

†1825 THE ROLE OF GRANULOCYTES IN THE LUNG FUNCTION RESPONSE TO GROUP B STREPTOCOCCAL TOXIN IN YOUNG LAMBS. Kenneth Sandberg, Barbara Engelhardt, Donna Bratton, Annick Van den Abbeele, Jens Groggaard, Carl Hellerqvist, Hakan Sundell. Vanderbilt School of Medicine, Dept. of Ped. and Biochem., Nashville, TN. (Sponsored by Mildred Stahlman)

Neonatal group B streptococcal sepsis is characterized by cardiopulmonary failure, leukopenia and pulmonary leukostasis. The aim of this study was to evaluate the role of granulocytes (G) in the response to infusion of group B Type III streptococcal exotoxin. Five lambs, age 1-4 weeks, were studied awake in a whole-body, pressure-compensated, integrated-flow plethysmograph before and after neutrophil depletion with hydroxyurea. A two phase reaction to the toxin was observed. During the first phase, which lasted about 30 minutes, circulating G decreased, pulmonary arterial (PA) pressure, temperature and lung lymph flow increased. At the same time a 50% reduction in dynamic lung compliance (C_{dyn}) and a 300% increase in lung resistance (R_L) was observed. Thoracic gas volume (TGV) was unchanged. In the second phase 3-5 h. after toxin, PA pressure and temperature remained slightly elevated, circulating G increased and lung lymph protein clearance (LPC) was doubled. In this phase R_L was moderately increased, but C_{dyn} and TGV were unaffected. After G depletion, GBS toxin infusion resulted in a significantly reduced increase in R_L (60%) in both phases and significantly less decrease in C_{dyn} (10%) in Phase I. PA pressure response was unchanged, whereas the increase in LPC was less marked. The results indicate that G contribute to, but are not the sole mediators, of altered lung mechanics and increased permeability of pulmonary exchange vessels seen after GBS toxin administration; whereas pulmonary hypertension does not appear to be mediated by G.

†1826 TRANSTHORACIC IMPEDANCE AS A METHOD OF MEASURING TIDAL VOLUME DURING HIGH FREQUENCY VENTILATION. Kenneth L. Sandberg, Elizabeth D. Krueger, Daniel P. Lindstrom, Hakan Sundell, Robert B. Cotton. Vanderbilt University Medical Center, Department of Pediatrics, Nashville, Tennessee.

During conventional ventilation, tidal volume (V_T) can be measured from variations in the transthoracic impedance (TTI) signal. The purpose of this study was to determine if TTI could be used to measure V_T during high frequency ventilation (HFV), thus providing a non-invasive technique which can be applied continuously during HFV of human infants. V_T was measured in 2 lambs (3-4 weeks old) placed in a whole-body, pressure-compensated, integrated flow plethysmograph during HFV provided by a flow-interrupter (Bird VDR). The frequency response of the plethysmograph was flat up to 20 Hz. TTI was measured from a tetrapolar disk electrode system (SAAB Respirometer). The impedance signal and the calibrated plethysmograph volume signal were recorded. A computer averaging technique was used to extract the high frequency V_T component of each signal from background volume changes associated with spontaneous breathing. Magnitude in ohms of the extracted TTI waveform (V_{TZ}) was compared with the corresponding plethysmographic volume change (V_{Tpl}). 54 simultaneous measurements of V_{Tpl} and V_{TZ} were made at frequencies varied between 300-900 breaths per minute and at V_T between 2.8 and 90 ml. V_{TZ} had a close linear correlation with V_{Tpl} (r=0.99). These results indicate that the frequency response of V_{TZ} is sufficient to apply the technique to HFV and that measurement of absolute V_T at high frequency can be provided by calibrating the impedance signal during low-rate conventional ventilation.

1827 COMPARATIVE ANALYSIS OF PNEUMOGRAM SCORING BY A COMPUTER ASSISTED SYSTEM (CAPS) VS MANUAL SCORING (MS). P. Sasidharan, E. Marquez, E. Dizon and C. Sridhar, Porter Memorial Hospital, Valparaiso, IN (Spon. by R. Schreiner)

We analyzed the pneumogram scoring done by CAPS to MS. 12-hour PPG's were recorded simultaneously on a cassette tape and directly to a recording paper on 42 infants for evaluation of apnea. The tapes were scored by the computer and the direct recording was scored manually. The results were analyzed for the following. Prolonged Apnea (PA) (≥15 sec); A6/D% (≥.5%); Periodic Breathing (PB) (≥3.0%). Tapes were scanned three times by the computer. No statistically significant differences were noted between each scan and the manual scoring. CAPS detected 100% of PA; 100% of PB and 90.5% of AD noted in MS. MS detected 30% of PA, 90.5% of AD, and 40.9% of PB seen in CAPS.

	Abnormal PPG's		
	CAPS	MS	P
A6/D	21	21	NS
PB	22	9	◀0.01
PA	10	3	NS

There was an abnormally high PB by CAPS (P=◀0.01). 23 PPG's were abnormal by MS and 25 PPG's were abnormal by CAPS. (P=NS). 21 (84%) abnormal PPG's by CAPS were detected by MS. 21 (91.3%) abnormal PPG's by MS were detected by CAPS. These results indicate that CAPS is a valuable aid in PPG interpretation. Abnormal PB is seen more often by CAPS. However, we recommend caution in total reliance on CAPS for PPG scoring.

1828 PNEUMOGRAMS IN SIDS SIBLINGS
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We studied 12 hour pneumograms (PPG) in 17 siblings of SIDS. Mean postnatal age of study is 8.61 ± 16.9 weeks at a mean post-conceptual age of 47.88 ± 17.38 weeks. The following criteria were used in the interpretation. A6/D% (◀.5%); Periodic Breathing (PB); Prolonged Apnea (PA) (≥15 sec); disorganized breathing. Eight pneumograms were abnormal (47%). The most common abnormality was multiple short apnea 8/8 (100%). One infant (12.5%) had excessive PB and one infant had prolonged apnea (12.5%). The mean postnatal age of normal PPG is 15.66 ± 21.3 weeks. The mean postnatal age of study of abnormal PPG is 0.67 ± .58 weeks (P=◀.05). We did ventilatory response to 2% and 4% CO₂ on 6 of the normal PPG group and found that 4 of them had abnormal slopes (◀25) (66.6%). Our results indicate that nearly half of all pneumograms are abnormal in SIDS siblings. The most common abnormality is increased apnea density A6/D% (◀0.5%). These pneumograms were done earlier than the group who had normal PPG. It is possible to speculate that some of those with normal PPG might have had an abnormal PPG earlier. Ventilatory response to CO₂ is abnormal in 2/3 of the normal PPG group and is valuable in assessing ventilatory control in these infants. We recommend a 12 hour nocturnal pneumogram on all SIDS siblings during the first week of life and a ventilatory response to CO₂ test if the PPG is normal.

1829 VENTILATORY EFFECTS OF PERIPHERAL CHEMO-RECEPTOR STIMULATION IN MATURING RABBITS.
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While it is well known that significant changes in ventilatory control occur during postnatal development, the maturational influence of peripheral chemoreceptor stimulation (PCS) during normoxia (N) and hypoxia (H) have not been systematically evaluated. Accordingly, in the present study, we separately assessed the ventilatory responses to PCS with sodium cyanide (NaCN), both during steady-state inhalation of 21% (N) and 10% (H) O₂. Following tracheostomy and carotid artery catheterization under light ether anesthesia, pulmonary ventilation (V_E) was continually monitored in newborn rabbits (age range: 1-30 days) placed in a body plethysmograph. During N, while saline had no effect, infusions of NaCN (dose range: 0.01 to 0.4 mg/kg) established reproducible dose-dependent increases in V_E. The maximal percent increases in V_E (V_E^{max}) with NaCN systematically increased with age; however, "sensitivity" to NaCN, represented by the dose of NaCN producing 50% of V_E^{max}, was not age related. In marked contrast to N, during steady-state H, lower doses of NaCN (i.e., less than 0.1 mg/kg) produced less V_E stimulation, while higher doses produced V_E depression resulting in some cases in acute apnea. Bilateral carotid body denervation abolished the V_E responses to NaCN. These findings in maturing rabbits indicate that: (1) during normoxia, PCS with NaCN produces ventilatory stimulation; however, (2) during steady-state hypoxia PCS produces ventilatory depression which may lead to apnea.

1830 EFFECT OF VARIOUS BODY POSITIONS ON THE RESPIRATORY RATE OF INFANTS WITH TACHYPNEA. Sima M. Sconyers, Bruce E. Ogden, Howard S. Goldberg. (Spon. by Alan H. Klein) UCLA School of Medicine, Cedars-Sinai Medical Center, Departments of Pediatrics and Medicine, Los Angeles, California.

In neonatal disease states where lung compliance is reduced (e.g., inadequate resorption of fetal lung fluid, or, surfactant deficiency) an infant's normally low functional residual capacity (FRC) decreases even further. Tachypnea is an efficient compensatory maneuver for the newborn. We evaluated the effect of different bed and body positions on the increased respiratory rate observed in infants with transient tachypnea of the newborn (TTN), infant respiratory distress syndrome (IRDS) and bronchopulmonary dysplasia (BPD). Seventeen infants were studied (TTN: n=6; IRDS: n=6; BPD: n=5) in 4 different positions: supine flat, supine elevated, prone flat and prone elevated. Respiratory rate and heart rate were evaluated in each position. Analysis of variance for the three patient groups showed a lower respiratory rate when the bed was elevated compared to flat (p=0.0001), in the prone posture compared to supine (p=0.031), and no significant difference in heart rate. The lowest mean respiratory rate occurred when patients were in the prone elevated position. The significant improvement in tachypnea seen in the prone and elevated positions was likely related to improved FRC resulting from reduced cephalad stress on the diaphragm from the abdomen. Positioning neonatal patients with respiratory insufficiency was a simple and safe therapeutic maneuver with prompt and demonstrable benefit.