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Case Report

Extensive Bowel Gangrene Following Laparoscopic Appendectomy in 7-Year Old Boy

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Abstract

Return visits to the emergency department following pediatric appendectomies are not uncommon. The majority of these patients have minor issues treated in the emergency department and are sent back home. Few require readmission and further treatment. We present a 7 year-old boy who had an uncomplicated laparoscopic appendectomy and was discharged home the following day in good and stable condition. He returned to the emergency room on POD #6 with non-resolving abdominal pain. An abdominal CT scan was obtained, which was normal. He was reassured and discharged to home, with instruction to return if his condition did not improve. He returned to the emergency room once again on POD #10 with progressively worsening abdominal pain. His CT evaluation at this visit showed gangrenous bowel that required immediate surgery and bowel resection. The post op recovery was smooth and uneventful, and he was discharged home in good and stable condition. We present this case as a rare occurrence to discuss the possible causes of bowel gangrene following appendectomy, the most common of which is mesenteric vein thrombosis. Mesenteric vein thrombosis, although rare, should be considered and evaluated carefully because an early diagnosis of MVT is crucial to preventing its progression to a major bowel resection.

Keywords: *Bowel Gangrene; Laparoscopic Appendectomy; CT*

Introduction and Case Presentation

An otherwise healthy 7 year-old boy presented to the emergency room at Moses Cone Memorial Hospital with right lower quadrant abdominal pain of acute onset. A clinical diagnosis of acute appendicitis was suspected and confirmed by abdominal ultrasound. He underwent urgent laparoscopic appendectomy. A severely inflamed appendix was removed without any complications. He was admitted for overnight observation and pain management and discharged the following morning, tolerating regular diet and with resolution of pain. The procedure was smooth and uneventful.

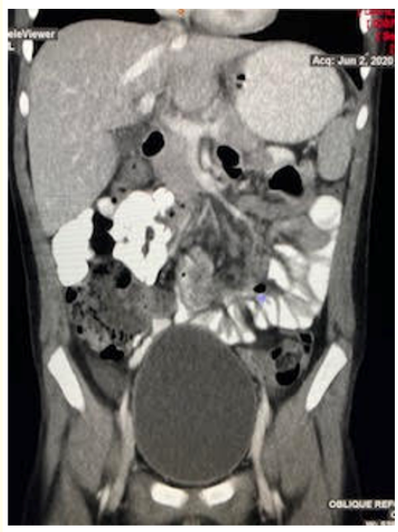

Figure 1: *CT on POD #6 ED visit – normal result.*

On post-op day (POD) #6, he returned to the emergency department with abdominal pain worsening in the previous 12-24 hours, without nausea or vomiting. He was afebrile and had normal vital signs and a tender but nondistended abdomen. An abdominal CT scan yielded a normal image with changes consistent with post-operative abdomen. He was observed in the emergency department for a few hours. With improvement of pain and tolerance of orals, the patient was discharged home and instructed to return if symptoms worsened or failed to improve.

He returned to the emergency department on POD #10, with more severe abdominal pain, still without fever, nausea or vomiting. In the interim from his last ER visit on POD #6, he had inadequate oral intake and experienced progressively worsening pain. A repeat CT scan on this second visit showed ischemic, edematous small bowel. He was taken emergently to surgery, where exploratory laparotomy confirmed ischemic gangrenous bowel. His entire bowel was eviscerated and examined carefully. There was no perforation, no volvulus, no band or adhesion found, and the entire colon was healthy. The ileocecal junction followed proximally showed pink and viable loop of only 9 cm of terminal ileum. At that point, there was a distinct demarcation of gangrenous bowel proximal.

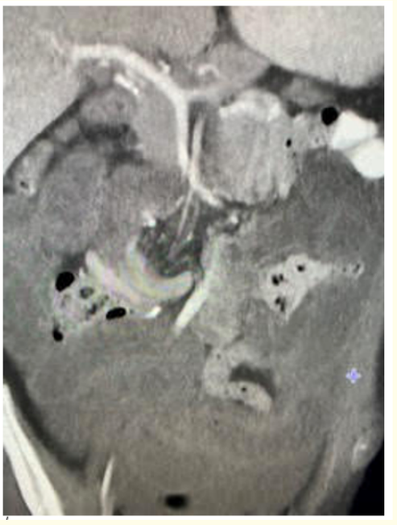

Figure 2: *CT showing ischemic bowel on POD #10.*

The measured length of gangrenous bowel was 190 cm. The length of viable bowel from ligament of Treitz to the junction of gangrenous bowel was 90 cm. An extensive bowel resection was performed, and end to side ileal-ileal anastomosis was done. He had a smooth and unremarkable post-operative recovery. He was started with orals on POD #2 and gradually advanced to soft diet on POD #4 and was discharged home on POD #5. At the time of discharge, he was tolerating a soft diet, his liquid stools had started to become semi-solid and his vital signs were normal. His hemoglobin improved from 7.5 g/dL in immediate post op to 7.8 g/dL at the time of discharge. He has since been followed up with his primary care physician and Pediatric Gastroenterology for monitoring of his nutritional status, to identify and treat any signs and symptoms of short bowel syndrome.

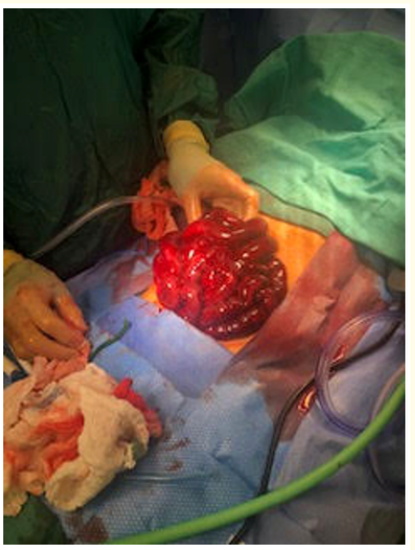

Figure 3: *A clear demarcation between healthy and ischemic bowel was discovered.*

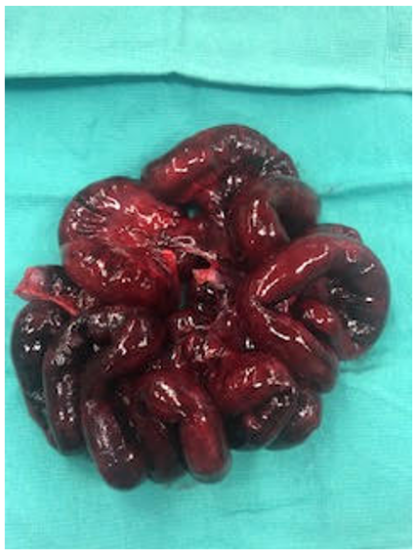

Figure 4: *Resected bowel.*

Discussion

A review of literature demonstrates that post-appendectomy complications are not uncommon, but complications such as extensive bowel ischemia are indeed rare. 30-day readmission rates following appendectomies in pediatric patients have been studied and found to be around 8 - 9%, though these statistics vary depending on a variety of factors, such as the presence of surgical complications, progression of disease, and patient health/risk factors [1]. It is relevant to note that upon CT finding of bowel ischemia in the 7-year old patient, coagulopathy was ruled out as a possible cause of his post-surgical complication, although a complete hypercoagulable work-up was not done. An extensive literature search for potential causes of similar extensive bowel gangrene following pediatric laparoscopic appendectomy was not fruitful. Through this search, however, it was discovered that mesenteric vein thrombosis (MVT) has been found to be a cause of bowel ischemia, albeit a rare one [2]. Arterial thrombosis was eliminated as a possible cause due to the presence of ascitic fluid and intestinal wall edema. Therefore, due to the abundance of literature, linking MVT and bowel ischemia, we discuss below the possibility of ischemic bowel occurring following laparoscopic appendectomy due to idiopathic mesenteric vein thrombosis.

Some of the most common causes of mesenteric vein thrombosis that have been identified include coagulation disorders, cancer, intraabdominal inflammation, and the postoperative state [3]. Most relevant to forming a diagnosis in our case was his initial normal CT scan. Over the last few decades, CT scans have become part of standard diagnostic tools in cases of suspected MVT and are estimated to be able to identify about 90% of MVT cases [4]. However, worth mentioning is the finding that CT can be less successful in identifying early thrombosis of small mesenteric vessels [3]. Our patient's first CT scan was ultimately normal, and it is possible that his MVT developed in the interim between his first and second ED visit, though it is also feasible that CT was not able to catch the development of MVT at this "early" stage.

Histopathology report of the resected bowel revealed vasculitis-like changes involving a variety of different sized vessels. Vasculitis of the mesenteric circulation may be localized or associated with systemic diseases such as IgA vasculitis, SLE, ANCA-mediated vasculitis, Kawasaki disease, polyarteritis nodosa, and hypocomplementemic urticarial vasculitis. This finding directs the question of interest to ask-did vasculitis cause the MVT, leading to ischemia? Or did MVT cause vasculitis, and thusly ischemia? Vasculitis is known to be triggered

by a variety of causes, one of which is infection. In the context of COVID-19 and a growing body of evidence that links COVID-19 infections with Kawasaki disease-like inflammation [5], it is relevant to acknowledge that both pre-operative COVID-19 nasopharyngeal swabs were negative. A more likely and obvious hypothesis is that the patient's appendicitis may have contributed to the development of some intraabdominal vasculitis. Fulminant appendicitis may be complicated by infective thrombophlebitis of the portal vein (pylephlebitis) and thus MVT [2,6]. CT scan from the patient's second ED visit showed that his portal vein was open, demonstrating that the portal drainage system was receiving blood from his inferior mesenteric vein. The literature suggests that inferior mesenteric thromboses are inexplicably less common [4]. Additionally, the portion of the ischemic bowel removed corresponded with drainage of the superior mesenteric vein, which was thrombosed.

Interestingly, a strikingly similar case was reported by Harris., *et al.* (2014) in a 7 year-old boy with appendicitis. He presented with abdominal pain and vomiting on POD #2 following his laparoscopic appendectomy. A CT on POD #2 showed bowel ischemia and required bowel resection. The extent of his bowel ischemia was additionally similar in length to ours. However, the conclusion of this article suggested an MVT due to venous stasis from insufflation during laparoscopy [7]. This could be considered as a possibility in a case where the patient presents in the immediate post-operative period, rather than 6 days after the procedure such as in our case. Our patient showed a normal CT scan at onset of pain, beginning on POD #6. The span of 4 days between his normal CT and the CT showing ischemia suggests that the MVT developed much later than in the case reported by Harris., *et al* [7]. An extensive vasculitis was reported by the pathologist in our resected specimen. Vasculitis leading to extensive thrombosis resulting in gangrene has not been reported in the literature.

Conclusion

We reported a case of extensive bowel ischemia following an uncomplicated laparoscopic appendectomy. This exceedingly rare complication is most likely due to mesenteric vein thrombosis. An early recognition and treatment of this condition can prevent its progression into a major catastrophe.

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