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Pregnancy after Roux-en-Y Gastric Bypass

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A Retrospective, Observational Study from a Center in Buenos Aires, Argentina

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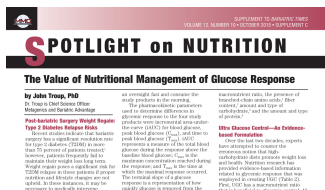


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October 2015 Spotlight on Nutrition



Brasesco, MD

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ABSTRACT

Currently, bariatric surgery is the most effective treatment available to treat morbid obesity. Women that are of childbearing age are a unique portion of the bariatric patient population. The objective of this study was to examine the pregnancy outcomes in women becoming pregnant after undergoing bariatric surgery and compare pre-and post-surgery results. This retrospective observational study included 256 women who became pregnant after undergoing Roux-en-Y gastric bypass. Of the 256 women, 125 had a pregnancy prior to the surgery. We sought to compare the outcomes of the pre-surgery pregnancies to the post-surgery pregnancy in this patient subset. We found that patients experienced significant improvement and/or remission of type 2 diabetes mellitus after RYGB, and a decrease in the incidence of gestational diabetes, gestational hypertension, and pre-eclampsia. We concluded that Roux-en-Y gastric bypass resulted in healthier pregnancy outcomes when compared with pregnancy that occurred pre Roux-en-Y gastric bypass.

Introduction

A mother's health conditions during pregnancy have a significant impact on the in utero environment, fetal development and the health of a child.[1] As worldwide obesity rates rise, the health consequences affects an important subset of individuals, women of

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childbearing age. The prevalence of maternal obesity, defined as body mass index (BMI) of 30kg/m2 or more, has increased in the last few years and has become one of the most common health risk factors seen in obstetric practice.[2,3] In Argentina, 20.8 percent of adults over 18 years old have obesity.[4]

Research shows that obesity is associated with infertility and, in those that are able to achieve pregnancy, an increased risk of gestational diabetes mellitus (GDM), gestational hypertension, and pre-eclampsia.[5] Obesity has also been associated with an increased risk of spontaneous abortions, premature labor, cesarean section, and death.[5] Parturients with obesity are also more likely to experience thrombosis episodes, as well as postpartum bleeding.[6]

Maternal obesity has been associated with conditions related to abnormal fetal growth, including macrosomia (an estimated fetal weight of greater than or equal to 4,000g) and risk of neural tube defect (NTD).[7]

Bariatric surgery is currently the best treatment option available for morbid obesity.[8] Weight loss in women with obesity-related impaired fertility is associated with improved metabolic status, which makes pregnancy more probable.[9, 10] In these cases, the lost weight not only improves fertility, but it also reduces the risk of obstetric complications and becomes of an enormous benefit for the health of the mother and the child. Given that the number of post BS pregnancies is rising, the follow-up of these pregnancies has become a clinical, nutritional and obstetric challenge.

We conducted a retrospective, observations study to examine the pregnancy outcomes in women becoming pregnant after undergoing baritric surgery and compare pre-and post-surgery results.

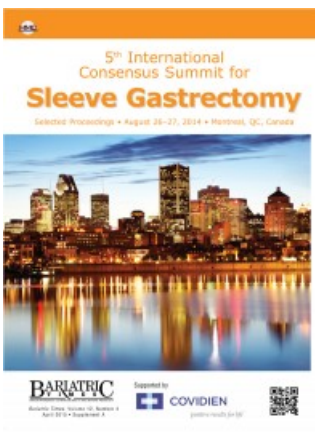
Methods

This retrospective observational study included 256 women 18 years or older that became pregnant after undergoing Roux-en-Y gastric bypass (RYGB) from 2008 to November 2014. All women studied were followed up and cared for at Obesidad y Cirugía Mini

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invasiva (OCMI) in Buenos Aires, Argentina.

Formal consent was not required, and all procedures were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

The following cases were not included in the study: Pregnancies in process, multiple pregnancies, and/or cases that did not gather the data needed for this investigation. From 351 consecutive cases, 256 patients met the study's criteria. From these 256 women, a subset of 125 were found to have had pregnancies prior to RYGB, which permitted comparison between the post-RYGB outcomes with patients' pre-RYGB pregnancies. Pre RYGB variables were as follows: age at which surgery was performed, weight (kg), BMI (kg/m²), past history of infertility (defined as the incapacity to fulfill pregnancy after reasonable time of adequate sexual intercourse without contraceptive measures), [11] Presence of type 2 diabetes mellitus (T2DM), and gestational diabetes. Gestational diabetes during pre-surgery pregnancy was determined according to American Diabetes Association (ADA) criteria (any degree of glucose intolerance with onset or first recognition during pregnancy). [12] Presence of essential arterial hypertension, gestational arterial hypertension, and/or pre-eclampsia were determined according to the criteria of the seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. [13]

Post RYGB variable of T2DM remission was defined according to ADA's consensus criteria from 2009 [14] Partial remission is hemoglobin A1c (HbA1c) lower than 6.5% and fasting glucose between 100 and 125mg/dl [5.6–6.9 mmol/l] for one year and in absence of active pharmacological therapy or ongoing procedures. Complete remission is a return to "normal" measures of glucose metabolism (A1C in the normal range, fasting glucose <100 mg/dl [5.6 mmol/l]) for one year and in absence of active pharmacologic therapy or ongoing procedures Prolonged remission is defined as complete remission that lasts more than five years. [14]

The time between the surgical intervention and the beginning of the pregnancy was



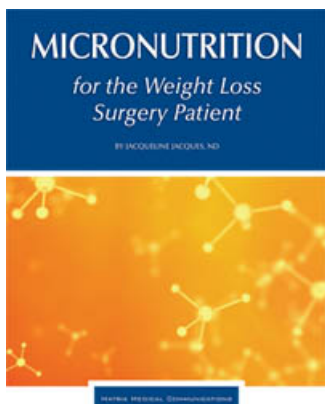
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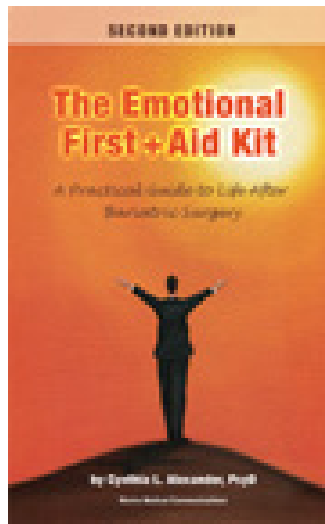
documented. Other variables included the following: BMI at the beginning of pregnancy, weight gain during pregnancy (kg), term week calculated by date of last menstrual period (LMP) and ultrasound, weight of the newborn (kg), macrosomia (newborns of more than 4kg of weight), vaginal delivery or cesarean section, and fetal deaths. Surgery-related complications during pregnancy were also studied.

Oral glucose tolerance tests were not used to diagnose post surgery T2DM. RYGB produces an alteration in intestinal transit and absorption; therefore, the results of an oral glucose tolerance test in this population do not permit for an accurate diagnosis of T2DM.[15] Moreover, there are reports in the literature about reactive hypoglycemia and dumping during the oral tolerance glucose test performed after a RYGB.[16] Since there were no internationally accepted guidelines for the diagnosis of GDM in this specific patient population, the study subjects were followed with plasma glucose and fructosamine testing every two months. A cut off plasma glucose value of 100mg/dl or higher was considered for diagnosis. In patients diagnosed with gestational diabetes, fructosamine was considered an indicator of the degree of metabolic control. In women with a past history of T2DM who were in remission after RYGB, at-home self-monitoring was also indicated. The self-monitoring had to be performed during fasting and two hours after breakfast, criterion adapted from the diagnostics algorithm of diabetes and pregnancy of Sociadad Argentina de Diabetes (SAD), Argentina's diabetes society.[17]

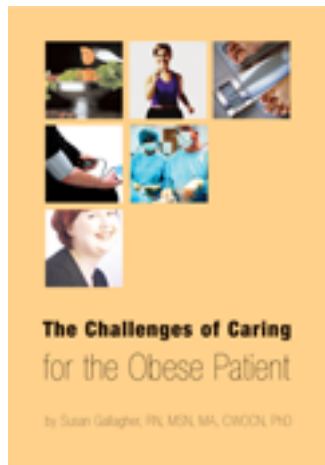
Statistical analysis. Qualitative data were expressed as percentages; quantitative data, mean \pm standard deviation. Ninety-five percent confidence intervals for proportions were calculated following the exact binomial method. Differences between two groups of quantitative data were assessed by the Student's t test. Differences between qualitative data were assessed using the Chi-squared test (Yates corrected) or McNemar technique (The McNemar test was used to test the difference between paired proportions). The p values below 0.05 were considered statistically significant.

Results. From the 351 patients that got pregnant since 2008 to November 2014, 256 met criteria for our study. Of the 256 patients, 125 had had a pregnancy prior to undergoing RYGB. Patients between 20 and 44 years old (33.0 ± 4.6) were included. The average pre-

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surgery weight was 118.5kg (range: 81–188kg) and the average BMI was 44.9kg/m² (range: 35–71kg/m²). It was noted that 7.8 percent of the women had a past history of infertility, 12.1 percent had a history of T2DM, and a 12.5 percent essential arterial hypertension ([Table 1](#)).

Prior to RYGB, 31 of the 256 women studied had a history of T2DM (12%). After the RYGB, 93.5 percent had T2DM remission.

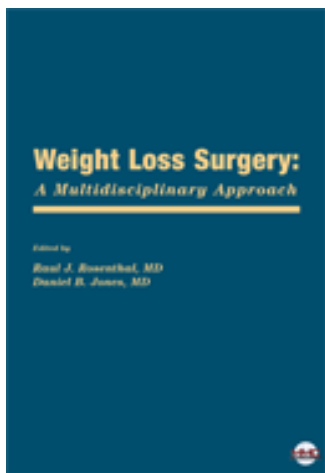
On average, pregnancies occurred 17.7 months after the surgery (range: 1–120 months). At the beginning of pregnancy, women had had an average BMI of 29.53kg/m² (range: 20–67kg/m²). During the pregnancies, the mean weight gain was 7.66kg (range: -38kg–40kg). Women who became pregnant within six months postoperatively were marked as showing a decrease in weight during the pregnancy as they were still experiencing weight loss from the surgery. The average term week was 38 (range: 21–41 weeks).

The women were followed after giving birth. The average weight of the newborns was 3.65kg (range: 0.43–4.2kg). Newborns over 4.0kg were considered macrosomial. Two newborns showed malformations: one with Down's Syndrome and another one with foot malformity. Eight babies exhibited macrosomia (3.1%).

The birth method was also evaluated. Results showed a great number of cesarean sections, 150 (58.6%) and 47 vaginal births (18.4%). There were 59 spontaneous abortions and/or fetal deaths (17%). Two patients experienced RYGB-related complications that required surgical interventions (one internal herniation at week 12 of the pregnancy and one cholecystectomy due to cholelithiasis). During the postnatal period, only one internal herniation was recorded (12 days after the cesarean section). No maternal deaths were recorded ([Table 2](#)).

We also compared the complications from pregnancies before RYGB (n=125) to those experienced in the same women after RYGB. Thirteen of these women reported GDM during pregnancy prior to RYGB, and two also experienced it in pregnancy after RYGB (10.4% vs 1.6%). There was also a lower incidence of gestation related hypertension

Multidisciplinary Approach



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(28.8% vs. 16.8%), and a lower incidence of pre-eclampsia (11.2% vs. 5.6%) [Table 3].

Discussion

This observational, retrospective study examined women that underwent surgery and were cared for by our multidisciplinary surgical team at OCMI. Of 256 patients included, 125 had had a pregnancy previous to undergoing RYGB. Thirty one women had T2DM (12.1%). After RYGB, 29 women (93.5 percent) showed a clear remission of the disease. It is important to note that the study participants were young with just a few years duration of T2DM, a factor that should be considered when examining remission of the disease. Though, studies have shown significant T2DM improvement or remission in older subjects.

For instance, the Swedish Obese Subjects (SOS)[18] study demonstrated a clear and steady weight loss effect with a remission of T2DM in patients with severe obesity (mean BMI 41kg/m²) with a mean age of 48 years. Subjects were followed up at 2 (n=4047) and 10 (n=1703) years post bariatric surgery (banding, vertical banded gastroplasty, or gastric bypass). From the total patients with T2DM, 72 percent presented remission of the disease and 36 percent persisted in such state at 10-year follow up.[18,19]

Another study, Surgical Treatment and Medications Potentially Eradicate Diabetes Efficiently (STAMPEDE),[20] evaluated the efficacy of intensive medical therapy alone versus medical therapy plus RYGB or sleeve gastrectomy in patients with a mean age of 49. The target glycated hemoglobin level of 6.0% or less at 12 months occurred in 12 percent of patients in the medical-therapy group, as compared with 42 percent and 37 percent in the bypass and sleeve-gastrectomy groups, respectively.

In our study, pregnancies on average occurred 18 months after the surgery. The most frequent recommendation in this patient population is to wait at least 12 months after weight loss surgery when weight loss from the surgery typically plateaus and weight is more stable. Our subjects and outcomes are similar to those of a recent study by González et al,[21] who evaluated maternal and perinatal outcomes after bariatric surgery (vertical-banded gastroplasty, sleeve gastrectomy, and gastric banding, RYGB, and biliopancreatic diversion). The mean BMI at the beginning of the pregnancies was of

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29.5kg/m² in our subjects and 30.4 to 34.6 in the study by González et al.

It is important to note that among the the women in our study that got pregnant within the first 12 months following RYGB and had a history of infertility prior (7.8%) reported during the clinical interview that they did not use contraceptive methods because they did not think they could reverse infertility by “just losing weight.”

There is evidence in the literature that supports the connection between obesity and infertility. The relative risk of infertility has been documented as high as 3.1 in patients with a BMI over 27kg/m².^[22] Weight reduction has been shown to restore hormonal imbalance and increase fertility in women with overweight and obesity.^[9]

In a retrospective study that examined answers to patient surveys, Teitelman et al^[10] found a pre-surgery anovulatory rate of approximately 50 percent in women that underwent a weight loss surgical procedure, with a recovery of the normal menstrual cycle in 71. 4 percent, demonstrating a positive correlation between the weight loss and the reestablishment of the normal ovulatory cycle. Therefore, weight loss surgery may improve fertility by helping to restore menstrual regularity.

The majority of patients in the study adhered to a nutritional program. The average weight gain during pregnancy was 7.66 kg. It is important to note that one patient who gained the maximum amount of weight during pregnancy (40kg) did not adhere to the indicated nutritional program.

The average term was at 38 weeks, and babies weighed an average of 3.065kg. There were eight (3.1%) macrosomic newborns. These results mirror similar studies in this patient population.

A study carried out by Patel et al showed a significant decrease in the median weight at birth and the incidence of macrosomia after a RYGB in comparison to severely obese patients.^[23]

Additionally, Weintraub et al[24] found a significant reduction in the incidence of macrosomia in the women that gave birth after the weight loss surgery in comparison to those who gave birth before the surgery (3.2% versus a 7.6%; $p= 0.004$).

We further analyzed the women that had macrosomic newborns and found that two of them experienced T2DM remission after RYGB in the period of time before or during pregnancy. One of these women had hypertriglyceridemia that did not require treatment with medication. None of the women that had macrosomic newborns had GDM. In this sub-group, average BMI at which pregnancies were initiated was 31kg/m² (range: 26–41kg/m²), meaning that they had overweight and/or obesity, both factors that are predictive of macrosomy. Also, their average weight gain during pregnancy was 12.5kg (9–22kg), a factor that further increased their BMI.

Of the 256 women we studied, 58.6 percent gave birth via cesarean sections (due to obstetric decisions) and 18.4 percent had vaginal births. The strikingly elevated number of cesarean sections was studied case by case. We found that that these women and/or the obstetrician chose cesarean section due to preference and/or complications experienced, including cord circulation and labor without dilation.

We identified 59 fetal deaths; which represented 23 percent of pregnancies. This matches articles in the literature that reported a prevalence of fetal death between 24 to 30 percent in natural pregnancies occurring after weight loss surgery.

Two women experienced surgery-related complications. One was an internal herniation at Week 12 of pregnancy, and the other was a cholelithiasis that lead to a laparoscopic cholecystectomy. Accurately diagnosing these complications was difficult because symptoms like epigastric pain, nausea, and vomiting are all common during pregnancy. Both cases were resolved surgically and without further complications.

Other symptoms experienced during pregnancy, such as increased intra-abdominal pressure, displacement of organs due to a gravid uterus, and a predisposition to vomiting, can cause complications. Maggard et al[6] conducted a systematic review of the literature

and described 20 out of 75 cases of complications that required surgical intervention during pregnancy after a weight loss surgical procedure. These reports included 14 bowel obstructions, one gastric ulcer, four events involving the band, and one case of stenosis. Of these cases, there were three maternal deaths and five neonatal deaths. This information highlights the importance of follow up in patients who become pregnant after undergoing weight loss surgery. Additionally, we feel that follow up should be done by the multidisciplinary team at the same center that performed the surgery. There were no maternal deaths in our sample.

When comparing the complications of the pregnancies that occurred before RYGB to those after RYGB, we found a lower incidence of GDM (10.4% vs 1.6%), gestational hypertension (28.8% vs 16.8%) and pre-eclampsia (11.6% vs 5.6%). According to the American Diabetes Association, approximately seven percent of all pregnancies are complicated by GDM.[25,26]

This is important data to take into account because maternal obesity has been shown to be connected to a higher probability of childhood obesity and T2DM during adolescence. Also, 45 percent of women who have overweight or obesity during a pregnancy and GDM have recurrence in the following pregnancy, and 63 percent have a higher risk of developing T2DM.[27] In a nationwide cohort study conducted in Sweden, Johansson et al[28] showed that a history of bariatric surgery was associated with reduced risks of GDM.

Other important findings of our study included the following: reduction of the incidence of gestational arterial hypertension (8.3%), pre-eclampsia (2.7%), and hypertension. Hypertension complicates 5 to 15 percent of pregnancies and affects both the mother and the child. It continues to be the greatest cause of maternal and perinatal morbidity.[13] Weight loss after bariatric surgery improves the maternal and perinatal comorbidities through the reduction of the obstetric risk related to obesity, GDM, and gestational arterial hypertension.[29,30]

Bennett et al[31] conducted a cohort retrospective study of insurance claims in the United

States. They found that among 585 women that underwent bariatric surgery, those that that gave birth after the procedure (n=269) had substantially lower rates of pre-eclampsia and eclampsia (odds ratio: 0.20; CI 95% 0.09–0.44), hypertension (odds ratio: 0.39; 0.20–0.74) and gestational hypertension (odds ratio: 0.16; 0.07–0.37), even after adjusting for age, multiple pregnancy, surgical procedure and pre-existing diabetes.

Similarly, in a large retrospective study of all women between 1988 and 2006 with bariatric surgery in Israel, Weintraub et al[24] found a significant reduction in the rates of gestational diabetes (17.3% versus 11.0%; $P=0.009$) and gestational hypertension (23.6% versus 11.2%; $P=0.001$). These results were obtained after analyzing 301 registers before and 507 after the surgery. In the same manner, Wittgrove et al,[32] in a retrospective study of pregnancies after RYGB, found a decrease in the rates of GDM and gestational arterial hypertension.

Conclusion

In our study, we observed improvement and/or remission of T2DM in this population, as well as a reduction in the incidence of GDM, gestational arterial hypertension, and pre-eclampsia.

The previously presented evidence highly suggests that patients that undergo bariatric surgery have less risk of maternal complications related to these conditions. In addition, research shows that weight loss can reduce the risk of fetal macrosomia.

Follow up after surgery is integral, and is especially important for women of childbearing age. The multidisciplinary care team should monitor this patient population to ensure adequate nutrition and to quickly identify complications related surgery. More education and research on the special considerations in this patient population can potentially improve pre- and post-natal care of the patient and result in better outcomes for the mother and child.

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