



Concomitant ventral hernia repair and bariatric surgery: a retrospective analysis from a UK-based bariatric center

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Abstract

Background Ventral hernias (VH) are frequently encountered in patients with morbid obesity. Concomitant ventral hernia repair (VHR) and bariatric surgery (BS) is practiced but still controversial. Wound-related complications (seroma, hematoma, wound infection) and hernia recurrence rates are possible inhibitor factors. We aimed to estimate the rate of complications from concomitant BS (laparoscopic Roux-en-Y gastric bypass and sleeve gastrectomy) and VHR and identify patient subgroups at higher risk of complications from synchronous repair.

Methods A retrospective analysis of successive 106 patients who underwent concomitant BS + VHR at our institute (09/2007 to 09/2015) was performed using data from patients' record. Parameters considered were: type of repair (open/laparoscopic and primary closure/mesh), size and type of hernia (<5 cm, 5–10 cm, > 10 cm and primary/incisional), patient gender and comorbidities.

Results One hundred and six patients underwent concomitant BS and VHR. Fifty-nine had laparoscopic VHR and 47 open. Hernias recurred in 5 (8.47%) laparoscopic and 7 (14.89%) open VHR. Wound-related complications were common in open (15%) vs. laparoscopic (11.7%) VHR. Patients with VH recurrence included 8 (75%) with defects > 5 cm, 10 (83%) female, and all had BMI > 45. Six patients had wound infection, 5 of which had type 2 diabetes mellitus. Six patients had hematoma, 5 of which underwent mesh repairs. Finally, four patients developed seroma (BMI > 48, defects > 5 cm, laparoscopic mesh repair).

Conclusion Synchronous VHR and BS in a bariatric unit is feasible with low recurrence rate. Laparoscopic VHR has lower complication rates than open, apart from seroma formation. Patients with diabetes have higher risk of infection.

Bariatric surgery (BS) has gained a crucial role in the management of morbid obesity. The number of bariatric operations is constantly increasing globally [1]. In the UK, the

criteria for patients considered for National Health Service (NHS) funded surgical intervention include body mass index (BMI) ≥ 40 kg/m² or BMI 35–39.9 kg/m² with obesity-associated comorbidities [2–4].

Obesity itself can be a contributing factor toward primary and recurrent ventral hernias (VH) [5–8]. It is not uncommon to find a VH prior to or during BS. In fact, recent studies have identified that up to 8% of the patients have a VH prior to Roux-en-Y Gastric Bypass [9, 10].

Concomitant ventral hernia repair (VHR) during Roux-en-Y gastric bypass (RYGB) or sleeve gastrectomy (SG) has been described but remains a matter of controversy and discussion [11]. Many factors come into consideration which determine short- and long-term post-bariatric hernia-related complications. The most common complications include seroma formation, mesh or wound infection, hematoma and hernia recurrence.

Thus far, there has been limited research on the extensive parameters and complications of BS and concomitant VHR.

Marco Barreca: deceased in 2016.

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There have been some series describing this approach, but the number of cases remains small [9, 11–15].

We aim to assess the rate of hernia recurrence and wound-related complications from a retrospective analysis of patients undergoing BS and concomitant VHR. In addition, we tried to compare the complication rates of concomitant VHR between open and laparoscopic approaches as well as primary and incisional hernias. Finally, our goal is to prove the feasibility of this approach as well as encourage synchronous repair in order to minimize the risk of small bowel obstruction (SBO).

Patients and methods

This is a retrospective study on prospectively collected data looking at patients who underwent concomitant BS + VHR in a large bariatric unit. The study period was between September 2007 and September 2015. An anonymized database was populated with data collected from patients' operative and anesthetic notes, discharge letters, as well as outpatient follow-up appointments. Further information about follow-up was obtained from direct patient contact.

The parameters considered for our retrospective analysis were primary vs. mesh repair, as well as the size and type of hernia itself measured peri-operatively. The defects' sizes were classified into three categories (small, medium and large) and VH type to two (primary and incisional). We also compared outcomes from open and laparoscopic hernia repair. Finally, we investigated whether the postoperative course and benefits of bariatric surgery (weight loss and resolution of comorbidities) were hindered by the additional concomitant procedure. We also considered whether

any complications from the hernia repair changed the course of BS and recovery.

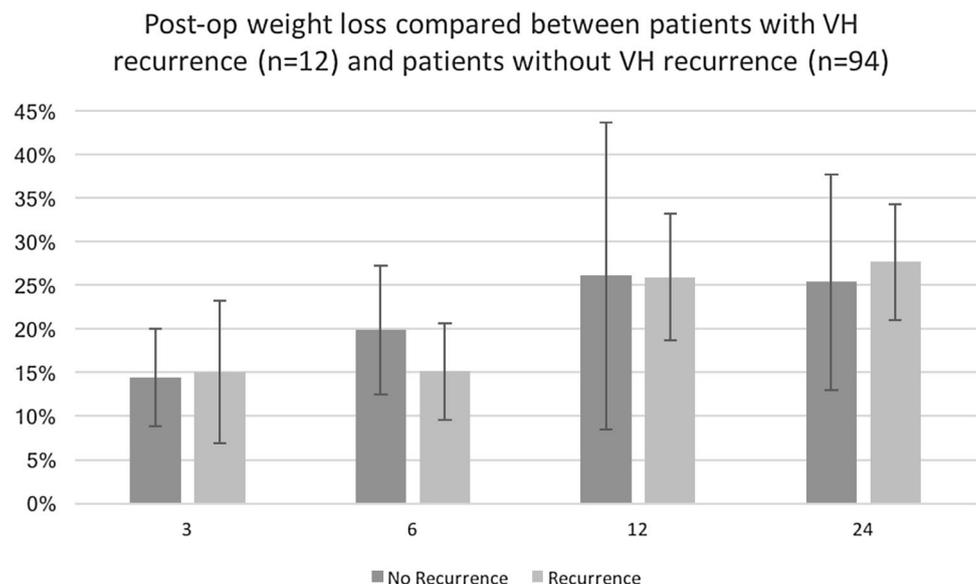
Results

Data of 2223 bariatric patients were examined. One hundred and six patients (4.8%) underwent concomitant BS and VHR from September 2007 to September 2015. Of those, 63 were female and 43 were male with F/M ratio 1.5:1. The mean age was 49 ± 7.4 (33–67), and the mean BMI was 53 ± 9.0 kg/m² (37–76). Mean length of hospital stay (LOS) was 4.1 ± 1.5 days. Post-op weight loss (%) in the group of patients without hernia recurrence at 3, 6, 12 and 24 months was 14.4 ± 5.6 , 19.9 ± 7.4 , 26.1 ± 17.6 and 25.4 ± 12.4 , respectively. In the group of 12 patients who had recurrence of hernia, the postoperative weight loss (%) at 3, 6, 12 and 24 months was 15.1 ± 8.2 , 15.1 ± 5.5 , 25.9 ± 7.2 and 27.7 ± 6.6 (Fig. 1).

As shown in Fig. 2, 97 patients (92%) underwent a laparoscopic Roux-en-Y gastric bypass (RYGB), 1 patient an open RYGB and 8 patients (7.5%) had a Laparoscopic sleeve gastrectomy (LSG). Furthermore, 43 (40.6%) from the BS group underwent concomitant laparoscopic primary hernia repair, 16 (15.1%) laparoscopic incisional hernia repair, 37 (34.9%) open primary and 10 (9.4%) open incisional hernia repair.

The size of ventral hernias was categorized by the largest measurement of the defect in cm. Therefore, there were 46 small VH (< 5 cm), 24 medium (5–10 cm) and 21 large (> 10 cm). For 15 of the patients, there was no information on the size of the VH defect, provided from the operation notes or any of the pre-assessment or follow-up appointments.

Fig. 1 Postoperative weight loss when compared between patients with VH recurrence and patients without VH recurrence in 3-, 6-, 12- and 24-month follow-up



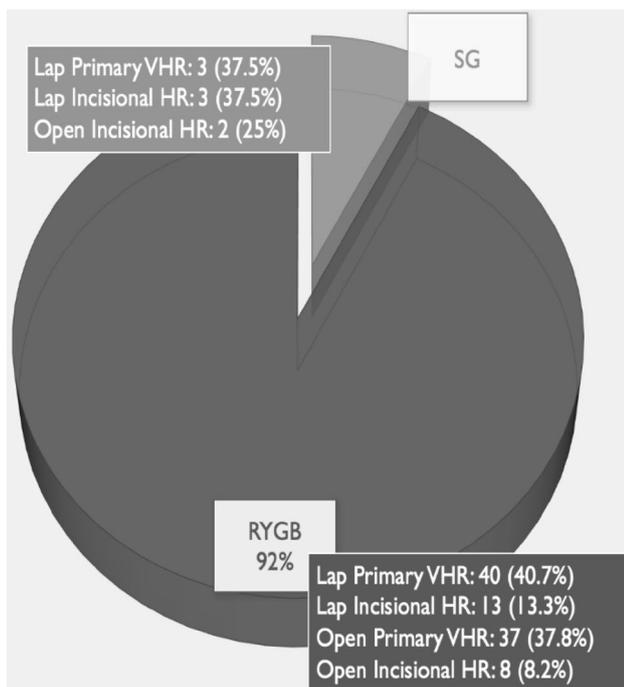


Fig. 2 Concomitant VHR and BS. Number of patients who underwent laparoscopic vs. open, primary vs. incisional VHR during Roux-Y gastric bypass and sleeve gastrectomy

Out of the 106 patients, 28 (26.4%) experienced wound-related complications or hernia recurrence. All wound-related complications manifested in the short term (< 1 year postoperatively), with 16 (15.1%) patients presenting with either a hematoma, seroma or infection. In the long-term (> 1 year), 12 (11.3%) patients had a hernia recurrence. These are analyzed more extensively in Fig. 3 and Table 1.

More specifically, from the 59 patients undergoing BS and concomitant laparoscopic VHR (both primary and incisional), 5 (8.5%) experienced a hernia recurrence, 1 (1.7%) infection, 4 (6.8%) seroma and 2 (3.4%) a hematoma formation. In the subgroup of patients who underwent an open VHR during BS, 7 (14.9%) had a VH recurrence, 5 (10.6%) infection, 4 (8.5%) a hematoma formation and no patients had a seroma formation.

A total of 12 patients had VH recurrence, 5 of which were repaired laparoscopically and 7 had open repair. The size of the hernia defect was available for 10 out of the 12 patients, and 8 of them had defects measuring > 5 cm. The majority, 10 out of 12, were female, and all of them had BMI > 45. Out of those, 5 were primary closures without mesh and 7 were repaired using a mesh (synthetic with/without absorbable barrier, composite or non-absorbable).

Only 4 patients had a seroma formation after laparoscopic repair of their ventral hernia. These had a BMI > 48 with medium (> 5 cm) defects repaired with mesh. Hematoma formation occurred in a total of 6 (5.7%) patients, 5 of which

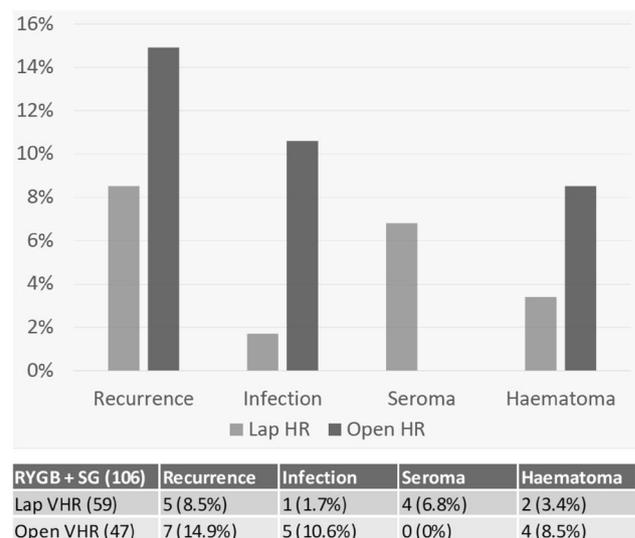


Fig. 3 Wound-related complications and hernia recurrence in laparoscopic vs. open hernia repair during bariatric surgery

underwent a mesh repair for the VH. In 4 of these patients, the hematoma self-resolved with conservative management.

Out of 106 patients, 57 had type 2 diabetes mellitus (DM). Infection occurred in 6 patients, 5 of which were known to have DM. All wound infections resolved with conservative treatment. Of the patients who had a seroma formation, 3 out of 4 had DM. The other two types of complications were evenly split among patients with or without diabetes. Hernia recurrence occurred in 6 patients with DM and 6 patients without DM and hematoma formation occurred evenly in patients with or without diabetes.

Overall, 26 of the VH were incisional and 80 were primary (umbilical and peri-umbilical). Open incisional hernia repair had a much higher rate of infection and hematoma formation compared to both laparoscopic primary and incisional HR as well as open primary repair. Seromas were only observed in the laparoscopic approach, mainly due to

Table 1 Wound-related complications and hernia recurrence in laparoscopic vs. open as well as primary vs. incisional hernia repair during bariatric surgery

RYGB and SG (106)	Recurrence	Infection	Seroma	Hematoma
Lap VHR primary (43)	5 (11.6%)	1 (2.33%)	3 (6.98%)	2 (4.65%)
Lap incisional HR (16)	0 (0%)	0 (0%)	1 (6.25%)	0 (0%)
Open VHR primary (37)	4 (10.8%)	3 (8.1%)	0 (0%)	3 (8.1%)
Open incisional HR (10)	3 (30%)	2 (20%)	0 (0%)	1 (10%)

leaving the hernia sac intact. The rate of recurrence, on the contrary, was similar in both incisional hernia (3 out of 26, 11.5%) and primary hernia repairs (9 out of 80, 11.2%), displaying no difference in etiology between these two conditions despite the different pathology; however, the sample size limits the statistical significance.

Out of the 106 patients, 6 experienced complications related to the bariatric surgical procedure itself (three omental bleedings, two anastomotic leaks and a gastrojejunostomy stenosis). One patient experienced adhesions between small bowel loops and the mesh used for VHR that required re-operation and adhesiolysis. We followed up the patients for a minimum of 2 years postoperatively and monitored the pattern of excess weight loss and resolution of comorbidities. There was no difference in bariatric outcomes (such as excess weight loss post-Bariatric surgery over the next 2 years and resolution of obesity related comorbidities) between patients who underwent BS alone and BS with VHR at our institute. Adding VHR to the bariatric surgery did not increase the percentage of bariatric surgery complications such as bleeding, leak or stenosis. There was no chest infection or pulmonary embolism (PE)/deep vein thrombosis (DVT) documented despite the slightly prolonged operating time. Length of hospital stay (LOS) was not prolonged by adding VHR to BS, though the enhanced recovery after surgery (ERAS) protocol was not yet in use in our unit.

Discussion

Patients who undergo a bariatric procedure compose a challenging group of individuals, posing a greater challenge intra- and postoperatively and therefore having higher mortality and morbidity rates [6]. On that account, it has been argued that concomitant BS and VHR might lead to more complications compared to performing BS alone [16]. At the same time, VH has a higher incidence in the bariatric population due to higher intra-abdominal pressures than the average individual, in combination with weaker abdominal wall muscles [17]. It is therefore important to identify and address those challenges in order to improve outcomes.

The importance of performing two procedures concomitantly lies in the notion that the alternative (deferred VH repair after bariatric surgery), although it might decrease the chances of recurrence and make the VHR technically easier, is associated with higher rate of non-repaired hernia complications [13]. More specifically, after a LRYGB, the incidence of incarceration and small bowel obstruction (SBO) increases; a prominent theme despite the contradictions of some studies that have been performed thus far [11].

A few large studies have analyzed the complications that can arise from concomitant BS + VHR. Firstly, Spaniolas et al. one of the biggest series (n = 503), suggested that

synchronous VHR is only associated with elevated surgical site infection rate but not overall morbidity. Subsequently, Sharma et al. published series (n = 159) which compared techniques (open vs. laparoscopic hernia repair, mesh vs. primary suture). Their early complication rate was minimal, suggesting that synchronous repair is a feasible option but a 12-month follow-up revealed a moderately high rate of hernia recurrence (25%) requiring re-operation [18]. Other studies have reported variable recurrence rates after concomitant VHR and BS in the overall obese population. Ching et al. [19] reported 12% recurrence rate (n = 168), Krecioch et al. [20] with 7.8% (n = 144) and Raziel et al. [21] 1.8% (n = 54). Smaller cohort studies [9, 22, 23] agreed that VHR is feasible at the same time of BS as well as concluded that concomitant surgery is safe and does not interfere with the outcomes of the bariatric procedure.

We have shown that overall there was a hernia recurrence in 11.3% of the patients, all of which had an initial BMI greater than 45 (100%) and VH larger than 5 cm (80%). In addition, 83.3% of VH recurrences occurred in female patients. Primary hernia repairs had approximately the same recurrence rate as incisional hernia repairs in our series, following the same postoperative pathway despite the different pathology; however, the sample size limits the statistical significance [24]. Nonetheless, our recurrence rate of VHR tends to be similar to the one in the general non-bariatric population (12.7%) [25, 26].

Wound-related complications included seroma and hematoma formation as well as mesh infection. A total of 4 patients developed an uncomplicated seroma, all female who underwent laparoscopic hernia repair for defects measuring > 5 cm and had a BMI > 48. Formation of hematomas correlated positively with mesh repairs (4 out of 6 patients, or 66.7%). Patients with diabetes were, as expected, more prone to infection (5 out of 6). Hernia size and gender had no effect on infection postoperatively. The number of cases identified as having these complications in our study was too small to allow a meaningful statistical analysis. The frequency at which these complications occur appears to depend on the technical aspect of the hernia repair (with or without mesh), the type of ventral hernia itself (primary or incisional), the size of the defect (small < 5 cm, medium 5–10 cm, large > 10 cm), as well as the patient's BMI and gender.

Therefore, what can be deducted from our series is that a female with BMI > 45 and a ventral hernia defect measuring > 5 cm would have a higher chance of recurrence and wound-related complications. Such patients might benefit from deferred VHR, depending on its contents and ensuring they are low risk of hernia-related complications. This could be achieved with VH surveillance post-BS.

Our study investigated hernia recurrence as well as wound-related complications (infection, seroma and

hematoma) and compared the outcomes from laparoscopic vs. open surgery. It also had additional follow-up by direct contact with the patients after they had been discharged from outpatient review. Long-term complications, more specifically hernia recurrence, tend to be difficult to quantify due to loss of follow-up. National Institute for Clinical Excellence (NICE) Clinical Guideline (CG) 189 Obesity pointed out the importance of a minimum of 2-year follow-up in the bariatric surgical service in the NHS [27]. To assess bariatric surgery's efficacy fully, at least 80% of initial cohorts should display long-term outcomes with a follow-up exceeding 2 years [28].

Nonetheless, our study carries certain limitations. The sample size is moderately adequate, and since this is a retrospective analysis, some data are missing or not retrieved at all. For example, we could not retrieve operative time from our notes, the hernia size was not documented in all our patients, as well as follow-up to 2 years was not always available or accurate. Finally, the multiple surgical approaches and various techniques in hernia repair have limited statistical significance or p value analysis.

Conclusion

Ventral hernias are not uncommon in the bariatric population. The severity of possible complications of an unrepaired ventral hernia post-BS (especially post-LRYGB) has increased the conviction for concomitant procedures. The low VHR-related complications rate of recurrence, hematoma, infection and seroma, as well as the advantage of avoiding an additional operation, all favor synchronous repair. Therefore, concomitant BS and VHR in a bariatric unit seems a feasible approach.

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Compliance with ethical standards

Disclosures Sylvia Krivan, Andrea Giorga, Marco Barreca, Omer Al-taan and Vigyan Jain have no conflicts of interest or financial ties to disclose.

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