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BRIEF COMMUNICATION

Simultaneous Large Paraesophageal Hernia Repair and Laparoscopic Roux-en-Y Gastric Bypass: a Single Institution's Experience

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Abstract

This study reviews a single institution's experience with simultaneous (redo) laparoscopic Roux-en-Y gastric bypass (LRYGB) and primary large paraesophageal hernia (PEH) repair. A retrospective review was done of all 13 patients who underwent simultaneous LRYGB and large PEH repair between February 2014 and December 2017 at our institution. All patients had a large type III or IV PEH. All patients underwent primary crural repair, without the use of a reinforcing mesh. No patients underwent additional surgery for obstruction of the gastric pouch or for symptomatic recurrence of PEH. No mortality was reported. Our study highlights that simultaneous primary large PEH repair and primary or redo LRYGB is safe and feasible.

Keywords Laparoscopic Roux-en-Y gastric bypass · LRYGB · Bariatric surgery · Large paraesophageal hernia · Large PEH · Type III or IV paraesophageal hernia · Primary crural repair · Primary crus closure · Simultaneous LRYGB and PEH repair · Gastro-esophageal reflux disease · GERD · Large hiatal hernia

Introduction

The obesity pandemic has led to a rising occurrence of obesity-related comorbidities [1]. Obesity is significantly associated with a higher risk of gastro-esophageal reflux disease (GERD) and hiatal hernia (HH). Bariatric surgery is the most effective treatment for inducing substantial weight loss and resolution of associated comorbidities such as GERD in morbidly obese patients [2]. In these patients, hiatal hernia prevalence may be as high as 40% [3].

Consequently, bariatric surgeons are sometimes confronted with morbidly obese patients with hiatal hernias, both during preoperative work-up and during bariatric surgery. Recent retrospective research highlights the safety and feasibility of concurrent bariatric surgery and HH repair [4–6]. However, the hiatal hernias considered in previous research were predominantly sliding hiatal hernias [3, 5, 6]. The safety and feasibility of bariatric surgery combined with large (type III or IV) paraesophageal hernia (PEH) repair remain relatively understudied. Figure 1 shows the various types of PEH.

Performing laparoscopic PEH repair simultaneously with bariatric surgery generally results in a technically more challenging surgical procedure [4–6]. Laparoscopic Roux-en-Y gastric bypass (LRYGB) and laparoscopic sleeve gastrectomy (LSG) have both been proposed as a single-stage procedure together with type III or IV PEH repair, and promising results in several small series (1 to 23 patients) have been reported [7–11].

In the existing literature, the added value of mesh reinforcements when performing large PEH repair is still debated, with some bariatric surgeons arguing that LRYGB itself is a sufficient procedure in treating GERD symptoms potentially resulting from PEH [4]. Although long-term data from randomized studies are lacking, the use of mesh reinforcements carries the risk of serious complications, such as esophageal stenosis and esophageal erosion [12]. To date, there is no consensus on the optimal surgical treatment for morbidly obese patients with PEH.

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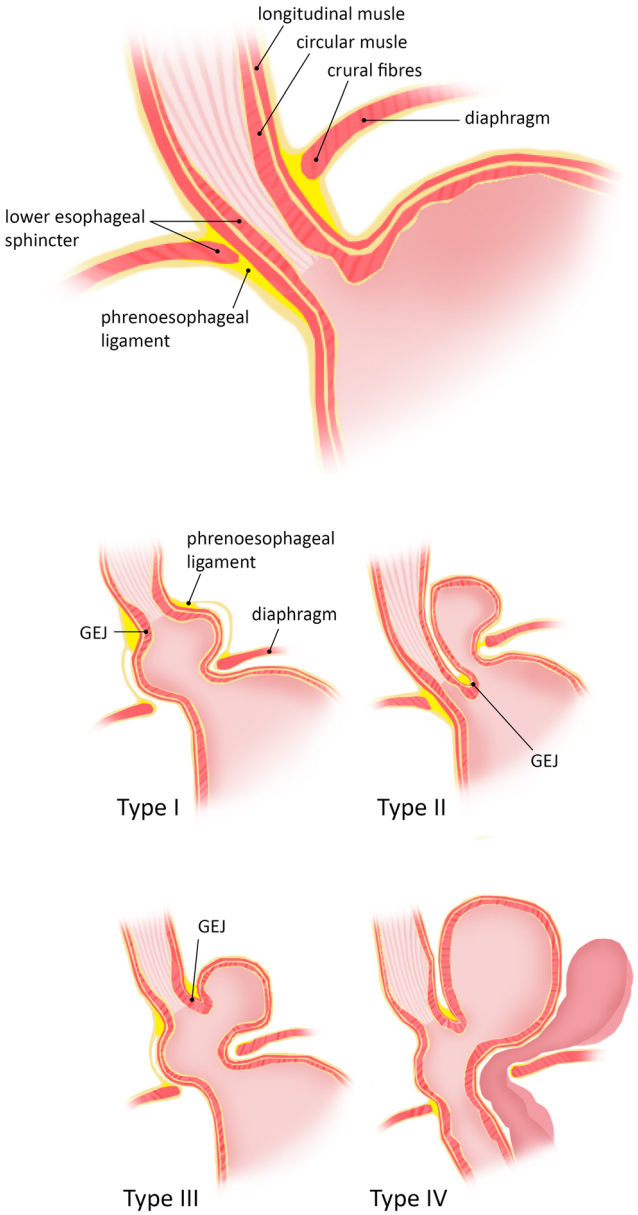

Fig. 1 PEH classification. From left to right and from top to bottom: the normal anatomy, a type I PEH, a type II PEH, a type III PEH, and a type IV PEH

Adding to the growing body of literature, this case series reviews a single institution's experience with simultaneous LRYGB and primary large PEH repair. The feasibility, the operative details, postoperative morbidity and mortality, and the effect on GERD symptoms are assessed. In addition to the more commonly researched primary LRYGB combined with PEH repair, patients undergoing redo surgery combined with PEH repair are included in this study. In redo surgery, a gastric band is removed and a LRYGB is performed, generally as a one-step procedure [13]. To the best of our knowledge, this report is the largest series of combined bariatric surgery and primary large PEH repair (i.e., without a mesh), in which patients undergoing redo surgery are also included. We hypothesize that concurrent large PEH repair and (redo) LRYGB is an effective and safe treatment for morbidly obese patients with a large PEH.

Methods

Patients

A retrospective review was done of all patients who underwent simultaneous LRYGB and large PEH repair between February 2014 and December 2017 at the Elisabeth-TweeSteden hospital, a large bariatric and esophageal cancer center in Tilburg, the Netherlands. The following items were reviewed: patient demographics, body mass index (BMI), comorbidities, preoperative imaging studies, American Society of Anesthesiologists (ASA) classification, operative details, 30-day postoperative complications, postoperative length of hospital stay (days), percentage total weight loss (%TWL), percentage excess BMI loss (%EBMIL), the presence of GERD before and after surgery, and mortality.

Preoperative Work-Up

All patients were extensively screened by our multidisciplinary team (consisting of a surgeon, an internist, a specialized psychologist, and a dietician). In the absence of a history of upper gastro-intestinal surgery and in the absence of symptoms relating to obstruction of liquid or solid foods, neither further preoperative radiological imaging studies nor gastroscopies were performed. If patients had a history of gastric surgery or a (symptomatic) PEH or presented with symptoms of obstruction of liquid or solid foods, additional radiological imaging (i.e., a conventional X-ray or a CT-scan) was performed. If patients had a history of therapy-resistant GERD or other upper gastro-intestinal diseases, a gastroscopy was performed.

Procedure

All combined procedures were performed by a team of experienced bariatric surgeons at our center. Peritoneal access was obtained using a Veress needle, after which 5 working trocars were introduced. A liver retractor was used to retract the left lobe of the liver. In this way, optimal exposure was obtained and the PEH was identified. Following adhesiolysis, the gastrophrenic ligament was split. The distal esophagus and the intrathoracic part of the stomach were mobilized, after which the hernia sac and the intrathoracic part of the stomach were reduced. Complete reduction of the intrathoracic stomach was considered a key step of the procedure. Subsequently, the hernia sac was partially resected and a primary crural repair was performed. The type of repair depended on the size of

the defect, the exposure, and the position of the distal esophagus entering the abdominal cavity. Posterior repair was performed whenever possible. However, if no adequate posterior repair could be performed due to difficult exposure, anterior repair was performed. In case of large crural defects, the repair was ideally performed both posteriorly and anteriorly in order to optimally reconstruct the normal anatomic position of the esophagus entering the abdominal cavity. After completion of the crural repair, a gastric pouch was created for the LRYGB. All patients were treated in accordance with postoperative bariatric fast-track protocol [13].

LRYGB

We performed a LRYGB by creating a gastric pouch (< 50 ml), a 120–150-cm antecolic positioned Roux limb, and a 50-cm biliopancreatic limb. Both the gastro-jejunostomy and the entero-enterostomy were created using a linear stapler. The remaining anastomotic defects were closed using absorbable barbed sutures. Mesenteric defects were not routinely closed.

Redo Surgery

The technique of creating a LRYGB after removal of an adjustable gastric band in redo procedures did not differ from the technique used in primary LRYGB procedures.

GERD Questionnaire and GERD Health-Related Quality of Life

We simultaneously obtained the GERD questionnaire (GERD-Q) and the GERD Health-Related Quality of Life (GERD-HRQL) questionnaire by telephone. Patients were contacted between January 2018 and May 2018.

GERD-Q

The extent to which patients postoperatively experienced symptoms suggestive of GERD was measured with the GERD-Q. The GERD-Q is a standardized complementary instrument for the diagnosis of gastro-esophageal reflux disease, consisting of 6 self-report items [14]. Patients reported the frequency of symptoms suggestive of GERD (heartburn, regurgitation, sleep disturbance due to reflux symptoms, or use of medications for reflux symptoms) on a Likert scale of 0 to 3, and the frequency of symptoms negatively associated with GERD (epigastric pain and nausea) on a reversed Likert scale of 3 to 0. This resulted in a total GERD-Q score ranging from 0 to 18. Following Jonasson et al., we used a cut-off GERD-Q score of ≥ 9 to verify the presence of GERD [14].

GERD-HRQL

To assess the severity of GERD symptoms postoperatively and the impact on patients' health-related quality of life, the GERD-HRQL instrument was used [15]. This questionnaire consists of 10 items resulting in a total GERD-HRQL score ranging from 0 (asymptomatic in all items) to 50 (fully impaired in all items). For each item, patients reported the degree to which they experienced a given symptom as bothersome on a 5-point ordinal Likert scale, with responses ranging from "no symptoms" to "symptoms are incapacitating for daily life." The GERD-HRQL questionnaire contains 1 additional item assessing patients' overall satisfaction, which is not included in the total score.

Analysis

Data were analyzed using Microsoft Excel 2010. All data were presented as median (range) or number (%) as appropriate.

Results

Patients

A total of 13 cases were identified. Ten patients underwent LRYGB (77%); 3 patients underwent redo surgery in which a gastric band was removed and a LRYGB was performed (23%). The median age at the time of surgery was 56 years (range 46–65). Twelve patients were female (92%); 1 patient was male (8%). The median preoperative BMI was 40.4 kg/m^2 (range 37.2–53.2). The median ASA classification was 3 (range 2–3), with 92% of the patients classified as ASA 3. Ten patients were preoperatively diagnosed with GERD (77%). A large PEH was preoperatively identified in 8 patients (62%). The large PEHs were identified after a CT-scan (in 2 patients), after a gastroscopy (in 2 patients), after both a CT-scan and a gastroscopy (in 2 patients), after a barium swallow X-ray (in 1 patient), or after a CT-scan followed by a gastroscopy and a gastric emptying scintigraphy (in 1 patient). In 5 patients, a PEH was not diagnosed preoperatively and was consequently identified during surgery.

Hernia Repair

All patients had a large type III or IV PEH. In patients with a type IV PEH, herniation of the spleen was not encountered. Although technically more challenging, herniation of the colon did not result in any major surgical difficulties. All patients underwent primary crural repair by approximating the crus using non-absorbable Ethibond (polybutylate-coated polyester) sutures. Posterior repair was performed in 1 patient

(8%). Anterior repair was performed in 4 patients (31%). In 6 patients, both anterior and posterior repair was performed (46%). Anatomic location of the repair was not specified in 2 patients (15%).

Additionally, in 2 patients (15%), the gastric pouch was fixated to the bypassed portion of the stomach using a non-absorbable suture, impeding cranial sliding. Median operative time was 138 minutes (range 101–322). All combined procedures were successfully completed laparoscopically.

Postoperative Outcomes

One patient (8%) was treated with intravenous antibiotics for postoperative pneumonia. This patient had a history of asthma with persistent airway obstruction and lung embolism. No other 30-day postoperative complications were encountered in any of the patients, including those who underwent redo surgery. The median postoperative length of stay was 1 day (range 1–8). The median %TWL was 30% (range 13–49%) after a median follow-up period of 10 months (range 3–52). The median %EBMIL was 78% (range 36–113%). In 6 out of 10 symptomatic patients who were treated for GERD, anti-reflux medication usage could be discontinued during follow-up. No patients reported complaints of obstruction of liquid or solid foods. No patients underwent additional surgery for obstruction of the gastric pouch or for symptomatic recurrence of PEH. No mortality was observed.

GERD Questionnaire and GERD Health-Related Quality of Life

We simultaneously obtained the GERD questionnaire (GERD-Q) and the GERD Health-Related Quality of Life (GERD-HRQL) questionnaire by telephone from 12 patients. One patient was unable to provide responses due to an unrelated terminal illness. The questionnaires were obtained postoperatively in all cases, although the time between surgery and GERD-Q and GERD-HRQL assessment varied. The median time between surgery and completion of the questionnaires was 12 months (range 4–49).

The median postoperative GERD-Q score was 6 (range 5–8), out of a possible total score of 0 to 18. None of the patients had a GERD-Q score exceeding the cut-off score of ≥ 9. The median GERD-HRQOL score was 0 (range 0–5), with a total possible score ranging from 0 (excellent GERD-HRQL) to 50 (poor GERD-HRQL). Overall, none of the patients reported to be dissatisfied about the degree to which they experienced postoperative GERD symptoms, with 85% of the patients reporting excellent GERD-specific quality of life outcomes.

Discussion

There is no consensus on the optimal treatment of morbidly obese patients with a large (symptomatic) paraesophageal hernia. This case series of 13 morbidly obese patients reviews a single institution's experience with simultaneous bariatric surgery and primary large PEH repair.

In our series, no perioperative technical problems were encountered. Although most of the patients had an ASA 3 classification, 30-day morbidity was low. Major surgical complications did not occur and no mortality was observed. Patients achieved excellent weight loss results with a median total follow-up period of 10 months. The absolute PEH recurrence rate could not be determined, since we did not subject asymptomatic patients to postoperative diagnostic testing. However, GERD medication could be ceased during follow-up in 60% of the symptomatic patients and there were no surgical re-interventions for therapy-resistant GERD or for obstruction due to symptomatic recurrence of PEH. Thus, the symptomatic recurrence rate of PEH in our patient group was 0%.

Our positive outcomes are in line with a case series by Pham et al., which showed promising results after a mean follow-up period of 6 months in 23 morbidly obese patients with combined PEH repair and LSG [10]. In the majority of these patients, a biologic mesh was used for additional reinforcement. The patients achieved good weight loss results, and there were no major perioperative or postoperative complications. In addition, the study by Pham et al. indicates that hospital admission costs are reduced when performing a combined procedure as compared with performing the procedures separately. The present study indicates that excellent results are also yielded when PEH repair is performed simultaneously with LRYGB without the use of a reinforcing mesh.

A previous single-center study by Chaudhry et al., which included 14 patients with 9 patients completing a median long-term follow-up period of 35 months, demonstrated a reduction in anti-reflux medication usage and excellent weight loss after primary PEH repair and LRYGB in a single procedure [11]. Importantly, the authors verified the safety and feasibility of such a procedure. Our findings are similar to those of Chaudhry et al., providing further support for simultaneous large PEH repair and LRYGB and representing new evidence for the safety and feasibility of such a simultaneous procedure in patients undergoing bariatric redo surgery.

In our series, no meshes were used for surgical PEH repair. A well-conducted multicenter prospective randomized trial in non-obese patients presented no difference in long-term PEH recurrence between patients treated with biologic mesh repair and patients treated with primary repair [16]. These findings might be extrapolated to morbidly obese patients who achieve adequate long-term weight loss after bariatric surgery, since obesity is a risk factor for recurrence [17]. Indeed, no re-

interventions for PEH recurrence have been necessary in any of our patients so far.

There is some debate as to whether the use of a biologic mesh or bio-absorbable mesh is beneficial in terms of avoiding PEH recurrence [8, 12, 16]. The main argument against the use of meshes is that it bears the risk of severe complications, such as esophageal stenosis and esophageal erosion. When using a mesh for reinforcing crus closure, biologic meshes or bio-absorbable meshes seem to carry the lowest risk of postoperative complications when compared to synthetic meshes, but the costs of these meshes are higher. As our study shows, however, adequate crus closure without a mesh seems safe and sufficient in preventing symptomatic PEH recurrence when substantial weight loss is achieved.

This study does not compare between primary crus closure and crus closure with mesh reinforcement, as it merely describes the outcomes of the surgical techniques applied at our institution. Although there was no control group with mesh reinforcement, the results presented in this article look promising regarding the safety and feasibility of primary crural repair. In future research, randomized prospective trials with larger patient groups and long-term follow-up could shed more light on the potential advantages of primary crus closure compared with closure with mesh reinforcement.

The retrospective nature of this study did not allow for comparisons between preoperative and postoperative GERD-Q scores or between preoperative and postoperative GERD-HRQL assessment in individual patients. Furthermore, the number of included patients is small and the median follow-up period is relatively short, which are common limitations in previous studies examining the results of concurrent bariatric surgery and large hiatal hernia repair [7–11]. Another limitation of the present study is that the total costs of performing a simultaneous PEH repair and a bariatric procedure were not analyzed. Thus, financial considerations are not taken into account in our conclusions. In addition, the large PEH was preoperatively diagnosed in the majority of cases in our series. Only 5 patients were not known to suffer from a large PEH prior to surgical weight loss treatment. The surgical team was able to anticipate and prepare for a surgically more complex procedure in most cases. However, good results were obtained in all 5 patients requiring an unforeseen simultaneous large PEH repair and LRYGB.

In conclusion, morbidly obese patients with a large PEH can be treated safely and effectively by means of combined bariatric and hernia surgery, even in cases in which PEH is not identified preoperatively. Furthermore, in patients with a symptomatic and thus preoperatively diagnosed large PEH, the combined procedure results in substantial symptom relief. Our study highlights that simultaneous large PEH repair without mesh reinforcement and (redo) LRYGB is safe and feasible.

Compliance with Ethical Standards

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Conflict of Interest All authors declare that they have no competing interests.

Human and Animal Rights and Informed Consent For this type of study, formal consent is not required.

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