

Laparoscopic sleeve gastrectomy

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Abstract

Morbid obesity is the second leading preventable cause of death after cigarette smoking in the world. It is a chronic pathology which requires interdisciplinary management in which bariatric surgery plays a fundamental part. It results in greater weight loss and better maintenance of weight loss than any other treatment in the effort to resolve or diminish secondary comorbidities associated with morbid obesity. One of the surgical tools used for this surgery is sleeve gastrectomy (vertical gastrectomy). This procedure has demonstrated itself to be physiological, effective, and safe for management of this disease. These days it is considered to be a procedure restricted only by the hormonal changes it brings about in orexigenic hormones such as ghrelin, glucagon-like peptide-1 (GLP1) and peptide YY (PYY). Morbidity and mortality rates for this surgery are very low, but surgical results to date are excellent. This has moved sleeve gastrectomies into an important place within bariatric surgery.

Key words

Morbid obesity, super obesity, PYY, laparoscopic.

Obesity and overweight have reached epidemic proportions in the entire world, with no less than 2.6 million deaths per year.

Recent calculations from the WHO indicate that in 2005 there were approximately 1,600 million overweight adults (older than 15) and at least 400 million obese adults. Also, WHO estimates that in 2015 there will be approximately 2,300 million overweight adults and more than 700 million obese adults. In 2005 there were at least 20 million obese children under the age of 5 (1). Although it was believed that this was exclusively a problem in rich countries, obesity is increasing rapidly in poorer countries, especially in urban areas (1).

Prevalence of overweight and obesity in Colombia is reaching alarming levels because they affect about half of the country's population according to the National Survey on the Nutritional Situation (Encuesta Nacional de Situación

Nutricional - ENSIN) (2) carried out by the Colombian Institute of Family Welfare in coordination with the National Survey on Demographics and Health on a sample of 19,500 households. The problem affects all socio-economic layers of society in a more or less even way. According to the ENSIN survey, the percentage of women between 19 and 64 years of age affected by overweight and obesity in Colombia is 49.6% while the percentage of men affected is 39.9%. The total population affected by overweight and obesity is 46.1% (2).

This statistical tendency has demonstrated that dealing with the obese population has increased the use and cost of health care services in the whole world. The cost of caring for this part of the population is 81% higher than health care for the non-obese population. Since bariatric surgery began to be used massively, the time required to recover the cost of this surgery has decreased progressively. In 2002,

the average time needed to recover the cost of surgery was 6 years, but through the massive use of laparoscopic surgery this time had fallen to two years by 2005. Today it is well known that in the American health system cost recovery for already performed Bariatric surgery is between 2 and 4 years, depending on whether the technique used is laparoscopic or open surgery.

Treatment for obesity is clearly multidisciplinary and interdisciplinary. The best results come from the combination of the best therapeutic surgeries and changes in nutritional habits, physical activity, and treatment for psychological problems such as anxiety. Also, it is important to understand that obesity is a chronic disease that requires strict control and follow up for the rest of a person's life (4). 88% of bariatric programs in the United States are interdisciplinary. When these are compared to those that are not, they are significantly superior in terms of definite treatment of comorbidities and preventing patients from regaining weight (3).

Vertical gastrectomy began as a new surgical tool in bariatric surgery in 1999. It was part of the biliopancreatic diversion with duodenal switch that has significantly improved results. Later, Dr. M. Gagner and his team introduced this technique for super-super-obese patients, as the first step in minimizing surgical complications and the inherent risks faced by these patients. In the second stage, biliopancreatic diversion with duodenal switch or a Roux-en-Y gastric bypass can be completed (5, 6). Studies on this issue have shown that not only did surgical risks and complications significantly decrease for super-super-obese patients, but more than 30% of them did not need the second stage because of the notable improvement of their comorbidities and significant weight losses (5-7). These positive results in super-super-obese patients created the opportunity for sleeve (vertical or tubular) gastrectomy to become a new tool of bariatric surgery.

When vertical gastrectomy in biliopancreatic diversion with duodenal switch was first performed it was with the idea of adding to a strictly restrictive procedure to improve the long-time results of surgery with a derivative concept that was not restrictive. Then the concept of making the restrictive part of the surgery the first part of two step surgery was born. This was performance of the vertical gastrectomy first, followed by the biliopancreatic diversion with duodenal switch or Roux-en-Y gastric bypass under better risk circumstances. The improvement in these patients allowed us to understand that the vertical gastrectomy was not only a restrictive procedure (8, 9). Today, we still do not fully know how and why vertical gastrectomy works, however it has been proven that several factors interact. The first is reduction of the volumetric capacity of the stomach. This can vary according to the calibration plug and according to where gastric resection starts (taking the pylorus as the reference point).

Although there is no universal consensus, the author recommends using a 34F calibration plug resection and starting at a distance of 2cm to 5 cm from the pylorus. A second factor is the prevalence of the pylorus that could function as a natural gastric band contributing to the effect of satiety (9, 10). The most striking factor about this technique is that when resection of the gastric fundus is performed, ghrelin production decreases substantially. Comparative studies show that vertical gastrectomy and biliopancreatic diversion with duodenal switch are surgical techniques that significantly reduce the concentration of this orexigenic hormone in a sustainable manner. Although the Roux-en-Y gastric bypass also reduces production of this hormone, it is not as relevant as vertical gastrectomy and biliopancreatic diversion with duodenal switch. Definitely this phenomenon does not occur in purely restrictive techniques such as adjustable gastric banding. Thus, these studies confirm that the vertical gastrectomy is not purely restrictive but also directly produces hormonal changes. These hormonal changes are also seen in increased GLP-1 and PYY, similar to changes seen in the Roux-en-Y gastric bypass. There is a rapid decrease in levels and improved glucose homeostasis (9). Ghrelin by itself causes several diabetogenic effects such as increases in growth hormone, cortisol and epinephrine. At pharmacological dosages it produces inhibition of insulin secretion. One consequence is that surgical suppression of ghrelin leads to glucose homeostasis (9, 11, 12). Various authors conclude that, if both Roux-en-Y gastric bypass and vertical gastrectomy result in similar marked increases of insulin, GLP-1 and PYY which improves glucose homeostasis, than the idea that the proximal small intestine alone mediates improvement in glucose homeostasis cannot be supported (13-16, 20).

Although vertical gastrectomy is a relatively new procedure, it is used with increasing frequency because of its results. It has almost entirely replaced the use of restrictive techniques such as gastric banding. The literature reports experiences with excellent results in patients with super obesity. These were patients with low BMI but with comorbidities, histories of previous abdominal surgery and chances of intestinal obstruction because of adhesions, severe illnesses such as liver cirrhosis, Crohn's disease, HIV and other conditions for which surgery such as biliopancreatic diversion and Roux-en-Y gastric bypass would not be recommended for obese patients with these diseases. There are also reports of patients who have undergone vertical gastrectomies after poor results from treatment with laparoscopic adjustable gastric bands (7, 8, 17). Today, because of its excellent results in terms of weight loss and resolution and improvement of comorbidities that accompany morbid obesity, laparoscopic vertical gastrectomy is accepted as first line surgical treatment

by the various bariatric surgery associations around the world and by entities which regulate health care.

The world literature on vertical gastrectomy has not yet reported results of extensive experience because this is a relatively new technique. Vertical gastrectomy has evolved and is no longer the classical procedure used in biliopancreatic diversion with duodenal switch. There is no consensus yet on the type of calibration plug. However, over time results have apparently improved with 32F and 34F plugs. Volumes are lower because not only is the gastric fundus resected but also most of the gastric antrum, as resection moves closer to the pylorus (18, 21, 22).

So far there has been no meta-analysis which analyzes only the results of this particular surgical procedure, but there are isolated studies that demonstrate its effectiveness. The AMBS reports an analysis of 15 studies with follow ups of less than 5 years and one study with 3 years of follow up. On the other hand, there is only one article reporting a study with 6 years of analysis. Loss of excess weight varies between 33% and 88% over periods of 3 years approximately, and 56% +/- 25.5% over 6 years. The rate of resolution for diabetes mellitus type 2 within approximately 2 years is between 47% and 100%, for hypertension it is between 15% and 93%, for sleep apnea it is between 56.2% and 100%, and for hyperlipidemia it is between 45% and 73%. The rate of complications (including minor and major complications) has been reported between 0% and 24%. The reported mortality rate is 0.34% (21, 22).

Laparoscopic vertical gastrectomy is a safe and effective procedure a very low rate of complications and mortality. It is a physiological technique that can not be classified as simply restrictive surgery because it produces significant changes in production of hormones, particularly ghrelin, PYY and GLP-1. These effects in patients with morbid obesity have so far shown far superior results than have similar, but purely restrictive treatments, such as Roux-en-Y gastric bypass. Bariatric surgery has proven to be very effective in the treatment of obesity, but we still need more data from its functioning and, in the case of the vertical gastrectomy, longer follow-up times.

Conflicts of interest

The author declares no conflict of interest related to this publication.

REFERENCES

1. Organización Mundial de la Salud. Obesidad y sobrepeso. Nota descriptiva N° 311- septiembre de 2006.

2. Instituto colombiano de bienestar familiar ICBF. Encuesta nacional de la situación nutricional en Colombia ENSIN. 2005.
3. Pierre-Yves Crémieux. A Study on the Economic Impact of Bariatric Surgery. *Am J Manag Care* 2008; 14(9): 589-596.
4. JPH. Wilding. Treatment strategies for obesity. *Obesity reviews* 2007; 8(Suppl. 1): 137-144.
5. Ren CJ, Patterson E, Gagner M. Early results of laparoscopic biliopancreatic diversion with duodenal switch: a case series of 40 consecutive patients. *Obes Surg* 2000; 10: 514-523.
6. Regan JP, Inabnet WB, Gagner M, Pomp A. Early experience with two-stage laparoscopic Roux-en-Y gastric bypass as an alternative in the super-super-obese patient. *Obes Surg* 2003; 13: 861-864.
7. Baltasar A, Serra C, Pérez N, et al. Laparoscopic Sleeve Gastrectomy: A Multi-Purpose Bariatric Surgery. *Obesity Surgery* 2005; 15: 1124-1128.
8. Akkary E, Duffy A, Bell R. Deciphering the Sleeve: Technique, Indications, Efficacy, and Safety of Sleeve Gastrectomy. *Obesity Surgery* 2008; 18: 1323-1329.
9. Peterli R, Wölnerhanssen B, Peters T, Devaux N, Kern B, et al. Improvement in Glucose Metabolism after Bariatric Surgery: Comparison of Laparoscopic Roux-en-Y Gastric Bypass and Laparoscopic Sleeve Gastrectomy. A Prospective Randomized Trial. *Ann Surg* 2009; 250: 234-241.
10. Nelson Trelles, Michel Gagner. *Sleeve Gastrectomy. Operative Techniques in General Surgery*. Elsevier Inc. 2007.
11. Davenport AP, Bonner TI, Foord SM, et al. International Union of Pharmacology. LVI. Ghrelin receptors nomenclature, distribution, and function (review). *Pharmacol Rev* 2005; 57: 541-546.
12. Murphy KG, Dhillon WS, Bloom SR. Gut peptides in the regulation of food intake and energy homeostasis. *Endocr Rev* 2006; 27: 719-727.
13. Cummings DE, Overduin J, Foster-Schubert KE, et al. Role of the by passed proximal intestine in the anti-diabetic effects of bariatric surgery (review). *Surg Obes Relat Dis*. 2007; 3: 109-115.
14. Rubino F, Gagner M, Gentileschi P, et al. The early effect of the Roux-en-Y gastric bypass on hormones involved in body weight regulation and glucose metabolism. *Ann Surg* 2004; 240: 236-242.
15. Rubino F, Forgione A, Cummings DE, et al. The mechanism of diabetes control after gastrointestinal bypass surgery reveals a role of the proximal small intestine in the pathophysiology of type 2 diabetes. *Ann Surg* 2006; 244: 741-749.
16. le Roux CW, Aylwin SJ, Batterham RL, et al. Gut hormone profiles following bariatric surgery favor an anorectic state, facilitate weight loss, and improve metabolic parameters. *Ann Surg* 2006; 243: 108-114.
17. Wei-Jei Lee. Laparoscopic sleeve gastrectomy for diabetes treatment in nonmorbidly obese patients: Efficacy and change of insulin secretion. *Surgery* 2010; 147: 664-669.

18. Eldo E. Frezza. Analysis of the Results of Sleeve Gastrectomy for Morbid Obesity and the Role of Ghrelin. *Surg Today* 2008; 38: 481-483.
19. Jose Luis Leyba, et al. Laparoscopic Roux-en-Y Gastric Bypass Versus Laparoscopic Sleeve Gastrectomy for the Treatment of Morbid Obesity. A Prospective Study of 117 Patients. *Obesity Surgery* 2010; 21: 212-216.
20. Bettina Woelnerhanssen, Effects of postbariatric surgery weight loss on adipokines and metabolic parameters: comparison of laparoscopic Roux-en-Y gastric bypass and laparoscopic sleeve gastrectomy—a prospective randomized trial. *Surgery for Obesity and Related Diseases* 2011; 7: 561-568.
21. American Society for Metabolic and Bariatric Surgery. Position statement on sleeve gastrectomy as a bariatric procedure. Endorsed by Executive Council June 17, 2007.
22. Mathieu D'Hondt. Laparoscopic sleeve gastrectomy as a single-stage procedure for the treatment of morbid obesity and the resulting quality of life, resolution of comorbidities, food tolerance, and 6-year weight loss. *Surg Endosc* 2011; 25: 2498-2504.