

C A S E R E P O R T

Internal hernia after an open gastrectomy: a challenging surgical management and a narrative review of the literature

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Abstract. Internal hernia (IH) is a serious complication that can occur after both laparoscopic and open surgery for the treatment of gastric cancer; the transverse colon and mesocolon, act as a natural partition between stomach and the small intestine and, once any type of gastrojejunal anastomosis is constructed, a potential space for internal hernia is created. We present the case of a 68-year-old patient diagnosed with intestinal ischemia due to an IH in the site of the jejunojejunostomy after an open gastrectomy for gastric cancer, treated with negative wound pressure therapy (NWPT) on open abdomen (ABTHERA™ dressing) (www.actabiomedica.it).

Key words: interna hernia, open abdomen, negative pressure therapy, mesenteric ischemia, negative wound pressure therapy, NWPT

Introduction

Internal hernia is a potential complication known to occur after many types of surgeries, particularly the ones that contemplate a Roux-en-Y anastomosis. Its incidence is still unclear, but the majority of the study groups observed an incidence ranging from 0,19 to 5% (1).

IH is reported to be more frequent after gastric by-pass surgery for the treatment of morbidly obesity, particularly in patients treated with a laparoscopic approach (2).

This kind of approach is advantageous in terms of minor perioperative blood loss, shorter hospital stay and lower risk of complications, but at the same time it reduces the formation of postoperative adhesions hesitating in higher bowel mobility which increases the risk of limbs herniation. Since its non-specific clinical signs and symptoms and laboratory findings, the diagnosis of IH remains challenging. To avoid severe complications such as bowel necrosis, an accurate management and early treatment of this condition is

needed. Surgical resection of the affected tract is often a necessary but occasionally not so obvious decision.

We present a case of difficult surgical management characterized by a superior mesenteric artery obstruction due to a secondary internal hernia after gastrectomy in which we opted for a two-stage open abdomen approach and the application of a negative-pressure wound therapy.

Case presentation

In 2019 a 68-years old man presented to the emergency room complaining of abrupt onset of abdominal pain spread to all the quadrants, vomiting and diarrhea. At the physical exam abdomen was distended, with diffuse pain with rebound tenderness. No bowel sound was audible at the auscultation. His past medical history was notable for gastric antrum adenocarcinoma (diagnosed in 2018) with signet ring cells for which he underwent a total open gastrectomy with

a D2 lymphadenectomy and Roux-en-Y anastomosis. The patient was currently under adjuvant chemotherapy regimen with capecitabine. Because of the findings at the physical exam, he underwent an abdomen ultrasound which revealed distention of the small intestine anseae with no evidence of peritoneal effusion. The patient subsequently underwent an abdomen CT scan which showed off a torsion of the jejunal mesentery and jejunal dilatation (Figs.1 and 2). All the small intestine anseae appeared diffusely hypo perfused and atonic, with evident hydro aerial levels. This evidence was strongly suggestive for internal hernia causing acute mesenteric ischemia due to the torsion of superior mesenteric artery and vein (Fig. 3).

At the venous blood gas analysis his lactate was 4mmol/L, all the other labs values were in range.

The patient underwent an exploratory laparotomy which disclosed an intestinal infraction spread to all the intestinal loops, except for the Roux limb; this condition was determined by the herniation of the intestinal anseae through the jejunojejunostomy space. resolve the bowel distress inducing IH was required Furthermore, the intestinal loops were twisted along their vascular axis worsening the patient's clinical presentation.

Following the resection of the Roux-en-Y limb foot, derotation and repositioning of the incarcerated bowel, only a limited improvement was observed, and the bowel remained diffusely suffering. Given the extensive involvement of the bowel, we faced the tough decision whether to resect or not. Considering the perioperative findings, the surgeon opted for an "open abdomen treatment" and a negative pressure wound therapy (NPWT) ABTHER ADVANCE™ open abdomen dressing device was placed (3). Finally, an ostomy with the resected intestinal limb was created.

After surgery the patient was transferred to the intensive care unit. Forty-eight hours after surgery the patient was re-taken into the operating room to remove the ABTHER ADVANCE™ open abdomen dressing. At this point, all the small intestine loops appeared viable and adequately perfused, with a minimal residual wall edema. Considering the significant clinical improvement, the stoma was closed, and the Roux-en-Y limb was re-anastomosed 30cm downstream from the previous one. To allow an optimal and complete recovery of the intestinal vitality we decided to reposition the ABTHER ADVANCE™ open abdomen dressing device for additional 48 hours.

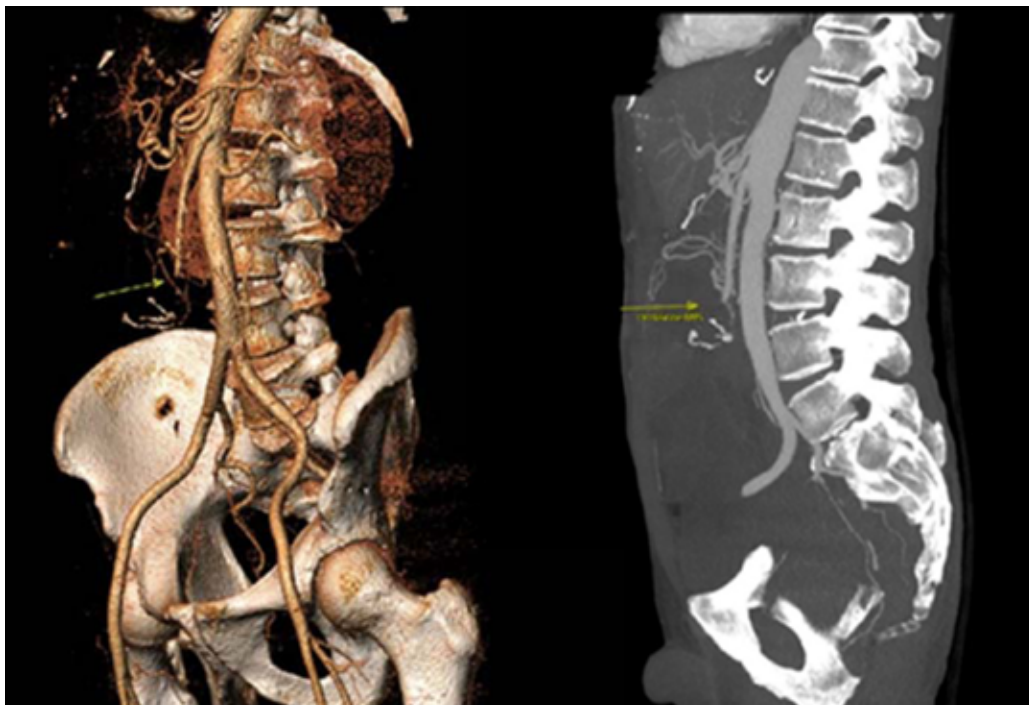


Figure 1: CT scan of the abdomen.



Figure 2: cross section of CT scan showing dilated bowel.

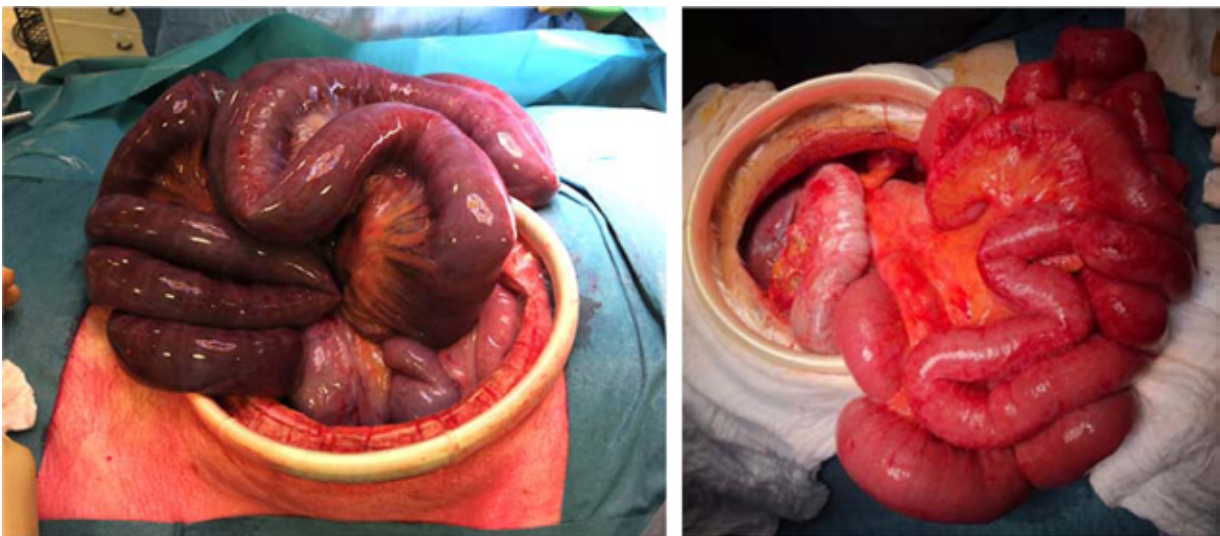


Figure 3: bowel loops before at the first surgery (on the left side) and the outcome at the time of the second surgery (on the right side).

The patient finally underwent a last surgery in which the ABTHER ADVANCE™ open abdomen dressing device was removed; all the mesenteric defects were closed with an interrupted suture of Vicryl® 3-0 and the abdominal wall was definitively closed.

Seven days after the last surgery the patient was discharged, and he remained asymptomatic at the 24 months follow-up visit.

Discussion

Some decisions in surgery may be difficult. The two-stage open abdomen approach is a considerable option in some specific cases. To our knowledge this represents one of the few described cases of an extensive intestinal vascular distress treated with the application of an intrabdominal NPWT ABTHER

ADVANCE™ open abdomen dressing device. In this specific clinical case, surgeons were challenged by the critical decision of what to do in front of an extensive bowel vascular distress secondary to strangulation of the superior mesenteric artery due to internal herniation of the bowel after open gastrectomy.

Due to the increasing number of bariatric surgeries and gastric resections performed laparoscopically, in recent years there has been an increase of the incidence of internal hernia cases reported. Despite this complication, the laparoscopic approach, where possible, remains the first-choice treatment due to all the advantages it offers.

The Roux-en-Y reconstruction can be performed through to different approaches: antecolic or retrocolic placement of the Roux-limb. The first one is commonly used in laparoscopic surgeries, the second one, on the contrary, is preferred in open surgeries. Antecolic placement is associated with a lower incidence of internal hernia, in fact it creates only two mesenteric defects: jejunojejunostomy and Petersen. Differently, a retrocolic approach generates three defects: transverse mesocolon, jejunojejunostomy and Petersen (2,4,5).

In the case of our patient, during the gastrectomy no mesenteric defect closure was performed; this in addition to a postoperative weight loss may have led to the onset of this life-threatening complication.

Although there isn't a univocal opinion regarding the real usefulness of closing the mesenteric defects during open and laparoscopic surgeries yet, this procedure could prevent the occurrence of internal hernias, especially in patients with an increased risk.

The aspect on which we want to bring to the readers' attention is that it was initially decided not to resect the suffering intestine immediately. The intra operative scenario was characterized by a massive intestinal suffering due to the Peters' hernia in which almost the whole bowel limbs were involved. To release the herniated and suffering bowel, it was necessary to resect the Roux biliary loop which had been constructed during the previous surgery of resection of the stomach. Due to the persistent suffering of the bowel despite the observation period following the release from hernia and volvulus, we faced the decision whether to resect or not.

In the first case, we would have condemned the patient to important morbidity due to a short bowel

syndrome and to a serious and life-threatening danger. In case we decided not to resect, we would have had to decide whether to immediately reconstruct the Roux foot (biliary loop) or not.

The intraoperative scenario was characterized by a massive intestinal distress due to a Peters' hernia near-complete small bowel involvement. We specify this was not an intestinal ischemia as clear signs irreversible partial or extensive necrosis were absent. Despite the critical condition, after careful evaluation we opted for a conservative wait-and-see approach to monitor the dynamic evolution of the affected area considering the vascular origin of the bowel distress and the light improvement following the resolution of the IH and volvulus. This conservative strategy was adopted to avoid radical interventions as the patient's condition was not unstable and requiring for immediate extensive bowel resection.

An immediate bowel resection would in fact have involved the removal of a large portion of the intestine putting the patient at a high risk of short bowel syndrome in the postoperative period; moreover, to derotate the intestine it was necessary to resect the Roux-en-Y limb and its following reconstruction on a suffering tissue would have exposed the patient to a high risk of anastomotic dehiscence. To this extent, we thought of a solution to improve the small bowel microcirculation. We immediately decided to use ABTHERA™ open abdomen dressing for two main reasons; first, it was used as a temporary abdominal wall closure system, since the repeated abdominal exploration was required. Secondly, we introduced this strategy to implement the microvascular perfusion of the intestinal wall (6).

The literature is still scarce in this sense, and available articles (mainly experimental studies and reports of single cases) sustain the ability of this device to improve the bowel micro circulation (7). Abdominal NPWT has been reported to allow a better control of intra-abdominal pressure, thus avoiding abdominal compartmental syndrome (4, 5) and promoting microvascular reperfusion by wall oedema reduction and peritoneal fluid aspiration. (7) In addition, NPWT has been shown to significantly improve systemic inflammation and organ damage and its efficacy was partly attributed to the attenuation of peritoneal inflammation

by the removal of cytokines and other biochemical mediators in the ascitic fluid. Indeed, NPWT showed superior ability to evacuate ascites compared to traditional passive wound drainage closed systems.

Even though it wasn't a scenario ascribable to a compartmental syndrome for which the laparostomy solution would have been indicated (note) due to its beneficial effect on the microcirculation, a two-stage open abdomen approach could have contributed to an improvement on microcirculation also in this case.

In particular, ABTHERA™ Open Abdomen Negative Pressure Therapy is a temporary abdominal closure system. It allows surgeons to facilitate management of the open abdomen where primary closure is not possible or advisable, or where repeated planned abdominal entries ('re-looks') are required. ABTHERA™ Therapy is designed to actively remove fluid and help reducing edema providing medial tension, which helps minimize fascial retraction and loss of domain (8, 9).

It consists of a non-adherent fenestrated visceral protective layer with foam extensions, and a separate overlying reticulated open-cell foam dressing, both of which are sealed under an adhesive plastic drape before connecting to a negative pressure therapy unit. It provides separation between the abdominal wall and viscera, protecting abdominal contents and allows for rapid access for re-entry.

In this report, we described our use of negative pressure wound therapy as delivered by V.A.C.® Therapy (KCI USA, Inc., San Antonio, TX).

Does our approach find a match in literature?

Maintaining an open abdomen by means of temporary abdominal closure (TAC) is a valuable surgical technique in the management of a wide range of complex abdominal injuries and conditions including trauma, damage control, sepsis, and re-laparotomy (11). Over the last decade, Negative Pressure Wound Therapy (NPWT) has been recognized as a valid method of Temporary Abdominal Closure (2,3). Although evidence for NPWT is emerging at an increasing rate, a consensus on how and when to use NPWT on the open abdomen is lacking. The benefits of managing patients with open abdomens include prevention

of intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS), early identification of intra-abdominal complications (e.g. bowel ischemia on animal models and ease of re-entry (11).

For the resolution of the abdominal compartmental syndrome, laparostomy and resection of ischemic intestinal wall or of the entire tract of involved intestine are fundamental.

It's not so clear how to surgically behave in front of a massive intestinal sufferance which is not completely resolved after the solution of its cause. As happened in the case we described, bowel was cyanotic, distended, edematous and scarcely vital (there was no sign of peristalsis) despite the resolution of the volvulus and the release from internal hernia in which the bowel vessels were strangled (11,13). In these cases, a two-stage open abdomen approach could be useful, as in our particular case.

Even though the guidelines suggest the use of an open abdomen approach to treat acute mesenteric ischemia in case of deranged physiology, bowel edema and the necessity to perform a second look (14,15), traditional teaching in emergency general surgery emphasized a single-stage operation with primary abdominal closure and on-demand laparotomy for clinical deterioration (15).

To this effect, a temporizing closure is utilized, which include skin-only closure, loose packing of open fascial defects, silos or more recently, negative pressure wound therapy (NPWT) (16). One NPWT is the ABTHER ADVANCE™ Open Abdomen Dressing.

It is indicated for temporary bridging of abdominal wall openings where primary closure is not possible and /or repeat abdominal entries are necessary. The intended use of this dressing is in open abdominal wounds with exposed viscera including, but not limited to, abdominal compartment syndrome, the intended care setting is a closely monitored area within the acute care hospital, such as the ICU.

In the literature and in the WSES guidelines (the open abdomen in trauma and non-trauma patients 2018) there are no evidence for the treatment of acute vascular emergencies with NPWT systems.

However, the lack of studies on this subject, prevent us from being able to compare the different surgical strategies that could be applied in these situations.

With the dutiful realism necessary to the analysis of this case report, we aim to tell how a suffering bowel not improving after its release from hernia and volvulus registered a restitutio ad integrum with temporary laparostomy and the use of NPWT. Certainly, we can't affirm that the evident bowel recovery is totally due to the only use of NPWT. Furthermore, it's not possible to state that this improvement is due to the only resolution of hernia and volvulus or to the laparostomy.

Despite the seriousness of the initial clinical picture, the choice of opting for an open abdomen treatment with the positioning of an intrabdominal ABTHER ADVANCE™ open abdomen dressing device, allowed to preserve all the intestinal loops, without requiring extensive intestinal resection with the subsequent risk of developing short bowel syndrome. Abdominal NPWT involves applying some degree of suction to an open abdominal wound. Through use of a visceral drape and constant negative wound pressure, this technique prevents visceral adherence. The Negative Peritoneal Wound Pressure Therapy (NPWT) has also been reported to remove fluid and pro-inflammatory cytokines from the peritoneum, which may reduce abdominal third space volume, the systemic inflammatory response, and promoting microvascular reperfusion through a wall edema (17) in animal mode (18,19,20).

Conclusions

Internal hernia is a rare but serious complication after gastric cancer surgery.

The resection of the ischemic bowel tract is often required when present.

As happened in our case, bowel can show sufferance signs with clear and evident necrosis signs. In such doubtful cases, as demonstrated by our case, a two-stage surgical planning with the use of a ABTHER ADVANCE™ open abdomen dressing device in the meantime between the two surgeries could be an option in selected cases in which there isn't a massive intestinal sufferance.

Conflict of Interest: Each author declares that he or she has no commercial association (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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