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Is concomitant cholecystectomy necessary in obese patients undergoing laparoscopic gastric bypass surgery?

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Abstract
Background Morbid obesity is associated with a high prevalence of cholecystopathy, and there is an increased risk of cholelithiasis during rapid weight loss following gastric bypass. In the era of open gastric bypass prophylactic cholecystectomy was advocated. However, routine cholecystectomy at laparoscopic gastric bypass is controversial.
Methods We performed a retrospective review of a prospectively maintained database of morbidly obese patients undergoing laparoscopic Roux-en-Y gastric bypass (LRYGB) from February 2000 to August 2006. All had routine preoperative biliary ultrasonography. Concomitant cholecystectomy at LRYGB was planned in patients with proven cholelithiasis and/or gallbladder polyp $\geq$1 cm diameter.
Results 1711 LRYGBs were performed. Forty-two patients (2.5%) had a previous cholecystectomy and were excluded from further analysis. Two hundred and five patients (12%) had gallbladder pathology: cholelithiasis in 190 (93%), sludge in 14 (6.8%), and a 2 cm polyp in 1 (0.5%). One hundred and twenty-three patients with cholelithiasis (65%) had a concomitant cholecystectomy at LRYGB, while 68 (35.7%) did not. Of these, 123 (99%) were completed laparoscopically. Concomitant cholecystectomy added a mean operative time of 18 min (range 15–23 min). One patient developed an accessory biliary radicle leak requiring diagnostic laparoscopic transgastric endoscopic retrograde cholangiopancreatography (LTG-ERCP). Of the 68 patients with cholelithiasis who did not undergo cholecystectomy 12 (17.6%) required subsequent cholecystectomy. A further 4 patients with preoperative gallbladder sludge required cholecystectomy. All procedures were completed laparoscopically. One patient required laparoscopic choledochotomy and common bile duct exploration (CBDE) with stone retrieval. Eighty-eight patients (6%) with absence of preoperative gallbladder pathology developed symptomatic cholelithiasis after LRYGB; 69 (78.4%) underwent laparoscopic cholecystectomy; 3 presented with gallstone pancreatitis and 2 with obstructive jaundice, requiring laparoscopic transcystic CBDE in 4 and LTG-ERCP in one.
Conclusion In our experience, concomitant cholecystectomy at LRYGB for ultrasonography-confirmed gallbladder pathology is feasible and safe. It reduces the potential for future gallbladder-related morbidity, and the need for further surgery.

Keywords Bariatric surgery · Cholecystectomy · Morbid obesity · Morbidity · Mortality · Laparoscopic Roux-en-Y gastric bypass

Abbreviations

BMI	body mass index
CBDE	common bile duct exploration
GB	gallbladder
LRYGB	laparoscopic Roux-en-Y gastric bypass
LTC-CBDE	laparoscopic transcystic common bile duct exploration
LC-CBDE	laparoscopic choledochotomy with common bile duct exploration
LTG-ERCP	laparoscopic transgastrostomy endoscopic retrograde pancreatography

Competing Interests Declared: None

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Worldwide, the incidence of obesity has increased dramatically, reaching epidemic proportions [1, 2]. Surgery has been demonstrated to be the most effective method to achieve long-term sustained weight loss in the morbidly obese with resolution of most comorbidities [3, 4]. There are a number of available surgical options [5]. Open Roux-en-Y gastric bypass (RYGB) was first described in 1964, and since the introduction of the laparoscopic approach its popularity has continued to increase [6–8]. Currently, laparoscopic Roux-en-Y gastric bypass (LRYGB) is the predominant bariatric procedure performed worldwide [8, 9].

Gallbladder disease is one of the most frequent obesity-related co-morbid conditions, and obesity per se is a risk factor for the development of gallbladder pathology, particularly cholelithiasis [10–12]. Additionally, it has been clearly shown that periods of rapid weight loss further enhance the risk of cholesterol cholelithiasis [13–15]. Theoretically, prophylactic cholecystectomy at the time of gastric bypass surgery should reduce the risk of future gallbladder-related pathology and its complications, the risk of further surgery, and alleviate concerns of loss of transoral access to the biliary tree. However, the performance of a routine or prophylactic cholecystectomy in morbidly obese patients undergoing gastric bypass surgery is controversial [16–18]. In the 1970s and 1980s, routine cholecystectomy was advocated by many at open gastric bypass [12]. In view of the reported high incidence of gallbladder disease found at surgery and on pathological examination many continue to recommend routine removal at open RYGB [16, 19–21]. Proponents cite the ease and feasibility of cholecystectomy through the upper midline incision, with removal of the potential for further surgery for symptomatic cholelithiasis [16]. However, although Mason et al. demonstrated an increase in concomitant cholecystectomy during bariatric procedures from 1986 to 2000, only 30% of surgeons performing a standard RYGB perform prophylactic cholecystectomy [22]. In the current era of minimally invasive procedures the need for concomitant cholecystectomy has been questioned [17, 23–26].

The present study was designed to determine the incidence of prior cholecystectomy and current gallbladder pathology in morbidly obese patients presenting to our institution for LRYGB, and to evaluate the feasibility and safety of a policy of selective concomitant cholecystectomy at LRYGB in patients with proven gallbladder pathology. We also wished to evaluate outcome when cholecystectomy was not performed at LRYGB in the presence of gallbladder pathology, and to determine the incidence of development of new gallbladder pathology during the phase of rapid weight loss following surgery.

Patients and methods

A retrospective review of a prospectively maintained database and medical chart review of all morbidly obese patients presenting to our institution for LRYGB over a 6½ year period from February 2000 to August 2006 was performed. All procedures were carried out by two surgeons (SS and RJR) in accordance with the National Institute of Health consensus criteria for the management of morbid obesity [4]. Permission for the study was obtained from the Institutional Review Board. Exclusion criteria included previous cholecystectomy and open gastric bypass. All patients underwent routine preoperative gallbladder, biliary tree, and liver ultrasonography. Concomitant cholecystectomy at the time of LRYGB was planned in all patients with ultrasonographic-confirmed cholelithiasis and/or gallbladder polyp $\geq$1 cm diameter. Cholecystectomy was not performed for gallbladder sludge or polyps $<$1 cm diameter. A standard LRYGB with a 50 cm biliopancreatic and $\geq$100 cm antecolic antegastric alimentary limb determined by body mass index (BMI) was performed as previously described [27]. A seven-trocar technique was utilized and, when necessary, an additional 5 mm trocar was inserted into the right subcostal region to facilitate cholecystectomy (Fig. 1) [27]. Intraoperative ultrasonography was not performed. Two large-bore drains were inserted routinely, one in the right subhepatic space and the second adjacent to the gastric pouch in the upper abdomen. Both drains were removed prior to discharge. Routine prophylactic postoperative bile salt therapy was not administered. Patients were reviewed in our outpatient

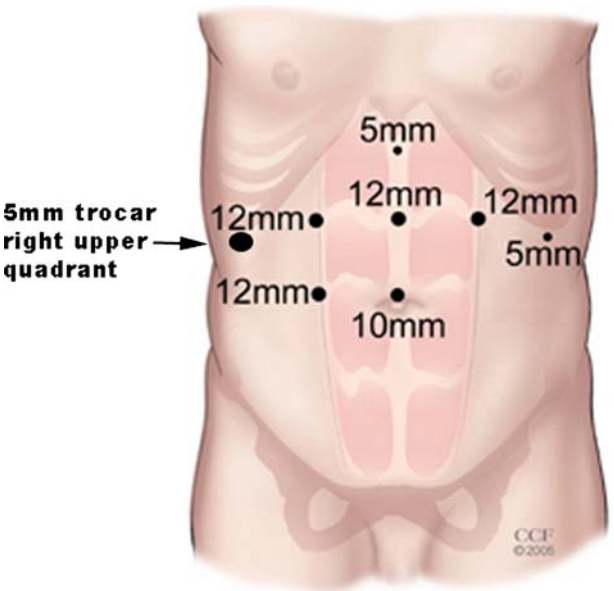

Fig. 1 Standard seven-trocar placement for laparoscopic Roux-en-Y gastric bypass with optional additional 5-mm right upper quadrant trocar for concomitant cholecystectomy

clinic at 1, 3, 6, and 12 months, and yearly thereafter. Repeat biliary ultrasonography was performed if clinical suspicion of gallbladder pathology. All data pertaining to each patient including demographic data, comorbidities, preoperative investigations, perioperative, and postoperative outcomes were recorded in a prospective database.

Results

From February 2000 to August 2006, 1713 consecutive patients underwent RYGB. Of these, 44 patients were excluded due to prior cholecystectomy in 42 (2.5%) and open RYGB in 2 (0.1%). No statistically significant differences with respect to age, gender, weight, BMI, or medical comorbidities were noted between excluded and eligible patients. The average follow-up period for the eligible study group was 30.5 months (range 0–6.5 years). On routine preoperative ultrasonography, gallbladder pathology was documented in 205 patients (12%) including cholelithiasis in 190 patients (93%), gallbladder sludge in 14 (6.8%), and a 2-cm-diameter gallbladder polyp in one (0.5%) (Fig. 2). In accordance with our protocol of selective cholecystectomy, 123 patients (64%) with significant gallbladder pathology underwent concomitant cholecystectomy at LRYGB. The indication was cholelithiasis in 122 patients and a 2-cm-diameter gallbladder polyp in 1 patient. Concomitant cholecystectomy was performed in an additional patient who requested prophylactic cholecystectomy at LRYGB. For the purpose of the study this patient was excluded from further analysis. One procedure (0.8%) required conversion due to technical difficulties due to previous abdominal surgery unrelated to the cholecystectomy. Concomitant cholecystectomy resulted in an additional mean operative time of 18 min (range 15–23 min), but had no influence on intraoperative blood loss, perioperative fluid administration, or analgesic requirements. Histopathological examination demonstrated gallstones in 119 specimens (97%), chronic cholecystitis in 119 (97%), cholesterolosis in 32 (26%), and a benign gallbladder polyp in 1. There were no deaths in the series, and complications occurred in three patients (2.4%). Two patients developed a minor wound infection requiring oral antibiotics, and one a bile leak requiring reintervention. In this case, diagnostic laparoscopic transgastrostomy endoscopic retrograde cholangiopancreatography (LTG-ERCP) demonstrated an accessory biliary radicle leak which was managed conservatively with percutaneous drainage. The average length of hospital stay in the study population from the time of admission for LRYGB was 2.6 days (range 2–10 days), which was unaffected by performance of concomitant cholecystectomy.

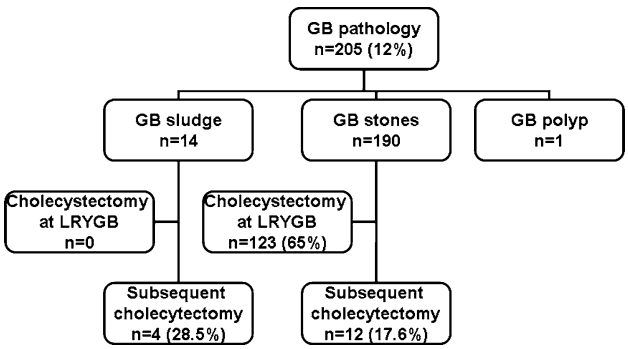

Fig. 2 Management of preoperative ultrasonographic-detected gallbladder pathology in morbidly obese patients undergoing laparoscopic Roux-en-Y gastric bypass; GB, gallbladder; LRYGB, laparoscopic Roux-en-Y gastric bypass

Sixty eight patients (35.7%) with preoperative ultrasonographic detected cholelithiasis did not undergo concomitant cholecystectomy at LRYGB due to surgeon preference, technical factors related to previous abdominal surgery, high BMI, severe comorbidity, and/or patient preference. There was a significant difference in the total number of concomitant cholecystectomies performed by the two surgeons (RJR $n = 111$, SS $n = 13$). Subsequent cholecystectomy was required in 12 of 68 patients (17.6%). A further four patients with preoperatively detected gallbladder sludge (28.5%) developed symptomatic gallbladder pathology requiring cholecystectomy. Nine of the patients (56%) presented with complicated gallbladder pathology with acute cholecystitis in seven and choledocholithiasis in two. The remaining seven patients presented with biliary colic. Cholecystectomy was performed a mean of 18.2 months following LRYGB (range 20 days to 48 months). All procedures were completed laparoscopically. One patient required laparoscopic choledocotomy with common bile duct exploration (LC-CBDE) and extraction of multiple stones after a failed transcystic approach. Postoperative t-tube cholangiogram demonstrated a retained left hepatic duct stone which was extracted under radiological guidance by the Brenner technique.

During follow-up, symptomatic cholelithiasis developed in 88 patients (6%) with normal preoperative ultrasonography. The majority ($n = 68$, 77.2%) presented with biliary colic. Fifteen patients (17%) presented with acute cholecystitis, 3 (3.4%) with gallstone pancreatitis, and 2 (2.3%) with obstructive jaundice. Cholecystectomy was performed in 69 patients (78.4%). All procedures were completed laparoscopically. Of the three patients who presented with gallstone pancreatitis, two required LTC-CBDE (with stone retrieval in one) and LTG-ERCP in one (with stone retrieval). A LTC-CBDE was performed in the two patients with obstructive jaundice, with stone retrieval required in one. Of interest, during the study period a further three patients who underwent cholecystectomy prior to LRYGB presented with choledocholithiasis, requiring LTG-ERCP and stone retrieval in one, and LC-CBDE with stone extraction in two.

Discussion

Obesity is a risk factor for gallbladder pathology, with histological abnormalities including cholelithiasis reported in 45–96% of morbidly obese patients [11, 19, 20, 28]. A sevenfold increase in the risk of gallstone development has been observed in women with a BMI $\geq$45 kg/m^2 [29]. Obese individuals have a threefold increased rate of excretion of cholesterol into hepatic bile, decreased cholecystokinin-induced gallbladder contractility with stasis, and increased nucleation factors including increased levels of gallbladder mucin-promoting precipitation of cholesterol crystals. Following routine cholecystectomy at bariatric surgery cholelithiasis, cholesterolosis, or cholecystitis has been documented in up to 96% of gallbladders removed [20, 30]. A more recent study revealed pathological cholecystopathy in 93% of 89 consecutive morbidly obese patients, with cholelithiasis in 25% [16]. After RYGB, rapid weight loss can precipitate cholelithiasis in >35% of patients (range 28–71%) due to cholesterol supersaturation of bile from mobilized tissue stores, reduced gallbladder contractility due to vagal nerve injury, and/or absence of cholecystokinin-induced contraction due to exclusion of enteric contents from the upper gastrointestinal tract, and excess mucin production [11, 13, 14]. However, there are contradictory reports regarding the true incidence of symptomatic cholelithiasis necessitating cholecystectomy after RYGB with reported figures varying from 3% to 28% of patients [14, 17, 31–33].

The question therefore arises as to whether all gallbladders, diseased and normal, should be removed at the time of LRYGB to avoid future gallbladder-related morbidity. Three operative approaches exist of prophylactic, selective, or delayed cholecystectomy when symptoms develop. Several groups in the open gastric bypass era advocated prophylactic cholecystectomy [11, 14, 30]. More recently, this approach has become less popular due to reported increased operative time, duration of hospitalization, potential complications, and surgeon concern regarding removal of a normal organ [13, 17]. Only one patient in our series had a prophylactic cholecystectomy in the absence of ultrasonographic-detected gallbladder pathology, at the patient's request. Some continue to recommend routine cholecystectomy at RYGB, citing operative feasibility, safety, and avoidance of potential subsequent surgery [16]. In our series, symptomatic cholelithiasis developed in 88 patients after LRYGB with a normal preoperative ultrasonogram, necessitating cholecystectomy in 69 patients (78%). A routine cholecystectomy in the absence of gallbladder pathology would have exposed 1378 patients to an unnecessary procedure with potential complications. With increasing frequency, selective cholecystectomy at RYGB is being advocated in patients with proven gallbladder disease on preoperative imaging, or in patients with abnormal gallbladders confirmed by intraoperative ultrasonography [13, 23, 25, 26, 34]. Laparoscopic cholecystectomy can be performed safely at the time of LRYGB. However, additional ports may be required, and increased operative time and duration of hospital stay have been reported [23, 26]. In our experience, although operative time was increased by a mean of 18 min (range 15–23 min), other parameters including intraoperative blood loss, perioperative fluid, and analgesic requirements were unaffected. An additional 5-mm right upper quadrant trocar was inserted if required to improve access and facilitate the cholecystectomy. In our experience, concomitant cholecystectomy at LRYGB was associated with low morbidity with two minor wound infections, and one bile leak, which was managed conservatively. Also, in-hospital stay was not prolonged compared to the LRYGB-only group.

Others recommend delayed cholecystectomy after bariatric surgery for symptomatic cholelithiasis. In a recent study by Patel et al., delayed cholecystectomy was recommended if patients became symptomatic after LRYGB due to a low incidence of postoperative symptomatic gallstones in their series, technical ease of performance after weight loss, and the potential for reduced perioperative morbidity in these 'healthier' patients [32]. However, 21% of their patients had a previous cholecystectomy, the study group was small with exclusion of 53% of the patient population, routine preoperative screening for gallbladder pathology was not performed, and the follow-up period was short at only 7.5 months (range 7–10 months) [32]. We would argue that cholelithiasis can result in significant morbidity including acute cholecystitis, cholangitis, gallstone pancreatitis, cholecystenteric fistulae, and gallstone ileus. In our series, subsequent cholecystectomy was required in 18% of 68 patients with preoperatively detected cholelithiasis and 28.5% of 12 patients with sludge who did not undergo concomitant cholecystectomy at LRYGB. Over 50% of these presented with complicated gallbladder pathology including acute cholecystitis, resulting in technically challenging surgery and choledocholithiasis requiring additional procedures. The incidence of symptomatic cholelithiasis in 6% of our patients following LRYGB is similar to other reported series [26].

There are a number of weaknesses in this study. Sixty-eight patients (35.7%) with documented gallbladder pathology did not undergo concomitant cholecystectomy for several reasons including previous abdominal surgery, high BMI, severe comorbidity, and surgeon and/or patient preference. High BMI, severe comorbidity, and technical difficulties due to prior surgery may independently increase the complexity of the procedure resulting in longer operative time, higher blood loss, and a poorer outcome.

Although all patients with significant gallbladder pathology were considered for concomitant cholecystectomy, gallbladder removal was deferred if the surgeon was concerned that the surgery time would be unnecessarily prolonged with compromise to patient safety. If a concomitant procedure was not technically possible in a patient with biliary colic cholecystectomy was performed 4–6 weeks later.

In conclusion, we advocate routine preoperative biliary ultrasonography on all morbidly obese patients presenting for LRYGB, and a selective approach to concomitant cholecystectomy with removal of all gallbladders at the time of LRYGB with ultrasonography-detected pathology. In our experience, concomitant selective cholecystectomy at LRYGB is feasible, safe, associated with a low conversion rate, no significant operative time extension, and low morbidity (2.4%) and mortality (0%) rates. This approach reduces the potential for postoperative gallbladder-related morbidity, and patient exposure to readmission and reoperation with consequent reduction in unnecessary expense and potential complications.

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