Journal of Visceral Surgery (2013) 150, 85—95

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REVIEW

Adjustable gastric banding, sleeve gastrectomy or gastric bypass. Can evidence-based medicine help us to choose?

Anneau, bypass ou sleeve : que choisir ?

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KEYWORDS
Gastric banding;
Sleeve gastrectomy;
Gastric bypass;
Review

Summary Dietary management of obesity, based on modification of eating patterns, increased physical activity and psychological and social support has provided inconsistent and disappointing results. Surgery is an invasive and often irreversible alternative that offers substantial and durable weight loss at the price of non-negligible morbidity and mortality. Three procedures account for almost all bariatric surgical procedures in France: adjustable gastric banding (AGB), vertical or sleeve gastrectomy (SG), and gastric bypass (GBP). The goal of this review is to help the surgeon make the best choice among these procedures, depending on his surgical convictions, abilities, and habits. Evidence-based data were extracted from the literature using the major data-base resources (Medline, Web of knowledge, Scopus); as well the most recent recommendations from relevant learned societies and health care organisms were analyzed. In 2010, 26,558 bariatric operations were performed in France; these were more or less equally distributed between AGB, SG and GBP. In 2011, the proportion of SG increased enormously and represented 43.9% of all bariatric procedures. In terms of weight loss and perioperative morbidity/mortality, SG tends to stand midway between AGB and GBP.

Introduction

Obesity is a pandemic affecting 300 million people worldwide. Two-thirds of the planet's population live in countries where overweight is responsible for more deaths than malnutrition [1]. In France, 6.9 million people have a body mass index (BMI) greater than 30 kg/m^2 (estimation OBEPI 2012 [2]). Obesity is causally implicated in 44% of patients with diabetes, one of five cases of myocardial infarction, and from 7 to 41% of cancer. One

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1878-7886/$ — see front matter © 2013 Published by Elsevier Masson SAS.
http://dx.doi.org/10.1016/j.jviscsurg.2013.03.011

out of three children born today will develop type 2 diabetes and according to an *Agence France Presse* article of May 2012 [3], these children's projected life-expectancy will be less than that of their parents.

Exclusive dietary management, based on modification of eating habits, increased physical activity plus psychological and social support, provide inconsistent and frankly disappointing long-term results [4]. Surgery, although invasive and often irreversible, is an alternative that offers substantial and durable weight loss at the price of non-negligible morbidity and mortality [5]. Three procedures account for the quasi totality of bariatric surgery performed in France: adjustable gastric banding (AGB), vertical sleeve gastrectomy (SG) and gastric bypass (GBP).

The practice of bariatric surgery, for many years marginal if not marginalized [6], has developed progressively over the last 50 years, in parallel with the obesity epidemic itself and then advanced significantly with laparoscopic surgery. Bariatric surgery represents today one of the only expanding sectors of surgical activity and a substantial part of patient recruitment in the private sector. Bariatric surgery is increasingly supervised at present. Recommendations emanating from the American National Institute of Health (NIH) in 1991 [7] and more recently from the French Haute Autorité de Santé (HAS) [6] have allowed better definition of the limits of bariatric surgery. Regardless of the technique, surgery is indicated for patients with morbid obesity (BMI $\geq$ 40 kg/m^2) or severe obesity (BMI $\geq$ 35 kg/m^2) in patients with associated co-morbidity that may improve with weight loss. Candidates for bariatric surgery must follow a strict nutritional plan for at least 6 months, and formal evaluation by a multidisciplinary team should lead to a therapeutic management scheme. Training in bariatric surgery is essential, both in medical school and through postgraduate training (*diplôme interuniversitaire de chirurgie bariatrique*); this has allowed to instruction of surgeons in the principles and particularities in the surgical management of obese patients in the last 5 years.

Methodology and goal of this update

Evidence-based data (EBD) were extracted from the literature using the major databases (Medline, Web of Knowledge, Scopus) and the most recent recommendations from relevant learned societies and health care organisms were reviewed (specifically the French HAS [8], la Société Française et Francophone de Chirurgie de l'Obésité et des Maladies Métaboliques (SOFFCO-MM) [9], the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) [10], and the National Institute for Health and Clinical Excellence (NICE)) [11]. Data relative to less-frequently performed procedures such as the duodenal switch, Scopinaro's operation, and the calibrated vertical gastroplasty will not be discussed here.

The choice of the procedure should depend on evidence-based data, patient preferences, and surgeon preference and experience, taking into consideration the surgeon's familiarity with a particular procedure, but preferring one operation over another depending on the particular circumstances of the case.

The goal of this update is to give the surgeon the information necessary to best choose the procedure, taking into consideration the surgeon's convictions and capabilities, and habitudes. Nevertheless, bariatric surgery should be performed by surgeons who have undergone specialty training and are capable of performing any of the three procedures. Lazzati et al. found that in half of the 355 centers where bariatric surgery was performed in 2011, surgeons performed a single procedure in more than 80% of patients [12]. Out of 100 bariatric centers created in France between 2007 and 2009, only a quarter were capable of proposing any of the three techniques, thereby limiting the ''choice'' offered to the patient [13].

Description of the techniques

Adjustable gastric banding

The principle of gastric banding relies on the creation of a 15 mL compartment using the gastric fundus, delineated by a circular band consisting of a silicon tube with a balloon connected to a reservoir via a catheter (Fig. 1). Injection of saline or contrast material into the reservoir increases the pressure of the silicon tube on the gastric wall and restricts egress from the compartment, limiting the amount of food ingested. Early satiety helps the patient limit the quantity of food ingested while reducing the sensation of hunger. If the patient fails to govern alimentary intake, nausea, regurgitation or abdominal pain result obliging the patient to adapt to the following rules: ingestion of moderate quantities, varied alimentation, prolonged mastication, while avoiding calorie-rich foods (yoghurt, sweet drinks, pastries).

Sleeve gastrectomy

Also called longitudinal gastrectomy, this procedure removes three quarters of the stomach along the greater curvature, including the fundus and a portion of the gastric body. A tubulized portion of the stomach is left along the lesser curvature, calibrated intra-operatively by a 32 to 36 Fr gastric tube. The division starts at the antrum, 2—6 cm from the pylorus. For certain authors, antral preservation decreases postoperative reflux into the esophagus.

Gastric bypass

This procedure consists of creating a 20 mL proximal gastric pouch anastomosed to a Roux-en-Y jejunal limb 1.5 m in length. There is no gastric resection and it is theoretically possible to reverse the bypass although this is done only rarely.

Surgical epidemiology

In 2010, there were 26,558 bariatric operations performed in France, more or less equally distributed between AGB, SG and GBP. In 2011, the proportion of SG increased enormously and represented 43.9% of the procedures [14]. The proportion of GBP is increasing progressively today as high volume centers performing the procedure acquire the expertise necessary and are capable of managing the related complications. The proportion of AGB is slowly but steadily decreasing, principally in favor of SG (Fig. 2).

Weight loss

There are no controlled randomized trials comparing SG, GBP and AG. Moreover, side-by-side comparisons are