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Biliary Disorders in Morbidly Obese Patients Before and After Sleeve Gastrectomy

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ABSTRACT

Background: Obesity is an increasingly serious public health problem on a global level. Morbid obesity is defined as a Body Mass Index (BMI) of 40 Kg/m^2 or more or a BMI of 35 Kg/m^2 or more with obesity related comorbidities. Morbid obesity is associated with an increased incidence of wide spectrum medical and surgical pathological problems.

Objective: To clarify the relation between morbid obesity, rapid loss of weight after sleeve gastrectomy and gallstone formation and if there is a need for adding prophylactic cholecystectomy during sleeve gastrectomy to obtain the best possible results after surgery.

Patients and Methods: A total number of 50 morbidly obese patients were included in the study from September 2018 to April 2019 (prospective study). All patients were treated at Surgery Department of Al-Azhar University Hospitals. Males and females were considered for inclusion.

Results: In our study, five cases (10%) underwent simultaneous cholecystectomy (selective cholecystectomy) for their asymptomatic gall stones detected by routine pre-operative pelvi-abdominal ultrasound. Simultaneous cholecystectomy was associated by a significant increase in the operative time by about 36 minutes without effect on the post-operative morbidity or hospital stay compared with other patients with no gallstones. **Conclusion:** Sleeve Gastrectomy for morbidly obese patients was followed by gall bladder stones in only 6.2%. Therefore, prophylactic intra-operative cholecystectomy seems to be not indicated and should be replaced by short-term (3 months only) of oral ursodeoxycholec acid during the period of maximum weight loss.

Keywords: Sleeve gastrectomy, morbidly obese.

INTRODUCTION

Obesity is recognized as the most prevalent metabolic disease world-wide, reaching epidemic proportions in both developed and developing countries and affecting both adults and children. The WHO has already declared obesity a global epidemic that constitutes one of the biggest current health problems [(1)].

According to the NICE (National Institute for Clinical Excellence) guidance, people are considered to be morbidly obese if they have a body mass index (BMI) of 40 kg/m^2 or greater or they have a BMI between 35 kg/m^2 and 40 kg/m^2 with a significant disease (for example, diabetes, high blood pressure) that may show marked improvement if they lose weight [(2)].

The co-morbidities of morbid obesity affect essentially every organ system [(3)]. Obesity itself has a major effect on health, contributing to and exacerbating a plethora of illnesses including hypertension, type 2 diabetes, hypercholesterolaemia, stroke, cardio-vascular disorders, hypertension, biliary disorders, osteoarthritis, obstructive sleep apnoea (OSA) and some types of cancer. Psychological and serious psychosocial disorders are also not uncommon amongst obese people [(4)].

The targets for treatment of overweight and obesity are to reduce body weight, and to maintain lower body weight over the long term. An alternative goal is to prevent further increase in body weight as a minimum goal in patients who are unable to lose weight. Successful treatment of obesity should result in a preferential reduction of abdominal fat, an improvement of obesity-related health risks, an improvement in the life quality, and a marked decrease in mortality rate [(5)].

Clinicians should counsel all morbidly obese patients (defined as those with a BMI >30 kg/m^2) on lifestyle and behavioral modifications such as appropriate diet and exercise, and the patient's goals for weight loss should be individually set [(5)].

Pharmacologic therapy can be applied to obese patients who have failed to achieve their goals in weigh loss through diet and exercise alone. However, there needs to be a doctor-patient discussion of the drugs' side effects, the lack of long-term safety data, and the temporary nature of the weight loss achieved with medications before starting therapy [(5)].

Bariatric surgery is known to be the most effective and long lasting treatment for morbid obesity and related conditions, but now mounting evidence suggests it may be among the most effective treatments for metabolic diseases and conditions including type2 diabetes, hypertensive disorders, hypercholesterolemia, non-alcoholic fatty liver disease and obstructive sleep apnea (OSA) [(6)].

Weight loss operations could be classified into three categories: Restrictive procedures, malabsorptive procedures & combination operations employ both restriction and malabsorption. Open and laparoscopic approaches refer to how to have access to the abdominal cavity not the type of surgery being performed. Both approaches have the same surgical principles, risks and effect on reduction of weight [(6)].

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Bariatric surgery is accompanied by some metabolic changes, formation of gall stones is one of this changes.

AIM OF THE WORK

The aim of this study is to clarify the relation between morbid obesity, rapid loss of weight after sleeve gastrectomy and gallstone formation and if there is a need for adding prophylactic cholecystectomy during sleeve gastrectomy to obtain the best possible results after surgery.

PATIENTS AND METHODS

A total number of 50 morbidly obese patients were included in the study from September 2018 to April 2019 (prospective study). All patients were treated at Surgery Department of Al-azhar University Hospitals.

Males and females were considered for inclusion and informed consent for inclusion in the study has been obtained from patients after explanation of the nature of the procedure and possible complications.

Inclusion criteria: BMI more than 40 kg/m^2 or BMI more between 35-40 kg/m^2 with presence of obesity related risks e.g. hypertensive disorders, diabetes, osteoarthritis and hyperlipidemia. Patients should be morbidly obese for 2- 5 years with failure of both medical and conservative treatment plans. Age between 12- 55 years. Mentally stable. Cooperative and motivated patient.

Exclusion criteria: Lack of motivation. Mental disorders and psychological instability that prevent the patient from understanding the procedure. Drug or alcohol addicts. Patients unfit for general anesthesia. Morbid obese patient who underwent previous bariatric surgery other than sleeve gasterectomy. Causes of gall bladder stones related to other specific disorders.

Our patients were subjected to:

Complete medical and surgical history including: Personal history: name, age, sex, occupation, residence, marital status, and special habits. Obesity history: Onset of obesity. Dietary history: Amount of ingested food (below average, average or above average). Type of ingested food (Carbohydrate eating, Protein eating or Fat eating). Hunger sensation. Stimuli for eating. Other methods used for losing weight and their impact: Food reduction, Specific diet regimen, Exercise, Acupuncture or Liposuction. Sexual history. Desirable weight loss and the rate of weight loss expected by the patients. Family history of obesity. Comorbidities of obesity:

a. Diabetes mellitus: Onset, type and regimen of treatment.

b. Cardiovascular sequels: Shortness of breathing (dyspnea), hypertensive disorders, Ischemic Heart Disease (IHD), Hypercholesterolemia and increased triglyceride levels.

c. Respiratory sequels: - Difficulty in respiration with normal daily activities. - Daytime hypersomnolence with tendency to fall asleep while driving or at work.

- Frequent nocturnal arousals with sensation of choking.
- Loud snoring and morning headache.

d. Gastrointestinal sequels: - Fatty dyspepsia (due to gallbladder stones).

- Gastro-esophageal reflux disease.

e. Gynecological and reproductive disorders:

- Menstrual history (age of menarche and menstrual disorders).
- Fertility and Hirsutism.
- Complications related to pregnancy (hypertensive disorders, pre-eclampsia, gestational diabetes and late fatal death).
- Difficult or complicated delivery.
- Fatal growth abnormality or indication of admission to a neonatal intensive care unit.
- Impotence and oligospermia in males.

f. Orthopedic and rheumatologic related hazards: Joint pain, Decreased range of motion and Back pain.

g. Urinary incontinence.

h. Hernia risk: Swelling that bulges on cough or straining and disappears on lying flat (in the groin, around umbilicus or at the site of previous incision, etc...).

i. Infections associated with morbid obesity: - Fungal infection and Surgical wound infection.

k. **Neurological complications** such as Headache and chronic Pain at the lateral aspect of the thigh or Carpal tunnel syndrome.

l. Psychological disabilities: Employment problems, marital problems, social disability, physical disability, depression or suicidal tendencies.

B. Clinical examination including:

General examination: Pulse, blood pressure, temperature, and respiratory rate. Mental status and cooperation. Built and attitude. Examination of external genitalia in males to detect retraction. Dermatitis and skin folds discoloration. Fat distribution: increases adipose tissue in nonspecific areas. Areas of more skin redundancy. Pubic and suprapubic areas. Central (android) versus peripheral (gynoid) obesity.

Abdominal examination: To detect organomegally and signs of any gastrointestinal disease (e.g. cholecystitis, diverticulitis, peptic ulcers, etc...). Scar of previous operations. Hernias.

C. Measurements:

Weight in kilograms. Height by meter. BMI is calculated by dividing the weight in kilograms by the

square of height in meters [BMI = weight (Kg) / height (m^2)].

D. Body circumferences (all measures were taken in centimeters): Waist circumference. Waist-Hip Ratio (WHR). Chest circumference. Abdominal circumference. Mid-arm circumference. Mid-thigh circumference.

E. Laboratory investigations: Complete blood count (CBC). Liver function tests (mg/dl). Renal function tests (mg/dl). Blood glucose level (gm/dl fasting and random). Total Serum cholesterol, Triglyceride (mg/dl), LDL & HDL. Serum calcium (mg/dl), Phosphorus, Magnesium. Serum Iron, Ferritin. Serum Folic acid. Serum TSH. Serum cortisol (am and pm) and aldosterone.

F. Radiological investigations: Chest X-ray. Abdominal ultrasonography: To detect or rule out the presence of gallstones. To exclude organomegally and other abdominal disorders.

G. Echocardiography, stress test, and perhaps even cardiac catheterization when indicated especially in patients with a known history cardiovascular disorders after a preoperative cardiology consultation.

Ethical Committee Approval: informed consent for inclusion in the study has been obtained from patients after explanation of the nature of the procedure and possible complications.

Operative Procedure:

Pre-operative preparations: Patients were advised to lose weight before surgery by placing them on protein diet for 2 weeks prior to surgery. This helps to shrink the visceral fat and particularly the fatty deposits in the liver. Patients were admitted to the hospital one day before surgery to undergo most of their pre-operative tests. Upon admission, they were seen by an anaesthesia and an internal medicine doctors. Patients were given Enoxaparin (Clexan) 80 mg on the evening of admission, and daily thereafter during the hospital stay. An epidural catheter was subjected in most of the patients for management of postoperative pain. Sequential compression stockings were used. Bowel preparations and enemas were used. Urinary catheter and nasogastric tubes were applied just before operation or with induction of anesthesia. Fasting for 24 hours with adequate hydration using I.V. fluids 35 ml/kg/day. Two grams of cefazolin was given to all patients 60 minutes before operation. 500 mg of metronidazole was given intravenously just before skin incision.

Operative Technique of laparoscopic SG: Laparoscopic Sleeve Gastrectomy was performed in the French position (legs abducted with the surgeon standing between the patient's legs). The operation was performed under general anesthesia. Pneumoperitoneum (15 mmHg) was done using a Veress needle.

The procedure required five trocars (Fig. 20): 5 mm subxiphoid trocar for liver retractor, 15 mm right upper quadrant for working channel and removing specimen, 10 mm supraumbilical for optic system, 12 mm left upper quadrant working channel for endoGIA and gastric retraction and 10 mm left subcostal anterior axillary line trocar for working channel [7].

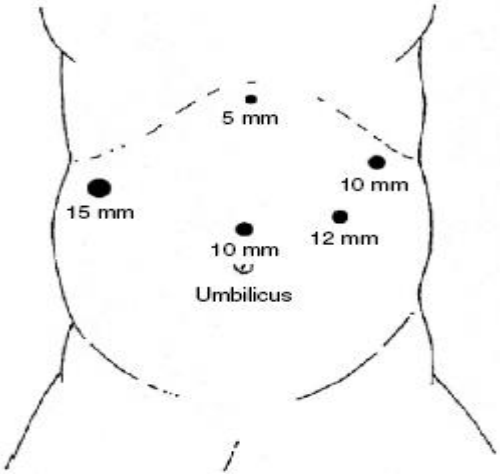

Figure (1): Trocar placement in sleeve gastrectomy.

When the greater curvature is exposed, using a Ligasure or harmonic device, the gastroepiploic gastric branches are divided starting at 2 to 10 cm proximal to the pylorus until the His angle, dividing the short gastric and posterior fundic vessels (fig. 21).

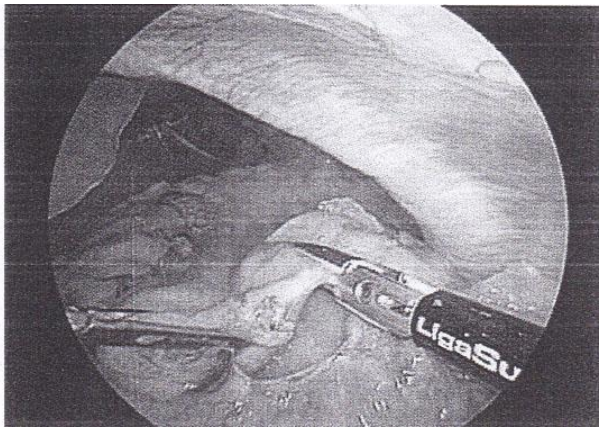

Figure (2): Dissecting in close proximity to the greater curvature of the stomach in a cephalad direction, intra-operative image.

A 32-French or 40-French bougie was introduced by the anesthesiologist to the stomach and the surgeon pushes it along the lesser curvature into the pyloric channel and duodenal bulb. Then, an Endo GIA stapler with 4.8-mm staples (green cartridge) was introduced through the 15-mm port located in the right quadrant, in order to start the division of the antrum 2-3 cm proximal to the pylorus, which was completed with another green cartridge to the incisura anguiaris. The gastric tubulization was performed by division of the gastric corpus straight to the His angle applying 3-4 cartridges of 3.8-mm endoGIA stapler (blue cartridge) (fig.22).

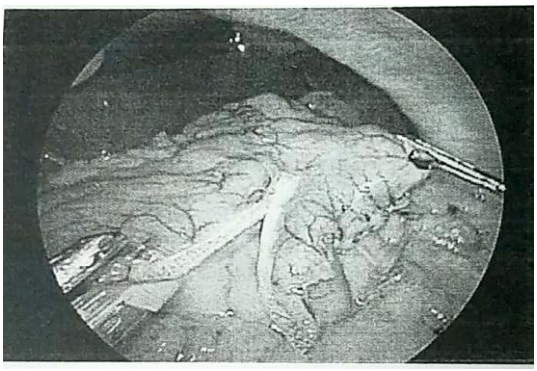

Figure (3): Technique used for LSG. The stapler is fired successively from the antrum to the angle of His adjacent to an intragastric bougie.

Then, reinforcement with absorbable sutures was performed over the mechanical suture (Figure 23). Several authors have described oversewing the long staple line, whereas others have used buttressed staples or fibrin glue as a sealant. At the end, a small gastric tubular pouch of 60-80 ml capacity was left.

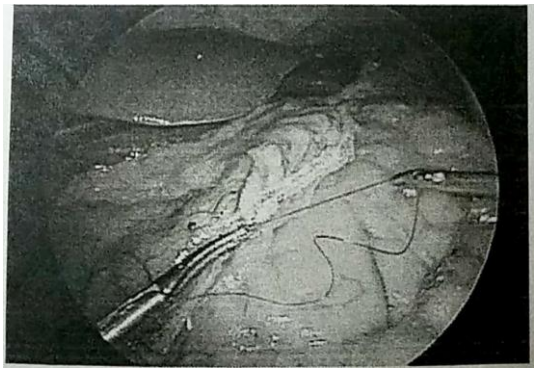

Figure (4): Oversewing the junctions of each staple firing.

Methylene blue test is used to exclude leaks of the suture-line and measure the gastric capacity after blocking transiently the flow into the duodenum. The resected specimen was removed easily trough the 15-mm port of the right upper abdominal quadrant. This specimen is sent for histological examination (figure 24).

Figure (5): Specimen after laparoscopic sleeve gastrectomy.

Post-operative course included:

Proton pump inhibitor was administrated routinely in all patients. Ryle tube was removed at the 2nd post-operative day. Gastrografin meal was performed at the 3rd postoperative day and oral fluids intake was started if there was no signs of leakage. Early ambulation was advised from the first post-operative day. Drain was removed once oral fluids intake was started after assurance that was no leak. The patients were discharged four days after surgery according to post-operative course.

After discharge:

A- Diet: Patients continued on clear fluids for about one week (sugar free). Then full fluids during the second week. Then soft food during the third week. Then begin regular food.

B- Supplementation: Calcium 1000 mg per day orally. Vitamin D 800 IU per day orally. Vitamin B12 1.200 mg per day orally. Iron and Multivitamins. Ursodeoxy cholic acid 600 mg for 7 patients for 3 months.

Statistical analysis

Data was analyzed using SPSS (Statistical Package for Social Sciences) version 10. Qualitative data was presented as number and percent. Comparison between groups was done by Chi-Square test. Quantitative data was tested for normality by Kolmogorov-Smirnov test. Normally distributed data was presented as mean ± SD and range (min - max). Paired t-test was used for comparison within groups. Student t-test was used to compare between two groups. $P < 0.05$ was considered to be statistically significant.

RESULTS

Table (1): Demographic features of included patients (Ns = 50).

	Mean	SD	Range
Age (years)	28.8	8.7	15 – 45
Weight (Kg)	155.8	24.7	100 – 230
Height (m)	1.71	0.09	1.5 – 1.7
BMI (m^2)	63.2	11.2	40 - 95

Table (2): Pre-operative sweet eaters percentage (N = 50).

Sweet eaters	No	Percent
N	10	20%
Y	40	80%
Total	50	100%

Table (3): Practice of regular exercise and family history of obesity (N:50).

	No	Percent
Regular exercise	5	10%
family history obesity	37	74%

Table (4): Pre-operative obesity related comorbidities at baseline.

Obesity related comorbidities	No	Percent
Diabetes mellitus	27	54%
Hypertension	20	40%
Dyslipidemia	27	54%
Fatty liver	47	94%
Gall stones	5	10%
Gastritis	20	40%
PU	2	4%
Reflux esophagitis	5	10%
Obstructive lung disease	5	10%
Restrictive lung disease	33	66%
Sleep apnea	2	4%
Hernia	5	10%
Psychological upset	17	34%
Reproductive disorders	7	14%
Osteoarthritis, back pain	35	70%

Table (5): Previous abdominal surgeries (N = 50).

Previous abdominal surgeries	Number	Percent
Caesarean section	10	20%
Cholecystectomy	5	10%
Appendectomy	3	6%
Previous hernia repair	3	6%
Abdominoplasty	13	26%
Total	34	68%

Table (6): Post - operative complications of SG (N = 50).

List of Post - operative complications	No	Percent
Gastritis and gastric ulcer	3	6%
Superficial wound infection	18	36%
Deep wound infection	3	6%
Leakage	3	6%
Pulmonary infections	7	14%
Pulmonary embolism	5	10%
ICU admission	5	10%
Incisional hernia	7	14%
GB stone formation	3	6%
Mortality	3	6%

Table (7): Weight and BMI changes during follow up (N = 50).

	Pre-operativ	3 months	6 months	1 year	p-value
Weight (kg)	157.5 ± 23.7	135.3 ± 22.7	126 ± 23.6	111.2 ± 20.9	P1 < 0.001 P2 < 0.001 P3 < 0.001
BMI (kg/m^2	63.4 ± 9.7	52.6 ± 8.7	48.5 ± 7.9	42.5 ± 9.5	P1 < 0.001 P2 < 0.001 P3 < 0.001

P1: preoperative versus 3 months postoperatively
P2: preoperative versus 6months postoperatively
P3: preoperative versus 1 year postoperatively

Table (8): Serum cholesterol changes during follow up (N = 50).

	Pre-operative	3 months	6 months	1 year	p-value
T.CHOL (mg/dl)	197.9 ± 26.4	170.7 ± 23.5	138.8 ± 28.2	105.9 ± 18.5	P1 < 0.001 P2 < 0.001 P3 < 0.001

P1: preoperative versus 3 months postoperatively
P2: preoperative versus 6months postoperatively
P3: preoperative versus 1 year postoperatively

Table (9): Serum calcium changes during follow up (N = 50).

	Pre-operativ	3 months	6 months	1 year	p-value
Serum Ca (mg/dl)	8.7 ± 0.3	8.6 ± 0.4	8.6 ± 0.2	8.6 ± 0.3	P1 = 0.3 P2 = 0.5 P3 = 0.5

P1: preoperative versus 3 months postoperatively
P2: preoperative versus 6months postoperatively
P3: preoperative versus 1 year postoperatively

Table (10): Liver function tests changes during follow up (N = 50).

	Pre-operative	3 months	6 months	1 year	p-value
Serum Bil (mg/dl)	0.8 ± 0.08	0.7 ± 0.09	0.7 ± 0.07	0.6 ± 0.1	P1 = 0.7 P2 = 0.5 P3= 0.9
SGOT (U/L)	25.7 ± 7.8	26.4 ± 6.7	24.4 ± 8.9	23.9 ± 5.6	P1 = 0.6 P2 = 0.7 P3 = 0.9
SGPT (U/L)	23.5 ± 9.8	24.5 ± 7.6	24.1 ± 4.5	22.3 ± 3.3	P1 = 0.3 P2 = 0.6 P3 = 0.4

P1: preoperative versus 3 months postoperatively
P2: preoperative versus 6months postoperatively
P3: preoperative versus 1 year postoperatively

Table (11): Operative time.

	Min - Max	Mean	± SDF
SG without cholecystectomy	85 – 130	105.6	11.5
SC with cholecystectomy	120 - 150	135	6.8

Table (12): Incidence of gall bladder stones before and after SG.

	Preoperative	Postoperative
Number	10	3
Percent	20%	6%

DISCUSSION

Risk factors for biliary disorders in the general population such as age, and female gender have been widely studied and well known to surgeons and clinicians. Diabetes mellitus has also a weak association with gall stone formation [8]. Obesity also has long been recognized for it's strong association with gall bladder disorders [9]. This has held true with many indicators of obesity including body mass index (BMI), waist-to-hip ratio [10], skin fold thickness, and low levels of physical activity [11].

In our study and after performing pelviabdominal ultrasound (US) in all patients pre-operatively to detect or rule out gallstones or sludge. 10 (20%) of 50 patients had pre-operative evidence of gall bladder disorders shown either by a history of cholecystectomy or gallstones detected on routine pre-operative trans abdominal ultrasound. five cases (10%) with asymptomatic gall bladder stones and five cases (10%) with previous cholecystectomy. These findings are similar to other studies by ***Mason*** [12] in which 19% (1,811 / 8,097) of the patients had submitted to cholecystectomy before surgical treatment of obesity. In addition, another study by ***Sioka et al.*** [13] found that 23.2% of the patients were defined with pre-operative gallstones and previous cholecystectomy was performed in 8% of patients. Another study by ***Dittrick et al.*** [14] concluded that the incidence of gallstones has been reported to be 5% in the general population, while it is significantly increased in obese population reaching 45%.

In our study, five cases (10%) underwent simultaneous cholecystectomy (selective cholecystectomy) for their asymptomatic gallstones detected by routine pre-operative trans-abdominal sonography. This was similar to other study by ***Villegas et al.*** [15] who performed simultaneous cholecystectomy on 14% of patients after intra-operative diagnosis of gallstones or sludge with the aid of laparoscopic ultrasound and another study by ***Taylor et al.*** [16] who performed simultaneous cholecystectomy on 15% of patients. ***Sioka et al.*** [13] underwent simultaneous cholecystectomy in 9 of 32 patients (28.1%) who had pre-operative symptomatic cholecystitis. Eight operations were completed laparoscopically, while one open cholecystectomy was performed due to multiple adhesions from previous operations. Neither peri-operative nor post-operative complications occurred.

In our study, simultaneous cholecystectomy was associated by a significant increase in the operative time by about 36 minutes without effect on the post-operative morbidity or hospital stay compared with who did not underwent simultaneous cholecystectomy. ***Ahmed et al.*** [17] retrospectively analyzed a series of 400 consecutive obese patients and found only significant differences in terms of operative times, which were 29 minutes longer for patients undergoing simultaneous elective cholecystectomy during gastric bypass. Laparoscopic cholecystectomy in patients with morbid obesity may be associated with increased operative difficulty and morbidity compared with non obese patients [18].

However, the role of prophylactic cholecystectomy at the time of bariatric surgery remains controversial. The fact that pathologic evidence of gallbladder disorders has been found in more than 75% of routinely resected specimens supports those who support prophylactic cholecystectomy [15].

On the other hand, the fact that only 7% to 16% of patients will suffer symptomatic gallstones, ***Villegas et al.*** [15] concluded that less than 10% of patients with negative ultrasound exams require subsequent cholecystectomy. ***Erlinger*** [20] does not support performing a prophylactic cholecystectomy.

Theoretically, gallstones should be more common after malabsorptive than after a purely restrictive procedure such as sleeve gastrectomy. However, studies on early hormonal effects after gastric bypass have shown no significant change in cholecystokinin level before or after meals [21]. In addition, factors that promote gallstones such as reduction in gallbladder emptying, increased gallbladder residual volume, and decreased refilling have been demonstrated after gastric banding [22].

In our series, three patients (6.25%) out of 40 cases experienced gallstones during the first post-operative year (seven months after the operation), that implies what happened during "the period of rapid weight loss. Seven of these cases were administrated ursodiol 600 mg for three months post operatively and the only presented case with post-operative gall stones was of the cases who did not take ursodiol post-operatively. It seems that this effect is similar to the effect of RYGB, since the gallstones tend to occur in the first six months and rarely after one years [23].

Li et al. [24] reported in his study that the incidence of gallstones or sludge was noted to develop in 8.7% of patients after laparoscopic Roux-en-Y gastric bypass and 3.8% of patients after sleeve gastrectomy. Another randomized study by ***Miller et al.*** [25] using post-operative ursodeoxycholic acid showed a cholecystectomy rate of 4.7% in 2 years after vertical banded gastroplasty and adjustable gastric banding (as restrictive procedures). ***Dhabuwala et al.*** [26] reported a higher rate (11.8%) for symptomatic gallstone formation among patients after gastric bypass. In another study of gastric bypass patients by ***Scott et al.*** [27] intra-operative ultrasound with concomitant cholecystectomy if positive and postoperative prescription of ursodeoxycholic acid when ultrasound was negative. However, similar rate of 10.1% for symptomatic gallstones was detected after a mean follow-up period of 10 months.

In our study, there are no cases with post-operative complicated gallstones (0%) while ***Sioka et al.*** [13] concluded that the incidence of post-operative complicated gallstones was 4.7% by either acute cholecystitis, acute pancreatitis and choledocholithiasis.

Nowadays, the conservative management of reserving cholecystectomy for symptomatic disease in gastric banding (restrictive procedure) and RYGB (mal absorptive procedure) serves as a safe plan of treatment [28]. While asymptomatic gallstones (silent gallstones) represent a dilemmatic approach. The natural history of asymptomatic gallstones suggests that many affected individuals will remain asymptomatic [29].

Furthermore, recent trend analysis in RYGB patients suggests that concomitant cholecystectomy should be considered only in symptomatic cholecystitis [30].

The current statement of cholecystectomy and LSG has not been validated. Three strategies could be available. The first is to offer a laparoscopic cholecystectomy, whether gallstones are identified in the routine pre-operative assessment, even if they are asymptomatic (approach of Hamad) [31].

This prophylactic approach presupposes that natural history of gallbladder disorders in LSG patients is different to that in general population. The second is the simultaneous service of cholecystectomy with LSG, without pre-operative investigation (approach of Fobi) [15]. The third is the treatment of the symptomatic patients only without pre-operative scanning (noninterventionist policy) [32].

The use of ursodeoxycholic acid has been proposed as a preventive measure for the gallstone formation. More specifically, ***Sugerman et al.*** [33] reported that the oral dose of 600 mg ursodiol following gastric bypass for 6 months or even until gallstone formation was associated with decreased rate of gallstone formation. These results are also in compliance with another study in vertical banded gastroplasty and gastric banding (restrictive procedures), which also supported that the rate of cholecystectomy was less frequent in the group receiving ursodiol compared to placebo group (4.7 versus 12%) [25].

However, recent cost-effective analysis reported that even though the use of ursodeoxycholic acid lessened the costs of concurrent cholecystectomy and reduced the hospital stay along with logical cost raise in selective cholecystectomy, the authors concluded that the prescription of ursodiol is unaffordable as an additional cost and proposed the non-use of ursodiol after bariatric surgery [34].

Finally, we acknowledge that short follow up period is considered a limitation in our study.

CONCLUSION

Sleeve Gastrectomy for morbidly obese patients was followed by gall bladder stones in only 6.2%, so prophylactic intra-operative cholecystectomy is not highly indicated and should be replaced by short term (3 months only) of oral Ursodeoxycholec acid during the period of maximum weight loss.

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