



Case report

Lateral hernia secondary to colorectal submucosal resection repaired by robotic-assisted approach: Case report

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ABSTRACT

Introduction and importance: Lateral abdominal wall defects are a rare event and commonly result from iatrogenic causes and trauma. We report the first known case of flank hernia after endoscopic submucosal resection of a colonic polyp complicated by colonic perforation.

Case presentation: This is a case of a 50-year-old male who underwent endoscopic colonic resection complicated by perforation of the colon. Eight months later, he presented with an enlarging, asymptomatic left flank bulge. CT showed a large flank hernia which was successfully repaired using a robotic transabdominal preperitoneal (TAP) approach.

Clinical discussion: The hypothesis is that the endoscopic resection with colonic perforation caused an iatrogenic injury to the abdominal wall creating a lateral abdominal hernia. Injury to abdominal wall musculature may take months to develop into a clinically apparent hernia. Flank hernias can be successfully repaired using a robotic minimally invasive approach.

Conclusion: Flank bulge and hernias must be included or at least be considered as consequence of a potential complication from endoscopic colonic perforation. Surgeons and endoscopists must be aware of this potential complication and its latent presentation. This case stresses the importance of long-term outcomes monitoring, particularly with innovative procedures.

1. Introduction and importance

Lateral abdominal wall defects are a rare and challenging entity [1]. These hernias typically result from iatrogenic causes and trauma. True congenital lateral defects are exceedingly rare and comprise less than 1 % of all congenital abdominal wall defects [2–4]. According to Baumann and Butler et al. [5], lateral defects involve the oblique muscle conglomeration and their attachments cranially to the costal margin and caudally to the iliac crest.

The most common complications after colorectal endoscopic submucosal dissection (ESD) are bleeding and perforation [6]. There are no reports in the literature regarding a traumatic abdominal wall hernia after a colorectal endoscopic resection. Primary or traumatic flank hernias can be repaired by open approach or by a minimally invasive technique.

We present a case of a patient with no history of abdominal surgical procedure or trauma who developed a lateral hernia after a colonoscopic

resection of a large lesion in the descending colon complicated by perforation. The patient underwent a robotic-assisted repair with mesh placement eight months later. This case has been reported in line with SCARE criteria [7].

2. Case presentation

Our patient is a 50-year-old male with a relevant past medical history of COPD (active smoker 0.25 packs/day) and obesity. He underwent submucosal resection of a large adenomatous lesion of the descending colon by colonoscopy eight months ago. The procedure was complicated by a full thickness colonic perforation that occurred during resection of the lesion using a thermal device. The perforation was treated with an endoscopic closure device. He presented to clinic with a three-month history of an enlarging, asymptomatic left flank bulge. On exam, the patient had a large left lumbar hernia (Fig. 1).

CT scan of the abdomen showed a left lateral lumbar hernia with a

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defect extending approximately 9.5 cm craniocaudal and 7.6 cm anteroposterior dimension containing fat and a portion of descending colon. In addition, small bilateral inguinal hernias and an umbilical hernia were found (Fig. 2).

2.1. Operative findings

Upon laparoscopic inspection, the prior tattooed area in the proximal descending colon related to the endoscopic resection was noted. This area aligned directly to the bulge and hernia sac (Fig. 3). The hernia defect spanned a length of 9.5 cm and a width of 7.6 cm. It extended through the transversus abdominis and internal oblique muscles, exposing the overlying external oblique muscle (Fig. 4).

2.2. Surgical technique

Patient was placed in the right lateral decubitus position. The robot was docked over the patient's right side. Using a transabdominal approach, a large preperitoneal flap was created and the hernia sac with its contents was reduced.

The dissection was continued posteriorly to the sac towards the paraspinous muscles and cranially underneath the diaphragm. The 12th intercostal nerve and iliohypogastric nerve were identified within the operative field and preserved (Fig. 5). Using a #1 barbed suture, the 9.5 × 7.6 cm defect was closed with a running fashion without excessive tension (Fig. 6). A 20 cm × 20 cm heavyweight polypropylene mesh was then introduced into the preperitoneal space and secured with interrupted 2-0 Vicryl sutures (Fig. 7). The abdomen was desufflated to 8 to 10 mmHg during defect closure and mesh placement. The peritoneal flap was closed with an absorbable 3-0 barbed suture, excluding the mesh from the intra-peritoneal viscera (Figs. 8 and 9). The preperitoneal space was desufflated with the aid of an Angiocath. The patient had an uncomplicated recovery and was discharged home with oral pain medication from the PACU.

3. Clinical discussion

Anatomically, lateral wall defects are unique. The lateral abdominal wall territory has been described horizontally as the region from the linea semilunaris to the posterior paraspinous muscles. The vertical extent of this area is from the costal margin to the iliac crest [6].

Lateral hernias or flank hernias can be the result of myofascial laxity, denervation injury, trauma or more often an iatrogenic event. True congenital lateral wall defects are exceedingly rare, with very few

reported cases. In 2008, the European Hernia Society developed a classification system of lateral abdominal wall hernias dividing the flank into four L zones on each side. L1: subcostal (between the costal margin and horizontal line 3 cm above the umbilicus); L2: flank (lateral to the rectus sheath in the area 3 cm above and below the umbilicus); L3: iliac (between a horizontal line 3 cm below the umbilicus and the inguinal region); L4: lumbar (latero-dorsal of the anterior axillary line) [8].

It is important for the surgeon to identify and understand the mechanism for herniation in order to plan for proper surgical repair. Previous reports of delayed flank herniation have been noted after blunt force trauma [9]. Our patient presented without history of previous surgical intervention or abdominal trauma. The only significant history was that of previous endoscopic submucosal resection of a large adenomatous polyp of the proximal descending colon. The endoscopy procedure note described full thickness resection of the colonic wall with endoscopic clips. The abdominal musculature is innervated in segments by T7-T12 spinal roots [10] and disturbance of these nerves can lead to weakening of the lateral wall and musculature which could have the potential to generate bulges or hernias [11]. The hernia surgeon (D.K.H) surmised that an inadvertent thermal injury to the transversus abdominis and internal oblique muscles had occurred during submucosal resection due to the intraoperative findings, as the tattoo that had been applied to the colonic wall by the endoscopist at the site of submucosal resection was found to be directly opposed to the large flank hernia. The conclusion was made that an iatrogenic thermal event during colonic perforation resulted in the formation of a small flank hernia which enlarged over the ensuing eight months until it became clinically apparent. The patient's obesity, COPD, and propensity to form hernia (coexisting umbilical and inguinal hernias on CT) may have contributed to hernia formation in this instance.

This case is the first known reported case of flank herniation after submucosal resection of a colonic polyp. As techniques for endoscopic surgery become more advanced, traditional formal surgical resections can often be avoided. However, the endoscopist must employ sound judgment as the boundaries of traditional surgery are breached and should be fully aware of all potential complications in both the acute and chronic settings.

The unfamiliar anatomy, the constraints of the lateral abdominal wall, and the lack of an established surgical technique makes this surgical entity particularly difficult to treat. As a result, there is a paucity of literature discussing repair techniques, optimal surgical modalities, and the outcomes after repair. We were able to offer our patient a robotic repair of the resultant large flank hernia while adhering to traditional



Fig. 1. Lateral abdominal wall defect. a Anterior view. b Posterior view.

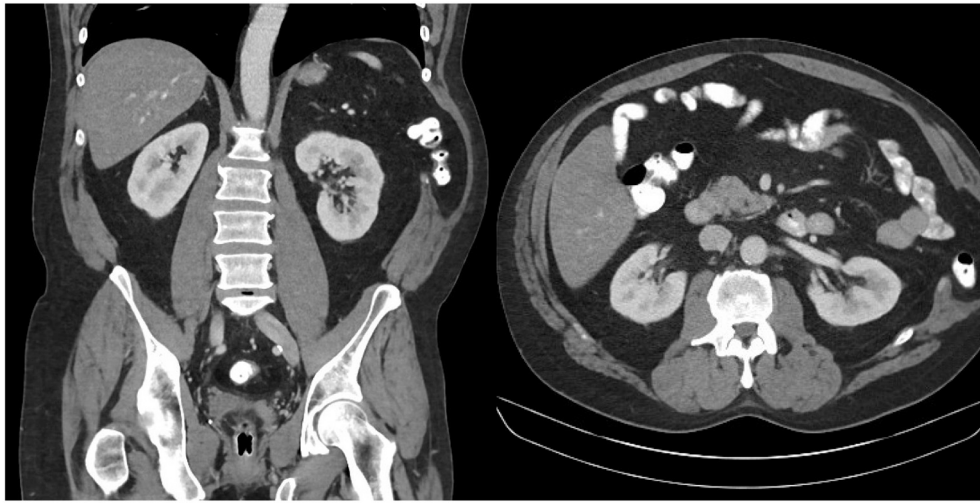


Fig. 2. CT scan showing left colon protruding into the lumbar defect. a Axial view, 12th rib is visible at the caudal aspect of defect, and b sagittal view 12th rib at posteroinferior border of defect.

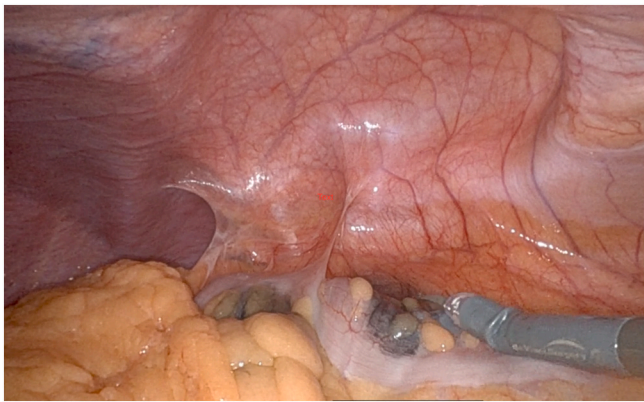


Fig. 3. Colonic tattoo opposite to hernia defect in upper left quadrant.

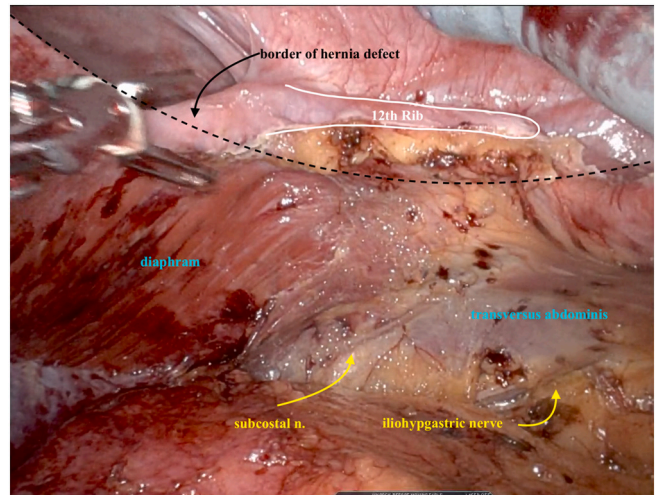


Fig. 5. Exposed nerves, 12th rib and muscle after preperitoneal dissection.

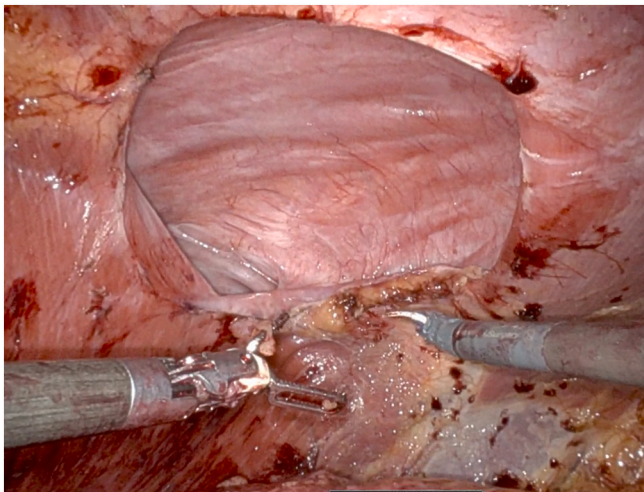


Fig. 4. Hernia defect through transversus abdominis and internal oblique muscles. External oblique fibers are seen as "roof" of the defect.

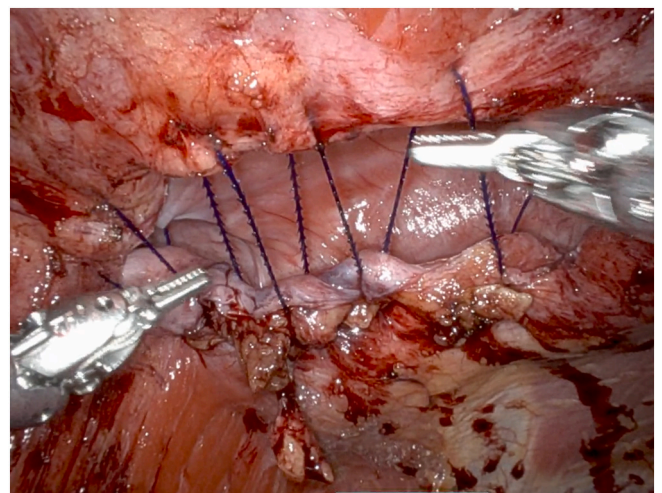


Fig. 6. Closing defect with barb monofilament absorbable suture.

surgical principles.

The minimally invasive approach has numerous advantages: shorter length of stay, less postoperative pain, decreased rate of surgical site

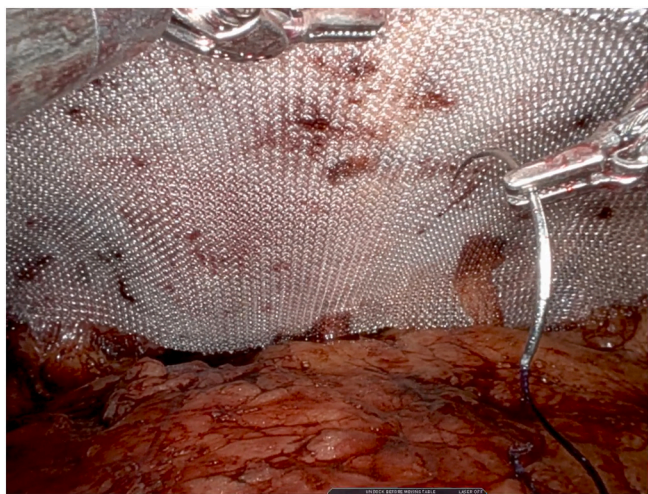


Fig. 7. Securing mesh in preperitoneal space.

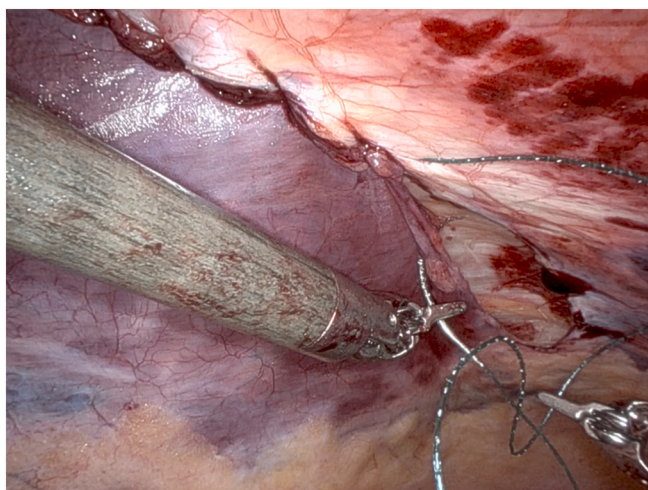


Fig. 8. Closing peritoneal flap.

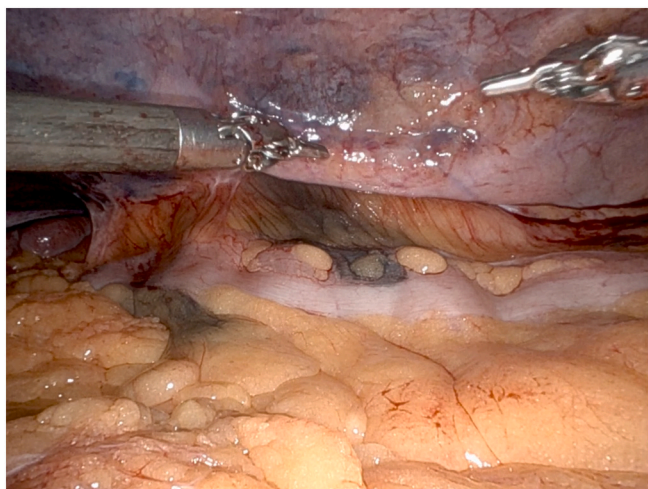


Fig. 9. View of completed repair, colonic tattoo visible opposite to the repair.

infection (SSI), and others [12]. Robotic-assisted abdominal wall repair (RAWR) is exponentially growing and as it offers key advantages over laparoscopy [13]. For surgeons, a three-dimensional view of the operating field and articulating instruments allow for a more precise and ergonomic operating experience. The robotic-assisted approach can benefit patients who present with complex abdominal wall defects and who would otherwise be submitted to an open approach with all its morbidity [14].

4. Conclusion

Flank hernias are uncommon forms of abdominal wall herniation that often result from iatrogenic causes. Endoscopic submucosal resection complicated by full thickness colonic perforation likely resulted in thermal injury to the transversalis and internal oblique musculature in our patient, causing the latent development of a flank hernia. This is an unusual and rare event after endoscopic resection, and there are no known previous reports of this complication in the literature. As the ingenuity and imagination of endoscopists and surgeons lead to continued innovation, this case demonstrates the importance of careful outcomes monitoring, and should alert the endoscopist of flank hernia formation as a potential late complication to submucosal resection.

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Not applicable.

Ethical approval

As this was a case study, IRB approval was not required. All measures were performed to assure HIPPA compliance in accordance with federal law and ethical standards. Sensitive patient health care information was protected.

Consent

Informed consent was obtained.

Author contribution

Dr. Pacheco, Tulio: data collection, writing the paper, editing
 Dr. Lima, Diego: data collection, editing
 Mr. Halpern, Robert: data collection, image editing
 Dr. Malcher, Flavio: study concept/design, editing
 Dr. Halpern, David: study concept/design, editing

Registration of research studies

Not applicable.

Guarantor

Dr. David Halpern.

Declaration of competing interest

Drs. Deigo Lima, Tulio Pacheco, Robert Halpern and David Halpern have no conflict of interest. Dr. Flavio Malcher discloses consulting fees from Medtronic and Bard Davol. Intuitive, Deep Blue and Integra.

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