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PRETERM BIRTH – A STRONG AND INDEPENDENT RISK FACTOR OR HIGH BLOOD PRESSURE IN YOUNG SWEDISH MEN

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Background: Low birth weight due to fetal growth restriction is an established risk factor for hypertension later in life, but the effect of preterm birth is less well studied.

Methods: A population-based cohort study including 329,477 Swedish men conscripting for military service 1991 – 2001, using individually linked data from three national registres. Multipe logistic regression analyses were used to evaluate the risk of high systolic blood pressure (SBP; ≥ the 90th percentile). Adjustments were done for perinatal and socioeconomic confounders. **Findings:** here was an inverse relationship between gestational age and risk of high SBP at conscription. Compared to men born at term (gestational age 37–41 weeks) the adjusted odds ratio (OR) of high SBP increased to 2.58 (95% CI: 1.76–3.77) among men born extremely preterm (gestational age 24–28 weeks). Due to an interaction between gestational age and body mass index (BMI) at conscription, the cohort was stratified by gestational age. Compared to men born at term, obesity at conscription (BMI ≥ 30 kg/m^2) was more strongly associated with high SBP among men born very preterm (gestational age 24–32 weeks). Among men born at term, small-for-gestational age was associated with an increased risk of high SBP (adjusted OR = 1.32, CI: 1.24–1.39). On the other hand, there was no blood pressure effect of being small-for-gestational age in the very preterm group (adjusted OR 0.99, CI:0.64–1.53). **Interpretation:** reterm birth is the strongest perinatal risk factor for high SBP in young men. In particular, the combination of very preterm birth and later obesity is associated with a high risk of high SBP. In addition, being small-for-gestational age after preterm birth has no impact on later blood pressure. The association between preterm birth and blood pressure may have a different biological explanation than the established association between low birth weight at term and hypertension. Future research should consider that possibility.

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HYPERKALAEMIA IN THE EXTREMELY LOW BIRTH WEIGHT PRETERM INFANT

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Background: The purpose of the study was to investigate factors that affect potassium(K) homeostasis over the first 6 days of life in extremely low birth weight (ELBW) preterm infants.

Methods: Clinical and laboratory data was collected retrospectively on infants >23 and <27 weeks admitted to NICU from January '01 to December '02. Infants were excluded if they had a congenital abnormality or died at <24 hours. Haemolysed samples were excluded. Correlation of variables was analysed using Mann Whitney, Fisher Exact, one way ANOVA and multiple linear regression.

Results:80 infants were eligible with a median birth weight and gestational age of 722g(IQR 220g) and 25.0 wks(IQR 1.8 wks). 48(60.0%) had at least 1 episode of hyperkalaemia(K 6.5mmmol/L). Lowest mean K levels(4.8mmol/L SD 1.1) occurred on D1 rising to a peak mean (5.9 mmol/L SD 1.3) on D2 of life. Absolute [K] did not correlate with survival. There was a significant increase in [K] levels on D2-D3 in infants who died vs survivors (0.6mmol/L v –1.0mmol/L p=0.0087). 16 of 45 infants died in the hyperkalaemic group (35.5%).15 of 31died in the normokalaemic group (48.4%). This was not significant. There was no correlation between [K] and [Na] concentration;mean arterial pressure;urine output;gestation;sex or pH. There was a negative correlation between glucose levels and [K] on days 2, 6 (p- values 0.02, 0.007). Mean [K] were significantly higher in infants who were hypoglycaemic (glucose<2.8). This was noted on D2 of life(6.8mmol/L vs 5.6mmol/L p=0.003). The mean [K] were significantly lower in infants who had received 2 doses of antenatal steroids(ANS) (n = 41) vs those who received none (n= 21) on D1(5.(1.1) vs 4.6 (0.9) mmol/L p-value=0.02) and D2(6.5 (1.5) vs 5.(1.1) p=0.009). There was no significant difference in [K] noted with 1 dose ANS compared with infants who were given no ANS; this was a small group.

Conclusion: Hyperkalaemia affects almost¾ of ELBW preterm infants. [K] tend to rise from D1 to peak on D2. A rise on D3 is associated with a poorer chance of survival. The negative correlation between glucose and [K] may be due to lower substrate source of energy and a decrease in NA-K ATP-ase activity. ANS appear to have a protective effect on [K] levels in the first 48 hours of life in pregnancies of <27 weeks possibly due to steroid induced maturation of Na-K ATP-ase2. 2.Omar S et al Effect of prenatal steroids on potassium balance in extremely low birth weight neonates.Pediatrics 2000;106(3):561–7

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TOLERATING A TRIAL OF ENDOTRACHEAL CPAP PROVIDES MORE INFORMATION ON THE SUCCESS OF EXTUBATION IN PREMATURE INFANTS THAN MEASURED MINUTE VOLUMES

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Background: Ventilated very low birth weight (VLBW) infants are, despite advances in ventilation techniques, at risk of developing chronic lung disease (CLD), sepsis and upper airway obstruction. Expeditious weaning and extubation is desirable but in VLBW infants, failure rates of 20 - 40% have been reported. Re-intubation may cause physiological instability. Having a cot side test that can reliably predict success of extubation may reduce associated morbidity. The aim was to determine whether measures of respiratory function downloaded from the ventilator when the infant was clinically judged to be ready for extubation, could predict successful extubation . Failure of extubation was defined as the need for re-intubation within 120 hours.

Methods: Infants less than 1250g and ventilated on the Dräger Babylog 8000plus for at least 24 hours were eligible for this observational study. Tidal volumes (TV) integrated from airway flow were measured from the flow sensor, proximal to the endotracheal tube (ETT). Three epochs were recorded; 1 minute on weaning mode, 3 minutes of ETT CPAP followed by a further minute on the weaning mode. Cardiorespiratory monitoring continued throughout the study and if during the period of ETT CPAP, the infant became apnoeic with SpO2 below 75% and/or bradycardic (<100bpm), the test was discontinued. These infants were classified as failing the "CPAP test". Spontaneous respiratory rates (RR) were used to calculate minute volume where MV = TV x RR, and pattern of breathing observed for each epoch. The attendant clinicians were blinded to data obtained and the infant subsequently extubated to nasal CPAP.

Results: Of the 33 infants studied nine (27%) required re-intubation [acute stridor (1), apnoea (6) and respiratory acidosis (2)]. Of these nine infants, five had failed the CPAP test (sensitivity 96%, specificity 56%). 27 infants passed the CPAP test, four of whom needed re-ventilating with late onset apnoea (2), stridor (1) and bowel obstruction (1). The physiological measurements of MV, TV, on ETT CPAP were similar in both groups.

	All (n=33)	Success (n=24)	Failure (n=9)
Birth weight (g)	932 (225)	958 (215)	861 (248)
Gestational age (w)	27 (2)	27 (2)	26 (2)
Postnatal age at study (d)	9 (10)	8 (1)	11 (11)
ventilator rate (bpm)	28 (7)	28 (8)	29 (4)
Ventilator mean airway pressure (cmH20)	7.1(1.1)	7.1(1.2)	7.3(1.0)
Minute volume ETT CPAP (mls/kg/min)	297 (107)	286 (105)	326 (109)
Longest pause ETT CPAP (seconds)	10.6(6.8)	9.4(6.1)	13.8(7.6)

Demographic Data represented as means (SD). No statistically significant differences between groups

Conclusion: Infants who tolerated a brief period of ETT CPAP without apnoea or bradycardia, regardless of their measured pulmonary function were more likely to be successfully extubated. Late onset apnoea and unpredictable co-morbidities such as upper airway obstruction cannot be detected by this test.

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OBTAINING PULSE OXIMETRY DATA IN INFANTS - A RANDOMISED CROSSOVER STUDY OF PROBE APPLICATION TECHNIQUES

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Background: Pulse oximetry (PO) gives continuous and objective measures of heart rate (HR) and oxygen saturation. It is used routinely to monitor infants in intensive care. HR is critical in guiding interventions during neonatal resuscitation and is monitored clinically. This is subjective, intermittent, may be difficult and inaccurate. Though not widely used at resuscitation, PO may be useful in objectively detecting HR and titrating FiO2. There are different methods of applying PO probes. We wished to determine the time taken to apply a probe, the time to display accurate HR data and the proportion of correct first displayed HR for each of three methods.

Methods: Randomised crossover study of infants monitored with PO and ECG using a Masimo Radical™ (Masimo, USA) pulse oximeter. All were supine. The probe was applied to the right wrist or hand. It was applied to each infant on three occasions using the following methods: 1. probe connected to PO, then applied to neonate 2. probe connected to PO, applied to investigator's finger, then to infant 3. probe applied to infant, then connected to PO. The order in which the methods were used was allocated randomly. The time taken to apply the probe, to display data and to display accurate HR (ie. values that matched ECG values) were recorded with a stopwatch. The number of accurate first HR for each method was noted. Data were analysed using SPSS.

Results: We studied 40 babies, whose weights, gestational and post-natal ages varied.

	Range	Mean (SD)
Study weight (g)	560–4634	1659 (991)
Postnatal age (days)	0–101	22 (31)
Gestational at birth (weeks)	24–41	29(4.8)

There were no significant differences in the time taken to apply the probe using each method. The mean difference in the time to display correct HR between methods 1 and 3 was 10 seconds (p=0.004). The total time taken to display accurate HR data was quickest for method 3 followed by method 2 then 1. The mean difference in the total time between methods 3 and 1 was 7 seconds (p<0.05) but the differences between paired methods 3/2 and 1/2 did not reach statistical significance. The proportion of correct first displayed HR was 80%, 28% and 93% for methods 1, 2 and 3 respectively. Thus, although method 1 took slightly longer to apply the probe, it was the quickest to display accurate HR data.

	Probe connected to PO, then neonate	Probe connected to PO, applied to investigator's finger, then neonate	Probe applied to neonate, then connected to PO
Time taken to apply probe (sec)	9 (2)	10 (2)	12(2)
Time to display accurate HR after probe applied (sec)	23(20)	18(17)	13(7)
Total time taken to display accurate HR (sec)	32(21)	28(17)	25(7)

Data are mean (SD).

Conclusion: Applying the probe to the right hand or wrist before connection to the Masimo Radical pulse oximeter results in quicker acquisition of HR data which is more accurate in infants in intensive and special care settings. This method of probe application may be preferred during neonatal resuscitation.

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PLACENTAL INSUFFICIENCY AFFECTS NEURODEVELOPMENTAL OUTCOME IN VERY PRETERM INFANTS

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Background: Placental insufficiency has been related to changes in fetal hemodynamics, growth restriction, and neonatal mortality and morbidity. Outcome studies among very premature infants born from pregnancies complicated by placental perfusion defect are sparse.

Methods: The aim of this prospective follow-up study of infants born <32 weeks'gestation was to investigate the relationship between fetal hemodynamics and neurodevelopmental outcome at 1 year of corrected age. After informed consent, 17 infants out of a population of 163 infants born in Oulu University Hospital between November 1998 and November 2002 were enrolled. Inclusion criteria were: preeclampsia and/or pregnancy induced hypertension and/or intrauterine growth restriction, and Doppler US examination of placental and fetal hemodynamics within 24 hours before delivery. A detailed history of pregnancy and labor and medical condition of newborns were obtained. Placental histology was defined by a single pathologist. IL-1á, IL-â, IL-6, IL-8, TNF-á, VEGF, and VEGF-R2 were analysed from cord blood. Infants underwent a serial of brain ultrasound (US) evaluation. Neurodevelopmental outcome was assessed by Griffiths Mental Developmental Scales at 1 year of corrected age. Sub-optimal outcome was defined as general quotient (GQ) below the mean. The study was approved by ethics committee of Oulu University Hospital.

Results: Suboptimal outcome was diagnosed in 5 infants. Pulsatility index (PI) of umbilical artery (P = 0.005), ductus venosus and inferior vena cava (P <0.05) were higher and weight indexed cardiac output of right (RVCO), left (LVCO), and combined (CCO) ventricle (P < 0.05) were lower compared to infants with normal outcome. No correlation was found between retrograde flow pattern in aortic isthmus and suboptimal outcome. No signs of placental inflammation or elevation in cord cytokines were detected in any case (n = 17). Histologic examination revealed perfusion defect in all but one placenta. Increased US periventricular echodensity at 1 to 3 days after birth was found more often in infants with sub-optimal outcome (P = 0.015).

Conclusion: In very preterm pregnancies complicated by placental insufficiency sub-optimal outcome was associated with fetal myocardial failure defined as decrease in weight-indexed RVCO, LVCO, CCO, and rise in systemic venous pressure. In very preterm fetuses low cardiac output rather than retrograde diastolic flow pattern in aortic isthmus associates with sub-optimal outcome.