


Bridging the gap: a robotic approach to the repair of a traumatic diaphragmatic intercostal hernia

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Received 13 August 2024
Accepted 28 September 2024

CASE PRESENTATION

An adult patient initially presented to an outside hospital with a 12-hour history of cramping, sharp abdominal pain and a 24-hour history of obstipation. Laboratory studies revealed leukocytosis (white blood cell count $13.0 \times 10^9/L$) and lactic acidosis (2.3 mmol/L). A CT scan of the abdomen and pelvis with intravenous contrast revealed a large left-sided intercostal hernia between the 9th and 10th ribs containing fat and loops of small bowel, some of which contained air-fluid levels suspicious for a developing partial small bowel obstruction (figure 1). Of note, the patient reported that this hernia had been present for the past 18 months after a motor vehicle collision. Physical examination on arrival at our facility revealed an afebrile, hemodynamically stable patient with a non-distended but moderately tender abdomen. The intercostal hernia was able to be partially reduced. After administration of intravenous hydration, the previously noted lactic acidosis resolved. Given the location of the hernia, the thoracic surgery service was also consulted.

WHAT WOULD YOU DO NEXT?

- Non-operative management with nasogastric tube placement and a small bowel follow-through.
- Immediate intercostal hernia repair via an abdominal approach.
- Nasogastric tube placement, a small bowel follow-through, and a semi-elective hernia repair during the same admission.
- Immediate intercostal hernia repair via a thoracic approach.

WHAT WE DID AND WHY

The patient was admitted to the emergency general surgery service. After discussing the case with thoracic surgery, both services felt that as the patient was symptomatic but not acutely strangulated, we would proceed with a minimally invasive transabdominal approach during this admission in a semi-elective fashion.

A nasogastric tube was placed to decompress the small bowel in hopes of being able to fully reduce the hernia. On hospital day 1, a small bowel follow-through study was performed which was notable for contrast progression into the patient's colon. The patient also had a return of bowel function and had resolution of their abdominal pain and leukocytosis. Given the posterior location of the intercostal hernia, we elected to perform this case robotically.

On hospital day 5, the patient was taken to the operating room where he underwent a robot-assisted laparoscopic hernia repair with mesh. The patient was positioned with a bump under their left side. Three, 8 mm robotic trocars were then placed in a straight line across the patient's mid-abdomen, angled towards the left-sided hernia. An additional 12 mm laparoscopic assist port was placed in the patient's left lower quadrant. A left-sided chest tube was placed shortly after insufflation due to elevated peak pressures and drained approximately 1200 mL of serous fluid. The hernia was then examined and was noted to contain a significant amount of the patient's small bowel which was gently reduced from the hernia into the abdominal cavity (figure 2). The entirety of the left diaphragm was then evaluated and there was no diaphragmatic injury able to be identified. After discussion with thoracic surgery, we did not elect to reapproximate the patient's ribs as there was no evidence of respiratory compromise and we were concerned that the patient may develop chronic pain in the future. The hernia defect in the intercostal space was then closed with a running 0 V-Loc suture. A $20 \times 25 \text{ cm}$ piece of Symbotex mesh was then placed during this repair in an on-lay fashion and was sutured circumferentially using additional 0 V-Loc sutures (figure 3). The patient tolerated the procedure well and was discharged to home on postoperative day 3. They were seen in the clinic at both 1 and 6 months postoperatively and were noted to have returned to their normal activities with no pain, discomfort, or hernia recurrence. Ultimately, long-term follow-up is needed to ensure continued durability of this hernia repair.

DISCUSSION

Intercostal hernias are a rare type of hernia that involve a protrusion of intra-abdominal organs or the lung through a defect in the intercostal space. This type of hernia most often occurs after trauma in which there is a rupture of the costal margin, but rare cases have been described as occurring spontaneously.¹ When a rupture of the costal margin occurs, the intercostal muscles, diaphragm, and upper abdominal wall muscles are all at risk of damage.² Whereas there is a discrepancy in the literature regarding whether an intercostal hernia involves the presence of a concomitant diaphragmatic defect, a true abdominal intercostal hernia as described by Bobbio *et al* describes an intercostal defect with an intact diaphragm.³ Similar to our patient, the majority of intercostal hernias develop in the ninth intercostal space and more commonly occur in men.³ Traditionally, injuries involving the

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To cite: Fitzgerald CA, Chaudhary S, Noory M. *Trauma Surg Acute Care Open* 2024;**9**:e001604.

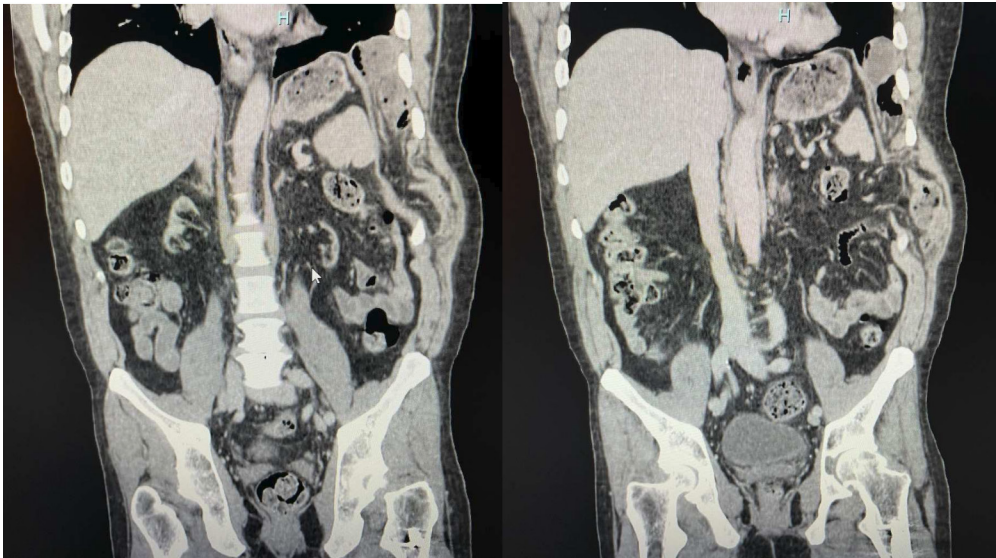


Figure 1 Coronal slices of admission CT of the abdomen/pelvis with intravenous contrast demonstrating an intercostal hernia in the ninth intercostal space containing small bowel.

costal margin have been classified according to the Sheffield Classification which categorizes these injuries based on the presence or absence of both a diaphragmatic rupture and an intercostal hernia. The Sheffield Classification also helps guide the surgical management of these unique hernias.⁴

Typically, these hernias are diagnosed in a delayed fashion when patients present with a large bulge in their lateral chest wall with many patients also noting pain, coughing, or dyspnea. CT scans are the diagnostic imaging test of choice in order to both diagnose the presence of an intercostal hernia and to plan an operative approach.⁵

Regardless of the presenting symptoms, operation is always indicated as up to 15% of intercostal hernias can be complicated by strangulation of the involved viscera.⁶ Surgical approaches are varied and have been described through both the thoracic and abdominal cavities via open or minimally invasive techniques. Furthermore, both primary repairs and mesh repairs have been successful. There is debate over whether rib approximation should be used, however, the majority of case reports avoid rib approximation due to the risk of the development of chronic pain. Regardless of the method of repair chosen, intercostal hernias have a high recurrence rate (noted to be upwards of 66%



Figure 2 Intercostal hernia defect after the small bowel and omentum had been reduced into the abdominal cavity.

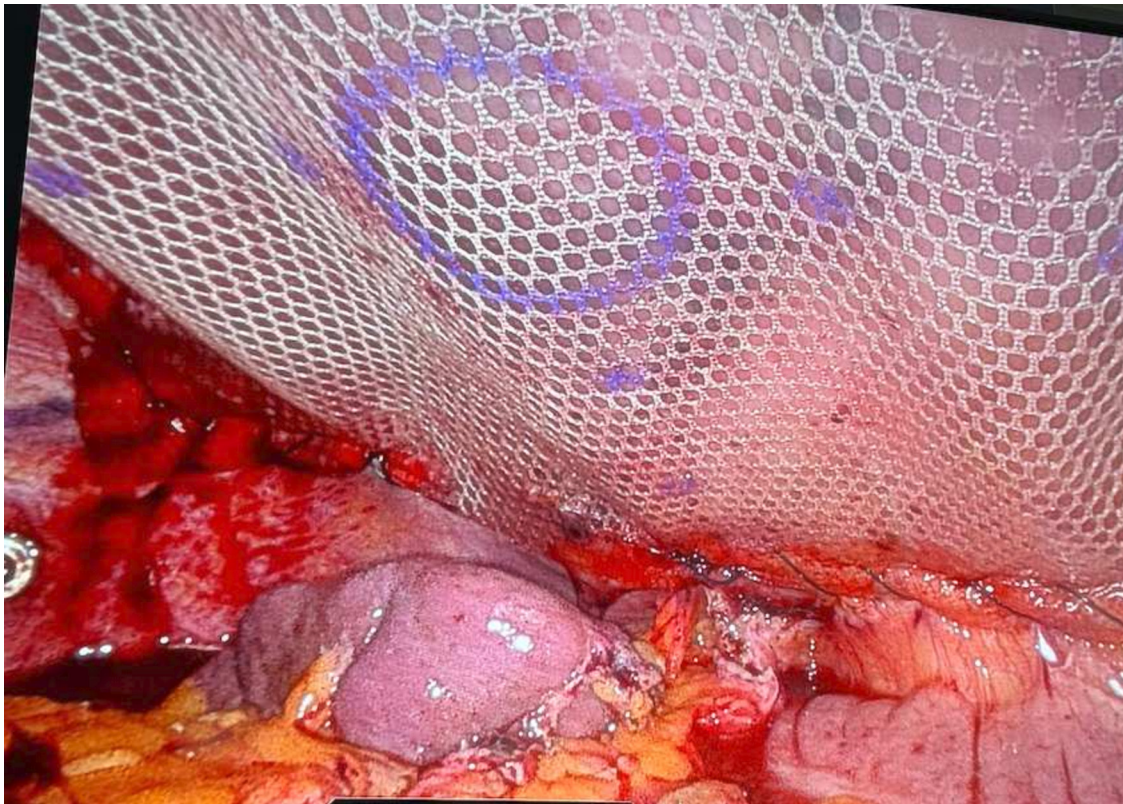


Figure 3 Completed hernia repair with 20×25 cm piece of Symbotex mesh.

in some case series) making the achievement of a tension-free repair key.^{7,8}

Contributors CAF and MN were the operative surgeons. All authors conceived the idea to submit this case as a case report. CAF wrote the case report. SC and MN reviewed and edited the case report. All authors were in agreement with the final article. CAF is the guarantor.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not applicable.

Ethics approval Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

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