

## ETCO<sub>2</sub> Monitoring of Neonates During Conventional Ventilation

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**Background:** Monitoring of EtCO<sub>2</sub> sampled from the carina (using double lumen ETT and Carinal VitaLine) may allow continuous, non invasive real-time assessment of CO<sub>2</sub> as opposed to arterial PaCO<sub>2</sub> which is sampled intermittently per the decision of the treating physician. Thus, carinal EtCO<sub>2</sub> may improve the control of ventilation over time, and thus may protect infants from the complications of hypocarbia and hypercarbia throughout the period of mechanical intubation.

Previous study<sup>1</sup> demonstrated the correlation and agreement between carinal EtCO<sub>2</sub> and PaCO<sub>2</sub> and showed that it was more accurate than the standard mainstream EtCO<sub>2</sub>. Following this we would like to demonstrate that it could have clinical benefits in the care of ventilated infants.

**Aim:** The aim of this study was to compare the time spent within a defined safe range of carbon-dioxide (30 mmHg < PaCO<sub>2</sub> < 60 mmHg), during conventional ventilation between infants monitored with carinal ETCO<sub>2</sub> and those who are not.

**Methods:** A randomized, controlled multicenter study was conducted at 3 tertiary care university-affiliated NICUs. Sidestream ETCO<sub>2</sub> was measured and recorded by a Microstream capnograph (Covidien) via the sampling port of a specialized endotracheal tube and Carinal Vitaline set. Enrolled infants were randomized to: 1. Open group: Data derived from the capnograph was displayed to the medical team and allowed to be used for patient care, 2. Masked group: The measurements were masked to the medical staff and hence were not available for patient care. ETCO<sub>2</sub> was compared with PaCO<sub>2</sub> drawn for patient care.

**Results:** Fifty-five infants (24 open, 31 blinded) participated in the study; groups were comparable. Analysis included 768 simultaneous measurements of ETCO<sub>2</sub> and PaCO<sub>2</sub>, 13 [3-35] measurements per/patient, during 37.1 [5.3-132.0] hours per/patient. ETCO<sub>2</sub> was in good correlation (r=0.73, p<0.001) and agreement (Bland Altman plot: mean difference ± SD of the differences: 3.1 ± 8.5 mmHg) with PaCO<sub>2</sub>. Infants in the masked compared to the open group spent significantly (p<0.01) more time at unsafe range of high (>60 mmHg: 8.8 vs. 3.7%, respectively) or low (<30 mmHg: 8.7 vs. 3.9%, respectively) levels of ETCO<sub>2</sub>. Arterial blood gas analysis results also show that the

monitored group had significantly larger rate of arterial blood gas sampling within the safe PaCO<sub>2</sub> range (p<0.05) and the safe pH range (7.25<pH<7.45, p<0.05). No adverse events occurred in the enrolled infants.

**Conclusions:** ETCO<sub>2</sub> monitoring was found to improve the control of CO<sub>2</sub> levels within a safe range during conventional ventilation. We speculate that this could decrease the sequel of hyperventilation and hypoventilation in these infants.

**References:** Kugelman A, Zyger-Aginski D, Bader D, Shoris I, and Riskin A. A novel method of Distal end-tidal CO<sub>2</sub> capnography in intubated infants: Comparison to arterial CO<sub>2</sub> and to proximal mainstream end-tidal CO<sub>2</sub>. Pediatrics 2008; 122: e1219-e1224.