Reproductive Implications of Bariatric Surgery: Pre- and Postoperative Considerations for Extremely Obese Women of Childbearing Age

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Extreme obesity remains a frustrating and formidable disease, with most sufferers requiring surgical intervention in order to achieve long-term, sustained weight loss. Most bariatric procedures today are performed on women, many of whom are of reproductive age; yet minimal evidence exists to guide clinicians in the care of such women before, during, and after pregnancy. This review outlines the fundamental nutritional and surgical alterations of the most commonly performed bariatric procedures with the aim to elucidate a physiologically sound approach to counseling and management of extremely obese women of childbearing age who are either contemplating or have already undergone bariatric surgery. Preconception, pregnancy, and lactation guidelines are offered based on available evidence. Outstanding questions are highlighted for further investigation.

Introduction

Over the past several decades, there has been a continual increase in average weight and body mass index (BMI) in most countries throughout the world. In the United States, not only are people getting heavier, the percentage of those who are more than 100 lb overweight has increased by 50% from 2000 to 2005, a rate twice as fast as less obese individuals [1]. Thus, as the population gets heavier, the percentage of people who suffer extreme obesity increases disproportionately. This trend extends to the obstetric population, wherein approximately 6% of women enter pregnancy with a BMI greater than 35 [2,3].

Obesity itself has a well-established adverse impact on both life expectancy and quality of life. As BMI increases, the ill health effects of obesity become exacerbated and cumulative. Comorbidities of extreme obesity in the general population include highly insulin-resistant type 2 diabetes mellitus, chronic hypertension, obstructive sleep apnea, osteoarthritis, and often debilitating social, physical, and psychological handicaps. There are reproductive implications of obesity as well, including infertility, menstrual disorders, and higher rates of uterine and breast cancer, all of which are attributed to increased peripheral estrogen production by adipose tissue. During pregnancy, pre-existing comorbidities place both the mother and fetus at risk for adverse perinatal outcome. In addition, obese women suffer pregnancy-specific complications more commonly, with greater incidences of gestational diabetes, preeclampsia, and cesarean delivery compared with their normal weight counterparts [4]. Surgical complications, including thromboembolism, infection, and wound dehiscence, also correlate directly with BMI. Fetal and neonatal effects of maternal obesity include increased risk of open neural tube defects, accelerated fetal growth (macrosomia), shoulder dystocia, uteroplacental insufficiency, fetal distress, stillbirth, and neonatal death [5,6]. There are long-term effects of intrauterine disturbances in fetal metabolism and growth, with increasing evidence that these children are more apt to develop hypertension, diabetes, obesity, and metabolic syndromes in adulthood [7,8].

A frustrating and biologically formidable adversary, the disease of obesity is extremely refractory to treatment, despite prodigious attempts on the part of clinicians and valiant, often superhuman, efforts by patients to combat the condition. Dietary modifications, even with very low energy meals (< 800 kcal/d), exercise, pharmacologic agents, and behavioral therapy, lead to modest weight loss of 5% or up to 10% of body weight. Although health benefits may be accrued with such modest weight loss, most obese patients desire greater achievements and feel defeated with these limited accomplishments. Maintenance of weight loss is even less successful, with most patients regaining at least 75% of the weight lost, and some gaining even more than was lost after 3 to 5 years [9,10]. The "yo-yo effect" of repeated attempts and subsequent failures at sustained weight loss can produce great emotional, if not medical, difficulties [11]. For this reason, in 1991 the National Institutes of Health recognized distinct criteria for opting for surgical management of extreme obesity [12].

Once fraught with frightening and repellent long-term and permanent postoperative morbidities and complications, modifications and improvements in surgical technique have made bariatric surgery an increasingly popular and effective treatment for severe obesity. The ability of trained surgeons to execute these procedures safely through minimally invasive techniques has resulted in an exponential increase in the number of procedures performed. The number of gastric bypass procedures has grown significantly from an estimated 14,000 in 1998 to an estimated 108,000 in 2003 [13]. It has been estimated that over 200,000 bariatric procedures were performed in the United States last year. Over 80% of patients having surgery are women and many are of reproductive age [13]. For practitioners of multiple disciplines in health care, counseling and management of the extremely obese woman of childbearing age who is either contemplating or has already undergone a bariatric procedure is becoming increasingly commonplace, yet remains a complex and minimally evidence-based endeavor. The patient and the clinician are confronted with a dilemma: Realistically, without surgery, the woman is most apt to enter pregnancy extremely obese, with all the attendant risks outlined earlier. Following surgery, there are specific nutritional and surgical complications that could arise from these procedures that can also impact negatively on both maternal and fetal outcomes.

Although pregnancy outcomes generally have been favorable following bariatric surgery, experience and reporting have been limited, such that there are no generally accepted pregnancy-specific modifications to the treatment plan for such postoperative women. Is the patient best served by a facile but perhaps ill-derived recommendation to complete her childbearing before undergoing surgery? How would the delay impact her health, reproductively or otherwise? If she chooses to pursue surgical treatment before pregnancy, might her risk of bariatric procedure–related pregnancy complications be amenable to mitigation or prevention either preconceptionally or during pregnancy? Should a desire to have children in the future impact the choice of bariatric procedure to be performed?

The present review aims to educate *Current Diabetes Report's* multidisciplinary readership about the pre- and postoperative reproductive implications of bariatric surgery. Recognizing the limitations of present-day knowledge informing this specific topic, the paper focuses on the physiologic basis for the mechanism of weight loss of various bariatric procedures and the resultant surgical and nutritional issues they create before, during, and after pregnancy. With this anatomic and physiologic foundation, biologically supportable guidance for the management of extremely obese women of childbearing age is provided. This selfsame basis for review and recommendation is then used to frame the continued gaps in our knowledge and propose specific investigations that can further elucidate best practice for the care of these women.

Types of Bariatric Procedures

As presently understood, bariatric procedures induce weight loss through at least one of the following mechanisms: restriction of food intake by limiting the capacity of the stomach; delayed gastric emptying by constriction of the surgically created stomal exit; limited absorption of carbohydrate and fat through bypass of the duodenum and variable lengths of the jejunum and minimizing the commingling of starchy and fatty foods with biliary and pancreatic digestive enzymes; and modification of appetite and satiety through incompletely understood surgical alteration of gastrointestinal tract neuroendocrine function [14,15]. As the patient adapts to these gastrointestinal changes, a number of powerful behavior modifications ensue wherein the patient maintains a limited quantity of food intake (induced by the restricted stomach capacity) and avoids high-calorie fats and refined sugars in the diet, which is reinforced by "aversion" to the negative consequences of malabsorption (eg, abdominal bloating, fecal urgency, diarrhea, and other unpleasant symptoms of hyperinsulinemia-induced hypoglycemia following ingestion of these substances). The three types of bariatric procedures currently performed in the United States are reviewed in detail in Figures 1, 2, and 3. It behooves the caretaker of the bariatric patient of childbearing age to understand the specific anatomic rearrangements as well as the physiologic alterations induced by these procedures because both these aspects will variably contribute to potential surgical and nutritional complications during a subsequent pregnancy.

The most common operation performed today is the Roux-en-Y gastric bypass (RYGB), shown in Figure 1. Along with biliopancreatic diversion (BPD) procedures, the RYGB is a major adaptation of the original jejunoileal bypass procedure performed in the 1950s. Its most significant modification is that there are no segments of the intestine that are allowed to remain uninvolved in the conduit of either food substances or digestive fluids. It was this stagnation of segments of bowel in the original procedures that resulted in bacterial overgrowth, extreme malabsorption, and highly morbid complications, such as hepatic fibrosis and failure,

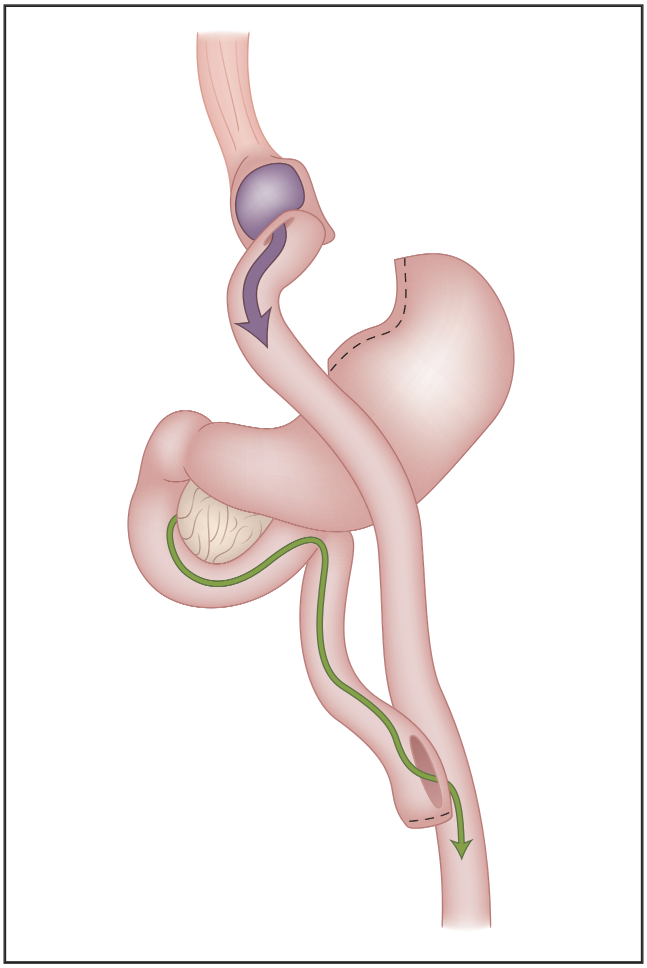

Figure 1. The Roux-en-Y gastric bypass (RYGB) procedure. A combination restrictive and malabsorptive procedure, the RYGB procedure involves the creation of a small pouch in the fundus of the stomach that limits intake, and the majority of the stomach, duodenum, and a portion of the jejunum are bypassed, resulting in some malabsorption. The food from the pouch empties directly into the distal jejunum via a constructed gastrojejunostomy. As shown, the descriptive "Y" is formed by having the proximal section of jejunum anastomosed into a lower portion of the intestine and the pancreatic and biliary juices mixed with the food in this distal portion of the jejunum. (*Adapted from* Brethauer et al. [16]; with permission.)

nephrolithiasis, and dangerous electrolyte imbalances leading to impaired mentation. Instead, in present-day malabsorptive procedures such as the RYGB, an "enteric limb" for the transit of food and a "biliopancreatic limb" for the transit of bile and pancreatic secretions remain fully vitalized and join together at a "common channel" created in the terminal portion of the jejunum, where digestion and nutrient absorption occur. The typical weight loss following RYGB is 60% to 80% of excess body weight (EBW) in 1 to 5 years [16,17].

The major restrictive bariatric procedure performed today is the adjustable gastric banding (AGB), shown in Figure 2. The Lap-Band (INAMED Health, Santa Barbara, CA) is the only device currently approved by the US Food and Drug Administration. By limiting the quantity

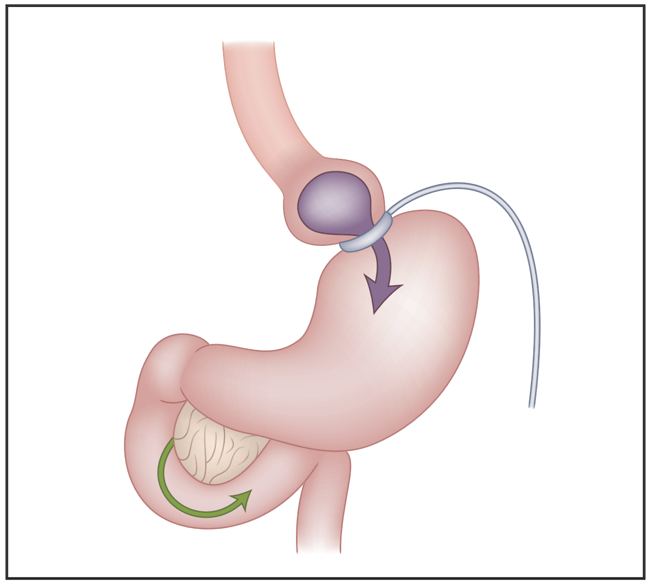

Figure 2. Adjustable gastric banding. A silicone band is placed around a portion of the proximal stomach, creating a small pouch above the band, limiting the diameter of the stoma (stomach outlet) and leaving the rest of the stomach and intestinal tract intact. (*Adapted from* Brethauer et al. [16]; with permission.)

the stomach can hold and delaying emptying into the distal portion, the patient feels fuller longer and eats less food, resulting in weight loss. Beyond this effect, however, neither malabsorption nor neuroendocrine alterations are induced, as the remainder of the gastrointestinal continuity remains unperturbed. As a result, the induced weight loss is usually more modest compared with the malabsorptive procedures, with expected weight loss for this procedure being only 44% to 68% of EBW [16]. This operation is more popular and has had better results in Europe, Scandinavian countries, and Australia compared with those reported in the United States.

The BPD with and without duodenal switch (Figs. 3A and 3B) is an effective malabsorptive procedure that is reserved for those individuals of highest BMI, typically greater than 50 kg/m^2. The procedure has the theoretic advantage that patients retain their normal eating capacity, but weight loss (70% to 80% of EBW) is achieved through much more significant malabsorption. There is a much higher incidence of side effects, including protein malnutrition, severe anemia, deficiencies of fat-soluble vitamins, and persistent diarrhea. The mortality risk is 1%, and morbidity of 20% to 25% makes this an unpopular procedure, except for the extremely obese patient [17].

The vertical banded gastroplasty, depicted in Figure 4, is a restrictive procedure similar to the AGB that is rarely performed any longer. It was abandoned because of complications at the staple line, which resulted in leaking and perforations. However, there may still be women of reproductive age who have undergone this procedure who will present to care providers for counseling and management regarding pregnancy.

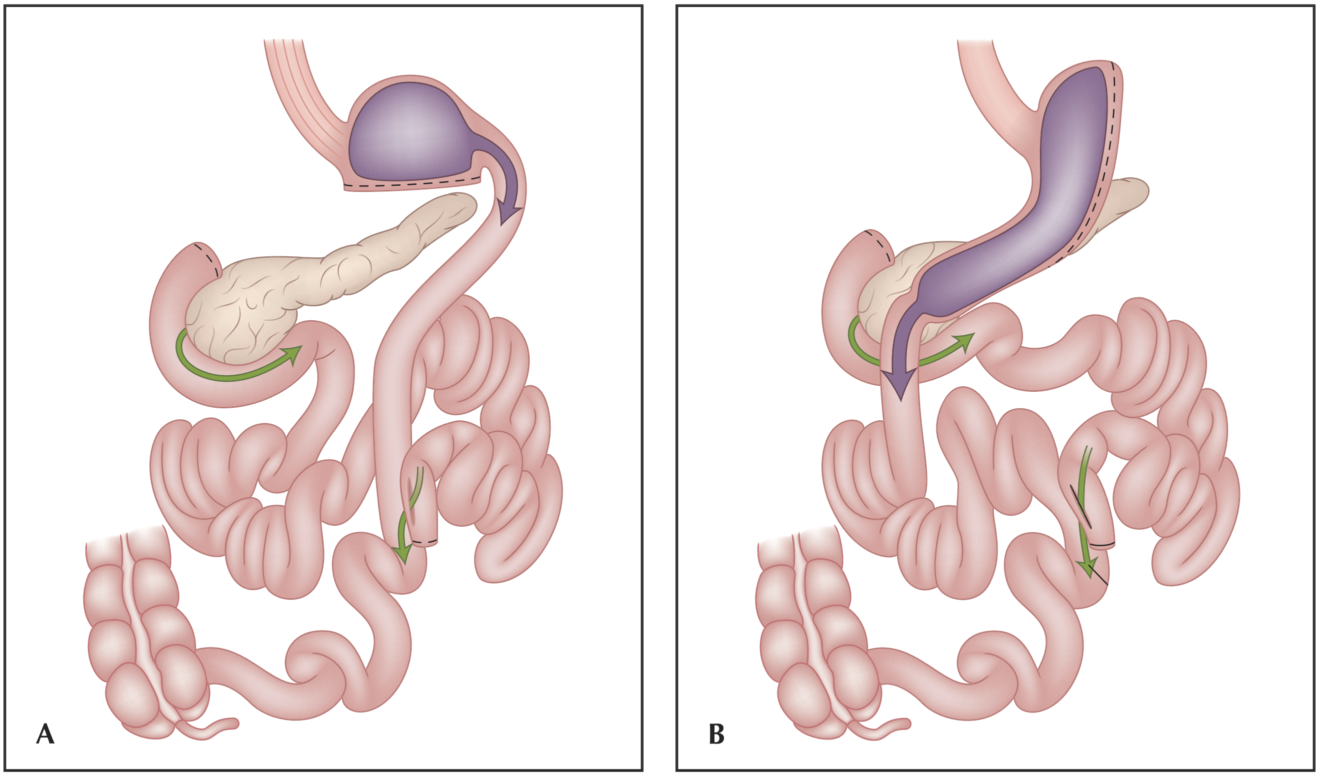

Figure 3. Biliopancreatic diversion (BPD) with and without duodenal switch. **A,** In this more complicated combined operation, the lower portion of the stomach is removed. The small pouch that remains is connected directly to the final segment of the small intestine, completely bypassing the duodenum and the jejunum. **B,** A variation of BPD includes a "duodenal switch," which leaves a larger portion of the stomach intact, including the pyloric valve and a small part of the duodenum. (*Adapted from* Brethauer et al. [16]; with permission.)

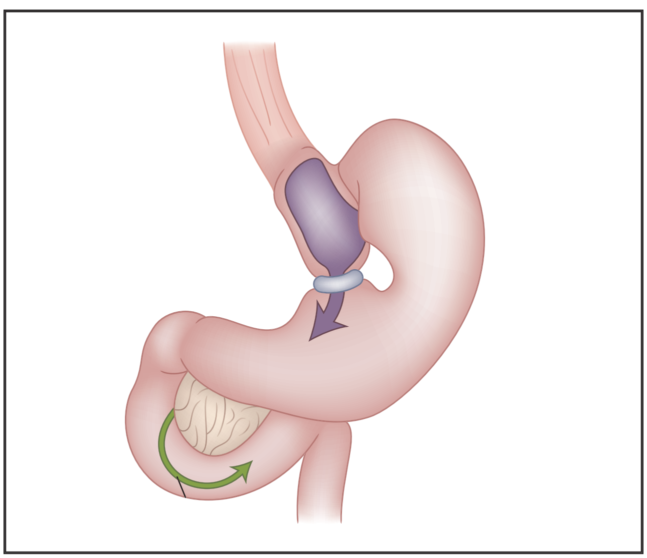

Figure 4. Vertical banded gastroplasty. A small pouch is created by stapling vertically across the upper portion of the stomach near the esophagus. A band restricts the outlet of the pouch, delaying the emptying of food, thus restricting intake and causing early satiety. (*Adapted from* Brethauer et al. [16]; with permission.)

Nutritional Considerations for Patients After Bariatric Surgery

Because weight loss occurs by a combination of restriction and malabsorption, deficiencies in protein and micronutrients can occur. All patients, regardless of reproductive plans, are advised to take vitamin and mineral supplements, which are sufficient in the majority of individuals to maintain normal levels. However, significant deficiencies may occur in some patients as a result of 1) decreased intake and intolerance of certain foods because of the small pouch, or 2) malabsorption arising from bypassing of the significant segments of the bowel where nutrients are absorbed. Protein, iron, vitamin B_{12}, folate, vitamin D, and calcium are the main nutrients that are affected. Because the fetus requires these micronutrients for normal development, maternal deficiencies may become exacerbated during pregnancy.

Protein deficiency is rarely seen except in the more extreme malabsorptive procedures such as the BPD. Signs and symptoms of protein deficiency include hypoalbuminemia and edema. Dietary counseling and supplements with protein shakes are usually sufficient to prevent significant deficiencies. The recommended daily intake of protein is at least 60 g for postoperative bariatric patients; an equivalent quantity is recommended in pregnancy.

Iron deficiency is more common after RYGB surgery due to bypass of the duodenum and proximal jejunum, where iron is absorbed. Serum iron and ferritin levels decrease over time [18], and deficiencies have been reported in as high as 39% of patients 4 years after gastric bypass. The incidence of iron deficiency after gastric banding has not been studied as well, but appears to be a less significant concern in patients after restrictive procedures. Folate and cobalamin (vitamin B_{12}) deficiencies are prevalent after bariatric surgery as well. In addition to malabsorption from bypassed critical gastrointestinal segments, decreased intrinsic factor production in the pyloric region of the stomach contributes to the malabsorption of vitamin B_{12}. Oral folic acid supplementation is usually sufficient to replenish folate stores, but the perturbation of intrinsic factor-mediated absorption of vitamin B_{12} may require treatment with parenteral cobalamin therapy in some patients.

The importance of folic acid in normal fetal development is well known and women of childbearing age are advised to take 400 µg of folic acid in a multivitamin supplementation to prevent spina bifida and other birth defects. A neural tube defect was reported in the infant of a woman after gastric bypass [19]. However, obese women are at higher risk than average-weight women for having children with neural tube and other birth defects [20]. Vitamin B_{12} deficiency was reported in a breastfed infant whose mother had subclinical vitamin B_{12} deficiency [21].

Iron-deficiency anemia is a significant problem in pregnancy in general and may be particularly refractory to treatment after gastric bypass [22]. Dixon et al. [23•] reported a more favorable profile in his patients after gastric banding. Only one of 79 patients had anemia, whereas seven had low iron levels. There were no deficiencies of folate or vitamin B_{12}.

Calcium and vitamin D deficiency can also compromise post-bariatric nutritional status. Calcium citrate or gluconate may be better absorbed than calcium carbonate owing to diminished gastric acid in the smaller pouch. It is important to advise patients to separate intake of their iron and calcium supplements by at least 2 hours. In pregnancy and lactation, the increased calcium requirement of 1500 mg can be difficult to obtain without supplementation.

Although rarely encountered in gastric bypass and restrictive procedures, fat-soluble vitamin deficiencies are more common in BPD or procedures that bypass the ileum. Vitamin A deficiency is common, but clinical manifestations are rare [24]. Vitamin E is rarely deficient and, although vitamin K levels may be lower than normal, clinically significant bleeding complications have not been apparent.

Thiamine is absorbed in the proximal small intestine and although rare, absorption may become compromised after bariatric surgery [25]. Thiamine deficiency can occur in patients with extreme vomiting, such as those with hyperemesis gravidarum [26]. Intravenous supplementation of thiamine, 100 mg/d, should be routinely given to patients with hyperemesis, especially after gastric bypass.

Surgical Complications Following Bariatric Surgery

Immediate or early postoperative complications of bariatric surgery include anastomotic leaks, thromboembolism, hyperemesis, and wound complications. Fortunately, these rarely complicate pregnancy directly, except as the need for surgical revision or medical treatment may have impacted the patient's permanent anatomy and gastrointestinal function. Late surgical complications include higher incidences of biliary stone disease, stomal stenosis, and ulcers at the margins of the surgical anastomotic sites. Some surgeons opt for simultaneous cholecystectomy at the time of original surgery; others treat patients prophylactically with ursodeoxycholic acid. Chronic use of aspirin and other nonsteroidal anti-inflammatory drugs, as well as some antibiotics, can increase the risk of marginal ulcers and subsequent stomal stenosis. Ulcers are generally responsive to proton pump inhibitor therapy; stenosis of the gastrojejunostomy stoma can be dilated endoscopically. Because pregnancy induces several gastrointestinal changes, including lowering of gastroesophageal junction opening pressure (which predisposes to reflux) and slowed transit of bile, these conditions may present for the first time or can be exacerbated during pregnancy. In some cases, medications used by patients may have limited safety profiles for pregnancy and lactation, and substitutions may be required. Similarly, treatment of some conditions, such as antiphospholipid antibody syndrome, whose adverse effect on pregnancy outcome can be mitigated with aspirin therapy, will be limited in the post-bariatric surgery patient.

Because the surgical technique of bariatric surgery requires access to the retroperitoneal space of Retzius, as well as construction of "extra" bowel loops, patients who have undergone bariatric surgery are predisposed to internal herniation and obstruction of the small intestine. Furthermore, the proximal "gastrojejunum" of the RYGB will usually stretch somewhat over time to accommodate larger meal intakes. Rarely, patients can "overextend" their pouch leading to rupture. Finally, compromised vasculature can, in rare circumstances, lead to necrosis of gastric remnants. All care providers must maintain a high degree of suspicion for these serious and potentially life-threatening complications when post-bariatric patients present with exacerbated abdominal complaints.

Pregnancy Outcomes Following Gastric Bypass

Pregnancy outcomes in women who have had bariatric surgery have been limited to a few series and case reports. Historically, concern was raised after Ingardia and Fischer [27] in 1978 reported after jejunoileal bypass a 20% incidence of small-for-gestational-age infants in 21 pregnancies delivered to mothers. However, in 1982, the first series of pregnancies after gastric bypass surgery showed that the infants were of normal weights, and 12 were, in fact, heavier at birth than their preoperative older siblings [28]. Subsequently, a report of the largest series of bariatric patients from Israel combined outcomes from both gastric bypass and gastric banding [29•]. Pregnancies from 298 patients after bariatric surgery were compared with the general population. Increased complications included premature rupture of membranes, labor induction, fetal macrosomia, obesity, and cesarean delivery. After controlling for possible confounding variables, only the relationship between bariatric surgery and cesarean delivery remained significant. There were no differences in perinatal mortality, congenital malformations, or low Apgar scores.

In a series of only gastric bypass patients, Wittgrove et al. [30] identified 41 women out of 2000 patients followed postoperatively and compared their pregnancies with a group of morbidly obese patients who delivered prior to surgery. The postsurgical group had fewer pregnancy-related complications, such as gestational diabetes, macrosomia, and cesarean section, than the group of similar morbidly obese women.

Unfortunately, the reassurance of these small retrospective series is tempered by case reports of serious complications both to the mother, fetus, and neonate. Small bowel obstruction, generally a rare occurrence in pregnancy, is a recognized complication of laparoscopic gastric bypass, with an incidence as high as 9% recently reported [31]. This effect has been attributed to variance in surgeons' closure of the mesenteric defects during the laparoscopic approach compared with the open surgical approach (Schauer, Personal communication). Increased intra-abdominal pressure and upward compression of the entire gastrointestinal tract toward the diaphragm by the expanding gravid uterus can theoretically predispose to an even higher incidence of obstruction and herniation during pregnancy. It is of concern that there have been several case reports of small bowel obstruction and internal herniation in pregnancy. Although most were successfully treated [32–34], there have been at least one maternal and two fetal deaths associated with this procedure [35,36].

Pregnancy After AGB

AGB is generally perceived as safer than gastric bypass; however, weight loss is less profound. Its popularity is increasing in the United States, as experience is becoming more widespread. Patients perceive AGB as less invasive and easier to tolerate than gastric bypass, and surgeons find it easier to perform. Several series attest to the favorable prognosis of pregnancies after AGB. Martin et al. [37] conducted trials of 359 obese women, of whom 20 conceived resulting in 23 pregnancies. Five women lost weight during pregnancy without obvious fetal or neonatal effects. Fluid from the band was adjusted in three women to treat nausea and vomiting; two of these women gained excessively, eliminating the effectiveness of the original bariatric treatment.

Dixon et al. [23•] prospectively collected data from pregnancies of 79 women after gastric banding and compared them with their penultimate pregnancies, matched obese women, and community standards. The women gained less weight than in their prior pregnancies (9.6 ± 9.0 vs 14.4 ± 9.7 kg for the 40 penultimate pregnancies) with similar birth weight: 3397 compared with 3350 g for prior pregnancies, and similar to community average birth weight. Pregnancy-induced hypertension (10%) and gestational diabetes (6.3%) were lower than in their penultimate pregnancies (45% and 15%), lower than in the obese cohort (38% and 19%), and similar to community outcomes (12% and 5.5%). Adjustments to the band through monitoring fluid levels improved weight gain. Skull et al. [38•] reported similar reductions in maternal weight gain, gestational diabetes, and pregnancy-related hypertension without significant differences in birth weights.

Although rare, surgical complications can also occur with gastric bands. An acute gastric perforated ulcer [39], an intragastric band migration, and a balloon defect have been reported [40].

Recommendations for Monitoring Pregnancy in Post-Bariatric Surgery Patients

It is common practice for surgeons to advise women to delay childbearing for 2 years after surgery. Ideally, preconception counseling should occur for all women after bariatric surgery. The American College of Obstetrics and Gynecology recommends that women not conceive for 12 to 18 months postoperatively [41]. This avoids conception during the rapid weight loss phase and allows for maximum weight loss in the mother. However, weight loss improves fertility in many obese women. Thus, many previously infertile women become pregnant before the 2-year mark. Dao et al. [42•] retrospectively compared 21 patients who became pregnant in the first year after surgery with 13 who became pregnant after 1 year. There were no significant episodes of malnutrition, adverse fetal outcomes, or pregnancy complications. Maternal weight changes were markedly varied however, ranging from a loss of 70 lb to a gain of 45 lb in the early group, and a gain of 13 to 75 lb in the late group. Birth weights were also wide ranging. Of the infants reported to be born at term, weight ranged from 1616 to 3940 g, indicating possible intrauterine growth restriction. Two patients had hypertension or preeclampsia; incidence of diabetes was not reported.

Nevertheless, despite these relatively benign consequences of early postsurgical conception, the first year after bariatric surgery can have many challenges for a patient as she adjusts to a new dietary regimen and new body image. Patients may have difficulty distinguishing postoperative accommodations of the bowel from pregnancy-related nausea or "morning sickness." Hyperemesis of pregnancy can be particularly difficult to treat, especially in a post-gastric bypass patient who has not adjusted to her small pouch. Women who have had bariatric surgery are well advised to use contraception and to avoid pregnancy until their weight loss has been optimized and stabilized.

For all bariatric patients who eventually become pregnant, consultation with a nutritionist after conception may be very helpful to assist the patient to maintain a healthy eating plan and to overcome the additional challenges that occur with pregnancy. Anemia should be identified and treated if present. Serum iron and ferritin levels should be monitored, as well as folate and vitamin B_{12} levels. Erythrocyte folate is a better indicator of folate deficiency than serum folate, the latter of which just reflects recent oral intake. Diagnosis of vitamin B_{12} deficiency is typically based on measurement of serum vitamin B_{12} levels; however, approximately 50% of patients with subclinical disease have normal B_{12} levels. A more sensitive method of screening for vitamin B_{12} deficiency is measurement of serum methylmalonic acid, which is increased early in vitamin B_{12} deficiency. Serum calcium, phosphate, and 25-OH vitamin D levels should be checked and if abnormal, parathyroid hormone levels should be evaluated as well. Low serum albumin level may indicate inadequate protein intake.

Screening for gestational diabetes is recommended in all pregnancies. However, many patients after gastric bypass experience the dumping syndrome and cannot tolerate either the 50-g glucose challenge or 100-g oral glucose tolerance test. Dumping syndrome is caused by rapid gastric emptying of hyperosmolar contents into the small bowel. This leads to fluid shifts from the intravascular compartment into the bowel lumen, resulting in rapid small bowel distention. Discomfort is characterized by abdominal cramps, bloating, nausea, vomiting, and diarrhea. In addition, the high carbohydrate load leads to hyperinsulinemia and subsequent hypoglycemia with delayed symptoms of tachycardia, palpitations, jitteriness, and perspiration. Although shock and loss of consciousness can occur, the dumping syndrome is usually limited and resolves spontaneously.

An alternative approach for diabetes screening and testing, as used in our institutions, can be as follows: A fasting blood sugar is drawn and the patient is instructed to eat as much of a carbohydrate-loaded breakfast as they can tolerate, followed by a 2-hour postprandial glucose. If the fasting blood sugar is less than 95 mg/dL and the 2-hour postprandial is less than 120 mg/dL, her values are normal and further testing can be avoided. If elevated, medical nutritional therapy and capillary blood glucose monitoring are instituted and the patient is followed according to the diabetic protocol.

Maternal weight gain is monitored at each visit and assessment of fetal growth is obtained. Sonographic evaluation of fetal weight is obtained if clinical evaluation of the mother is difficult or there is suspicion of growth disturbance, either intrauterine growth restriction or macrosomia.

Conclusions and Remaining Questions

Despite the increased frequency of bariatric surgery in women of reproductive age, several questions remain. Should pregnancy be undertaken before or after surgery? There is only limited information with which to advise a severely obese woman whether she should complete her childbearing prior to undergoing bariatric surgery. If she were to pursue pregnancy at her present weight, will her outcome be better than if she attempted pregnancy postoperatively? Would her outcome be better if she were to lose weight by nonsurgical methods? Is there evidence to support the use of one bariatric procedure over another in young women choosing bariatric surgery before childbearing? What should be the best nutritional guidelines for such patients? Is there reason to believe that adaptation to pregnancy is different for either the mother or the fetus? How is breastfeeding and infant nutrition affected by bariatric surgery? Only through research and collaboration among bariatric surgeons and obstetricians will we start to arrive at answers to the questions that can help us take optimum care of all our patients.

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