Al-Nahrain University

Collage Of Medicine

Department Of
Surgery

EFFECT OF SLEEVE GASTRECTOMY ON BLOOD SUGAR CONTROL OF DIABETES IN AL_KADHMIA TEACHING HOSPITAL

Research submitted to department of surgery /college of medicine/

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

((وَمَا تَوْفِيقِي إِلا بِاللَّهِ عَلَيْهِ تَوَكَّلْتُ وَإِلَيْهِ أُنِيبُ))

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DEDICATION

To My...

Parents, sisters & brothers,

For their ever support...

ACKNOWLEDGEMENT

I would like to express my gratefulness and appreciation to my supervisor Dr.anes for his helpful advises and encouragement in this study….with special dedication to my family how support me …to everyone help me in my life …

Thanks to all of you, appreciation and respect

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List of Abbreviation

SG: Sleeve gastrectomy

VSG: Vertical sleeve gastrectomy

LSG: Laparoscopic sleeve gastrectomy

BMI: Body mass index

HDL: High-density-lipoprotein

RYGB: Roux-en-Y gastric bypass

GERD: Gastroesophageal reflux disease

OGTT: Oral glucose tolerance test

SUMMARY

Background: Obesity is an important risk factor for type 2 diabetes (T2D). Bariatric surgery causes marked weight loss and complete remission of T2D in most patients. Moreover, bariatric surgical procedures that divert nutrients away from the upper gastrointestinal tract are more successful in producing weight loss and remission of T2D than those that simply restrict stomach capacity. The effects of surgery on body weight and metabolic function indicate that bariatric surgery should be part of the standard therapy for T2D.

Aim of study: The aim of the presented study is to assess the effect of sleeve gastrectomy procedure on blood sugar control of diabetes.

Patients and methods: Through the period extending from 1/11/2018 to 1/3/2019 ; a hospital based retrospective study at the surgical floor of AL-Imammain AL-Kadhimain teaching hospital. A total of 15 patients were reviewed with extreme obesity and diabetes type 2 including patients diagnosed by physician to had sleeve gastrectomy operation.

Results: The present study include many variables, data were analyzed and presented, the total number of collected cases were (15) including (4) male patients and (11) female patients in a ratio of 2:1. The general age ranged from (40 to 49) years, the mean age is 45 years . Regarding BMI before surgery: mean BMI is 42 ,the most frequent reported number was (9) patients at BMI above (35) and (6) patient at BMI above (40). BMI after 6 months surgery: mean BMI is 31, the most frequent reported number was (10) patient at BMI above (30) and (5) patient at BMI above (26). Fasting blood sugar reading before surgery: mean is (180) the most frequent reported number was (9) patient above (180) and (6) patient above (170). Fasting Blood sugar reading after 6 months surgery: mean

is (84.5) the most frequent reported number was (8) patient above (80) and (7) patient above (85).

Conclusion: Bariatric surgery is the most effective available therapy for T2D. Most patients with T2D who are treated with RYGB surgery achieve remission of their diabetes, defined as maintaining normal or near normal blood glucose concentrations and HbA1c without the use of diabetes medications. Remission rates as high as 95% have been reported after the BPD-DS procedure, but this operation is not widely used because of a high rate of postoperative nutritional abnormalities.

INTRODUCTION

1.1 Literature review

Epidemiology

The prevalence of obesity is increasing worldwide and in the United States. The degree of obesity is described using body mass index (BMI) which is calculated by using weight (in kilograms) divided by height in meters squared.

Class I obesity is defined as a body mass index >30 kg/m2;

Class II obesity is a BMI >35 kg/m2;

Class III (severe or morbid) obesity is >40 kg/m2;

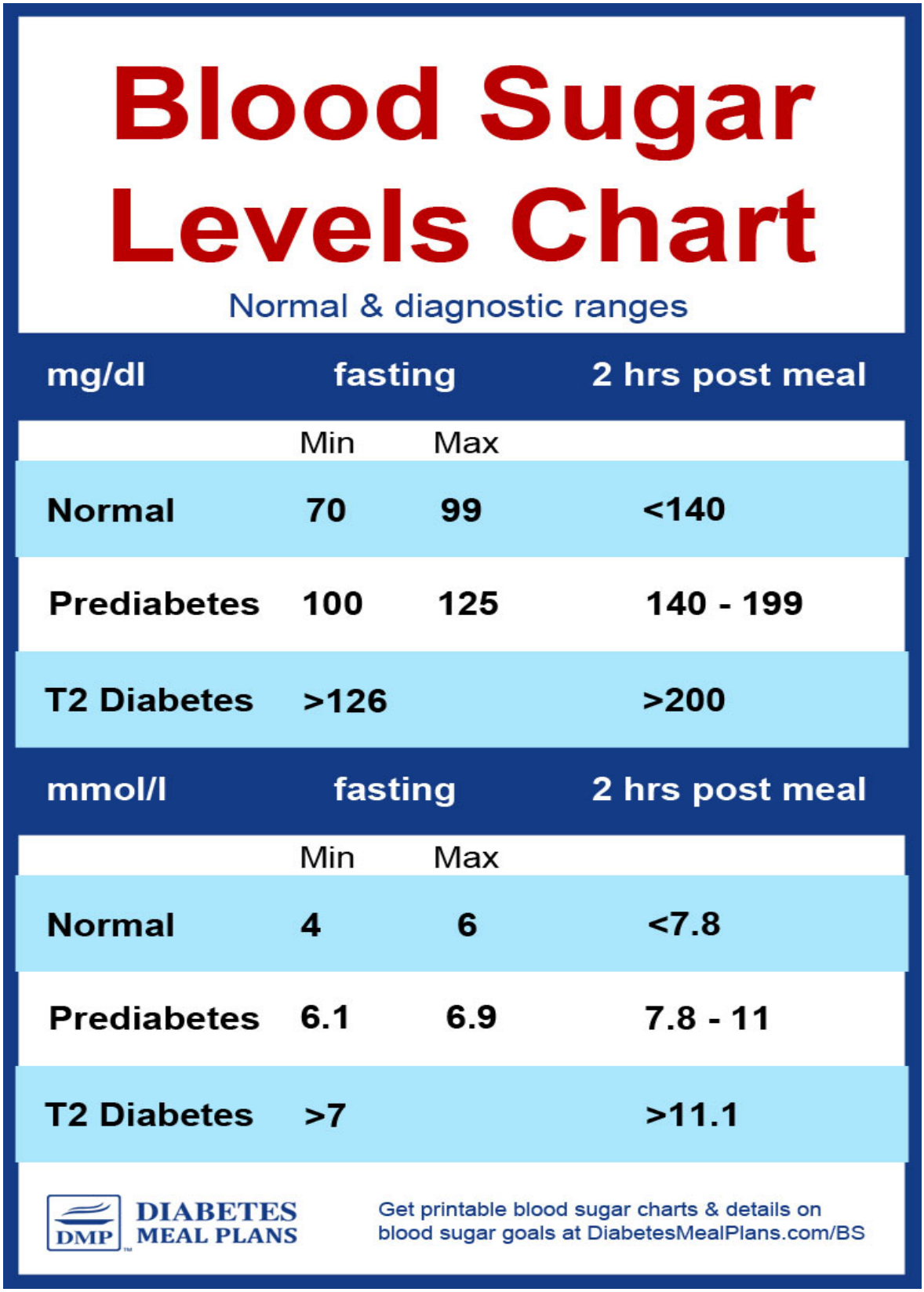
Class IV (super morbid) obesity is defined as >50 kg/m2.[3]

Table 1: Classification of BMI

BMI	Weight status
Below 18.5	Underweight
18.5-24.9	Normal
25.0-29.9	Overweight
30.0-34.9	Obese (Class I)
35.0-39.9	Obese (Class II)
40.0 and higher	Extreme obesity (Class III)

Cause and Risk Factors of Type 2 DM

Type 2 DM is characterized by insulin resistance, which may be combined



with relatively reduced insulin secretion.(4)

***Genetics,** genes may affect the amount of body fat that store and where that fat is distributed. Genetics may also play a role in how efficiently on body

converts food into energy and how the body burns calories during exercise.[4]

* **Lifestyle,** including obesity (defined by a body mass index of greater than 30, lack of physical activity, poor diet, stress, and urbanization.[5]

***Diet and eating habits,** Consumption of sugar-sweetened drinks in excess is associated with an increased risk.[6]The type of fats in the diet is also important, with saturated fat and trans fats increasing the risk and polyunsaturated and monounsaturated fat decreasing the risk.[7]

***Inactivity,** lack of physical activity is believed to cause 7% of cases.[8]

Treatment of DM & Obesity

Diet, exercise and behavior modification are the primary recommended treatments for DM & obesity. Therapy with medications(OBESITY) (orlistat, sibutramine) may be indicated for some individuals who have medical complications of obesity, but the associated weight loss is generally modest and there are side effects associated with the medications. Although many individuals may lose weight, most regain it over time. Systematic reviews of the effects of behavioral and drug therapies of obesity report an average long term weight loss of between four and seven kilograms[9].

Surgery

- **Sleeve gastrectomy** is a surgical weight-loss procedure in which the stomach is reduced to about 15% of its original size, by surgical removal of a large portion of the stomach along the greater curvature. The result is a sleeve or tube like structure. The procedure permanently reduces the size of the stomach, although there could be some dilatation of the stomach later on in life. The procedure is generally performed laparoscopically and is irreversible.
- **Gastric bypass surgery** refers to a surgical procedure in which

the stomach is divided into a small upper pouch and a much larger lower "remnant" pouch and then the small intestine is rearranged to connect to both. Surgeons have developed several different ways to reconnect the intestine, thus leading to several different gastric bypass (GBP) procedures. Any GBP leads to a marked reduction in the functional volume of the stomach, accompanied by an altered physiological and physical response to food.

- **switch (GRDS)**, is a weight loss surgery procedure that is composed of a restrictive and a malabsorptive aspect.
- Duodenal switchICD-9-CM43.89, 45.5145.91[1][edit on Wikidata]
- The restrictive portion of the surgery involves removing approximately 70% of the stomach(along the greater curvature) and most of the duodenum.
- The malabsorptive portion of the surgery reroutes a lengthy portion of the small intestine, creating two separate pathways and one common channel. The shorter of the two pathways, the digestive loop, takes food from the stomach to the common channel. The much longer pathway, the biliopancreatic loop, carries bile from the liver to the common channel.
- The common channel is the portion of small intestine, usually 75-150 centimeters long, in which the contents of the digestive path mix with the bile from the biliopancreatic loop before emptying into the large intestine. The objective of this arrangement is to reduce the amount of time the body has to capture calories from food in the small intestine and to selectively limit the absorption of fat. As a result, following surgery, these patients absorb only approximately 20% of the fat they intake.

Effect of Surgery

Effect of sleeve surgery on glycemic control

LSG cause remove most of the grehlin secreting area of stomach that effect reducing appetite ,and marked alterations in the metabolic response to meal ingestion, manifested primarily by an increase in early postprandial plasma GLP-1 and insulin concentrations, the importance of these changes in improving glycemic control and ameliorating T2D after substantial surgery-induced weight loss

effects of gastric bypass / bilio_pancreatic diversion ameliorates diabetes

foregut hypothesisn : bypass of proximal duodenum and jejunum reduces stimulated secretion of anti_incretin factors which normally inhibit insulin secretion thus allawing the unopposed effects of incretins to stimulate insulin secretion

hindgut hypothesis : rapid delivery of small bowel content into the distal jejunum and ileum exaggerates stimulated incretin (glucagon_like peptide_1 and peptide _yy) release which stimulates insulin secretion

Glycemic control improves rapidly after RYGB surgery in patients with T2D, before large changes in body weight have occurred.[10] In fact, 30%–100% of patients who have had RYGB or BPD are able to discontinue all diabetes medications and maintain a normal fasting blood glucose concentration within a few days after surgery, and only a 1%–2% weight loss.[11,12] However, patients who have RYGB surgery experience a sudden and marked reduction in energy intake, from ~3000–6000 kcal/day to ~200–300 kcal/day,[13,14] making it difficult to separate the effect of calorie restriction from intestinal

bypass on the improvement in glycemic control. Short-term calorie-restriction improves glucose homeostasis and can reduce the need for diabetes medications, because of a decrease in both the ingestion of carbohydrate calories and hepatic glucose production. The decline in plasma glucose concentration and HOMA-IR score observed in patients several days after RYGB surgery is similar to those observed in control subjects given the same diet.(14) The liver is particularly sensitive to short-term changes in energy balance. Consuming a low-calorie diet (~1100 kcal/day) for 2–4 days decreases basal hepatic glucose production rate and increases insulin-mediated suppression of hepatic glucose production,(15,16) which is likely an important contributor to the rapid decline in HOMA-IR score observed after RYGB surgery.(17)In patients with T2D, consuming a very-low-calorie diet (≤800 kcal/day) results in lower fasting plasma glucose and insulin concentrations and decreased HOMA-IR score within 4–10 days[18,19] and remission of T2D within 8 weeks.[20]Therefore, the rapid improvement in glycemic control after RYGB surgery could simply be a normal response to marked caloric restriction.

Laparoscopic Sleeve Gastrectomy

Sleeve gastrectomy was initially offered to patients with super severe obesity as the first part of a two part surgical procedure, which was later followed by a gastric bypass or a duodenal switch[21] . However, the weight loss associated with sleeve gastrectomy may be enough for some individuals.

The procedure is performed laparoscopically- a partial gastrectomy is done in which most of the greater curvature of the stomach is removed and a “tubular” stomach is created. The stomach capacity is reduced to about 25% of its prior capacity [22]. The pyloric valve is left intact, which means that digestion is not changed. Without the fundus, it is more resistant to stretching. Also the cells producing Ghrelin (a gut home involved in regulating food intake) are absent [23].

Ghrelin, an orexigenic hormone produced primarily in the gastric fundus, is significantlydecreased after SGand this decrease has been shown to persist 5 years after theprocedure.[24]Although ghrelin may affect changes in hunger, satiety, and even glucose metabolism after SG, it is unlikely the only mechanism that contributes to thelong-term effects of this procedure [25].

Technique of Operation

LSG involves a vertical gastrectomy that results in a narrow, tubular stomach. Theconcept of SG is simple, but some components of the operation, if performed incorrectly,can result in serious complications. Five ports are placed across the upperabdomen identical to placement for a gastric bypass. If exposure is difficult becauseof a large amount of perigastric fat or a large liver, a sixth port can be placed in the leftupper quadrant for the assistant. [26]The operating surgeon stands to the patient'sright side and uses a footboard and tapes the patient to the operating table for placementin a steep reverse Trendelenburg position during the procedure. The first step ofthe procedure is to divide the vascular attachments of the gastroepiploic arcade andthe short gastric vessels. This dissection is performed with ultrasonic shears, and isstarted along the greater curvature and extended proximally to the angle of His anddistally to within 4 cm of the pylorus. The stomach and fundus must be fully immobilizedduring the dissection.[27] The filmy posterior attachments should be divided so theentire posterior surface of the stomach can be seen. After the short gastric vessels aredivided at the upper pole of the spleen, the attachments between the fundus and theleft crus of the diaphragm must also be taken down. This technique is important toavoid leaving a large pouch of fundus at the top of the stomach and ensure that thegastroesophageal junction can be identified and avoided during the final staple firing.Once this dissection is complete, the first stapler is placed tangentially across theantrum. The authors use green loads for the first two staple firings because of theincreased thickness of the stomach in this area.

[28]The assistant should flatten thestomachwith lateral retraction and the anesthesiologist should remove the temperature probeand orogastric tubes before the first staple firing. The angle of the first firing is determinedby the patient's anatomy, but care should be taken to not use an angle that willnarrow the lumen at the incisura. The authors fire the first staple load before placingthe calibration tube and then close the stapler for the next firing, which helps guidethe calibration tube distally into the antrum use a diagnostic gastroscope(Olympus GIF-H180J, 9.9-mm outer diameter, Olympus, Center Valley, Pennsylvania)to calibrate the sleeve lumen and place the lighted tip of the scope into the antrumunder laparoscopic guidance (no insufflation is used to place the endoscope initially).

If any concern exists that the lumen is too narrow at the incisura, the stapler ismoved laterally before firing [29] This part of the procedure requires close attention,Port placement for laparoscopic sleeve gastrectomy. Thesurgeonstands to thepatient's right. The two middle ports are 12 mm and the lateral ports are 5 mm.

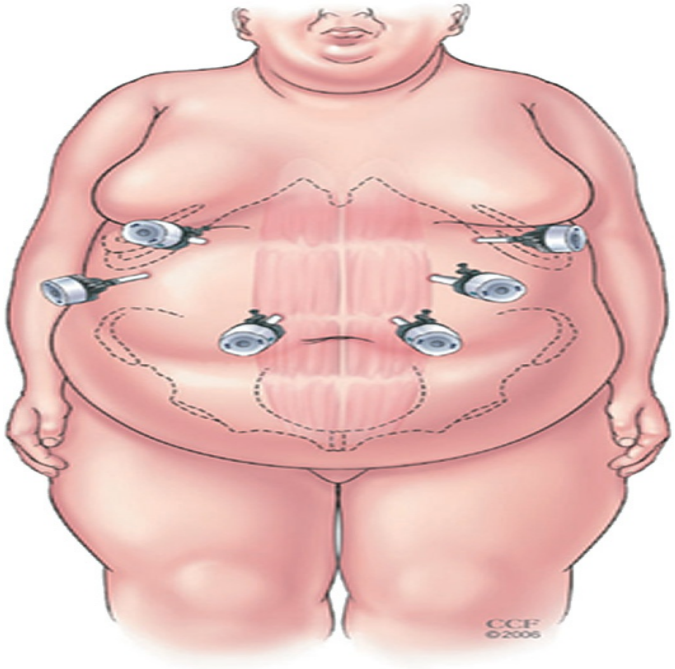
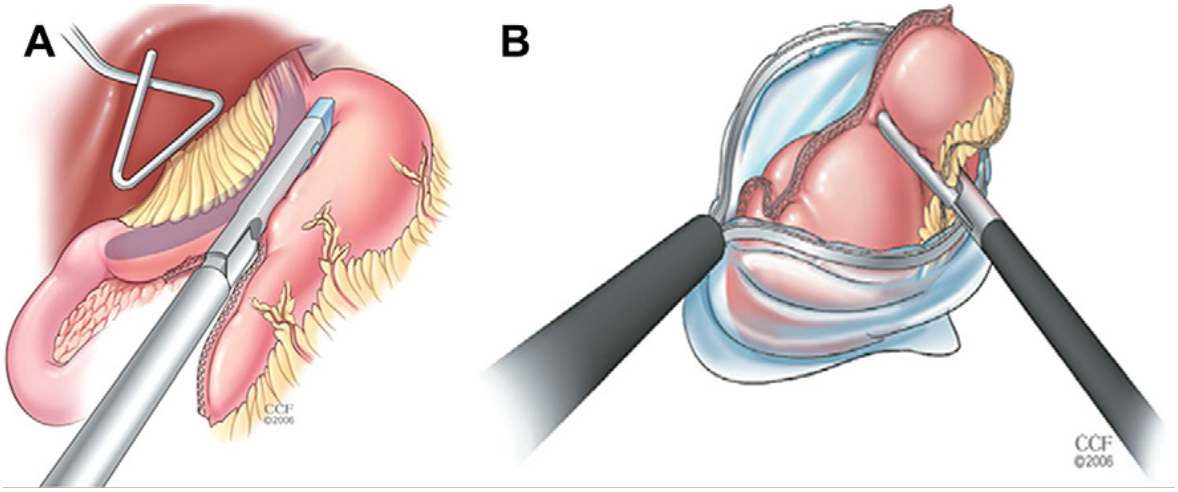
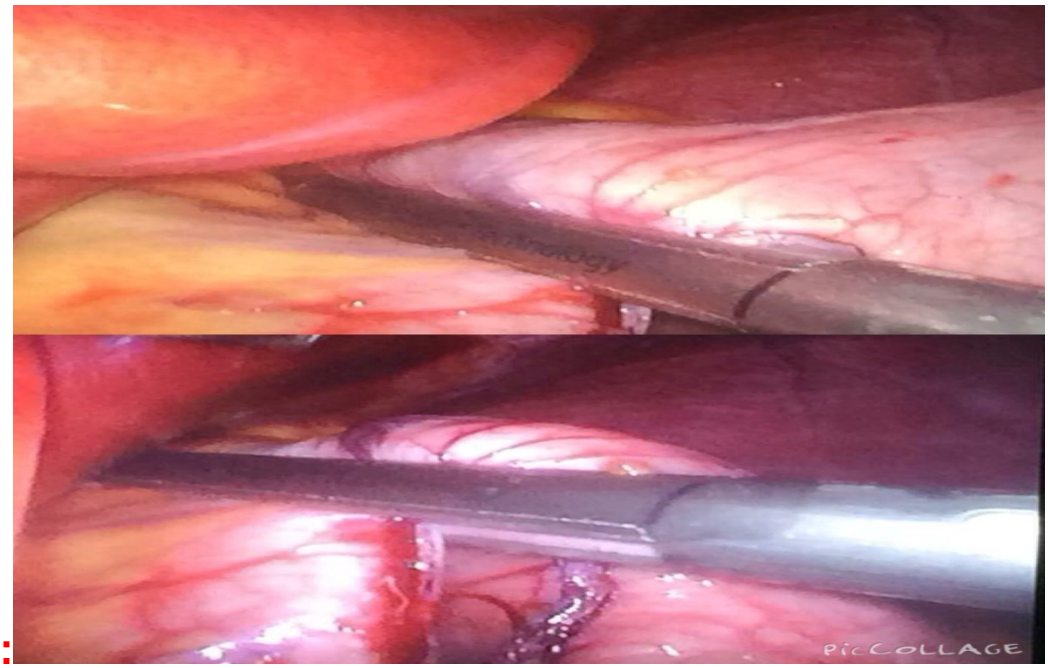


Fig. 1. Port placement for laparoscopic sleeve gastrectomy

Because a lumen that is too narrow at the incisura can result in severe dysphagiaand food intolerance from stricture formation or, more commonly, kinking of thestomach in this area. Once the surgeon is satisfied with the lumen size, the stapleris fired. Blue loads of the stapler are then fired proximally along the calibration tube.Because the staple line is oversewn with an imbricating suture, several millimetersof lumen are left between the calibration tube (30 French gastroscope) and the stapleline (ie, the calibration tube is not hugged tightly with the stapler). Care should be takento create a straight staple line and avoid anterior or posterior “spiraling” of the stapleline, which can also cause mechanical problems with the sleeve and can be avoidedthrough good lateral retraction of the stomach by the assistant.The position of the final staple firing is critical to avoid a leak. Leaving a significantportion of fundus will not be optimal in terms of weight loss or gastroesophageal refluxdisease (GERD) in the long term, but care must be taken not to impinge on the gastroesophagealjunction or esophagus during the final staple firing.Approximately 1 cm ofgastric serosa should be seen to the left of the stapler cartridge before the stapler isfired. Mobilizing a large fat pad off of this area early in the case can help identifyand avoid the gastroesophagealjunctionThe entire staple line is then oversewn with a continuous, imbricating suture.Caution must be taken not to imbricate too much tissue at the incisura, becausethis may also cause an obstruction in this area. If concern exists about the lumensize, a nonimbricating locking suture is placed in this area. After the suture line iscompleted, the endoscope is used to perform a leak test and evaluate the lumen forhemostasis and patency. Other methods of leak testing, such as the methylene bluedye test, can also be used, but the endoscopic view offers some reassurance thatthe lumen is uniform in size without obstruction. [30]The omentum is then sewn to theentire suture line to provide another potential barrier if a leak occurs. Sewing theomentum

or the gastrocolic fat back up to the distal sleeve may also anchor the sleeveand prevent kinking at the incisura. A closed-suction drain is placed under theomentum with its tip above the spleen. The 12-mm port sites are closed with a suturepasser and the resected stomach is placed in a specimen bag and removed from theabdomen.[31]



A: 

Fig(2):The linear stapler of sleeve gastrectomy.

The linear stapler is used to perform a vertical sleeve gastrectomy starting 4 cm from the pylorus. This technique is performed with a calibration tube in place (A). The resectedgastric body and fundus are removed in a laparoscopic specimen bag (B).

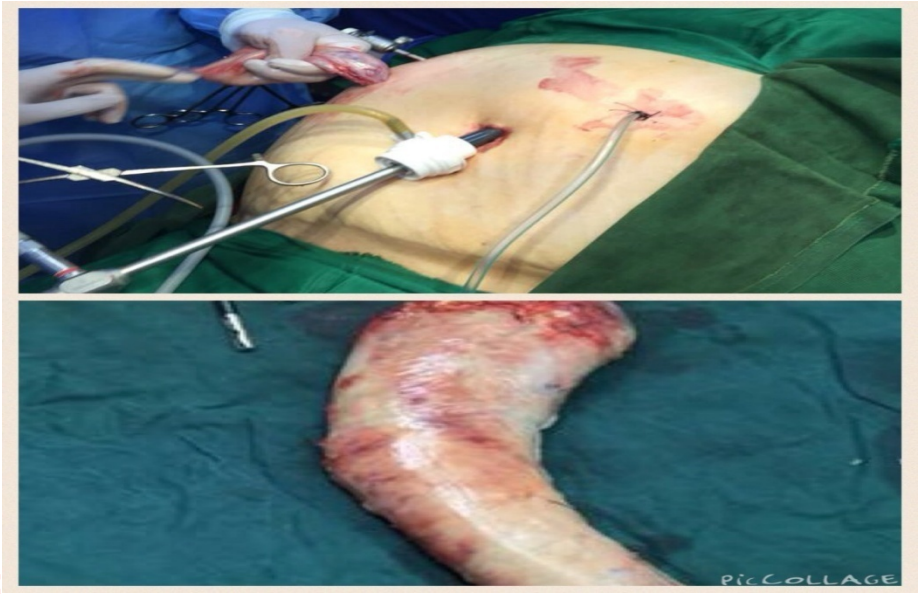
A: 

Fig.(3) A: Extract the cut portion of the stomach

B: Completed sleeve gastrectomy.

1.2 Aim of Study

The aim of the presented study is to assess the effect of sleeve gastrectomy procedure on blood sugar control of diabetes patients .

PATIENTS AND METHODS

Design

Through the period extending from 1/11/2018 to 1/3/2019 ; a hospital based retrospective study at the surgical floor of AL-Imammain AL-Kadhimain teaching hospital

Method

A total of 15 patients were reviewed with DM type 2 and obesity including patients diagnosed by physician to had sleeve gastrectomy operation, we collected information according to the following questioner:

Name: Age: Gender: Body mass index : Family history of obesity : Past medical history :DM , HT, joint disease ,IHD Past surgical history : Weight before and after surgery : Blood sugar before and after 6 month of surgery : Type of surgery and indication :

RESULTS

The present study include many variables, data were analyzed and presented, the total number of collected cases were (15) including (4) male patients and (11) female patients in a ratio of 3:1.

The age ranged from (40 to 49) years, the mean age is 45 years ,the most frequent reported age group is (40_45) years while the least is (45_49) years.

Regarding BMI before surgery: mean BMI is 42, the most frequent reported number was (9) patients at BMI above (35) and (6) patient at BMI above (40).

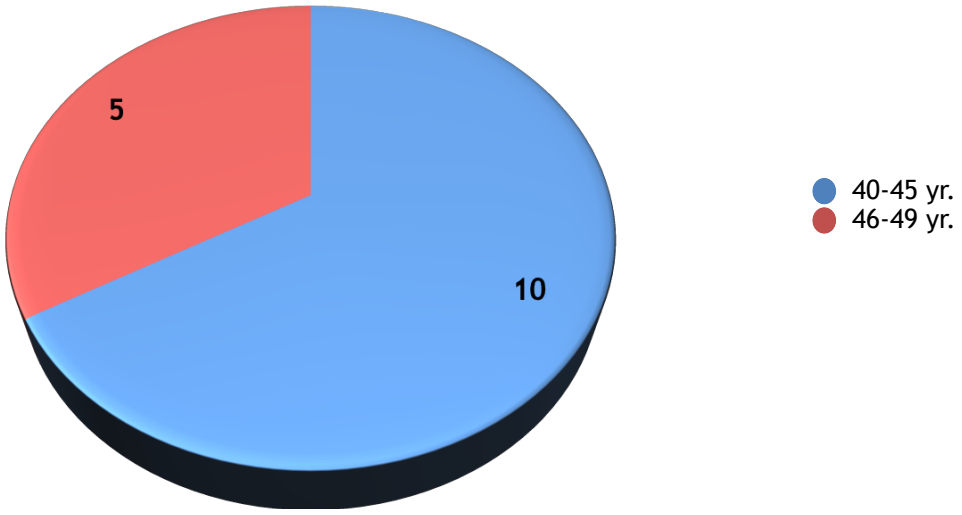
BMI after 6 months surgery: mean BMI is 31, the most frequent reported number was (10) patient at BMI above (30) and (5) patient at BMI above (26)

Fasting blood sugar reading before surgery: mean is (180) the most frequent reported number was (9) patient above (180) and (6) patient above (170)

Fasting Blood sugar reading after 6 months surgery: mean is (84.5) the most frequent reported number was (8) patient above (80) and (7) patient above (85)

Table 3: Age group of patients

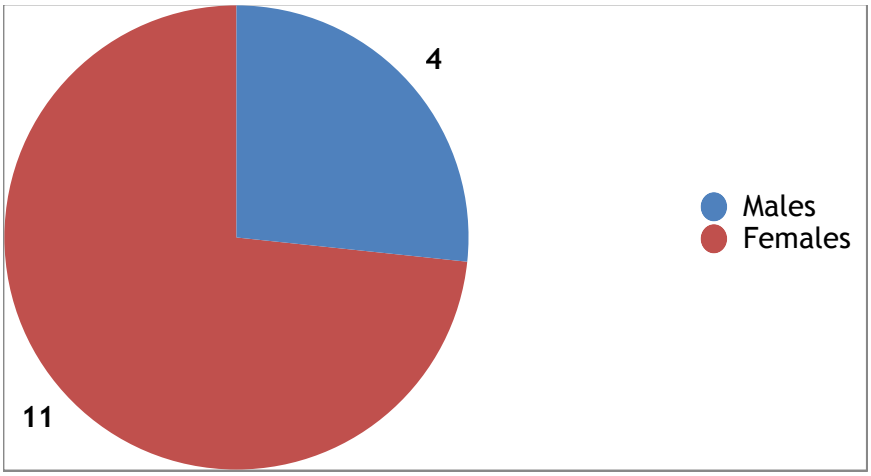
AGE GROUP	NO. OF PATIENTS	PERCENTAGE %
(40_45) YEARS	10	66.66%
(45_49) YEARS	5	33.33%
TOTAL	**15**	**100%**



Fig(4) : Age of the patients

Table 4: Gender of the patients

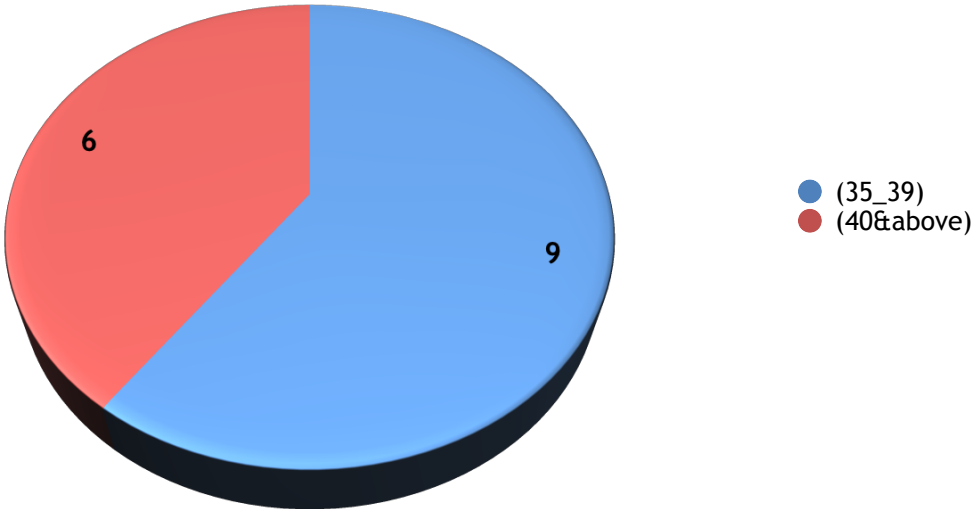
GENDER	NO. OF PATIENTS	PERCENTAGE %
MALE	4	26.6%
FEMALE	11	73.4 %
TOTAL	**15**	**100 %**



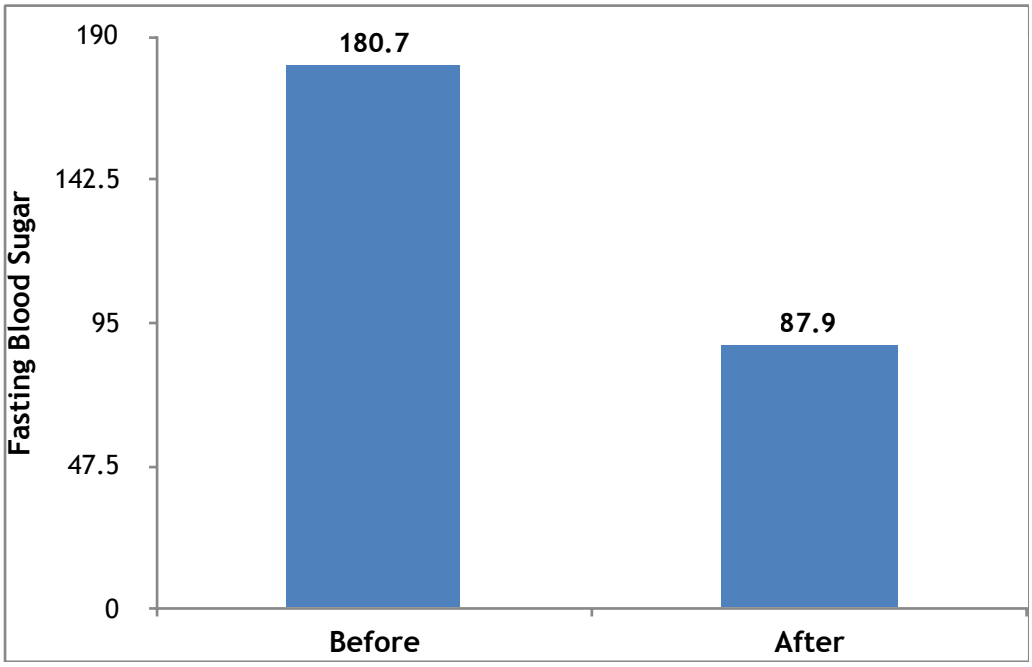
Fig(5): Gender distribution of the patients

Table 5: Body mass index of patients

BMI	NO. OF PATIENTS	PERCENTAGE %
(35_39)	9	60 %
40 and higher	6	40%
Total	**15**	**100 %**



Fig(6): Body mass index of patients



Figure(7) fasting blood sugar before and after 6 months of surgery (p< 0.001)

DISCUSSION

Sleeve gastrectomy (LSG) is currently one of the most common bariatric operations worldwide, although the long-term effects on body weight and diabetes have not yet been characterized in detail. A number of studies focusing on long-term effects are ongoing [32,33], that agree with our study but very few data on the very early weight-independent effects of LSG have been presented in patients with obesity and T2DM. Therefore, we performed a comparative study between different bariatric surgery to examine the postoperative effects on glycemic control after 6 months

The most important finding of the present study in patients with T2DM was that the early effect of SG on glucose control and insulin secretion Although based on a relatively limited number of patients, we found a statistically significant increase in the GLP-1 response at 6 months. However, this did not translate into a greater improvement of glucose metabolism variables in the RYGB group at that moment compared to the LSG group.

Moreover, calorie restriction is known to be a potent insulin sensitizer [34]. The improvement in glucose metabolism could be influenced by the preoperative fasting and postoperatively decreased caloric intake

And in another study also agree with our study : Most patients with T2D who are treated with RYGB surgery achieve remission of their diabetes, defined as maintaining normal or near normal blood glucose concentrations and HbA1c without the use of diabetes medications. Remission rates 95% achieve diabetes remission usually experience a marked improvement in glycemic control. Accordingly, bariatric surgery should be considered a part of standard therapy for T2D .Although UGI tract bypass procedures and even LSG cause marked alterations in the metabolic

response to meal ingestion and control blood sugar after 20% weight loss.[35]

The currently approved indication for bariatric surgery in patients who have T2D is a BMI of 35 kg/m^2 or greater, which was established in 1991 by a consensus conference sponsored by the National Institutes of Health [36]

Another study gender female 2:1 male and the age ranged from (40_49 years), the mean age is 45 years and this agree with the study by **(Fernando Maluenda ,Owen Korn at Department ofSurgery, University Hospital University of Chile)**who collected 214 patients , 162(75.7%) patients were female and 52 (24.3 %) were male, and mean patients age was 45 years (ranged from 20 to 68) and the result of this study is agree with our study in gender and mean age .approach

Another study by Marzieh Salehi, MD, a diabetologist with UC Health University of Cincinnati Physicians whose research is focused on the effect of weight-loss surgery on glucose metabolism, cautions that although there can be huge benefits for diabetic patients who undergo gastric bypass surgery, a group of patients experience severely low levels of blood sugar (hypoglycemia)—especially following a meal and typically several years after surgery. Symptoms of hypoglycemia often aren't recognized until they become debilitating or life-threatening.

Salehi says that many patients with type 2 diabetes who qualify for gastric bypass surgery rely on anti-diabetic medications like insulin injections to regulate glucose in the body. These same patients often leave the hospital following surgery with normal glucose control without taking any medications.

In the study, 54 patients received oral hypoglycemic agents for at least 12 months before surgery, and 6 patients received insulin. The mean follow-up period was 36 months. The resolution rate was 60.8% for the AGB patients, 81.2% for the GBP patients, and 80.9% for the SG patients. The postoperative time until interruption of therapy was 12.6 months for the AGB patients, 3.2 months for the GBP patients, and 3.3 months for the SG patients. The hyperinsulinemic euglycemic clamp test was performed 12 months after surgery for the cured patients. Insulin resistance was restored to normal values in all the patients. The greatest improvement from preoperative values occurred in the SG group.[37]

According to the results of studies conducted at the Naval Medical Center and Cleveland Clinic Florida, sleeve gastrectomy is quickly becoming a popular option that is as safe as or even safer than gastric bypass surgery. The research revealed that gastric sleeve has proven itself to be a relatively safe and effective procedure for patients suffering from morbid obesity

LSG is a new option being used in the treatment of morbid obesity and DM type 2. Benefits of LSG include low rate of complications,avoidance of foreign material, maintenance .of normal gastrointestinal continuity

CONCLUSIONS &RECOMMENDATIONS

5.1 Conclusions

Bariatric surgery is the most effective available therapy for T2D. Most patients with T2D who are treated with sleeve surgery achieve remission of their diabetes, defined as maintaining normal or near normal blood glucose concentrations and HbA1c without the use of diabetes medications. Remission rate is high that improvement in glycemic control after 20% weight loss . Although surgery-induced weight loss .

5.2 Recommendation

We need additional studies and training courses to raise awareness -
about the efficacy of bariatric surgery in effective weight loss was achieved and most patients had improvement or resolution of diabetes, hypertension, hyperlipidemia or obstructive sleep apnea and further follow up

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