

## Laparoscopic Gastric Bypass in a Patient with Peritoneal Encapsulation and Malrotation of the Intestine

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### Abstract

The number of bariatric procedures performed each year has increased exponentially worldwide. Thus, the bariatric surgeon will therefore off and on encounter rare conditions such as intestinal malrotation or encapsulation of the intestine. Here we describe a case of intestinal encapsulation, and discuss the challenges encountered in performing laparoscopic gastric bypass in a morbidly obese patient who was found to have the uncommon conditions of both peritoneal encapsulation and malrotation of the small bowel at the time of surgery. The procedure was performed with no complications.

### Introduction

Obesity is increasing at an alarming rate in the developed world, reaching epidemic proportions. In Europe one fifth of the population is obese [1]. Surgery has become the therapy of choice for morbid obesity, and laparoscopic Roux-en-Y gastric bypass (LRYGB) is one of the most commonly performed procedures. Several studies have shown a significant weight loss in patients treated surgically, with a long-term maintenance of the weight loss and improvement in many of the obesity-related medical illnesses [2].

Peritoneal encapsulation is a very rare developmental malformation, characterized by the presence of an accessory peritoneal sheath covering part or the entire small bowel. Clinically, most of the cases are diagnosed as incidental findings during unrelated surgery, and only few presented as bowel obstruction [3-6].

Intestinal malrotation is a surgical disease affecting primarily the pediatric population, with an incidence of approximately 1 in 500-600 live births [7,8]. The incidence of colon malrotation in adults has been estimated to be 0.2-0.5 % in older reports [7,9], although the truly incidence of intestinal malrotation in adults is unknown since the majority are asymptomatic; found incidentally at the time of another operation or radiologic examination, and very few will become clinically evident [10].

We describe a case of combined peritoneal encapsulation and intestinal malrotation in an asymptomatic patient found intraoperative at the time of a schedule laparoscopic Roux-en-Y gastric bypass at our institution.

### Case Report

A 38 years old man with a long-standing history of morbid obesity and body mass index of 35.5 kg/m<sup>2</sup> was schedule for laparoscopic Roux-en-Y gastric bypass and met the International Federation for the Surgery of Obesity, IFSO, consensus criteria for bariatric surgery [11].

Preoperative assessment was performed and the patient underwent surgeon, dietitian, nurse and anesthesiologist consults, and routine blood tests were run. The patient did not have other associated comorbidities or previous medical history, and no other preoperative radiological examinations were performed.

He denied any abdominal complaints of pain, nausea, vomiting or constipation, and had no past surgical history.

The patient underwent schedule LRYGB. The surgery was started routinely in French position, with the surgeon standing between the

patient's legs with the patient in reverse Trendelenburg position. The procedure was performed using four 12 mm trocars and a Nathan's retractor to lift up the liver. Initial access to the peritoneal cavity was gained using a trocar with visualization at the left upper quadrant, and the remainder trocars were placed over the right upper quadrant, midline, subxiphoid and left flank regions under direct laparoscopic visualization. Intra abdominal pressure was maintained at 14 mm Hg. Initially, the laparoscopy confirmed the stomach, liver and gallbladder in normal position. The angle of Hiss was dissected, a retrogastric channel formed and a 20 cc gastric pouch created as standard using linear stapler. The greater omentum was divided. When attempting to identify the Treitz ligament, the proximal small intestine was not found in its usual location at the base of the transverse mesocolon. Instead, a peritoneal membrane was found at the place of the duodenal-jejunal flexure. Despite extensive exploration, the anatomy could not be clearly defined, and an extra 12-mm trocar was placed in the left lower quadrant. The accessory peritoneal membrane lied posterior to the greater omentum, separating it from the small intestine, and it was attach superiorly to the transverse mesocolon and covered the whole small intestine, from the duodenal-jejunal flexure to the distal ileum. The colon and ileo-cecal valve were found at the normal position (Picture 1).

The peritoneal sac was excised with release of the intestinal loops. The duodenal-jejunal flexure was found at the right upper quadrant, corresponding to an incomplete form of malrotation of the small intestine.

The procedure was carried out in a mirror image, creating a 60 cm biliary limb and a 120 cm alimentary limb, with the Roux limb orientated to the lesser curvature.

Antegastric antecolic gastrojejunostomy was created using a linear stapler, and closed in a two layer, hand-sewn fashion. We measured

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Received November 02, 2011; Accepted November 23, 2011; Published December 02, 2011

Citation: Mesas Burgos C, Lundegårdh G, Loogna P (2011) Laparoscopic Gastric Bypass in a Patient with Peritoneal Encapsulation and Malrotation of the Intestine. J Clin Case Reports 1:101. doi:10.4172/2165-7920.1000101

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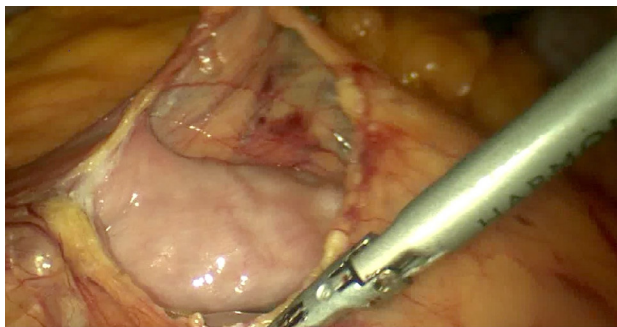
a Roux limb of 120cm, running the bowel in clockwise fashion rather than the usual counterclockwise orientation to account for the anatomic anomaly. The jejunojunctionostomy was created using linear stapler, and hand-sewn closure, with the small bowel anastomosis in the right lower quadrant. Care was taken to avoid twisting the small bowel mesentery. The mesenteric and Petersen's defect were not closed in accordance with our routine (Figure 1).

The integrity of the gastrojejunostomy was tested with methylene blue with no evidence of anastomotic leak. The patient tolerated the procedure well, the postoperative course was uneventful, and the patient was discharged home on the second postoperative day. The patient was doing well at 6 weeks and 6 months follow up.

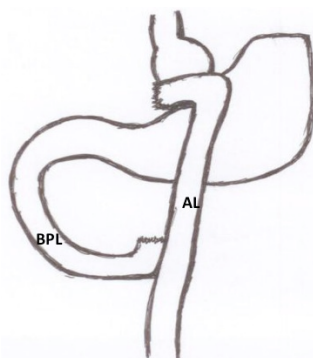
## Discussion

With the increasing number of gastric bypass procedures for treatment of morbid obesity, unexpected challenges might encounter. This case highlights the need for bariatric surgeons to have full understanding of congenital anomalies and their management.

Peritoneal encapsulation is an embryologic developmental abnormality first described by Cleland [12], where an accessory peritoneal sac contains part or the entire small bowel like in our case report. The accessory peritoneal membrane is derived from the peritoneum of the yolk sac, which withdraws into the abdominal cavity with the small bowel instead of remaining at the base of the umbilical



**Figure 1:** Perioperative findings: the accessory peritoneal membrane lies posterior to the greater omentum, separating it from the small intestine, and it is attached superiorly to the transverse mesocolon and covers the whole small intestine, from the duodeno-jejunal flexure to the distal ileum.



**Figure 1:** In the patient with intestinal malrotation, the gastrojejunostomy is created with the Roux limb orientated to the lesser curvature. The configuration of the distal enterostomy is reversed, with the biliopancreatic limb (BPL) lying to the right and the alimentary limb (AL) to the left of the patient.

cord during the 12<sup>th</sup> gestational week (g.w.) [4,13]. The incidence is unknown, since most of the cases are asymptomatic and is usually diagnosed as incidental findings during unrelated surgery and only few cases are presented as bowel obstruction [3,14-16]. There are not more than 50-60 cases described in the English literature [17-21], although the real number is difficult to assess since the condition has previously been confused with abdominal cocoon, a condition characterized by a total or partial encasement of the small bowel by a fibrocollagenous cocoon-like sac that lies adjacent to the serosa of the intestine [22-24].

90% of midgut malrotations are present in the first year of life, remaining an unusual finding in the adult population [8,25,26].

Understanding the embryology and development of the midgut is essential in understanding and treating rotational defects of the intestines. The primitive digestive tube in the early embryo is a straight tube that consists of the foregut supplied by the celiac artery, the midgut supplied by the superior mesenteric artery (SMA), and the hindgut, supplied by the inferior mesenteric artery. The midgut loop starts to elongate and rotate, a process divided in three stages: the first stage starts in the fifth g.w., when the midgut's cranial limb will rise to the distal portion of the duodenum, jejunum and major portion of the ileum. The caudal limb or cecocolic loop will develop into the terminal ileum, the caecum, appendix, ascending colon and the proximal 2/3 of the transverse colon. The midgut herniates into the extraembryonic cavity and rotates 90° counter clockwise bringing the cranial limb to the right of SMA and the cecocolic loop to the left. The second stage starts in the 10<sup>th</sup> g.w. by the return of the midgut into the embryonic abdomen. The cranial loop enters the abdomen to the right of SMA displacing the hindgut to the left. Then the cecocolic loop enters the abdomen with the transverse colon in front of the SMA and the caecum at the level of the right iliac crest. The midgut now completes 270° counter clockwise rotation around the axis of SMA and 90° around the longitudinal axis of the body putting the duodenal loop behind the SMA, transverse colon above SMA and descending colon to the left of SMA [27].

In our case, the colon and caecum were placed in their normal position in the abdomen, no Ladd's bands were found, but the Treitz's ligament was rudimentary and the duodeno-jejunal junction was placed in the right upper quadrant.

Peritoneal encapsulation is not necessarily associated with abnormal intestinal rotation, in fact none previous case report has described it. Both malformations take place in the same time frame of embryologic development, at 12<sup>th</sup> g.w., and it is possible to speculate that the same developmental hit affects both the withdrawn of the yolk sac into the cavity following the midgut, and the later rotation.

There are several case reports describing the presence of intestinal malrotation found at the time of scheduled gastric surgery in the literature [8,10,25,26,28-36], but to our knowledge this is the first report of the presence of peritoneal encapsulation at the time of scheduled gastric procedure, and also the first report of the unusual combination of these rare developmental anomalies.

When performing a Roux-en-Y gastric bypass in patients with intestinal malrotation, it is important to take consideration to the patient's anatomic variation in order to avoid risk for tension or kink at the gastro-jejunal anastomosis if the Roux limb has to be stretched from the patient's right side of the abdomen to the left upper quadrant. Therefore, orientating the alimentary Roux limb to the lesser curvature for the anastomosis is anatomically more intuitive and has less tension and risk for rotation or kink. Also is important to take consideration in

the orientation of the limbs in the creation of the entero-enterostomy: laying the bilio-pancreatic limb towards the patient's right side instead of the left, and the alimentary limb towards the left side instead of the right side like in the standard procedure, is the best orientation to prevent internal hernia, kinking and rotation. Moreover, a clear understanding and visualization of the anatomy are mandatory, and extra trocars should be widely used. Understanding these anatomical principles is important in the performance of safe bariatric surgery in patients with intestinal malrotation.

## Conclusion

Laparoscopic Roux-en-Y gastric bypass can be performed safely in patients with peritoneal encapsulation and/or malrotation of the small bowel, provided the surgeon understands these embryological anomalies and is experienced performing the procedure.

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