LIPID PROFILE CHANGES FOLLOWING BARIATRIC SURGERY, A COMPARATIVE STUDY BETWEEN SLEEVE GASTRECTOMY AND MINI-GASTRIC BYPASS

Maniham Mahmoud¹, Randa Reda², Alaa Abbass³ and Omnia Mohamed²

ABSTRACT:

Background: Bariatric surgery proved to be the only successful treatment option leading to long-term weight loss with improvement of obesity related comorbidities. The Laparoscopic Sleeve Gastrectomy (LSG) is now one of the most popular bariatric procedure worldwide with rising prevalence over last decade, while the Mini Gastric Bypass (MGB) is now gaining some popularity as a relatively new bariatric procedure.

Aim of the work: to evaluate the effect of two types of bariatric surgery; mini-gastric bypass and sleeve gastrectomy, on lipid profile and compare the results in both groups.

Patients and Methods: This study was carried out on sixty morbidly obese persons suffering dyslipidemia. This included 30 patients underwent mini-gastric bypass (Group1) and 30 patients underwent sleeve gastrectomy (Group2). Patients were evaluated preoperatively and 3 months postoperative regarding their anthropometric data (weight, height, and Body mass index) and total lipid profile (total cholesterol, HDL, LDL and triglycerides).

Result: Baseline preoperative anthropometric measures showed that no statistically significant difference between the two groups. Baseline pre-operative lipid profile measures showed no statistically significant difference between the two groups regarding total cholesterol and HDL levels while there was a significant difference in LDL and triglycerides levels.

It showed that LDL level of patients in (sleeve gastrectomy) group was significantly higher than LDL level of (mini gastric bypass) group (179.33 ± 28.98 mg/dl vs 157.86 ± 31.66 mg/dl respectively) (p value <0.05) while triglycerides level of patients in (mini gastric bypass) group was significantly higher than triglycerides level of (sleeve gastrectomy) group (222.50 ± 56.44 mg/dl vs 188.59 ± 28.92 mg/dl respectively) (p value <0.05).

Three months post-operative anthropometric measures showed that post-operative weight and BMI were significantly higher in mini gastric bypass group than sleeve gastrectomy group (108 ± 14.2 Kg vs 100.98 ± 12.27 Kg and 42.85 ± 4.90 Kg/m² vs 38.84 ± 4.39 Kg/m² respectively) (p value <0.05). (Table 4, Figure 7 & 8)

Three months post-operative lipid profile showed no statistically significant difference between the two groups regarding total cholesterol and HDL levels while there was a significant difference in LDL and triglycerides levels.
Comparing the two groups regarding amount of change in LDL. It shows that there was a statistically significant difference between pre and post-operative LDL in both groups (p value <0.05), there was a statistically significant difference between two groups regarding mean LDL (p value < 0.05) and there was a statistically significant difference between two groups regarding amount of change in LDL (p value <0.05).

**Conclusion:** According to our results both laparoscopic techniques; LSG and MGB were effective in achieving significant weight loss and improvement of obesity-associated medical comorbidities; dyslipidemia. Still LSG could be preferred in patients with dyslipidemia. The decrease of LDL, cholesterol and triglycerides being similar to MGB but a higher increase of HDL being documented.

**Keywords:** Obesity; Bariatric surgery; Lipid profile; sleeve; gastrectomy; MGB.

---

**INTRODUCTION:**

“Overweight” and “Obesity” refers to abnormal, excessive fat accumulation in an individual’s body leading to general health impairment(1).

Body mass index (BMI) is the most commonly used parameter to calculate the individual’s weight status according to World Health Organization (WHO). BMI higher than or equal to 25 kg/m² is suggested as overweight and BMI higher than or equal to 30 kg/m² indicates obesity(2). There are multiple factors playing role in pathophysiology of overweight and obesity including genetics, heredity, environmental and psychological factors, lack of adequate physical activity and hormonal imbalances. The most common factor is the imbalance between calorie intake and expenditure by physical activity(3). Obesity is linked with raised cardiovascular risk factors such as hypertension, type 2 diabetes mellitus and dyslipidemia(4). Obesity is the third preventable cause of death worldwide, following tobacco usage(4).

Lipid profile parameters suggesting obesity includes increased serum level of total cholesterol, low-density lipoprotein (LDL) cholesterol, very low-density lipoprotein (VLDL) cholesterol, triglycerides, apolipoprotein B and a reduction in serum high-density lipoprotein (HDL) cholesterol(5). Most patients with obesity present with lipid abnormalities; however, only 20% of the obese patients' population is not showing classical metabolic lipid changes(6).

Hyperlipidemia is widely recognized as one of the main comorbidities in severe obesity. It is therefore not surprising that research and treatment are increasingly focused on lipid profiles in the drive to potentially reduce cardiovascular related disease(7&8). Dyslipidemia is the major risk factor for coronary artery disease. Among obese patients, the estimated prevalence of hypertriglyceridemia is twice as high as in non-obese individuals(9).

In addition, the prevalence of so-called "atherogenic dyslipidemia", characterized by the combination of hypertriglyceridemia with high LDL and low HDL, is more prevalent in obese and overweight patients. To avoid the risk of manifestations of atherosclerotic disease, the third report of the National Cholesterol Education Program (NCEP)(10) instructs that patients with no other risk factors for coronary heart disease
Lipid profile changes following bariatric surgery, A comparative study between sleeve gastrectomy.

must maintain serum levels of LDL-cholesterol lower than 130mg/dl, total cholesterol less than 200mg/dl, and triglycerides lower than 150mg/dl. The desirable serum HDL cholesterol level should be greater than 50mg/dl for women and greater than 40mg /dl for men.

Dattilo et al. in their study showed that a weight loss of 1 kg leads to reduction in serum total cholesterol by 0.05 mmol/L and LDL cholesterol by 0.02 mmol/L and an increase in HDL cholesterol by 0.009 mmol/L.

The most widely accepted management of obesity includes either one of the following alone or combination of them: Diet planning, exercising, behavioral therapy (e.g., treating underlying psychological enablers of eating disorders), pharmaco-therapy and surgical intervention.

Weight-loss surgeries are known collectively as bariatric surgery. This involves making changes in the digestive system to help lose weight. Although it is designed to achieve and sustain substantial weight loss, it was demonstrated by numerous studies to improve obesity-related co-morbidities. Bariatric surgery has since evolved to four dominant procedures (Bilio-pancreatic Diversion (BPD), Roux-en-Y Gastric Bypass (RYGBP), Adjustable Gastric Banding, Sleeve Gastrectomy), ranging from largely malabsorptive to completely restrictive. They are regarded as the most effective therapies for treating obesity.

LSG is now one of the most widespread weight loss surgical procedures in Egypt. LSG is technically less complex procedure with effective weight loss. Other factor to consider LSG superior to MGB is the outcome results stated by Mostafa et al., (2019) who conducted a study in Egypt and reported that after prospectively comparing the two procedures for a year, almost both procedures have near same effect on loss of weight and resolving or better control on co-morbidities as DM, and HTN. However, MGB patients in need for multi-vitamins and minerals costing more than 1500 Egyptian pounds per month.

Although weight loss surgery results in significant improvements in serum lipid concentrations, few studies have compared the effect of different surgical techniques on lipid profile changes. A variety of surgical procedures are available and, currently, it is difficult to identify the most effective option based on patient characteristics and co-morbidities.

Type of Study: Comparative study.

Study Setting: The study was conducted at Ain Shams University (ASU) Hospitals.

Study Period: 12 months, onset in January-2020 to February-2021.

Sampling Method: This study was performed on a convenience sample of morbidly obese patients.

Sample Size: 60 morbidly obese patients.

Age: Age group ranges from 20 to 59 years.

Gender: No sex predilection.

Inclusion Criteria: morbidly obese patients who were going to undergo bariatric surgery at El-Demerdash Hospital and have history of dyslipidemia.

Exclusion Criteria: Patients having history of chronic liver disease, liver fibrosis and or having history of drinking alcohol were excluded.

Ethical consideration: A written informed consent was obtained from each participant after explaining the aim of the study & all the procedures that will be done. Privacy & confidentiality were concerned. Approval was obtained from the ethical committee. The study was conducted.
according to the stipulations of the ASU ethical and scientific committee.

**Study Method:** The study included sixty morbidly obese persons suffering dyslipidemia and underwent bariatric surgery at the department of bariatric surgery (department 5&6 general surgery) at El-Demerdash Hospital. The type of the operation to be done was defined by the treating surgeon or selected by the patient.

**Study Tools:**

Preoperative, interview questionnaire included the following data: name, age, gender, contact number, medical history (dyslipidemia, chronic liver disease and liver fibrosis), previous or current treatments.

Patients were evaluated preoperatively and 3 months postoperative regarding their anthropometric data (weight, height, and Body mass index) and total lipid profile (total cholesterol, HDL, LDL and triglycerides). Laboratory investigation was done at Ain Shams University – Clinical Pathology department

All patients are instructed to follow the general healthy dietary guidelines during the postoperative period (shared with them)

**Statistical Analysis:** The collected data was coded, tabulated, and statistically analyzed using SPSS program version 25.

Descriptive statistics was done for quantitative data as minimum, maximum and mean ±SD (standard deviation) and for qualitative data as count and percentage.

Student t test was used to compare quantitative data between two independent groups.

Paired samples t test was used to compare quantitative data for the same group before and after intervention.

Chi square test was used to compare qualitative data between different groups.

Repeated measure ANOVA test was used to compare amount of change in quantitative data after intervention between two groups.

P value < 0.05 was considered statistically significant.

**RESULTS:**

**Statistical Results:**

The study included 30 patients in each group. (Appendix-1)

Demographic data analysis between the two groups shows that age of patients in (mini gastric bypass) group was significantly higher than age of (sleeve gastrectomy) group (39.47 ± 11.13 years vs 33.67 ± 11.02 years respectively) (p value =0.05).

No statistically significant difference was found between the two groups regarding sex distribution (Table 1)

<table>
<thead>
<tr>
<th>Table 1: Gender and age distribution between the two groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Mini gastric bypass</td>
</tr>
<tr>
<td>Sleeve gastrectomy</td>
</tr>
</tbody>
</table>

**Comparison between two groups regarding change in anthropometric measures:**

**Weight:**

Comparing the two groups regarding amount of change in weight. It shows that there was a statistically significant difference between pre and post-operative weight in both groups (p value <0.05), there was no statistically significant difference between two groups regarding mean weight (p value > 0.05) and there was a statistically significant difference between two groups regarding amount of change in weight (p value <0.05). (Table 2 and Diagram 1)
Lipid profile changes following bariatric surgery, A comparative study between sleeve gastrectomy.

Table 2: Comparing the two groups regarding amount of change in weight

<table>
<thead>
<tr>
<th></th>
<th>Mini gastric bypass</th>
<th>Sleeve gastrectomy</th>
<th>Test for the effect of time</th>
<th>Test for the effect of group</th>
<th>Test for interaction*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preoperative</td>
<td>129.80 ± 17.46</td>
<td>131.65 ± 16.35</td>
<td>&lt;0.001</td>
<td>0.44 NS</td>
<td>&lt;0.001 HS</td>
</tr>
<tr>
<td>3 months Post-operative</td>
<td>108.80 ± 14.20</td>
<td>100.98 ± 12.27</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Test for interaction = amount of change between the 2 groups

Diagram 1: Estimated marginal means of weight

**BMI:**

Comparing the two groups regarding amount of change in BMI. It shows that there was a statistically significant difference between pre and post-operative BMI in both groups (p value <0.05), there was no statistically significant difference between two groups regarding mean BMI (p value > 0.05) and there was a statistically significant difference between two groups regarding amount of change in BMI (p value <0.05). (Table 3 and Diagram 2)

Table 3: Comparing the two groups regarding amount of change in BMI

<table>
<thead>
<tr>
<th></th>
<th>Mini gastric bypass</th>
<th>Sleeve gastrectomy</th>
<th>Test for the effect of time</th>
<th>Test for the effect of group</th>
<th>Test for interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preoperative</td>
<td>51.09 ± 5.69</td>
<td>50.61 ± 5.77</td>
<td>&lt;0.001</td>
<td>0.10 NS</td>
<td>&lt;0.001 HS</td>
</tr>
<tr>
<td>3 months Post-operative</td>
<td>42.85 ± 4.90</td>
<td>38.84 ± 4.39</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Test for interaction = amount of change between the 2 groups

Diagram 2: Estimated marginal means of BMI (Kg/m2)
Comparison between two groups regarding change in lipid profile:

**Total cholesterol:**

Comparing the two groups regarding amount of change in Total cholesterol. It shows that there was a statistically significant difference between pre and post-operative Total cholesterol in both groups (p value <0.05), there was no statistically significant difference between two groups regarding mean Total cholesterol (p value > 0.05) and there was no statistically significant difference between two groups regarding amount of change in Total cholesterol (p value >0.05). (Table 4 and Diagram 3)

**Table 4: Comparison between two groups regarding change in total cholesterol**

<table>
<thead>
<tr>
<th>Total Cholesterol</th>
<th>Mini gastric bypass</th>
<th>Sleeve gastrectomy</th>
<th>Test for the effect of time</th>
<th>Test for the effect of group</th>
<th>Test for interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative</td>
<td>268.43 ± 52.06</td>
<td>274.83 ± 41.78</td>
<td>&lt;0.001 HS</td>
<td>0.49 NS</td>
<td>0.42 NS</td>
</tr>
<tr>
<td>3 months Post-operative</td>
<td>226.87 ± 43.21</td>
<td>235.81 ± 35.79</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Test for interaction = amount of change between the 2 groups

**Diagram 3: Estimated marginal means of total cholesterol**

**HDL**

Comparing the two groups regarding amount of change in HDL. It shows that there was a statistically significant difference between pre and post-operative HDL in both groups (p value <0.05), there was no statistically significant difference between two groups regarding mean HDL (p value > 0.05) and there was a statistically significant difference between two groups regarding amount of change in HDL ( p value <0.05). (Table 5 and Diagram 4)

**Table 5: Comparison between two groups regarding change in HDL.**

<table>
<thead>
<tr>
<th>HDL</th>
<th>Mini gastric bypass</th>
<th>Sleeve gastrectomy</th>
<th>Test for the effect of time</th>
<th>Test for the effect of group</th>
<th>Test for interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative</td>
<td>34.03 ± 7.60</td>
<td>32.51 ± 5.64</td>
<td>&lt;0.001 HS</td>
<td>0.75 NS</td>
<td>0.001 HS</td>
</tr>
<tr>
<td>3 months Post-operative</td>
<td>37.76 ± 8.83</td>
<td>40.43 ± 6.53</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Test for interaction = amount of change between the 2 groups
Lipid profile changes following bariatric surgery, A comparative study between sleeve gastrectomy.

**Diagram 4: Estimated marginal means of HDL**

**LDL:**

Comparing the two groups regarding amount of change in LDL. It shows that there was a statistically significant difference between pre and post-operative LDL in both groups (p value <0.05), there was a statistically significant difference between two groups regarding mean LDL (p value < 0.05) and there was a statistically significant difference between two groups regarding amount of change in LDL (p value <0.05). (Table 6 and Diagram 5)

**Table 6: Comparison between two groups regarding change in LDL.**

<table>
<thead>
<tr>
<th></th>
<th>Mini gastric bypass</th>
<th>Sleeve gastrectomy</th>
<th>Test for the effect of time</th>
<th>Test for the effect of group</th>
<th>Test for interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDL Preoperative</td>
<td>157.86 ± 31.66</td>
<td>179.33 ± 28.98</td>
<td>&lt;0.001 HS</td>
<td>0.01 HS</td>
<td>0.02 S</td>
</tr>
<tr>
<td>3 months Post-operative</td>
<td>133.43 ± 25.73</td>
<td>149.51 ± 22.32</td>
<td></td>
<td>0.01 HS</td>
<td></td>
</tr>
</tbody>
</table>

*Test for interaction = amount of change between the 2 groups

**Diagram 5: Estimated marginal means of LDL**

**Triglycerides:**

Comparing the two groups regarding amount of change in Triglycerides. It shows that there was a statistically significant difference between pre and post-operative Triglycerides in both groups (p value <0.05), there was a statistically significant difference between two groups regarding mean Triglycerides (p value < 0.05) and there was a statistically significant difference between two groups regarding amount of change in Triglycerides (p value <0.05) (Table 6 and Diagram 6).
Table 7: Comparison between two groups regarding change in Triglycerides.

<table>
<thead>
<tr>
<th></th>
<th>Mini gastric bypass</th>
<th>Sleeve gastrectomy</th>
<th>Test for the effect of time</th>
<th>Test for the effect of group</th>
<th>Test for interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>TG</td>
<td>Preoperative</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>222.50 ± 56.44</td>
<td>188.59 ± 28.92</td>
<td>&lt;0.001 HS</td>
<td>0.01 HS</td>
<td>0.01 HS</td>
</tr>
<tr>
<td></td>
<td>3 months Post-operative</td>
<td>169.66 ± 41.14</td>
<td>146.38 ± 22.96</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Test for interaction = amount of change between the 2 groups

Diagram 6: Estimated marginal means of Triglycerides

DISCUSSION:

In the present study, baseline pre-operative lipid profile measures showed no statistically significant difference between the two groups regarding Total cholesterol and HDL levels while there was a significant difference in LDL and triglycerides levels. It shows that LDL level of patients in (sleeve gastrectomy) group was significantly higher than LDL level of (mini gastric bypass) group (p value <0.05) while triglycerides level of patients in (mini gastric bypass) group was significantly higher than triglycerides level of (sleeve gastrectomy) group (p value <0.05). Still pre-operative data in both groups showed baseline low levels of HDL, hypertriglyceridemia, and increased LDL levels which are frequently seen in obese patients similar to the results reported by Sullivan et al. (24).

All patients are instructed to follow the general healthy dietary guidelines during the postoperative period (Appendix-2)

In the present study, three months post-operative anthropometric measures show that post-operative weight and BMI were significantly higher in mini gastric bypass group than sleeve gastrectomy group (p value <0.05). In agreement to current study, Milone et al. (25) reported that the 3-month post-operative follow-up, there were changes in BMI. MGB patients showed lower changes in BMI as compared with LSG ones.

In the present study, three months post-operative lipid profile show no statistically significant difference between the two groups regarding Total cholesterol and HDL levels while there was a significant difference in LDL and triglycerides levels. It shows that LDL level of patients in (sleeve gastrectomy) group was significantly higher than LDL level of (mini gastric bypass) group (p
value <0.05) while triglycerides level of patients in (mini gastric bypass) group was significantly higher than triglycerides level of (sleeve gastrectomy) group (p value < 0.05). This result matches with previously reported studies by Benetti et al.\textsuperscript{(26)} and Pihlajamäki et al.\textsuperscript{(27)}.

In the present study, comparing the two groups regarding amount of change in Total cholesterol. It shows that there was a statistically significant difference between pre and post-operative total cholesterol in both groups (p value <0.05), there was no statistically significant difference between two groups regarding mean Total cholesterol (p value > 0.05) and there was no statistically significant difference between two groups regarding amount of change in Total cholesterol (p value >0.05). In agreement to current study, Benaiges et al.\textsuperscript{(28)} reported that the effect of both techniques on cholesterol levels was apparent from the third month.

In current study, comparing the two groups regarding amount of change in HDL. It shows that there was a statistically significant difference between pre and post-operative HDL in both groups (p value <0.05), there was no statistically significant difference between two groups regarding mean HDL (p value > 0.05) and there was a statistically significant difference between two groups regarding amount of change in HDL (p value >0.05). In agreement to current study, Benaiges et al.\textsuperscript{(28)} reported that changes in lipid profile 1 year after surgery differed between the two study groups. After LRYGB, total and LDL cholesterol concentrations fell significantly whereas no significant changes were observed in the LSG group.

In current study, comparing the two groups regarding amount of change in triglycerides. It shows that there was a statistically significant difference between pre and post-operative triglycerides in both groups (p value <0.05), there was a statistically significant difference between two groups regarding mean triglycerides (p value < 0.05) and there was a statistically significant difference between two groups regarding amount of change in triglycerides (p value <0.05). In agreement to current study, Benaiges et al.\textsuperscript{(28)} reported that changes in lipid profile 1 year after surgery differed between the two study groups. After LRYGB, triglyceride concentrations decreased similarly with both surgical procedures.

In conclusion, our findings showed that bariatric surgery improves weight loss and can help with managing or treating co-morbid illnesses through reducing triglyceride level and increasing HDL level, both of which improve patients’ long-term cardiac and hepatic status.

According to our results both laparoscopic techniques, LSG and MGB were effective, in achieving significant weight loss and improvement of obesity-associated medical comorbidities i.e. dyslipidemia. In spite that the decrease of
LDL, cholesterol and triglycerides after LSG is similar to MGB still a higher increase of HDL being documented this makes LSG to be the preferred surgery in patients with dyslipidemia. The reason of such difference could be that in LSG, unlike other restrictive techniques, resection of the gastric fundus is performed, after which a reduction in ghrelin has been described (R.S. Gill et al., 2011). Some evidence points to a relationship between ghrelin and HDL metabolism, since the presence of certain single nucleotide polymorphisms in ghrelin may affect HDL concentrations (29,30,31).

Conclusion:
Both studied laparoscopic techniques; LSG and MGB were safe and effective, still short term results showed that LSG could be the preferred operation in patients with dyslipidemia.

The reason is that in spite that the decrease of LDL cholesterol and triglycerides being similar to MGB, a higher increase of HDL being documented

REFERENCES:
Lipid profile changes following bariatric surgery, A comparative study between sleeve gastrectomy.


Lipid profile changes following bariatric surgery. A comparative study between sleeve gastrectomy.

Appendix 1

<table>
<thead>
<tr>
<th>Data 1</th>
<th>Data 2</th>
<th>Data 3</th>
<th>Data 4</th>
<th>Data 5</th>
<th>Data 6</th>
<th>Data 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value 1</td>
<td>Value 2</td>
<td>Value 3</td>
<td>Value 4</td>
<td>Value 5</td>
<td>Value 6</td>
<td>Value 7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Research Participants: Medical Data
Post-operative nutritional guidelines

There are four stages to your diet plan. You will start with stage 1 and progress to stage 4. If you have problems—like throwing up or feeling sick at your stomach—you may need to go back to an earlier stage. For example, if you are having problems with solid foods, step back to a pureed diet. If you are having problems with the pureed diet, go back to liquids. Then, slowly move to the next stage in your diet.

The first stage - Fluid phase (first 1-2 weeks after surgery):

All drinks should be smooth (no lumps or crumbs) and drinkable. Start with sips and if you feel comfortable increase the amount.
in each sip. Be careful not to swallow large amounts of your drink as this may cause vomiting.

Make it a goal to drink two and a half to three litters each day to avoid dehydration. At least a litter or a litter and a half of it should be nutritious fluids (see below). Avoid soft drinks.

Coffee, tea (without caffeine) and water are safe to drink but make sure you drink them in addition to, not a substitute for, nutritious beverages (see below).

**Nutritious drinks:**
- Skimmed or low-fat milk fortified with skimmed milk powder (one or two tablespoons per hundred ml)
- Fruit mixed with milk: Homemade is the best. The ones sold are high in sugar.
- Unsweetened fruit juice (restrict to one to two small glasses daily)
When you’re ready, move on to stage two for a week or two

**The second stage - Finely blended/pureed food (the third week):**
1. You should still avoid lumps in your food during this stage. Make sure your food is mixed well.
2. The goal is to reach the density of the yogurt.
3. Eat four to six meals a day.
4. Start with 2-3 tablespoons at a time and gradually increase as you feel comfortable (to 4-6 tablespoons)
5. Chew food well and eat it slowly.
6. Stop as soon as you feel full.
7. Do not drink liquids while eating. Wait at least 30 minutes after you finish eating to drink anything.
8. Make sure your meal contains a source of protein, this is important to help you recover.
When you are ready, go to the third stage

**The third stage - Soft foods (4th week):**

The texture that you will be eating at this point is pureed food that you can eat with a fork or spoon.
1. You don't need to add milk or fruit juice because you will be eating normal food.
2. Large pieces are allowed now! It is important to chew your food well and slow down while eating your meal.
3. You should reduce meals per day to three or four (and the fourth could be a light meal) and avoid eating between them. Get yourself used to the routine of three meals a day, even if you are not hungry at the time, this will help you lose weight in the long run.
4. Keep drinking fluids farther from eating.

**The fourth stage - Regular food (approximately five weeks after surgery):**

Your goal will be three meals a day and one or two snacks between meals.

The long-term goal is to have three servings each, one the size of a cup of tea, and a serving in the middle of a piece of fruit or yoghurt.

You don't have to add liquids that contain calories or protein, no milk, skimmed milk powder, or fruit juice

You may like the idea of skipping some foods because you are not hungry to speed up the process of losing weight, but this will lead to you getting used to unhealthy food behaviours and eating a lot in the next meal, and your food should include all the types of regular foods (and remember to chew them well). If it is a new food, put a very small amount in your mouth and chew well.

**The post-operative short guide to a healthy lifestyle:**
1. Eat 3 small meals a day with 2 protein snacks in between.
2. Four tablespoons of solid food, or four ounces by weight (8 tablespoons) of food at a meal.
This is a satiating portion per meal for the first months after surgery. Always weigh every meal
3. Choose your food wisely as your stomach space is limited.
4. Natural foods are better than canned.
5. Start every meal with protein.
6. Avoid white carbs
7. Your meals should be high in protein and low in fats and carbohydrates.
8. Do not drink soft drinks
9. Don't drink caffeinated drinks
10. Do not do anything else while eating; avoid distractions
11. Be mindful of every bite.
12. Eat slowly (Take your meal in 30 minutes).
13. Chew your food until it reaches the consistency of applesauce.
14. Drink at least 4 cups of zero-calorie fluids every day between meals
15. Exercise is one of the basics of losing weight. Get up and move!