OBSTETRICS

Impact of bariatric surgery on fetal growth restriction: experience of a perinatal and bariatric surgery center

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BACKGROUND: Bariatric surgery is known to improve some pregnancy outcomes, but there is concern that it may increase the risk of small for gestational age.

OBJECTIVE: To assess the impact of bariatric surgery on pregnancy outcomes and specifically of the type of bariatric surgery on the risk of fetal growth restriction.

STUDY DESIGN: A single-center retrospective case-control study. The study group comprised all deliveries in women who had undergone bariatric surgery. To investigate the effects of weight loss on pregnancy outcomes, we compared the study group with a control group matched for presurgery body mass index. Secondly, to assess the specific impact of the type of surgery on the incidence of fetal growth restriction in utero, we distinguished subgroups with restrictive and malabsorptive bariatric surgery, and compared outcomes for each of these subgroups with a second control group, matched for prepregnancy body mass index.

RESULTS: Among 139 patients operated, 58 had a malabsorptive procedure (gastric bypass) and 81 a purely restrictive procedure (72 a gastric banding and 9 a sleeve gastrectomy). Compared with controls matched for presurgery body mass index, the study group had a decreased rate of gestational diabetes (12% vs 23%, $P = .02$) and large for gestational age >90th percentile (11% vs 22%, $P = .01$) but an increased rate of small for gestational age <10th percentile. The incidence of small for gestational age was higher after gastric bypass (29%) than it was after restrictive surgery (9%) or in controls matched for prepregnancy body mass index (6%) ($P < .01$ between bypass and controls). In multivariable analysis, after adjustment for other risk factors, gastric bypass remained strongly associated with small for gestational age (adjusted odds ratio, 7.16; 95% confidence interval, 2.74–18.72).

CONCLUSION: Malabsorptive bariatric surgery was associated with an increased risk of fetal growth restriction.

Key words: bariatric surgery, fetal growth restriction, gastric banding, gastric bypass, pregnancy, obesity, body mass index

Obesity is a major healthcare problem, and its prevalence is increasing worldwide. In France, according to the 2012 ObEpi survey,[1] 10% of reproductive-age women are obese. During pregnancy, obesity is a cause of maternal, obstetric, and neonatal complications and has long-term consequences on the child. The incidences of gestational diabetes and hypertension/preeclampsia increase, especially for high body mass index (BMI).[2] The risks of cesarean section, postpartum hemorrhage, fetal macrosomia, and shoulder dystocia are increased.[3] The rate of fetal malformations, primarily spina bifida, increases, as well as neonatal morbidity and mortality.[4] In the longer term, the rates of childhood obesity and metabolic syndrome are higher among children born to obese mothers.[5]

EDITORS' CHOICE

Bariatric surgery is currently the reference treatment for severe obesity, allowing for major weight loss and improvements in a number of health outcomes.[6,7] A number of observational studies have reported reductions in the incidence of gestational diabetes and macrosomia in pregnancies after bariatric surgery.[8-11] However, bariatric surgery can lead to complications, in particular intestinal occlusions through various mechanisms, which can have severe consequences during pregnancy.[12,13] Moreover, the fact that bariatric surgery could favor fetal growth restriction is a major concern. A small increase in the rate of small for gestational age (SGA) was found in several studies,[9,10,14,15] although there are conflicting data.[16] In a preliminary study of 24 pregnancies,[17] we found a nonsignificant increased risk of SGA in case of gastric bypass compared to a nonoperated control population and a significant decrease in birthweight after gastric bypass, compared to obese women matched for prepregnancy BMI and normal-weight women. Recently, a large population-based Swedish study[9] confirmed a very significant increase in the incidence of SGA after bariatric surgery compared with matched controls on presurgical BMI. However, neonatal outcomes were not analyzed according to the type of weight loss surgery that was performed.

Indeed, there are 2 main types of bariatric surgery, purely restrictive procedures (gastric banding, sleeve gastrectomy) and malabsorptive or mixed procedures (gastric bypass, biliopancreatic diversion). The choice of type of procedure depends on several factors, particularly the patient's BMI and comorbidities. Mixed techniques have been preferred for many years because of their greater effectiveness on weight loss compared to gastric banding, but they have the disadvantage that they lead to nutritional deficiencies, which could have an impact on fetal development. Thus, one can hypothesize that the

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increased risk of SGA is specifically related to malabsorption. In a previous study comparing pregnancies after gastric bypass and banding,[18] we did not observe any difference in birthweight. Other studies comparing outcomes following gastric banding and gastric bypass also failed to reveal any difference in the incidence of SGA,[14,16,18,19] including a large population-based study.[15] There is as yet no consensus on the type of intervention to favor in a woman with a perspective of pregnancy.

The objectives of our study were to assess the impact of bariatric surgery on pregnancy outcomes and, specifically, to assess the impact of the type of bariatric surgery on the risk of fetal growth restriction.

Materials and Methods

This is a single-center retrospective case-control study. It was performed at Louis Mourier Hospital, in Colombes, France, a university center that includes both a level 3 maternity and a reference center for the treatment of obesity. We included all deliveries in women who had a history of bariatric surgery, whether they had been operated in the same center or elsewhere, between Jan 1, 2004 and Dec 31, 2013. Thirty-six patients were included in previous publications.[17,18,19] In order to avoid recruitment bias, we excluded multiple pregnancies, in utero fetal demises, and miscarriages. This treatment group was called group A.

To investigate the effects of weight loss on pregnancy outcomes, we compared patients in group A with control patients (group B), obese patients who never underwent bariatric surgery matched for BMI (weight [kg]/height [m]^2) before bariatric surgery and who delivered in the institution over the same period.

Secondly, to assess the specific impact of the type of surgery on the incidence of fetal growth restriction, we distinguished restrictive and malabsorptive bariatric surgery, and compared the characteristics and outcomes for each of these subgroups with a control group (group C) matched for prepregnancy BMI who gave birth in the institution over the same period. Prepregnancy BMI was calculated using weight measured at the first prenatal visit before 12 weeks. Matching on prepregnancy BMI was performed in order to test the hypothesis that bariatric surgery could have an impact on fetal growth independently of the actual weight loss obtained following the procedure.

Controls were chosen randomly on the same period of birth (by year) and matched individually on BMI (<25, 25−30, 30−35, 35−40, 41−45, and >45). The other matching factors were, when possible, maternal age (<20, 20−35, and >35), ethnic origin, and parity (nulliparous or parous).

SGA was defined as below the 10th percentile and large for gestational age (LGA) as >90th percentile, using birthweight z-scores calculated with the formulas published by Capmas et al[20] on a similar population in France, adjusting for gestational age and the infant's sex.

The study was approved by the Ethics Committee for Biomedical Research Paris-Nord (Institutional Review Board - IRB 00,006,477) (Study No. 13-044, No. 09-050, November 9, 2009).

The data were collected prospectively in the department's computerized database (DiammG; Micro6, Vandoeuvre-les-Nancy, France), which is approved by the French Computer Watchdog Commission (CNIL). The database is constituted by patient records, which are used for routine patient follow-up, and all of the variables required for the study were recorded prospectively at prenatal visits as part of routine care for all cases and controls. Continuous variables were analyzed by analysis of variance, and categorical variables were compared with chi-square or Fisher exact test. The independent effect of bariatric surgery on SGA or LGA was tested and quantified with a multivariable logistic regression. We adjusted for covariables previously described as risk factors of LGA and SGA and for variables found to be potential confounders in bivariate analyses. Stata 13.0 software (StataCorp, College Station, TX) was used for the statistical analysis.

Results

Between January 2004 and December 2013, 139 patients who underwent bariatric surgery were included in the study. Among them, 58 had a malabsorptive surgery (gastric bypass) and 81 a restrictive one (72 a gastric banding and 9 a sleeve gastrectomy). The mean interval between surgery and delivery was 38 months.

Pregnancy outcomes after bariatric surgery

We compared patients who underwent bariatric surgery (study group A) with the nonoperated obese patients matched for presurgical BMI (control group B). In the study group, the mean BMI before surgery was 45 (kg/m^2), compared with the prepregnancy BMI of 34.1, which was a mean decrease of 11 ± 6.8 and a relative decrease of 24.4%. The absolute mean decrease in weight was 31 kg.

The study group had a greater gestational weight gain, but a lower rate of gestational diabetes, than the nonoperated controls (Table 1).

There was no significant difference between the 2 groups for any of the obstetric and neonatal characteristics studied (Table 1) except for birthweight, which was significantly lower in the study group than in controls (3317 ± 520 g vs 3528 ± 514 g; $P = .001$), with both a lower proportion of LGA and a higher proportion of SGA.

Analysis of pregnancy outcomes according to type of bariatric surgery

We compared the women in group C (matched on prepregnancy BMI) with women in group A, divided into 2 subgroups depending on the type of surgery (restrictive or malabsorptive).[3] Maternal characteristics did not differ significantly between the 3 groups, indicating that the controls were correctly matched with the cases. However, women who had a malabsorptive procedure had a higher BMI before surgery than women who had a purely restrictive procedure (47.9 ± 5.6 kg/m^2 vs 43.4 ± 4.3 kg/m^2, respectively; $P < .001$).

Pregnancy outcomes did not differ significantly between the 3 groups regarding maternal weight gain during pregnancy, complications of pregnancy including gestational diabetes and pregnancy-induced hypertension,