Obesity & Bariatric Surgery

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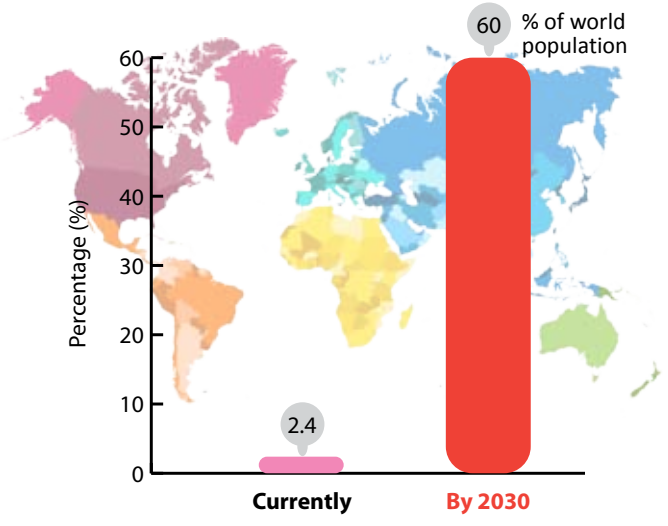
Obesity: The global epidemic

Obesity is a fast spreading metabolic disease of pandemic proportions whose prevalence has increased from 7% to a staggering 25% within the last three decades. Herein, severe obesity (BMI>40kg/m^2) is seen to affect a massive 2.4% of the population and if current trends are any indication, by 2030 overweight and obese individuals will comprise 60% of the world's population (Figure 1).[1] This obesity epidemic is a result of complex interactions between genetics, epigenetics, cultural and environmental parameters and while growth trends in most developed countries seem to have leveled off, upsurge of morbid obesity in many of these countries still continues with children being no exception.[1,2] In developing countries as well, obesity prevalence continues to trend upwards. The associated burden is profound, stemming from comorbidities, mortality risk, and economic costs incurred, with obesity known to increase the risk of major chronic conditions such as diabetes, dyslipidemia, and poor mental health while significantly impacting the risk of stroke, cardiovascular disease, and osteoarthritis.[2]

Management of obesity

Management of obesity goes beyond the obvious weight loss, encompassing risk reduction and improvement in overall health and quality of life of the patients.[3,4] An individualized treatment approach is often necessitated wherein the underlying secondary causes and comorbid conditions are duly controlled and treated.[3] Nevertheless, dietary modifications, lifestyle and behavioral interventions, pharmacotherapy and bariatric surgery constitute the pillars of therapy.[3,4] Initial therapy focuses on improving the nutritional content of the diet and increasing physical activity, for significant clinical benefits can be achieved even with modest weight loss.[4,5] Targeting a weight loss of 5–10% in individuals with obesity has indeed been seen to significantly improve patient outcomes and health-related outcomes for many obesity-related comorbidities, along with improved all-cause mortality.[5] For BMI

Figure 1: The increasing global prevalence of obesity epidemic



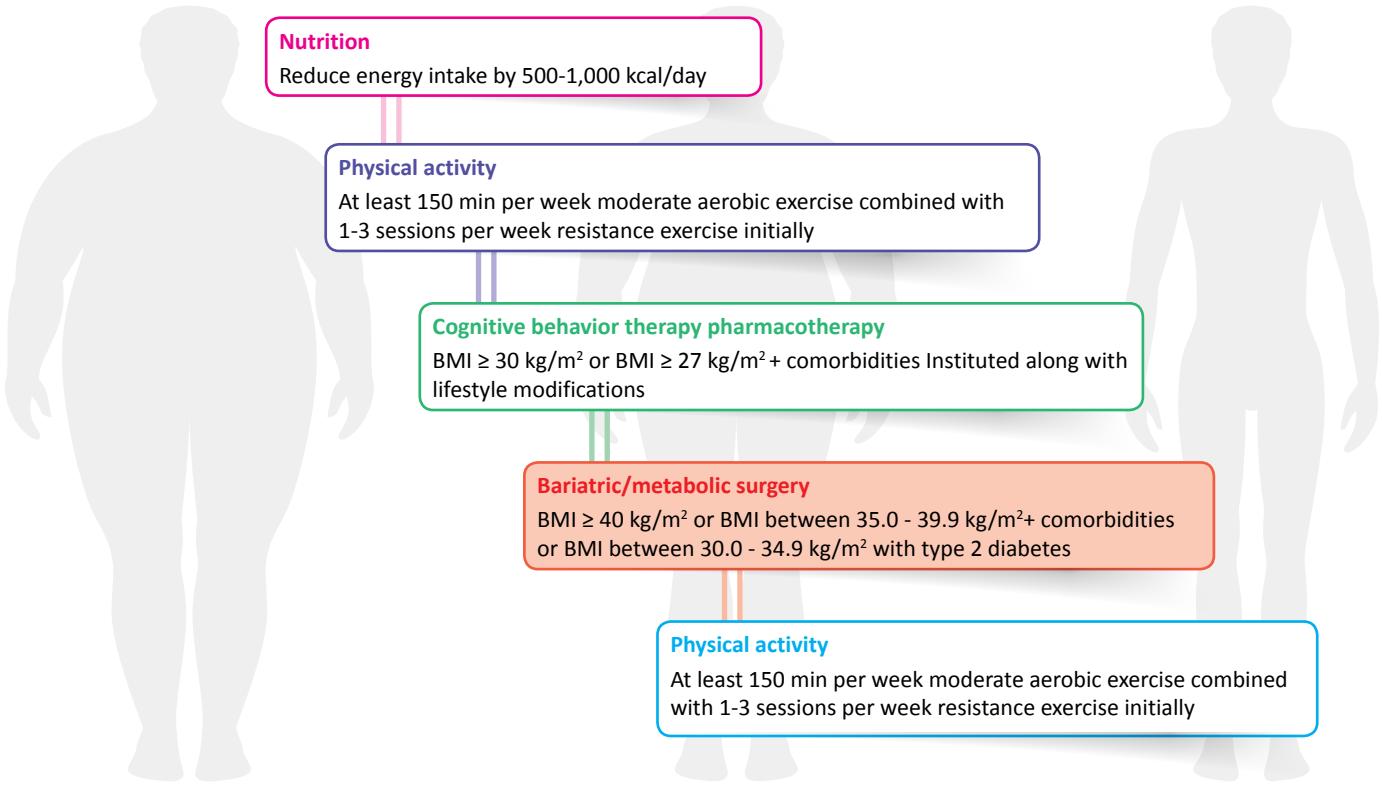
Adapted from: Panteliou E, Miras AD. What is the role of bariatric surgery in the management of obesity? *Climacteric.* 2017;20(2):97-102.

greater than or equal to 30 or BMI greater than or equal to 27 with comorbidities, pharmacotherapy is required for long-term weight management while individuals with BMI greater or equal to 40 or a BMI of 35 or greater with severe comorbid conditions are likely to benefit with bariatric surgery.[3] Figure 2 depicts the management approach that needs to be instituted in overweight and obese adults.[4]

Surgical treatment of the morbidly obese: An underutilized therapeutic alternative

Bariatric surgery is the most effective way of achieving significant and sustainable weight loss especially for the morbidly obese.[1] Level 1 evidence attests to a superior short- and long-term weight loss and improvement in glycemic status with bariatric surgery as compared to conventional medical therapy; remission of other comorbidities and improvement in quality of life along with prolonged survival is further reported. Moreover, it is a safe therapeutic approach with mortality comparable to common elective general surgical operations.[6] Despite this, bariatric surgery remains underutilized with less than 1% of obese adults receiving it. This necessitates development of less invasive weight loss treatments and increasing access to surgery if the global threat of obesity is to be effectively addressed.[1]

Figure 2: Algorithm for stepwise management of overweight and obese adults



Adapted from: Yumuk V, Tsigos C, Fried M, Schindler K, Busetto L, *et al.* European Guidelines for obesity management in adults. *Obes Facts.* 2015;8(6):402–424.

Bariatric Surgical Interventions

Surgery is indicated in cases of failed non-surgical interventions in patients with Class III obesity, that is, with a BMI greater or equal to 40 or medically complicated Class II obesity (BMI of 35 or greater with severe comorbid conditions) (Figure 2).[3,4,7] An extensive preoperative surgical risk evaluation is mandated while the patient needs to be duly informed and counseled regarding lifestyle changes, follow-up visits and exercise programs that would need to be adopted post-surgery.[3]

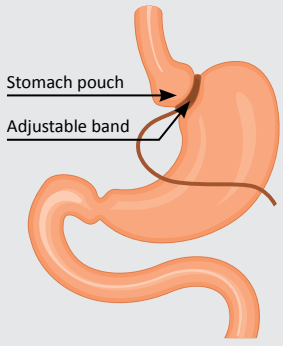
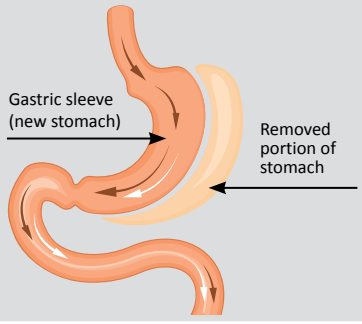
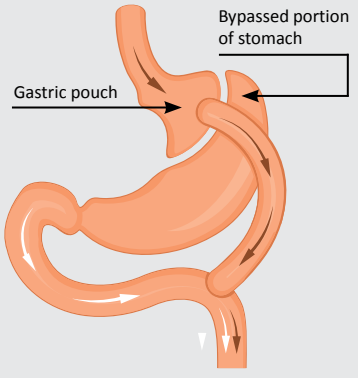
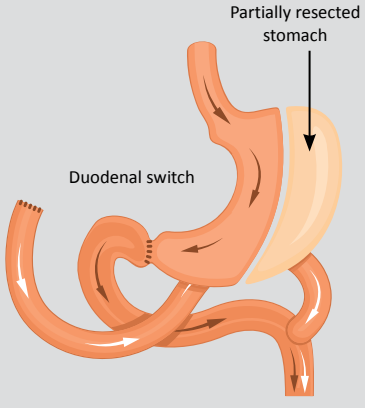
Currently, 90% of procedures are performed laparoscopically and the four most commonly performed bariatric surgeries include laparoscopic vertical sleeve gastrectomy (VSG), Roux-en-Y gastric bypass (RYGB), laparoscopic adjustable gastric banding (LAGB) and duodenal switch.[3,7] Table 1 gives a brief overview of the same.[6,7] Amongst these, gastric bypass is the most commonly performed procedure achieving rapid weight loss.[3] Though generally deemed safe with a 30-day mortality of 0.2% for laparoscopic RYGB and VSG, 0.1% for LAGB and 0.8% for biliopancreatic diversion, as with all surgical procedures certain complications can result with bariatric surgery as well. Factors such as the type of surgery, laparoscopic technique used, patient's pre-operative functional status and comorbidities and the surgical experience can influence outcomes and peri-operative morbidity and mortality.[1] Leak, infection, postoperative bleeding, thrombosis, and cardiac events can occur during early postoperative period while late complications can present in the form of malabsorption, vitamin and mineral deficiency, and refeeding or dumping syndrome.[3]

Effects of bariatric surgery on comorbidities of severe obesity and on health-related quality of life

Severe obesity affects a multitude of body systems with a broad expression of serious diseases; resultantly all of these illnesses respond favorably to bariatric surgery, often with total and permanent remission.[8] While the effect on remission of type 2 diabetes mellitus is notable, other components of the metabolic syndrome such as hypertension and dyslipidemia are seen to improve as well.[6] Patients diagnosed with asthma and gastroesophageal reflux disease often do not require their respective medications post bariatric surgery; chronic obstructive pulmonary disease, arthritis and obstructive sleep apnea are seen to improve, with remarkable reduction seen even in the prevalence of cancer in patients who have undergone bariatric surgery.[8]

The effects of bariatric surgery further extend to improvement in health-related quality of life (HRQoL) including physical and mental function, work capacity, confidence, and sexual activity, with studies indicating much of the initial improvement to be maintained over the long-term.[1,9] This holds clinical relevance in lieu of most bariatric surgery candidates reporting an impaired

Table 1: Commonly utilized bariatric surgical interventions

Procedure	Mechanism of weight loss	Description	Advantages and disadvantages	Illustration
Laparoscopic Adjustable Gastric Band (LAGB)	Restrictive	• A band encircling the proximal stomach and connected to a subcutaneous port/reservoir is inserted • The initially deflated band is progressively inflated via a subcutaneous port during subsequent postoperative visits to achieve gastric restriction and weight loss.	• No surgical division of the stomach hence short operative time; reversible and adjustable; low risk of vitamin and/or mineral malabsorption • High rate of late reoperation for obstruction, band slippage or erosion; weight loss lower than other procedures.	
Laparoscopic Sleeve Gastrectomy (LSG)	Restrictive/ endocrine or metabolic	• Greater curvature and fundus of the stomach are resected, leaving the remaining stomach fashioned into an elongated tube • Fundal removal decreases the levels of ghrelin, a major hunger-inducing hormone.	• Does not bypass duodenum consequently avoiding nutritional and vitamin deficiencies; rapid and substantial weight loss • Higher early complication rate with difficult to manage gastric leaks; increased risk of postoperative GERD.	
Roux-en-Y Gastric Bypass (RYGB)	Restrictive and diversionary/ malabsorptive	• Proximal stomach is separated from the distal stomach to form a small, restrictive gastric pouch with 20 to 30 mL capacity • Pouch is then connected to mid-jejunum which has been diverted away from the biliopancreatic secretions in the biliary or biliopancreatic limb.	• Notable long-term weight loss; reduction in caloric intake; favourable changes in hormones reducing appetite and in insulin sensitivity • Complex procedure requiring rerouting of intestine; long-term nutritional deficiencies, longer hospital stay and higher perioperative complications.	
Biliopancreatic diversion with duodenal switch (BPD–DS)	Restrictive and malabsorptive	• Comprises of two distinct components- sleeve gastrectomy and intestinal bypass wherein a tubular gastric pouch is created and ~50% of the small intestine is bypassed • Subsequently distal ileum is divided and anastomosed to the duodenum in a Roux-en-Y configuration; another anastomosis of the ileoileostomy is performed proximal to the ileocaecal valve.	• Highest weight loss achievable; favorable changes in gastrointestinal hormones improving glucose metabolism; highest rate of diabetes remission • Higher complication rates and mortality; potential for deficiencies in proteins, vitamins and minerals requiring strict compliance to dietary vitamin supplementation.	

Adapted from: 1. Nguyen NT, Varela JE. Bariatric surgery for obesity and metabolic disorders: State of the art. *Nat Rev Gastroenterol Hepatol.* 2017;14(3):160-169. **2.** Padwal R, Klarenbach S, Wiebe N, Hazel M, Birch D, *et al.* Bariatric surgery: A systematic review of the clinical and economic evidence. *J Gen Intern Med.* 2011;26(10):1183–1194

HRQoL pre-surgically.[9] Corroborating this, in the Catholic University of Rome trial[10] the quality of life assessment with RAND 36-item health survey 5 years post-surgically revealed patients receiving bariatric surgery to have a significantly better QoL with higher scores in all eight health domains as compared to those treated medically.[6,10]

Bariatric surgery and long-term nutritional issues: Focus on Lactose intolerance

All bariatric procedures harbor nutrient deficiencies attributable to modifications in the gastrointestinal anatomy and physiology.[11] The surgical alterations lead to a diminished ability to absorb nutrients, electrolytes, and bile salts, as well as deficiencies in iron, calcium, and other vitamins and minerals, translating into a long-term clinical problem.[11,12] Of note, lactose intolerance is a common sequelae. Resulting from decreased lactate production due to intestinal rearrangement post-surgery, it often presents as bloating, cramping, and diarrhea after drinking milk.[12-14] In this regard, the first month after surgery is critical, with most food intolerances occurring in the 0-6-month period.[13]

While malabsorptive procedures perpetuate nutrient deficiency and intolerances through changes in biliary- pancreatic functions, alterations in gastrointestinal transit time, bypass of the duodenum (a primary site of absorption), and promotion of small intestinal bacterial overgrowth, restrictive procedures result in nausea, vomiting, and regurgitation.[15] Moreover, even though diets with moderate amount of carbohydrates are recommended post bariatric surgery, the proportion ingested remains relatively constant while the overall energy intake is reduced. With lactase activity already known to be diminished progressively in adulthood, lack of the enzyme in the intestinal mucosa induced by surgery furthers its malabsorption and intolerance.[16] Abstaining from or at least reducing lactose in meals, or consuming smaller amounts of milk at a time, or using lactose-free or lactose-reduced milk, can be effective preventive strategy, although providing adequate supplementation or enzyme replacement therapies may be necessitated.[14-16] Thus, with the high prevalence of pre-existing deficiencies in the obese population, monitoring for deficiencies and intolerances and providing adequate supplementation, as well as assessing adherence to supplementation assumes paramount importance post bariatric surgery.[15]

Conclusion

Bariatric surgery has transformed over the years with the introduction of laparoscopic techniques. Nevertheless, its importance has always extended beyond its obvious weight reducing benefits into sustained reduction in mortality and morbidity associated with obesity. While for most morbidly obese the benefits greatly outweigh the risks, it is pertinent to remember that surgery and resultant massive weight loss initiate a momentous physical transformation that may often parlay into specific complications. Nutritional complications are, for the most part, correctible with careful adherence to supplementations, but frequent monitoring and consistent long-term follow-up is critical.

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