



Review Article

Clin Exp Pathol Res
ISSN (e): 2663-8193
ISSN (p): 2663-8185
2018; 1(1): 10-12
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Novelties in bariatric surgery: review and technical aspects

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Abstract

The global obesity rate has significantly increased over the past two decades representing a major public health challenge. This condition has significant physical, mental, and socioeconomic consequences for patients and health care systems. Bariatric surgery provides an effective therapeutic option for obese people who failed to lose weight through nonsurgical weight loss interventions and ameliorates up to 80% of the complications caused by obesity. Bariatric surgery is quickly advancing, and several techniques and endoscopic options are currently available. A multidisciplinary healthcare team should discuss the risks and benefits of each procedure with patients.

Keywords: Bariatric surgery, Obesity, Endoscopy, Devices.

INTRODUCTION

The obesity rate has significantly increased over the past two decade reaching epidemic levels [1]. This condition has significant physical, mental, and socioeconomic consequences for patients and health care systems worldwide. The standard definition of obesity is based on Body Mass Index (BMI, kg/m²). Obesity is precisely defined as BMI 30 kg/m² or higher. It can be further classified in class one (BMI of 30 to 35 kg/m²), class two (BMI of 35 to 40 kg/m²) and class three or morbid (BMI over 40 kg/m²), although BMI accuracy may vary by age, sex, race, and ethnic group [2-4].

Obesity is a complex disease with multifactorial origin. It compromises multiple organs and is associated with coronary heart disease, hypertension, and stroke, certain class of cancer, dyslipidemia, osteoarthritis among others. Inter-individual variability in response to intervention makes treatment of obesity notably challenger [5]. Bariatric surgery offers significant and positive outcomes on weight loss and ameliorates up to 80% of the complications caused by obesity in the majority of bariatric patients [6-8].

Although surgical treatment of obesity remains the most effective therapeutic option for obese people who failed to lose weight through traditional therapy, it is far from being a perfect solution [8, 9]. Bariatric surgery is quickly advancing, and each year modern techniques and new medical devices are being introduced. The goal of this literature review is to explore the latest novelties and advance in bariatric surgery.

Indications for bariatric surgery

Based on National Institute of Health guidelines, bariatric surgery should be considered in obese people with BMI levels of 40 kg/m² or higher, or BMI of 35 kg/m² or higher with obesity-related medical conditions, for example, hypertension, type 2 diabetes, and obstructive sleep apnea that are difficult to control with traditional therapy. Contraindications are untreated major depression, drug or alcohol abuse, a severe cardiopulmonary disease that would make the risk prohibitive, lack of comprehension of risks, benefits and expected outcomes, coagulopathy or inability to follow postoperative recommendations [2-4, 10].

Types of bariatric surgery

Bariatric surgical procedures are classified by function in three main categories: primarily malabsorptive, hybrid (restrictive and malabsorptive), and restrictive [2, 3, 10]. Laparoscopic adjustable gastric band (LAGB) and laparoscopic sleeve gastrectomy (LSG) are restrictive surgeries in which the number of nutrients consumed is reduced by decreasing the size of the gastric pouch. The jejunoileal bypass is an example of

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malabsorptive surgery that minimizes the time of small intestine is exposed to food. Roux-en-Y gastric bypass (RYGB) and biliopancreatic diversion with duodenal switch (BPD-DS) are considered hybrid approaches. Worldwide, RYGB and LSG are the most often performed bariatric procedure. All three categories are considered permanent [11,12].

Novel bariatric techniques

Surgical modifications and/or combination of standard bariatric procedures have been performed to reduce complication rate and improve clinical outcomes. A novel technique consists in laparoscopic duodenojejunal bypass with sleeve gastrectomy (SG-DJB) and preservation of the pyloric mechanism. This technique is a possible option to traditional RYGB. Raj et al. reported that in among 38 patients who underwent SG-DJB, the percent of the resolution of diabetes was 92%, with 72% of excess body weight loss [13]. Another promising technique consists in LSG plus side-to-side jejunioleal anastomosis (SG-plus) modification. Adding SG-plus provides the advantages of sleeve gastrectomy besides of enhancing neuroendocrine response related to quicker transit of chyme to the distal bowel, without excluding or resecting any intestinal segment [14]. Larger studies with long-term outcomes to evaluate different techniques are required before they can be widely performed.

Robot-assisted bariatric surgery

Minimally invasive bariatric surgery started with laparoscopic and then expand to robot-assisted, which is becoming more frequent. Compared with traditional surgery, robotic-assisted bariatric surgery provides the advantage of three-dimensional vision, higher precision in tissue manipulation by downscaling surgeon's moves and filtering out physiological tremor. Other benefits of using robot-assisted systems can include quicker postoperative recovery, better pain control, and shorter length of in-hospital stay [10, 15].

Adjustable gastric banding (AGB) was the first robot-assisted bariatric surgery. Edelson et al. compared 287 patients of robotic AGB with 120 patients who underwent laparoscopic AGB. No statistical differences were found in the operating room start times, length of in-hospital stay, complication rates, or percent excess weight loss [16, 17]. The learning curve of robotic RYGB may be shorter when compared with the laparoscopic approach, 15 vs. more than 100 cases [10,16]. The safety and economic viability are still debated, and the exact role of robot-assisted bariatric surgery still no clear [18].

Endoscopic bariatric therapies

Endoscopic bariatric therapy (EBT) is a relatively new approach that has developed rapidly in recent years. EBT is a cost-effective and accessible alternative intervention that can be used as a perioperative bridging therapy to promote weight loss in patients who will undergo bariatric surgery [10]. EBT can be classified according to the anatomic position, into gastric and small-bowel interventions. Gastric interventions tend to stimulate gastric mechanical and chemoreceptors, delay gastric emptying and modulate levels of gastric orexigenic hormones, whereas proximal small bowel procedures contribute to weight loss and glucose homeostasis [19].

The use of EBT in the field of bariatric surgery has been recognized as an alternative to diabetes mellitus therapy and is a cause of ongoing research [8, 20]. Promising options include endoscopic sleeve gastropasty, aspiration therapy, intragastric balloons, endoluminal duodenojejunal bypass sleeve, endoscopic sclerotherapy and implantable gastric stimulation [21].

The endoscopic intragastric balloon therapy was first performed in the 1980s using the Garren Edwards Gastric Bubble. It is considered a restrictive surgical technique [8, 19]. Two devices, Orbera Bioenterics

Intragastric Balloon and ReShape Dual Balloon are currently available for obese patients with BMI of 30 to 40 kg/m². Both devices are inserted and removed during gastroscopy, and after six months the balloon should be removed [9]. Intragastric balloons achieve an average 34% of excess weight loss, and around 15% of patients show no or insufficient weight loss [10].

Endoluminal equivalents of RYGB include the Endoluminal Bypass (ValenTx, Maple Grove, MN), the EndoBarrier (GI Dynamics Inc., Lexington, MA), also called as duodenal-jejunal bypass sleeve (DJBS) and Duodenal Mucosal Resurfacing (Fractyl Laboratories, Cambridge, MA), or the Revita DMR System. Those endoscopic devices attempt to mimic elements of RYGB decreasing ghrelin level decreases and increasing glucagon-like peptide 1 (GLP-1), oxyntomodulin and cholecystokinin (CCK) levels [19].

Non-endoscopic bariatric devices

The vagal nerve blocking device (vBloc) is a minimally-invasive alternative. vBloc is an FDA-approved device for weight management that blocks vagal parasympathetic response. It aids weight loss by decreasing appetite and increasing early satiety. In this procedure, electrodes are placed at the abdominal trunk of the nerve proximal to the stomach. The device utilizes intermittent high-frequency electrical current to produce intermittent vagal blockade [3, 9, 22].

LAGB is another non-endoscopic implantable device that restricts the gastric pouch and outlet. The gastric band is silicone-based placed around the proximal part of the stomach, which allows band anatomic adjustment [2, 3, 12]. LAGB is indicated for mild to moderately obese patients and compared to more invasive bariatric operations the rate of complications and procedural mortality are significantly lower in LAGB [22].

Another innovative device is the sensor monitored alimentary restriction therapy, also known as SMART. It is an oral removable prosthesis that decreases buccal cavity capacity, reduces caloric intake and prolongs mastication. This device does not have FDA approval for clinical use yet. It should be positioned in the upper palatal space before food ingestion [22].

CONCLUSION

Obesity is a systemic disease associated with substantial morbidity and mortality. Several bariatric surgical and endoscopic options are currently available each one with certain advantages and disadvantages. The perfect bariatric surgery should be minimally-invasive, cost-effective and a safe, but in clinical practice, this surgical technique does not exist. Given the multi-factorial nature of obesity, a multidisciplinary approach is recommended to maximize outcomes.

Conflict of interest

None declared.

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