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Efficacy of Oral Glucose Tolerance Testing of Pregnant Women Post Bariatric Surgery

Abstract

Worldwide, a large proportion of childbearing women are overweight or obese, and it is becoming increasingly common for pregnant women to have undergone bariatric surgery prior to conceiving. Women with a history of sleeve gastrectomy may not be able to undertake the oral glucose tolerance test (OGTT), due to the risk of dumping syndrome. There is limited current research on the effects of weight loss surgery on the pregnancy oral glucose tolerance test and conducting an OGTT on a woman who has had bariatric surgery may be an inadequate form of diagnosing GDM. A cost-effective alternative to an oral glucose tolerance test is to monitor pre- and post-meal blood glucose levels.

Keywords: Pregnancy; Bariatric; Glucose; Testing; GDM;

Key Points

There are an increasing number of childbearing women who have undergone bariatric surgery.
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Most women after bariatric surgery will no longer require diabetic medication however, they will be screened for gestational diabetes when pregnant.
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Pregnant women with a history of Roux-en-Y / sleeve gastrectomy may not be able to tolerate the oral glucose tolerance test.
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Conducting an OGTT on a woman who has had either a Roux-en-Y gastric bypass or a sleeve gastrectomy may be an inadequate form of diagnosing GDM and may lead to further health issues for the woman and fetus and less than optimal neonatal outcomes.
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Introduction

Globally, a large proportion of childbearing women are overweight or obese, with an estimated one in five women in the world aged 20 years or older being obese (BMI ≥ 30 kg/m²) in 2013 (Ng et al., 2014). It is becoming increasingly common for pregnant women to have undergone bariatric surgery prior to conceiving. Bariatric surgery has been associated with a decreased risk of gestational diabetes and excessive fetal growth; shorter gestation, and an increased risk of small-for-gestational-age fetuses (Johansson et al., 2015). Gestational Diabetes Mellitus (GDM) is defined as the onset of glucose intolerance in pregnancy and is increasing in prevalence due to a number of factors, one being the rising incidence of obesity (Catalano and Shankar, 2017). Within the United Kingdom, GDM affects between 3 – 5% of all pregnancies (Ryan et al., 2018). GDM is now recognised as one of the most common complications of pregnancy, and has increased by more than 30% worldwide within twenty years (Zhu and Zhang, 2016). Gestational diabetes can lead to adverse maternal and fetal outcomes and it is therefore important that GDM is diagnosed and managed appropriately in pregnancy (Monteiro et al., 2016). The World Health Organisation [WHO] (2016) recommends diagnosing GDM if any of the following criteria are met:

- a fasting blood glucose level of greater than 5.1 mmol/L,
- a blood glucose level of greater than 10 mmol/L at one hour post a 75g oral glucose ingestion
- a blood glucose level of greater than 8.5 mmol/L at two hours post a 75g oral glucose ingestion.

However, the World Health Organisation's criteria for diagnosing diabetes is not used within the UK, and Diabetes UK recommends:

- a fasting plasma glucose level of 5.6mmol/l or greater
- a 2-hour plasma glucose level of 7.8mmol/l or above (Diabetes UK, 2018).

Within many clinical environments, the diagnosis of GDM currently involves a fasting blood glucose level taken, and then the consumption of a 75g glucose drink over a five-minute period. The woman is then required to remain sedentary and further blood glucose levels are taken at one and two hours' post ingestion of the glucose drink (World Health Organisation, 2016). Some women have reported side effects from the oral glucose tolerance test in the form of sweating, headaches, light-headedness and stomach pain (American Diabetes Association, 2015). These side effects are commonly caused by hypoglycaemia and often subside after the test is completed. However, if a woman has history of sleeve gastrectomy, she may not be able to undertake the oral glucose tolerance test (OGTT), due to the risk of dumping syndrome. Dumping syndrome, or rapid gastric emptying occurs when food, particularly those high in sugar, pass rapidly from the stomach to the duodenum. It causes an initial rise in blood glucose level and a rapid increase in insulin secretion, which leads to rebound hypoglycaemia, producing symptoms which may include vomiting, diarrhoea, abdominal pain, irregular heart rate and dizziness (Feichtinger et al., 2017).

There is limited current research on the effects of weight loss surgery on the pregnancy oral glucose tolerance test, despite there being a recent increase in women of childbearing age undergoing bariatric weight loss surgery (Carreau et al., 2017), and this has seen a review of obstetric guidelines in relation to diagnostic tools used for these women, particularly in relation to testing for gestational diabetes mellitus. Conducting an OGTT on a woman who has had either a Roux-en-Y gastric bypass or a sleeve gastrectomy may be an inadequate form of diagnosing GDM and may lead to further health issues for the woman and fetus and less than optimal neonatal outcomes.

Roux-en-Y Gastric Bypass / Sleeve Gastrectomy

A Roux-en-Y gastric bypass is a bariatric weight-loss surgery that involves the creation of a small pouch from the stomach, which is then connected to the small intestine. Following this procedure, swallowed food travels through the newly created pouch of

stomach and then directly into the small intestine. This procedure can increase the risk of iron deficiency anaemia, as the amount of iron rich foods the new stomach can accommodate is greatly reduced and meat is often no longer tolerated (Salgado et al., 2014). However, there have not been any studies that have revealed any adverse effects on obstetrical outcomes, including intrauterine growth restriction of the fetus (Crusell et al., 2016).

A sleeve gastrectomy involves reducing the stomach to approximately 15% of its' original size, changing it from a pouch to a thin, vertical sleeve using a stapling device, and is renamed as a gastric sleeve. The gastric sleeve typically can accommodate between 50mls and 150mls and is approximately the size and shape of a banana. The prognosis of pregnancy following bariatric surgery has been deemed as good with no excess risk of congenital malformations (Dabi et al., 2017).

Oral Glucose Tolerance Test

The most significant issue for women who have had bariatric weight loss surgery and are undertaking an OGTT is the risk of rebound hypoglycaemia. There have been several documented studies on postprandial hypoglycaemia in women who have had a gastric bypass or sleeve gastrectomy (Lee et al., 2015, Jiménez et al., 2015). Roux-en-Y gastric bypass has the most significant links with hypoglycaemia as the secretion of postprandial glucagon-like peptide-1 (GLP-1) leads to a hyperinsulinemia response and causes hypoglycaemia between one and three hours' post-meal (Shantavasinkul et al., 2016).

Bonis and colleagues (2016) suggest that due to an early post-meal continuous subcutaneous Interstitial Glucose (IG) peak, undertaking a 75g OGTT may be a substandard diagnostic tool for GDM in women post Roux-en-Y gastric bypass (Bonis et al., 2016). This is because the two-hour level will likely be below the limit for a diagnosis of GDM and will therefore rely upon the one-hour level, in which the peak will have occurred prior to this period.

Therefore, the importance of post-surgery dietary restrictions, including the limitation of carbohydrate-rich foods and avoidance of simple sugars, supports the argument that postprandial hypoglycaemia will affect post-bariatric surgery pregnant women. Pregnant women may require individualised dietary education to fully understand the mechanisms of postprandial hypoglycaemia and the risks posed to themselves and the fetus if they experience frequent hypoglycaemic episodes.

If a woman feels she is unable to undertake an OGTT due to previously bariatric weight loss surgery, she may be instructed to monitor her capillary blood glucose levels. A recent study investigated the use of capillary blood glucose monitoring simultaneous to venous blood glucose monitoring during a 75g OGTT (Bhavadharini et al., 2016). The findings suggest that there is a similarity of up to 92.5% in results, therefore advocating that capillary glucose monitoring may be an effective alternative to an OGTT with venous monitoring. Capillary blood glucose monitoring is a cost-effective method of monitoring for glucose intolerance in pregnancy however, it does require compliance with monitoring by the woman to remain accurate. Women may be more inclined to be compliant with the monitoring as a capillary blood draw is less invasive than a venous blood draw, although the frequency and duration of capillary blood glucose monitoring may be inconvenient and less likely to be maintained for the period required to diagnose GDM.

The complications of post-bariatric surgery hypoglycaemia to a pregnant woman includes symptoms such as general malaise, shaking, headaches, confusion and drowsiness, with more severe complications including seizures and syncope (temporary loss of consciousness caused by a fall in blood pressure) (Lee et al., 2015). Women may also experience heart palpitations during hypoglycaemic episodes. A recent study revealed that hypoglycaemia in type 2 diabetes can trigger ventricular arrhythmias, particularly ventricular tachycardia (Pistrosch et al., 2015). This has the potential to increase morbidity to pregnant women, particularly if they have pre-existing cardiac conditions that may have been triggered by obesity.

The risks to the fetus due to maternal hypoglycaemia are generally associated with complications due to intrauterine growth restriction (IUGR). Complications related to IUGR are the leading cause of perinatal mortality with no congenital abnormalities (Nolan and Kent, 2014). Intrauterine growth restriction will most often lead to the neonate being born small for gestational age (SGA), and are more likely to experience morbidity in the form of breathing difficulties including asphyxia, hypothermia and hypoglycaemia (Melamed et al., 2016). There is also the potential for morbidity and mortality to the fetus due to maternal risks such as seizures, syncope or mechanical injury leading to oxygen deprivation or placental abruption.

Collaborative Care

In the United Kingdom (UK) a Whyte et al., (2016), recruited 120 midwives specialising in providing care for women with diabetes, based in 164 obstetric units to analyse their current practice on diagnosing GDM in women who had a history of bariatric surgery (Whyte et al., 2016). Midwives stated that their workplace had policies in place specific to women who had a history of weight loss surgery, and the majority said they regularly performed an OGTT as per hospital screening procedures. This suggests that clinical trials need to be implemented to address the effectiveness of using the OGTT in women with a history of bariatric surgery and will assist in developing universal guidelines for the management of post bariatric surgery pregnant women. An important issue in managing these women is including a multidisciplinary team approach, including guidance from a dietician, where screening for gestational diabetes and evaluating for any gastrointestinal complaints is a focus of care provided (Kominiarek, 2011).

Conclusion

This article has focused on early pregnancy testing for GDM, however GDM is a risk throughout pregnancy, especially in the second and third trimesters, with testing required at intervals, and not only when pregnancy is confirmed. Therefore, preconception counselling may be useful for women who have undergone bariatric

weight loss surgery. Obesity is a contemporary issue within maternity environments, that has led to an increase of exposure to pregnant women who have undergone bariatric weight loss surgery. Complications arising from gestational diabetes have the potential to cause severe morbidity and mortality to the woman, fetus, and neonate therefore, it is important that women continue to be screened for GDM. The oral glucose tolerance test may not be well tolerated by these women and alternative guidelines need to be developed on how to accurately diagnose GDM and manage this cohort of pregnant women. The incidence of postprandial hypoglycaemia can have negative consequences for the woman and neonate, including IUGR, seizures, syncope and mechanical injury in relation to these. A cost-effective alternative to an oral glucose tolerance test is to monitor pre-and post-meal blood glucose levels however, more research is required to determine the period, duration and effectiveness of this alternative method.

Reflective Questions

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| 1. The Oral Glucose Tolerance Test has been linked to a reaction in post bariatric pregnant women called 'Dumping Syndrome'. What do you understand this to be? |
| 2. What advice might you give a woman who tells you she does not think she will be able to tolerate the Oral Glucose Tolerance Test? |
| 3. What is the difference between a Roux-en-Y bypass and a Sleeve Gastrectomy? |
| 4. What is the policy regarding Oral Glucose Tolerance Test and post bariatric pregnant women in your maternity unit? |
| 5. Do you know how many pregnant women with post bariatric surgery are birthing at your current workplace? |

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