

ASSESSMENT OF FETAL WELL-BEING AND PERINATAL OUTCOME IN PREGNANCIES AFTER ROUX-EN-Y GASTRIC BYPASS

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ABSTRACT

OBJECTIVE. To evaluate fetal well-being in pregnancies after Roux-en-Y gastric bypass analyzing maternal complications and perinatal outcomes.

METHODS. From July 2001 to September 2009, we retrospectively analyzed the medical records of women who got pregnant after undergoing Roux-en-Y gastric bypass. Patients received prenatal care and gave birth at the Hospital das Clínicas, School of Medicine, Universidade de São Paulo. We analyzed the fetal well-being tests (cardiotocography, fetal biophysical profile, and umbilical artery Doppler velocimetry) performed in the last week before delivery. Maternal variables investigated were: demographics, maternal complications, type of delivery, peripartum and postpartum complications, maternal red blood cell counts, and perinatal outcomes.

RESULTS. Thirty pregnancies after Roux-en-Y gastric bypass were identified and 24 of them had fetal well-being assessed. All patients had normal results on cardiotocography, fetal biophysical profile, and umbilical artery Doppler velocimetry. There was one case of oligohydramnios. The main complication was maternal anemia (Hb < 11.0 g/dL, 86.7%). Twenty-one patients had cesarean section (70%). Delivery-related complications included one case of adherence, one of hematoma and uterine wall infection, and one of postpartum hysterectomy because of uterine fibroids and atony. The rate of small for gestational age infants was 23.3%.

Conclusion. There was no impairment of fetal well-being in pregnancies after Roux-en-Y gastric bypass. The main maternal complication was anemia and these patients need specific nutritional counseling including broad assessment of micronutrient deficiencies since the early stages of pregnancy.

KEY WORDS: Pregnancy. Anemia. Cesarean section. Fetus. Gastric bypass.

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Incidence and prevalence of morbid obesity have increased and bariatric surgery has emerged as a treatment option for this disease. Amongst patients who undergo bariatric surgery, many are women of childbearing age and, after surgery, there is significant improvement in fertility, with normal hormone levels and menstrual cycles, which promotes the occurrence of pregnancy.¹ The benefits of bariatric surgery consist of reduction in body weight and mitigation of risks related to associated comorbidities. However, there are major drawbacks caused by the nutritional deficits that are triggered by malabsorption of nutrients induced by the gastric bypass.

Pregnancy in obese women is associated with higher rates of maternal and perinatal complications as compared to pregnancies in women with normal body mass index (BMI). There is increased incidence of diabetes, hypertension, cesarean delivery, fetal macrosomia, and anesthetic complications.²⁻⁵ Nevertheless, studies involving pregnant women who underwent previous bariatric surgery have not demonstrated a significant impact on perinatal outcomes.⁶⁻⁹

On the other hand, regarding the effects on the maternal compartment in patients with morbid obesity, most studies have reported encouraging results after bariatric surgery. Some

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studies have shown reduction in the incidence of gestational diabetes, gestational hypertension, and preeclampsia.¹⁰⁻¹² Therefore, in this group of patients, the rate of pregnancy complications, both maternal and fetal, seems to be reduced after surgery compared with non-operated morbidly obese women.

Although there is a decrease in the occurrence of obesity-related comorbidities, different opinions published in the literature reveal the continuing concerns over safety regarding maternal and fetal health in pregnancy after gastric bypass. As a result, it is recommended that nutritional and maternal weight gain monitoring should be included in prenatal care during the course of pregnancy. For the implementation of special care for these cases, obstetricians should be aware that the information provided by research on this topic refers to different types of bariatric surgeries and the consequences in terms of malabsorption of micronutrients also vary.

In the present study, we present the effects of Roux-en-Y gastric bypass on the prenatal period of pregnancies. The objective of the present study is to analyze the results of the assessment of fetal well-being of these pregnancies and to analyze clinical maternal complications and perinatal results.

METHODS

The present study was carried out in a tertiary university hospital that offers health care to high-risk pregnant women. The subjects included in this study were women with previous bariatric surgery, specifically Roux-en-Y gastric bypass. All patients were followed up by the team of the Division of Nutrition and Diet and the Group of Nutrition Studies and received prenatal care at the outpatient clinic of the obstetrics department from July 2001 to September 2009. This is a retrospective and descriptive study. The research project was approved by the Research Ethics Committee of the institution (process no. 008/06).

Inclusion criteria were: pregnant women with a history of Roux-en-Y gastric bypass; singleton pregnancy; prenatal care and delivery at the hospital; and normal fetus on morphological ultrasound.

The patients were selected and the data collected included information obtained from medical records and birth records filed in the Medical Archives Division of the hospital, as well as information obtained from the computerized database of the department.

The patients were followed up by the Group of Nutrition Studies. This follow-up included anthropometric assessment (weight, height and BMI). The goal of the nutritional counseling was to achieve 15 to 25 kcal/kg/day¹³ to reach gestational weight gain of 7-11 kg, as recommended for overweight pregnant women (BMI from 26.1 to 29.0 kg/m²) by the Institute of Medicine.¹⁴ The patients were instructed to eat small meals,

cutting all foods into small pieces, especially meats, fruits, and vegetables. The patients were instructed to keep constant low fat intake (< 30% of total energy), especially saturated fat, and to avoid high-calorie foods and sweets, such as snacks, fried foods, chocolate, ice cream, cookies, and sugary drinks. The patients received a prophylactic or therapeutic intake of vitamin supplementation (iron and folic acid) during the prenatal period, when needed.

We evaluated 30 pregnancies after Roux-en-Y gastric bypass and the data related to the characteristics of the population are shown in Table 1.

Fetal well-being was assessed by antepartum cardiotocography, fetal biophysical profile (FBP), and umbilical artery Doppler velocimetry. The tests were performed in the same period the patients had prenatal care visits during the third quarter of pregnancy. In the present study, we analyzed the results of the last evaluation carried out up to seven days before delivery. Using ultrasound, we assessed the parameters of FBP (tone, fetal body movements, fetal breathing movements, and amniotic fluid volume). The ultrasound equipment used was a Toshiba model SSA-220A® and a Philips® model Envisor; and the cardiotocography equipment was Hewlett Packard®. The results obtained using cardiotocography were classified according to the protocol of the hospital, which includes the definition of normal active fetus when the tracing shows at least two transient accelerations with an amplitude range of 15 bpm within 30 minutes of tracing, fetal heart rate (FHR) baseline between 110 and 160 bpm, variability above 5 bpm, and no decelerations. Fetuses with abnormal cardiotocography tracings were classified as hypoactive fetus and inactive fetus. Amniotic fluid volume was assessed using the amniotic fluid index (AFI). Its values were classified as normal when greater than 5.0 cm. Umbilical artery Doppler velocimetry was performed with insonation of the umbilical cord segment near the placental insertion and without fetal breathing and body movements. At least three sonograms containing at least five uniform waves was considered satisfactory. The A/B indexes (systolic/diastolic ratio) and pulsatility index (PI) were calculated. The values obtained were compared to normal values for this vessel.¹⁵

We investigated the following variables: maternal morbidity (anemia - Hb < 11.0 mg/dL, need for blood transfusion, mode of delivery, birth complications, postpartum infection), perinatal outcomes (Apgar scores at birth, infant's birthweight, gestational age, fetal growth), and the following demographic variables: maternal age, parity, prepregnancy BMI, weight gain during pregnancy, and clinical complications in the current pregnancy.

Gestational age was estimated based on the last menstruation date (LMD), when confirmed by the gestational age estimated by the ultrasound performed at most until 20 weeks

of gestation. In cases where there was no agreement, gestational age was calculated according to the data of the first ultrasound. The weight of the newborn in grams measured at the delivery room was compared to the normal values provided by Alexander et al.;¹⁶ therefore, those with weight lower than the 10th percentile of the related range were classified as small for gestational age.

Data were analyzed using the program Statistica for Windows (version 4.3, Statsoft, Inc., 1993). Variables were analyzed descriptively, calculating absolute and relative frequencies. For quantitative variables, this analysis was performed using minimum and maximum values, calculating means and standard deviations.

RESULTS

A total of 30 pregnancies after Roux-en-Y gastric bypass were included in the present study. Of this sample, 24 patients had tests performed up to one week before delivery.

Maternal variables are shown in Table 1. With regard to maternal morbidity, anemia was the most frequent disease and it affected 86.7% of the pregnant women in our sample. All patients received oral iron supplementation or replacement. Three women needed intravenous iron replacement (two of them before childbirth and one after childbirth) and one woman needed blood transfusion to treat anemia.

Results of the assessment of fetal well-being are shown in Table 2. Cardiotocography showed normal results on all tests, the same was true for fetal biophysical profile. One case had a diagnosis of oligohydramnios with AFI lower than 5.0 cm. Umbilical artery Doppler velocimetry showed normal results in all cases.

In terms of delivery, we found that most were cesarean sections ($n = 21$), as shown in Table 3. The indications for cesarean section included: functional dystocia (5 cases - 23.8%), previous cesarean delivery with contraindication to induction of labor (4 cases - 19.1%), previous cesarean section (3 cases - 14.3%), suspected fetal macrosomia (3 cases - 14.3%), intrapartum fetal distress (3 cases - 14.3%), uterine fibroids (2 cases - 9.5%), and fetal growth restriction (1 case - 4.8%). Three cases had cesarean section complications: one patient had adhesions that interfered with the surgery; one patient progressed with a hematoma and surgical wound infection, undergoing drainage and antibiotic therapy with positive outcome; and one patient required a postpartum hysterectomy because of uterine fibroids and atony. The proportion of small for gestational age infants was 23.3%.

DISCUSSION

Surgical treatment of morbid obesity is a booming procedure nowadays. The objective of bariatric surgery is to reduce caloric intake in order to cause a permanent reduction in

the individual's body weight. However, Roux-en-Y gastric bypass may lead to specific nutritional deficiencies because it is a restrictive and malabsorptive surgery. Despite routine measures, such as iron therapeutic supplementation and replacement, there is high prevalence of anemia in these cases during pregnancy.¹⁷ Intolerance to certain foods, particularly red meat, is not uncommon among patients who underwent a bariatric surgery. As a result, there is low intake of iron in the maternal diet, causing a substantial reduction in the supply of heme iron.¹⁸ Furthermore, the restriction of gastric capacity hinders the production of gastric juice, which is necessary for digestion and release of iron from protein foods. This produces impaired oxidation of nonheme iron, which causes difficulties in the transition from ferric iron into ferrous iron, reducing the absorption of iron by enterocytes. Thus, as observed in the present study, iron levels are below normal.

Pregnancy in obese women is associated with increased incidence of complications such as gestational diabetes, gestational hypertension, preeclampsia, fetal macrosomia, prematurity, and higher rates of cesarean sections. The comparison of maternal outcomes between pregnancies before and after bariatric surgery suggests that there is a reduction of maternal complications such as diabetes and hypertension.¹² The same was true for fetal macrosomia. In the present sample, despite the high prepregnancy BMI, gestational diabetes was detected in only one pregnant woman.

The rate of cesarean sections was extremely high in the present study (70%), which can be explained by the fact that the hospital where the study was conducted is a tertiary university hospital with a large number of high-risk pregnancies and a cesarean rate of 57%.¹⁹ This finding corroborates the results of other studies involving pregnant women after bariatric surgery, which associated this type of surgical procedure with increased risk of cesarean section. Patel et al.⁷ found an incidence of 61.5% of cesarean sections in pregnancies after Roux-en-Y gastric bypass, which is similar to the percentage of obese women (46.5%), but significantly higher than that found in the control group of nonobese patients (36.2%). Considering that maternal blood loss is greater in cesarean sections, it is important to emphasize the need for strict control of maternal hemoglobin levels during late pregnancy because of the higher morbidity and mortality rate in cases of anemia.^{20,21}

The present study suggests that fetal well-being is preserved in pregnancies after Roux-en-Y gastric bypass. The acute markers of fetal well-being were normal in all cases (Table 2). Only one case had a diagnosis of oligohydramnios, which was characterized by involvement of the chronic marker of fetal well-being: volume of amniotic fluid. These data cannot be compared with previous studies because there are no studies in the literature presenting data on the assessment of

Table 1 - Characteristics of pregnancies after Roux-en-Y gastric bypass (n= 30)

Characteristics	n (%)	
Mother's age (years), mean (SD)	30.6	(4.4)
Time interval between surgery and conception (months), mean (SD)	35.4	(22.3)
Prepregnancy BMI (kg/m ²), mean (SD)	34.8	(7.0)
Gestational weight gain (kg), mean (SD)	8.4	(7.4)
Nulliparas, n (%)	11	(36.7%)
Anemia (Hb < 11.0 g/dL), n (%)	26	(86.7%)
Ferritin (mg / L), mean (SD) *	16.8	(13.7)
Maternal complications, n (%)		
Hypertension	9	(30.0%)
Premature rupture of membranes	4	(13.3%)
Hypothyroidism	4	(13.3%)
Uterine fibroids	2	(6.7%)
Gestational diabetes	1	(3.3%)

BMI: body mass index, Hb: hemoglobin, SD: standard deviation * there was no data related to 5 patients

Table 2 - Assessment of fetal well-being in pregnancies after Roux-en-Y gastric bypass (n= 24)

Result	n (%)	
Reactive cardiotocography	24	(100%)
Fetal biophysical profile		
10	23	(95.8%)
8	1	(4.2%)
Amniotic fluid index		
≥ 5.0 cm	23	(95.8%)
< 5.0 cm	1	(4.2%)
Amniotic fluid index, mean (SD)	11.7	(3.7)
Umbilical artery Doppler velocimetry		
A/B ratio, mean (SD)	2.50	(0.39)
Pulsatility index, mean (SD)	0.89	(0.15)

SD: standard deviation

Table 3 - Perinatal outcomes in pregnancies after Roux-en-Y gastric bypass (n= 30)

Result	n (%)	
Type of delivery, n (%)		
Cesarean section	21	(70.0%)
Vaginal delivery	9	(30.0%)
GA at delivery (weeks), mean (SD)	38.7	(1.5)
Preterm delivery (< 37 weeks), n (%)	2	(6.7%)
Birthweight (g), mean (SD)	3139.3	(583.3)
Small for gestational age infant, n (%)	7	(23.3%)
Apgar at 1st minute < 7	2	(6.7%)
Apgar at 5th minute < 7	0	(0%)

GA: gestational age, SD: standard deviation

fetal well-being in pregnancies similar to those included in the present sample.

In the present study, although the last assessment of fetal well-being was normal, there was intrapartum fetal distress in three cases. This finding suggests that intrapartum fetal electronic monitoring is important in pregnancies after bariatric surgery for strict monitoring of fetal well-being.

There as 23.3% of small for gestational age newborns in the present sample; this percentage is higher than that reported in other studies. In pregnancies after Roux-en-Y gastric bypass, Patel et al.⁷ found 11.5% of small for gestational age infants, which is a significant higher value than that found in the control group of nonobese patients (0.5%). Nutritional deficiency after this type of bariatric surgery involves the absorption of proteins, iron, vitamin B12, folates, vitamin D, and calcium. Nutritional assessment of the profile of micronutrient intake and nutritional counseling are recommended since the beginning of pregnancy.^{22,23}

Therefore, women who underwent previous bariatric surgery require specific nutritional counseling aimed at correcting the deficits. Maternal hemoglobin levels should be monitored and therapeutic replacement of iron and other minerals and vitamins should be mandatory because this is a relevant measure to promote better red blood cell status for childbirth.

Regarding the fetus, although in the present sample we did not find impairment of fetal well-being during the antepartum period, the occurrence of significant fetal growth restriction (23.3%) suggests the need for strict monitoring of the fetus both in terms of nutrition and oxygenation because the etiology of both aspects can be the same functional disorder.

CONCLUSION

There was no impairment of fetal well-being in pregnancies after Roux-en-Y gastric bypass. The major maternal complication was anemia and this finding suggests that these women need clinical follow-up focused on the evaluation of micronutrient deficiencies throughout the whole pregnancy.

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