A neonatal outcome-based definition of maternal hypotension during cesarean delivery- a pilot study Ling-Qun Hu MD, Yun Xia MD, Brett Worly MD MBA, Liz James, MD Ohio State University

Background and Hypothesis

- Newborns born via Cesarean delivery are at higher risk of neonatal intensive care admissions when compared to babies born via vaginal delivery (1,2)
- Spinal anesthesia, which is often employed in Cesarean deliveries, can lead to hypotension in up to 71% of patients (3) with varied consequences
- Blood pressure measured at the arm is commonly used to assess for circulation
- This prospective study aims at investigating the correlation between hypotension with neonatal outcomes in obese patients with or without hypertensive disorders of pregnancy by comparing blood pressure measurements taken at the arm and the ankle
- Null hypothesis: Poor neonatal outcomes are not associated with hypotension
 - 1. Geller EJ, et al. Journal of Perinatology. 2010.
 - 2. Klöhr SS, et al. Acta Anaesthesiologica Scandinavica. 2010.
 - 3. Butwick J, et al. British Journal of Anaesthesia. 2015.

Study Design

- Blood pressure measurements were taken at the arm and left ankle both in the supine and left uterine displacement positions at three time points: before spinal anesthesia, after spinal anesthesia, and postdelivery.
- Primary outcomes included maternal hypotension (based on 11different criteria) and neonatal outcomes including fetal heart rate< 110, Apgar Score at 1 minute <7, Apgar Score at 5 minutes <7, Airway Support, NICU admission under the umbrella term FAAN.
- Secondary outcomes included nausea and vomiting, arm discomfort, and shivering.

Results

- 97 patients were enrolled into the study, with 37 patients having some form of hypertensive disorder of pregnancy (HDP).
- 35% of babies born to patients with HDP met one of the FAAAN outcomes when compared to 12% of babies born to non-HDP
 - Notably, 22% of babies born to HDP patients were sent to the NICU vs 7% of babies born to non-HDP patients.
- There was no association with FAAAN outcome and hypotension, regardless of the definition being used.
- There was a larger decrease in blood pressure noted in the arm when compared to the ankle following spinal anesthesia. In addition, there was a higher SBP measured at the ankle when compared to the arm after delivery.
- 15 degree left uterine displacement increased blood pressure pre-spinal but not post.
- Secondary outcomes did not differ significantly between groups.

	Spinal Anesthesia (supine) (After - Before spinal)		Left Uterine Displacement (After - Before BPsupine-15° LUD)						Fetal Body Weight	
			Before spinal		After spinal		Post Delivery		(supine) (Post Delivery-After spinal)	
	Estimate Δ	P-value	Estimate Δ	P-value	Estimate Δ	P-value	Estimate Δ	P-value	Estimate Δ	P-value
SBP Arm (Mean (95%CI))	-11.6 (-16.4, -6.7)	<0.001	-3.0 (-7.9, +1.9)	0.223	-0.2 (-5.1, -4.7)	0.930	-1.7 (-6.6, -3.2)	0.491	+2.0 (-2.9, +6.9)	0.431
SBP Ankle (Mean (95%CI))	- 4.4 (-9.3, +0.5)	0.078	+4.2 (-0.7, +9.1)	0.093	-2.2 (-7.0, +2.7)	0.385	-1.6 (-6.5, +3.4)	0.532	+7.5 (+2.6, +12.5)	0.003
MAP Arm (Mean (95%CI))	-11.2 (-14.3, -8.1)	<0.001	-4.2 (-7.3, -1.1)	0.008	+0.1 (-3.0, +3.1)	0.968	-1.6 (-4.7, +1.5)	0.312	+4.4 (+1.3, +7.5)	0.005
MAP Ankle (Mean (95%CI))	-6.6 (-9.7, -3.5)	<0.001	+2.6 (-0.5, +5.7)	0.102	-1.0 (-4.0, +2.1)	0.542	-0.4 (-3.5, +2.7)	0.805	+5.3 (+2.2, +8.4)	0.001

Legends: Before Spinal: before spinal anesthesia; After Spinal: after spinal anesthesia; +: increase; -: decrease; LUD: left uterine displacement; BP: blood pressure; BPsupine: blood pressure on supine position; SBP: systolic blood pressure; MAP: mean blood pressure; OR: odds ratio; CI: confidence interval; Δ : difference.

Conclusion

- Poor neonatal outcomes correlated with hypertensive disorders of pregnancy.
- There were no correlation between hypotension and poor neonatal outcome, whether it was measured at the arm or ankle.
- No differences in rates of nausea and vomiting between cohorts
- Ankle BP measurements may provide better hemodynamic insights.
- Further research can provide insight on the relationship of hypotension, placental perfusion, and neonatal outcomes.