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Metabolic surgery for obesity: a critical account

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Obesity and its metabolic associated comorbidities (type 2 diabetes, lipid disturbances, etc.) constitute one of the most important health challenges in the present 21st century. What AIDS was in the last 20 years of the 20th century, diabetes and its consequences will be in the first 20 years of this century. The increase in the prevalence of diabetes and obesity (DIABESITY) is enormous; nowadays 240 millions people are suffering from diabetes (90-95% type 2 diabetes), and in 2025 the number will be around 380 millions.¹

Between the different therapeutical approaches to deal with this issue, it is now widely accepted by the scientific community that the manipulation of the gastrointestinal tract is the option that offers the best results, specially in those patients suffering from severe obesity.

The concept of metabolic surgery was defined by Buchwald and Varco in 1978 in their book *Metabolic Surgery* as “the surgical handling of a normal organ or system to achieve a biological result of health improvement”. Gastric surgery for gastroduodenal ulcers has been known for more than 100 years to be associated to weight reduction and an improved glycemic control in diabetic patients.²

Walter Pories published in 1995 a paper entitled: “Who would have thought it? An operation proves to be the most effective therapy for adult onset diabetes mellitus”, where he described the results obtained with an Roux en Y gastric bypass in 165 patients with type 2 diabetes and obesity: 82% long term improvement of their glycemic problems.³

Gastrointestinal (GI) manipulation (bariatric/metabolic surgical or endoscopic procedures) has shown to be an therapeutical alternative with excellent evidence based

results. This therapy has demonstrated to decrease significantly the incidence of the metabolic disorders associated to obesity. The Swedish Obese Study (SOS) showed a drop in the incidence of type 2 diabetes mellitus (T2DM), lipid disturbances, hypertension and hyperuricemia among subjects who were operated on them in comparison with control subjects over 2- and 10-years periods.⁴ In 2009, Henry Buchwald published a systematic review and meta-analysis about the role of bariatric surgery on weight and T2DM. A total of 135.246 patients were included in this analysis, and insulin, HbA1c, and fasting glucose decreased significantly after surgery.⁵ The overall percentage resolved was not uniform in depending on the different surgical procedures (Table 1). This data induced Buchwald to comment that “... the results of the amelioration or cure of diabetes mellitus after different bariatric surgery procedures, are better explained if we consider type 2 diabetes as a foregut disease.....”. The mechanism why this GI manipulations produce this metabolic effects are not completely clarified. There are three hypothesis: weight loss, the reduction in caloric intake and incretin effects of bypassing the hormone active foregut. The Figure 1 shows the different mechanisms of GI surgical and endoscopic manipulations involved in the amelioration of metabolic disturbances associated with obesity.

The conventional therapy for those patients with T2DM does not have a very high treatment adherence. Less than 50% of diabetic patients under insulin therapy get haemoglobin A1c levels <7%, and weight gain worsens the metabolic effects of the disease. On the contrary, bariatric

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Table 1 Diabetes meta-analysis

	Total	Gastric banding	Gastroplasty	Gastric bypass	BDP/DS
% EBWL	66.0	46.2	55.5	59.7	63.6
% resolved overall	76.8	63.0	79.7	80.3	95.1
% resolved <2 years	79.2	43.7	81.4	81.6	94.0
% resolved >2 years	73.3	68.3	77.5	79.9	95.9

BPD/DS: duodenal switch.
From Buchwald et al⁵.

“Classic” surgical procedures

Biliopancreatic diversion Duodenal switch Gastric bypass Gastric banding

“New” surgical procedures

Sleeve gastrectomy Gastric plication SADI-s

One of the main drawbacks for suggesting a patient with T2DM to undergo surgery was the possibility of an increased surgical risk. This perception was dispelled by the analysis conducted by Buchwald et al.⁷ Since the advent of laparoscopy, complications related to surgery have been minimized. In a review of 361 studies including 85,041 patients, mortality was 0.28% within the first days of surgery and 0.35% from 30 days to 2 years after surgery. Thus, patients undergoing bariatric surgery at an accredited center with experience in this field have a similar risk of complications (in this case mortality) similar to in any elective abdominal surgery, such as cholecystectomy for cholecystitis, in which mortality rates range from 0.3 to 0.6%.

Regarding the selection of which is or it is going to be the “ideal” operation, there is no unanimity in selecting it. There are some “classical” procedures and some others “new” (Table 2).⁸ All of them have their own characteristics and different mechanism of action (Fig. 1). Probably, at present time laparoscopic gastric by-pass (GBP) could be considered the “gold standard”, in terms of getting the majority of positive effects and being the most frequently surgical procedures performed.⁹

Another important issue in the field of metabolic surgery apart from its effectiveness in controlling or improving T2DM and other metabolic associated disorders is to know if these operations can get a better survival or in other words if they can achieve a reduced long-term mortality. In this sense, recently, the prospective SOS study showed that surgery for obesity was able to decrease all-cause mortality by 24%, taking into account that in this study surgical procedures were mainly restrictive techniques (vertical banded gastroplasty (VBG), and adjustable gastric band [AGB]).¹⁰

Figure 1 “Classical” and “new” surgical bariatric procedures.

surgical procedures (specially those malabsorptive: duodenal switch [DS], biliopancreatic diversion [BPD], single anastomosis duodeno-ileal with sleeve gastrectomy [SADI's]) have shown therapeutical success in >95% of patients after 20 years of follow-up.⁶

Table 2 Mechanisms of action of the different surgical and endoscopic gastrointestinal manipulations

	AGB	SG	GBP	BPD	BPD/DS	SADI/s	II	DJB	Endo/s
Restriction	+++++	++++	+++	++	++	++	+/-	+/-	++
Malabsorption	-	-	++	++++	++++	+++	++	++	+
Dumping	-	-	++++	++++	-	-	-	-	-
Anorexia	-	+++	+++	+++	+++	+++	++	+/-	+/-
Incretins	-	+	++++	++++	++++	++++	++++	++++	++++
Compliance	+++++	+++	+++	+++	+++	+++	+++	+++	+++
Glucose metabolism	+	+++	++++	++++	++++	++++	++++	++++	++++

AGB: adjustable gastric band; BPD/DS: duodenal switch; BPD: biliopancreatic diversion; DJB: duodeno-jejunal bypass; Endo/s: endoscopic sleeve; GBP: gastric bypass; II: ileal interposition; SADI/s: single anastomosis duodeno-ileal with sleeve; SG: sleeve gastrectomy.

When mixed procedures such as gastric bypass were used, 40% reduction in long-term mortality was achieved, and it should be pointed out that mortality due to T2DM was reduced by 92%.¹¹ Despite this substantial evidence, the other causes of mortality in patients undergoing bariatric surgery should not be overlooked, because there is a 58% increase in mortality for reasons not related to typical disorders of this group of patients (greater incidence of accidents, suicide, or poisoning), aspects which have not been adequately investigated.¹¹ The majority of clinicians think that the perception of the assumed patient improvement is possibly greater than expected. This is probably true in terms of quality of life, but not so much in terms of an increased longevity. In a mathematical model, if an analysis of years of gained life is performed, a person aged 42 years with morbid obesity (BMI 45 Kg/m²) would have a life expectancy of 2.9 years longer (35.03 years vs 32.08 years extra).¹²

But, which are the present criteria for indication of metabolic surgery? While resolution and/or control of T2DM represent clear options for many bariatric surgeons, endocrinologists have not been of the same opinion. Internist and endocrinologists currently consider bariatric surgery as the last therapeutic option in T2DM usually when patients are over 50 years of age, have suffered diabetes for longer than 10 years, and show a poor metabolic control (HbA1c >7%), probably associated with comorbidities (arterial hypertension, atherogenic dyslipidemia, steatohepatitis) and/or microvascular or macro-vascular complications. In fact, this treatment was not included in the official therapeutic algorithms of the different medical societies for the treatment of T2DM. It was not until 2009 that the American Diabetes Association included bariatric surgery as an effective alternative for treatment of T2DM in subjects with body mass index (BMI) ≥ 35 Kg/m².¹³

Now things are changed, and the new International Diabetes Federation about the role of Bariatric Surgery in obese patients with T2DM establish that surgery should be an accepted option in people who have Type 2 diabetes and a BMI of 35 Kg/m² or more.¹³ Also, IDF statement points out that surgery should be considered as an alternative treatment option in patients with a BMI between 30 and 35 Kg/m² when diabetes can not be adequately controlled by optimal medical regimen, especially in the presence of other major cardiovascular disease risk factors.¹³ The statement encourages that all international and national guidelines accept bariatric surgery as part of the treatment for T2DM.

At present time, in patients with T2DM and BMI <35 Kg/m², metabolic surgery should be considered on an individual basis in those subjects with multiple risk factors involving a high cardiovascular risk and/or a serious threat to their lives. In all other patients, management of diabetes and any associated risk factors with all medical and pharmacological tools available should be optimized. Although, there are several recent data about its safety and efficacy in this setting,^{14,15} metabolic surgery must be recommended in

this group of patients only within clinical trials or very well controlled protocols.

Conflicts of interest

The authors declare that they have no conflicts of interest in this article.

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