Cerebral and Somatic Tissue Oximetry During Different Physiologic Challenges

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Background: Measuring tissue oxygen saturation based upon near infrared spectroscopy (NIRS) allow reliable measurements of cerebral and regional circulations. We hypothesized that continuous tissue oximetry can detect changes in preload during leg raise test and Valsalva maneuvers.[1]

Methods: With IRB approval 28 healthy volunteers underwent two tests: 1) Leg rise Test (LRT)[2]: period of baseline monitoring (2 min) followed LRT (2 min) and 2) Valsalva maneuver: baseline period for (3 min) followed by Valsalva maneuvers for 20 seconds. Each subject was monitored with EKG, blood pressure. Stroke volume derived from the measured impedance to an electrical current applied to the chest was measured non-invasively (Starling, Cheetah Medical, MA, USA)[3]. Data analyzed with commercially available software (LabChart 7 Pro, v 7.3.8). Summary values are expressed as mean (SD). Values during LRT and Valsalva maneuver were compared to their corresponding baseline with paired t-tests, P value <0.05 is considered significant.

Results: Valsalva maneuvers was associated with reduction in SV, cerebral and forearm regional oxygen saturation by 18.2, 2.2 and 1.4 % respectively. LRT was associated with an increase in SV and forearm regional oxygen saturation by (15.7% and 1.0%) respectively. Summary of the data with percent change from baseline during each challenge is shown in table 1

Discussion: Valsalva resulted in an increase in intrathoracic pressure which impede venous return and reduce preload associated with reduction of SV resulting in reduction on oxygen saturation to brain and forearm. While in transient LRT there is increase in preload which is resulted in an increase in SV which is reflected by mild increase in the forearm rSO2

	Valsalva		
	Baseline	duirng Valsalva	% change
Cerberal rSO2	76.2 (6.7)	74.4 (7.8) **	-2.2
Forearm rSO2	75.9 (6.8)	74.8 (6.4) **	-1.4
SV	91 (20)	75(18) **	-18.2
	Leg raise test (LRT)		
	Baseline	duirng LRT	% change
Cerberal rSO2	76.8 (6.8)	76.9 (6.8)	0.1
Forearm rSO2	75.4 (7.7)	76.1 (6.9) **	1.0
SV	90 (24)	105 (26) **	15.7
** P value < 0.05			

Table 1: Summary of the data with percent change from baseline during each challenge

References:

1. Semin Cardiothorac Vasc Anesth 2016;20(3):213-24
2. *Intensive Care Med* 2010; 36(11):1875-1881.
3. *Am J Physiol Heart Circ Physiol* 2007; 293(1):H583-589