileal intussusception documented on ultrasound results.

2.6. Statistical analysis

We performed univariate analysis using Chi square test for categorical data and Mann-Whitney *U* test for continuous data. We used binary logistic regression for the multivariate analysis. We used the Statistical Program for the Social Sciences (IBM SPSS Statistic Version 21, IBM Inc., Chicago, IL).

2.7. Accounting for bias

We acknowledge the fact that guaiac testing will only be done in a fraction of the patients. We believe it will be driven primarily by provider style of practice, but to assure we overcome part of the bias we will run a multivariate model only if the rate of intussusception will be similar among patients tested vs. those who were not tested and only if guaiac testing was done on the majority of the patients.

3. Results

During the study period, 1258 cases met the study criteria; median age was 1.7 years (IQR 0.8, 2.9), 37% were females, and 176 (14%, 95% CI [12%, 16%]) had intussusception; 153 (87%) were ileo-colic and 23 were ileo-ileal. Twenty-six cases were intermittent (either seen on ultrasound with resolution, or had a positive ultrasound and a normal air enema).

Seven hundred eight children (56%) had guaiac test reported. The rate of intussusception was the same among children who had the testing done and those who did not (13% and 14.4% respectively, P = 0.7). However, Guaiac testing was performed more commonly in males (66% vs. 34%, P = 0.008), and in younger children (median age 1.6 years [IQR 0.7, 2.7] vs. 2 years [IQR 1.02, 3.34] P < 0.01).

The presence/absence of rectal bleeding was documented in 1052 children (84%) and the rate of intussusception was the same among children who had rectal bleeding reported vs. those who did not (14.3% vs. 12.6% respectively P = 0.58). Presence/absence of diarrhea with the corresponding characteristics was recorded on all 1258 cases. See Fig. 1 for case identification and Table 1 for patient characteristics and a univariate analysis.

Neither a guaiac test, nor rectal bleeding or bloody diarrhea were found to be predictive of intussusception (P values were 0.28, 0.052 and 0.63 respectively). Several predictors emerged as significant in the univariate analysis, including emesis, bilious emesis, absence of fever, abdominal pain, lethargy, and absence of irritability and any abnormality of abdominal X ray.

Table 2 presents the multivariate regression analysis. Adjusted Odds ratio for Guaiac test, rectal bleeding and bloody diarrhea were 1.3 (0.7, 2.4), 1.3 (0.5, 3.1) and 0.9 (0.3, 3.0) respectively. Several predictors appeared as significant in the multivariate model including abdominal pain, abnormal radiograph, vomiting, and lethargy. The presence of fever (temperature ≥ 38 °C), female gender and presence of diarrhea emerged as a protective/negative predictors.

4. Discussion

We have presented a large cohort of children being evaluated for intussusception. "Neither a positive guaiac test, nor rectal bleeding, or bloody diarrhea were found to be predictive of intussusception either on a univariate analysis or a multivariate model. We therefore conclude that in the majority of cases where there is blood in the stool, either occult or visible, it does not mirror the presence of currant jelly stool and the interpretation of blood in the stool should be done with caution.

Our data contradicts prior publications suggesting the presence of blood in the stool is highly predictive of intussusception. Harrington et al. [5] published a prospective study in which all patients undergoing contrast enema were included. Of the 88 patients evaluated for clinical predictors of intussusceptions, they found that a right upper quadrant mass, gross blood in stool, gross blood on rectal examination, and the triad of abdominal pain, vomiting, and right upper abdominal mass as positive predictors (Negative predictive value of all 3 was 77%, negative predictive value of Positive guaiac test was 76%, given the number of patients included the 95% confidence interval was wide). Kuppermann et al. [7] conducted a retrospective study between 1990 and 1995, again using air contrast enema as mode of diagnosis, and found that male sex, an abnormal radiograph, and rectal bleeding were predictive of intussusception. While both rectal bleeding and positive guaiac stool were found to be predictive on the univariate model, only rectal bleeding was found to be predictive on the multivariate model with an OR of 17.3 (2.9, 104). Klein et al. [2] also looked at all patients undergoing contrast enema to diagnose intussusception. Their prevalence of intussusception was 27%, and using univariate analysis, they were able to confirm