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ORIGINAL ARTICLE

Almost Routine Prophylactic Cholecystectomy During Laparoscopic Gastric Bypass is Safe

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Abstract
Background Morbidly obese patients are at high risk to develop gallstones, and rapid weight loss after bariatric surgery further enhances this risk. The concept of prophylactic cholecystectomy during gastric bypass has been challenged recently because the risk may be lower than reported earlier and because cholecystectomy during laparoscopic gastric bypass may be more difficult and risky.
Methods A review of prospectively collected data on 772 patients who underwent laparoscopic primary gastric bypass between January 2000 and August 2007 was performed. The charts of patients operated before 2004 were retrospectively reviewed regarding preoperative echography and histopathological findings.
Results Fifty-eight (7.5%) patients had had previous cholecystectomy. In the remaining patients, echography showed gallstones or sludge in 81 (11.3%). Cholecystectomy was performed at the time of gastric bypass in 665 patients (91.7%). Gallstones were found intraoperatively in 25 patients (3.9%), for a total prevalence of gallstones of 21.2%. The age of patients with gallstones was higher than that of gallstone-free patients (43.5 vs 38.7 years, $p<0.0001$). Of the removed specimens, 81.8% showed abnormal histologic findings, mainly chronic cholecystitis and cholesterolosis. Cholecystectomy was associated with no procedure-related complication, prolonged duration of surgery by a mean of 19 min (4–45), and had no effect on the duration of hospital stay. Cholecystectomy was deemed too risky in 59 patients (8.3%) who were prescribed a 6-month course of ursodeoxycolic acid.
Conclusion Concomitant cholecystectomy can be performed safely in most patients during laparoscopic gastric bypass and does not prolong hospital stay. As such, it is an acceptable form of prophylaxis against stones forming during rapid weight loss. Whether it is superior to chemical prophylaxis remains to be demonstrated in a large prospective randomized study.

Keywords Morbid obesity · Gastric bypass · Cholecystectomy · Gallstones

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Introduction

The prevalence of obesity is increasing almost exponentially worldwide, resulting in an enormous rise in the number of bariatric procedures performed each year. In the severely obese patients, cholesterol secretion by the liver is increased. This results in an increased cholesterol concentration in the bile without a proportional increase in phospholipids and bile salts [1, 2], which makes it difficult to maintain the cholesterol in solution. Obese patients also have a larger gallbladder with a reduced contractility [3]. These different mechanisms are responsible for an increased prevalence of gallstones in obese patients. Numerous studies have shown that the prevalence of gallbladder pathology, and especially gallstones, is three to five times higher in obese patients compared with the general population [1, 2, 4–11]. Weight loss associated with low-calorie diet, and especially rapid weight loss that follows bariatric surgery, further enhances the lithogenicity of the bile by increasing cholesterol secretion even more. Some bariatric procedures like Roux-en-Y gastric bypass (RYGBP) reduce the post-prandial level

of cholecystokinin, resulting in poor gallbladder emptying, and thereby altering the entero-hepatic circulation of biliary salts [2, 8, 12, 13]. These mechanisms also contribute to a higher risk of developing gallstones after bariatric surgery.

Because of the high prevalence of gallstone disease in morbidly obese patients and the high risk to develop gallstones during rapid weight loss after bariatric surgery, we decided to perform routine prophylactic cholecystectomy in our morbidly obese patients undergoing RYGBP, provided the intraoperative findings did not preclude a safe dissection. In this paper, we report the results of this policy with respect to safety, pre- and intraoperative findings, and histological findings, and discuss whether routine prophylactic cholecystectomy is justified during laparoscopic RYGBP.

Patients and Methods

Patients with a body mass index (BMI) in excess of 40 kg/m^2, or >35 kg/m^2 with at least one severe comorbidity, were offered laparoscopic Roux-en-Y gastric bypass after failure of conservative treatment and complete evaluation by a multidisciplinary team. Contraindications were according to the consensus development conference panel of the National Institute of Health and to the consensus on obesity treatment in Switzerland [14, 15].

Preoperative evaluation included, among others, upper gastrointestinal endoscopy and abdominal echography in all patients. The aim of the latter was to assess the size of the liver and to detect gallbladder stones. Gastroscopy was used to exclude gastro-duodenal lesions before Roux-en-Y gastric bypass and to detect *Helicobacter pylori* infection so as to eradicate it before surgery.

Our general policy was to offer concomitant cholecystectomy at the time of laparoscopic RYGBP to all patients. The presence of gallstones, symptomatic or not, was the reason in those in whom these were detected preoperatively by echography. In the remaining patients, the high incidence of gallstone formation after RYGBP, as reported in the literature, and the potential for long-term stone-related complications, was given as the reason for prophylactic cholecystectomy. No patient refused cholecystectomy. The patients were explained, however, that cholecystectomy would only be performed if the surgeon considered it safe at the end of the RYGBP in regards to local and general conditions of the patient.

Since the introduction of laparoscopic bariatric surgery in our department in December 1995, a prospective computerized bariatric database has been created, including preoperative patient's demographic and anthropometric data, comorbidities, operative and follow-up data. All patients undergoing laparoscopic RYGBP between January 2000 and August 2007 were included in this series. The charts of those operated between 2000 and 2004 were reviewed in details for data regarding the results of preoperative echography and histological examination of the gallbladder.

All patients were given prophylactic antibiotics (amoxicilline-clavulanate 2.2 g, or ciprofloxacine 200 mg and metronidazole 500 mg for those allergic to penicillin) intravenously at the induction of anesthesia. Prophylaxis against thromboembolism was started either the evening before surgery or at the induction of anesthesia using low-molecular-weight heparin at a dose that was adapted to the patient's body weight and pursued until the end of the second postoperative week. The surgical technique used for RYGBP included six trocars and has been described in details elsewhere [16]. After completion of gastric bypass and in the absence of any major intraoperative complication, the right upper quadrant was assessed for the feasibility of cholecystectomy. If exposure was deemed sufficient, and in the absence of severe adhesions surrounding the gallbladder, cholecystectomy was performed using the same trocars and instruments used for the primary procedure. No additional trocar was placed. Dissection of the gallbladder was performed using the Ultracision 10 mm (Ethicon Endo-surgery, 8957 Spreitenbah, Switzerland). No intraoperative cholangiography was performed. The gallbladder was delivered from the abdominal cavity through the 15-mm trocar incision, usually after transparietal puncture and aspiration of the bile. At the end of the procedure, a Jackson–Pratt drain was placed in the vicinity of the gastrojejunostomy, and a Penrose drain was left in the 15-mm trocar incision.

Results

A total of 772 patients underwent laparoscopic RYGBP as a primary bariatric procedure in our department between January 2000 and August 2007. There were 186 men and 586 women with a mean age of 39.8 years (extremes 18–66). The mean preoperative weight was 126.2 kg (86–227), and the mean BMI was 45.6 kg/m^2 (34–73.4). Fifty-eight (7.5%) of these patients had undergone prior cholecystectomy and were excluded from further analysis. In the remaining 714 patients, preoperative echography disclosed gallbladder stones in 81 patients (10.5%), and a small polyp of the gallbladder in one patient.

Cholecystectomy was performed at the time of laparoscopic RYGBP in 655 (91.7%) of these 714 patients. The indication was asymptomatic gallstones in 79 patients and routine prophylaxis of postoperative cholelithiasis in the others. Among the latter patients, with normal preoperative findings on transabdominal echography, 25 (3.9% false negative findings) were found to have gallstones intraoperatively. The

total prevalence of gallstones in the entire series was therefore 21.2%. Cholecystectomy was not performed in two patients with known asymptomatic cholelithiasis because exposure in the right upper quadrant was considered insufficient. In the remaining 54 patients, poor visibility was the reason for not performing cholecystectomy in 47 patients and liver cirrhosis discovered at surgery in four. Three patients, who were Jehovah witnesses, were not submitted to cholecystectomy to avoid any associated risk of hemorrhage. Patients who did not undergo cholecystectomy at the time of surgery were prescribed ursodesoxycholic acid orally for 6 months.

The mean age of patients with gallstones at RYGBP or a history of prior cholecystectomy was significantly greater than that of patients without gallstones (43.5 versus 38.7 years, $p<0{,}0001$, t test). There was no difference between the two groups regarding preoperative weight, BMI, or waist circumference. Patients who underwent concomitant cholecystectomy at the time of laparoscopic RYGBP were younger (38.9 versus 44.6 years, $p<0{,}0001$, t test), had a slightly lower BMI (45.4 versus 46.7 kg/m^2, $p=0.04$, t test), and a lower weight (125.4 versus 130.9 kg, $p=0.01$, t test) than those in whom cholecystectomy was not performed. The mean overall duration of surgery was significantly shorter in patients with concurrent cholecystectomy than in the remaining ones (142.6 versus 158.6 min, $p=0.0001$, t test). This mostly reflects the greater overall technical difficulties encountered during the performance of gastric bypass in patients in whom cholecystectomy was deemed too risky. In a consecutive group of 100 patients, the additional time required for cholecystectomy was monitored and found to be 19 min (5–45 min). Cholecystectomy was associated with no specific morbidity, except for one accidental puncture of the junction of the cystic duct and the common bile duct by a clip in a patient with gallstones. The latter was immediately closed with a single stitch without any short- or long-term consequence. There was no difference in the duration of hospital stay between patients with and without concomitant cholecystectomy (median 4 days in both groups).

Between 2000 and 2004, 351 patients underwent prophylactic cholecystectomy during laparoscopic RYGBP, 257 women and 94 men, with a mean age of 41.1 years (19–60 years). Their mean BMI was 45.7, similar to that of the whole series. Twenty-eight patients had had prior cholecystectomy, and cholecystectomy was deemed risky and therefore not performed during RYGBP in 38 patients. Cholecystectomy was therefore performed during RYGBP in 285 patients. In those who still had their gallbladder in place, preoperative echography showed stones in 54 patients (17%). The gallbladder could not be visualized on preoperative ultrasound examination in five patients (1.6%) because of technical difficulties. Table 1 shows the findings of the pathological examination of the gallbladder in this group. The latter was totally normal in only 52 (18.2%) patients. The most common findings were chronic cholecystitis in 180 patients (63.8%), followed by cholesterolosis in 144 (51%). There was no relationship between histological findings and age or BMI. Gallstones (5:4) and cholesterolosis (4:3) were more common in women, whereas chronic cholecystitis was more prevalent in men (7:6).

Table 1 Results of histopathological examination of the gallbladder

Type of lesion	Number (%)	Sex ratio
Chronic cholecystitis (CC)	180 (63.8)	133/47
Cholesterolosis	144 (51.0)	116/28
CC + cholesterolosis	94 (33.3)	73/21
Unknown gallstones	11 (3.9)	6/5
Cholesterol polyp	2 (0.7)	0/2
Metaplasia	3 (1.0)	2/1
Dysplasia	1 (0.3)	0/1
Adenomyosis	1 (0.3)	1/0
Total abnormal	230 (81.6)	156/73

Discussion

Our results show that almost routine cholecystectomy at the time of laparoscopic RYGBP is very safe, that echography can be misleading, and that the vast majority of gallbladders in morbidly obese patients show histopathological abnormalities.

According to the literature, the prevalence of gallstones in morbidly obese patients varies between 19 and 45% [1, 4, 6, 8, 9, 13, 18, 19], and up to 25% of patients have undergone cholecystectomy before bariatric surgery. Our results grossly fall within these ranges. Dittrick et al. [19] compared gallbladder histopathological findings in 478 morbidly obese patients with a control group of 481 liver donors. Seventy-two percent had abnormal findings at histological examination in the obese group, compared with 21% in the liver donors. Liem and Niloff [18] found abnormalities in 75% of gallbladders routinely removed in 141 patients and Aidonopoulos 97% in 64 patients. In 761 patients undergoing RYGBP reported by Fobi et al. [8], the incidence of gallbladder pathology was 86.2%.

Rapid weight loss after bariatric surgery is associated with an even greater risk to develop gallstones than obesity per se. Deitel and Petrov [20] reported an 11.5% incidence after bariatric surgery, and Kamrath et al. [21] noted 10.3% symptomatic gallstones with a very low calorie diet. Shiffman et al. [12] reported that 49% of 81 patients developed gallstones or sludge within 6–18 months of RYGBP, 28% of them requiring cholecystectomy. Schmidt et al. [6] found that 40% had developed cholelithiasis and/or required cholecystectomy after RYGBP. Amaral and

Thompson [10] reported a 27.6% incidence of complications related to gallstones after bariatric surgery, including common duct stones and pancreatitis. Some form of prophylaxis seems therefore warranted. A survey of members of the ASBS totaling more than 8,000 patients showed that 40% still had their gallbladder after the bariatric procedure and were, therefore, at risk to develop gallstones [1].

Another way to prevent gallstones after bariatric surgery is chemoprophylaxis with ursodeoxycholic acid (UDA) during rapid weight loss. In a randomized study, Sugerman et al. [22] showed that a 6-month course of this drug was superior to placebo (2 vs 32%). UDA is also effective with low-calorie diet [23]. Compliance may be limited, but the drug has been shown to be cost-effective [24, 25].

Recently, routine prophylactic cholecystectomy during RYGBP has been challenged by several authors, arguing that the risks might outweigh the benefit, but also because newer studies reported a much lower incidence of gallstones, especially symptomatic ones. Hamad et al. [17] found that in a group of 94 patients, cholecystectomy during laparoscopic RYGBP prolonged surgery by more than an hour and hospital stay by more than 1 day. Our results are not in accordance with the above regarding duration of surgery and hospital stay. Another group recently found simultaneous cholecystectomy to prolong surgery by a mean of 29 min, with no effect on hospital stay [26], and Villegas et al. [27] reported the additional operative time devoted to cholecystectomy to be 20 min, very similar to ours. In the same series, 45% of the patients without cholecystectomy were found to have developed gallstones or sludge within 6 months of RYGBP, but only one fourth of these patients (7.3% of the total) developed stone-related symptoms including cholangitis and septic shock. Patients compliant with drug prevention developed fewer stones. In the study of Hamad et al. [17], only eight patients (2.3%) who did not undergo cholecystectomy developed symptomatic stones during a 12-month follow-up. Another group recently reported on a large group of RYGBP patients without prophylaxis, of whom 8.1% developed gallstone-related symptoms and eventually required cholecystectomy. Both authors concluded that the incidence of symptomatic gallstones was low and that routine cholecystectomy was probably not mandatory [28].

Clearly, rapid weight loss after RYGBP is associated with a markedly increased prevalence of gallstones and gallbladder histopathological abnormalities, which may predispose to gallstones. The advantage of routine prophylactic cholecystectomy in RYGBP patients is that it reduces to zero the risk to develop gallbladder stones and their possible complications. This must be balanced with the risks associated with cholecystectomy. Laparoscopic cholecystectomy is safe in obese patients [29–31]. In patients undergoing laparoscopic RYGBP, placement of the trocars is not ideal for cholecystectomy and may make it more difficult. In our series, however, cholecystectomy, when attempted, could always be completed without complication.

Cholecystectomy has been associated with a variety of postoperative gastrointestinal symptoms, with major changes reported in up to 12% of patients [32–34]. Results from different studies, however, are inconsistent. Severe diarrhea is extremely rare after cholecystectomy. The fear to cause post-cholecystectomy symptoms should not be a reason for avoiding cholecystectomy during RYGBP.

In conclusion, the incidence of gallbladder pathology is high. Without any form of prophylaxis, gallstones develop in a significant number of patients after RYGBP, and there seems to be a consensus on the need for prevention. We can recommend prophylactic cholecystectomy as a safe method in the majority of patients, provided exposure of the gallbladder area is sufficient. In the remaining patients, a 6-month course of ursodeoxycholic acid at 600 mg daily seems adequate. Only a large prospective randomized trial comparing cholecystectomy at the time of RYGBP with a 6-month pharmacological prevention will answer the question as to which method is superior for gallstone prophylaxis after RYGBP.

References

1. Mason EE, Renquist KE. Gallbladder management in obesity surgery. Obes Surg. 2002;12:222–9.
2. Faloon WW. Hepatobiliary effects of obesity and weight-reducing surgery. Semin Liver Dis. 1988;8:229–36.
3. Marzio L, Capone F, Neri M, et al. Gallbladder kinetics in obese patients. Effect of a regular meal and a low-calorie meal. Dig Dis Sci. 1988;33:4–9.
4. Aidonopoulos AP, Papavramidis ST, Zaraboukas TG, et al. Gallbladder findings after cholecystectomy in morbidly obese patients. Obes Surg. 1994;4:8–12.
5. Papavramidis S, Deligianidis N, Papavramidis T, et al. Laparoscopic cholecystectomy after bariatric surgery. Surg Endosc. 2003; 17:1061–64.
6. Schmidt JH, Hocking MP, Rout WR, Woodward ER. The case for prophylactic cholecystectomy concomitant with gastric restriction for morbid obesity. Am Surg. 1988;54:269–72.
7. Worobetz LJ, Inglis FG, Shaffer EA. The effect of ursodeoxycholic acid therapy on gallstone formation in the morbidly obese during rapid weight loss. Am J Gastroenterol. 1993; 88:1705–9.
8. Fobi MAL, Lee H, Igwe D, et al. Prophylactic cholecystectomy with gastric bypass operation: incidence of gallstone disease. Obes Surg. 2002;12:350–53.
9. Dittrick GW, Thompson JS, Campos D, et al. Gallbladder pathology in morbid obesity. Obes Surg. 2005;15:238–42.
10. Amaral JF, Thompson WR. Gallbladder disease in the morbidly obese. Am J Surg. 1985;149:551–7.
11. Carey MC. Pathogenesis of gallstones. Am J Surg. 1993;165: 410–19.
12. Shiffman ML, Sugerman HJ, Kellum JM, et al. Gallstone formation after rapid weight loss: a prospective study in patients

undergoing gastric bypass surgery for treatment of morbid obesity. Am J Gastroenterol. 1991;86:1000–5.
13. Brandao de Oliveira CI, Chaim EA, Borges da Silva B. Impact of rapid weight reduction on risk of cholelithiasis after bariatric surgery. Obes Surg. 2003;13:625–8.
14. Consensus development conference panel: gastrointestinal surgery for severe obesity: consensus development conference statement. Ann Intern Med. 1991;115:956–61.
15. Consensus sur le traitement de l'obésité en Suisse. Schweiz Med Wochenschr. 1999;129 Suppl 114:4–20S.
16. Suter M, Giusti V, Héraief E, Zysset E, Calmes JM. Laparoscopic Roux-en-Y gastric bypass. Initial 2-year experience. Surg Endosc. 2003;17:603–9.
17. Hamad G, Ikramuddin S, Gourash WF, Schauer PR. Elective cholecystectomy during Roux-en-Y gastric bypass: is it worth the wait? Obes Surg. 2003;13:76–81.
18. Liem RK, Niloff PH. Prophylactic cholecystectomy with open gastric bypass operation. Obes Surg. 2004;14:763–5.
19. Guadalajara H, Sanz Baro R, Pascual I, et al. Is prophylactic cholecystectomy useful in obese patients undergoing gastric bypass? Obes Surg. 2006;16:883–5.
20. Deitel M, Petrov I. Incidence of symptomatic gallstones after bariatric operations. Surg Gynecol Obstet. 1987;164:549–52.
21. Kamrath RO, Plummer LJ, Sadur CN, et al. Cholelithiasis in patients treated with a very low calorie diet. Am J Clin Nutr. 1992; 56:255–7S.
22. Sugerman HJ, Brewer WH, Shiffman ML, et al. A multicenter, placebo-controlled, randomized, double-blinded, prospective trial of prophylactic ursodiol for the prevention of gallstone formation following gastric bypass induced rapid weight loss. Am J Surg. 1995;169:91–7.
23. Shiffmann ML, Kaplan GD, Brinkman-Kaplan V, et al. Prophylaxis against gallstone formation with ursodeoxycholic acid in patients participating in a very low calorie diet program. Ann Intern Med. 1995;122:899–905.
24. Wudel LJ, Wright JK, Debelak JP, et al. Prevention of gallstone formation in morbidly obese patients undergoing rapid weight loss: results of a randomized controlled pilot study. J Surg Res. 2002;102:50–6.
25. Shoheiber O, Biskupiak JE, Nash DB. Estimation of the cost savings resulting from the use of ursodiol for the prevention of gallstones in obese patients undergoing rapid weight reduction. Int J Obes. 1997;21:1038–45.
26. Ahmed RA, O'Malley W, Johnson J, Boss T. Cholecystectomy during laparoscopic gastric bypass has no effect on duration of hospital stay. Obes Surg. 2007;17:1075–9.
27. Villegas L, Schneider B, Provost D, et al. Is routine cholecystectomy required during laparoscopic gastric bypass? Obes Surg. 2004;14:206–11.
28. Portenier DD, Grant JP, Blackwood HS, et al. Expectant management of the asmptomatic gallbladder at Roux-en-Y gastric bypass. SOARD. 2007;3:476–9.
29. Gatsouolis N, Koulas S, Kiparos G, et al. Laparoscopic cholecystectomy in obese and nonobese patients. Obes Surg. 1999;9:459–61.
30. Simopoulos C, Polychronidis A, Botaitis S, et al. Laparoscopic cholecystectomy in obese patients. Obes Surg. 2005; 15:243–6.
31. Angrisani L, Lorenzo M, De Palma G, et al. Laparoscopic cholecystectomy in obese patients compared with nonobese patients. Surg Laparosc Endosc. 1995;5:197–201.
32. Sauter GH, Moussavian AC, Meyer G, et al. Bowel habits and bile acid malapsorption in the months after cholecystectomy. Am J Gastroenterol. 2002;97:1732–5.
33. Fort JM, Azpiroz F, Casellas F, et al. Bowel habits after cholecystectomy: physiological changes and clinical implications. Gastroenterology. 1996;111:617–22.
34. Hearing SD, Thomas LA, Heaton KW, Hunt L. Effects of cholecystectomy on bowel function: a prospective, controlled study. Gut. 1999;45:889–94.