



Gallstone Formation Prophylaxis after Bariatric Surgery: Experience in Saudi Arabia

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ABSTRACT

Background: The incidence of gallstones formation association with the obesity epidemic and rapid weight loss is dramatically increasing in recent years. Therefore, the aim of the review of literature was to discuss the gallstone formation prophylaxis and weight loss procedure with especial focus to the available related literature from Saudi Arabia. **Methods:** A review of the literature was made using the most common electronic sources including: electronic database, EMBASE, MEDLINE search using keywords: gallstones, bariatric surgery, weight loss, and Saudi Arabia. The major outcomes gained were related with the different procedure associated with bariatric surgeries to find out possible predictive factors for the development of gallstone and prevention measures. **Conclusion:** Although there a gap in literature from Saudi Arabia, the real movement towards a more conservative attitude in the gallstone formation prophylaxis after bariatric surgery needs more physicians to be involved to face the increasing biliary complications.

Keywords: Gallstone prophylaxis, Saudi Arabia, Weight loss, Bariatric surgery

INTRODUCTION

Obesity or over weight is a rising health problems in the Kingdom of Saudi Arabia (KSA) [1-3]. There are more than 75% of the total Saudi affected by obesity and overweight. More or less all age groups are touched in general and adults in particular [4-7]. Obesity among adult males and females were (14% and 23.6%) respectively, while Overweight among adult males and females were (30.7% and 28.4%) correspondingly [5]. Prevalence of obesity and overweight among children and adolescent 5-18 years was 11.3%, 23.1% respectively [8].

In recent years there is an increasing number of patients referred for surgical treatment of their obesity in Saudi Arabia [9], which has raised the problem gallstones disease. The prevalence of cholesterol gallstones is high among obese persons. Weight loss further increases the risk of gallstones: the prevalence of new gallstones reaches more than 30% within 12-18 months after gastric by-pass surgery. The increased occurrence of stones is commonly because of supersaturation of bile with cholesterol, due to an increased synthesis by the liver and secretion into bile. Known risk factors for gallstones through weight loss are a relative loss of weight more than 24% of original body weight, a proportion of weight loss more than 1.5 kg per week, a very low-calorie diet with no fat, result in a high serum triglyceride level, particularly overnight [10].

Ursodeoxycholic acid reduces cholesterol saturation of bile and gallstone occurrence throughout weight loss. Additional preventive options include a control of weight loss rate, a decrease of the extent of overnight fast, and uptake of a minor quantity of fat in the diet [10].

The purpose of this review was to summarize the key evidences in term of weight loss and its associated surgical

procedures, gallstone incidence, gallstone formation prophylaxis when a patient had a bariatric procedure, and subsequent management. This was done with specific focus in literature from Saudi Arabia.

Obesity and gall-bladder diseases

Obesity is global health problem leads to many life-threatening illnesses, including cardiovascular disease, diabetes mellitus, and metabolic syndrome. In obesity fats infiltration various organs and the infiltrated fats secrete many cytokines leading to the dysfunction of organs such as the gallbladder. Several studies have reported that, obesity, insulin resistance, hyperinsulinemia, and metabolic syndrome are correlated with different gallbladder diseases such as gallbladder stones, cholecystitis, gallbladder polyps, and even gallbladder cancers [11,12].

The most commonly performed weight loss procedures

Adjustable gastric band: This is restricting technique, which the stomach is bounded with a silicone band immediately below the cardia to generate a proximal small pocket, combined to the greater stomach via a communication with adjustable caliber, which can be adjusted by injecting fluid into a subcutaneous port. The likely excess of weight loss is 45% to 55% in the long term. In this procedure procedures there are no metabolic mechanisms in the peri-operative days, the alimentary transit passes via the duodenum, so the main lithogenic consequence is employed by the change in the meal contents (mostly composed of protein instead of fat), and decreasing of overall chime volume. The above factors contribute to the occurrence of gallstones together with the elevated secretion of cholesterol into the bile, associated with the weight loss [13].

Vertical banded gastroplasty: This is an old procedure performed mainly before the introduction of laparoscopy and of linear cutting-stapler. It is restrictive procedure with likely excess of weight loss is 55% to 60% and same impact in term of gallstones formation. The frequency of gallstone formation after vertical banded gastroplasty was stated to be considerable higher (up to 7%) [14-16].

Roux-En-Y gastric bypass: It shrinks of the stomach volume by creating a small (25 cc to 30 cc) gastric pouch instantly beneath the cardia, with the bypass of the foregut (duodenum and 40-70 cm of jejunum). This method gives good outcomes in in relation to weight loss (WL 65% to 75%), with a relatively minor side effects. The incidence of gallstones formation subsequent to this surgical method differs from 6.7% to 52.8% [17-20]. There are several mechanisms impaired in the gastric bypass that can be responsible for gallstone formation: The decrease of the gastric volume is accompanied with a complete diversion of the duodenum [21]. It is still imprecise if the division of the vagus nerve could be accountable for an additional risk of biliary stones in association with a reduced motility of the gallbladder. The gastric bypass procedure commonly results in an inconstant weight loss. This intense weight loss leads to peripheral fat mobilization and its augmented excretion into the biliary ducts, accordingly supersaturating the bile. Bariatric surgery and the gastric bypass in particular, leads to a reduction in fluid intake, therefore increasing the risk of precipitating crystals both in the biliary and renal districts [22].

Sleeve gastrectomy: It was believed to be the first step of a two performed bilio-pancreatic diversion, permitting the super-obese patient to lose abundant weight to decrease the risk for the second (more invasive) surgery. This procedure provides excellent outcomes as an independent procedure with weight loss of 60% to 65%. The gastric emptying following sleeve gastrectomy lead to a fast passage via the foregut, thus allowing to speculate it could be measured functionally as a gastric bypass [23,24]. This is possibly the cause for a slightly, but significant, lower incidence of gallstones post-surgery as reported before [25].

Bilio-pancreatic diversion or duodenal switch: This procedure provides a weight loss of 75% to 85%. These outcomes result from the selective malabsorption of meal contained fats. The possible side effects of this procedure include: protein malnutrition, lipid soluble vitamin and calcium deficiencies. The steatorrhea commonly related to this procedure leads to an overall loss of micelles containing as well as, biliary acids with subsequent impairment of the enterohepatic circuit. The decrease in the whole concentration of the biliary acids would ultimately upsurge the risk determined by the supersaturation of the bile [26].

Weight loss and gallstone formation

Obesity is accompanied by excess bile stasis and cholesterol saturation, and an elevated risk of gallstone formation. On the contrary, bile opus is regulated after reduction in body weight. It would appear advantageous to Promoting

weight loss in obesity however, would decrease the tendency to gallstone formation. In spite of the impending health advantages of weight reduction, very-low-calorie diets seem to rise up the risk for cholesterol crystal and gallstone formation. The frequency of gallstone formation appears to be rely on the degree of caloric control, the rate of weight loss, and the period of the dietary interfering. Existing data suggest that newly formed gallstones in active weight loss individuals arise within 4 weeks and with incidence rates 15 to 25-fold greater than in the general obese population. The gallstones yield symptoms in about one-third of the patients, of whom around one-half will be referred surgical treatment. Suspected processes underlying gallstone formation during weight reduction comprise increased biliary cholesterol saturation secondary to increased cholesterol mobilization, bile stasis due to low caloric consumption, and elevated nucleation because of the fluctuations in bile arachidonate and glycoprotein concentrations. There is a lack of data regarding the special effects of gradual weight loss rates and risk of gallstone formation [27].

Prevention of gallstone formation

Even with the widespread agreement for the existing management of the biliary prophylaxis, there is no consensus on how to prevent the gallstones formation, and there is still a lack of evidence on whether it could be well-meaning to suggest a medical prophylaxis. Moreover, with the increasing number of patients requiring bariatric surgery, creating a closer collaboration between physicians and bariatric surgeons is important toward best handling this issue. Additionally, awareness considering the prevention of gallstones is deemed important. Several reports have indicated high incidence rates of cholecystectomies after surgically induced weight loss procedures [28-31]. These might be done irrespective to the increased rate of complications and this recommends the establishment of at least a medical prevention using bile acids analogues. Indeed, these drugs revealed worthy outcomes in dropping the occurrence of gallstones following a significant weight loss as reported in earlier studies [32-35]. The main worries for a wide-ranging distribution of such drugs are denoted by costs and lack of compliance to the therapy, but there are no quarrels against their usage, despite a shortage of data about side effects in the obese population. Once a medical prevention is recognized, precise measurement of dose aligned with the previous surgical procedure is recommended, since a mal-absorptive method would need a higher dose than usual because of the extra noticeable reduction of the biliary acids in these patients [36].

In light of the latest guidelines for the three most common procedures: adjustable gastric bands (AGB); sleeve gastrectomy (SG); and roux-en-Y gastric bypass (GBP). The risk of nutritional deficiencies is strongly associated with the proportion of weight loss and the type of surgical procedure implemented. Purely restrictive procedures (AGB, SG), for example, can induce digestive symptoms, food intolerance because of the peri-surgical eating complaints. GBP also has a slight malabsorptive constituent. The Key points for whatever the bariatric procedure include: mineral and multivitamin supplementation; prevention of gallstone formation with the usage of ursodeoxycholic acid; and regular follow up of all patients. Pre-operative therapeutic patient education (TPE) programs, including a new multidisciplinary attitude based on patient-centered education, may be valuable for greater patients' long-term compliance, which is usually deprived [36].

Ursodeoxycholic Acid (UDCA)

UDCA and high fat weight loss diets may be regarded as a primary gallstones formation prophylaxis during weight loss. The number of patients who developed gallstones in the UDCA was 5% compared to control group 23% [37]. This is consistent with the reduced cholesterol supersaturation of bile, the physio-chemical requirement for reducing gallstone formation risk [38].

An essential attention is when to start prophylactic treatment. Non-surgical trials prompted UDCA therapy instantaneously on calorie restriction, while bariatric surgery trials commenced UDCA within days.

UDCA reduces gallstone formation occurrence from 19% to 3% in the diet only trials and from 28% to 9% in the post-bariatric surgery trials. A curvilinear link between the rate of weight loss in obese people and the frequency of gallstones formation has been witnessed [39], with a weekly maximum of 1.5 kg being considered as ideal to limit the risk. Additional evidence shows that a weight loss more than 25% of the body weight rises gallstone risk significantly [40], and this was perceived in three of the bariatric surgery trials but none of the diet only trials. Moreover, variances in intestinal and/or gallbladder motility, which may be controlled by UDCA [41,42], could have contributed to these variations, with only some of the involved trials reporting better gallbladder shrinkage on UDCA administration [19,43,44]. The perceived heterogeneity between trials principally imitates variances between the bariatric surgery

trials. This might be due to disparities in UDCA dosage or extent of the treatment (range, 12-72 weeks) and follow up (12-96 weeks). Moreover, post-surgery diet strategies might have varied in terms of caloric constituents and energy content. A weight-decreasing diet rich in fat (19% to 30%) lowered the frequency of gallstones compared to that with lower fat content (3% - 5%) [28,45].

On the other hand, most studies were incapable the timing of the development of symptomatic gallstones, but some studies have presented the use of UDCA to reduce the risk of cholecystectomy [46,47]. Furthermore, a latest meta-analysis reported that prophylactic cholecystectomy during laparoscopic gastric bypass should be averted in patients without gallstones due to the little inevitability of consequent cholecystectomy (<7%) [48]. In respect to the cost viewpoint, the option to do cholecystectomy to prevent gallstones formation, particularly in obese patients undergoing weight loss, depends on the rate of gallbladder-associated symptoms afterward surgery. In a study followed 13,443 patients after bariatric surgery for period of 22 years indicated a low frequency of gallstones, and the majority of patients were asymptomatic [49]. Consequently, a conservative non-surgical attitude for gallstone prevention may be favored. It is likely that the reduced compliance reflects the challenges in following the weight loss diets rather than the interventions for primary gallstone prevention.

Nevertheless, the current high incidence rates of gallstones associated with both the obesity epidemic and weight loss interventions requires non-surgical preferences for the primary prevention of gallstones, which presently persist underused. Evidence-based guidelines are required to guide preventive interventions for clinical practice. UDCA and/or a diet higher in fat might lower the general risk of gallbladder stones formation throughout weight loss. Future studies involving a combination of clinical and genetic factors [50,51] might help in the accurate identification of the patients who are at highest risk of symptomatic stones and likely to gain more benefit from non-surgical gallstone formation prophylaxis.

Gallstones formation prophylaxis in Saudi Arabia

In recent years there is a rapid increase in the number of bariatric surgeries in Saudi Arabia due to the great increase in the incidence of obesity and its associated weight loss desires. Unfortunately, this dramatic increase of surgical weight loss treatment is continued to be faced by deep lack of published literature from Saudi Arabia. Therefore, the following section was intended to highlight the available studies from Saudi Arabia in this context.

In study performed 39 vertical banded gastroplasty operations for treatment morbid obesity, the mortality rate was 2.5%, whereas the failure rate reached 13% [52]. Another study from Saudi Arabia involved 18 morbid and super-obese patients were subjected to laparoscopic adjustable silicone gastric banding. No major operative complications were faced, and the patients completed a good postoperative recovery after this procedure [53]. In a study evaluated the advantage of preoperative endoscopy in morbidly obese patients who have intended to undertake bariatric surgery. The medical records of morbidly obese patients underwent flexible esophagogastroduodenoscopy (EGD) prior to the weight-reduction surgery were reviewed. The endoscopic findings and demographic data were recorded and analyzed. The data suggested that it might be necessary to do preoperative EGD in patients undertaking bariatric surgery, although it perhaps will not change the surgical intervention [54]. Another study from Saudi Arabia targeting the post bariatric patients from April 2011 to October 2011 to address the prevalence and patient's desire for body contouring procedures. The study concluded that with the growing number of weight loss surgeries, there is higher number of patients' desire a body contouring surgery, which make massive disparity between request and availability [55]. Another study highlighted experiences of obesity, its apparent causes and reasons for surgery, as described by seven 7 Saudi women intending bariatric surgery. The women experienced cultural restrictions on their physical and social activities. Obesity personified these restrictions, appealing stigma and moral failure. Traditional clothing, foods, hospitality norms and limited outdoor female activities were considered as barriers to weight loss. Bariatric surgery was chosen to protect health and to access normative female roles. Some were encouraged by relatives who had undertaken surgery [56].

A recent study from Saudi Arabia has established clinical guidelines in order to help health-care providers to manage problems obesity and overweight at all levels. This guideline was adapted from Scottish Intercollegiate Guidelines Network for management of obesity after taking permission in this regard. The guidelines cover preventive and curative aspects of overweight and obesity and could be employed at primary, secondary, and tertiary care levels in Saudi Arabia. The study indicated that the role of bariatric surgery as part of the overall management pathway

for obesity in adults has been inspected. Health advantages, harms, and factors affecting efficacy have been well-thought-out. Bariatric surgery should be involved as part of an overall clinical pathway for adult weight management. Bariatric surgery should be part of a program of care that is provided by a multidisciplinary team comprising surgeons, dietitians, nurses, psychologists, and physicians. There should be close communication between health professionals for effective management of patients' comorbidities as weight loss befalls. Specialist psychological/psychiatric opinion should be pursued as to which patients require assessment/ treatment prior to or after surgery [57].

CONCLUSION

Gallstones formation nowadays is a common problem occurs after rapid weight loss, mainly after bariatric surgery. Gallstone formation prophylaxis measures and potential associated complications are still debated. Gallstone formation prophylaxis measures, however, should be determined in agreement with patient status (evaluated clinically and by routine ultrasound) and the type of bariatric surgery. Cholecystectomy should be implemented in patients with symptomatic gallstones regardless of the scheduled operation. In other settings, ursodeoxycholic acid should be given postoperatively for six months.

Although there a gap in literature from Saudi Arabia, the real movement towards a more conservative attitude in the gallstone formation prophylaxis after bariatric surgery needs more physicians to be involved to face the increasing biliary complications.

Authors Contributions

BAA, HGA: Conception and design of the work; Drafting the work; Final approval of the version to be published; and Agreement for all aspects of the work.

HAA, ASA, AKA, MZA, ASA, RYB, MAZ and MMSB: Conception and design of the work; Acquisition and interpretation of data; Final approval of the version to be published; and Agreement for all aspects of the work.

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