Birthweight, intra-uterine fetal growth pattern and feto-placental Dopplers of pregnancies following bariatric surgery

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Objective
To assess intra-uterine fetal growth pattern, feto-placental Dopplers and birthweight (BW) of pregnancies following bariatric surgery (BS) compared to pregnancies without BS.

Methods
Pregnant women with previous BS (restrictive or malabsorptive procedure) and those without were recruited prospectively in the study from May 2015 until March 2017. Fetal biometry, including head circumference (HC), abdominal circumference (AC), femur length (FL), estimated fetal weight (EFW) (Hadlock) and feto-Placental Dopplers including uterine artery (UtA) pulsatility index (PI), umbilical artery (UA) PI, middle cerebral artery (MCA) PI and cerebro-placental ratio (CPR) were measured at 20-24, 30-32 and 35-37 weeks of gestation. UtA were assessed trans-vaginally and were measured at 12-14, 20-24 and 30-32 weeks. BW was measured at birth. Fetal biometry and Doppler measures were modelled using Bayesian hierarchical normal linear regression models. All variables were modelled as a function of gestational age and BS group, adjusted for maternal age, BMI at baseline and development of gestational diabetes. BW was modelled using a Bayesian normal linear regression model. Estimated differences in mean BW by BS group were calculated adjusting for maternal age, BMI at baseline, development of gestational diabetes and gestational age at delivery. Model estimates are summarised and reported as posterior means and quantile-based 90% credible intervals (CrI). All analyses were conducted using Stan version 2.15 (1) run via RStan (2) in R version 3.4.0 (3).

Results
We studied 36 pregnant women with previous BS (16 with a restrictive and 20 with a malabsorptive procedure) and 61 controls with similar BMI but without previous surgery. We found that the BS group had lower EFW on average than controls throughout gestation, from 19g lighter (95% CrI [0, 36]) at 22 weeks, up to 120g lighter (95% CrI [21, 219]) at 36 weeks; the difference in EFW was greater for the malabsorptive (153g lighter 95% CrI [31,270]) than the restrictive group (74g lighter on average 95%CrI [-55, 202]). This difference in the EFW is attributed to small differences in AC and FL measurements during gestation, particularly in the malabsorptive group. There was no difference in the HC. Mean UtA-PI was, if anything, lower on average for the BS group at 12-14 weeks gestation only and this was mainly attributed to the malabsorptive group. There was no difference in UA-PI, MCA-PI and CPR ratio between the groups. Babies of mothers post BS had lower average BW than those of the controls. Babies in the malabsorbative surgery group were 302 g (90% CrI [84, 529]) lighter on average than the no surgery group. Mean BW was also lower for the restrictive surgery group (228 g, 90% CrI [-25, 485]) and we found little evidence that BW differed between the two types of surgery.

Conclusion
Fetuses in the BS group were lighter on average than in controls throughout gestation and at birth, particularly in the malabsorptive group. It is likely that this reduction in growth in the BS fetuses is not driven by placental insufficiency. Further studies to investigate the underlying mechanisms are required.