

Internal Hernias after Laparoscopic Roux-en-Y Gastric Bypass: Incidence, Treatment and Prevention

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Background: Laparoscopic Roux-en-Y gastric bypass (RYGBP) has been shown to be a safe and effective alternative to traditional "open" RYGBP. Although lack of postoperative adhesions is one advantage of minimally invasive surgery, this is also responsible for a higher incidence of internal hernias. These patients often present with intermittent abdominal pain or small bowel obstruction with completely normal contrast radiographs.

Methods: Data was obtained concurrently on 2,000 consecutive patients from February 1998 to October 2001 and analyzed retrospectively. Radiographs, when available, were interpreted by both the operative surgeon and radiologist before intervention.

Results: 66 internal hernias occurred in 63 patients, an incidence of 3.1%. 1 patient presented with a traditional adhesive band and small bowel obstruction. 20% of patients had normal preoperative small bowel series and/or CT scans. The site of internal hernias varied: 44 - mesocolon; 14 - jejunal mesentery; 5 - Petersen's space. Although most patients were symptomatic, 5% were incidental findings at the time of another surgical procedure. 5 patients required open repair. 6 patients presented with perforation either at the time of diagnosis or as a result of manipulation of the bowel. There was 1 death associated with complications of the internal hernia. The negative exploration rate was 2%.

Conclusion: Internal hernias are more common following laparoscopic RYGBP than "open" RYGBP. Contrast radiographs alone are unreliable in ruling out this diagnosis. Early intervention is crucial; most repairs can be performed laparoscopically. This diagnosis should be entertained in all patients with unexplained abdominal pain following laparoscopic RYGBP. Meticulous closure of all potential internal hernia sites is essential to limit this potentially lethal complication.

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Introduction

Minimally invasive alternatives to "open" surgical procedures offer advantages, such as fewer wound complications, superior cosmesis and often better visualization. Likewise, intra-abdominal adhesions are markedly reduced following laparoscopic surgery. Adhesions are, however, required for fixation of the Roux-limb to prevent its displacement and to close mesenteric defects that can allow postoperative herniation of bowel and subsequent closed-loop obstruction or ischemia.

Although internal hernias have been reported after "open" gastric bypass, it is thought to be rare. We observed a much higher incidence of this complication after the laparoscopic procedure, as it was never seen in our "open" patients. Early in our experience, we used absorbable sutures for fixation of the retrocolic Roux-limb and to close the jejunal mesenteric defects. This proved to be inadequate and other methods and suture materials were adopted.

Authors have reported a varying incidence of this complication, usually as postoperative bowel obstructions. There have been no reported series of patients presenting only with intermittent abdominal pain without bowel obstruction secondary to internal hernia. Ironically, the advent of laparoscopic surgery has increased the incidence of this problem, but also has simplified the diagnosis and treatment of this entity.

We present our experience with the complication

of internal hernias and postoperative bowel obstruction after laparoscopic Roux-en-Y gastric bypass (RYGBP).

Methods

From February 1998 to October 2001, 2,000 patients underwent laparoscopic bariatric surgery for morbid obesity. All procedures were performed by one of three surgeons (KDH, KBB, TH). The vast majority were primary laparoscopic RYGBP procedures. Overall conversion to "open" rate was <1%.

All patients met National Institutes of Health standards for bariatric surgery. Patients underwent a detailed informed consent process and were required to attend preoperative classes before surgery.

The original technique has been described previously.³ A divided, proximal gastric pouch is based on the lesser curve as described by MacLean.⁴ The Roux-limb is retro-colic and ante-gastric in configuration. The gastro-jejunostomy is completely hand-sewn.

During the course of this series, the method of fixation and mesenteric closure changed as we became aware of the increased prevalence of internal hernias. Initially, we used absorbable sutures to secure the Roux-limb at the colonic mesentery and to close the jejunal mesenteric defects. Petersen's space (retro-Roux) was not addressed. Later, we used interrupted non-absorbable sutures (silk or Ethibond®), and then continuous running non-absorbable material, also closing Petersen's space as suggested by Sugerman (Sugerman H, personal Communication).

Internal hernias presented with varied symptoms. Some hernias were found "incidentally" during explorations for other pathology such as cholelithiasis or marginal ulceration. Some patients were found only to have a mesenteric defect without overt herniation of bowel. Symptomatic patients presented with overt herniation of bowel with or without obstruction.

Evaluation and management of these patients depended upon their presentation. Patients who presented with severe abdominal pain and obvious

bowel obstruction were offered surgery without further evaluation. In others, the diagnosis was not as obvious.

Patients who presented with intermittent abdominal pain were evaluated with contrast upper GI series with small bowel follow-through, CT scanning or both. Ultrasound and endoscopy were also utilized, depending on the patient's particular symptom complex. All patients with unexplained abdominal pain underwent exploration.

All patients were approached laparoscopically initially, unless severe bowel distension or frank peritonitis was present. Most patients were explored through the original port sites. Several patients, early in the series, required "open" conversion as the anatomy was confusing or a perforation and enteric spillage had occurred.

All patients who underwent secondary operations were explored for the possibility of internal hernias. When potential defects were encountered, they were closed with running, non-absorbable suture, as is our practice today. Bowel herniation was reduced before closure and fixation, when encountered.

Radiographs were reviewed by the radiologist and the operative surgeon before surgery and after, in the case of a "missed" or false negative reading. Data was collected concurrently and analyzed retrospectively.

Results

Laparoscopic RYGBP was attempted on 2,000 consecutive patients. Twenty patients required "open" conversion. Of the 24 patients who had previous bariatric or gastric procedures, two were converted to "open".

Sixty-six internal hernias occurred in 63 patients – an incidence of 3.1%. Three patients had potential defects in more than one area, although acute symptoms were generally attributable to the mesenteric hernia defect.

Thirty-three patients presented with acute obstruction. Twenty-six patients presented with abdominal pain that resolved after surgical intervention. Four patients were found to have internal hernias as an incidental finding (Table 1). Interestingly, 20% of patients had a normal preoperative contrast

Table 1. Symptoms in patients with internal hernia

Presentation	No. of Patients	% of Patients
Abdominal pain	26	41.3
Bowel obstruction	33	52.3
Asymptomatic	4	6.3

small bowel series and/or CT scan (Table 2).

Although most patients were symptomatic, 5% were incidental findings at the time of another surgical procedure, such as laparoscopic cholecystectomy. Often a defect was identified without the presence of internal herniation of bowel. Regardless, the defects were always closed at the time of identification. Five patients required open repair. Six patients presented with perforation either at the time of diagnosis or as a result of manipulation of the dilated bowel.

There was one death associated with complications of the internal hernia. Although the patient presented with abdominal pain without obstruction, laparoscopic repair was complicated by early recurrence 2 days after surgery with frank bowel infarction. This is the only case of recurrence of internal herniation in this series.

Patients presented with internal hernias at one of three areas: the transverse mesocolon, the jejunal mesenteric defect and Petersen's space (Table 3, Figure 1).

One patient developed a small bowel obstruction due to a traditional adhesive band; this was treated laparoscopically. There was one recurrent paraesophageal hernia that presented with free rupture into the pleural space. This occurred over 1 year after the original repair and gastric bypass. This was repaired laparoscopically as well.

Time from initial surgical procedure to presentation of symptoms was variable (Figure 2). There was no correlation between individual surgeon, suture material, or method of fixation identified.

Table 2. Preoperative evaluation

Preoperative Studies	No. of Patients	%
None	18	29
CT and/or contrast	44	71
Abnormal	35/44	80
Normal	9/44	20

Table 3. Site of internal herniation

Site	No. of Patients	% of Patients
Transverse mesocolon	44	67
Jejunal mesentery	14	21
Petersen's space	5	7.5
Multiple sites	3	4.5

Discussion

The RYGBP is the most common bariatric operation performed in the United States. Laparoscopic solutions have attempted to emulate the anatomic construct of the "open" procedures, while dealing with the limitations imposed by the minimally invasive environment. As the phenomenon of internal hernia is a rare occurrence in the "open" procedure, most investigators did not anticipate this to be a problem with laparoscopic procedures.

Wittgrove found this to be a very rare complication in his remarkable series of over 1,000 patients.⁵ His technique utilizes a retro-colic, retro-gastric Roux-limb without fixation or closure of mesenteric

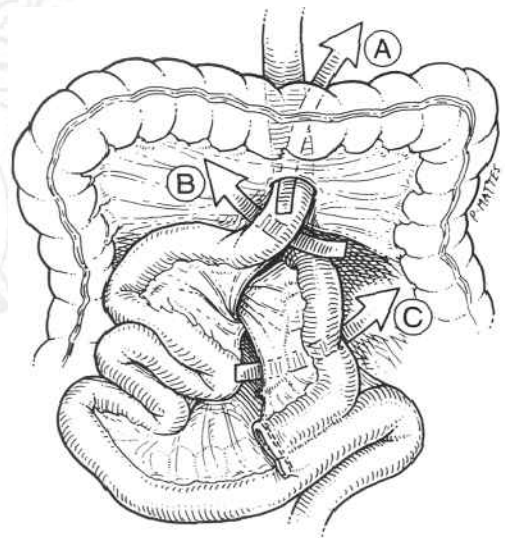


Figure 1. Potential mesenteric opening that could lead to internal hernia after Roux-en-Y gastric bypass. (A) Transverse mesocolon defect. (B) Petersen hernia (space between mesentery of Roux-limb and transverse mesocolon). (C) Jejunojejunostomy mesenteric defect. (From Schweitzer MA, DeMaria EJ, Broderick TH, Sugerman HJ. Laparoscopic closure of mesenteric defects after Roux-en-Y gastric bypass. *J Laparoendosc Adv Surg Tech A* 2000; 10: 173-5, with permission).

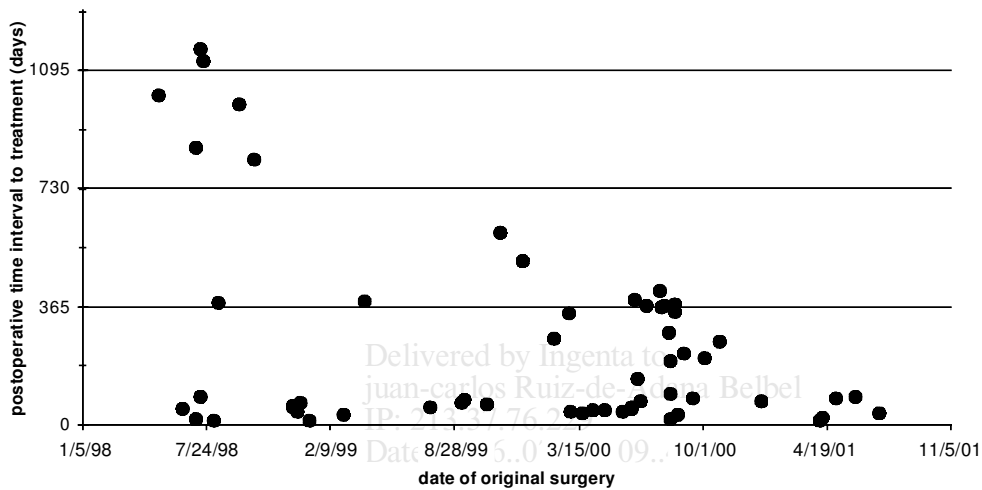


Figure 2. Postoperative time interval to treatment.

defects.^{6,7} One possible explanation is that in formation of the Roux-limb, the jejunal mesentery is not divided and staple-lines are in apposition to the transverse mesocolon so as to limit the potential for defects.

Internal hernias as a complication of laparoscopic RYGBP have been reported previously,⁸⁻¹⁰ and are not limited to the bariatric literature. Reports of intestinal volvulus after “open” choledocho-enteric anastomoses have occurred in transplant patients.¹¹ In these immunosuppressed patients, adhesions appear to be limited similar to that observed with laparoscopic surgery.

The time interval between the initial surgical procedures to the onset of symptoms was highly variable. Plain radiographs can be unremarkable in the presence of a complete obstruction, requiring either a contrast study or laparoscopy for definitive diagnosis. As 20% of patients with symptomatic internal hernias in our series had completely normal contrast studies, one cannot rely on the absence of radiographic findings to rule out this as a possibility. This is in contrast to the series reported by Blachar et al¹² who reviewed patients with known internal hernias and found a lower false-negative rate. Interestingly, many of the original interpretations in that series failed to diagnose the internal hernias prospectively. Only after the diagnosis was known, were specific findings noted.

Our series clearly demonstrates that the phenomenon of internal hernias can only be prevented by meticulous closure of all potential defects. With our

progression from absorbable to non-absorbable suture material and interrupted to continuous running techniques, the incidence of internal hernias has dramatically decreased. However, the variable time to presentation does not allow us to conclude that we have completely eliminated this potential complication. In fact, our 3-year data underestimated the overall prevalence of this problem.

Fortunately, the very reason that makes internal herniation possible, lack of postoperative adhesions, also facilitates laparoscopic evaluation and repair. Often, exploration, reduction and repair can be performed through three or four of the original trocar sites electively as an outpatient.

Only when patients present with an obvious bowel obstruction or severe pain, is surgical intervention an emergency. Frequently, patients present only with intermittent postprandial abdominal pain and nausea. Symptoms may be so episodic, that patients will often not disclose this as a problem to their physician, thinking that this is expected after surgery or due to their perceived non-compliance with dietary recommendations.

Conclusions

Internal hernias have been described after “open” surgery, but are rare. The incidence is much more common after laparoscopic procedures because of lack of intra-abdominal adhesions. Despite

improved fixation techniques, the potential for internal herniation still exists. The actual incidence is difficult to determine, because of the variable time from surgery to presentation.

Unless complete bowel obstruction is encountered, many patients will present with intermittent, non-specific abdominal complaints, reminiscent of cholelithiasis, irritable bowel syndrome or interpreted as patient non-compliance with dietary recommendations. Work-up should include non-invasive studies as indicated, but is not complete unless an exploration is performed. Up to 20% of these studies will be normal, even though symptoms are due to intermittent obstruction or ischemia as a result of the internal hernia.

Current fixation techniques employing continuous non-absorbable suture to close all potential defects including Petersen's space are described, but it is too early to conclude if this will eliminate the problem. However, laparoscopic exploration and repair can be safely performed through previous laparoscopic trocar sites.

Only by having a high degree of suspicion and by prompt surgical intervention, can one avoid the potentially lethal complications of internal hernias such as bowel infarction and/or perforation. Furthermore, patients with intermittent abdominal pain may in fact have an anatomic explanation for their complaints.

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