Prevention or Surgical Treatment of Gallstones in Patients Undergoing Gastric Bypass Surgery for Obesity

Jayaprakash Sreenarasimhaiah, MD

Address
University of Texas Southwestern Medical Center, 5323 Harry Hines Boulevard, MC 8887, Dallas, TX 75390-8887, USA.
E-mail: jayaprakash.sreenarasimhaiah@utsouthwestern.edu

Current Treatment Options in Gastroenterology 2004, 7:99–104
Current Science Inc. ISSN 1092-8472
Copyright © 2004 by Current Science Inc.

Opinion statement
It is well known that obesity is a risk for gallstone formation and biliary sludge. Additionally, it has been clearly shown that rapid weight loss following bariatric surgery is a risk factor for cholesterol cholelithiasis. Multiple serious complications from gallstones such as cholecystitis, cholangitis, gallstone pancreatitis, and cholecystenteric fistulae may occur. Thus, it is necessary to employ medical or surgical methods to prevent or treat gallstones in this group. Therapy should be individualized. Although there is a high incidence of gallstones in this group, only a minority of individuals will develop symptomatic disease. When used in patients who are compliant, ursodeoxycholic acid therapy can be effective to prevent gallstone formation during rapid weight loss. The cost effectiveness of routine ursodeoxycholic acid therapy compared with the potential costs of complicated gallstone disease needs to be further investigated. Combined cholecystectomy with Roux-en-Y gastric bypass surgery is a safe and appropriate therapeutic option in those with preoperatively known gallstones, biliary sludge, and prior episodes of cholecystitis. However, routine cholecystectomy at the time of gastric bypass surgery is not warranted for all patients because of the increased time of operation and postoperative hospitalization, as well as all the potential complications after cholecystectomy. The approach of routine cholecystectomy in this setting subjects many patients to an unnecessary procedure because the majority will not develop symptoms or complications of gallstones. Furthermore, cholecystectomy is technically easier to perform after weight loss occurs.

Introduction
Cholelithiasis is one of the most common disorders worldwide. In the United States, cholecystectomy has become the most common elective surgical procedure [1]. Although there are many risk factors, obesity has long been known to predispose to gallstone formation. The relationship of obesity with cholesterol metabolism is the suspected mechanism but is not well understood. Moreover, rapid weight loss that results from bariatric surgery has been identified as a compounding risk for cholesterol cholelithiasis [2]. Well recognized is the fact that gallstones can lead to a wide range of complications and often require definitive management. Thus, it is imperative that either medical or surgical methods be employed to prevent or treat gallstone disease in this high-risk population. This review elucidates the risks for cholesterol gallstone formation in those undergoing bariatric surgery for obesity. The efficacy of medical therapy to prevent gallstone formation or complications is also examined. Furthermore, the risks, benefits, and timing of cholecystectomy in this setting are discussed.

Roux-en-Y gastric bypass (RYGB) has become the most commonly performed surgical therapy for morbid
obesity. Guidelines established by a National Institutes of Health Consensus Conference in 1985 defined morbid obesity as a body mass index (BMI) in excess of 40 kg/m². In addition to this group of patients, those with a BMI of 35 kg/m² who have weight-related co-morbidities such as diabetes and hypertension are also frequently candidates for RYGB surgery [2,3]. The operation involves the creation of a small-volume gastric pouch of less than 30 mL and does not involve any portion of the gastric fundus, which has the potential to stretch. A small anastomosis from the gastric pouch is created to a loop of jejunum to limit rapid pouch emptying. The Roux limb can be of variable length but is usually 75 cm (Fig. 1) [4,5]. Weight loss is achieved by a combination of restricted food volumes and clinically undetectable malabsorption. Caloric restriction is a major consequence of RYGB surgery, resulting in consumption of only 400 to 600 kcal/d soon after surgery and not exceeding 1200 kcal/d after 6 months. On average, a reduction in BMI of 16.4 kg/m² is achieved by 1 year and approximately 35% of initial weight is lost by 18 to 24 months [6].

There are many risk factors for gallstone formation. The most common ones include female gender, pregnancy, increased parity, hypertriglyceridemia, and obesity [7]. The prevalence of gallstones in morbid obesity has been estimated to be 21.6%, which is significantly higher than the average population. The Nurses’ Health Study showed a sevenfold increased risk for gallstone formation in those women with a BMI exceeding 45 kg/m² [8]. Additionally, many obese individuals have decreased gallbladder contractility responsiveness to cholecystokinin compared with non-obese persons [8*•].

In obese states, secretion of cholesterol into bile is increased due to higher 3-hydroxy-3-methylglutaryl coenzyme A (HMG CoA) reductase activity. Subsequently, hepatic cholesterol biosynthesis is increased, giving a theoretical potential to therapy with cholesterol-lowering agents [9]. Increased hepatic cholesterol synthesis results in a rise of bile cholesterol–saturation index that is proportional to BMI but independent of other variables such as ethnicity, gender, or age [10]. Morbidly obese individuals have also been shown to have increased levels of mucin within the gallbladder, which accelerates the growth of cholesterol monohydrate crystals into gallstones. Arachidonic acid and its precursors have been implicated as mediators of increased mucin production [11,12]. This has subsequently led to trials using prostaglandin inhibitors such as ibuprofen or aspirin to prevent gallstone formation in this high-risk group.

Rapid weight loss from morbidly obese states can also precipitate gallstone formation as early as 3 months after surgery. It has been postulated that during rapid weight loss, cholesterol is mobilized from tissue stores to be secreted into bile. Several studies have demonstrated that the bile cholesterol–saturation index increases during rapid weight loss or prolonged fasting [2,8••]. During caloric restriction, increased hepatic secretion of cholesterol results in the supersaturation of bile. Additionally, gallstone formation may be influenced by reduced gallbladder contractility and excess production of mucin, which stimulates cholesterol crystal nucleation. Weight loss induced by bariatric surgery carries an increased risk of gallstone formation, particularly in those procedures that result in malabsorption. Multiple studies have suggested that new stones form following RYGB surgery in around 40% of cases (range, 28% to 71%) [13]. Despite the high incidence of gallstones in this group, only around one in nine patients (11%; range, 2.8% to 33%) become symptomatic, necessitating cholecystectomy [14].

In one study of 761 patients who underwent gastric bypass surgery, the prevalence of gallbladder pathology was 86.2%. Additionally, 12.35% of patients with negative preoperative gallbladder ultrasound examinations had cholelithiasis discovered in gallbladder specimens obtained during prophylactic cholecystectomy [15]. However, not all gallbladder abnormalities will become symptomatic and necessitate cholecystectomy. O’Brien and Dixon [13] performed laparoscopic adjustable gastric banding in 1000 patients and followed them for a median of 42 months as they continued to lose weight. Only 6.8% of this group developed symptomatic gallstone disease or treatment. The authors acknowledge that the RYGB procedure may carry a higher risk for gallstone formation due to malabsorption and more rapid early weight loss.

Medical therapy for gallstones has not been as definitive as cholecystectomy but has had some efficacy, particularly in prophylaxis. Ursodeoxycholic acid has been used in both treatment and prevention of gallstones because of its ability to enhance cholesterol solubility. A multicenter, randomized, placebo-controlled trial by Sugerman et al. [16] examined the efficacy of varying

---

**Figure 1.** Roux-en-Y gastric bypass diagram. This figure shows the creation of a small-volume gastric pouch. The gastrojejunostomy is usually a fixed diameter of approximately 1 cm. The distance between the proximal (gastrojejunostomy) and distal (duodenoejunostomy) anastomosis can vary from 50 to 75 cm in length.