Editorial

Surgical treatment of morbid obesity: implications to pregnancy

It is estimated that over 1 billion people are overweight or obese worldwide.[1] Currently, obesity affects about 1/3 of the U.S. adult population older than 20 years, which added up to 32.6% of overweight individuals and 5.9% of morbidly obese people, make up a total of more than 70% of adults with a BMI equal to or greater than 25 kg/m^2 in the USA. From 1960 to 2006, the prevalence of obesity among U.S. people aged 20 to 74 years increased from 13.4% to 35.1%.[2] It is estimated that approximately 10 million individuals have a BMI between 35 and 40 kg/m^2.[3] This proportion is increasing gradually in both sexes in all age groups, particularly in children and adolescents, in all racial and ethnic groups, and in all social and economic levels.[4] The World Health Organization estimates that in 2015 around 54% of U.S. women will be obese.

Based on these data, we can get an idea of the extent to which obesity affects the entire Western world. In Europe, data are also alarming, with more than half of the individuals being considered overweight and obese.

In Brazil, IBGE data for 2003 showed that 40% of adults older than 20 years were overweight and 11% of the population was obese.[5] In this period, morbid obesity reached 0.69% of the adult population, or about 600,000 people. In the last three decades, this population increased 255%.[1]

More recent data from the Ministry of Health dated of 2009 show that 43.3% of the population is overweight. This increase was seen mainly in men, 47.3% compared with 39.5% of women, with prevalence in the South region. In Porto Alegre, 49% of adults are overweight and 15.9% are obese.[6]

In Brazil, obesity has increased in both sexes, currently affecting 13% of the adult population, with 12.4% of men and 13.6% of women. The age group with the highest concentration of obese individuals is between 45 and 54 years of age.[5]

Obesity was regarded as a disease typical of developed countries; however, the globalization of habits that encourage a sedentary lifestyle and the increased supply of food high in calories have turned obesity into a problem also affecting developing countries. This is a pandemic directly related to a lifestyle that is clearly obesogenic due to the promotion of environments that offer increased supply of foods high in calories, including unhealthy food and lack of physical activity.[1]

Obesity is a predisposing factor for the development and exacerbation of potentially severe diseases such as hypertension, insulin resistance, type 2 diabetes mellitus, dyslipidemia, and the consequent atherosclerosis and metabolic syndrome, with direct impact on morbidity and mortality related to these diseases and their effects on target organs and systems.

Health care costs directly related to this condition and its influences on associated diseases accounted for 9% of health expenses in 2005 in the USA, that is, about US$ 100 billion, and the indirect costs for the economy are incalculably greater.[7]

All available modalities of clinical treatment for weight loss have poor results, with up to 95% recurrence in patients with morbid obesity (BMI $\geq$ 35 kg/m^2 associated with comorbidities, or BMI $\geq$ 40 kg/m^2,). BMI stands for body mass index, which is calculated by the ratio between the weight in kilograms and the body surface area in m^2.[8] According to the 1991 consensus of the NIH (U.S. National Institute of Health), surgery was considered and remains as the only effective treatment for these patients who have experienced failure with previous clinical treatment. In Brazil, since 2000, the Ministry of Health has included the surgical treatment of morbid obesity among the procedures covered by the Unified Health System (SUS), establishing criteria for its indication.[9] In 2005 and 2010, the Federal Council of Medicine also set standards for the surgical treatment of morbid obesity, as well as guidelines for the composition of a multi-professional team to follow up these patients in the pre-, intra- and postoperative periods.[10]

Using the different bariatric techniques available, the surgical treatment yields good results, with the Roux-en-Y gastric bypass (RYGB) being the surgery most often used to treat morbid obesity. RYGB shows results with more than 75% of patients losing 50% or more excess of body weight, a result that is maintained five years after the surgery. Because of technological development and advances in anesthetic and postoperative care, morbidity and mortality rates have greatly decreased and currently are approximately 5% and 1%, respectively.[11]

As a consequence of successful surgical treatments, there has been an increase in the number of procedures performed. While 16,000 bariatric procedures were carried out in the USA in 1990, in 2005, 113,500 surgeries were performed; an increase of 700%, and in 2008 the number of surgeries was approximately 220,000.[12]

The surgical treatment of obesity can be typically divided into three categories: restrictive, mixed, and malabsorptive surgeries. Restrictive surgeries cause basic effects originated from the restriction in protein and calorie intake; mixed surgeries associate food intake restriction with the effect of intestinal malabsorption of nutrients; and malabsorptive surgeries have less or no restriction and cause a greater effect on food malabsorption by the small intestine. Because of the broader knowledge that has been acquired about the role of enteropeptides produced by various segments of the digestive tract in response to the arrival of nutrients, this classification certainly tends to be replaced by the adaptive and enterohormonal role produced by several technical procedures in the metabolism and control of hunger and satiety.[13]

In the 1950s, malabsorptive surgeries initiated the era of

surgical treatment of obesity with the jejunoileal bypass. The high rate of complications associated with severe malabsorption and extensive intestinal bypass caused this technique to be abandoned. In the late 1970s, Scopinaro designed a biliopancreatic diversion bypass with smaller intestinal diversion associated with distal gastrectomy, a procedure that has been used until now. An adaptation of this technique was proposed in the 1980s by Hess and Marceau (duodenal switch), which suggested a vertical gastrectomy, fashioning a gastric tube with preservation of the pylorus and anastomosis with the distal segment of the small intestine in the same proportions used in the Scopinaro procedure.

In the 1980s, Mason proposed the vertical banded gastroplasty as a restrictive procedure. Such option shows fewer implications for protein, vitamin, and trace elements absorption. High recurrence rates have caused this technique to be almost completely abandoned, with the suggestion of Roux-en-Y bypass gastroplasty, which consists of a small gastric pouch with a volume capacity of between 30 and 50 ml that restricts food intake. Such pouch may or may not have emptying restriction by means of a gastric band, and it also includes a short Roux-en-Y bypass, promoting diversion of the largest portion of stomach, duodenum, and beginning of jejunum from food transit. This mixed procedure established by Fobi and Capella, with some variations, is the surgery most often used worldwide and particularly in Brazil, since its introduction by Garrido Jr, it has been routinely used in several bariatric surgery centers.[14]

Other procedures are also on the list of bariatric procedures currently used. Adjustable gastric banding, which is a primarily restrictive procedure, was developed in the mid-1990 and consists of a silicone band that restricts a small portion in the gastric cardia, turning the stomach into an hourglass, with the caliber of the band being adjusted through a port in the subcutaneous tissue of the abdominal wall.

The interest in bariatric surgery has been increasing as this set of treatments becomes a safe and effective option for treating this severe and epidemic disease and new procedures are suggested. Vertical gastrectomy has been investigated with the focus on a specific niche of indication, either as an initial procedure in severe cases, or as the technique of choice in borderline cases, with lower BMIs or involving extreme age groups, regarding which there has been an increasing discussion about the extension of surgery recommendation.

In recent years, knowledge about the pathophysiology of obesity and other diseases, like diabetes and metabolic syndrome, has become greatly broader partly because of the important contribution from the research in the field of bariatric surgery. There has been great advances also in terms of the physiological effects of the several techniques with changes in the neurenteric axis that regulate the metabolism mediated by intestinal neuropeptides, with important effects on the regulation of hunger and satiety, glucose metabolism, and pancreatic endocrine function. Most surgeries have also neurohormonal effects in addition to those related to restriction and/or malabsorption. When the food bolus reaches certain regions of the digestive system more quickly or fails to reach them, it generates a cascade of hormonal and neuropeptide mediators, with important effects on the regulation of metabolic homeostasis. The evolution of this knowledge leads to implications never imagined before, such as the possibility of surgical treatment of type 2 diabetes, which has become a current research field based on specific protocols being developed throughout the world.

Of the surgical patients aged between 18 and 45, about 80% are women. Between 2003 and 2005, approximately 50,000 women per year in this age group underwent bariatric surgery. As a result of this increase in the number of surgeries, an increasing number of women of reproductive age will have a history of bariatric surgery.

In addition to the implications of the comorbidities listed above, polycystic ovary syndrome, infertility, gestational diabetes, hypertension related to pregnancy, fetal macrosomia, preterm labor, abortion, fetal malformations, and juvenile obesity are associated with obesity in women of childbearing age.

The weight control achieved by the surgical treatment, with the consequent reversion of infertility, and the increasing number of women of reproductive age undergoing surgery lead to implications related to the bariatric surgery and the effects of these metabolic and physiological changes during pregnancy.

Despite the fact that the history of bariatric procedures dates back to the 1960s, there are few studies available about the implications of this type of surgery in the pregnancy and gestational period.

The changes in digestive physiology after the surgery, which can lead to malabsorption of certain nutrients such as vitamins, minerals, and proteins,[15] are responsible for most of the concerns related to pregnancy after undergoing bariatric surgery, being associated with possible influences on fetal growth and nutritional deficiencies in the fetus and pregnant woman.[16]

Postoperative weight loss occurs more rapidly in the first year, and the weight usually stabilizes after 18 months. Although few studies have specifically evaluated this issue, finding no significant changes between early and late pregnancies, strict contraception is generally recommended for at least one year after the surgery.[17]

With respect to maternal and fetal parameters, Wax et al. found no differences in patients undergoing RYGB compared with controls from the general population regarding the incidence of hypertension, premature rupture of membranes, oligohydramnios, and delivery after 41 weeks.[18]

On the other hand, comparing pregnant women with obese women who underwent bariatric surgery, Wittgrove et al.[17] demonstrated that the incidence of complications in the surgery group is smaller than in the population of nonoperated obese individuals. Likewise, their series showed a lower incidence of

macrosomia, hypertension, and diabetes in operated women compared with the morbid obese population.

Vitamin deficiencies are found in patients undergoing RYGB, most commonly iron deficiency in women of childbearing age, calcium deficiency, and hypovitaminoses A, D and B12. There is need of a strict control of possible deficiencies in pregnant women as the demand for these nutrients increases.

In a study published in the current issue, Nomura et al. evaluated the fetal and perinatal outcome of pregnancies after RYGB, showed the incidence of anemia in 86.7% of the cases (Hb < 11 mg/dL), with three out of 30 patients requiring parenteral iron replacement and receiving blood transfusion. However, these findings did not affect fetal well-being or caused major maternal complications. It is important to emphasize that this study evaluated patients using a gastric band in the RYGB for restriction of gastrojejunal efflux. Such surgical procedure is related to higher rates of intolerance to protein, especially beef.[19] Faintuch et al.[20] also studied pregnant population after RYGB with gastric band and found decreases in hemoglobin and iron in the second quarter of pregnancy. Anemia is a result of poor absorption of iron and cobalamin due to limitations caused by gastric and duodenal exclusion and reduction in iron intake promoted mainly by the contention ring or very tight anastomoses. It is found mainly in women of reproductive age as a consequence of chronic weight losses. Sometimes usual supplementation with oral multivitamins is not effective. A recent series of evaluation of patients after RYGB who received daily oral supplementation showed prevalence of iron deficiency in 40% of patients two years after surgery, and in 54% of patients after three years, in whom vitamin B12 deficiency occurred in 27%.[21] Currently, given the unfavorable impact on nutrition, gastric bands have not been used in many bariatric surgery centers.

Specific nutritional deficiencies, if uncorrected, could lead to severe fetal implications, such as growth retardation, malformations, and fetal death.

Regular laboratory control is essential, and correction of deficiencies prior to pregnancy is also crucial and always easier. All patients who underwent surgery receive daily oral vitamin supplementation and occasional parenteral supplementation. Identification and correction of deficiencies in the pre-pregnancy period, nutritional counseling during pregnancy, and pregnancy specific vitamin supplementation in addition to the supplementation used in the normal postoperative follow-up period most of the time are enough to prevent nutritional deficiencies related to RYGB in pregnant women.

In terms of malabsorptive surgeries, special attention should be given to possible protein deficiencies by means of increased protein intake and monitoring of the nutritional status of pregnant women using supplementation if necessary. In other surgeries, this concern is less significant, except in cases where there is lack of intake of protein foods, such as in cases of RYG with the use of a silicone ring in which there is intolerance to beef. In these cases, regular protein supplementation is recommended. Hyperemesis gravidarum may aggravate these specific situations of vitamin and mineral deficiencies, and even calorie and protein deficiencies, and should be carefully monitored.

There are few reports in the literature up to 2009 of internal hernias and bowel obstructions in pregnancies after bariatric surgery as complications directly related to the surgery. There are three critical moments when this risk increases: in the second quarter, when the uterus becomes an abdominal organ and competes for space with the intestine, at the end of pregnancy, when the fetal head descends, and in the postpartum period, when there is uterine involution, periods in which there is extensive intracavitary rearrangement. In addition to the membranes and adherences, there are spaces where internal hernias may develop. Early diagnosis and fast management decrease the morbidity of this complication.[22] Because it has nonspecific presentation, the suspicion of internal hernia is always mandatory in cases of uncharacteristic abdominal pain or intestinal subocclusion episodes. Bilious vomiting raises strong suspicion of obstruction distal to the enteroanastomosis. A CT scan with oral contrast is very sensitive in identifying obstructions, and surgery is the most appropriate management.

In the case of adjustable gastric banding, early in the gestation, recurrent vomiting can lead to slippage of the band and subsequent obstruction. As a prophylactic measure, complete emptying of the band in this initial period is recommended, with subsequent reinsufflation during pregnancy depending on the symptoms and nutritional status of the patient and fetus, and again emptying the band at the end of pregnancy to minimize the impact of the restriction during lactation.[23]

Based on these data, some preventive measures are recommended. Postoperative follow-up, control, recognition and early correction of nutritional deficiencies, and multivitamin supplementation, especially in women of childbearing age using iron supplementation, folic acid, calcium, and vitamin B12 are essential. As in the usual postoperative follow-up of all patients undergoing surgical treatment of obesity, in women and particularly pregnant women, careful multidisciplinary follow-up increases the chances of success. The postponement of pregnancy to one year after bariatric surgery also reduces the possibility of complications.

Therefore, bariatric surgery minimizes the risks associated with morbid obesity, as well as the gestational risks for the woman and the fetus related to morbid obesity.

Marco Aurelio Santo[1]
Daniel Riccioppo[1]
Ivan Cecconello[2]

1- Unidade de Cirurgia Bariátrica e Metabólica do Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, São Paulo, SP

2- Professor Titular das Disciplinas de Cirurgia do Aparelho Digestivo e Coloproctologia da Faculdade de Medicina da Universidade de São Paulo, São Paulo, SP

Referências
1. Ford ES, Mokdad AH. Epidemiology of obesity in the Western Hemisphere. J Clin Endocrinol Metab. 2008;93(11 Suppl 1):S1-8.
2. National Center for Health Statistics Health E-Stats. Prevalence of overweight, obesity and extreme obesity among adults: United States, trends 1976–80 through 2005–2006. [cited 2010 nov 4]. Available from: http://www.cdc.gov/nchs/data/hestat/overweight/overweight_adult.htm.
3. US Obesity Trends: trends by state 1985-2009. [cited 20101 nov 4]. Available from: http://www.cdc.gov/obesity/data/trends.html.
4. Mokdad AH, Ford ES, Bowman BA, Dietz WH, Vinicor F, Bales VS, et al. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. JAMA. 2003;289(1):76-9.
5. Prevalência de déficit de peso, excesso de peso e obesidade na população com 20 ou mais anos de idade, por situação de domicílio, segundo sexo e cor ou raça: Brasil período 2002-2003. [citado 4 nov 2010]. Disponível em: http://www.ibge.gov.br/home/estatistica/populacao/condicaodevida/pof/2002analise/tab0607e.pdf.
6. 13% dos brasileiros adultos são obesos. [citado 3 nov 2010]. Disponível em: http://portal.saude.gov.br/portal/aplicacoes/reportagensEspeciais/default.cfm?pg=dspDetalhes&id_area=124&CO_NOTICIA=10078.
7. The hidden cost of obesity. [cited 2010 nov 1]. Available from: http://www.forbes.com/2006/07/19/obesity-fat-costs_cx_mh_0720obesity.html.
8. Bukt MJF, van Dalen T, Muller AF. Surgical treatment of obesity. Eur J Endocrinol. 2008;158(2):135-45.
9. Ministério da Saúde. Portaria GM/MS n. 390, 6 de julho de 2005. [citado 2010 set] Disponível em: http://dtr2001.saude.gov.br/sas/PORTARIAS/Port2005/PT-390.htm.
10. Resolução CFM Nº 1.942/2010. Publicada no D.O.U. de 12 de fevereiro de 2010, Seção I, p. 72) Altera a Resolução CFM nº 1.766, de 13 de maio de 2005, publicada no Diário Oficial da União em 11 de julho de 2005, Seção I, página 114, que estabelece normas seguir as para o tratamento cirúrgico da obesidade mórbida, definindo indicações, procedimentos e equipe [citado 2 nov 2010]. Disponível em: http://www.portalmedico.org.br/resolucoes/cfm/2010/1942_2010.htm.
11. Pories WJ. Bariatric surgery: risks and rewards. J Clin Endocrinol Metab. 2008;11(Suppl 1):S89–S96.
12. Buchwald H, Danette M. Metabolic/bariatric surgery Worldwide 2008. Obes Surg. 2009;19(12):1605-11.
13. Santoro S, Malzoni CE, Velhote MC, Milleo FQ, Santo MA, Klajner S, et al. Digestive adaptation with intestinal reserve: a neuroendocrine-based operation for morbid obesity. Obes Surg. 2006;16(10):1371-9.
14. Garrido Jr AB, editor. Cirurgia da obesidade. São Paulo: Atheneu; 2002.
15. Pajecki D, Dalcanalle L, Oliveira CPMS, Zilberstein B, Halpern A, Garrido Jr AB, et al. Follow-up Roux-en-Y gastric bypass patients at 5 or more years postoperatively. Cecconello I. Obes Surg. 2007;17(5):601-7.
16. Guelinckx I, Devlieger R, Vansant G. Reproductive outcome after bariatric surgery: a critical review. Hum Reprod Update. 2009;15(2):189-201.
17. Wittgrove AC, Jester L, Wittgrove P, Clark GW. Pregnancy following gastric bypass for morbid obesity. Obes Surg. 1998;8(4):461-4.
18. Wax JR, Cartin A, Wolff R, Lepich S, Pinette MG, Blackstone J. Pregnancy following gastric bypass surgery for morbid obesity: effect of surgery-to-conception interval on maternal and neonatal outcomes. Obes Surg. 2008;18(12):1517-21.
19. Nomura RMY, Dias MCG, Igai AMK, Liao AW, Miyadahira S, Zugaib M. Avaliação da vitalidade fetal e resultados perinatais em gestações após gastroplastia com derivação em y de roux. Rev Assoc Med Bras. 2010;56(6): 670-4.
20. Faintuch J, Dias MCG, Fazio ES, Oliveira FC, Nomura RM, Zugaib M, et al. Pregnancy nutritional indices and birth weight after Roux-en-Y gastric bypass. Obes Surg. 2009;19(5):583-9.
21. Vargas-Ruiz AG, Hernández-Rivera G, Herrera MF. Prevalence of iron, folate, and vitamin b12 deficiency anemia after laparoscopic Roux-en-Y gastric bypass. Obes Surg. 2008;18(3):288-93.
22. Higa KD, Ho T, Boone KB. Internal hernias after laparoscopic Roux-en-Y gastric bypass: incidence, treatment and prevention. Obes Surg. 2003;13(3):350-4.
23. Maggard MA, Yermilov I, Li Z, Maglione M, Newberry S, Suttorp M, et al. Pregnancy and fertility following bariatric surgery: a systematic review. JAMA. 2008;300(19):2286-96.