

## END-TIDAL CO<sub>2</sub> MONITORING FOR ASSESSING VENTILATION-PERFUSION TRENDS IN NEONATES >2500G

AnnaMarie Arias-Shah<sup>1</sup>, Joseph L Hagan<sup>2</sup>, Suzanne F Iniguez<sup>3</sup>, Richard T Nguyen<sup>4</sup>, Lee Evey<sup>2</sup>, Mohan Pammi<sup>2</sup>, Caraciolo J Fernandes<sup>2</sup>

<sup>1</sup> Baylor College of Medicine, Department of Pediatrics, Neonatology

<sup>2</sup> Baylor College of Medicine, Pediatrics, Neonatology

<sup>3</sup> Texas Children's Hospital, Respiratory, Neonatology

<sup>4</sup> Texas Children's Hospital, Respiratory, Pediatrics

**Background:** Continuous end-tidal CO<sub>2</sub> (ETCO<sub>2</sub>) monitoring is commonly used in adult and pediatric intensive care units, however its use in the neonatal intensive care unit (NICU) is not common. While conflicting data exist regarding its accuracy in neonates, few studies have addressed how monitoring the arterial CO<sub>2</sub> (PaCO<sub>2</sub>) to ETCO<sub>2</sub> difference (PaCO<sub>2</sub>-ETCO<sub>2</sub>) can aid in assessing ventilation and perfusion (V/Q) trends. Newborns with congenital diaphragmatic hernia (CDH) are potentially an ideal population to study the effects of V/Q status on PaCO<sub>2</sub>-ETCO<sub>2</sub> agreement via pre- versus post-operative comparisons. Our study aims are to: 1) To assess the accuracy of mainstream ETCO<sub>2</sub> monitoring in neonates weighing >2500 grams and 2) To determine whether ETCO<sub>2</sub> to PaCO<sub>2</sub> agreement improves in CDH infants after surgical repair.

**Materials/Methods:** This was a prospective, single center observational study conducted in neonates >2500g receiving conventional mechanical ventilation in the NICU. ETCO<sub>2</sub> measurements at the time of arterial blood gas (ABG) sampling were compared with PaCO<sub>2</sub> from the ABG for a maximum of five days. Data abstracted included demographic data, ventilator parameters, medications, and antenatal MRI measurements of CDH severity. Linear regression and Bland-Altman plots were used to determine agreement between PaCO<sub>2</sub> and ETCO<sub>2</sub>. Mixed linear effects models were used to evaluate the PaCO<sub>2</sub>-ETCO<sub>2</sub> difference observed in neonates with CDH before and after surgical repair.

**Results:** We enrolled a prospective cohort of 41 neonates (gestational age 38 +/-2 weeks and weight 3280g +/- 710 g, mean +/- SD). A total of 338 dyad measurements comparing ETCO<sub>2</sub> to corresponding PaCO<sub>2</sub> on ABG were collected. ETCO<sub>2</sub> was consistently lower than PaCO<sub>2</sub> (mean difference of 9.9 mmHg +/-7.6). The correlation between ETCO<sub>2</sub> and PaCO<sub>2</sub> measurement was r= 0.740. In neonates with CDH (n=6), ETCO<sub>2</sub> accuracy increased after surgical correction from an average difference of 12.4 ± 7.2 mm Hg pre-operatively compared to 4.4 ± 5.6 mm Hg post-operatively (p=0.007).

**Conclusions:** There is moderate agreement between ETCO<sub>2</sub> and PaCO<sub>2</sub> in mechanically ventilated neonates >2500g. In neonates with CDH, the PaCO<sub>2</sub>-ETCO<sub>2</sub> difference improves significantly after surgical correction. These findings suggest that monitoring the trends in PaCO<sub>2</sub>-ETCO<sub>2</sub> may be more useful than the absolute value alone in providing real-time information about V/Q trends or pulmonary hypertension status in newborns.