

# Double Trouble: Ten-Year-Old Girl With Chronic Diarrhea and Acute Abdominal Pain

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## Case Report

A 10-year-old previously healthy female patient presented to the Emergency Department (ED) with 4 days of severe abdominal pain, primarily in the umbilical region. Pain was intermittent with a few episodes per hour, each lasting roughly 10 minutes. She had associated nausea and nonbilious, nonbloody emesis when pain was most intense. She was unable to tolerate any oral intake. She presented to her pediatrician on day 3 of illness; blood work was obtained and was reportedly normal. She was prescribed ondansetron by her pediatrician, which did not improve her symptoms.

One month prior to the onset of her acute abdominal pain, she began having watery, nonbloody stools at least 3 to 4 times a day. Diarrheal episodes would result in fecal incontinence. Stools occurred around-the-clock, sometimes waking her from sleep. She denied fevers, chills, myalgias, headaches, rhinorrhea, sore throat, loss of taste or smell, chest pain, joint pains, rashes or petechiae, oral ulcers, significant weight changes, dysuria, hematuria, hematochezia, melena, and vaginal discharge. Remainder of review of systems was negative.

Her past medical and surgical histories were insignificant. Vaccination record was up-to-date. No family history of autoimmune or chronic gastrointestinal (GI) conditions was found.

From a social perspective, she lived on a farm with her parents and brother. She reported a pet turtle. She had also been caring for Holstein calves for 6 weeks prior to admission. She denied consuming unpasteurized milk. Although she had recently gone camping and fishing, she denied drinking water from rivers or streams. Her only recent sick contact was her mother, who had a recent episode of colitis of unclear cause that improved with antibiotics. Regarding COVID-19 risk factors, her family had been following recommended measures such as hand washing, mask wearing, and social distancing. There was no known direct contact with individuals who tested positive for COVID-19.

Prior to presenting to our institution, she had presented to an outside hospital ED. She was given a fluid

bolus and intravenous ondansetron. An abdominal X-ray performed was read as normal. She was subsequently discharged. Due to persistent symptoms, she presented to our ED that same evening.

Upon presentation to our ED, her initial physical examination revealed sinus tachycardia, dry mucous membranes, delayed capillary refill of 3 to 4 seconds, normoactive bowel sounds, and diffuse abdominal pain with palpation, most notable at the periumbilical region, without peritoneal signs. She was given a fluid bolus for dehydration and intravenous acetaminophen for the abdominal pain. Her blood glucose was 69 mg/dL; she received a 10% dextrose bolus. Her basic metabolic panel was significant for metabolic acidosis with an elevated anion gap, acute kidney injury, hypokalemia, hypophosphatemia, and hyponatremia. Complete blood count with differential showed lymphopenia but was otherwise unremarkable. Her erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) were normal. Urinalysis was significant for specific gravity greater than 1.030, ketonuria of 80 mg/dL, and 5 to 10 RBCs/HPF (red blood cells per high power field). Magnetic resonance imaging (MRI) of her abdomen and pelvis ruled out appendicitis and revealed trace intra-pelvic free fluid. Stool studies including parasitic panel were sent. She was admitted to the inpatient pediatric service for further workup and care.

## Hospital Course

Once admitted, our patient was maintained on intravenous fluids. An abdominal ultrasound was performed during an episode of severe pain, which revealed small bowel–small bowel intussusception (see Figure 1).

Clinical Pediatrics  
2022, Vol. 61(9) 654–658  
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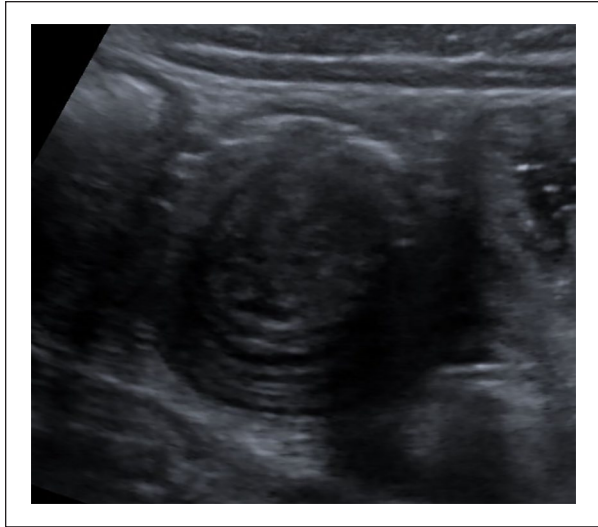


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**Figure 1.** Small bowel–small bowel intussusception. Classic target sign is the radiographic finding on abdominal ultrasound.

Pediatric surgery was consulted and recommended bowel rest and pain management. Pain was controlled with acetaminophen and morphine. Repeat abdominal ultrasound 2 days later revealed resolution of the intussusception. Her abdominal pain slowly resolved, her diet was advanced, and her pain medications and intravenous fluids were slowly weaned.

During the hospitalization, she continued to have frequent watery stools with abdominal cramping even after her intussusception had resolved. She required regular repletion of magnesium, potassium, and phosphorus due to poor oral intake and excessive stool output. The following stool studies were negative: *Salmonella*, *Shigella*, *Yersinia*, *Clostridium difficile*, *Campylobacter*, *Vibrio*, and Enterotoxigenic *Escherichia coli*. Fecal leukocytes were negative. Serologies for Epstein-Barr virus (EBV) and cytomegalovirus (CMV) were negative. Unfortunately, the ova and parasite stool study results were delayed (sent to an outside lab instead of performed in-house), due to the ongoing COVID pandemic and limited testing capabilities. However, on the day prior to discharge, the parasitic panel returned positive for *Cryptosporidium parvum*, the likely cause of her chronic watery diarrhea. Prescriptions for nitazoxanide 200 mg twice a day for 3 days, a probiotic, and dicyclomine as needed for cramping were prescribed on discharge.

## Final Diagnosis

Our patient originally presented to our hospital with acute abdominal pain secondary to an acute small bowel

to small bowel intussusception. However, she also had underlying chronic (over 4 weeks' duration) secretory diarrhea, caused by the parasite *Cryptosporidium parvum*. This parasitic bowel infection likely caused small bowel edema, which was the impetus for her to develop an intussusception of her bowel. The electrolyte and metabolic derangements were a result of chronic diarrhea and acute anorexia.

## Discussion

It is important to distinguish that there are 2 related but distinct pathological conditions in our patient described above. Failure to realize this could yield an inaccurate or incomplete diagnosis and a poor patient outcome. Therefore, it was important to generate 2 separate differential diagnoses in this case, 1 for acute abdominal pain and 1 for chronic secretory diarrhea.

Regarding her abdominal pain the diagnoses in were considered (Table 1). Inflammatory bowel disease (IBD) was less likely with a stable weight, normal ESR (of 3), normal albumin, normal hemoglobin, and no inflammatory cells in the stool. Transglutaminase IgA and IgG were both negative, reducing the likelihood for celiac disease. Appendicitis, pyelonephritis, and cholecystitis were ruled out with MRI on admission. Ovarian torsion was also unlikely as her ovaries were visualized and normal on the MRI. Urinalysis on admission was negative for hemoglobin and microscopy showed only 5 to 10 RBCs making nephrolithiasis possible, but less likely than other entities. Urine culture grew 10,000 colonies of *E coli* but patient denied dysuria, urinary frequency, urgency, or flank pain, so unlikely to be urinary tract infection (UTI)/pyelonephritis. An abdominal X-ray was negative for small bowel obstruction. Peptic ulcer disease was less likely due to the location and episodic nature of her abdominal pain unrelated to timing of meals. Malignancy was less likely due to the acute nature of the pain and lack of weight changes, fevers, or mass/lymphadenopathy on MRI. Lipase and MRI were negative for acute pancreatitis. Intussusception was diagnosed via the abdominal ultrasound that captured the bowel telescoping.

Intussusception is defined as the slipping of a portion of bowel into the neighboring portion. This condition generally occurs in young children, and only 30% occur in individuals greater than 2 years of age. Risk factors for intussusception include young age, intestinal malformations, and any condition that leads to inflammation of the GI tract as identified in (Table 2). The rotavirus vaccine has also been associated with intussusception. In some cases, a pathologic lead point, which is an anatomic anomaly that predisposes the bowel to intussusception, is identified. Examples of pathologic lead points include

**Table 1.** Differential Diagnosis for Abdominal Pain for Preadolescent Female Patient.<sup>1</sup>

Gastroenteritis (viral, bacterial, parasitic)	Hirschsprung disease
Inflammatory bowel disease	Ovarian torsion or cyst
Celiac disease	Nephrolithiasis
Constipation	Intussusception
Appendicitis	Small bowel obstruction
Pancreatitis	Pyelonephritis/cystitis
Musculoskeletal	Cholecystitis
Mass/malignancy	Gastroesophageal reflux, esophagitis, gastritis, peptic ulcer disease

**Table 2.** Predisposing Factors for Pediatric Intussusception.<sup>2</sup>

## Anatomic lead point

- Appendix
- Meckel's diverticulum
- Peutz-Jegher polyp or cancer
- Hypertrophied Peyer patch (polyps)
- Lipomas
- Malrotation

## Associated infections

- Adenovirus
- Rotavirus infection (and vaccine)
- Parasitic infections

## Associated diseases

- Crohn disease
- Celiac disease
- Cystic fibrosis
- Neuronal intestinal dysplasia
- Hemophilia
- Leukemia/lymphoma
- Henoch-Schonlein purpura
- Bleeding disorders

Meckel's diverticulum, polyp, or tumor. In most cases of intussusception, no cause is discovered (idiopathic) and no lead point is identified.<sup>1,2</sup>

The clinical presentation of intussusception usually reveals waxing and waning crampy abdominal pain associated with typical gastroenteritis symptoms such as vomiting and diarrhea.<sup>2</sup> The abdominal pain occurs due to peristalsis at the intussuscepted segment that is transiently obstructed.<sup>1</sup> Physical examination may reveal abdominal discomfort in any quadrant, typically without rebound tenderness. Although rarely found, the classic triad of symptoms is abdominal pain, palpable "sausage shaped" mass, and bloody ("currant jelly") stools. If the area is not actively peristalsing, the patient may be asymptomatic. Patients often present dehydrated due to anorexia secondary to pain and/or in shock due to bowel ischemia. Therefore, tachycardia, hypotension, delayed capillary refill, dry mucous membranes, and oliguria could be present in affected children.<sup>1,2</sup>

Intussusception is diagnosed primarily using ultrasound. Intussusception can only be confirmed when the bowel is actively intussuscepted, although there have been improvements in identifying them due to an increase in point-of-care ultrasounds.<sup>3</sup> Intussusception is classified based on location, which determines therapy.<sup>4</sup> In a large bowel to large bowel intussusception, the mainstay of treatment is nonoperative reduction of the intussusception using air or contrast enemas. However, when the intussuscepted site is more proximal in the small bowel, bowel rest with supportive care is suggested, as it is too proximal for an enema to be effective and most resolve spontaneously.<sup>5</sup> Rarely, the involved area of the small bowel requires surgical intervention if the intussusception does not resolve spontaneously with supportive care.<sup>2</sup>

We discussed the various diagnoses listed in Table 3 to determine the cause for our patient's diarrhea. She did not take any medications nor use drugs or alcohol. She had no prior surgeries. Given that she was 10 years old, congenital causes and microvillus inclusion disease were very unlikely. There was no family history of multiple endocrine neoplasia syndromes, she had no personal history of neuroendocrine tumors, and no flushing with illness, all making neuroendocrine tumor unlikely. Hyperthyroidism was also unlikely as she had not had palpitations, persistent tachycardia, weight loss, or failure to gain adequate weight in the past. Addison's disease was unlikely given normal skin pigmentation and blood pressures that were normal for age, although she did have mild hyponatremia on admission. Inflammatory bowel disease was ruled out for reasons mentioned above. Given the relatively short duration of symptoms and few systemic symptoms, infectious causes were at the top of the differential. Viral, bacterial, and parasitic causes of gastroenteritis were evaluated with stool studies starting on day 1 of admission. Her ova and parasitic stool study finally established the diagnosis of Cryptosporidiosis, which is an infection caused by the organism *Cryptosporidium parvum*.

*Cryptosporidium parvum* is a zoonotic protozoal infection that is commonly transmitted to humans via

**Table 3.** Differential Diagnosis for Chronic Secretory Diarrhea.<sup>6,7</sup>

<b>Gastroenteritis/enteritis</b>	<b>Neuroendocrine tumors</b>
Viral: Rotavirus	VIPomas
Bacterial: <i>Vibrio cholerae</i> , <i>Aeromonas</i>	Zollinger-Ellison Syndrome
Parasitic: <i>Cryptosporidium parvum</i> , <i>Giardia</i>	Carcinoid
<b>Postsurgical</b>	<b>Medications</b>
Cholecystectomy	Antibiotics (amoxicillin/clavulanate)
Gastrectomy	Nonsteroidal anti-inflammatory drugs
Vagotomy	Biguanides (metformin)
Intestinal resection	Calcitonin
	Cardiac glycosides (digitalis)
	Colchicine
	Ticlopidine
<b>Congenital secretory diarrhea</b>	<b>Congenital defects in epithelial cell signaling</b>
Congenital sodium diarrhea	Microvillus inclusion disease
Congenital chloride diarrhea	Tufting enteropathy
Hyperthyroidism	Alcoholism
Inflammatory bowel disease (Crohn disease)	Addison's disease
Autoimmune enteropathy	Vasculitis

water contaminated with feces containing oocysts.<sup>8,9</sup> In the United States, cows are a common reservoir. Studies have shown high rates of colonization of *Cryptosporidium* in pre-weaned calves,<sup>10</sup> such as the Holstein calves for which our patient was caring prior to admission. In developing countries, parasitic infections, particularly *Ascaris lumbricoides*, have been associated with intussusceptions.<sup>11</sup>

The typical presentation of Cryptosporidiosis is non-bloody, watery diarrhea, poor appetite, and crampy abdominal pain; systemic symptoms such as fevers, myalgias, and chills are not typically present. With immunocompetent patients, the symptoms normally last several weeks at most. If the patient is immunocompromised, symptoms can progress to extraintestinal manifestations such as hepatitis, pancreatitis, and cholangitis. Diagnosis involves polymerase chain reaction (PCR) studies on stool samples; older methods included microscopy with modified acid-base fast stain.<sup>12</sup> Treatment is usually not required, unless a patient is immunocompromised, as the symptoms are self-limiting. For an immunosuppressed patient or a prolonged duration of symptoms, a 3-day course of nitazoxanide is first-line therapy.<sup>13</sup> In addition, it is imperative to counsel the patient to limit further exposure to the reservoir, if identified, as well as practice good hand hygiene.<sup>14</sup>

## Conclusion

In summary, intussusception of bowel occurs in settings of inflammation, with or without a pathologic lead point, and causes intermittent episodes of acute abdominal pain. One possible cause of intussusception is a bowel

infection (ie. enteritis, or colitis) causing edema. *Cryptosporidium* is one cause of chronic diarrhea, which results in colitis and gut edema. This parasitic infection is usually acquired by fecal-oral route; animals serve as the reservoir. Typical symptoms of a *Cryptosporidium* infection include watery diarrhea, crampy abdominal pain, anorexia, and dehydration. Fortunately, Cryptosporidiosis is typically self-limiting but can be treated with nitazoxanide in severe cases.

This case demonstrates 2 vital concepts in clinical medicine. First, patients will not always present with classic textbook presentations, such as with our patient who developed intussusception at an atypical age and location of the bowel. Last, it is vital to identify the underlying cause of the patient's primary diagnosis. In our case, the patient developed intussusception because she had small bowel edema from a *Cryptosporidium parvum* infection. Had we stopped our investigation after finding the intussusception, we would not have identified the underlying cause of her diarrhea and bowel edema, which could have potentially resulted in further intussusceptions and need for further medical care or surgery.

## Author Contributions

BD: Contributed to conception and design; contributed to analysis; drafted the manuscript; gave final approval; agrees to be accountable for all aspects of work ensuring integrity and accuracy.

LK: Contributed to conception and design; contributed to analysis; critically revised the manuscript; gave final approval; agrees to be accountable for all aspects of work ensuring integrity and accuracy.

LM: Contributed to conception and design; contributed to analysis; drafted the manuscript; gave final approval; agrees to be accountable for all aspects of work ensuring integrity and accuracy.

### Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

### Ethical Approval/Patient Consent

Consent for publication of this case report was obtained from patient's parents.

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