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EFFECT OF HEAD ELEVATED PRONE POSITION (15°) ON THE INCIDENCE OF APNEAS IN PRETERM INFANTS

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Background: Nursing of preterm infants in *head elevated prone position (HEPP)* has been proposed to reduce apneas without controlled clinical trial up to now.

Objective: To investigate the effect of *HEPP* compared with horizontal prone position on the incidence of apneas.

Design: Randomized, controlled, cross-over trial.

Patients: 20 spontaneously breathing preterm infants with apneas: 26-31 gestational weeks, birth weight 730-1680 g, postnatal age 2-49 d. 15 infants treated with aminophylline (serum concentration 44-81 µmol/l).

Intervention: Each infant was nursed in prone position in an incubator and spent a total of 24 hours in horizontal position and a total of 24 hours in *HEPP* (15°). Position was changed every 6 hours in random order.

Outcome measures: Number of apneas (absence of breathing movements for >10 s by thoracic impedance). Number of severe apneas >20 s and hypoxemia (arterial saturation by pulse oximetry <85% or bradycardia <90 bpm).

Results: There were 24% less apneas in *HEPP* compared with horizontal position (mean difference 16 apneas / 24 h, 95%CI 5-27). Severe apneas were reduced by 21% in *HEPP* (mean difference 9 apneas / 24 hrs, 95%CI 3-15).

Conclusion: Nursing in head up tilt position (15°) reduces central apneas in preterm infants.

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CYTOKINE SERUM LEVELS AND WHOLE BLOOD SUPEROXIDE ANION GENERATION IN MOTHERS AND NEWBORNS DURING PERIPARTUM

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The present study was undertaken in order to evaluate the relationship between cytokine plasma levels and leucocyte burst in mothers and neonates during peripartum. Serum levels of IL-1β, IL-6, TNF-α, IFN-γ and GM-CSF, and whole blood superoxide anion generation (SAG) were evaluated in 27 healthy mothers, 16 undergoing spontaneous delivery (SD) and 11 elective caesarean section (ECS), and in their babies. Blood specimens were taken from the mothers at the beginning of labour (BL), during labour (DL), immediately after delivery (AD) and 4 days after delivery (4DAD) in the SD group, and before the operation, AD and 4DAD in ECS group, from the cord and from the babies 4DAD. The cytokines (IU/ml) were measured by enzyme-linked immunoassay. The SAG assay was performed spectrophotometrically by the method of superoxide dismutase inhibitable reduction of ferricytochrome C, with opsonized zymosan stimulation of PMN in whole blood. Statistical analysis was performed by two-tailed "t" test and by linear correlation. After delivery, SD mothers had higher levels of IL-1β, IL-6 and IFN-γ than ECS (IL-1β: 55.6 ± 49 vs 38.4 ± 23 p < 0.05; IL-6: 74.8 ± 68 vs 12.8 ± 6.7, p < 0.005; IFN-γ: 1.05 ± 1.02 vs 0.55 ± 0.38 p < 0.05; mean ± SD). IL-6 was higher in SD cord than ECS (20.6 ± 13 vs 12.6 ± 2.5, p < 0.05). No differences were found between the SD and ECS groups for TNF-α and GM-CSF. SAG in mothers was significantly correlated with SAG in the cord blood of their babies (BL: r = 0.64, p < 0.01; DL: r = 0.71, p < 0.001). IL-6 values in mothers BL significantly correlated with SAG in mothers AD (r = 0.62, p < 0.04) and SAG in cord blood of their babies (r = 0.54; p < 0.05). In conclusion, labour appears to be associated with increased IL-1β, IL-6 and IFN-γ and more active phagocyte function.

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IRON RELEASE IN ERYTHROCYTES IN NEONATAL OXIDATIVE HEMOLYSIS

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Recent studies on the mechanism of oxidative hemolysis demonstrate that erythrocytes exposed to oxidizing agents rapidly release intracellular iron promoting the conversion of superoxide anion and hydrogen peroxide into the very reactive hydroxyl radical in cells depleted of glutathione. Therefore intraerythrocyte reacting iron can be taken as a marker of oxidative stress. The aim of the present study is to ascertain the erythrocyte oxidative stress in the newborn infant. Fifty-eight healthy newborn infants, 31 born by vaginal delivery, 16 by elective caesarean and 11 by emergency caesarean section, age 26 to 42 weeks (26-28: n=4; 29-32: n=4; 33-37: n=12; 38-42: n=35) weight 700 to 4.250 g, were examined. All had an Apgar score of more than 8 at 1 min. Heparinized blood samples were drawn at birth from the umbilical vein and on 4th day of life from a peripheral vein. Free iron levels (nmol/ml) in erythrocytes were determined as desferrioxamine iron complex in ghost-free erythrocyte lysate by HPLC. Statistical analysis was performed by two-tailed "t" test and by linear correlation. Cord blood of full term newborns was found to have higher (but not significantly) free iron levels than adult blood (4.08 ± 3.7 vs 3.4 ± 0.06; mean ± SD). Conversely premature infants showed significantly higher free iron levels than adults (7.09 ± 3.06 vs 3.4 ± 0.06; p < 0.001) and infants at birth (7.09 ± 3.06 vs 4.08 ± 3.06; p < 0.05) and on 4th day of life (6.98 ± 8.89 vs 2.37 ± 1.54 p < 0.02). A significant correlation between intraerythrocyte free iron concentration and gestational age was observed at birth (r = 0.33, p = 0.04) and on 4th day of life (r = 0.45; p = 0.004). Red cells of premature infants are exposed to increased oxidative stress which may depend on extracellular as well as intracellular toxic species of oxygen. This data may be important for evaluating the risk of oxygen radical toxicity in the newborn.

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ELECTRON SPIN RESONANCE STUDY OF ERYTHROCYTE CELL MEMBRANES IN A CASE OF HALLERVORDEN-SPATZ DISEASE WITH ACANTHOCYTOSIS. Maria A. Farnetani, *Giuseppe Buonocore, and Paolo Balestri. Institute of Pediatrics, and †Division of Neonatology, University of Siena, Italy

The electron spin resonance (ESR) technique was used to study the erythrocyte cell membrane skeletal network in a case of Hallervorden-Spatz disease (HSD) with acanthocytosis. Our aim was to determine whether the erythrocyte morphological abnormality was due to changes in cell membrane structure. The patient, a 9-year old girl, showed progressive spastic diplegia with equinovarus foot posture, generalized dystonia, dysarthria and mental deterioration. Investigations revealed pigmentary retinopathy, vacuole inclusions in bone marrow cytosomes, low levels of erythrocyte glutathione peroxidase and acanthocytosis with normal serum lipoproteins. The diagnosis of HSD was made on the basis of magnetic resonance evidence of iron deposits in the pallidum nuclei (eye-of-the-tiger sign). ESR study was performed using the protein-SH-specific nitroxide radical 4-maleimide-2,2,6,6-tetramethylpiperidinyloxy. This was checked by evaluating the W/S ratio between the ESR spectrum intensity of weakly immobilized -SH groups (W) and of strongly immobilized -SH groups (S) in erythrocyte ghost membranes. The ESR spectra were recorded on a Bruker 200M spectrometer operating in the X-band. Ten healthy, 8-10 year old children were used as controls. Erythrocyte ghost membranes of the patient had a higher W/S ratio (6.54) than those of controls (5.63 ± 0.35; mean ± SD; median: 5.56) demonstrating an increased availability of -SH mobile groups from membrane proteins. The high W/S ratio suggests important variations in the state of the skeletal protein network erythrocyte cell membrane. These structural abnormalities of the cell membrane may explain the acanthocytosis which could be a consequence of reduced erythrocyte antioxidant power due to low GSH-Px activity.

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ACUTE EFFECTS OF POSTURAL DRAINAGE ON GASTRO-OESOPHAGEAL REFLUX IN INFANTS WITH CYSTIC FIBROSIS

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It has been routine management to prescribe daily physiotherapy (PT) for all newly diagnosed patients with Cystic Fibrosis (CF). Newborn screening was introduced in the state of Victoria in 1990, resulting in the commencement of daily PT from around 2 months regardless of symptoms. Recent reports suggest that infants with CF may have a higher incidence of gastro-oesophageal reflux (GOR) than normal. Postural drainage (PD) may increase GOR in infants with CF.

Aim: to measure the acute effects on oesophageal pH of standard PT with head down tilt (SPT), versus modified PT without head down tilt (MPT), of 4 widely used PD positions in infants with CF. **Method:** 11 infants (5 female, 6 male) with CF underwent 30 hour oesophageal pH monitoring during which SPT and MPT were carried out on two consecutive days with reversal of order. This information was analysed by computer and compared to the corresponding periods of time without PT (No-PT). **Results:** There was a significant increase in number of reflux episodes (NRE) and fraction of time (FRT) during SPT compared to No-PT. (NRE /hour: No-PT 1.13±0.63/hour versus SPT 2.74±1.77, p<0.01) (FRT: No-PT 7.65±5.94% versus SPT 13.94±11.54%, p<0.05). MPT was not associated with a significant increase in NRE or FRT. **Conclusion:** SPT increases acid reflux in some infants with CF, but further longitudinal research to ascertain effects on lung function is required. The effectiveness of MPT on muco-ciliary clearance needs to be evaluated.

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HIGH SPIN-SPIN RELAXATION TIMES SEEN BY PROTON MAGNETIC RESONANCE SPECTROSCOPY IN PIGLET BRAINS CORRELATE WITH ATP DEPLETION AFTER ACUTE HYPOXIA-ISCHAEMIA. Ernest Cady, Ann Lorek*, Juliet Penrice*, David Edwards*, Guy Brown*, Huw Owen-Reece*, Vincent Kirkbride*, Christopher Cooper*, Marzena Wylezinska, Richard Aldridge, John Wyatt*, and Osmund Reynolds*. Depts. of Medical Physics and Bioengineering, and Paediatrics, University College London, United Kingdom.

Using ¹H and ³¹P magnetic resonance spectroscopy (MRS) we aimed to investigate relationships between ¹H spin-spin relaxation times (T_{2s}) and nucleotide triphosphate (NTP; largely ATP) levels in newborn piglet brains after acute hypoxia-ischaemia. Six newborn piglets had bilateral common-carotid occlusion and hypoxaemia for ≤ 1.5 hr followed by reperfusion and normal oxygenation. NTP levels were defined relative to the exchangeable ³¹P pool (EPP = inorganic phosphate + phosphocreatine (PCr) + (γ + α + β)-NTP). Control T_{2s} (mean (SD)) of choline (Cho), creatine + PCr (Cr), and N-acetylaspartate (Naa) were 255 (50), 160 (23), and 215 (34) ms respectively; NTP/EPP was 0.21 (.01). During the insult, Cr T₂ rose to 263 (51) ms (p<0.0002; paired t-test) as NTP/EPP fell to 0.05 (.05) (p<0.0005). An hour after resuscitation, both NTP/EPP and Cr T₂ reverted to control values. In 3 piglets, studies continued for up to 50 hr. NTP/EPP fell as secondary energy failure (SEF) developed and the Cho, Cr, and Naa T_{2s} rose linearly to 520 (p<0.02), 620 (p<0.001), and 590 (p<0.001) ms respectively. The increased T_{2s} during the development of SEF were probably due to failure of the ATP-dependent Na⁺/K⁺ pump indicating their value as indices of cellular oedema following birth asphyxia.