The different types of internal hernia after laparoscopic Roux-En-Y gastric by-pass for morbid obesity: MDCT features

Poster No.: C-419
Congress: ECR 2009
Type: Educational Exhibit
Topic: Abdominal and Gastrointestinal
Authors: A. Kawkabani-Marchini, A. Paroz, S. Romy, M. Sutter, A. Denys, P. Schnyder, S. Schmidt; Lausanne/CH
Keywords: Morbid obesity, internal hernias, gastric bypass, MDCT features
DOI: 10.1594/ecr2009/C-419

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR's endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.

As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method is strictly prohibited.

You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages.

Please note: Links to movies, ppt slideshows and any other multimedia files are not available in the pdf version of presentations.

www.myESR.org
Learning objectives

1. To provide an overview of the different types of internal hernia (IH) occurring after laparoscopic Roux-en-Y gastric bypass (LRYGBP) performed for morbid obesity.

2. To describe the correspondent MDCT features in relation with the underlying anatomical landmarks in order to differentiate their localisation and to direct the surgeon during following laparoscopic closure of mesenteric defects.

Background

Obesity represents a major health problem worldwide. Bariatric surgery is recognized as the only effective treatment for morbid obesity, given the high failure rate of conservative measures, such as exercise, diet and pharmacology. The various forms of bariatric surgery include vertical banding as well as antecolic and retrocolic Roux-en-Y bypass (RYGBP) (1). RYGBP has been shown to be more effective than the other techniques with a reported weight loss of 60-70% at 10 years follow-up (2,3). Traditionally performed as "open" surgical procedure, the minimally invasive alternative, the laparoscopic Roux-en-Y gastric bypass (LRYGBP), had nowadays gained far wider acceptance because of fewer wound complications, shorter hospital stay and better cosmetic results (4,5). A brief summary of the LRYGBP procedure is listed in Table 1 on page (6,7). Likewise, post-operative intra-abdominal adhesions are less common, while LRYGBP is associated with a relatively high incidence (0.8-5%) of internal hernias (IH) when compared to open RYGBP (3,4,8,9).

It has been postulated that the weight loss seen in these very obese patients, typically occurring some months after bariatric surgery, causes rapid reduction of the intraperitoneal fat which, in turn, leads to subsequent enlargement of the surgically created mesenteric defects and consecutive loosening of the mesenteric sutures (10, 11, 12). This gives ways to the prolapse of small bowel loops into these newly opened windows, the potential IH sites. The time interval between LRYGBP to the onset of symptoms indicative of IH is highly variable, occurring at any time after surgery (4,9).

MDCT is being increasingly used for complications of gastric bypass surgery that might not be readily identified with a conventional upper gastrointestinal series (2). MDCT imaging findings of many types of IH have also been widely described (13). However, the different types of IH following LRYGBP have not yet been radiologically differentiated.
Table 1: Surgical procedure of LRYGBP

1. Introduction of 6 trocarts with a 45° angled optic.
2. Formation of a 10-15 ml gastric pouch that is surgically separated from the rest of the stomach, referred to as the remnant stomach.
3. The jejunum is divided approximately 30 cm distal from the angle of Treitz, mobilized from the mesentery and brought up to create a side-to-side gastrojejunostomy with the gastric pouch. This anastomosed jejunal loop is referred as the Roux limb or efferent limb. The other separate limb is the biliopancreatic limb. Typically, a small afferent or “blind” loop is present as a result of the side-to-side approach (at the gastrojejunostomy).
4. To complete the operation, a jejunoojejunostomy is created approximately 100 cm distal from the gastrojejunostomy (the Roux limb and the biliopancreatic limb are joined), and all the mesenteric defects (Fig 3) are closed, at best by non-absorbable and running suture.

Fig.
Imaging findings OR Procedure details

LRYGBP (Fig 1 on page) can be performed as ante- or retrogastric and retro- or antecolic procedure. At our institution, the retrocolic and retrogastric approach is generally used. The CT features of a normal postoperative gastrointestinal anatomy are shown in.

We reviewed the images and surgical records of all the patients operated on internal hernias after previous LRYGBP at our hospital from 2004-2008. We focussed on these patients that had been investigated by MDCT shortly before surgery because of acute abdominal symptoms (n= 28). MDCT had been performed with a section thickness of 2.5 or 1.25 mm, secondary coronal reconstructions and mostly after oral and intravenous contrast agent administration with a scan delay of 70s. In agreement with other authors (2,3,4,5,8,9,14), our data allowed us to differentiate four different anatomical types of IH potentially occurring after LRYGBP (Fig 3 on page). However, like in some previous published cases (2,3,4), small bowel obstruction was only inconstantly associated with the presence of a surgically proven IH in our 28 patients. Furthermore, false-negative imaging findings have been described in up to 20% of patients with internal hernias after LRYGBP despite presence of acute abdominal symptoms (4).

As demonstrated in, the surgical defects leading to prolapse of small bowel loops can be situated either at the level of the transverse mesocolon, at the Petersen’s space, which represents an opening between the mesocolon and the jejunal mesentery, or at the entero-enterostomy site.

1. Transmesocolic hernia:

The small bowel prolapses through the surgically created window in the transverse mesocolon permitting the passage of the Roux limb (Fig 3). It is the most common type of the four IH after LRYGBP (3). However, it cannot occur after antecolic placement of the Roux limb, thus avoiding the incision of the transverse mesocolon.

In transmesocolic hernia, a saclike cluster of bowel loops is seen next to the excluded stomach, either anteriorly (8) or posteriorly (Fig 5a on page) (2). In general, the Roux limb is dilated (Fig 5b on page), but not the remnant stomach nor the biliopancreatic limb (8).

2. Petersen's hernia: ( and )

The Petersen's space is the opening between the transverse mesocolon and the mesentery of the Roux limb, caudally to the mesocolic defect created for the passage of the Roux limb (2) (Fig 3 on page). Thus, a Petersen's hernia means the presence of small bowel between the Roux limb mesentery and the transverse mesocolon. It is the second most common IH (3,15).

The excluded stomach is dilated (Fig 6a on page and 7a on page), and often the biliopancreatic limb also. When small bowel obstruction is present, MDCT demonstrates a saclike cluster of small bowel loops displaced into the left abdomen, passing behind the Roux limb and in front of the Treitz angle, then abutting against the left diaphragm and the left abdominal wall.
A horizontal course of the superior mesenteric vessels is often seen (Fig 7b on page ).

3. Mesojejunal hernia:

Small bowel loops prolapse through the entero-enterostomy mesenteric defect, a window between the two mesenteries belonging to the Roux limb and biliopancreatic limb that are joined at the distal anastomosis. A sac-like cluster of small bowel loops is therefore seen adjacent to this jejunojejunal anastomosis, the latter may be displaced into the left hypochondriac space, possibly abutting against the left anterior abdominal wall.

Mesenteric vessel engorgement, displacement and mesenteric swirl sign (Fig 8b on page ) are typically detected around the jejunojejunal anastomosis (5,8). The stomach (Fig 8a on page ) and the Roux limb are also often distended.

4. Jejunojejunal hernia (Paroz hernia):

This type of IH after LRYGBP has only recently been described. It is located between the jejunojejunalostomy and the extremity of the biliopancreatic limb without mesentery involvement (Fig 3). Rapid weight loss is therefore very unlikely to be the underlying primary cause, but the technique of surgery (use of absorbable sutures or remaining gap between single stitches) may primarily explain this HI. Even very small surgical defects of this site can lead to the development of internal hernias (14). Small bowel distension very much varies in degree and appearance, either partial or complete. However, it is always located around the jejunojejunal anastomosis which is involved (et). Distension of the stomach, Roux-limb and the biliopancreatic limb may be seen.
Images linked within the text of this section:
Fig.: Fig 1: Schematic drawing of the gastric bypass anatomy with the small gastric pouch (1); the remnant stomach (2); anastomosis of the pouch to the Roux limb (3); the Roux limb (4); the biliopancreatic limb (5); and the jejunoojejunual anastomosis (6).

Fig.: Fig 5: Transmesocolic hernia occurring in a 44-year-old woman, 1 month after the LRYBGP. Axial (a,b,c) and coronal (d,e) CT images demonstrate retrogastric bypass with dilatation of the Roux limb, containing positive oral contrast (a-e, arrow). Note the cluster of dilated bowel loops (a-e, dotted arrow) located posteriorly to the excluded stomach. Look at the "transition point" located at the surgically created mesocolic orifice (c, arrowhead).
Fig.: Fig 5: Transmesocolic hernia occurring in a 44-year-old woman, 1 month after the LRYBGP. Axial (a,b,c) and coronal (d,e) CT images demonstrate retrogastric bypass with dilatation of the Roux limb, containing positive oral contrast (a-e, arrow). Note the cluster of dilated bowel loops (a-e, dotted arrow) located posteriorly to the excluded stomach. Look at the "transition point" located at the surgically created mesocolic orifice (c, arrowhead).
Fig.: Fig 6: Petersen's hernia in a 38-year-old woman occurring 1.5 years after LRYGBP. Axial (a,b) and coronal (c) CT images demonstrate the distension of the excluded stomach (a, dotted arrow) and a cluster of dilated small bowel loops (b and c, arrowhead) located at the left side of the Roux limb (a and c, short arrow).
**Fig.**: Fig 6: Petersen's hernia in a 38-year-old woman occurring 1.5 years after LRYGBP. Axial (a,b) and coronal (c) CT images demonstrate the distension of the excluded stomach (a, dotted arrow) and a cluster of dilated small bowel loops (b and c, arrowhead) located at the left side of the Roux limb (a and c, short arrow).
Fig.: Fig 7: Fifty-four-year-old patient with Petersen's hernia occurring 15 months after LRYGBP. Axial CT images (a, b available in arterial phase only, because clinical indication of this examination was to exclude aortic rupture) show the important distension of the gastric remnant (a, long arrow) and the sac-like cluster of dilated bowel loops (b, arrowhead), mostly located at the left side of the Roux limb (short arrow). Note the horizontal course of the superior mesenteric vessels (b, dotted arrow).
Fig.: Fig 7: Fifty-four-year-old patient with Petersen’s hernia occurring 15 months after LRYGBP. Axial CT images (a, b available in arterial phase only, because clinical indication of this examination was to exclude aortic rupture) show the important distension of the gastric remnant (a, long arrow) and the sac-like cluster of dilated bowel loops (b, arrowhead), mostly located at the left side of the Roux limb (short arrow). Note the horizontal course of the superior mesenteric vessels (b, dotted arrow).
Fig.: Fig 8: Mesojejunal hernia occurring in a 32-year-old-woman 2 years after gastric bypass. Axial CT images (a, b) nicely demonstrate the important dilatation of the excluded stomach (a, arrow) and of the Roux limb. Note the marked mesenteric whirl sign (b-d, dotted arrow) at the jejunojejunal anastomosis indicating mechanical obstruction with volvulus, even better visible on coronal (c) and transverse (d) MIP reconstructions.
**Fig.**: Fig 8: Mesojejunal hernia occurring in a 32-year-old-woman 2 years after gastric bypass. Axial CT images (a, b) nicely demonstrate the important dilatation of the excluded stomach (a, arrow) and of the Roux limb. Note the marked mesenteric whirl sign (b-d, dotted arrow) at the jejunojejunal anastomosis indicating mechanical obstruction with volvulus, even better visible on coronal (c) and transverse (d) MIP reconstructions.
Fig.: Fig 3: Schematic drawing of the localization of the four types of IH possibly occurring after LRYGBP: Transmesocolic hernia (1); Mesojejunal hernia (2); Petersen's hernia (3); Jejunojejunal hernia (Paroz hernia) (4).
Conclusion

Nowadays, we observe a steadily increase of LRYGBP, much more commonly associated with the incidence of internal hernia than the traditional open approach, thus compensating for the lack of postoperative adhesion. Preoperative diagnosis of IH remains difficult since clinical symptoms are little specific, hence MDCT is increasingly performed. Exact knowledge about underlying pathophysiology and anatomical landmarks is essential for distinguishing the four different types of IH occurring after LRYGBP on MDCT, since radiological features are difficult to recognize and may even overlap. The radiologist should be aware of the potential anatomic sites to ensure subsequent straightforward laparoscopic exploration.

Personal Information

Dr Sabine Schmidt
Dr Aïda Kawkabani Marchini

Service de radiodiagnostic et radiologie interventionnelle
Centre Hospitalier Universitaire Vaudois
1011 Lausanne
Switzerland
Sabine.Schmidt@chuv.ch
Aida.Kawkabani@chuv.ch

References


