29 CARBON DIOXIDE INDUCED CHANGES IN CEREBRAL BLOOD VOLUME IN THE NORMAL TERM NEONATE

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A previous study suggested that changes in cerebral blood volume in response to carbon dioxide (CO_2) are greater in term than in preterm infants (Wyatt: Ped Res 1990;28;290).

The AIM of this study was to investigate the influence of postnatal age and sleep state on this CO_2-response in healthy full-term neonates.

METHODS: 21 infants were studied on day 1 and 4. A change in tcPCO_2 was monitored continously with a sensor heated to 44 C (Kapnomonitor Hellige) and cerebral blood volume was assessed by near infrared spectroscopy with emitter and receiver placed 4.5cm to 7cm apart over the right temporal region (NIR 1000 Hamamatsu). Sleep state was observed clinically.

RESULTS: *CO_2-response of cerebral blood volume*
Day1: median: 0.28, range: 0.11 - 0.60ml/100g/kPa
Day4: median: 0.39, range: 0.21 - 0.63ml/100g/kPa

There was no significant difference between day 1 and day 4, nor between active and quiet sleep.

CONCLUSION: Cerebral blood volume in response to CO_2 varies widely in normal term neonates. As postnatal age and sleep state do not explain this variation, further studies are needed to clarify the nature of this wide range.

30 VENOUS CEREBRAL BLOOD FLOW (VCBF) IN NEWBORN INFANTS

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VCBF (cm/sec) was evaluated by transcranial Doppler Ultravelocimetry of the Galen vein in 5 Groups of newborns of different Cestational Ages (GA:w),Birth Weights (BW:g) and Postnatal Ages (PNA: d):Group 1),11 infants,GA=32.9±1.9,BW=1975±288,PNA=1-4;Group 2),13 infants,GA=32.8±2,BW=1961±524,PNA=5-14;Group 3),7 infants,GA=31.4 ±2.6,BW=1489±343,PNA=15-30;Group 4),18 infants,GA=39.3±0.9,BW=3401 ±369,PNA=1-4;Group 5),8 infants with RDS treated with Continuous Positive Airway Pressure (CPAP),GA=31.5±2,BW=1621±723,PNA=2-14. VCBF was GA and PNA dependent,i.e. it increased significantly with both GA and PNA in the first 4 Groups (p 0.05).(See Table).In infants of Group 5) VCBF decreased significantly (p 0.01) with increasing CPAP by approximately 1 cm/sec per cm H_2O CPAP increment. The present study provides normal values of VCBF velocity in the newborn and suggests that monitoring VCBF in infants with RDS could provide useful informations on the possible interferences of excessive CPAP on the cerebral circulation.

GROUPS	1)	2)	3)	4)
VCBF,cm/sec MEAN (SD)	8.5 (1.3)	9.5 (1.0)	11.0 (1.0)	9.6 (0.9)

31 THE EFFECT OF AMINOPHYLLINE ON CEREBRAL HAEMODYNAMICS ASSESSED BY NEAR INFRA-RED (NIR) SPECTROSCOPY

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NIR spectroscopy was used to measure the effect of aminophylline on cerebral blood flow (CBF) and volume (CBV). Mean arterial BP, heart rate, transcutaneous (tc) p02 and pCO2 and intracerebral concentrations of oxyhaemoglobin (oxyHb), deoxyhaemoglobin, and cytochrome aa3 were continuously recorded (Hamamatsu Photonics KK, NIR1000). CBF was estimated using change in oxyHb concentration as a tracer (ref.1). Twenty CBF measurements were made on 4 preterm infants (birthweight 739-893g, gestation 25 - 28w, age 3-18d) receiving a loading infusion of 6.2 mgs/kg aminophylline. CBF was unchanged in one infant and fell in 3. Median reduction of CBF was 23% (median 3.8 mls/100g/min, range 0 - 9.8). There was no consistent change in CBV. All infants showed a slight fall in tcpCO2 (median 0.2 KPa range 0.14 - 0.7) and a rise in mean BP (median 3mmHg, range 2 - 4). Aminophylline may have effects on CBF independent of CO2 mediated changes.

1) Edwards et al, Lancet 1988, ii, 770-771

32 EVALUATION OF TOLAZOLINE TEST IN THE TREATMENT OF PERSISTENT PULMONARY HYPERTENSION OF THE NEWBORN (PPHN) BY DOPPLER ECHOCARDIOGRAPHY

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To reverse pulmonary hypertension and to improve hypoxemia in PPHN, tolazoline (TZ) was tested to assess its ability to decrease pulmonary resistances.
We aim to study the response to TZ vasodilation by Doppler echocardiography.
We sequentially studied profiles of blood velocities in the left pulmonary artery. Through the second intercostal space, the zero angle incidence beam with the LPA allows reproducibility of repeated measurements. The ductal flow was recorded and gradient calculated. After baseline, TZ bolus infusion was started at 1 mg/kg for 15 min, then increased by steps of 1mg/kg if no response. Measurements were done every 5 min during the test.
Material: The cohort included seven cases of PPHN:Diaphragmatic hernia, respiratory distress syndrome, Strepto, Coli and Mycoplasma sepsis.
Results: the different responses were 1-Immediate increased pulmonary blood flow and increase in PaO2, 2-TZ dose dependent increased PBF, 3-immediate increase in flow and deferred increase in Pa O2, 4 -Absence of response.
In conclusion, Doppler evaluation of PBF, during TZ infusion, demonstrates immediate response on PBF allowing dose adaptation. It also demonstrates the magnitude of reversed shunt across the ductus to increase diastolic PBF. Transductal gradient gives estimation of pulmonary arterial pressure.It shows presence of intrapulmonary right to left shunt and evidence of hypoventilation. Then increased doses of TZ leading to ominous side-effects are avoided.

33 HEMODYNAMIC EFFECTS OF SODIUM BICARBONATE IN NEONATES

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Recent studies have questioned the administration of sodium bicarbonate (SB) to critically ill patients because of negative hemodynamic effects.

We studied 16 paralyzed and normoventilated neonates (mean age 33.5 weeks) with metabolic acidosis (base excess < -8). Hemodynamic and blood gas data were measured before, 1, 5, 10, 20, and 30 minutes after SB.

SB induced a rapid and significant rise in pulsed Doppler cardiac output (+27.7%), aortic blood flow velocity (+15.3%), systolic BP (+9.3%), base excess (+39.3%), PaCO2 (+14.6%), tcPCO2 (+11.8%), and tcPO2 (+8%). In spite of the PaCO2 elevation, pH significantly improved (from a mean of 7.24 to 7.30). Calculated systemic vascular resistance (-10.7%) and diastolic BP (-11.7%) decreased significantly, while PaO2 (-4.9%) and heart rate (+2.5%) did not change. Central venous pressure (+6.5%) increased slightly.

Our data indicate that SB improves cardiac output through a reduction in systemic vascular resistance, and an increase in contractility and in preload.

34 CARDIAC OUTPUT, CEREBRAL AND GASTROINTESTINAL BLOOD FLOW IN EARLY AND LATE CORD-CLAMPED TERM NEONATES

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The Leboyer birth method requires that the newly born infant is placed on the mother's abdomen and the cord is clamped when it stops pulsating. In the present study, hematocrit, blood viscosity, cardiac output (CO), and blood flow velocity (mV)(pulsed Dopplerultrasound) in the A. carotis interna (ACI), A. cerebri anterior (ACA) and Truncus coeliacus (TC) were measured in 10 full-term neonates with early cord-clamping (<20 s) and 10 with Leboyer delivery on the first and fifth day after birth. At birth blood volume calculated from the residual placental blood volume was 20% higher in the Leboyer group compared to the early cord-clamped infants.

Day (Group)	1 (Early)	5	1 (Leboyer)	5
ACI (m/sec)	0.16 ±0.04	0.21 ± 0.07	0.15 ± 0.03	0.21 ± 0.05
ACA (m/sec)	0.15 ±0.03	0.19 ± 0.05	0.13 ± 0.04	0.18 ± 0.04
TC (m/sec)	0.26 ± 0.06	0.27 ± 0.06	0.27 ± 0.06	0.27 ± 0.07
SV (ml/kg)	2.3 ± 0.5	2.1 ± 0.3	2.3 ± 0.5	2.2 ± 0.4
CO (ml/kg/min)	271.57 ± 51.7	265.46 ± 49.1	295.60 ± 52.4	256.53 ± 21.7
Hematocrit	53 ± 7.3	50 ± 6.9	61 ± 6	57 ± 2
Viscosity (cP)	4.1 ± 0.8	3.7± 0.5	5.4 ± 1*	5.0 ± 1.3*

On the first and fifth day, blood pressure (P), cardiac output, flow resistance (R=P/F) and flow velocities were similar in the two groups, whereas hematocrit, blood viscosity and erythrocyte transport (haematocrit x blood flow (velocity)) were significantly (*P<0.05) increased in the Leboyer group. Since the flow resistance is linearly related to blood viscosity and inversely to the vessel diameter, our results indicate that the increased blood viscosity after Leboyer birth is compensated for by vasodilation. We conclude that the Leboyer birth method does not adversely affect blood circulation.