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AORTIC STROKE & MINUTE DISTANCE:
A NEW WAY TO ASSESS DUCTAL SHUNTING.
JR Skinner, S Hunter, EN Hey. Newcastle upon Tyne, England.

Echocardiographic assessment of L-R ductal shunting has relied on indirect estimates of flow ie. left atrial, and left ventricular to aortic ratios (LA:Ao, LVEDD:Ao). Since left ventricular output (LVO) increases with L-R ductal shunting it could provide an alternative means of assessment. Measurement by echocardiography is innaccurate due to error in measurement of aortic root cross-sectional area (AoCSA). Doppler measurement of the aortic flow integral or 'stroke distance' (AoSD) is highly reproducible. LVO =AoCSA x AoSD x heart rate, therefore, AoSD & minute distance (MinDis=AoSD x heart rate) were evaluated as alternative methods, excluding AoCSA. Studies before and after ductal constriction or closure were compared in babies <32 weeks gestation. 48 courses of indomethacin (indo) were needed in 39 babies. 8 babies, in whom indo failed, were assessed prior to ligation. Results were also compared with 107 scans from 53 babies, aged < 28 days, & <32 weeks with a closed duct*.

Results:	pre indo	pre ligat^n	post indo/lig^n	closed duct*
No. scans/babies	48/39	8/8	40/34	107/53
AoSD >12cm (%)	75	100	3	4
MinDis >1900cm (%)	75	100	0	4
LA:Ao >1.4 (%)	74	100	5	4
LVEDD:Ao >2.0 (%)	64	88	10	6

Conclusion: Aortic stroke & minute distance can be used to assess ductal shunting & can be usefully combined with other methods. Significant shunting is likely when AoSD >12cm or MinDis >1900cm.

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CARDIAC FUNCTION IN THE SHOCKED VERY LOW BIRTHWEIGHT INFANT. Bryan Gill, Michael Weindling. Department of Child Health, University of Liverpool, Liverpool Maternity Hospital, Liverpool L7 7BN.

The aetiology of hypotension/poor tissue perfusion in the VLBW infant is unclear. This study assessed cardiac function in the first few hours after birth using Echocardiography.
60 VLBW infants were studied. 26 infants were shocked and received treatment in the first 24 hours. 34 required no treatment and constituted a control group. The left ventricular shortening fraction (SF%), an index of cardiac function, was recorded and correlated with a number of clinical factors.
Median SF% was 31% in the shocked infants vs 38% in the controls ($p=0.001$). Taking SF% $\leq$=30% as abnormal, 50% (13/26) of shocked infants had an SF% $\leq$=30% whereas only 3% (1/34) of controls had a SF% $\leq$=30%, $p=0.0001$. The median Apgar at 1 minute and 5 minutes were significantly lower in the shocked vs control infants. ($p<0.001$ and $p<0.01$ respectively).
Myocardial dysfunction appeared to be a feature in those VLBW infants who required treatment for shock. This is likely to have important implications for the most appropriate treatment of such infants.

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THE RELATIONSHIP BETWEEN EPISODES OF BRADYCARDIA, APNOEA AND HYPOXAEMIA IN PRETERM INFANTS. Christian F Poets [1], Valerie A Stebbens [2], Horst von der Hardt [1] and David P Southall [2]. Department of Paediatric Pulmonology, Hannover Medical School, Hannover, FRG (1), Department of Paediatric Clinical Physiology, National Heart & Lung Institute, London, UK (2).

Little is known about the pathogenesis of bradycardias in preterm infants. We therefore studied episodes of bradycardia and their relationship with apnoeic pauses and desaturations in overnight tape recordings of arterial oxygen saturation (SaO_2, Nellcor N100 in beat to beat mode), breathing movements, nasal airflow and ECG from 80 preterm infants at the time of discharge from hospital (mean gestational age at birth 32.5 wk (SD 2.6 wk), and at the time of study 36.3 wk (SD 2.3 wk). A bradycardia was defined as a fall in heart rate to ≤67% of baseline level for ≥4 s, an apnoeic pause as a cessation of respiration for ≥4 s, and a desaturation as a fall in SaO_2 to ≤80%. 196 bradycardias were found in 46 (58%) of the recordings.

There was a close relationship between bradycardias, apnoeic pauses and desaturations: excluding artefact, 83% of the bradycardias were associated with apnoeic pauses, and 87% with desaturations. Where all 3 phenomena occurred in combination (n=117), they commenced almost simultaneously: apnoeic pauses preceded the onset of the bradycardias by a median of +4.6 s (range -4.0 to +11.0 s); desaturations commenced +5.4 s (-2.2 to +12.7) before the bradycardias and +0.5 s (-5.1 to +5.8) before the apnoeic pauses (after correction of the SaO_2 values for the response time of the pulse oximeter in each infant (median 6.0 s)).

These observations suggest that a reflex mechanism may be involved in the pathogenesis of some bradycardias in these preterm infants. This reflex can involve an inhibition of respiratory movements, a change in ventilation to perfusion matching (resulting in a fall in SaO_2), and a slowing of the heart rate.

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BEST POSTDUCTAL pO_2 ($BPDPO_2$) AND pCO_2 ($BPDPCO_2$) DO NOT PREDICT OUTCOME OF CDH INFANTS IN EXTREMIS, STABILIZED WITH ECMO PRIOR TO SURGICAL REPAIR. Lucienne S. Sanchez, Ann O'Brien, Kathryn D. Anderson, Kurt D. Newman and Billie L. Short. Divs. of Neonatology and Surgery, George Washington University, Washington, D.C.

Infants with congenital diaphragmatic hernia (CDH) constitute the poorest prognostic group of ECMO-treated neonates (survival rate of 61% vs 83% overall). It has been suggested that $BPDPO_2 < 100$, $BPDPO_2 < 60$ and $BPDPCO_2 \geq 40$ may be used to exclude CDH patients unlikely to respond to therapy. We have previously reported that published predictors of high mortality in CDH patients, repaired prior to ECMO, were unreliable. We now report similar findings in a population of CDH infants treated with ECMO prior to surgical repair. Since 1989 we have placed CDH infants on ECMO prior to surgery if they are *in extremis*, with $pO_2 < 40$ x 2 hours. The $BPDPO_2$ was < 100 in all 16 patients treated, yet 9/16 (56%) survived.

Results±SD:	Mean $BPDPO_2$	$BPDPO_2$ <60	Mean $BPDPCO_2$	$BPDPCO_2$ >40
Survivors	51 ± 14	7/9	39 ± 10	4/9
Non-Survivors	49 ± 6	6/7	40 ± 12	4/7

Survivors and non-survivors did not differ with respect to gestational age, birth weight, oxygenation index or alveolar arterial oxygen gradient.

Conclusions: 1)Neither $BPDPO_2 < 60$, nor $BPDPCO_2 \geq 40$ distinguished survivors from non-survivors in CDH infants *in extremis*, treated with ECMO prior to surgery. 2)The heterogeneity of CDH patients and of the medical management between centers, warrants a multi-center assessment of this poor prognostic group.

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SKIN CAPILLARY BLOOD FLOW DETERMINATIONS IN NEONATES – EVALUATION OF A VIDEOPHOTOMETRIC MICROSCOPY METHOD.
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This investigation evaluates the accuracy of television microscopy when applied to studies of skin capillary hemodynamics in newborn infants. Microscopic videorecordings of 16 nailfold capillaries in 5 healthy neonates were analyzed by a computerized videophotometric system (Capiflow®, Capiflow AB, Kista, Sweden). In each capillary, the skin capillary blood cell velocity (CBV) and the capillary erythrocyte column diameter were simultaneously determined at an average of four different locations, equally distributed on the arteriolar and venular side of the capillary. At each measuring site (n = 64), repeated determinations of the CBV (x 4) and capillary dimension (x 8) were performed by re-analyzing the same 2-min videotape sequence.

The coefficient of variation (CV = 1SD/mean x 100 %) for repeated CBV measurements, was 3.4 (0.9 — 13) %. The corresponding CV value for diameter measurements was 6.7 (0.5 — 12) %. The method's validity was tested by calculating capillary blood cell flow values, which were assumed to be the same in simultaneously studied but different sections of the capillary. A high correlation was found between arteriolar and venular side capillary blood cell flow ($r = 0.94$, $p < 0.001$).

	Arteriolar limb of the capillary		*Venular limb of the capillary*
CBV, mm/s	0.42 (0.21 — 1.04)	$p < 0.001$	0.32 (0.17 — 0.77)
Diameter, µm	9.3 (7.0 — 12.1)	$p < 0.01$	10.2 (7.2 — 14.7)
Flow, nl/min	1.7 (1.1 — 5.1)	ns	1.7 (1.0 —5.5)

Conclusion: Videophotometric microscopy give reliable and valid measurements of neonatal nailfold CBV and capillary dimensions.

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EVALUATION OF THE TPV/RVET RATIO IN DETERMINING PULMONARY ARTERIAL PRESSURE IN THE NEONATE
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Accurate Doppler determination of pulmonary arterial pressure (PAP) has recently become possible by measuring peak velocity of tricuspid regurgitation (TR) and application of the Bernoulli equation. Since not all babies have TR, it is necessary to assess alternative methods; one is the assessment of the pulmonary waveform, dividing the time to peak velocity (TPV) by the ejection time (RVET). During a longitudinal haemodynamic study of healthy and sick term and preterm babies, the TPV/RVET ratio was measured on 258 occasions in babies who also had PAP determined by the TR method.

Results: Overall, there was a weak correlation of TPV/RVET with PAP (r=0.43), with wide scatter, and the relationship was affected by gestation and ductal patency. eg. duct closed (n=96) r=0.51, duct large (n=127) r=0.33. All well babies <33 weeks (n=12) r=0.67.

	TPV/RVET<33 weeks		TPV/RVET >36 weeks		
Systolic PAP from TR	no.	mean (SD)	no.	mean (SD)	
51-60 mmHg	6	0.24 (.09)	8	0.31 (.06)	ns
41-50 mmHg	33	0.29 (.07)	9	0.38 (.10)	p<0.005
31-40 mmHg	26	0.30 (.06)	8	0.38 (.10)	p<0.05
20-30 mmHg	30	0.38 (.11)	8	0.45 (.10)	ns

Conclusion: The way TPV/RVET ratio is related to PAP varies with gestation and ductal patency. Individual ratios are of limited value in predicting PAP. Ratios in prematures are lower at a given PAP than in term babies.