



Case report

Mechanical ileus and mesenteric ischemia in a patient with simultaneous internal herniation through Petersen's and jejunojejunal spaces following laparoscopic Roux-en-Y gastric bypass: A case report

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ABSTRACT

Introduction: Internal herniation (IH) of the small bowel after laparoscopic Roux-en-Y gastric bypass (LRYGB) is a well-known complication, with an incidence ranging from 1 to 5% depending on the route of the Roux limb and the closure of the mesenteric defects at the time of the initial operation. Simultaneous herniation of the biliopancreatic and Roux limbs through both Petersen's and jejunojejunal spaces with mesenteric torsion resulting in early small bowel ischemia has not been described earlier.

Presentation of case: A 63-year-old patient presented with mechanical small bowel ileus and early mesenteric ischemia due to simultaneous herniation of the alimentary and the biliopancreatic limb through the Petersen's and jejunojejunal spaces with subsequent rotation and torsion of the mesentery 33 months after LRYGB. The condition was managed by surgically reducing the hernias and closure of the mesenteric defects. Partial bowel resection was not performed. The patient's postoperative course was uneventful.

Discussion: Simultaneous herniation of the biliopancreatic and Roux limbs through both intermesenteric windows caused consequent life-threatening complications after LRYGB. Antecolic approach and closure of mesenteric defects with non-absorbable sutures are recommended when technically feasible. Proper history taking and clinical examination, as well as communication between surgeons and radiologists, are crucial in establishing a rapid diagnosis.

Conclusion: Internal hernia following LRYGB can be fatal. In cases of uncertainty, emergency exploratory laparoscopy or laparotomy should be performed. The open approach seems superior for recurrent small bowel obstruction (SBO) due to recurrent IH. High vigilance is necessary when IH is suspected, despite normal laboratory and radiological findings.

1. Introduction

Internal herniation of the small bowel after laparoscopic Roux-en-Y gastric bypass (LRYGB) is a well-known complication with incidence ranging from 1 to 5% [1,2]. IH can be defined as 'the protrusion of herniated bowel through one or more of the intermesenteric spaces' [2]. These spaces are created during the mobilization of the Roux limb to create a gastrojejunostomy. The incidence of IH is reportedly higher following the laparoscopic approach than with the open approach. This can be attributed to the minimal adhesive reaction after laparoscopic surgery compared to open surgery [3]. Postoperative loss of mesenteric

fat is a critical contributing factor in the etiology of internal hernias.

IH can potentially occur through either two or three defects, depending on the technique used for the Roux limb (retrocolic or antecolic). In the antecolic approach, herniation can occur through the space between the mesentery of the biliopancreatic and Roux limbs (jejunojejunostomy) or through the Petersen's space, which is the space between the Roux limb and the transverse mesocolon. In the retrocolic approach, the created defect in the transverse mesocolon can be added to the previously mentioned intermesenteric spaces. Higa et al. analyzed 2000 cases and showed that 67% of cases of IH were mesocolic, 21% were jejunojejunal, and 7.5% were in Petersen's space [4].

Abbreviations: BMI, body mass index; CBC, complete blood count; CT, computed tomography; LRYGB, laparoscopic Roux-en-Y gastric bypass; SBO, small bowel obstruction.

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We report a case of complications following LRYGB, wherein the patient was managed by surgically reducing the hernias and closure of the mesenteric defects. The work has been reported in line with the SCARE criteria [5].

2. Presentation of case

A 63-year-old man presented to the emergency department with a one-day history of constant diffuse colicky pain in the entire abdomen associated with recurrent nausea. He had undergone laparoscopic Roux-en-Y-gastric bypass 33 months earlier at another institution. His body mass index (BMI) during the initial surgery was 39 kg/m². The post-operative course at that time was unremarkable, and the patient was discharged on the third postoperative day. The patient underwent an excessive postoperative weight loss with a BMI reduction from 39 to 18 kg/m² over the next 33 months. Moreover, he had lost 20 kg in the last 3 months.

He reported constant pain that increased and correlated with the postprandial phase during his current visit. He complained of nausea and constipation for approximately 4 days but did not seek medical help till the symptoms became intolerable. He had no signs of fever or other symptoms. His medical and surgical history showed that he had suffered a severe road traffic accident in the past and had bilateral pelvic vein thrombosis with subsequent warfarin therapy. During his current presentation, his vital signs were within normal limits, and abdominal examination revealed a distended abdomen with diffuse abdominal tenderness. There was no guarding or rigidity. His bowel sounds had increased. Laboratory results, including complete blood count (CBC), basic metabolic panel, lactic acid, LDH and liver function tests, were within normal limits. However, his CRP level was slightly elevated.

To assess the dynamics of the intestinal movement, exclusion of gallbladder pathology following massive weight loss, and to look for free fluids, we performed abdominal ultrasonography, which revealed massive dilatation of the small bowel with a small amount of fluid collection between the intestinal loops. Abdominal CT revealed a subtotal mechanical ileus of the small intestine in the middle-upper abdomen with volvulus and torsion of the mesenteric vessels (whirlpool sign) with severe narrowing of the superior mesenteric vein (Fig. 1).

Emergency laparoscopy was performed beginning with the placement of 12 mm optical trocar 14 cm below the xiphisternum, paramedian for the camera and establishment of the pneumoperitoneum, along with two additional 12 mm trocars in the right and left lumbar regions, as well as a 5 mm epigastric incision for the Nathanson retractor. Intraoperatively, massively distended, cyanotic loops of the small intestine were found with chylous ascites, a sign of acutely exacerbated chronic congestion (Figs. 2, 3, 4, and 5). Chylous fluid was

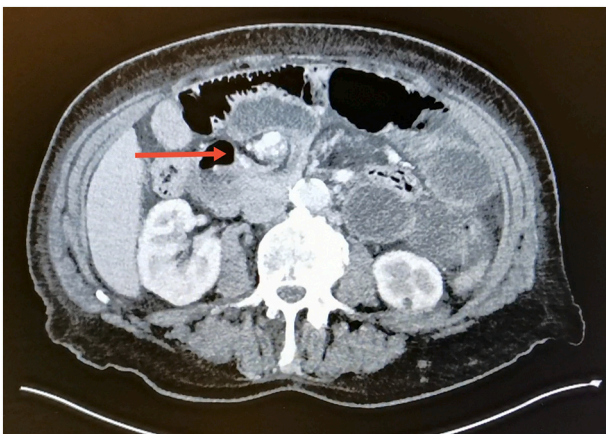


Fig. 1. Whirlpool sign.



Fig. 2. Distended, cyanotic loops of the small intestine with chylous ascites, a sign of acutely exacerbated chronic congestion.



Fig. 3. Distended, cyanotic loops of the small intestine with chylous ascites, a sign of acutely exacerbated chronic congestion.



Fig. 4. Distended, cyanotic loops of the small intestine with chylous ascites, a sign of acutely exacerbated chronic congestion.

aspirated and sent for microbiological examination. Following the alimentary loop was challenging, as it was submerged and fixed dorsally. Even the biliopancreatic loop was dorsally fixed and could not be traced completely. The Petersen's space was highly stretched by parts of the small bowel mesentery. Upon tracing the highly congested small intestinal loops, we found several defects on the walls, clarifying that reducing the twisted herniated small bowel loops was not possible laparoscopically. A decision was made to convert to laparotomy. After conversion, it was evident that portions of the alimentary and biliopancreatic loops had herniated through both windows (Petersen foramen and the jejunojunal mesenteric defect) with a subsequent

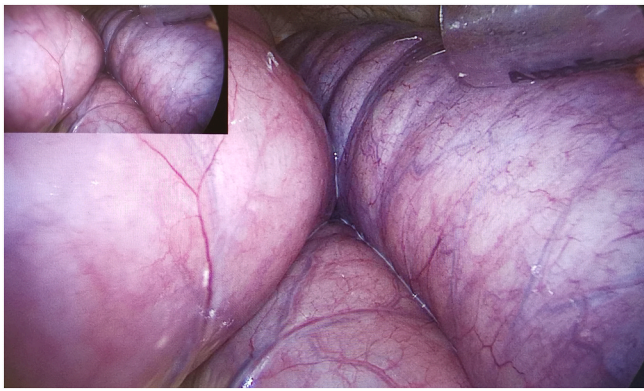


Fig. 5. Distended, cyanotic loops of the small intestine with chylous ascites, a sign of acutely exacerbated chronic congestion.

rotation by 180 degrees, causing strangulation.

Subsequently, the hernia was reduced. The entire small intestine was carefully examined, and wall defects were sutured after performing open decompression through wall defect; the discoloration resolved rapidly. The color of the entire intestine returned spontaneously to normal after 1 min. Partial bowel resection was not performed.

Closure of the Petersen foramen and jejunojejunal mesenteric defect was attempted using a non-absorbable suture. An intensive abdominal lavage was performed, followed by drainage tube insertion through the trocar incisions, since the small bowel content was scattered in the intraabdominal space. The multimorbid patient was monitored overnight in the surgical ICU. A broad-spectrum antibiotic was administered intravenously for seven days. The postoperative course was unremarkable, and the patient was discharged on the 11th postoperative day with a minor wound redness.

3. Discussion

We reported the treatment of complications following LRYGB by surgically reducing hernias and closure of the mesenteric defects. The patient could be discharged without major complications.

A meta-analysis of 45 studies on IH after LRYGB, which included over 33,000 patients, showed that the most common site for herniation using the antecolic approach was the jejunojejunal mesenteric space. In contrast, in the retrocolic groups, internal herniation mainly occurred through the mesocolonic defect followed by the jejunojejunostomy [2,4,6–9]. Many studies have reported almost no internal herniation or a significant reduction in the incidence of IH following the antecolic approach with simultaneous closure of all mesenteric defects after the initial operation [9–11].

The clinical presentation of IH may vary from mild and intermittent abdominal cramps to acute small bowel obstruction (SBO), causing mesenteric strangulation in extreme cases, which can be lethal. Importantly, intestinal gangrene can also occur without SBO, and not every herniation of the bowel results through the mesenteric space in SBO as the small bowel can be mobile enough to slip back in the correct position. This phenomenon explains the intermittent nature of the symptoms reported by many patients. Most SBOs following LRYGB occur between 6 and 24 months postoperatively with a reported prevalence of 0.6–11% [12,13]. The diagnosis of internal hernia can be challenging. Combining clinical signs and imaging studies, such as computed tomography (CT), can help establish an accurate diagnosis.

The radiographic features suggestive of IH include the presence of small bowel loops in the upper abdomen, presence of the jejunojejunostomy above the level of the transverse colon, evidence of small bowel mesentery crossing the transverse mesocolon, small bowel obstruction, swirled appearance, and engorgement of the mesenteric vessels so-called whirlpool sign (Fig. 1). The presence of the ‘whirlpool sign’

raises the specificity of CT for IH diagnosis from 70% to 100%, although the sensitivity remains low at 70% [14]. The definitive diagnosis of IH can be made using laparoscopy or laparotomy.

Both intermesenteric spaces following the antecolic approach were wide open in our case. Although the antecolic approach and closure of defects during the initial operation reduced the risk of internal hernia, according to many studies [9], there was significant variability in the rates of internal hernias in different bariatric centers. This can be attributed to other factors such as completeness of mesenteric space closure and suture material (e.g., absorbable vs. non-absorbable), which might dramatically influence the effectiveness of the closure. Some surgeons prefer to leave the defects open to avoid technical difficulty, kinking of the jejunojejunostomy, and time-consuming, as well as the risk of tearing the mesentery and subsequent bleeding [15]. Some centers use stapling instead of suturing, as it is less time-consuming and easier to perform.

We preferably use non-absorbable sutures in a running fashion to close the mesenteric defects as they cause fewer adhesions, reducing the overall risk of developing SBO [16,17]. In cases of SBO or those similar to our case with concomitant mesenteric ischemia, reducing the hernia laparoscopically is sometimes challenging because of the lack of space and the vulnerability of the intestinal wall. In such cases, conversion to laparotomy is inevitable.

Finally, for patients with recurrent internal herniation after the laparoscopic procedure, Capella et al. suggested an open approach through laparotomy to maximize the possibility of adhesion, reducing extensive mobility of the small bowel [12].

4. Conclusion

Internal hernia following LRYGB can lead to potentially fatal complications. When technically feasible, the antecolic approach must preferably be used and to close the mesenteric defects with non-absorbable sutures during the primary operation. Proper history taking and clinical examination, as well as communication between surgeons and radiologists, are crucial to establishing a rapid diagnosis. In cases of uncertainty, laparoscopy or laparotomy should be performed without delay. Considering the risk of recurrent IH, the open approach might be a superior treatment option for recurrent SBO. A high sense of vigilance is necessary when IH is suspected, even in the normal laboratory and radiological findings.

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“Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request”.

Data statement

All the data used in this publication are available.

Ethical approval

All Procedures performed were in accordance with the ethical standards of our Institution and declaration form.

Consent

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Registration of research studies

None.

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CRediT authorship contribution statement

Dr. Alaa Mousli: Writing- Review & Editing, Visualization.

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Declaration of competing interest

None.

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