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Pregnancy after laparoscopic gastric banding: Maternal and neonatal outcomes

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ABSTRACT

Introduction: Laparoscopic Adjustable Gastric Banding (LAGB) is a safe and effective treatment for obesity. A strong evidence links weight loss with improved fertility outcomes and reduced gestational complications in subsequent pregnancies. Our aim is to describe the impact of LAGB on maternal and neonatal outcomes.

Methods: Data were collected retrospectively from the database of our University Center for the Multicentric Treatment of Severe Obesity. From January 2006 to December 2011, 438 patients underwent LAGB. Of these, 140 women of reproductive age (18–46 years old) were included in our study. The following parameters were registered during follow-up: number of pregnancies, delivery and miscarriage, time from LAGB to pregnancy, band adjustments, weight gain during pregnancy, gestational and obstetrical complications (gestational diabetes mellitus, hypertensive disorders, prolonged labor), mode of delivery, neonatal birth weight and complications (low birth weight, IUGR, prematurity, macrosomy).

Results: We registered 26 pregnancies with a total of 22 babies born and 4 miscarriages. The mean time from LAGB to pregnancy was 15.8 months. Band adjustments were performed in 100% of patients during the first trimester; the average weight gain at the end of pregnancy was 14.66 kg. None presented gestational or obstetrical complications. One patient presented band slippage, which required surgery, and one patient presented iron-deficiency anemia. 100% of deliveries were by cesarean section. No perinatal complications or malformations were recorded, and the average baby weight was 3027 g.

Conclusion: LAGB is a safe procedure, well tolerated during pregnancy and without negative implications on both the mother and the baby. According to our experience and recent studies, band loosening should be reserved to symptomatic patients to avoid unhealthy weight gain.

1. Introduction

Obesity is a major health problem in western world and it is rapidly increasing. In women of reproductive age, obesity is associated with numerous reproductive sequelae, including anovulation, irregular menses, subfertility, miscarriage. These reproductive sequelae result from the effect of obesity on a number of different steps in the reproductive process, including ovarian follicular recruitment, oocyte development and quality, oocyte fertilization, and embryo development and implantation [1]. There is strong evidence that obese women have a higher risk of pregnancy-related complications such as gestational diabetes, gestational hypertension, macrosomia, higher rate of cesarean section. A weight loss can significantly reduce this risk and bariatric surgery offers an effective treatment of morbid obesity, resulting in long-term weight loss higher than 60% and often with complete resolution of several comorbidities [2,3]. Laparoscopic Adjustable Gastric Banding (LAGB) is the safest, the more effective and the least invasive bariatric procedure. Being more and more performed in women of childbearing age, the number of pregnancies after LAGB is increasing. Our aim was to evaluate the impact of LAGB on pregnancy, maternal and newborn outcomes.

2. Methods

2.1. Patients and data

This retrospective study analyzes the implications for the mother and the newborn in women of childbearing age (18–46

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years) who became pregnant after the positioning of LAGB. Data were collected from the database of our University Center for the Multicentric Treatment of Severe Obesity. All patients were followed regularly and urged to inform us about any intention to become pregnant or of pregnancy. The following parameters were registered during our follow-up: weight recorded at each visit, band adjustments, number of pregnancies after the intervention, delivery and miscarriage, the interval between the intervention and the pregnancy (in months), weight gain during pregnancy, gestational and obstetrical complications (gestational diabetes mellitus, hypertensive disorders, prolonged labor), mode of delivery, neonatal birth weight and neonatal complications (low birth weight, IUGR, prematurity, macrosomy, perinatal mortality). For any missing data points, patients were interviewed by direct phone contact.

According to our protocol for the management of pregnancies after LAGB, the band is deflated at the beginning of their pregnancies.

3. LAGB: surgical technique

Elastic compression of the lower limbs is applied throughout the intervention and the patient is positioned in a 15–30° reverse Trendelenburg position. Pneumoperitoneum is achieved using a Veress needle placed in the left hypochondrium. Two 10–12 mm trocars and two 5 mm trocars are placed. The operation starts with the section of the gastrophrenic ligament and continues with the opening of the pars flaccida of the small omentum. The fat on the posterior wall of the lesser sac is retracted to expose the right crus of the diaphragm, then a grasper is passed into the opening and moved along the right crus to create a tunnel. A lap band placer is then inserted in this path to appear on the greater curvature of the stomach at the site of prior dissection of the angle of His. The band is drawn along this pathway and then closed.

4. Results

From January 2006 to December 2011, a total of 438 LAGB were performed at our University Center. Of these, 140 were performed on women of childbearing age (18–46 years old). 32 women had recorded pregnancies during this time period. We considered in this study only the singleton pregnancies and only the first pregnancy after banding. Demographics and maternal data are listed in Table 1. We excluded from the study 6 patients who recorded pregnancy after gastric banding removal. We considered for the study 26 women who recorded one pregnancy after LAGB, with a total of 22 babies born and 4 miscarriages. The pregnancies were registered after a mean time period of 15.8 months (range 1–48) from the banding at an average age of 31.3 years old (range 21–41). The average body mass index (BMI) preoperatively was 42.34 kg/m^2 with an average weight of 111.6 kg (range 87–187 kg). The average BMI at the beginning of pregnancy was 33.65 kg/m^2 and at the end of pregnancy of 39.67 kg/m^2. Band adjustments were performed in 100% of patients during the first trimester of pregnancy: the band was fully deflated in order to completely abolish the gastric restriction. The average weight gain during pregnancy was 14.66 kg. None presented gestational complications, although 4 patients had a history of gestational diabetes mellitus and hypertension with the previous pregnancies. One patient presented band slippage during the first trimester which required operative intervention, with no deleterious effect on the fetus. One patient presented iron-deficiency anemia during pregnancy, which was promptly treated and caused no complications for the mother and the fetus. 100% of deliveries ($n = 22$) were by cesarean section. In 36% of cases ($n = 8$) the reason of the cesarean delivery was prior cesarean section, but the 63% of cases ($n = 14$) were primiparous women. Average baby weight was 3027 gr (range 1100–3650 gr.). No perinatal complications or malformations were recorded. In 95.4% of cases ($n = 21$) babies were born at term (from the 37th to the 42nd gestational week). In one case, a delivery at the 30th week was necessary due to an impaired umbilical artery flow, detected at Doppler velocimetry. The baby, whose weight was 1100 gr, was admitted at the Neonatal Intensive Care Unit and dismissed after 4 weeks without complications or sequaele. We reported 4 miscarriages in the first trimester of pregnancy. In one case, a thrombophilia was diagnosed after the miscarriage. We could not identify any evident reason of miscarriage for the other three patients (Table 2).

Table 1
Maternal data.

	Mean (±SD)	Range
Age (years)	31.3 (±6.77)	21–41
Pre-LAGB BMI (kg/m^2)	42.64 (±5.23)	37.2–49.8
Pre-LAGB weight (kg)	111.6 (±14.35)	87–147.7
Time from LAGB to conception (months)	15.8 (±8.6)	12–38
Pre-pregnancy BMI (kg/m2)	33.65 (±6.82)	27.6–42.3
Pre-pregnancy weight (kg)	85.6 (±9.93)	70–112.4
Pre-delivery BMI (kg/m^2)	39.67 (±5.1)	32.4–46.5
Pregnancy weight gain (kg)	14.66 (±8.2)	7–29.6

5. Discussion

The impact of obesity has been significant on western world population, affecting also fertility outcomes. Bariatric surgery is an effective tool in achieving a successful weight loss in morbidly obese patients, subsequently improving fertility outcomes. More and more women undergo bariatric surgery and numerous pregnancies are registered after surgery, with positive outcomes [4]. Women who are obese at the beginning of a pregnancy have a higher risk of developing gestational diabetes, hypertensive disorders, thromboembolism, and cesarean section. The risk of developing gestational diabetes in a non-obese woman is approximately 1–3% vs 17% in women who are obese before pregnancy. This leads to a higher risk of fetal macrosomia and subsequently of shoulder dystocia [5]. For this reason, it is preferred a weight loss before pregnancy in obese women. In our experience, apart from one case of iron-deficiency anemia successfully treated, we did not observe gestational complications, although four patients had a positive history for gestational diabetes and hypertensive disorders with other pregnancies prior to LAGB. In one patient was registered a band slippage which required a surgical intervention during pregnancy. Band Slippage is described in 3–5% of patients with gastric banding [6,7]. One of the main factors that contribute to band slippage during pregnancy is the increased intra-abdominal pressure and frequent vomiting, for this reason patients with

Table 2
Neonatal outcomes.

Total number of pregnancies after LAGB (n)	26
Total number of pregnancies carried to parturition (n)	22
Total number of babies born (n)	22
Female	63.3%
Male	36.7%
Miscarriages (n)	4
Cesarean section rate	100%
Average birth weight (g)	3027
Pre-term delivery (<37 weeks gestation)	4.5% (1/22)
Low birth weight (<2500 g)	4.5% (1/22)

LAGB should be counseled about the increased risk of band slippage during pregnancy.

The average interval between surgery and pregnancy was 15.8 months. We consider it as an acceptable period, given that it is generally recommended to wait at least 12–18 months after LAGB to become pregnant in order to allow an acceptable weight loss. Several studies have reported a significant weight loss within 2 years after LAGB, followed by a period of stable weight, thus suggesting that pregnancies in this period of stable weight are safer [6,8].

Our data showed an average weight gain of 14.66 kg, higher than the Institute of Medicine (IOM) criteria would recommend (5.9 kg in BMI > 30 kg/m^2) (Table 3). This can be explained with the band loosening systematically performed in our patients because of the fear of nutritional deficiencies during pregnancy. Carelli et al. showed that patients who had not their band deflated recorded an average weight gain of 10.6 kg, compared to patients whose band was fully loosened that had an average weight gain of 14.1 kg [9]. No effect on the newborn was reported in women who did not receive a band adjustment. Several studies report better weight outcomes by avoiding band deflation in asymptomatic patients, choosing to adjust the band only in case of referred nausea, vomiting or gastroesophageal reflux. According to these results, we decided to change our protocol regarding band adjustments and perform a band loosening only in symptomatic patients.

Cesarean section was performed in 100% of pregnancies. In 36.6% of cases this is due to a cesarean section for other pregnancies, prior to LAGB. However, in all the other patients, there is no evident reason to explain this extremely high rate. Obesity can affect the risk of cesarean delivery by increasing the risk of pregnancy-related complications, in particular gestational diabetes [10,11]. Some studies suggested that obesity increases the risk of cesarean section because it increases maternal pelvic soft tissue which narrows the diameters of the birth canal and increases the risks associated with dystocia, a macrosomic infant, or cephalopelvic disproportion [12–17]. However, data in literature reported that Gastric Banding and bariatric procedures in general are not an indication to prefer this delivery: Sheiner also described a high cesarean section rate, not correlated to bariatric surgery [18]. In our experience, no gestational complications were identified to justify the cesarean section, therefore, these surprising results should be analyzed on the basis of the increasing tendency in our country to prefer this kind of delivery. We believe that there is still poor information in our country about the outcomes of bariatric surgery on pregnancy, and this can influence the process in obstetrical decision making. However, such a high cesarean section rate would require a separate study with analysis of peripartum records. One of the main concerns in pregnancies after bariatric surgery is the risk of micronutrient deficiencies which may affect both fetal and placental growth [19]. Several studies have reported high rates of low birth weight (LBW) and small-for-gestational age babies born from women with history of bariatric surgery [20]. However these data are related to malabsorbitive procedures, and is not the case of our experience which considers only pregnancies after LAGB. Our results showed positive perinatal outcomes, in terms of birth weight and neonatal health, although further studies including the Apgar score would be more exhaustive.

Several hypothesis have been proposed to explain the increased miscarriage rate observed in obese women [21,22]. The low levels of progesterone caused by insulin-resistance might inhibit the normal functions of the corpus luteum, or obesity could damage the endometrial receptivity to the implantation of the embryo and its growth [23]. Morceau reported that the miscarriage rate of approximately 20–30% in the general population [24]. In our study the miscarriage rate is 15.38% ($n = 4$), significantly less than the average, suggesting that LAGB does not increase the miscarriage rate. An important limitation to this study is that it is retrospective and relies on maternal self-report for some data, especially for data about the neonatal outcomes. Further research with matched non-LAGB control pregnancies is necessary to provide data for comparison.

Table 3
Institute of medicine recommendations for gestational weight gain.

Pre-pregnancy BMI	Total weight gain (kg)
Underweight (<18.5 kg/m^2)	12.5–18.0
Normal weight (18.5–24.9 kg/m^2)	11.5–16.0
Overweight (25.0–29.9 kg/m^2)	7.0–11.5
Obese (>30.0 kg/m^2)	5.0–9.0

6. Conclusion

Obesity is a growing problem and the number of women in childbearing age after bariatric surgery is increasing. On the basis of our results, we can conclude that LAGB is a safe procedure in women of reproductive age, is tolerated during pregnancy and has no negative implications on the fetus. We realized through these results that the band loosening or complete deflation should be avoided if the patient is asymptomatic in order to avoid unhealthy weight gain.

Ethical approval

Ethical approval was requested and obtained from the "Azienda Universitaria Federico II" ethical committee.

Conflicts of interest

All Authors have no conflict of interests.

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Author contribution

Vincenzo Pilone: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data; also participated substantially in the drafting and editing of the manuscript.

Ariola Hasani: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data; also partecipated substantially in the drafting and editing of the manuscript.

Rosa Di Micco: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data.

Antonio Vitiello: Participated substantially in conception, design, and execution of the study.

Angela Monda: Participated substantially in execution of the study and in the analysis and interpretation of data.

Giuliano Izzo: Participated substantially in execution of the study and in the analysis and interpretation of data.

Leucio Iacobelli: Participated substantially in execution of the study and in the analysis and interpretation of data.

Elisabetta Villamaina: Partecipated substantially in execution of the study and in the analysis and interpretation of data.

Pietro Forestieri: Partecipated substantially in the drafting and editing of the manuscript.

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