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Introduction. Transcutaneous CO₂ monitoring is well described in neonates through adolescents. There has been literature evaluating the relative efficacy of transcutaneous CO₂ (TCO₂) versus end tidal CO₂ (EtCO₂) monitoring as a reflection of PaCO₂. Publications relating to use in respiratory failure [1] and congenital heart disease [2] have found better correlation with PaCO₂, however a recent review suggest that TCO₂ is an adjunct to end tidal CO₂ [3]. An article which suggests EtCO₂ monitoring for longitudinal NICU monitoring [4] supports this, however a more variable intraoperative cohort suggests that TCO₂ may be more accurate [5]. The prior studies compared each monitor to arterial blood gas measurements but did not directly compare TCO₂ to EtCO₂.

Methods. Three premature babies (2M, 1F) with hydrocephalus underwent surgery for placement of McComb reservoirs. Baby B is the twin of Baby A. At time of surgery, babies ranged from 32 to 35 weeks post-gestational age, and weighed between 1.74 to 3.06 kg. Two of the babies (A and C) returned for surgery 1 to 3 weeks later to remove the reservoir and other issues. Following standard anesthesia care, patients were followed intraoperatively with transdermal CO₂ and end tidal CO₂ . CO₂ readings and vital signs were recorded q5 mins throughout surgery. PaCO₂ measurements were available in four of the 5 surgeries. All patients were anesthetized with sevoflurane, supplemented with fentanyl, propofol and/or rocuronium.

Results. Measured CO₂ was consistently higher with TCO₂ than EtCO₂. The correlation (Pearson r) between the two measures of CO₂ was significant at P<.05. The correlation of TCO₂ with EtCO₂ in neonates on two occasions shows good test-retest reliability over time (8 to 21 days) in Babies A and C. The final measurement of TCO₂ correlated 0.78 with PaCO₂ taken at the end of the case; this correlation is not significant with only 4 data points, but EtCO₂ showed a much weaker relationship. (Fig. 3)

Discussion. This was a limited comparison, these preliminary observations are intended to inform a future study. With only 3 cases, measurement is over a very limited range of values, limiting the conclusions that can be drawn. Within individual patients, there is considerable variation in CO₂ measures over time despite stable pulse & O₂ saturation (Figs. 1 and 2). The role of intraoperative events (e.g. intubation, drug administration, change in body position) remains to be clarified and may help to explain some of the variability in the correlation between Transdermal and End tidal measures of CO₂.

References.

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- [3] Tobias J. *Ped Anes* 2009; 19: 434-44.
- [4] Nangia S, et al. *Ind J Ped* 1997;64: 389-94.
- [5] Nosovitch MA, et al. *Paediatr Anaesth* 2002; 12: 48-52.

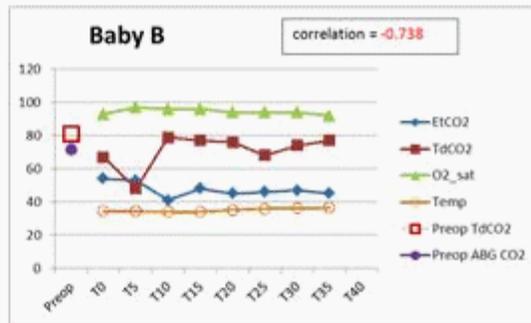
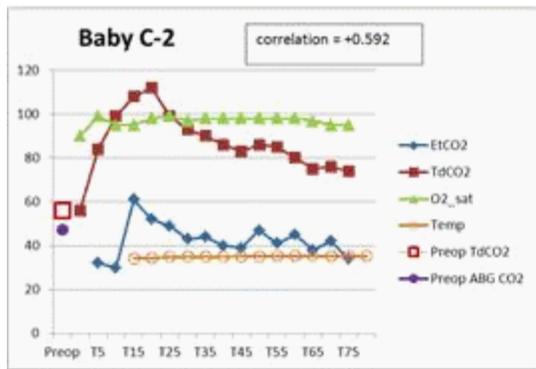


Figure 1. Baby C, 2nd surgery. Positive correlation between TCO₂ and EtCO₂, $r=+0.592$, $P<.05$, 2-tailed.

Figure 2. Baby B. Negative correlation between TCO₂ and EtCO₂, $r= -0.738$, $P<.05$, 2-tailed.

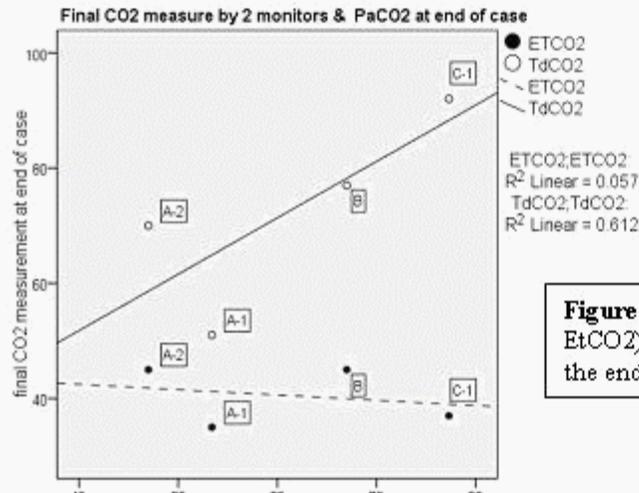


Figure 3. Final TCO₂ measurement (but not EtCO₂) correlates well with PaCO₂ measured at the end of surgery.