Small bowel volvulus with phytobezoar after laparoscopic appendectomy

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ABSTRACT
Small bowel volvulus in the absence of a congenital anomaly is rare but has been described in post-operative patients after abdominal surgery and is usually related to inflammatory conditions. The authors describe an adolescent girl with small bowel volvulus secondary to an oral fiber bolus after laparoscopic appendectomy that required emergency laparotomy and reduction. She subsequently developed early post-operative complete bowel obstruction requiring re-laparotomy and resection.

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Midgut volvulus is due to a rotational anomaly, but segmental volvulus also can occur secondary to masses (lymphatic malformations, duplications, tumors) of the small bowel. Post-operative bowel obstruction caused by volvulus can occur secondary to adhesions or hernias, but generally not in the immediate post-operative period. Early post-operative small bowel obstruction in children is uncommon outside of post-operative inflammation or in rare instances from small bowel or ileo-colic intussusception. We report a case of an adolescent girl presenting with small bowel volvulus after laparoscopic appendectomy requiring exploratory laparotomy followed by a small bowel obstruction one week later requiring small bowel resection.

1. Case report

A 14-year-old girl presented with classic signs and symptoms of appendicitis. An ultrasound was consistent with appendicitis and she was taken for a laparoscopic appendectomy. During the operation, the appendix was in an antececal position minimally adhered to the abdominal wall. With minimal manipulation, a non-perforated appendix was removed with two staple loads fired across the appendix and mesoappendix. She tolerated the procedure well and was discharged on the day after surgery.

At home, she had return of regular bowel function but returned five days later with worsening abdominal pain and emesis. Her pain started hours after eating copious amounts (“handfuls”) of sunflower seeds directly from the flower. On presentation, she was hemodynamically normal and had a white blood cell count of 9500 cell/mL. Ultrasound demonstrated free fluid in the abdomen without focal collections. Due to ongoing pain of unclear etiology, a CT with oral and intravenous contrast was obtained and demonstrated a closed loop obstruction involving the distal ileum. The proximal limb showed areas of mucosal non-enhancement concerning for bowel ischemia (Fig. 1). Repeat blood work demonstrated a bicarbonate of 16, also concerning for ischemia.

Given these concerning findings and the patient’s escalating abdominal pain, diagnostic laparoscopy was performed. The diagnostic laparoscopy was converted to open laparotomy after a portion of the small bowel was found to be ischemic. Laparotomy revealed an approximately 45 cm long volvulus of the terminal ileum proximal to the ileocecal junction. There was a large amount of undigested material found in the volvulus that had the tactile consistency of seeds. The volvulus was reduced and the small bowel was run from the ligament of Treitz to the cecum; the undigested material was milked distal to the ileocecal valve. The staple lines...
were intact. There was no evidence of free staples. There were no signs of malrotation, mesenteric defects, omental defects, or adhesions. The affected small bowel was ischemic, but appeared viable. Its mesenteric aspect was markedly edematous with visibly engorged vessels consistent with ischemia. The bowel was covered with warm saline-soaked gauze for 30 min and evaluated by Doppler to ensure that there was mesenteric blood flow to the previously ischemic segment (Fig. 2). Peristalsis was present in the affected segment and the bowel appeared to regain normal color. No resection was performed. She began passing flatus and having bowel movements on her second post-operative day. She was mobilized, her nasogastric tube was removed, and she was slowly advanced to a regular diet. She was discharged home on post-operative day five.

The patient was doing well at home tolerating a regular diet, passing gas and stools, but presented three days after discharge with acute abdominal pain, nausea, vomiting, and chills. Peritoneal signs were present on abdominal examination. A CT suggested a high-grade small bowel obstruction with the transition point in the right lower quadrant. She was tachycardic but normotensive and afebrile, and had a white blood cell count of 13,400 cells/mL.

At laparotomy, she was found to have a complete obstruction of her terminal ileum at the same site as her volvulus. There was, however, no recurrent volvulus. Rather, the entire length of bowel that had been previously volvulized was tethered and adhered on its mesenteric aspect where the vessels had been markedly engorged. The adhesions of the bowel on its own mesentery were released with blunt dissection (Fig. 3). Again, the previous staple lines were intact; there was no evidence of loose staples, open enterotomies, mesenteric defects, omental defects, or perforations. Though the bowel was viable, the mesenteric aspect to which it was adherent was markedly indurated, thickened, and erythematous, suggesting an intense post-ischemic inflammatory
response. Given the recurrent obstruction and concerns about future recurrence, the patient underwent resection of approximately 50 cm of terminal ileum with stapled ileo-colic anastomosis. She recovered to a regular diet and normal bowel function. She was discharged home nine days after surgery on a course of cephalaxin for a superficial wound infection. Pathologic review of the specimen showed serosal adhesions and granulation tissue with giant cells and exuberant mesenteric fibrosis. She was doing well with no complaints one month post-operatively. She will be followed annually for signs or laboratory evidence of vitamin B12 deficiency that may require supplementation.

2. Discussion

Most episodes of small bowel volvulus in children are related to malrotation, though other congenital conditions such as duplications, bands, and lymphatic malformations can also be causes along with both congenital and non-congenital tumors [1]. Post-operative small bowel volvulus can also occur in older children and adults [2–5] often related to a “twist” after stoma formation or due to an adhesive band serving as the lead point. In addition, adhesions have been attributed to foreign objects within the abdomen such as surgical staples [5]. While our patient had recent abdominal surgery, she had none of the aforementioned conditions to cause a small bowel volvulus. She did, however, have what felt like a large bolus of plant seed material within the bowel. One possible explanation for the volvulus is that the bulk acted like a pendulum causing the ileum to twist upon itself. Previous reports of intra-operative patient position change and concurrent pneumoperitoneum have been suggested in adults to contribute to volvulus formation by allowing for excessive movement of the bowel into a position more susceptible for volvulus formation [3]. This seems less likely as our patient was eating regular food and having normal bowel movements prior to the volvulus formation.

This is the fifth reported case of small bowel volvulus after laparoscopic appendectomy [2–5]. It is, however, the first reported case of acute small bowel volvulus in children after a single ingestion of seeds or other food bolus. Small bowel obstruction and chronic volvulus caused by phytobezoar, a concretion of vegetable matter such as vegetable skins, seeds, and vegetable/fruit fibers, have been described in adults and children [6,7]. The majority of these cases presented after gastric resection or ulcer treatment, rather than uncomplicated laparoscopic appendectomy. We believe the bolus of seeds was retained in the terminal ileum, perhaps due to a competent ileocecal valve, very mild ileus, and inflammation post-appendectomy.

Unfortunately, this patient also developed early post-operative small bowel obstruction after volvulus reduction. The nature of the adhesions of the volvulized (and reduced) bowel to the visible and palpable inflammation of the mesentery suggests that this was an intense, rapid post-ischemic inflammatory response. Though intestinal stricture is well-recognized late complication after ischemia and reperfusion of bowel, this type of immediate post-ischemic obstruction has not been previously reported after other cases of volvulus reduction.

Early post-operative small bowel obstruction is a relatively uncommon event, especially after less extensive laparoscopic cases such as appendectomy [8]. While the phenomenon does not have a consensus definition, it often describes an absence of flatus and stool passage after a period of normal post-operative bowel function within 30 days of surgery, as was experienced by our patient [8–10]. The most common pathophysiologies causing this obstruction are adhesions, incisional hernia, internal hernia, and severe inflammation; additionally, cases in small bowel and ileo-colic intussusception presumably initiated by intestinal dysmobility have been reported in children. Based on what we found intra-operatively, the cause of our patient’s obstruction was most likely severe inflammatory adhesion formation.

3. Conclusion

This case adds to the list of rare possible complications after “routine” pediatric laparoscopic appendectomy. In addition, though uncommon, this case illustrates several issues related to perioperative care after laparoscopy. First, volvulus should be considered on the differential diagnosis of life-threatening immediate post-operative complications. As discussed, while the incidence of volvulus after laparoscopic appendectomy is extremely low, the consequences are serious and should not be overlooked. Pediatric surgeons frequently encounter volvulus, where the bowel can be preserved after reduction. Early post-ischemic bowel obstruction is a possible complication associated with bowel preservation. In our patient, this unique case of a near immediate adhesional obstruction after volvulus reduction required laparotomy and bowel resection to prevent further such occurrences.

Last and most importantly, we question whether patient or family counseling about dietary choices immediately after routine laparoscopic appendectomy or laparoscopic surgery in children should be offered. In our experience, most pediatric surgeons advance their patients to a regular diet while in the hospital; upon discharge, the extent of dietary counseling is often limited to the words “regular diet” in the discharge instructions. While an adult may be more cautious about their diet within the perioperative period, children may think less about the types of foods they eat and how easy those foods are to digest. Perhaps indigestible foods high in fiber should be discouraged in this period. We propose that after pediatric laparoscopic appendectomy patients and their families should be given clear but simple instructions to maintain an easy to digest regular diet in the immediate perioperative period.

Conflict of interest
No authors have any disclosures.

References