

BARIATRIC SURGERY (SURGERY FOR THE TREATMENT OF OBESITY)

WHAT IS OBESITY?

Obesity is the condition whereby the individual sustains the body weight that is significantly higher than ideal body weight for people of his height. A person is labeled as obese when he has body weight twice of the ideal body weight. This condition predisposes the person to many kinds of health problems and also increases his likelihood of premature death.

In order to make easy the identifying of obesity, a general formula relating body weight to the height is used. This is called "Body Mass Index (BMI)". It is defined as a number calculated by dividing the body weight (in Kg) by square of the height (in meters).

Thus:

$$\text{BMI} = \frac{\text{Body wt (Kg)}}{\{\text{Ht (m)}\}^2}$$

In the Western population, a normal individual should have BMI of 20-25 Kg/m². When the BMI is between 25 to 30, the person is overweight. When it is above 30 Kg/m², the person is obese. A BMI above 35 is severe obesity. If the person has comorbid diseases associated with obesity, he is labeled as "Morbid Obesity". This usually occurs when an individual is over 35 Kg/m². The more BMI one has, the more likely he will have associated comorbidities and thus shortened life. BMI above 40 Kg/m² has a very high chance of having at least one comorbid and thus we usually labeled people with BMI above 40 Kg/m² as morbid obesity as well. In Asian population, it has been found that people are more prone to comorbidities at a lower BMI level than the Caucasians. The definite figures have not been clearly defined. However, there is a consensus of the Asia-Pacific Bariatric Surgery Group in 2005 stating that Asian people with BMI between 32 kg/m² and 37 kg/m² with diabetes or with two other comorbidities; or those who have BMI above 37 kg/m²; should be equivalent to morbid obesity in the Western people.

The so-called comorbids of obesity are many. The most common ones are type II diabetes mellitus, hypertension, sleep disturbance including snoring and sleep apnea, high cholesterol, asthma and several bone and joint problems because of the heavy weight. Table 1 shows the prevalence of overweight in some countries. It can be seen that the prevalence of overweight and obesity is not constant between different countries or, in fact, even in different areas of the same country.

Table 1: The prevalence of overweight in adults in various countries

USA	61%
Australia	59%
Russia	54%
United Kingdom	51%
Brazil	36%
China	15%

In Australia and USA, 60% of adults are overweight. More than 20% are obese (BMI > 30), more than 15% are severely obese (BMI > 35) and more than 8% are morbidly obese (BMI > 40). In Thailand, the most recent statistic announced by the Ministry of Health shows the prevalence of overweight in 20 provinces to be 39% in adults and out of these, about 24% are having chronic illness because of obesity. There was another survey in 1996 in Thailand, which showed the prevalence of overweight and obesity to be 28.3% and 6.8% respectively. Females have the higher prevalence than males in every country.

Comorbids of obesity include Type II DM (insulin-resistant), Hypertension, Hypercholesterolemia and dyslipidemia, Asthma and Sleep apnea, Infertility. People who are obesity also have increased risks in developing coronary disease, myocardial infarction, strokes, degenerative knee joint problems, gallstone, gastroesophageal reflux, miscarriage and cancers, eg. uterine, breast, colon cancers.

In a survey in 1991, the incidence of diabetes mellitus (DM) in Thai people relative to BMI shows the significance of weight on this chronic disease. In people who have normal body weight, the incidence of DM is 2.1%. People who are overweight have an incidence of 5.2%, whereas those who have body weight in the obesity category have an incidence of 6.3%.

The incidence of hypertension also correlates with the BMI. In the same survey in Thailand, people who have normal BMI have 4.6% chance of hypertension, whereas those who are overweight and obese have the incidence of 11.1% and 18.4% respectively.

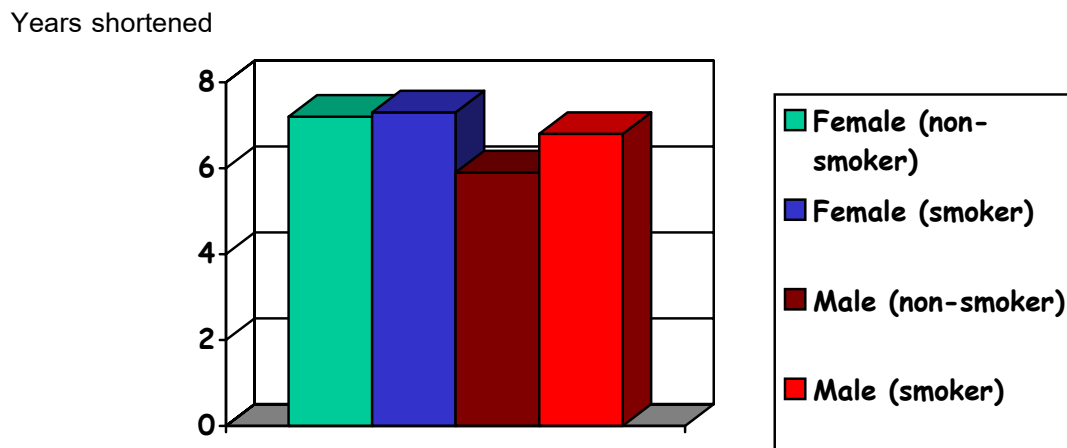


Figure 1: Shortened life span (years shortened from normal life span) in males and females who are obese (BMI>30) compared to their normal counterparts

Studies consistently showed that morbidly obese patients have several years shortened life span compared to their non-obese counterparts (Figure 1)

HOW CAN WE COPE WITH OBESITY?

It has been proved that when the weight of morbidly obese patients reduced, the severity and prevalence of their comorbidities will also be reduced. Therefore, there are justified reasons to recommend weight reduction for those patients who have BMI over 35 kg/m².

Generally speaking, there are 2 categories of accepted treatment plans for weight reduction: conventional and surgical. The conventional method of weight reduction usually consists of some forms of medicines combined with diet management and intensive programs of exercise. The surgical method consists of surgical procedures that aim at limiting food intake (restrictive) with or without reducing nutrient absorption (malabsorptive).

Conventional (medical) method of weight reduction may be effective to some degree, but it usually needs strong will powers in the part of the patient. It is very difficult to overcome the temptation of over-eating in this population of people and to mobilize them to adequate exercise. Unfortunately, despite the seemingly successful attempts, once they stop or lessen their efforts, the weight usually rapidly return to the original level; and frequently even to higher weight, the so-called "Yo-Yo Effect". Therefore, the American National Institute of Health Consensus Statement on Surgical Treatment of Obesity in 1991 stated that in those who had failed to lose weight by conventional methods or regained the weight after weight reduction, surgical method is indicated.

The surgical procedures that are used for weight reduction are collectively called "Bariatric Surgery". There have been several procedures recommended so far; but the most popular now-a-days are the laparoscopic adjustable gastric banding and laparoscopic Roux-en-Y gastric bypass.

Laparoscopic adjustable gastric banding is purely restrictive procedure. It uses the principle of creating a small gastric receptacle for food with a narrow outlet at the proximal part of the stomach. A "gastric band", made of silicone, is used to wrap around the proximal part of the stomach. This gastric band has a balloon that is connected to a silicone catheter leading to a metallic port that is buried in the subcutaneous space underneath the skin at the abdominal wall (Figures 2 and 3). By injecting suitable liquid into the subcutaneous port the balloon can be inflated, thus causing a narrower outlet. Thus, this is in a sense of "adjustable" system that can be made suitable for individual patient at specific time after the surgery. It has been found that this type of change to the stomach causes the patient to be full easily when he takes his meal (so-called "early satiety"). It also reduced the patient's desire to eat, in contrast to his previous behavior of frequent eating. The band allows him

only small meals and teaches him to chew the food well before swallowing, otherwise he will feel discomfort in his stomach. However, all the ingested food that is swallowed will be absorbed normally. He will not have any problem with malnutrition if he takes adequately nourishing food.

For the other bariatric procedure, laparoscopic Roux-en-Y gastric bypass, the surgeon makes some anatomical changes in the patient's digestive tract. Using laparoscopic technique, the stomach is divided to create a very small pouch. A loop of small intestine, which is cut at the site about 100 cm beyond the duodenum, is brought up to connect to the stomach to serve as its outlet. This outlet is made very narrow so as to control the volume of food leaving the stomach. The connection of this anatomical change is arranged in the form that looks like a "Y" configuration, thus giving the name "Roux-en-Y". By so doing, the patient will be allowed to eat only small meals (restrictive mechanism) and also the digestion of the ingested food is delayed by the 100-cm intestinal loop before it can mix with the digestive enzymes. The latter mechanism causes some degree of "malabsorption". There is another modification of the gastric bypass procedure. This is called laparoscopic mini-gastric bypass. By this name, the stomach is divided longitudinally instead of transversely and the anastomosis between the stomach and the small intestine is done by a "loop-type" instead of roux-en-Y type. This procedure is designed to be less extensive than the roux-en-Y bypass and harbors less operative complication.

Currently, laparoscopic gastric bypass is more popular in USA whereas laparoscopic gastric banding is more popular in Europe and Australia. Perhaps this is because the gastric band was just approved by the American FDA in the year 2001, so most American surgeons are more accustomed to the gastric bypass procedure, which has been done for more than 10 years in USA. In addition to the different mechanisms of action, the two procedures differ in the degree of adjustability and reversibility. Once performed, the gastric bypass is not easily reverted without a major operation, whereas the gastric band can be easily removed by another laparoscopic session just to cut and let it out; and the result will be a normal digestive tract exactly the same as his preoperative condition.

WHO IS ELIGIBLE FOR SURGERY?

Any surgery harbors some risks. Not every obese individual is suitable to have surgical treatment. There has been a consensus statement that bariatric surgery is indicated in the following patients:

- Caucasian patients who have BMI over 35 kg/m^2 with one or more comorbid; or BMI over 40 kg/m^2 with or without comorbid; Asian patients who have BMI $32\text{-}37 \text{ kg/m}^2$ with diabetes mellitus alone or two other comorbid of obesity; or BMI over 37 kg/m^2 .
- They have failed other modalities of treatment to reduce the weight including medicine, diet and exercise.
- The patients should be able to follow strictly the diet and exercise advises after surgery.

Besides, the surgical candidates should have physical status that can tolerate major surgical procedure under general anesthesia. The diabetes, blood pressure and pulmonary function must be well controlled. They should be informed about the nature of the surgical procedure, the risks and their roles in the post-operative period. They should understand that there will be a major change in their life style in terms of their eating behavior and exercise and that their cooperation is vital to the success.

RISKS OF SURGERY

This hospital provides laparoscopic adjustable gastric banding. Generally, any obese patients undergoing surgery under anesthesia have some risk associated with the anesthesia itself. Cardiac and pulmonary complication can occur, although with low incidence if the patients are selected based on their physical status prior to surgery. There is also a small risk of developing deep vein thrombosis whenever these patients stay in any position for a long time. This is prevented by giving intermittent support to the legs during surgery and administering anticoagulant. Preoperative and post-operative breathing exercise can also minimize these complications.

The surgery itself may harbor some risks. Intra-operative and post-operative bleeding can complicate the situation, but the surgeons would do their best to minimize it. Injury to internal organs like spleen and liver may occur and thus necessitate careful

dissection during dissection and once occurs needs immediate management. Post-operative wound infection can also occur but most of the times it is not serious.

Since the gastric band is an artificial device, it may have wear and tear events. The balloon, tubing and connections may break or leak leading to loss of its ability to inflate the balloon and thus cannot adjust the size of the band. This results in failure to reduce the weight. If this happens, the surgeon has to fix the problem by suitable surgical management. This may involve repairing the connector or even by replacing the band with a new one.

The band that is fixed in place with a few stitches may migrate to another position or slipped from its place. This may loosen the band and allow prolapse of the rest of the gastric wall into the space of the band, causing tightening of the food outlet. The patient will then experience pain and vomiting after swallowing. This might necessitate surgical correction or replacement of the band.

In some rare occasion, the band may erode into the stomach due to continued pressure on the gastric wall. The patient will then lose the ability to control his or her weight and also needs to be fixed surgically.

Although any of these untoward effects can occur, the incidence is not high and totally may account for 10% of the cases operated, including minor complications.

PATIENT'S ROLES AFTER SURGERY

The patient must understand well that surgery is just a tool to help them lose weight. The most important roles leading to success are still his or her cooperation after the surgery. The surgeon will explain about changes in the patient's diet and behavior of eating. The patient will take only small meal at a time, three meals a day and avoid drinking water during meal. He or she can drink water between meals but that must not contain calories. The food must be chewed well before swallowed to avoid obstructing the gastric band. In addition to diet control, the patient should make himself or herself active to increase body energy expenditure.

The patient must take notes regarding his or her eating behavior as well as changes in the body weight. In case of adjustable gastric banding, keeping track with body weight is

also essential in the follow-up and adjustment of the balloon of the gastric band. Ideally, the weight should reduce progressively during the first one or two years until it reaches the plateau. We expect the weight to come down at the rate of 0.5-1 kg per week. If the weight becomes stabilized, the surgeon will consider adjusting the band by injecting some fluid (0.5-1 ml) through the injection port that is fixed in the abdominal wall underneath the skin. The increased amount of fluid in the balloon will then cause more food restriction.

STANDARD POST-OPERATIVE PATIENT CARES

No matter what bariatric procedure is done, the post-operative cares are quite similar. Usually the patient stays 2-3 days in the hospital after surgery. When he or she leaves the hospital, he or she usually is able to walk and does everyday activities with minimal pain. Driving a car is usually possible at one week; and the surgical wound should be able to be left exposed within one week.

There are 2 important issues the patient needs to follow after the operation. They include the nature of meals and the degree of exercises.

FOOD AFTER SURGERY

Both gastric banding and gastric bypass surgeries involve the making of a small gastric reservoir. Therefore, there will be a big change in the patient's eating environment; and this needs to be learned.

During the first several days, we don't want the patient to vomit, since vomiting can result in severe movement of the stomach. This may cause leakage of the anastomosis or displacement of the gastric band in the early post-operative days. Therefore, during the first week the patient should take only liquid food and will be given adequate anti-emetic agents to prevent vomiting. After the anastomosis heals well or the band is relatively firmly fixed to the stomach, then the meal can be progressively increased in bulks. He or she will be allowed to have pureed food, then soft diet and eventually ordinary food. This progression should take about 4 to 6 weeks. A dietitian will be of great help in advising the types of food suitable to the patient.

After the initial month, when the patient can take regular food, it is strongly advised that he takes 3 meals a day. During each meal, he should not drink water, since water will

facilitate swallowing of more food in the case of gastric banding and may lead to dumping syndrome, with palpitation and syncope because of too rapid flux of hypertonic food into the small intestine in the case of gastric bypass. However, taking a glass of water prior to commencing the meal is allowed. The patient can also take as much water as needed between meals; but this should not contain calorie. Thus drinking of juice, milk, chocolate, ice cream or coffee with sugar is not advisable.

In the case of gastric banding, each patient might notice that there is certain type of food that he or she cannot eat because he or she tends to have vomiting after taking it. The types of food that each patient cannot tolerate may be different from that noticed by other patients; and there is still no explanation about this phenomenon. However, what should be done is just to avoid that specific type of food. In some patients, supplementing with vitamin, iron or calcium may be necessary, especially in the case of gastric bypass and other more extensive malabsorptive procedures. The surgeon, physician or dietitian will give advice about this supplement to the patient.

POST-OPERATIVE ACTIVITIES

Surgery can facilitate restriction of food intake and/or reduction of food absorption, but it cannot increase energy expenditure by itself. To be able to lose weight well, the patient should not only take less energy, but he or she should increase energy loss from the body. Usually an obese person tends to be quite inactive because it is difficult for him or her to move up and down from a chair or bed. Besides, movement can cause pain in his or her joints and muscles that bear the weight because of osteoarthritis (destroyed and inflamed joints). However, once the body weight reduces, it becomes much easier for the patient to move around and start to exercise. The most important factor now is will power. The patient should remind himself or herself that he or she must keep active all the time, otherwise the intention to lose weight will not be fully successful.

For those who do not exercise routinely, walking is a good type of exercise to start with. The patient should aim to have about 30 minutes of exercise totally each day. After some time, he or she will feel more comfortable to proceed to jogging, swimming and so on.

POST-OPERATIVE FOLLOW-UP VISITS

After leaving the hospital, the patient should come back to the outpatient department for follow-up regularly for the rest of his or her life. During the first month, the patient should come to outpatient visit once a week or once every six weeks. After the first month or so, the patient should return for follow-up once every month for about one to two years. After that, he or she will come back every 3 to 6 months until the end of the second year. Beyond the second year, the weight is usually expected to plateau and the follow-up intervals can extend to once or twice a year for the rest of his or her life. Obviously, whenever complication or any abnormal symptoms arise, the patient should visit the surgeon for proper evaluation and management without delay.

The purposes of post-operative follow-up are mostly two folds: to detect and correct complication and to make appropriate adjustment of the band. During each follow-up, the physician will record the patient's weight and ask for any possible complication arising from the procedure or the band itself. Then he will determine whether an adjustment of the band is necessary in that follow-up session. If the patient's weight is reducing satisfactorily during that period of time, adjustment of the band is not necessary. However, if the body weight shows a tendency to stabilize or even increase, then adjustment will be indicated. This is done by injecting a volume of suitable fluid into the balloon of the band through the subcutaneous port. The fluid that is recommended is a contrast medium for neurological or urological radiography diluted in saline. Normal saline solution is also acceptable.

OUTCOME OF SURGERY

Since we offer mainly laparoscopic gastric banding in this hospital, we will concentrate mentioning only about the outcome of this procedure. After a successful gastric banding, the weight is expected to reduce gradually starting from the early post-operative period. During the first month when the patient is adapting to the new way of eating, the weight can come down about 5-8 kg. Then it tends to stabilize and that will be a suitable time for the first adjustment of the band. If there is no complication, the weight loss is expected to be at the rate of 0.5-1 kg/week until it plateaus. This will take between one to two years.

IS THERE ANY POSSIBILITY OF REOPERATION?

Unfortunately, yes. As mentioned before, the fact that the band is an artificial device subjects it to wear-and-tear effects. The connections between the balloon to its connecting tube and between the tube to the injection port can disrupt, separate or break leading to leakage of the fluid in the system. When this occurs, the restricting effect will partially be lost and the patient will fail to lose further weight. This can be corrected by re-operation to excise the broken part and reconnect them. If the balloon is broken, the band will have to be replaced.

If the band slips from its proper place, part of the gastric wall will prolapse into the circled band and causes the patient to develop obstruction to food passage. He or she will note that swallow is associated with pain and vomiting. The patient will also experience heartburn or even chest pain. When this occurs, the first thing to do is to deflate the balloon by withdrawing some volume of fluid from the band. If this does not result in resolution of the symptom, a contrast radiological examination should be done. Should a band slippage is proved, the band has to be replaced by a laparoscopic procedure.

If the band erodes into the stomach, usually as the effect of pressure necrosis, the patient will lose the sensation of early satiety and will regain the weight. The erosion of the band can be proved by gastroscopic examination, which will reveal part of the band in the gastric lumen. When this happens, the band should be removed and the defect on the gastric wall repaired by suturing if necessary.

Altogether, the chance of having long-term complications, both major and minor, is about 10%. The chance of having to removed the band, albeit because of major complication or because the patient cannot tolerate the presence of the band, is about 5%.

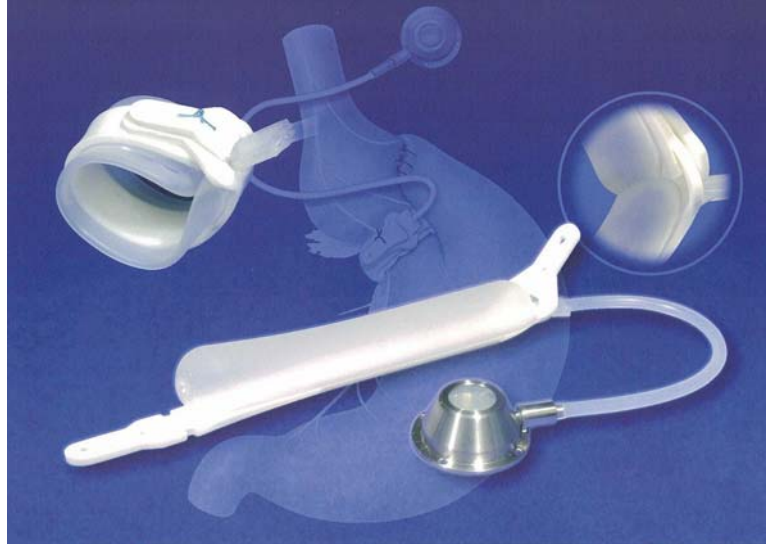


Figure 2: The Swedish Adjustable Gastric Band, before and after closing

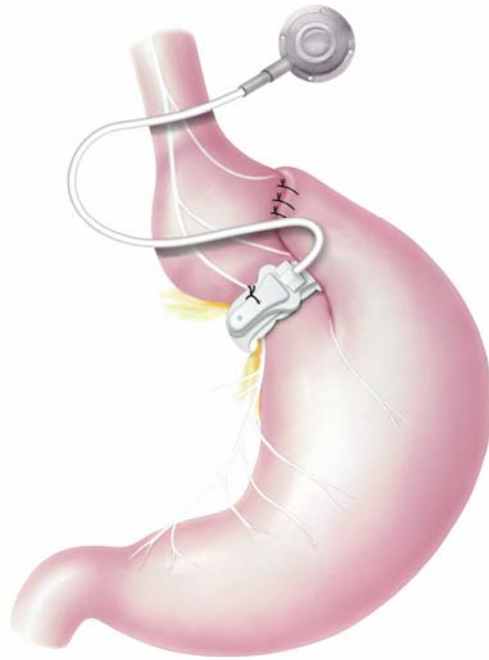


Figure 3: The gastric band in place, wrapping around the proximal part of the stomach. The injection port will be fixed under the skin at the abdominal wall. The small tube connects the injection port to the balloon of the band.