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EFFICIENCY OF MASK VENTILATION IN PRETERM INFANTS AT BIRTH

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Aim: To investigate the efficiency of mask ventilation in preterm infants after birth.

Methods: Recordings of airway pressures and gas flow of infants < 32 weeks gestation needing mask ventilation at birth were reviewed. Respiratory support was delivered with a T-piece and mask. Inflations in the first 5 minutes were analyzed for significant leak (> 60%), low expired tidal volume (V_{Te}) < 3.0 ml/kg, high V_{Te} (> 15 ml/kg in initial sustained inflations of 3 seconds, > 10 ml/kg in subsequent inflations). Airway obstruction could only be observed leak was minimal.

Results: Recordings of 26 infants (mean (SD) gestation 28.0 (1.6) weeks, birth weight 1120 (322) grams) were suitable for analysis. In 26 infants 130 sustained inflations (5 (2) per infant) were given and median (IQR) leak was 84 (40-100)% and V_{Te} was 2.1 (0-6.7) ml/kg. In 20/26 infants 1513 subsequent inflations (75 (50) per infant) were given and leak was 56 (8-100)% and V_{Te} 2.9 (0.3-5.8) ml/kg. The proportion of infants and percentage of inflations with significant leak, low V_{Te} , high V_{Te} and obstruction are shown in Table 1.

	Sus- tained inflations Propor- tion of patients (%) (N = 26)	Sus- tained inflations Percen- tage of inflations (N=130)	Sub- sequent inflations Propor- tion of patients (%) (N =20)	Sub- sequent inflations Percen- tage of inflations N=1513
Significant leak (>60%) (> 60%)	21 (80 %)	80 (60- 100) %	20 (100 %)	50 (21-82) %
Low V_{Te} (< 3.5 ml/kg)	20 (77 %)	80 (40- 100) %	20 (100 %)	60 (29-75) %
High V_{Te} (> 15 ml/kg for sustained and > 10 ml/kg for continued inflations)	3 (12 %)	40 (20- 40) %	13 (65 %)	5 (2-16) %
Obstruction during *inflations with minimal leak (<30%)	4 (15 %)	80 (30- 100) % *N=30	10 (50 %)	22 (10- 53 %) *N=426

[table 1]

Conclusion: During mask ventilation of preterm infants at birth tidal ventilation is frequently low and hampered by mask leak and obstruction. High V_{Te} occurred occasionally.

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SURFACE ACTIVITY OF SMALL VOLUME AIRWAY ASPIRATES SUCTIONED DURING NEONATAL RESUSCITATION

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Background: Only small amounts of surfactant are needed for measuring biophysical activity in the captive bubble surfactometer (CBS). Using large sample volumes, amniotic fluid or gastric aspirates have been used before for prediction of lung maturity in neonates. With the CBS the analysis of surfactant samples from neonatal aspirates with small volumes and low amounts of phospholipids can be performed.

Aims: To prepare surfactant samples from small volumes of oro-nasal aspirates suctioned during

neonatal resuscitation, to determine the surface activity and to compare the results with clinical data.

Methods: Suction aspirates and clinical data of 74 individuals were collected with parental consent, weighed and mucus, cell detritus plus large particles were removed. Subsequently the samples were ultracentrifuged. The pellet was resuspended at a ratio of 60 μ L/1g of original sample size. Then surface tension of 1-5 μ L of the samples was determined after 5 min adsorption to a ~20 μ L bubble in the CBS using sucrose as a surfactant hypophase.

Results: Surface tension of aspirates of neonates with a bw < 1500g was 48.6 $\pm$ 5.4mN/m (Mean $\pm$ SD) and significantly increased compared to individuals >2000g (35.8 $\pm$ 9.9; p < 0.01). Absorption surface tension in non-ventilated neonates was significantly lower (34.1 $\pm$ 9.8mN/m) compared to CPAP treated neonates (47.8 $\pm$ 7.4 mN/m; p < 0.05) or mechanically ventilated individuals (48.4 $\pm$ 5.6 mN/m; p < 0.01)

Conclusions: Small volume airway samples from neonatal aspirates may be used to determine biophysical activity of the surfactant system quantitatively using the CBS. The obtained data correlate with the clinical course, birth weight and the mode of ventilatory support.

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PULSE OXIMETRY SCREENING FOR DETECTION OF CRITICAL CONGENITAL HEART DISEASE IN THE UNITED KINGDOM

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Background and aims: Pulse oximetry screening (POS) has been proposed as an effective and non invasive screening tool to increase the detection of critical congenital heart disease (cCHD). The objective of our survey was to assess the current practice in UK neonatal units.

Methods: Level 3 and level 2 units in the UK were contacted to participate in a telephonic questionnaire in April 2010.

Results: All 135 units contacted agreed to participate in the survey. 20(15%) units are currently practising routine POS. POS is usually performed before 24 hours in all units either by a trained nurse or doctor. Four centres were part of a multicentric

trial in 2008-09. Saturation of < 95% in either limb (right hand or any foot) or $\geq$ 3% difference between the two is considered significant (positive). In the remaining 16 centres postductal saturation of < 95% in the foot is considered positive. A second reading is obtained in all positive cases within next 2 hours and if still positive, a senior review followed by early echocardiogram is undertaken. All units expressed that a saturation reading of < 90% in a baby who has no other obvious cause warranted an urgent echocardiogram.

Conclusion: Two large trials in Europe have recommended that POS should be used as an adjunct to postnatal examination to improve detection of cCHD. Our survey shows that a minority of centres are practising POS in UK and are using different criteria. With mounting evidence, all units should consider adopting POS as a screening tool.

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HIGH-SPEED VIDEO ANALYSIS OF HIGH-AMPLITUDE BUBBLE-CONTINUOUS POSITIVE AIRWAY PRESSURE DEMONSTRATES THAT "WATER HAMMER" EFFECTS CAUSE LARGE OSCILLATIONS IN AIRWAY PRESSURE

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Background and aims: We have shown, in lavaged rabbits, that High-Amplitude Bubble-Continuous Positive Airway Pressure (HAB-CPAP, see figure) provides greater gas exchange and lower work of breathing than conventional bubble-CPAP (PedsResearch, June, 2010). The mechanisms generating the high amplitude pressure waves are the focus of this study.

Methods: A high-speed camera (Phantom V9.1; 900 frames/s) was used to visualize, simultaneously, the bubbling action in the HAB-CPAP device and airway pressures (Paw) measured in the patient circuit. Signals were generated with/without an infant lung model attached to the patient circuit. Measured changes in Paw were compared with calculated values obtained using a force balance.

Results: Videos revealed sharp increases in Paw concomitantly with the release of bubbles. Water appears to rush down the inclined tube and transfers momentum to the air it contacts, producing a water hammer effect. The rapid rise in