

# Managing Malnourishment in Pregnancy after Bariatric Surgery

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## Abstract

**Background:** Little information exists to guide monitoring and treatment of malnourishment during pregnancy after bariatric surgery. Here we present a case with severe deficiencies and recommendations for testing and treatment.

**Case:** Our patient underwent a duodenal switch procedure resulting in significant weight loss and numerous deficiencies. She then experienced a neonatal demise with multiple congenital abnormalities, including diaphragmatic hernia, possibly related to severe vitamin A deficiency. After high doses of oral and parenteral replacement, pancreatic enzymes, and total parenteral nutrition, she delivered an anatomically normal but growth-restricted neonate in a subsequent pregnancy.

**Conclusion:** Bariatric procedures may result in nutritional deficiencies that affect pregnancy outcome. Women with severe deficiencies require pre-pregnancy counselling, monitoring, aggressive treatment, and a multidisciplinary approach to care.

## Résumé

**Contexte :** Il n'existe que peu de données pour guider le suivi et le traitement de la malnutrition pendant la grossesse à la suite d'une chirurgie bariatrique. Nous présentons ici un cas caractérisé par de graves carences nutritionnelles ainsi que des recommandations aux fins de dépistage et de traitement.

**Cas :** Notre patiente a subi une permutation duodénale qui a entraîné une importante perte de poids et de nombreuses carences nutritionnelles. Sa grossesse s'est soldée par le décès du fœtus, qui présentait plusieurs anomalies congénitales, dont une hernie diaphragmatique, possiblement attribuables à une grave carence en vitamine A. La patiente a par la suite reçu de grandes doses de produits de remplacement par voies orale et parentérale et d'enzymes pancréatiques, et a été alimentée par nutrition parentérale totale avant de donner naissance à un bébé ne présentant aucune anomalie anatomique, à l'exception d'un retard de croissance.

**Conclusion :** Les chirurgies bariatriques peuvent être à l'origine de carences nutritionnelles ayant des effets défavorables sur l'issue

de la grossesse. Avant de tomber enceintes, les femmes présentant de graves carences ont besoin d'être conseillées, suivies et traitées de façon intensive au moyen d'une approche de soins multidisciplinaire.

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## INTRODUCTION

Obese women generally experience an improvement in overall health after bariatric surgery, with benefits extending to pregnancy.<sup>1,2</sup> These benefits include weight loss, decreased rates of diabetes and hypertension, and improvement in cardiovascular health.<sup>3</sup> In pregnancy, rates of preeclampsia, gestational diabetes, and LGA infants decline,<sup>1,2</sup> but the risks of SGA infants and shorter gestation increase for these women compared to BMI-matched control groups.<sup>2,4</sup> Additionally, some investigators have demonstrated a trend toward stillbirth or neonatal death.<sup>2</sup>

From 2003 to 2005, 49% of all bariatric procedures were performed on women of child-bearing potential.<sup>1</sup> Despite the benefits, malnutrition due to malabsorption of essential vitamins and nutrients is a common complication. The type of bariatric procedure performed further determines which nutrients will be most affected and how severe the effect will be. Therefore, in those patients who have not completed child-bearing, it is important to keep in mind the type of bariatric surgery and the impact of bariatric surgery on the health of the patient and on her future pregnancies.

## CASE

Our patient had undergone a duodenal switch procedure at age 21, after which she lost 215 pounds to reach her current weight of 155 pounds. She had two early spontaneous abortions and

**Key Words:** Bariatric surgery, pregnancy, malnourishment, vitamin deficiency

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**Table. Serum nutrient levels in second pregnancy**

Nutrient	10 weeks	24 weeks	33 weeks	35 weeks	Normal range	Supplement, highest dose given
Calcium ionized	1.20		1.16		1.17–1.31 mmol/L	2400 mg daily
Copper	81	79			80–155 µg/dL	2 mg daily
Folate			17.3		>5.4 ng/mL	1 mg daily
Iron <sup>a</sup>	27	86			50–170 µg/dL	100 mg IV weekly PRN
Magnesium			1.9	2.4	1.6–2.4 mg/dL	70 mg daily
Vitamin A	0.13	0.16	0.25	0.32	0.3–1.2 mg/L	18,000 IU daily PO (PNV), 100,000 IU weekly IM PRN
Vitamin B12		300	326		211–911 pg/mL	12 µg daily
Vitamin D 250-H	10.0	18.7	10.2	9.5	30–100 ng/mL	50,000 IU daily
Vitamin E-α	4	5.3		5.9	6.0–23.0 mg/L	1200 IU daily
Vitamin E-γ	0.2	0.3		2.6	0.3–3.2 mg/L	1200 IU daily
Vitamin K	0.21	0.43	0.2		0.22–4.88 nmol/L	700 µg daily (PNV) + 5 mg IM per month, 10 mg SQ weekly PRN
Zinc	34	33	43		70–120 µg/dL	150 mg daily

PRN: as needed; PO: by mouth; PNV: prenatal vitamin; SQ; subcutaneous injection.

<sup>a</sup>Blank cells indicate the nutrient was not measured at GA.

in her third pregnancy was transferred to us at 22 weeks due to fetal diaphragmatic hernia.

She was profoundly deficient in many vitamins and micro-nutrients, including vitamin A deficiency resulting in night blindness. Intrauterine growth restriction was also identified. At 31 weeks, she experienced preterm premature rupture of membranes with chorioamnionitis and delivered. The neonate weighed 1630 g with Apgar scores of 2/4/7 but shortly after passed away due to prematurity and hypoplastic lungs as a result of the diaphragmatic hernia. Autopsy confirmed the prenatal findings of large diaphragmatic hernia, fused eyelids, skin tag at the tip of the left nostril, high arched palate, right supernumerary thumb, fused single right lung lobe, and cardiac anomalies. Microarray analysis was normal, demonstrating a 46 XX female.

The patient presented to us at 10 weeks' gestation in her next pregnancy on standard supplemental dosing for patients with a history of duodenal switch. Despite these supplements, she was found to be deficient in vitamins A, D, E, and K, iron, and zinc, as detailed in the [Table](#). By 24

weeks and after, we were able to increase most levels to normal or near normal, except for vitamin D and zinc, using the dosages as detailed in the last column of the [Table](#).

At 32 weeks, IUGR was diagnosed. She was instructed to continue Ensure (Abbott Laboratories) daily. By 34 weeks, the estimated fetal weight had decreased to the sixth percentile, and she was admitted to initiate total parenteral nutrition until delivery based on literature noting success in the outpatient setting.<sup>5</sup> She was also started on Ursodiol to increase bile flow, pancreatic enzyme supplementation, a water soluble form of fat-soluble vitamins (AquADEK, Yasoo Health), thiamine 100 mg, and selenium 100 µg/day.

At 37 weeks, she was induced and delivered an SGA neonate weighing 2135 g (fifth percentile) with normal-appearing features. At postpartum follow-up, the patient and baby girl were doing well.

## DISCUSSION

The biliopancreatic diversion with duodenal switch procedure, as performed in our patient, is efficacious, but it is a more severe type of bariatric surgery.<sup>6</sup> It involves a decrease in stomach volume and transection and reattachment of the duodenum, such that a large portion of the small bowel, where many nutrients are absorbed, is removed from the primary tract and the pancreatic and biliary salts, which help absorb fats, are dumped into the small bowel far distally immediately before entry into the large bowel. Alternate bariatric methods include (1) gastric banding, in which a band is placed over the stomach to restrict intake and can be

## ABBREVIATIONS

BPD	biliopancreatic diversion
ACOG	American Congress of Obstetricians and Gynecologists
IUGR	intrauterine growth restriction
RCOG	Royal College of Obstetricians and Gynaecologists
LGA	large for gestational age
SGA	small for gestational age

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