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## Internal Hernia following Laparoscopic Roux-en-Y Gastric Bypass, preventive measures

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## **Internal Hernia following Laparoscopic Roux-en-Y Gastric Bypass, preventive measures**

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### **Keywords**

- Internal hernia
- Gastric Bypass
- Morbid obesity

### **Abstract**

#### **Introduction:**

Laparoscopic Roux-en-Y gastric bypass (LRYGB) is one of the commonest operations for weight loss surgery especially in the western countries. Internal hernia (IH) can occur following LRYGB and may lead to dreadful complications as small bowel obstruction and strangulation. **Objective:** To analyse trends of IH after LRYGB and how to prevent it. **Methods:** A narrative review of the literature was through an online search of the MEDLINE (via Pubmed) database, using the following keywords “Obes\*”, “Gastric Bypass” and “Internal Hernia”. **Results :** Different methods were prescribed for management of mesenteric defects after LRYGB. Closure revealed better out come in front of non-closure technique. Closure with sutures was the most popular and had a superior outcome. **Conclusion:** Closure of all IH defects after LRYGB defects revealed lower incidence of internal hernias. Superior long-term results came with closure using sutures. There are other methods for closure but still need more evaluation.

## INTRODUCTION

To date, the only sustainable cure for reducing weight and co-morbidities in the morbidly obese population is bariatric surgery [1].

Worldwide, 833,687 bariatric operations were performed in the duration between (2015-2018). Laparoscopic Roux-en-Y gastric bypass (LRYGB) took the second place after laparoscopic sleeve gastrectomy (LSG) among the most preferred operations, 294,530 operations, accounting for 35.3 per cent of all operations [2].

Internal hernia (IH) can occur following LRYGB when small bowel slides through the mesenteric defects that was created during mobilizing the alimentary Roux limb to the pouch newly created. Possible sites for IH are the defects in the mesentery at the site of jejunojejunostomy (JJ defect) and between the gastrojejunostomy and alimentary Roux limb (Petersen's defect). If the retrocolic route for the Roux limb was chosen, another defect is created in the transverse mesocolon [3].

With a reported prevalence as high as 19 per cent [4], IH is one of the commonest complications of LRYGB. Clinical presentation diverges from mild abdominal cramps which is intermittent in nature to acute small bowel obstruction (SBO) and strangulation. SBO with a prevalence of 0.6–11 per cent [5] and IH are surgical emergencies that requires urgent surgical intervention in the most of cases [6].

Clinical diagnosis of IH is challenging. While bowel obstruction has solid clinical criteria through which clinical diagnosis can be made, IH can just present with an intermittent and vague clinical presentation that renders the clinical diagnosis difficult. The diagnosis is generally made by abdominal CT with a varying degree of

sensitivity and specificity [7,8]. Variable methods have been described to reduce the incidence of IH by closing the mesenteric defects.

### **Objective:**

To conduct a critical analysis of the existing literature on the IH after Roux-en-Y gastric bypass for morbid obesity and whether closing mesenteric defects has an impact on incidence of IH.

### **Methods:**

A narrative review of the literature was conducted via an online search of MEDLINE (via Pubmed) for published studies dating from the launch of the database through December 2020 using the following keywords “Obes\*”, “Gastric Bypass” and “Internal Hernia.” The results were analyzed, giving priority to those reporting the results of surgical techniques reported for management of mesenteric defects post laparoscopic Roux-en-Y Gastric Bypass.

### **Results**

Ahmed et al reported an incidence of 0.8 per cent for IH to occur through jejuno-jejunostomy, 1 per cent through transverse mesocolon if retrocolic method is used and 0.3 per cent through Petersen's defect with an average loss of excess body weight loss per cent (%EBWL) of  $59 \pm 3.3$  during a period of  $13.6 \pm 1.5$  months [3].

The incidence reported in the literature for IH varied widely from 0.2 percent to 19 per cent [4,9].

Regarding closure vs non-closure of the defects, Aghajani et al. compared 1570 patients who had LRYGB without closure of mesenteric defects with 2443 patients who had both defects stapled. They reported that all procedures were done by surgeons who had same level of experience. Follow-up at 5 years was only achieved in 71 per cent of patients. The incidence

of post-operative IH was significantly higher in the non-closure group by 11.7 per cent versus 2.5 per cent in the closure group at 60 months [10].

Amor et al compared 2 groups of patients who had both defects left open and who had both defects closed primarily at the operation in a study on patients who had the operation in the duration between 1998 to 2013. Although surgical technique for the operation was standardised, there was no mention of the surgeons' expertise. With a follow up ranging between 5-10 years after surgery, there were 20 incidences of symptomatic IH which required surgical intervention, 0.96 per cent in total. A significant difference was found between groups as IH developed in 1.66 per cent of patients with both defects left open and in around 0.78 per cent of patients with primary closure of both defects [11].

A recent meta-analysis done by Shahab et al comparing closure versus non-closure of mesenteric defects in laparoscopic Roux-en-Y gastric bypass included six observational studies comprising 10,031 patients and two randomized controlled studies (RCTs) including 2609 patients. Analysis showed lower risk of IH after closure of defects, (odds ratio (OR) 0.28, 95 per cent confidence interval (CI) 0.15, 0.54) for

observational studies and (OR 0.29, 95% CI 0.19,0.45) for RCTs. The overall conclusion is that lower risk of IH was linked with closure of mesenteric defects in LRYGB in comparison with non-closure of mesenteric defects [12].

Another recent meta-analysis including the Swedish multicentre, randomised trial and other eight studies comprising 16,520 patients with a mean follow-up ranging from 34 to 120 months concluded that closure of mesenteric defects was associated with a lower incidence of IH (odds ratio, 0.25 [95% confidence interval 0.20, 0.31];  $p < 0.01$ ) [13]. Table 1 summarizes main studies comparing non-closure vs closure of the defects.

Regarding method of closure, while Amor et al [11] reported IH incidence of 0.78 per cent when defects are closed with continuous purse-string nonabsorbable braided suture (Ethibond Excel), Blockhuys et al [14] reported 2.58 per cent incidence of IH with using continuous non-absorbable suture. Rodriguez et al [15] reported an incidence of 1.16 per cent with interrupted non-absorbable sutures for closure of mesenteric defects.

**Table 1. Summary of main studies included in the review.**

Study	Duration	Follow-up period	Design	Total number			Method of closure	IH rate
				NC	Closure	Total		
Aghajani et al 11	2005-2015	5 years	Retrospective	1570	2443	4013	NC vs closure of both defects using stapler	NC vs closure: 11.7% vs 2.5%
Amor et al 12	1998 - 2013	5-10 years	Retrospective	421	1672	2093	NC vs continuous purse-string nonabsorbable suture.	NC vs closure: 1.66% vs 0.78%
Shahab et al 13	2014-2019	Median / Mean: 4 / 4.5 years	Meta-analysis	4978	7662	12640	NC vs closure with suture/stapler	lower risk of IH after closure of defects, (OR 0.28, 95% CI 0.15, 0.54) for observational studies and (OR 0.29, 95% CI 0.19,0.45) for RCTs
Dimitrios et al 14	2010 - 2019	2.8 – 10 years	Meta-analysis	5987	10533	16520	NC vs closure with sutures / staples.	closure of the mesenteric defects was associated with a lower incidence of IH (OR, 0.25 [95% CI 0.20, 0.31]; $p < 0.01$ )

NC= Non-closure.

Other method for closure of mesenteric defects is by a stapler device. Aghajani et al closed the mesenteric defects with a special stapler, Endohernia® stapler, and reported an incidence of 2.5 per cent for IH to develop. They reported follow-up time of 60 months [10,16].

Silecchia et al used fibrin glue for closure of mesenteric defects. The composition of fibrin glue is thrombin, calcium chloride, fibrinogen, aprotinin, and factor XIII. Although they didn't report IH after LRYGB, the follow-up duration is short, 15 months, only [17].

### **Discussion:**

Since LRYG is one of the commonest surgical bariatric procedures especially in western countries, extra caution should be paid to reduce and if possible, prevent related complications. New mesenteric defects resulting from creating new connections, gastro-jujunosomy and jujeno-jujunosomy, can cause IH of the small bowels.

Sequelae of IH include SBO (1–2 percent) [18] and closed loop obstruction which leads to bowel strangulation along with the dilatation of the gastric remnant which may end with bowel perforation [19].

The wide variation in the incidence of IH can be explained by the fact that there is no consensus on the definition of IH.

Diverse techniques were described for management of mesenteric defects. Non-closure technique without division of small bowel mesentery was described by Minyoung et al with an outstanding reported incidence of 0.2. percent over a follow-up of four years [20]. The non-closure technique is the easiest, fastest and most economic, however, different meta-analyses illustrated that actual closure of mesenteric defects resulted in

better outcome which makes the non-closure technique lose its advantages in front of mesenteric defect closure [12,13,21].

Closure of mesenteric defects with sutures has the lowest incidence of IH, but it comes at a cost. The steep learning curve to close the defect without cutting through the mesentery causing expanding haematoma, extra intraoperative time increasing risks of general anaesthesia and secondary kinking of small bowels leading to bowel obstruction [22] and strangulation [23,24] are all well recognized risks of mesenteric defects closure with sutures. Also, because of weight loss, the formerly sutured defects might open leading to delayed IH presentation after 24 months [3].

Although closure with stapler looks easy, quick and appealing, extra cost will be added to the already pricy operation in addition to better rates of post LRYGB IH that can be achieved with stitch closure when compared to it (2.5 per cent IH at 60 months).

Using fibrin glue for closure of the defect resulted in outstanding outcome of no IH on the short-term, but still needs further assessment to track its long-term effects. Also, the extra cost for the glue should be kept in mind.

### **Conclusion:**

In patients undergoing LRYGB for weight loss, IH is a major complication that can result in small bowel obstruction and strangulation. Closure of all mesenteric defects revealed lower incidence of internal hernias. The most common and popular method is closure with sutures. Other methods of closure still need more follow-up and evaluation.

### **Conflict of interest:**

The authors declare no conflict of interest.

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