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Elective Cholecystectomy During Laparoscopic Roux-En-Y Gastric Bypass: Is it Worth the Wait?

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Background: Combined gastric bypass and cholecystectomy have been advocated for open bariatric procedures. Our goal was to evaluate the safety of this technique in laparoscopic bariatric surgery patients with gallstones diagnosed preoperatively.

Methods: 94 out of 556 consecutive morbidly obese patients (16.9%) underwent laparoscopic gastric bypass with simultaneous cholecystectomy (LGBP/LC) for cholelithiasis.

Results: 328 patients (59%) had a concomitant secondary procedure, most commonly cholecystectomy (28.7%). Preoperative BMI was 48.6±6.9 kg/m^2 for LGBP/LC patients and 48.8±7.3 kg/m^2 (*P*=0.85) for LGBP alone. 5 patients had preoperative biliary colic; the others were asymptomatic for cholelithiasis. Postoperatively, at a mean follow-up of 7.6±6.7 months, the percent excess weight loss (%EWL) was 46.1±0.25 for the combined procedure vs 50.2±63.0 (*P*=0.55) for LGBP alone. There were no conversions to open procedures for the LC. Port placement for the LGBP was not altered for LC. None required intraoperative cholangiography. Operative time for the combined procedure was 293.4±79.8 minutes vs 244.8±77.2 minutes for LGBP alone (*P*<0.0001). Length of stay for the combined procedure was 4.35±10.8 days vs 2.69±1.8 days for LGBP alone (*P*=0.0069). There were no postoperative bile leaks or bile duct injuries.

Conclusion: Concomitant LGBP/LC is safe and feasible without altering port placement. Combining these procedures significantly increases operative time and nearly doubles the hospital stay.

Key words: Cholecystectomy, gallstones, cholelithiasis, gastric bypass, laparoscopy, morbid obesity, bariatric surgery

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Introduction

Combined gastric bypass and cholecystectomy has been advocated for open bariatric procedures.[1,2] Whether routine or selective cholecystectomy should be performed at the time of gastric bypass remains controversial. The safety and efficacy of concomitant gastric bypass and cholecystectomy (LGBP/LC) has not been documented in the setting of minimally invasive bariatric surgery. The goal of this study is to evaluate the safety of this technique in laparoscopic Roux-en-Y gastric bypass patients who have had gallstones diagnosed preoperatively by abdominal ultrasound.

Materials and Methods

Ninety-four out of 556 consecutive morbidly obese patients (16.9%) who underwent laparoscopic Roux-en-Y gastric bypass (LGBP) from December 1997 through May 2001 had simultaneous elective cholecystectomy (LGBP/LC) for cholelithiasis. All patients were candidates for bariatric surgery in accordance with National Institutes of Health consensus criteria (body mass index (BMI) ≥40 kg/m^2 or BMI ≥35 kg/m^2 with weight-related comorbidities). All patients who had cholelithiasis on routine preoperative abdominal ultrasound underwent cholecystectomy. Informed surgical consent was obtained for all patients. Six laparoscopic ports were used to perform the LGBP as previously described;[3] the same ports were subsequently used

for the laparoscopic cholecystectomy after completion of the gastric bypass. The gallbladder was retracted using the right subcostal ports and dissection was carried out using the left upper quadrant port. Histologic examination was performed on all specimens.

Postoperatively, all patients who did not undergo laparoscopic cholecystectomy were given prophylactic ursodiol 300 mg orally twice a day for 6 months for gallstone prevention.

Data was analyzed using the t-test or chi-square tests. A *P*-value <0.05 was deemed statistically significant.

Results

Out of 556 patients, 108 (19.4%) had had prior cholecystectomy. A concomitant secondary procedure was performed in 328 (59%); the most common was cholecystectomy in 28.7% (94 out of 328) (Table 1). Out of 462 patients, 234 (50.6%) undergoing LGBP without cholecystectomy had an additional procedure (Table 2), while 55 out of 94 patients (58.5%) who had combined LGBP/LC underwent an additional procedure. No significant difference in sex distribution was identified (Table 2). The patients in the LGBP/LC group were significantly older than those in the LGBP group (*P*=0.01). Mean preoperative BMI was not significantly different between the LGBP group and the LGBP/LC group.

Operative time for the combined procedure was significantly prolonged compared to that for LGBP alone (*P*<0.0001) (Table 3). In the LGBP group, eight patients were converted to an open procedure (1.7%). In the LGBP/LC group, one patient (1.1%) was converted to an open procedure during the gastric bypass because of dense intraabdominal adhesions from previous abdominal surgery. None of the patients underwent conversion to an open procedure in order to perform the cholecystectomy. The laparoscopic port placement for the LGBP was not altered for performance of the cholecystectomy. There was one perioperative mortality in the LGBP/LC group (<30 days) from a pulmonary

Table 1. Secondary procedures performed at time of laparoscopic gastric bypass

Procedure	No. of LGBP patients (% out of 462)	No. of LGBP/LC patients (% out of 94)
Liver biopsy	85 (18.4%)	21 (22.3%)
Lysis of adhesions	69 (14.9%)	8 (8.5%)
Gastrostomy tube	26 (5.6%)	3 (3.2%)
Umbilical herniorrhaphy	25 (5.4%)	10 (10.6%)
Intraoperative ultrasound	7 (1.5%)	7 (7.4%)
Ventral herniorrhaphy	4 (0.01%)	2 (2.1%)
Repair of paraesophageal hernia	3 (0.006%)	2 (2.1%)
Repair of gastrointestinal tear	3 (0.006%)	0
Partial gastrectomy	3 (0.006%)	0
Takedown of fundoplication	3 (0.006%)	0
Adjust ventriculoperitoneal shunt	1 (0.002%)	0
Small bowel resection	1 (0.002%)	1 (1.1%)
Splenectomy	1 (0.002%)	0
Meckel's diverticulectomy	1 (0.002%)	0
Remove skin tag	1 (0.002%)	0
Gastropexy	1 (0.002%)	0
Snare gastric polyp	0 (0.002%)	1 (1.1%)
Total	**234 (50.6%)**	**55 (58.5%)**

Table 2. Patient characteristics

	LGBP	LGBP/LC	*P*
n	462	94	
Mean age (yrs)	42.2 ± 9.3	44.8 ± 9.3	0.01
No. of (%) females	377 (81.6%)	76 (80.9%)	0.98
Preoperative BMI (kg/m^2)	48.8 ± 7.3	48.6 ± 6.9	0.85

Table 3. Early outcomes after laparoscopic gastric bypass with or without cholecystectomy

	LGBP n=462	LGBP/LC n=94	*P*
Operative time (min) [range]	244.8 ± 77.2 [105-734]	293.4 ± 79.8 [128-484]	<0.0001
Conversions (%)	8 (1.1%)	1 (1.7%)	0.99
Deaths	1	1	0.67
Length of stay (days) [range]	2.69 ± 1.8 [2-23]	4.35 ± 10.8 [2-84]	0.0069

embolus and one perioperative mortality in the LGBP group (from a cardiac arrhythmia). Length of inpatient stay for the combined procedure was 4.35±10.8 days versus 2.69±1.78 days for the gastric bypass alone (P=0.0069).

The mean operative time for LGBP without additional procedures was 230.6±62.7 min, while the mean operative time for LGBP with additional procedures was 270.7±93.1 min (P<0.0001) (Table 4). For combined LGBP/LC, the operative time was 294.9±81.6 min without additional procedures versus 293.7±83.0 min with additional procedures (P=0.94). When operative times between LGBP and LGBP/LC without additional procedures were compared, the difference was statistically significant (P<0.0001). A comparison of operative times for LGBP versus LGBP/LC with additional procedures was not statistically significant (P=0.09).

Five patients had preoperative symptoms of biliary colic or right upper quadrant abdominal pain; the remainder were asymptomatic. Postoperatively, there was no significant difference between the two groups with respect to mean postoperative BMI and mean excess weight loss (Table 5). There was no significant difference in follow-up time between the two groups.

Table 4. Operative times for LGBP and LC/GBP

Operation	Additional procedures	n	Operative time (min)
LGBP	No	228	230.6 ± 62.7
LGBP	Yes	234	270.7 ± 93.1
LGBP/LC	No	39	294.9 ± 81.6
LGBP/LC	Yes	55	293.7 ± 83.0

Table 5. Late outcomes after laparoscopic gastric bypass with or without cholecystectomy

	LGBP n=462	LGBP/LC n=94	P
Postoperative BMI (kg/m^2)	37.4 ± 15.4	37.6 ± 7.6	0.92
% Excess weight loss	50.2 ± 63.0%	46.1 ± 0.25%	0.54
Follow-up (mon)	8.4 ± 7.7	7.6 ± 6.7	0.52

The rate of major perioperative complications for the LGBP group was 8.6% versus 19.1% for the LGBP/LC group, P=0.004 (Table 6A). There were no postoperative bile leaks or bile duct injuries. The rate of minor complications was 12.9% for LGBP versus 16.0% for the combined group, P=0.70 (Table 6B).

All gallbladders had pathologic findings on histologic examination (Table 7). In 93 of the 94 gallbladders removed (99%), histologic evidence of chronic cholecystitis was present. Seventy-seven (82%) had cholelithiasis and 27 (29%) had cholesterolosis.

Eight patients out of 364 who did not have simultaneous cholecystectomy (2.3%) developed biliary colic following LGBP and underwent subsequent cholecystectomy after a mean of 12.4 months. Histologic examination demonstrated cholecystitis in all gallbladder specimens, with stones in six (76%), cholesterolosis in one (13%), and gallbladder sludge in three (38%).

Table 6A. Major early postoperative complications

Complications	n(%) in LGBP group	n(%) in LGBP/LC group
CARDIAC		
Arrhythmia	2 (0.4%)	0
Cardiac Arrest	1 (0.2%)	0
RESPIRATORY		
Failure	7 (1.5%)	2 (2.1%)
Pulmonary embolism	3 (0.6%)	1 (1.1%)
Pulmonary edema	2 (0.4%)	0
GASTROINTESTINAL		
Small bowel obstruction	8 (1.6%)	3 (3.2%)
Leak from gastrojejunostomy	5 (0.1%)	3 (3.2%)
Leak from excluded stomach	2 (0.4%)	1 (1.1%)
Leak from jejunostomy	0	1 (1.1%)
RENAL		
Acute renal insufficiency/failure	3 (0.6%)	2 (2.1%)
INFECTIOUS		
Abscess (intraabdominal)	4 (0.8%)	1 (1.2%)
WOUND		
Dehiscence	1 (0.2%)	1 (1.2%)
HEMATOLOGIC		
Bleeding	10 (2.2%)	3 (3.2%)
TOTALS	48 (8.6%)	18 (19.1%)
P=0.004		

Table 6B. Minor early postoperative complications

Complication	n(%) in LGBP group	n(%) in LBGP/LC group
RESPIRATORY		
Atelectasis	13 (2.8%)	2 (2.1%)
Pneumonia	3 (0.6%)	1 (1.1%)
Effusion	1 (0.2%)	0
Pneumothorax	1 (0.2%)	0
GASTROINTESTINAL		
C. difficile colitis	4 (0.8%)	0
Ileus	5 (1.1%)	0
Subclinical gastrojejunostomy leak	7 (1.5%)	2 (2.1%)
RENAL		
Urinary tract infection	4 (0.8%)	1 (1.1%)
Renal calculus	0	1 (1.1%)
WOUND		
Wound infection	21 (4.5%)	3 (3.2%)
Dehiscence	1 (0.2%)	1 (1.1%)
SOFT TISSUE		
Cellulitis	4 (0.8%)	0
Subcutaneous emphysema	0	2 (2.1%)
HEMATOLOGIC		
Deep venous thrombosis	1 (0.2%)	0
Hypokalemia	7 (1.5%)	2 (2.1%)
TOTALS	72 (12.9%)	15 (16.0%)
P=0.70		

Discussion

Obesity is a major risk factor for cholelithiasis; gallstones are found in 45% to 91% of the morbidly obese.[1] The Nurses' Health Study demonstrated a seven-fold increase in the risk of development of gallstones in women with a body mass index BMI ≥45 compared to those with BMI <24.[4] Up to 95% of gallbladders removed at the time of bariatric surgery have evidence of cholelithiasis, cholesterolosis or cholecystitis.[5] However, a significant number with cholesterol stones and sludge will remain asymptomatic.

Table 7. Pathologic findings of gallbladders removed at time of combined laparoscopic gastric bypass and cholecystectomy

Pathologic finding	No. (%)
No abnormal histologic findings	0
Cholelithiasis only	0
Cholecystitis only	11 (11.7%)
Cholesterolosis only	0
Cholelithiasis and cholecystitis	56 (59.6%)
Cholelithiasis and cholesterolosis	1 (1.1%)
Cholecystitis and cholesterolosis	6 (6.4%)
Cholelithiasis, cholecystitis and cholesterolosis	20 (21.3%)

Rapid weight loss is associated with the development of cholelithiasis.[6] The weight reduction associated with bariatric surgery places these patients at substantial risk for the development of cholelithiasis.[7] In a study by Amaral and Thompson,[1] cholecystectomy was required in 28% of patients who underwent Roux-en-Y gastric bypass within 3 years. Shiffman and colleagues[7] reported that 36% of 105 gastric bypass patients developed stones, most within 6 months. Forty percent (13 out of 32) of the patients who developed gallstones became symptomatic, and nine (28%) subsequently underwent cholecystectomy. The mechanism for gallstone formation in the setting of rapid weight loss is thought to be due to increased hepatic secretion of cholesterol resulting in supersaturation of bile with cholesterol.[8]

Because of the high incidence of symptomatic gallbladder disease in the postoperative bariatric surgery patient, some surgeons advocate the performance of routine "prophylactic" cholecystectomy at the time of open bariatric surgery. Fakhry et al[9] performed cholecystectomy at the time of open Roux-en-Y gastric bypass in 136 patients. The addition of cholecystectomy did not significantly affect operative time or postoperative morbidity. Schmidt et al[2] performed routine simultaneous cholecystectomy at the time of bariatric surgery and detected histologic abnormalities in 96% of gallbladders. Fobi et al[10] published a review of 154 patients who underwent simultaneous open transected silastic ring vertical gastric bypass and prophylactic cholecystectomy; 42% of the gallbladders removed demonstrated pathologic findings such as cholelithiasis, cholecystitis and cholesterolosis. Fobi advocates the performance of routine cholecystectomy at the time of gastric bypass not only because of the high incidence of gallbladder disease in this patient population, but also because of the low morbidity associated with concurrent cholecystectomy.[10]

Most surgeons in the United States, on the other hand, favor a selective approach to concomitant cholecystectomy, based on the presence of symp-

toms associated with gallstones. Mason surveyed members of the American Society for Bariatric Surgery and found that only 30% of surgeons remove normal-appearing gallbladders at the time of Roux-en-Y gastric bypass surgery while the majority adopt a selective approach.[11] Jones reported that only 9% of 673 consecutive Roux-en-Y gastric bypass patients required subsequent cholecystectomy, usually several years following gastric bypass.[12] He advocated selecting patients for simultaneous cholecystectomy on the basis of family history of biliary tract disease requiring cholecystectomy and clinical evidence of chronic cholecystitis at the time of surgery. While some surgeons perform cholecystectomy for those bariatric surgical patients diagnosed with gallstones preoperatively, others do not obtain preoperative abdominal ultrasound and instead select patients solely based on the presence of symptoms. Advocates for concomitant cholecystectomy solely in patients with symptomatic disease argue that the majority of patients undergoing Roux-en-Y gastric bypass do not develop symptoms of biliary colic postoperatively despite the presence of gallstones. Therefore, according to this philosophy, subjecting patients with asymptomatic gallstones to the added risks of cholecystectomy is unwarranted, especially when cholecystectomy is technically more difficult and may pose higher risks in the morbidly obese patient.

For patients not undergoing concomitant cholecystectomy, pharmacologic prevention of postoperative gallstone formation has been shown to be effective. Ursodeoxycholic acid decreases gallstone formation in the setting of rapid weight loss by decreasing biliary cholesterol saturation.[7] In a multicenter, randomized, double-blind prospective trial by Sugerman et al,[13] a 6-month course of oral ursodiol (600 mg daily) was found to be significantly more effective than placebo in preventing gallstone formation (32% for ursodiol versus 2% for placebo, $P<0.001$). However, compliance with the preventive medications may be problematic. A study by Wudel and colleagues[14] randomized 60 bariatric surgery patients without gallstones to ursodiol (600 mg/day), ibuprofen (600 mg/day), or placebo in a double-blind fashion. Only 28% (17 out of 60) were compliant in taking the medication. Forty-one (68.3%) completed the study; 29 (71%) developed gallstones postoperatively. Gallstone formation was significantly less frequent in the patients given ursodiol compared with those given ibuprofen.

The authors have evaluated the gallbladder preoperatively using abdominal ultrasound in bariatric surgical patients. Those who were demonstrated to have gallstones underwent simultaneous cholecystectomy at the time of gastric bypass in this study. Patients without cholelithiasis were given oral ursodiol 600 mg daily for 6 months for prevention of gallstones.

To our knowledge, this is the first study to evaluate outcomes for selective laparoscopic cholecystectomy during laparoscopic gastric bypass. In our series, all patients with gallstones found on routine preoperative ultrasound underwent concomitant cholecystectomy at the time of LGBP regardless of symptoms. We found no significant difference in gender distribution between those who underwent cholecystectomy and those who did not. Adding cholecystectomy neither affected conversion rates to laparotomy nor increased the incidence of biliary-related complications such as bile leaks, bile duct injury, or bleeding from the gallbladder fossa. The study size (n=94), however, may be inadequate to detect rare but significant cholecystectomy-related complications.

There was no significant difference in the early minor postoperative complication rate ($P=0.70$). The early major complication rate was higher for the combined LGBP/LC group ($P=0.004$); however, because this is not a prospective randomized study, the two groups were not equivalent and factors other than the additional cholecystectomy may have contributed to a higher major complication rate in this group. The patients in the LGBP/LC group were significantly older than the LGBP patients ($P=0.01$). A larger proportion of the patients who had LGBP/LC had additional procedures compared to the LGBP group (58.5% versus 42.1%). Furthermore, none of the early major complications were related to the biliary tract. Thus, based on this data, one cannot necessarily conclude that adding cholecystectomy to the LGBP increases the postoperative complication rate.

Adding laparoscopic cholecystectomy, however, increased operating time by nearly 50 minutes, which appears longer than expected. This may be a result of an increase in technical difficulty related to severe obesity such as hepatomegaly, poor exposure

due to increased visceral fat and obscure anatomy due to surrounding fat. Furthermore, the patients included in the analysis were part of the learning curve for the LGBP. When the operative times between LGBP and LGBP/LC were compared by excluding additional procedures, the difference was highly statistically significant. A slightly longer operating time may be insignificant in terms of patient outcome, but we did find a surprisingly longer hospital stay for those patients undergoing simultaneous cholecystectomy (4.35 days vs 2.69 days). Since we did not find an increase in cholecystectomy-related complications, one plausible explanation may be that the additional procedure significantly increased postoperative pain, nausea and surgical trauma in a way that adversely affected bowel function and overall recovery.

A reasonable alternative to avoid the longer operating time and hospital stay would be to defer LC until after LGBP, when the technical difficulty decreases as weight is lost. Furthermore, as stated previously, many patients may never develop symptoms and therefore may never require cholecystectomy. A major disadvantage of deferring cholecystectomy in those with asymptomatic gallstones is that rarely, some patients may develop acute cholecystitis or gallstone pancreatitis, which would result in significant but potentially avoidable morbidity. Despite the prolonged operating time and hospital stay, the combined LGBP/LC approach obviates the need for a second operation and avoids the potential morbidity of subsequent acute gallbladder disease.

Since completing this study, we have modified our approach. We continue to perform concomitant laparoscopic cholecystectomy in patients with asymptomatic gallstones following completion of LGBP. However, in the setting of unfavorable exposure to the gallbladder, anomalous biliary ductal anatomy, or technical difficulty in completing the gastric bypass, we now defer cholecystectomy to a later date if the patient subsequently develops biliary colic.

Conclusions

Performing LC for cholelithiasis at the time of LGBP significantly increased operating time and duration of hospital stay but did not increase cholecystectomy-related complications.

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