

Diabetes and obesity: A debate on bariatric interventions and its implications

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Abstract

In this editorial, we comment on an article by Tang *et al* published in the *World Journal of Diabetes*. Obesity and diabetes are two pathological situations that are intrinsically related. Neither lifestyle changes nor pharmacological treatments have achieved diabetes remission. From this perspective, bariatric surgery has been widely used as an approach for weight loss in obese patients and as a strategy to promote metabolic modulation. The main effects of bariatric surgery involve direct action in improving cardiovascular function and endothelial function and reducing insulin resistance, leading to diabetes remission in the short term following surgery. In this context, it has been observed that hormones from the gastrointestinal tract and endothelium play a prominent role in this process. By reversing endothelial dysfunction, it is possible to balance pro-inflammatory cytokine production, improving the availability of nitric oxide and inhibiting vascular oxidative stress. Furthermore, it can be considered an efficient anti-inflammatory strategy, alleviating interferon-gamma-mediated adipose tissue inflammation. The current challenge must be to unravel the pathophysiological mechanisms and potential targets for treating metabolic diseases.

Key Words: Bariatric surgery; Diabetes mellitus; Oxidative stress; Endothelial dysfunction; Obesity

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Core Tip: In this editorial, we address the pathophysiological mechanisms associated with bariatric surgery in type 2 diabetes remission. Within this perspective, we discuss gastrointestinal tract hormones, mainly peptide-1, which is a hormone secreted by gastrointestinal L cells and released immediately after food intake, as well as the benefits obtained after reversing endothelial syndrome *via* bariatric surgery.

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INTRODUCTION

Obesity is a disease characterized by excessive accumulation of body fat, and it has been associated with adverse metabolic conditions[1]. It directly contributes to increased cardiovascular risk with increased mortality[2]. Among the main changes caused by obesity are insulin resistance, arterial hypertension, dyslipidemia and chronic inflammation[3, 4]. Diabetes and obesity have generated a great burden on the health system, and today they are considered epidemic diseases[1] and have incapacitated some economically active individuals[5]. The impacts on the quality of life of this group must be taken into consideration, given that obesity and diabetes are health conditions generally diagnosed simultaneously[6]. The literature has shown that obesity promotes a significant increase in mortality related to metabolic diseases[7]. Insulin resistance, its high rates, decreased hormonal regulation and systemic inflammation are pathophysiological characteristics that make obesity and diabetes close realities[8]. Insulin resistance occurs due to the increased release of fatty acids, lipids and other advanced factors from adipose tissue, leading to numerous complications [9]. In this context, the need for disease control is clear, as diabetes management goes far beyond glycemic control. Maintaining an ideal weight is essential to prevent or reduce the incidence of macro and microvascular diseases and their complications[2,10]. Even in the face of the constantly developing pharmaceutical industry, with numerous promising drugs, studies point to bariatric surgery as a promising and potentially curative approach for the treatment of obesity and type 2 diabetes mellitus[11]. Also described as metabolic surgery, bariatric surgery has shown efficacy in providing prolonged remission of diabetes without the need for continuous pharmacological treatment[12]. Among patients undergoing bariatric surgery, approximately 75%-80% of patients showed significant improvement in type 2 diabetes control at 1-year follow-up appointments[12,13]. The proportion of patients who achieved diabetes remission across studies was estimated to be between 30 and 77%[13]. However, this proportion decreased when a longer follow-up period was performed in patients with chronic diabetes[14]. There are validated tools that have been used preoperatively to predict whether the patient will have diabetes remission after bariatric surgery. These include the DiaRem score, which has predictive power based on variables such as age, glycated hemoglobin values, insulin use, and use of other blood glucose-reducing agents[15].

BARIATRIC SURGERY: WHAT HAS CHANGED OVER TIME

Over the decades, bariatric surgery has proven to be very effective in achieving significant and sustainable weight loss in many patients[16]. Laparoscopic techniques have contributed to access to new techniques in bariatric surgery in the last decade. Some techniques have been transformative in the field. These include vertical banded gastroplasty[17], which decreased at the end of the 1990s and the adjustable laparoscopic gastric band[18], which emerged around 2012. From then on, biliopancreatic bypass[19] decreased compared to Roux-en-Y gastric bypass (RYGB)[20]. Finally, the use of laparoscopic sleeve gastrectomy[21] has rapidly increased in recent years.

MECHANISMS OF PHYSIOLOGICAL ADJUSTMENTS AFTER BARIATRIC SURGERY

The described mechanisms regarding the effects of bariatric interventions on glycemic index remission are still not clear. Most studies indicate that the weight loss provided by surgery is a determining factor in the resolution of type 2 diabetes [22]. Therefore, patients who experience greater weight loss are more likely to control or even remit the disease compared to those with less weight loss. Other variables include the patient's age, duration of illness and glycemic control, which are mechanisms independent of weight loss[4]. The main marker of diabetes resolution for years has been weight loss. However, there is a growing trend towards the use of metabolic markers, such as an increase in cardiovascular risk factors, endothelial function and lipid profile[23].

RYGB surgery has been increasingly used because it is known to be beneficial in weight loss and in reducing deaths from cardiovascular complications[24]. Glucagon-like peptide-1 (GLP-1) has been considered a key metabolic variable to verify clinical improvement after RYGB, whose effects (GLP-1) are independent of weight. This peptide has protective effects on the endothelium in addition to its metabolic actions. After RYGB surgery, there is a marked increase in GLP-1,

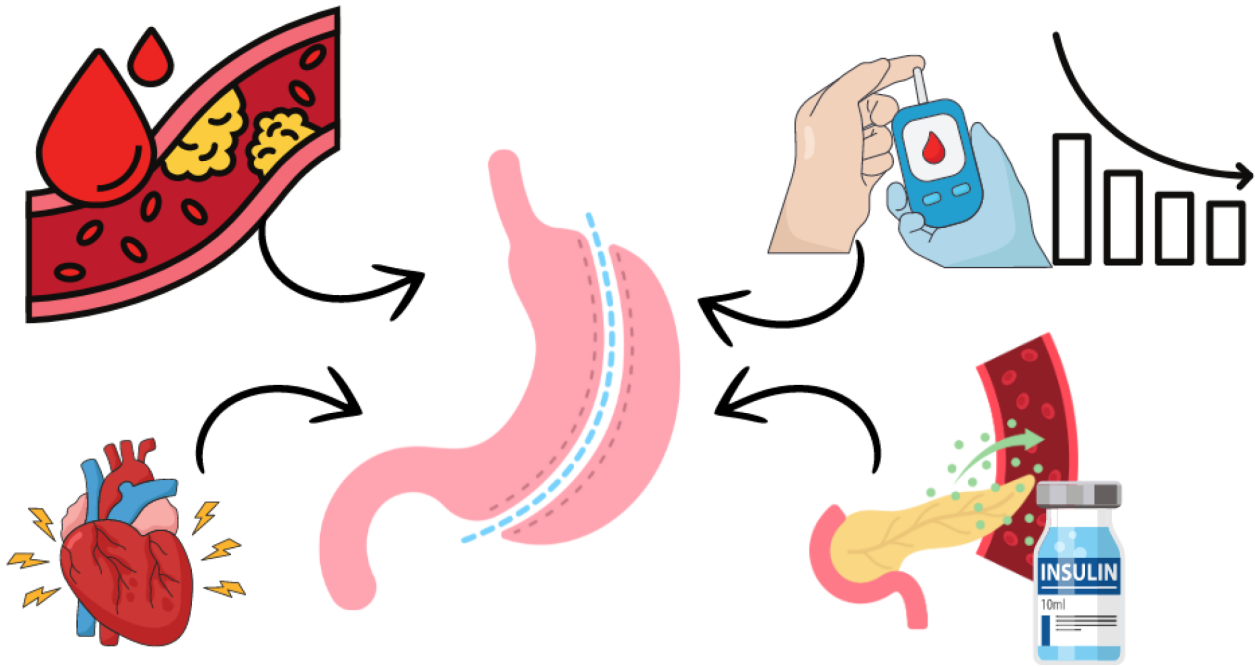


Figure 1 The effects of bariatric surgery involve a direct action on improving cardiovascular function, improving endothelial function and reducing insulin resistance, leading to diabetes remission in the short term after surgery.

which does not occur with weight loss due to dietary restriction. In this sense, a hypothesis has been formulated that GLP-1 is altered in the face of rapid metabolic changes and that this would only occur after RYGB, given that insulin resistance occurs even before weight loss after bariatric intervention[25,26].

ENDOTHELIAL EFFECTS OF BARIATRIC SURGERIES

There are reports that the visceral adipose tissue of patients with obesity presents gene expression related to inflammation, oxidative stress and production of pro-inflammatory cytokines. This leads to impaired arteriolar function and possibly endothelial dysfunction[27], which can cause important cardiovascular changes. When stimulated, the endothelium can release agents that cause vasomotor function and hemostasis[27,28]. In contrast, the endothelium in healthy conditions presents low levels of oxidative stress and endothelial smooth muscle with relaxed tone due to the release of some markers that act on this vascular smooth muscle. This balance of vasodilators and vasoconstrictors as well as procoagulant and anticoagulant agents is essential for the ideal physiological balance of the endothelium. Endothelial dysfunction occurs due to an imbalance of these agents and evolves into some cardiovascular pathologies, such as cerebrovascular diseases, as well as peripheral arterial disease, coronary artery disease and type 2 diabetes[29,30].

CONCLUSION

Bariatric surgeries may be beneficial in protecting against cardiovascular disease, especially when performed early, before the development of endothelial lesions (Figure 1). However, hormonal changes play a crucial role in diabetes remission. There is an urgent need for in-depth research that fully explains the metabolic and hormonal effects of the gastrointestinal tract and the different perspectives on the mechanisms underlying this approach.

FOOTNOTES

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