

Post-Operative Small Bowel Intussusception in a Pediatric Trauma Patient: A Literature Review and Unique Case Report

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Background	Intussusception is a well-documented cause of acute abdomen in the pediatric population; however, post-traumatic and post-operative intussusceptions are exceptionally uncommon.
Summary	An otherwise healthy eight-year-old girl presented as a level II trauma via EMS following a motor vehicle accident (MVA). The patient complained of diffuse abdominal pain and back pain on arrival. Physical exam was remarkable for tachycardia, right coastal margin tenderness to palpation, non-labored breathing, diffuse abdominal tenderness and a seatbelt sign. Abdominal computed tomography (CT) scan was suspicious for duodenal and/or mesenteric injury, warranting an exploratory laparotomy. After this initial operation, she later presented with symptoms of small bowel obstruction. Repeat CT of the abdomen obtained on post-operative day 14 showed dilated loops of distant small bowel, air fluid levels and a swirled appearance of the mesentery, concerning for a closed loop obstruction. She was taken back to the operating room and intra-operative findings revealed a feathery adhesion of the small bowel to the transverse colon with no dilation of the proximal small bowel and a distal jejunojejunal intussusception.
Conclusion	Due to the rarity of both types of intussusceptions, surgeons and pediatricians alike tend to miss or delay making the diagnosis. Early detection and treatment are essential, and the gold standard of treatment for both posttraumatic and post-operative intussusception is manual surgical reduction.
Keywords	pediatric, intussusception, post-traumatic intussusception, post-operative intussusception

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Case Description

Intussusception, which refers to self-invagination of intestine, is a common cause of acute abdomen. Furthermore, intussusception is the most common cause of abdominal emergencies in children two years of age and younger.¹ The etiology is considered idiopathic in 75 percent of young children. Other causes include enteric infections or underlying disorders such as Meckel's diverticulum, small bowel lymphoma, Henoch-Schonlein purpura, cystic fibrosis, post-operative and posttraumatic intussusception. Post-operative and post-traumatic intussusceptions are very uncommon, with the latter being even less common.²

Post-operative intussusception (POI) is well known to occur mostly after operations involving the gastrointestinal (GI) system but has also been reported post retroperitoneal dissections and tumor resections, diaphragmatic procedures, and extensive bowel manipulation.³ Posttraumatic intussusception (PTI) is exceedingly rare, with only 22 reported cases in the English literature.^{2,4,5} This usually presents after blunt abdominal trauma, and the cause is often unknown. We report a case of jejunojejunal intussusception of an eight-year-old girl after blunt abdominal trauma and exploratory laparotomy.

An otherwise healthy eight-year-old girl presented as a level II trauma via EMS following a motor vehicle accident (MVA). She was a restrained passenger in the rear seat behind the driver in an MVA involving her car and a school bus. Significant damage was noted to her vehicle. EMS reported possible transient loss of consciousness during the incident.

On arrival, the patient complained of diffuse abdominal pain and back pain on arrival. History was limited due to patient's age, clinical condition and absence of a guardian. Physical exam was remarkable for tachycardia, right costal margin tenderness to palpation, non-labored breathing, diffuse abdominal tenderness and a seatbelt sign. Laboratory studies revealed a white blood cell count of 13,400/mm³, hemoglobin of 13.4g/dL, amylase level of 119U/L, lactic acid of 3.5mmol/L and lipase level of 126U/L. Chest radiograph showed ill-defined opacities in the right lung suggestive of pulmonary contusion. A possible right proximal humeral fracture (which was later ruled out from repeat X rays) and lower lateral right and left rib fractures were noted on additional plain films.

Focused Assessment with Sonography in Trauma (FAST) was performed in the ED and was negative for any intra-abdominal or cardiac pathology. Computed Tomography (CT) of abdomen and pelvis showed abnormal wall thickening as well as hyper-enhancement and mild dilatation of the proximal duodenum suspicious for duodenal and/or mesenteric injury, ill-defined right upper quadrant low attenuation fluid, and fluid accumulation in the deep pelvis. These findings were concerning for possible small bowel or mesenteric injury. An emergent laparotomy revealed mild duodenal hematoma, small bowel mesenteric contusion and transverse colon and duodenal mesenteric defects, which were repaired. Kocher maneuver was performed to fully evaluate the duodenum and nearby structures. There was no additional retroperitoneal exploration performed during this laparotomy.

The patient's initial postoperative course was unremarkable. She had an uneventful stay in the Pediatric Intensive Care Unit (PICU) and was transferred to the pediatric floor on postoperative day three. After the initiation of clear fluid diet, she complained of abdominal pain and nausea and experienced multiple episodes of bilious vomiting. Patient was made NPO and her symptoms initially improved, but she again experienced increasing abdominal pain and vomiting after several days. Repeat CT of the abdomen obtained on postoperative day 14 showed dilated loops of distant small bowel, air fluid levels and a swirled appearance of the mesentery, concerning for a closed loop obstruction. At immediate exploration, she had a significant adhesion from the small bowel to the transverse colon causing both obstruction and distal long-segment jejunojejunal intussusception which was manually reduced without incident. She tolerated the procedure well and was admitted back to the floor postoperatively. Her hospital course subsequent to her second operation was uneventful.

Discussion

Even though intussusception is a well-known cause of acute abdomen in the pediatric population, the etiology is usually unknown. Some well-documented causes include enteric infections, underlying disorders such as Meckel diverticulum, small bowel lymphoma, Henoch-Schonlein Purpura, and cystic fibrosis. Postoperative and posttraumatic intussusception cases are very rare, with the latter being even less common.

POIs have been described following various forms of surgical procedures. Approximately 51 percent of POIs occur following surgeries involving the GI system, 20 percent postretroperitoneal tumor resections, nine percent following diaphragmatic surgeries, six percent after urinary system surgeries and four percent postpartial pancreatectomy.³ The etiology is thought to be multifocal, but peristaltic impairment is believed to be the most prominent cause.³ Causes of this disorder in peristalsis include excessive bowel manipulation, abnormal serum electrolytes, anesthetic agents, post-operatively administered medications or impaired bowel innervation.⁶ Approximately 75 percent of patients usually present with signs of small bowel obstruction within seven days of their initial operation.³ The major presenting symptoms include bilious vomiting, failure to tolerate feeds, or increased nasogastric tube output, which is observed in about 87 percent of patients with POI.³ Roughly 85 percent of POIs occur in the small bowel and thus require laparotomy and manual surgical reduction, which is the gold standard of treatment. When appropriate, laparoscopic reduction may also be performed. In about seven percent of cases, the intussusception is unable to be manually reduced or the bowel may be ischemic, perforated or unlikely to be viable. In such situations, bowel resection and anastomosis is performed. Few cases (five percent) involve the ileocecal junction and therefore, can be treated with air enemas.³

On the other hand, PTIs are exceedingly rare with only 22 reported cases in the English literature.^{2,4,5} This usually occurs after blunt abdominal trauma, and the source is sometimes unknown. However, 4 of the 22 cases reported intramural hematoma as the main cause of the intussusception.^{2,4} Other reported causes of PTI include impaired peristalsis, bowel edema and local spasms.² About 36 percent of reported cases of PTI occurred in children ages 4–10 and all involved the small bowel.^{2,4} Thus, laparotomy and manual surgical reduction is also the gold standard of treatment just as in POI. Again, if the intussusception is unable to be manually reduced or the bowel is ischemic, perforated or unlikely to be viable, bowel resection and anastomosis is performed.

Our patient presented with blunt abdominal trauma and was found to have an intramural hematoma both on CT and during the initial exploratory laparotomy. She did not develop signs of an obstruction until postoperative day 4,

after initiation of clear fluid diet. This presentation was similar to most POIs reported in literature. Specifically, the intussusception occurred after surgery involving the GI system, presented with bilious vomiting and occurred within the first week after initial operation. Intramural hematoma, however, was also noted during the first laparotomy, as reported in 18 percent of cases of PTIs. Repeat CT was concerning for a closed loop obstruction even though an intussusception was not reported per se. We are uncertain if the intussusception was related directly to the intramural hematoma, the initial operation which involved bowel manipulation and exposure/dissection of the retroperitoneum leading to disorder of peristalsis, or the adhesion to colon acting as a lead point, or some combination of the aforementioned factors.^{4,5,7}

Conclusion

Intussusception is a common cause of acute abdomen in children 2 years and younger. The most common location is at the ileocecal junction. POIs and PTIs are very rare with only 22 cases of PTI reported in the English literature.^{2,4,5} The major presenting symptoms include bilious vomiting, failure to tolerate feeds, or increased nasogastric tube output, and patients usually present during the first seven days postoperatively.³ About 18 percent of cases of PTIs have been described to be due to intramural hematoma. Other causes described include bowel edema and local spasms.

Since both POI and PTI usually involve the small bowel, manual surgical reduction is the treatment of choice for both POI and PTI.² Our case demonstrates the need for surgeons and pediatricians to always have this rare etiology of intussusception in mind, as early detection and management are essential.

Lessons Learned

Postoperative intussusception (POIs) and post-traumatic intussusception (PTIs) are very rare with only 22 cases of PTI reported in the English literature. Nonoperative reduction with therapeutic enemas is less effective and most require operative intervention. The surgeon must recognize this condition quickly to avoid bowel compromise.

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