

Online supplement

Methods:

Monitoring systems

Within our delivery room we have physiological recording system to record changes in heart rate, oxygen saturation, respiratory function, and cerebral oxygenation if research personal is available.

IntelliVue MP50 monitor (Philips Healthcare, Philips Electronics Ltd., Markham, ON, Canada) was used to continuously measure heart rate, oxygen saturation, and blood pressure. A Masimo Radical pulse oximeter (Masimo Corporation, Irvine, CA) probe set at maximum sensitivity and two second averaging was placed around the infant's right hand or wrist to measure oxygen saturation. Heart rate was measured using electrocardiogram with three Micro-Premie Leads (Vermed, Bellows Falls, VT, USA).

A respiratory profile monitor (NM3, Philips Healthcare, Electronics Ltd., Markham, ON, Canada) was used to continuously measure tidal volume (V_T), airway pressures, gas flow, and exhaled CO_2 . Airway pressure and gas flow are measured using fixed orifice differential pressure pneumotachometer. V_T was calculated by integrating the flow signal. Exhaled CO_2 was measured using non-dispersive infrared absorption technique. According to the manufacturer, the accuracy for the gas flow is ± 0.125 L/min and for ECO_2 ± 2 mmHg[1].

An InVos™ Cerebral/Somatic Oximeter Monitor (Invos 5100, Somanetics Corp., Troy, MI) with the neonatal sensor was used to measure $crSO_2$. A transducer contains a light emitting diode and two sensors with different distances. The InVos™ Cerebral/Somatic Oximeter Monitor calculates the regional cerebral oxygenation, which

is expressed as the percentage of oxygenated hemoglobin (oxygenated hemoglobin/total hemoglobin). The transducer was positioned on the left fronto-parietal forehead in each infant regardless of mode of delivery. The sensor on the forehead was secured with a wrap[2].

Results:

Respiratory Parameters

Infants in the CC+SI group had significant higher respiratory rates with 91 (1) inflations/min vs. 29 (2) inflations/min in the 3:1 C:V group ($p=0.0001$). The delivered tidal volume ranged between 0.6 to 4.4 mL/kg in the CC+SI group and 0.8 to 4.5 mL/kg in the 3:1 C:V group. Median (IQR) minute ventilation was significantly higher in the SI+CC group compared to the 3:1 C:V group 165 (85-216) vs. 101 (48-110) mL/kg/min ($p=0.0001$). The PIP during CC (3:1 C:V or SI) was similar between groups 3:1 C:V ratio group 26.5 (2) mm Hg compared to 29 (4.5) mm Hg ($p=0.563$). PEEP was significantly higher in the CC+SI group with 24.6 (2.4) mmHg to 6.8 (0.8) mmHg in the 3:1 C:V group ($p=0.0001$). Leak was significantly lower in the CC+SI group with 30 (40) % compared to 63 (40)% ($p<0.001$) in the 3:1 C:V ratio group. Overall, the exhaled CO₂ was significantly higher in the CC+SI group with 11 (9) mm Hg compared to 2 (1) mm Hg ($p<0.001$) in the 3:1 C:V ratio group suggesting improved gas exchange in the CC+SI group.

References

- 1 van Os S, Cheung P-Y, Pichler G, *et al.* Exhaled carbon dioxide can be used to guide respiratory support in the delivery room. *Acta Paediatrica* 2014;**103**:796–806. doi:10.1111/apa.12650
- 2 Pichler G, Binder-Heschl C, Avian A, *et al.* Reference ranges for regional cerebral

tissue oxygen saturation and fractional oxygen extraction in neonates during immediate transition after birth. *J Pediatr* 2013;**163**:1558–63.
doi:10.1016/j.jpeds.2013.07.007