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COMPARISON OF DOPPLER MEASURES AND THEIR CORRELATION WITH FLOW IN AN IN VITRO MODEL AND WITH CLINICAL FINDINGS IN NEWBORN INFANTS. James Menke, Richard Miles, Mohammed Bashiru, Dermot Moore, and David Sumner. (Spon. by Dwight Powell) Children's Hospital, OSU, Columbus, Ohio and SIU, Springfield, Illinois.

Doppler ultrasound has been applied in the evaluation of blood flow in the anterior cerebral artery in the neonate with cerebrovasculature disease. There is significant controversy as to which Doppler measure best reflects the status of the cerebrovasculature. We compared five commonly used Doppler indices of blood flow: Pourcelot's pulsatility index (PPI), Gosling's pulsatility index (GPI), diastolic amplitude (D), area under the curve (AUTC), and Systolic amplitude (S). The indices were derived from recordings obtained from an in-vitro model at different flow rates and from 33 newborn infants with either asphyxia (A), intraventricular hemorrhage (IVH), or "normal" state. In the in-vitro model, all had correlation coefficients > 0.93 when compared with an electromagnetic flowmeter, indicating that all indices correlate well with flow rate. The ability of the indices to classify the patients according to clinical diagnosis was evaluated using discriminant analysis. All indices appear to correlate well with flow in an in-vitro model with a fixed probe angle. In addition, PPI, GPI, and D were of equal value in detecting IVH and A. The wide range of diastolic measure appear to allow a clear separation between the groups. We suspect this because the other two angle sensitive measures, S and AUTC had smaller ranges and were less accurate.

Correlation Coefficient	PPI	GPI	D	AUTC	S
	-0.94	-0.94	0.99	0.981	0.982
% correct diagnosis	100	97	91	73	55

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INDOMETHACIN RESPONSE IN PRETERM INFANTS WITH SEVERE RDS TREATED WITH HUMAN SURFACTANT (HS). T. Allen Merritt, Richard E. Swensson, Norman S. Talner and David J. Sahn; UCSD Medical Center, School of Medicine, Department of Pediatrics, San Diego, and Yale University, School of Medicine, New Haven, Conn.

To determine whether the early improvement in very preterm infants with severe RDS receiving human surfactant (HS) treatment was related to decrease in ductal left-to-right shunting, we studied 9 infants treated with HS within 6 hours after birth (B.W. \times 957 Gm.; G.A. \times 27 wks.) and compared them to 11 controls (B.W. \times 1038 Gm.; G.A. 27.2 wks.). All 9 HS treated infants showed marked left-to-right PDA shunting when studied with 2D echo/Doppler prior to, 1-4 hours after HS. Control infants were also studied at comparable times and all demonstrated ductal flow by 10 hours after birth. Infants were then treated with IV indomethacin. There was a decrease in ductal flow in all infants receiving HS at 6-12 hours with 7/8 HS-treated patients having evidence of ductal closure (no reverse flow in the pulmonary artery and no PDA seen) at 18-24 hours after HS. All control infants continued to demonstrate some evidence of ductal shunting until the second day with ductal closure occurring in 7/11. Thus early treatment of RDS with HS appears to augment response of the ductus to indomethacin in very small preterm infants with severe RDS, and may be contributory to their ventilatory improvement. (HD 16292)

● 1461

DETERMINANTS OF ORAL BREATHING IN PREMATURE INFANTS. MJ Miller, WA Carlo, KP Strohl, AA Fanaroff, RJ Martin. CWRU, Depts Peds & Med, Clevel, OH.

We have previously demonstrated that 40% of term neonates may exhibit effective oral ventilation during nasal occlusion. To evaluate the influence of postnatal maturation on oral breathing (OB), we measured nasal and oral ventilation in response to 15 sec nasal occlusions (10/study) in 11 sleeping preterm infants (gest. age 29 \pm 1wk, BW 1.3 \pm 0.2kg). When OB occurred, nasal occlusion was maintained for up to 1 min. Studies were performed at 31-32, 33-34 and 35-36 wk post-conceptual age. Nasal and oral airflow (via 2 resistance matched pneumotachometers), TcPO₂ and esophageal pressure (via fluid filled catheter) were recorded. Frequency of OB in response to nasal occlusion increased with advancing postconceptual age from 8 \pm 8% at 31-32wk to 26 \pm 18 at 33-34wk (n=9, p<0.04) and 29 \pm 29% at 35-36wk (n=7). Unlike term infants, OB in preterm infants is characterized by intermittent airway obstruction and respiratory pauses, resulting in a fall in minute ventilation from 447 \pm 95 to 229 \pm 88cc/min/kg (p<0.01) and TcPO₂ from 64 \pm 8 to 56 \pm 6 (p<0.01). Inspir. (R_I) and expir. (R_E) total airway resistances were calculated from the ratio of flow resistive pressure to flow at half maximal volume. On switching from nasal to oral breathing, R_I increased from 41 \pm 30 to 234 \pm 228 (p<0.004) and R_E increased from 62 \pm 16 to 145 \pm 43 cmH₂O·L⁻¹·sec (p<0.004). We conclude that oral breathing becomes more frequent and effective with increasing postnatal maturation. High oral airway resistance appears to be the critical factor which limits oral ventilation in preterm infants. Supp. by NHL 25830 and 31173.

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ORAL GENTAMICIN: PREVENTION OF NECROTIZING ENTEROCOLITIS; Gaines M. Mimms, Michael S. Schimmel, Joaquin Miranda, Eli Koenig, Tove S. Rosen, John M. Driscoll (Spon. by L. Stanley James) College of Physicians & Surgeons, Babies Hospital, N.Y. The hypothesis that the elimination of a critical type and number of intestinal bacteria decreases the incidence of NEC has been previously studied. A prospective, randomized, double-blind controlled trial of oral gentamicin 10 mg/kg/day QID for 10 days was conducted over 14 months in infants weighing < 1500 grams at birth. Serial stool and oropharyngeal cultures were obtained. The diagnosis of NEC was made by the presence of intramural air on x-ray. "Suspect" NEC was diagnosed in infants with clinical signs consistent with NEC who were placed on NEC protocol for at least 5 days without developing intramural air. The following table summarizes the results:

	CONTROL	PROPHYLAXIS
N	24	34
"Suspect" NEC	3	3
NEC	1	1
Gram negative flora by day 10-15	18	5
Abnormal colonization:		
S. Epidermidis	20	32
Klebsiella	1	3

The groups were comparable in sex distribution, birth weight, gestational age, Apgar scores and age at first feed. Oral gentamicin results in a significant delay in acquisition of gram negative intestinal flora without changing the previously reported prevalence at our institution of abnormal colonization (moderate-heavy growth) of S. Epidermidis or Klebsiella. Despite this statistically significant (P<.001) alteration of intestinal flora no difference in the incidence of NEC or "Suspect" NEC was seen.

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ARE NON-INVASIVE MEASUREMENTS OF OXYGEN TENSION AND SATURATION RELIABLE IN STABLE INFANTS? Jacqueline Mok, F John McLaughlin & Henry Levison, Chest Division, Hospital for Sick Children, Toronto, Canada.

Recent reports have questioned the accuracy of transcutaneous measurements of oxygen tension (TcPO₂), especially in older infants. We therefore validated TcPO₂ values as well as pulse oximeter measurements of oxygen saturation (TcSO₂) by comparing them with arterial blood in infants undergoing elective cardiac catheterization. A Litton Oxymonitor was used to measure TcPO₂ and TcSO₂ was monitored with a Nellcor Pulse Oximeter. Eight infants, aged from 7-61 weeks (mean 35.4), were studied. All were hemodynamically stable and normothermic. Nine simultaneous measurements were made of arterial and transcutaneous PO₂, as well as SO₂. The results are shown in the Table.

	Arterial PO ₂	TcPO ₂	Arterial Sat O ₂	TcSO ₂
Mean	75.8	58.5	93.9	88.8
SD	18.9	19.3	9.7	8.4

The mean arterial-transcutaneous PO₂ difference was 17.3 mmHg, while O₂ saturation difference was 5.1%. Age did not affect either the arterial-transcutaneous difference in PO₂ (r = -0.32), or O₂ saturation (r = 0.11). However, a significant correlation existed between arterial-transcutaneous PO₂ difference and skin fold thickness (r = 0.80, p < 0.05). We conclude that discrepancies seen in TcPO₂ measurements in older infants are due to increasing skin fold thickness with age. The Nellcor Pulse Oximeter readings may also have been affected by skin thickness.

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PROTEOLYTIC-ANTI-PROTEOLYTIC HOMEOSTASIS IN THE VENTILATED NEWBORN.

Daniel L. Mollitt and Donald J. Cannon, (Spon. by Donald E. Hill), Departments of Surgery, Pediatrics and Biochemistry, University of Arkansas, Little Rock, Arkansas.

Endogenous proteolytic enzymes and their inhibitors have been identified as important factors in the normal, and certain pathologic, restructuring of pulmonary tissue. This study evaluates these substances in the ventilated newborn. Sera was obtained from 10 ventilator dependent newborns. Total elastase activity and alpha-1 antitrypsin concentration were determined by radial diffusion technique. Total elastase inhibitory capacity was quantitated on elastin agar. Similar control assays were performed on 10 normal unventilated newborns. Differences were evaluated for significance by T-test.

Total serum elastase activity was markedly elevated in the ventilator dependent newborn as compared to controls (2.51 \pm 0.27 versus 1.91 \pm 0.12 units/ml, p < 0.001). Alpha-1 antitrypsin content was slightly elevated in the ventilator dependent group (341 \pm 31 versus 287 \pm 57 ml/dl, p < 0.02). These alterations, however, were not associated with any significant change in total elastase inhibitory capacity (3.79 \pm 2.17 versus 3.04 \pm 1.18 units elastase inhibited per ml, p = 0.35).

Ventilation in the newborn results in elevated circulating serum elastase levels. This is associated with an increased antiproteolytic concentration (alpha-1 antitrypsin) but no significant change in total serum antiprotease activity. These alterations in proteolytic-antiproteolytic homeostasis may play a role in ventilation induced pulmonary changes in the neonate.