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PNEUMOCARDIOGRAMS OF PREMATURE INFANTS AT DISCHARGE

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Pneumocardiograms (PCG) are utilized in many hospitals to decide which premature infants are to be discharged on monitors. This is done despite the fact that PCGs have not been shown to be predictive, and no normal PCG values have been established in this population. With these problems in mind, a population of premature infants was studied over a 365-day period just prior to their discharge from a Level III Perinatal Center. The only premature infants excluded were those who did not tolerate weaning from theophylline. None of the 140 subjects were on theophylline at the time of their recordings. Analysis was performed by a computer system (Pediatric Diagnostic Service). The mean gestational age for the patients was 32.8 wks (range:26-36) as determined by modified Dubowitz examination. The mean birth weight was 1740 Gm (range:580-2940). The mean postconceptional age (PCA) at the time of recording was 37.1 wks. Preliminary data analysis has revealed a mean total periodic breathing (PB) of 18.3 min, representing a mean 3.04% of sleep time (ST) for the entire population. The mean apnea density (AD<sub>6</sub>) was 1.29%. No significant differences were noted in the mean heart rate, respiratory rate, AD<sub>6</sub>, total PB, and ST in infants >36 wks PCA vs infants <36 wks PCA. At all PCAs, no significant differences were found in those same parameters between males and females. Bradycardias (<80 BPM) occurred in 23 infants. Eleven children had apneic episodes >15 seconds; none had apnea >20 seconds.

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Cerebral Blood Flow Velocity (CBFV) Increases

Postnatally in the Healthy Premature Infant  
But is Impaired in the Sick Infant. J. Perlman,  
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The Doppler technique has been utilized in the newborn at the anterior fontanel for the noninvasive assessment of CBFV in the anterior cerebral arteries. The objective of this longitudinal study of the premature infant was to determine whether normal postnatal changes in CBFV occur and whether such changes are disturbed by disease. CBFV was quantitated by determination of area under the velocity curve (expressed as planimeter units/min). Thus far, 60 premature infants (mean gestational age (GA), 29 wks) have been studied. 15 infants have been healthy "growers." 45 "sick" infants have required prolonged intubation for respiratory disease, often with symptomatic PDA and/or asphyxia. A striking postnatal increase in CBFV was observed in the healthy infants (Table), irrespective of GA.

Day	Healthy	Sick	Day	Healthy	Sick	Day	Healthy	Sick
3	650	525*	20	1035	557†	40	1410	738†
10	835	578 <sup>+</sup>	30	1209	726†			

[\*p<.05; †p<.01]

In contrast to the healthy infants, the sick infants did not exhibit the sharp postnatal increase in CBFV and also, had distinctly lower CBFV at all ages studied. Thus, the data define in the preterm infant a distinct postnatal increase in CBFV. Moreover, the impairment in this postnatal increase in sick infants suggests 1) that such infants may be at risk for ischemic brain injury, and 2) that serial measurement of CBFV is one useful means for evaluating the status of neonatal brain.

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The Relationship of Cerebral Blood Flow Velocity

(CBFV), Determined by Doppler, to Regional  
Cerebral Blood Flow (rCBF), Determined by Positron  
Emission Tomography (PET). J. Perlman, P. Herscovitch, S.  
Corriveau, M. Raichle, JJ Volpe. Wash. Univ. Sch. Med., St.  
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The Doppler technique has been utilized at the anterior fontanel in the newborn to measure CBFV from the anterior cerebral artery. Measurement of CBFV has been shown in an animal model to correlate with simultaneous measurements of CBF. The objective of this study was to compare in the human newborn the determination of CBFV by Doppler with the determination of rCBF by PET. Twenty premature infants have been studied. Diagnoses included IVH (8), asphyxia (4), hydrocephalus (4), and PDA (4). Measurement of area under the CBFV curves (AUCV) was used to quantitate CBFV. CBF was determined by PET with 0-15 water as we have described previously (Pediatrics, 1983). rCBF was measured at the following sites: Lt. sylvian cortex (LSC), Rt. sylvian cortex (RSC), Lt. frontal cortex (LFC), Rt. frontal cortex (RFC). rCBF ranged from 8 to 52 ml/100 g/min (16 + 13 mean + SD), and AUCV, from 342 to 1350 planimeter units/min (723 + 258). Correlation coefficients were:

Region on PET Scan:	RSC	LSC	RFC	LFC
Correlation with CBFV:	.76	.76	.78	.80 (all P<.001)

These data demonstrate a significant correlation between CBFV and rCBF. We conclude that the noninvasive assessment of CBFV by Doppler is related to rCBF and thus is a valuable means of assessing changes in the cerebral circulation of the newborn.

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Respiratory Origin of the Fluctuations in Blood

Pressure Associated with Intraventricular  
Hemorrhage in Preterm Infants. J. Perlman and  
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We have previously demonstrated that fluctuating cerebral blood flow velocity and arterial blood pressure (ABP) are associated with intraventricular hemorrhage (NEJM 309, 1983). The cause of these ABP fluctuations (ABP Flucs) is unknown. In the present study we determined the relation of respiratory muscle activity to fluctuations in ABP. We studied four preterm infants on ventilators for RDS with ABP Flucs. We monitored esophageal (Pes), gastric (Pg), and ABP pressure. Consistent findings were: 1) ABP flucs have the same frequency and direction of change as Pes and Pg changes associated with spontaneous breathing; 2) spontaneous apneic pauses were accompanied by sudden and complete cessation of ABP Flucs; 3) large cough-like swings in Pes and Pg, seen in all infants were associated with the largest ABP Flucs; 4) cutaneous stimulation had no effect on ABP Flucs provided no change in Pes and Pg occurred; 5) respirator pressure swings had only small effects on ABP Flucs in one infant; 6) the effects of change in Pes and Pg on ABP were nearly simultaneous (0.05-.2 s.), thus respiratory pressure changes appeared to be superimposed on cardiac swings in ABP. These findings suggest that the fluctuations in ABP are caused by two mechanisms: 1) direct transmission of pleural and abdominal pressure to the cardiovascular system during spontaneous breathing and/or 2) fluctuations in venous return produced by breathing pressures. (Funding NIH HD 10993)

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EFFECT OF IV TOCOPHEROL (VIT E) ON RETINOPATHY OF

PREMATURITY (ROP) Dale L. Phelps, Arthur Rosenbaum,  
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287 infants were enrolled in a double masked, randomized controlled trial of vitamin E (E) v placebo (P) given from day 1 until the retinal vessels reached the ora serrata. Initial IV doses were changed to oral after the infants fed well. The first dose of E was 20mg/kg, the mean dose to maintain plasma levels at 3-3.5mg/dL during the first week was 15±6mg/kg/d, and during the second week was 3±4mg/kg/day.

Mortality (20% P v 22% E), acquired sepsis (7% P v 6% E), confirmed NEC (4% P v 4% E) days of phototherapy (5.4±3.9 P v 5.9±4.3 E, X±SD), and length of hospitalization (62±40 P v 63±41 days E) did not differ. Grades 3 and 4 CNS hemorrhage was more common in infants <1 kg who received E (14/42) than in those infants <1 kg who received P, (4/43), p<0.02.

28/99 P infants and 25/97 E infants who completed the study developed active ROP and in 8/99 P v 11/97 E it was grade 3 or worse ROP. One in each group developed retinal detachments, grade 4 cicatricial ROP. More E infants (16/111, 14%) than P infants (8/121, 7%) developed retinal hemorrhages, p<0.06. This was the only statistically or clinically significant difference for ROP outcome in these infants.

Based on these data, the potential benefits of E treatment do not outweigh the potential risks.

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DECREASE OF PERIVENTRICULAR HEMORRHAGE WITHOUT

PLANNED INTERVENTION. Alistair G.S. Philip, Louise R.  
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Intraventricular/periventricular hemorrhage (IV-PVH) continues to be a major problem for preterm infants. Since the advent of ultrasound scanning, detection of IV-PVH has been made with some precision. We have routinely used an ATL sector scanner to detect IV-PVH in infants with gestational age <34 weeks since 1979. All scans have been interpreted by a single individual (WCA), providing a high degree of consistency. During the 5 year period Sept 1979-Aug 1984, we studied 637 infants <34 weeks gestation who survived for more than 24 hours. A progressive decline in the overall incidence of IV-PVH occurred, despite an increase in the proportion of infants <26 weeks gestation. Only 2% (7% of all IV-PVH) had evidence of parenchymal hemorrhage in 1981-84.

Year	Total <34w	Gest. <26w	grade of IV-PVH(n)			IV-PVH <34w	IV-PVH <1500g.
			1	2A*	2B		
1980	124	8%	9	22	8	39%	46%
1981	147	5%	15	17	12	31%	41%
1982	112	14%	11	14	8	31%	33%
1983	131	12%	10	11	3	27%	35%
1984	123	21%	13	9	7	26% <sup>+</sup>	26%

\*2A=IVH, 2B=IVH+dilation, 3&4=parenchymal hemorrhage. +p<0.05.

The reasons for this decline are uncertain, but seem to include an increase in maternal-fetal transfers and changing attitudes of obstetricians towards extreme prematurity. The decline of IV-PVH without resorting to pharmacologic agents emphasizes the importance of controlled trials in evaluating intervention.