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Internal Hernia After Bariatric Surgery: A Comprehensive Review

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Received Date: 29-09-2022; **Accepted Date:** 19-11-2022; **Published Date:** 26-11-2022

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Abstract

Introduction: Internal Hernias (IH) are one of its most common and feared complications after Laparoscopic Roux-en-Y Gastric Bypass (RYGB). Its prevention has become one of the main topics of debate among obesity surgeons. Alimentary limb (antecolic vs. retrocolic) and the closure of mesenteric defects (jejuno-jejunal mesenteric defect, mesocolic and Petersen's

Dalmau M | Volume 3; Issue 3 (2022) | JSRP-3(3)-045 | Review Article

Citation: Vilallonga R, et al. Internal Hernia After Bariatric Surgery: A Comprehensive Review. J Surg Res Prac. 2022;3(3):1-9.

DOI: <https://doi.org/10.46889/JSRP.2022.3302>

defect) seem to play an essential role. The aim of this review is to elucidate and show evidence regarding IH and RYGB.

Materials and Methods: Research was carried out in Pubmed to identify those articles and studies containing data referring to incidence, treatment, pathogenesis and prevention of internal hernia. All randomized controlled trials, clinical trials, review papers, and meta-analysis were included.

Results: Out of the 44 initially found studies, 26 were finally chosen for further review, being 7 of them the only ones that met the inclusion criteria.

Conclusion: The antecolic orientation of the alimentary limb and closure of mesenteric defects shows lower incidence of internal hernias, yet being the available scientific evidence not conclusive enough so as to define a single trend when performing this surgical procedure. More comparative studies are needed to define the real impact of closing mesenteric defects in the prevention of internal hernias.

Keywords

Internal Hernia; Bariatric Surgery; Gastric Bypass; Petersen Space; Intestinal Occlusion

Introduction

Bariatric surgery and Laparoscopic Roux-en-Y Gastric Bypass (LRYGB) is effective for the management of morbid obesity and has gained popularity in the last decade in terms of performed number of cases [1]. Many papers have reported the benefits of the use of minimally invasive approaches for the patient in terms of complications and length of stay compared to open approach, it remains controversial the risk of developing an Internal Hernia (IH) [2,3]. Internal hernias may constitute a major life-threatening complication in the mid-long term follow up after gastric bypass and might result in small bowel obstruction, ischemia, and necrosis [3-5]. The literature available and evidence regarding the occurrence of IH remains unclear and has been related to many factors, including the closure or not of the defect, the absence of adhesions, the weight loss which would affect a loss of mesenteric fat, and use of different surgical techniques [6-10].

The aim of our study is to review the outcomes of closure versus non-closure of mesenteric defects in patients undergoing LRYGB for morbid obesity and understand the potential factors that might contribute to the development of an IH after LRYGB.

Patients and Methods

Research was performed in PubMed/MEDLINE in August 2021 to identify articles reporting Internal Hernia (IH) complication after laparoscopic gastric bypass and evidence regarding its pathogenesis and prevention. All eligible studies were selected according to a list of keywords including “Roux-en-Y gastric bypass”, “gastric bypass”, “internal hernia”, “complications” or “following gastric bypass. All papers included would have been published before 2011 years ago, being meta analysis, clinical trials, randomized controlled trials or systematic reviews. The reference list of the pooled articles was also manually checked to identify relevant papers.

Two authors (RV and RM) searched and reviewed the full text of all clinical studies. The reference lists of selected studies were examined to obtain other relevant articles. The inclusion criteria of the review was the prevention and management of internal hernias. The most relevant, or comprehensive publications were finally included in the analysis to avoid duplicates. However, in order to include the highest evidence available, including meta analysis, some papers reported data from the same study population.

A total of 44 records were identified by the initial search of the PubMed/MEDLINE databases. Of these, 26 papers were excluded after screening by title and abstract. Relevant papers, including short Randomized controlled trials, clinical trials, review papers, and meta-analysis were kept for the further review process. Two other independent reviewers assessed the studies (SVM and CCT). These reviewers (SVM and CCT) independently reviewed the full-text versions of all studies classified as relevant or possibly relevant. Any disagreements were resolved by repeat extraction and check by RV.

Data Extraction

The two aforementioned investigators extracted data from each included study, which was then included in a summary table (Table 1). The extracted information included details related to the incidence of internal hernias, patients' demographic characteristics (e.g., age, gender), type of gastric bypass, type of defect closed (Petersen's space and/or jejunum-jejunal defect, intraoperative complications, long-term complications. As we included different metanalisi, the reviewers extracted the result of possible similar questions regarding internal hernia management in order to discuss the similarity of the results or the differences among different reviews.

Results

A total of 44 studies were identified using our search criteria for screening in PubMed/MEDLINE. Following the methodology and after an assessment of the title, according

to our inclusion criteria, 26 articles were removed as they were not relevant and specific for the topic. Finally, 26 studies remained for content review. Of the 26 studies, we identified 7 relevant papers meeting the inclusion criteria and are summarized in Table 1.

Study	Journal /Year	Type of Study	Number of Pts	Follow-up Time	Orientation of AL / Type of Closure	Incidence of IH	Another Complications Reported
Geubbels N [11]	Br J Surg. 2015	Metanalysis	31.320	0 - 11yrs	AC : CG (all defects) vs. CG (only the JJ defect) vs. Non.CG RC : CG (all defects) vs. CG (only the MC defect)	AC CG : 1% AC CG (only the JJ) : 3% AC Non.CG 2% RC CG : 3% RC CG (only the MC defect) : 2%	Complications derived from closure of MC defect: tearing of the mesentery and bleeding, tension to the JJ defect, reopening of both defects (when suturing with Non-AS)
Rondelli F [15]	Obes Surg. 2016	Metanalysis	13.600	0.6-3.6yrs	AC vs RC	RS. S: 2.8% (RC) vs. 1.2% (AC) (p=0.12 ; not SS) PS.S : 6.8% (RC) vs 0.8% (AC)	AC orientation decreases the IH. The route of the AL does not condition the incidence of gastro-jejunosomy (GJ) leak-age, GJ and JJ obstruction, adhesion, incisional hernia, total

							complications or recurrent IH?
Kristensen SD [16]	Br J Surg. 2021	RCT	401	2-5 yrs	AC : CG vs. Non.CG	At 2 yrs: 8.0% (Non.CG) vs. 4.5% (CG) (p=0.231; not SS) At 5 yrs: 15.5% (Non.CG) vs. 6.5% (CG) (p=0.005; SS)	Operative time increased 4 minutes for CG with non A-MC
Magouliotis DE [17]	Obes Surg. 2020	Review article	16.520	34- 120 mo = 3-10yrs	AC : CG vs. Non.CG RC : CG vs. Non.CG	IH was significantly greater in the Non.CG: OR 0.25 [95% CI: 0.20, 0,31] (p=0.001; SS)	The CG reported lower incidence of SBO and reoperations. The Non-CG reported a higher incidence of late SBO, mainly attributed to IH. Both approaches presented similar complication rates (bleeding, leakage and marginal ulcer) and % EWL

Stenberg, E [18]	Obes Surg 2019	Descriptive	34707	5 yrs	AC : CG vs. Non.CG	The CG reported lower incidence of internal hernia and SBO	Using either Non.A MC or Non.AS. Reduce the risk of SBO. Non.AS appears to be slightly more effective
Hajibanedh S [19]	Surg Endosc. 2020	Metanalysis	12.640	4-4.5 yrs	CG vs. Non.CG	OS : 2% (CG) vs 10% (Non.CG) (OR 0.28, 95% CI 0.15, 0.54) RCT: 2% (CG) vs 7% (Non.CG) (OR 0.29, 95% CI 0.19, 0.45)	The available evidence is not conclusive regarding the risks of SBO not related to IH and early SBO in the CG
Al Harakeh [20]	Surg Obes Relat Dis 2016	Metanalysis	7043	0 - 68 mo 0-5.7yrs	AC AG vs. RC RG	1.3% (AC AG) vs 2.3% (RC RG) (p=0.001; SS)	SBO: 1.4% (AC AG) vs. 5.2% (RC RG) (p=0.001; SS)

Table 1: RYGB - Roux en Y gastric bypass; AL - Alimentary Limb; RCT - Randomized Control Trial; OS: Observational Studies; RS. S - Retrospective Studies; SS - Statistically Significant; PS.S - Prospective Studies; IH - Internal Hernia; AC AG- Antecolic antegastric; RC RG - Retrocolic retrogastric; JJ defect- jejunojejunostomy defect; MC defect: Mesocolonic defect; CG - Closure group; Non.CG - Non closure group; SBO - Small bowel obstruction; EWL - Excess weight loss; Pts - Patients; Yrs - Years; Mo - Months. Non-A MC: Non absorbable metal clips; Non-AS : Non absorbable sutures.

Discussion

The LRYGB results in creation of mesenteric defects when performing a gastrojejunal anastomosis and a Roux-en-Y reconstruction. Through these two mesenteric defects small bowel loops can herniate. These defects include the jejuno-jejunal mesenteric defect and the Petersen's defect (the potential defect between the alimentary Roux limb and the transverse mesocolon) (REF). There are few strategies during the LRYGB to prevent it. The closure of the aforementioned mesenteric defects during LRYGB is the unique proposed as a strategy to reduce the risk of internal hernias. Although evidence from non-comparative studies suggests that closure of the mesenteric defects is associated with a lower risk of internal hernias after LRYGB, the comparative evidence regarding the outcomes of closure versus non-closure of mesenteric defects in LRYGB is poorly understood [11].

Furthermore, it has been said that closure of these defects depends on several factors, like the surgical skill and the technique used. Besides, closure of these defects is not guarantee for sustained closure. It has also been said that closure itself can lead to the formation of internal hernia [12].

It is very important to give a proper definition of internal hernia. The most accepted one according to literature is "Presence of herniated bowel through one or both of the mesenteric defects". The more frequent site of internal herniation was Petersen's defect. Therefore, this herniation site along the jejuno-jejunal mesenteric defect together contribute a great proportion of IH. Which is why both of them must be closed during antecolic LRYGB. Small bowel obstruction was addressed when closing these mesenteric defects but data supporting this finding is low and more research is required for solid conclusions.

Even though, the standard for diagnosing an IH is relaparoscopy. CT has been used but with a low percentage of specificity. That changes when 'whirlpool sign' is present, defined as the swirled appearance of the mesenteric vessels, the specificity increases to 100 per cent.

One of the factors that could contribute to the formation of IH is the rapid weight loss. The fast reduction of the internal fat overcomes the capability of proper healing of the closed mesenteric defects. But more data is needed to support this finding [13]. Even more, the anticlockwise rotation of the Roux limb, left or right Roux limb configuration and the division of the jejunal mesentery are factors that can predispose the development of IH, more studies addressing its relationship with IH are needed.

On the other hand, pregnancy after a LRYGB may increase the risk of an internal hernia, due to the increase in intra-abdominal pressure, which together with the physiological changes of pregnancy and fetal development, can mask the diagnosis and delay treatment. In a systematic study that included 59 patients with an internal hernia during pregnancy, the average gestational age was 28.69 +/- 5,005 weeks. Only 5 of the 59 patients had closure of the mesenteric defects, however only 5 of the studies had reported this preventive measure. The

most common presenting symptoms were nausea, vomiting and epigastric pain. Escalona, et al., reported that most internal hernias occur in retrocolic LRYGB than in antecolic LRYGB [14].

It is important to rule out this complication in pregnant women with a history of having undergone LRYGB surgery, since intestinal ischemia and necrosis can occur within the first 16 hours. The participation of the bariatric surgeon in the timely and adequate diagnosis of internal hernia is vitally important, as well as the imaging tests to be requested since these will or will not involve radiation of the fetus with possible sequelae according to gestational age of the patient.

Improved fertility following a Roux-en-Y Gastric Bypass (RYGB) can lead to pregnancy and increase the risk of internal herniation as some authors previously reported [14]. However, regardless of orientation of the Roux limb and despite previous closure of mesenteric defects, internal herniation can still occur. In this specific situation, a triad of epigastric pain, pregnancy, and a history of RYGB should be a red flag for clinicians to consider internal hernias as a top differential diagnosis [15-21].

Conclusion

Closure of the mesenteric defects using non-absorbable running sutures is known to reduce the risk of internal hernia and small bowel obstruction after laparoscopic gastric bypass surgery. Some specific situations like pregnancy might play an external role in hernia formation, however, when GBP is performed closing the mesenteric defects, risk is decreased.

Conflict of Interest

Authors declares no conflicts of interest.

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Dalmau M | Volume 3; Issue 3 (2022) | JSRP-3(3)-045 | Review Article

Citation: Vilallonga R, et al. Internal Hernia After Bariatric Surgery: A Comprehensive Review. *J Surg Res Prac.* 2022;3(3):1-9.

DOI: <https://doi.org/10.46889/JSRP.2022.3302>

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