Residual risk of adverse maternal, fetal and infant outcomes following surgical weight loss: A population-based, matched cohort study

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Introduction

- Pre-pregnancy obesity and obesity during pregnancy are associated with poorer maternal and fetal outcomes
    - e.g. gestational diabetes, macrosomia, birthing complications, congenital malformations
- Benefits of weight loss on peripartum outcomes demonstrated
- Unclear whether obesity confers residual risk

Objective

To determine whether surgical weight loss is associated with an increased incidence of adverse pregnancy and neonatal outcomes, compared to that seen in otherwise similar individuals with no prior history of bariatric surgery

Methods

- Multicentre, population-based, matched cohort study using linked databases
- All patients who underwent bariatric surgery 2010-2016 in Ontario, Canada with subsequent pregnancy from 2011 onwards
    - Matched to individuals with no prior history of obesity surgery in 4 BMI categories (<25, 25-29, 30-35, and >35 kg/m^2)
- Surgical group compared 3:1 to each non-surgical BMI cohort based on BMI at first-trimester visit

Methods

Primary Outcomes

Maternal: gestational diabetes, preeclampsia/Hemolysis Elevated Liver enzymes and Low Platelets (HELLP) syndrome, hemorrhage, severe perineal laceration, caesarean delivery

Fetal: pre-term birth, neonatal death/stillbirth, small for gestational age, large for gestational age, congenital malformation, severe birth trauma, Apgar score <7 at 5-minutes, composite outcome related to morbidity/mortality

Statistical Analysis

- Standardized differences with importance threshold 0.10
- Unadjusted rates of primary and secondary outcomes for entire cohort
- Multivariable logistic regression for association between obesity class and outcomes
- Results reported as odds ratio (OR) with 95% confidence intervals and p-values

Results

- 698 surgical patients with conception date between 2011-2017 matched to 8,369 controls

	BMI≤25	25<BMI≤30	30<BMI≤35	BMI>35	Surgical Group	*P Value*
Maternal Age at Index Date	32.28 ± 4.89	32.24±4.82	32.20±4.81	32.16±4.74	32.32±4.96	0.892
Maternal Early Pregnancy BMI	21.98±2.48	27.79±1.10	32.13±1.41	40.81±5.93	33.43±7.37	<0.001
Diabetes	25 (1.2%)	41 (2.0%)	83 (4.0%)	110 (5.3%)	143 (21.9%)	<0.001
Hypertension	26 (1.2%)	73 (3.5%)	117 (5.6%)	161 (7.7%)	154 (22.1%)	<0.001

- Maternal pre-operative BMI for surgical group: 49.05±7.90

Results

Pregnancy Outcomes by Maternal BMI and Weight Loss Group

	BMI≤25	25<BMI≤30	30<BMI≤35	BMI>35	Surgical Group	*P Value*
Gestational Diabetes	140 (6.7%)	232 (11.1%)	303 (14.5%)	358 (17.1%)	62 (8.9%)	<0.001
Preeclampsia/HELLP Syndrome	55 (2.6%)	115 (5.5%)	176 (8.4%)	262 (12.5%)	27 (3.9%)	<0.001
Other Pregnancy Complications	304 (14.5%)	419 (20.0%)	489 (23.4%)	628 (30.0%)	238 (34.1%)	<0.001
Gallstone Disease	≤5 (0.0%)	7 (0.3%)	11 (0.5%)	19 (0.9%)	17 (2.4%)	<0.001

Results

Labour and Birth Outcomes by Maternal BMI and Weight Loss Group

	BMI≤25	25<BMI≤30	30<BMI≤35	BMI>35	Surgical Group	*P Value*
Induction	525 (25.1%)	680 (32.5%)	776 (37.1%)	881 (42.1%)	272 (39.0%)	<0.001
Caesarean delivery	676 (32.3%)	840 (40.2%)	868 (41.5%)	937 (44.8%)	255 (36.5%)	<0.001
Intrapartum hemorrhage	≤5 (0.2%)	6 (0.3%)	≤5 (0.1%)	7 (0.3%)	≤5 (0.7%)	0.175
Postpartum hemorrhage	109 (5.2%)	129 (6.2%)	118 (5.6%)	134 (6.4%)	34 (4.9%)	0.343
Operative vaginal delivery	247 (11.8%)	181 (8.7%)	159 (7.6%)	136 (6.5%)	42 (6.0%)	<0.001
Severe perineal laceration	69 (3.3%)	50 (2.4%)	67 (3.2%)	31 (1.5%)	9 (1.3%)	<0.001
Maternal premature rupture of membranes	284 (13.6%)	328 (15.7%)	327 (15.6%)	281 (13.4%)	89 (12.8%)	0.047

Results

Infant Outcomes by Maternal BMI and Weight Loss Group

	BMI≤25	25<BMI≤30	30<BMI≤35	BMI>35	Surgical Group	*P Value*
Infant length of stay	2.42 (5.42)	2.98 (8.04)	3.36 (9.53)	3.47 (12.21)	3.16 (7.12)	0.002
Infant birth weight (g)	3,304.4 (518.4)	3,385.9 (589.6)	3,421.1 (608.7)	3,451.1 (652.5)	3,186.8 (613.6)	<0.001
Gestational age at birth	38.9 (1.75)	38.8 (2.18)	38.7 (2.2)	38.6 (2.3)	38.4 (2.32)	<0.001
Stillbirth/neonatal death	9 (0.4%)	10 (0.5%)	10 (0.5%)	15 (0.7%)	≤5 (0.7%)	0.663
NICU admission, within 30 days	239 (11.4%)	306 (14.6%)	347 (16.6%)	370 (17.7%)	122 (17.5%)	<0.001
Congenital malformation within 30 days	93 (4.4%)	120 (5.7%)	120 (5.7%)	110 (5.3%)	36 (5.2%)	0.319
Severe infant morbidity/mortality	117 (8.5%)	236 (11.3%)	249 (11.9%)	263 (12.6%)	79 (11.3%)	<0.001

Results

Adjusted estimates of the association of BMI variation and bariatric surgery on maternal outcomes

Maternal Outcomes				
Adjusted Odds Ratio for Gestational Diabetes Non-Surgery Per BMI Category vs. Surgery				
	Point Estimate	95% Wald Confidence Limits [a]		p value [b]
BMI ≤ 25 vs. Surgery	1.268	0.891	1.803	0.1872
25 < BMI ≤ 30 vs. Surgery	2.195	1.574	3.062	<.0001
30 < BMI ≤ 35 vs. Surgery	2.935	2.124	4.055	<.0001
BMI > 35 vs. Surgery	3.472	2.524	4.776	<.0001
Adjusted Odds Ratio for Preeclampsia/HELPP Syndrome Non-Surgery Per BMI Category vs. Surgery				
	Point Estimate	95% Wald Confidence Limits [a]		p value [b]
BMI ≤ 25 vs. Surgery	1.504	0.900	2.513	0.1192
25 < BMI ≤ 30 vs. Surgery	3.039	1.899	4.862	<.0001
30 < BMI ≤ 35 vs. Surgery	4.416	2.806	6.952	<.0001
BMI > 35 vs. Surgery	6.648	4.263	10.368	<.0001
Adjusted Odds Ratio for Post-partum Hemorrhage Non-Surgery Per BMI Category vs. Surgery				
	Point Estimate	95% Wald Confidence Limits [a]		p value [b]
BMI ≤ 25 vs. Surgery	0.985	0.649	1.497	0.9452
25 < BMI ≤ 30 vs. Surgery	1.179	0.783	1.774	0.4305
30 < BMI ≤ 35 vs. Surgery	1.090	0.724	1.642	0.6802
BMI > 35 vs. Surgery	1.237	0.826	1.851	0.3019

Results

Adjusted estimates of the association of BMI variation and bariatric surgery on fetal/infant outcomes

Fetal/infant outcomes				
Adjusted Odds Ratio for Stillbirth/Neonatal Death Non-Surgery Per BMI Category vs. Surgery				
	Point Estimate	95% Wald Confidence Limits [a]		p value [b]
BMI ≤ 25 vs. Surgery	0.568	0.215	1.503	0.2549
25 < BMI ≤ 30 vs. Surgery	0.595	0.230	1.542	0.2854
30 < BMI ≤ 35 vs. Surgery	0.501	0.189	1.329	0.1650
BMI > 35 vs. Surgery	1.030	0.430	2.464	0.9475
Adjusted Odds Ratio for Apgar Score <7 at 5-minutes Non-Surgery Per BMI Category vs. Surgery				
	Point Estimate	95% Wald Confidence Limits [a]		p value [b]
BMI ≤ 25 vs. Surgery	0.489	0.282	0.846	0.0106
25 < BMI ≤ 30 vs. Surgery	0.867	0.529	1.421	0.5718
30 < BMI ≤ 35 vs. Surgery	0.846	0.519	1.380	0.5035
BMI > 35 vs. Surgery	1.047	0.654	1.678	0.8478
Adjusted Odds Ratio for Composite Fetal/Infant Morbidity/Mortality [c] Non-Surgery Per BMI Category vs. Surgery				
	Point Estimate	95% Wald Confidence Limits [a]		p value [b]
BMI ≤ 25 vs. Surgery	0.763	0.563	1.034	0.0812
25 < BMI ≤ 30 vs. Surgery	1.070	0.800	1.431	0.6474
30 < BMI ≤ 35 vs. Surgery	1.132	0.850	1.508	0.3954
BMI > 35 vs. Surgery	1.213	0.914	1.609	0.1813

Discussion

- Surgical weight loss associated with significantly altered pregnancy and perinatal trajectory with no severe adverse outcomes
  - Despite higher BMI, outcomes in those with previous surgical weight loss were similar to BMI $\leq$ 25, and lower than the higher BMI classes

- Surgical weight loss exceeds expectations
  - Surgical weight loss may be protective for range of outcomes
  - Likely multifactorial, including weight-independent mechanisms

Thank you!

Questions?