

Measuring Changes In Cardiac Output During Cesarean Section Using Left Ventricular Outflow Tract Velocity Time Integral (LVOT VTI)

Julia Morrison¹, Kevin Ren¹, George Dumitrascu¹, Elizabeth Miller¹, Colleen McFaul¹, Elio Belfiore¹, Wesley Rajaleelan¹, Arnaud Hondjeu¹, Daniel McIsaac¹, Mohamed Eissa¹ ¹The University of Ottawa, Department of Anesthesiology and Pain Medicine



CVD is a leading cause of • maternal mortality



HR and BP are often unreliable or late markers of cardiac output, especially during C-section



Echocardiography is an important tool in the diagnosis and management of CVD in pregnancy



- that passes blood into the aorta

Obtain A5C view by placing cardiac probe beneath patient's left breast



uOttawa



Inclusion Criteria:

- I. Singleton pregnancy.
- 2. Gestational age 36-42 weeks.
- 3. Elective caesarean section (CS) done under spinal anesthesia

Exclusion Criteria:

- I. Maternal cardiac disease
- 2. Multiple gestation.
- 3. BMI > 40
- 4. Polyhydramnios
- 5. Obstetrical emergencies
- 6. CS done under general anesthesia or epidural anesthesia.

SCANNING PROTOCOL Ŵ

- 1. 55 full term parturients recruited (in progress)
- following timepoints:
 - **T1)** Pre-op holding
 - and initiation of phenylephrine at 40 mcg/min
 - **T3)** 3-5 minutes post-delivery
 - T4) PACU 30-60 minutes post-op





One POCUS-certified anesthesiologist performed serial LVOT VTI measurements at the

• T2) 3-5 minutes after spinal anesthetic is administered, adequate blockade confirmed,



Tabl **T** 1 4 1

Timepoint	Mean MD (cm/min)	Standard Deviation (MD)	Mean LVOT VTI (cm)	Standard Deviation (LVOT VTI)
T1	2011.39	423.42	24.93	5.54
T2	1705.21	428.00	22.29	4.11
Т3	2348.89	621.48	28.49	5.24
T4	1639.81	345.87	24.19	4.75

Table 2: Mean MD and LVOT VTI Difference Between T-4 vs. TI

Timepoint	Mean MD	P-	Lower	Upper	Mean LVOT	P-value	Lower	Upper
	Difference	value	95% CI	95% CI	VTI Difference		95% CI	95% CI
	vs T1				vs T1 (cm)			
	(cm/min)							
T2	-306.18	0.0334	-587.62	-24.75	-2.64	0.0547	-5.33	0.055
Т3	337.50	0.0109	80.52	594.48	3.56	0.0038	1.19	5.93
T4	-371.59	0.0007	-577.74	-165.44	-0.74	0.418	-2.55	1.078









- Compared to TI (pre-op), there was a statistically significant increase in MD (and thus CO) at T3 (postpartum), and a statistically significant decrease at T2 (postspinal) and T4 (PACU)
- MD increase at T3 is consistent with augmented preload due to maternal autotransfusion and relief of inferior vena cava obstruction immediately after delivery
- MD decrease at T4 fits with the known decline in CO about one-hour post-delivery
- MD decrease at T2 corresponds with the expected sympathectomy and preload drop immediately after spinal anesthesia



- LVOT VTI via POCUS is feasible to measure at multiple intra-op timepoints during CS, and results reflected expected peripartum CO changes
- Further participant analysis is required to investigate how factors such as blood loss, spinal dose, and glycopyrrolate use affect LVOT VTI and MD
- Findings support future research that will be required to apply this technique in high-risk CS patients



5-chamber view



pulsed wave doppler at the LVOT

Tracing the envelope of the LVOT flow

THANK YOU!



REFERENCES:

5. JAMA 1996; 276: 889-97	9
6. JAMA 2001; 286: 309-14	I
7. N Engl J Med 2003; 348: 5-14	I
8. Am J Cardiol. 1996 Sep 15; 78:708–	·

	Anesth A	Analg	201	;	2: I	384-9
--	----------	-------	-----	---	------	-------

- 2. Anesth Analg 2011; 112: 1392-402
- 3. Intensive Care Med 2010; 36: 1327-32
- 4. Anesth Analg 2011; 113: 994-1002

- Eur Heart J. 1995; 16:194–200
- 10. Cardiovasc Res. 1983;17:75-80
- I. Cardiovascular Journal of South Africa. 2016; 27(2), 89–94
- 12. Anesth Essays Res. 2013 May-Aug;7(2):155–159