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# Intestinal perforation due to minor blunt abdominal trauma—a harbinger of underlying disease pathology<sup>☆</sup>

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## ABSTRACT

When a patient suffers a blunt intestinal injury after a low-energy mechanism, be prepared to find a pathologic area in the bowel. We present the case of a previously healthy 13-year-old female who presented complaining of abdominal pain hours after impact with the safety bar of an amusement park ride. Upon operative exploration, she was found to have extensive inflammation of the distal ileum including the ileocecal valve with creeping mesenteric fat and a full-thickness perforation of the inflamed segment. An ileocecectomy and primary anastomosis were performed. Pathology confirmed the presence of Crohn's disease. This case is the first reported incidence of a traumatic perforation leading to a diagnosis of pediatric Crohn's disease. Blunt perforation of the bowel following a low-impact mechanism should heighten the suspicion of an underlying disease process.

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Blunt abdominal injuries resulting in perforation of a hollow viscus are rare, with an incidence of less than 0.3%, with small bowel injuries being the most common [1]. Most of these types of injuries are secondary to motor vehicular collisions [2]. Hollow viscus injuries due to minor trauma are suggestive of an underlying disease process that makes the intestine more susceptible to injury.

## 1. Case report

A previously healthy 13-year-old female with a past medical history significant only for anemia (thought to be secondary to menses) and occasional constipation (secondary to iron supplementation but no other history of gastrointestinal complaints) present to her local emergency department (ED) with complaints of abdominal pain. Earlier that day, she had been on a water ride at an amusement park and hit her abdomen on the safety bar after a short but rapid descent and sudden stop. She experienced immediate abdominal pain that continued to worsen over time and was shortly followed by nausea; other members of her family that accompanied her on the ride were without complaint. Her

evaluation in the ED included an abdominal computed tomography (CT) scan that revealed thickened distal ileum and cecum with extraluminal air suggestive of intestinal perforation (Fig. 1).

She was transferred to our ED and was found to be hemodynamically stable. She had no external signs of trauma, but had peritoneal irritation on abdominal exam. She was taken to the operating room for diagnostic laparoscopy. Upon inspection, the peritoneal cavity contained cloudy bilious fluid in all four quadrants and in the pelvis, along with diffuse serosal inflammation of the large and small bowel, making it difficult to proceed laparoscopically. On exploration after conversion to laparotomy via a lower midline incision, a 15-cm long segment of her terminal ileum was found to be markedly thickened. There was associated creeping fat and a thickened, foreshortened mesentery. A perforation was visible in the distal portion of the inflamed segment, just proximal to the ileocecal valve (Fig. 2). An ileocecectomy was performed to remove the perforation and the grossly inflamed ileum and a stapled side-to-side, functional end-to-end anastomosis was created. The abdomen was thoroughly irrigated and the abdomen was closed.

Her postoperative course was complicated by persistent fevers; an abdominal ultrasound on postoperative day 6 revealed a complex fluid collection in her right lower quadrant. This collection, along with a large right pleural effusion, was percutaneously drained the following day. She improved after drainage and was discharged home with a course of intravenous broad spectrum antibiotics.

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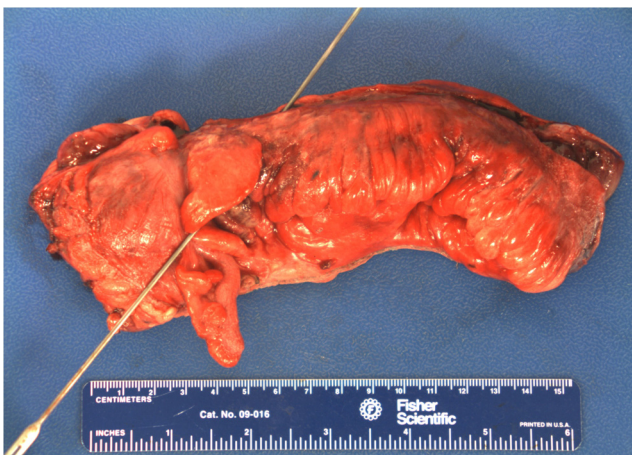
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**Fig. 1.** Preoperative CT. Coronal section revealing thickened ileum with adjacent extraluminal air (arrow).

Pathologic evaluation of the operative specimen revealed chronic ileitis, intramural and transmural fissures, intramural granulomas, mucosal ulceration at the proximal margin of the specimen and mild cecal involvement, all consistent with a diagnosis of Crohn's disease. Twelve weeks after her initial operation, she underwent a colonoscopy with biopsies that revealed normal



**Fig. 2.** Pathology specimen. Thickened ileum with probe indicating site of perforation.

terminal ileum and chronic inactive colitis. She has since been started on anti-inflammatory therapy with 5-aminosalicylic acid.

## 2. Discussion

Traumatic intestinal perforation typically requires the application of a significant amount of force to the abdomen. The trauma associated with this case was relatively minimal and not likely to cause such an injury under usual circumstances. In this case we believe the injury resulted from a force applied to a focal point on the stiff, thickened intestinal wall, causing it to flex and crack, leading to perforation. In the literature there are four other instances of minor trauma leading to perforation: three sports-related insults (basketball, skiing, and football) and one on a water slide, all consisting of person-to-abdomen (i.e. shoulder, foot) impacts leading to ileal or colonic perforations [3–6]. All of these patients had known inflammatory bowel disease (3 Crohn's, 1 ulcerative colitis) [3–6].

The bowel in Crohn's disease is inflamed by definition, and inflammation can weaken the bowel wall. The transmural inflammation associated with Crohn's is thought to be the cause of fistula formation via contained perforations into adjacent organs [7]. However, if this process occurs away from another abdominal organ, the "fistula" forms with the peritoneal cavity, resulting in a free perforation and the development of peritoneal signs [8].

Intestinal perforation is a known complication of Crohn's disease that may result from a number of factors. Steroid administration and severe disease burden have been associated with an increased risk of perforation in Crohn's patients [9], but as this patient had not been previously diagnosed, she was not receiving any steroid therapy, though her pathology did reveal severe ileitis. Areas of severe inflammation or those that are proximal to an obstruction (i.e. stricture) are more prone to perforate [10]. In the case presented, no distal strictures were noted upon intraoperative examination; however, distal obstruction is more a factor in spontaneous free perforations. Spontaneous free perforations are rare, occurring at a rate from 1% to 5% [11], only 2% of those occurring in the small bowel, with the ileum being the most common site [12]. Many perforations are secondary to an inciting factor like colonoscopy [13] and, more recently, capsule endoscopy in patients with an undiagnosed stricture [14,15]. Perforation has been cited a number of times as the presenting symptom in Crohn's, either spontaneous [16] or from capsule endoscopy [17,18].

There are few reported cases of traumatic intestinal perforation in patients associated with Crohn's disease, due to major [19] or minor trauma. Most of those cases are in patients with a known history of Crohn's disease. A similar case was reported of a 22 year-old male with no prior medical history who was involved in a motor vehicle collision and developed an ileal perforation secondary to a fistula rupture [20]. Gur et al. [4] reported a case of a 48 year-old male who was diagnosed with Crohn's after a fall from about 20 feet. He did not have a perforation, but was found to have a mesenteric tear near his inflamed ileum [4]. To our knowledge, this is the first report of traumatic intestinal perforation leading to diagnosis of Crohn's disease in the pediatric population. This is also the first reported traumatic bowel injury from an amusement park ride.

## 3. Conclusion

Crohn's disease, and the associated transmural inflammation, makes individuals susceptible to intestinal perforation after minimal trauma. Conversely, perforation as a result of minimal trauma should suggest an underlying pathology that warrants further investigation.

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