

## Obesity, Surgery, and Diet:

Excess body weight plays a major role in the development of some diseases that would require surgery and also in all aspects of surgery (planning, execution, recovery) for all diseases, related or unrelated to body weight. Defining excessive body weight is very difficult. The main source to determine ideal body weight comes from the Metropolitan Life Insurance tables published in 1943. While these tables serve well the insurance industry they tend to make most people over their ideal weight; these tables are only reasonable for people of a median stature and age, the short, the tall, the young and the old tend to be overweight. The advent of bariatric surgery has forced a more precise definition of obesity, and this has led to the use of body mass index (BMI) which is body weight divided by the square of height. The 'proposed' normal BMI for a median statured adult person (5'7") ranges between 18.5 and 25 (120 and 160 lbs). However, in the US the median BMI is 26.5. Adults with a BMI between 25 and 30 (160 to 190 lbs; about 30% of the US population) are overweight, and those with BMI above 30 are obese (35%: 30% with BMI between 30 and 40, and 5% with BMI >40 or extremely obese). For causes of overweight and obesity in the US see below.

A very typical problem associated with obesity is the development of hernias. The reason is pretty simple: the body walls are made of muscle and fascia (tendon like material) which only have enough strength to hold pressure within a certain range. This range is proportional to our height, which in turn determines our ideal body weight and BMI. As weight is accumulated in the body pressure builds up, primarily in the abdomen and stretches the muscles and fascia. Once the pressure overcomes the resistance of the muscles, hernias develop. This can be in the groins (inguinal), navel (umbilical), midline (ventral, epigastric or diastasis of the recti) and in previous incisions (incisional). Other problems resulting from increased pressure inside the abdomen are hiatal hernia and reflux esophagitis, hemorrhoids, and varicose veins in the legs.

The best metaphor to understand this phenomenon is assuming that muscles and fascia are a piece of garment. When we gain weight we start feeling the pressure of our clothes and replace them for a bigger size before they break. While the muscles and fascia also have a predetermined size, we don't have a choice of replacing them for a bigger size so they stretch until eventually they break.

As far as undertaking surgery on an obese patient there are several considerations. Firstly, obesity increases the risk of surgery by increasing the risk of pulmonary and cardiac problems. Obese patients are less able to expand their lungs and at greater risk of forming clots in the legs which can travel to the lungs. Obesity is associated with diabetes and hyperlipidemias which in turn lead to cardiac disease. Secondly, the incisions we make to perform surgery at a higher risk of wound infections. This is a combination of more bacteria present in the skin folds, less resistance to infection by the increased adipose tissue, and the high blood sugar levels. Thirdly, whether the surgery is performed for hernias or not obese patients are at risk of incisional or recurrent hernias due to the factors already mentioned.

Surgeons have always faced a challenge in gaining sufficient exposure within the abdomen to do a surgical procedure when the patient is obese. Nowadays this challenge is heightened when minimally invasive (laparoscopic) surgery is used. In obesity, adipose tissue accumulates under the skin and

infiltrates spaces within the abdomen. When a camera is introduced into the abdomen of very obese patients all what one can see is yellow adipose tissue, in order to visuallize an organ (gallbladder, bowel) the adipose tissue has to be pushed away. One technique used to help gain exposure is to move the operating room table feet up and down and side to side so the tissue and organs that obstruct our view move away by gravity. The range of movement in a severely obese patient is limited because of the risk of falls and of placing too much weight in certain parts of the body (buttocks or shoulders).

Over the last century hernia surgery underwent its own evolution just as in most other areas of surgery. Once surgeons gained an understanding of the anatomy they designed operations to suture back the defects producing hernias. The problem was that as the closure increased the tension of the tissues it did not hold the abdominal contents very long and the hernia would come back. In the later part of the century, industry came up with a number of different products designed to patch the hernia defect without creating tension. This could be meshed or a solid patch or a combination of both. The purported benefit of the patching of hernias follows the principle of body walls being a garment. If one has a hole in the elbow of a coat the best repair is to place a patch rather than simple reapproximation of the edges which will be subject to excessive pressure when the person bends the arm. The big difference is that the patch used for the coat is usually as flexible as the rest of the coat. Hernia patches are incorporated into the body creating scar tissue through them (mesh) or around them (solid). Over time the patched area becomes stiff. If the abdominal wall is still under excessive pressure the area to exert this pressure is reduced by the presence of the patch and consequently the pressure is higher. Therefore, hernia patches in obese patients tend to fail by detaching from the surrounding abdominal wall leading to a recurrent hernia or to new hernias elsewhere in the abdominal wall. In addition, hernias patches can become infected, can erode through the intestine, and can make future operations very difficult and more risky.

The latest trend in hernia surgery is the use “biological” patches. These new patches are made of animal (pig gut) or human tissue (cadaveric skin) that have been cleared of any immune cells and sterilized. They are meant to serve as a matrix for the body to lay collagen (scar protein). The limited experience already gained with these patches is that they only keep the strength for a limited time (several months) and eventually the abdominal wall weakens again and hernias recur.

The key for the success of hernia surgery is to reduce intrabdominal pressure to normal levels, and in the obese patient that means to lose weight. Individuals who are not obese also develop hernias due to either genetic factors or increased intrabdominal pressure due to other mechanisms: lifting, pushing, coughing (chronic bronchitis), labor and delivery, and straining to urinate or defecate. If the excessive pressure can be eliminated then hernias can be successfully repaired by either using the native tissues (overlapping them or rotating them) or using patches in some hernias (inguinal).

Conclusions:

- 1) Obesity produces hernias
- 2) There is no safe and effective way for repair of hernias unless excess body weight is lost

- 3) In ventral, umbilical and incisional hernias patches, whether meshed or solid, synthetic or biological are always an inferior solution to repairs using the body's own tissues
- 4) Obesity adds risk and complexity to most surgeries
- 5) Whenever possible, elective surgeries should be deferred until achieving weight loss (in our practice we don't embark in elective surgery until a patient reaches a BMI of 32 or less)

Now the question is how to lose weight. There is probably more written about weight loss programs than about any other topic. There are many companies profiting from fattening people and many others profiting from taking weight off people. There is also extensive research looking for explanations on the development of obesity. While there are some very rare cases of genetic obesity the great majority of obese people just eat beyond their energy expenditure. This means that it is possible (but rare) to develop obesity while engaged in a rigorous program of physical activity if the person takes in more calories than the body is consuming in the physical activity. The great majority of obese people fall into a vicious cycle of excessive intake and reduced physical activity, i.e., by eating one gets heavy making exercising more difficult so more time is spent in sedentary activities that can be carried out while eating (typically reading or watching television).

Saying that losing weight is not easy is an understatement. It takes a lot of determination and motivation to even decide to start a weight loss program. The first deterrent is the fear of failure, one has tried so many times and failed that wishes to avoid the frustration of accepting another defeat. Then there is all the blocking of messages that one has to handle, from television to magazines to social occasions and various other routines. Finally, there is the inconvenience of planning and procuring good food as opposed to eating on the go (fast food) which has become much more popular out of practicality.

Nobody can claim a solution to the problem of losing weight. The following is a very simplistic approach:

1. Break the routine
  - a. Metabolic: Diet
  - b. Activity: Exercise
2. Losing weight
  - a. Diet
  - b. Exercise
3. Avoid falling back into old routine
  - a. Diet

## b. Exercise

### Break the routine:

If you are honest with yourself you know exactly how you are eating excessively and how you are missing the opportunity of exercising. For instance, we all know that the bread and butter before dinner are dispensable, and that a couple flights of stairs beat waiting for an elevator. When we have accumulated an excess of weight the body is set in certain patterns and rates of fuel consumption (metabolism). As any biological system, the human body strives to maintain homeostasis. In a state of obesity there is also homeostasis; fuels are burn in amount proportional to exercise and in type proportional to consumption, the surplus of fuel is deposited in reserve. If carbohydrates are in large supply the metabolism is geared to burn carbohydrates in most tissues and turns the excess into fat.

Trying to change the metabolism from an obesity setting to normal is very difficult. The body will resist any minor changes and demand to continue on the same pathways. For instance, just cutting back on portion size and start walking 3 times a week will be easily counteracted by the body. The most effective way of resetting the metabolism is to make a drastic change, similar to a shutdown and restart of the computer. The best way of doing that is a short period of fasting: a “cleansing of the body” or “hunger strike” against the pro-obesity industries. Just drinking fluid and electrolytes for 2 to 3 days will shift the metabolism from burning carbohydrates and storing fat into burning fat and mobilizing the stores of fat. Most organs adapt well to this change. The brain is the one that enjoys better the consumption of carbohydrates. When switching into the use of fat as a fuel (ketone bodies) there is some head discomfort, it does not quite amount to a headache but is noticeable. It is very transient right around 36 hours into fasting and fortunately lasts only a few hours, perhaps 8.

The thought of fasting may seem overwhelming but it is really not that difficult. It is easier to get up in the morning, exercise and grab a sports drink than sitting down and trying to decide what to have and what not to have for breakfast. The great news is that once the transition into burning fat occurs hunger seems to go away. The ingestion of even a small amount of simple carbohydrates for breakfast (slice of bread) sets up a vicious cycle that results in repeated ingestion of calories throughout the day. Elevation of blood sugar from absorption of ingested carbohydrates elicits insulin release from the pancreas. If the food being ingested consists of simple carbohydrates (monosaccharides: glucose or fructose) or starch (alpha-polysaccharides) blood sugar rises and it is taken up by tissues very quickly. By the time the pancreas is done releasing insulin there is not enough blood sugar for its effect so that triggers hunger and craving of more sugar. The slice of bread for breakfast will elicit the need of a snack by midmorning. The insulin response is totally different of the carbohydrates are in a complex form such as in fruits and vegetables. Since the digestion and absorption is much slower the peaks of blood sugar and insulin secretion match and cancel each other.

One of the problems of fat burning is bad breath from ketosis. A tempting solution for this bad breath is chewing gum, however, this is not a good idea because the chewing sets off the sequence of saliva/gastric juice production and hunger. Instead, mints, and even some minty liquid antacids can help with bad breath without triggering hunger.

This initial fasting should be carried as long as possible, never less than 3 days. Scientific studies have shown that starvation can be tolerated for 60 days as long as a person is receiving adequate amounts of fluids and electrolytes. Somewhere between 3 and 5 days of fasting is probably optimal for the purpose of breaking the routine. Believe it or not: days number 3, 4 and 5 are much easier than 1 and 2.

### Exercise:

Most people confronted with the challenge of running on the treadmill at 6 miles/hour for 30 minutes would say: impossible. I would venture to say that with the exception of people with serious coronary artery disease (CAD), restrictive lung disease (COPD) or limited range of motion in the lower extremities (arthritic changes of hips, knees and feet) most people will be able to do it. Age, excess weight, and other diseases will determine how long it will take to reach that point; it may be a week for some and a month for others. The treadmill is the easiest physical exercise for weight loss. First, it can be done all year around independent of weather conditions, and without moving from home. Second, it can be graded very precisely into very small increments (speed, incline and time). Third, it can be done while getting distracted with watching news on television, sports or a movie. Fourth, it can be stopped if necessary to go to the bathroom, to answer a phone call, or respond to any other call. Fifth, the risk of physical harm is minimal, the surface is soft and uniform so slipping and falling is not as much of any issue as it is with jogging. There are those who believe that the “pounding” on the ground (or treadmill) from running is bad for the joints. This is a typical intuitive observation which makes logical sense but fails the rules of biology. The more you use your joints the better it is, more cartilage is renewed from the surface of the joints. The reverse extreme of this phenomenon is the deconditioning of astronauts in the weightless environment of space crafts.

Bad side effects of fasting and treadmill use are only excuses!. I would say don't even bother in telling casual acquaintances that you are doing it. You will always find a naysayer, especially one relying on one of the many for-profit ventures for weight loss. Those who claim that an overweight person can lose weight effortlessly and without curtailing calories are simply deceiving people.

### Losing:

This is another hurdle but is when you start seeing the rewards. The ideal diet for weight loss should provide essential nutrients while providing some satiety (reduce hunger) and maintaining a good gut function (bowel movements). For any diet to be successful the amount of nutrients (calories) has to be reduced, so here is where frequency of meals and portion control becomes important. The basic components of the diet are protein, fat and carbohydrates. Carbohydrates are further divided into starch (easily digestible) and dietary fiber (poorly digestible). Starch can in turn be divided in simple carbohydrates (mono and disaccharides) and polysaccharides.

The human engine functions more efficiently with a mixed fuel regimen. One trick to make it be more inefficient (burn more calories per unit of work) is to avoid the mixing. This is the basis for two days of protein and fat, alternating with two days of carbohydrates, primarily in the form of dietary fiber. Protein comes in meats (beef, chicken and fish), eggs, and dairy products, with minimal amounts in vegetables (almonds). Fat is also present in animal sources of nutrients and in vegetable oils. Dietary

fiber comes in fruits and vegetables. This dissociation keeps the metabolism from reaching the homeostasis that the body seeks and results in a “wasteful” use of nutrients (calories).

The cells in the body demand calories for 4 primary purposes: 1) to maintain the electrical potential across membranes (otherwise cells would burst), 2) to renew proteins (otherwise chemical process in the body would not be properly regulated), 3) to maintain a constant and adequate delivery of oxygen (contraction of heart and respiratory muscles), and 4) to maintain substrate cycling. Substrate cycling is the constant production (synthesis) and degradation (lysis) of molecules. Metabolic pathways cannot shutdown in the body, if they did they could not be restarted with the necessary speed to respond to a sudden need of physical activity. The typical example is sudden danger (fire or wild animal in proximity) when the ensuing physical activity (running) demands fuels in several orders of magnitude from resting conditions. The analogy is a wheel turning: it can be made a fast speed sooner when the wheel is already in motion than a wheel that was not moving (just like when you time crossing an intersection exactly as the light turns green without coming to a stop, even the little compact car can pass faster than the sports car that had stopped). Substrate cycling is increased by diseases (fever and burns speed up cycling) resulting in sudden weight loss. One possible mechanism of the greater weight loss with a dissociated diet is through increased substrate cycling, perhaps more cycling of the nutrient pathway not being supplied at the moment.

Exercise:

Physical activity is also designed to keep the body metabolism from reaching homeostasis. If we kept our activity at 4.5 miles per hour, 20 minutes a day for an extended period of time the body will manage to do the same activity with fewer calories (practical demonstration: less sweat). Therefore it is essential to keep introducing variables and force to sweat every time. The three variables in the treadmill: speed, incline and time allow for many combinations. Another variable is carrying weights while running. As we lose weight the body is doing the same exercise with less effort because of the lower load. Therefore, the loss of load can be compensated by carrying weight. It is much safer to use wrist and ankle weights than dumbbells of any sort.

Avoid falling back into the old routine:

Methodic execution of the second phase can achieve a 15-20 pound weight loss in a month. Once one has reached the desired goal of weight loss (BMI less than 25) the final challenge is to avoid regaining weight back.

Diet

The basis for continued success is to continue avoiding the calorie dense foods while allowing yourself breaks: Friday and Saturday, and any other special event. Calorie dense foods are to be consumed only in exceptional circumstances: alcoholic beverages, breads, pies, sodas, candies, creams, pasta, sugary cereals, cakes and pastries. While it may seem like a punishment the reward is that the rare occasion in which one consumes one of these items they taste a lot more special. You should monitor your weight

at least weekly. If you notice a weight increase give yourself a 2 + 2 days of dissociation until you return back to your new normal.

## Exercise

After weight loss exercise is very enjoyable: running, biking and sports activities seem effortless, muscle tone feels good, joint and muscle aches from strenuous activities are gone, and embarking in new activities does not seem daunting anymore. Once one has reached an exercise rhythm, e.g., 20 or 30 minutes per day 5 or 6 days a week, other activities have to fall in sync. For instance, if the best time for exercising is first in the morning, social activities going late into the evening can easily interfere with the next morning's exercising. Physical activity should be sought for in every possible way. Elevators should become a thing of the past, even when one is in a hurry stairs will take us faster and in more reliable time than the elevator. A bad habit is to take the elevator just to read messages in a hand-held device. Moving the car for a few blocks is also a missed opportunity for walking, even if the weather is bad.

None of these steps is easy, but there is really no easy way to lose weight.

## Causes of overweight and obesity in the US (A very personal opinion of Dr. Rolandelli)

The human body was made to keep a stable weight in a very different environment: fewer digestible calories available and much more work to obtain them. We are responding to an instinct of survival by storing calories just in case we may not find them later (!). Our digestive organs are too efficient; the stomach is probably too big and secretes too much acid for the highly processed foods we eat nowadays. In addition, the American food industry attacks us with ingredients (salt and sugar) and marketing to promote consumerism. Food has been equated to other goods in the marketplace, the cheaper the price the more we should consume. The food industry benefits from government subsidies (corn) to manufacture cheap, calorie dense, foods. In America when the economy shrinks people gain weight because they cannot longer afford good food. In addition, marketing of calorie-dense foods uses confusing messages such as "power" and "energy" to equate them as healthy. We all want to be powerful and energetic human beings, but not obese!. Unfortunately this societal conspiracy has been brewing for a century so our parents and grandparents were already victims of indoctrination with false information such as the "hearty breakfast". Therefore, they have imprinted in our brains, along with all the good things they taught us, that calories and cholesterol rich foods are essential to go out and get the work done for the day. To complicate matters further now we have an obesity industry offering all kinds of remedies and declaring obesity a health crisis, an epidemic, and some sort of unexplainable curse due to newly discovered hormones. The food industry rewards us with savings if we eat food that makes us obese, the antiobesity industry profits from the remedies, the insurance industry charges us higher premiums, and the health care industry spends more money dealing with obesity and its consequences. There are many who profit in maintaining the status quo with all these vicious cycles in some kind of conspiracy against the well intentioned person who wants to maintain a healthy weight. If you felt guilty about your weight and alone against these powerful forces: stop feeling guilty, you are not alone, just get on with the fight.

