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INTERCOSTAL RETRACTOMETER FOR ESTIMATION OF INTRAPLEURAL PRESSURE. Gregory P. Heldt, William H. Tooley, John A. Clements and Malcolm B. McIlroy. Cardiovascular Research Institute, Univ. of California, San Francisco, Ca.

We have developed an intercostal retractometer for the non-invasive estimation of intrapleural pressure. It consists of a scored lucite disc covered by a thin acetate membrane. The scored lines and the membrane with the disc form a small space which is filled with liquid. The membrane is attached to the skin and any retractive force applied to the device by the intercostal space is translated into pressure changes in the liquid, detected by a P50A Statham strain guage.

Twelve studies were performed in 3 infants with hyaline membrane disease, averaging 1180 g weight, and 30 wks G.A. Comparison with estimated intrapleural pressure was made using an esophageal balloon placed in the mid-thorax. The retractometer was calibrated by measuring the occluded airway pressure, which followed changes in esophageal pressure to within ± 1 cm H_2O over a range of 30 cm H_2O. This calibration method also allows for the detection of artifacts due to inappropriate positioning of the device. The regression line of retractometer output vs esophageal pressure had an average slope of 0.4 and predicted the esophageal pressure to within ± 1.7 cm H_2O (95% confidence limit).

In using the device, care must be taken to eliminate artifacts due to movement of the instrument and faulty attachment to the chest wall. The response of the device is attenuated by subcutaneous tissue, roughly in proportion to the thickness of the tissue. (Supported in part by Contract HR 6-2093)

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MECHANICAL OVER VENTILATION (MOV) AS A FACTOR IN PULMONARY AIR LEAK (PAL). Marguerite J. Herschel, Margaret M. Henry, Roberta L. Merisalo, Constantinos Papagaroufalis, Douglas J. Koza, Joseph L. Kennedy, Jr., Tufts Univ. School of Medicine, St. Margaret's Hospital for Women, Depts. of Peds. & Radiol., Boston. (Spon. by Timos Valaes).

36 infants treated from Oct. 76 to Dec. 77 with pressure limited ventilation for respiratory failure in HMD had a 25% incidence of pulmonary air leak (PAL). Mortality was 80% with PAL, 20% without. PAL occurred at <48 hrs. in 8/9.

TOTAL 35		MECH VENT BEFORE 8 HR. (21)		MECH VENT AFTER 8 HR. (14)	
		lived (10)	died (11)	lived (13)	died (1)
PAL (9)	MOV (7)	1	5	1	0
	Non-MOV (2)	0	2	0	0
NO PAL (26)	MOV (1)	0	0	1	0
	Non-MOV (25)	9	4	11	1

PAL was common in patients who had sustained $PaCO_2$ < 40 mm Hg (mechanical over ventilation - MOV) and whose FiO_2 and breaths per minute were lowered rather than peak airway pressure, as PaO_2 improved. 5/6 of the infants with early ventilation who died without MOV were severely asphyxiated at 1 min (Apgar ≤3) compared with 1/5 of the infants who died with MOV. Deaths in Non-MOV infants may be associated with adverse perinatal factors predisposing the lung to injury.

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CARDIOPULMONARY CONSEQUENCES OF POSITIVE END-EXPIRATORY PRESSURE (PEEP). Bernard H. Holzman and Emile M. Scarpelli, Pulmonary Division, Dept. of Pediatrics, Albert Einstein College of Medicine, New York, New York 10461.

Cardiopulmonary adaptation to PEEP was studied in 7 normal spontaneously breathing dogs during stepwise increase of PEEP to 3,6,9,12 and 15 cm H_2O. Each pressure was sustained for 20 mins during which time a steady state was achieved. [To obviate protocol bias pressure changes were also made at random. The response to reduction of PEEP was also monitored, as was a control group kept at 1.0 cm H_2O PEEP]. Increasing levels of PEEP produced [1] no change of tidal volume and inspiratory time; [2] a progressive fall of respiratory rate and minute volume; [3] progressive decrease of passive expiratory flow; and [4] generation of active expiration which became pre-inspiratory at the highest pressures. These responses occurred immediately and thus may be reflex in nature. As PEEP was increased, functional residual capacity (FRC) increased, specific pulmonary compliance fell, and progressively less of the applied airway pressure was transmitted to an esophageal balloon used for estimating pleural pressure. Whereas right atrial and pulmonary arterial pressures increased with increasing PEEP, cardiac output was not altered when compared with the control group. Thus PEEP may induce reflex changes in respiratory rhythm, as well as mechanical changes related to FRC and compliance. The former tend to compromize alveolar ventilation and work of breathing. The latter affect both ventilatory work and cardiovascular performance. (Supported by the NHLBI, NIH grant numbers HL 16137 and HL 07060).

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EVALUATION OF ANTIBIOTIC THERAPY IN PATIENTS WITH CF. Huang, Nancy N.; Braverman, Shirley; Laraya-Cuasay, Lourdes; Keith, Helen; Yasmin, Nasira Temple Univ. School of Medicine, Dept. of Pediatrics, St. Christopher's Hospital for Children, Philadelphia, Pa. 19133

The effect of secondary bacterial infections of the bronchopulmonary system on patients with CF has been firmly established, and it has been possible to partially control these infections by aggressive bronchial drainage and energetic antibiotic therapy. The therapeutic effect of these modalities of treatment has not been evaluated quantitatively.

This study attempts to measure the efficacy of amikacin with carbenicillin in 15 patients (median age 14 yrs) with pseudomonas infection. Subjects were scored on the severity of disease according to parameters in clinical, roentgenological, and pulmonary function exams, white cell and differential counts. Scores of 1,3,or 5 (severe,moderate,good) were assigned to each parameter at pre and post therapy stages; deterioration, stability, or improvement was reflected by the changes in the post minus the pre scores. Preliminary summary of the data from these patients indicates that the parameters of the clinical exam were most sensitive to change. Improvement was reflected best in subjects with elevated white cell counts on pre therapy exam.

Since these patients were older, most had already developed irreversible changes in parameters measured by roentgenological and pulmonary function exams. The same scoring system applied to infants and young children without permanent damage may yield different results.

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$F_{CINCINNATI}$: A NEW ALPHA$_1$-ANTITRYPSIN VARIANT IN TWO NEGRO FAMILIES. George Hug, Gail Chuck and Magne K. Fagerhol. Dept. of Pediatrics, University of Cincinnati, Cincinnati, OH 45229 USA and Dept. of Immunohaematology, Ulleval Hosp., Oslo 1, NORWAY.

Serum of children repeatedly hospitalized for asthma was compared with that of controls in regard to trypsin inhibitor capacity (TIC, normal 0.82mg/cc±0.21 IS.D.), α_1-antitrypsin concentration (3.2mg/cc±0.9) and phenotype determined by thin layer polyacrylamide gel isoelectric focusing (PAG-IEF). The same unusual phenotype was observed in two unrelated Negro families: In one the variant appeared in mother and son (the only ones examined), in the other the variant was present in twin brothers, their father and his brother. The twin's mother, however, and 7 paternal relatives had MM. Variant serum was submitted to outside laboratories and will be sent to others who express an interest. The variant band was labeled $F_{Cincinnati}$ because of the proband's domicile and because it moved slower than F but faster than G on standard acid starch gel. On PAG-IEF this variant band moved faster than the F,G, and I bands. In the affected individuals concentration and TIC were reduced but not abnormally so (mean: 2.2 and 0.66mg/cc, respectively), and the complete phenotype was reported as $F_{Cincinnati}$. This phenotype was also found in one other black man of whom we know only that he had pancreatitis. The significance of the α_1-antitrypsin $F_{Cincinnati}$ allele is unknown although 3 of the 7 affected individuals had asthma; 4 had repeated pneumonia and six had signs of allergic disease.

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RESTORATION OF LUNG PRESSURE-VOLUME (PV) CHARACTERISTICS WITH VARIOUS RATIOS OF DIPALMITOYL LECITHIN (DPL) AND PHOSPHATIDYL GLYCEROL (PG). Machiko Ikegami, Forrest H. Adams, UCLA Medical Center, School of Medicine, Department of Pediatrics, Los Angeles, California.

We have demonstrated that DPL is the most effective phospholipid in establishing alveolar stability when used in combination with unsaturated PG. The purpose of this study was to determine the ability of different molar ratios of DPL/u-PG to restore the lung PV characteristics to normal. The surfactant (S) depleted adult rat lung model was used. For all PV curves the % of original total lung capacity (%TLC) at 5 cm H_2O on the deflation limb was calculated. PV measurements were made three times on each lung: prior to depletion of S (mean 54.9%), after maximal removal of S by lung washing (mean 10.0%), and after the instillation of a 2 ml DPL/u-PG suspension into the trachea. DPL/u-PG suspensions were prepared by suspending various molar ratios of DPL and u-PG in saline and sonicated at 0°C. The concentration was 5 mg of Phospholipid/ml. The results for each of the different ratios of DPL/u-PG suspension were: 10/0, 26%; 9/1, 37%; 7/3, 39%; 5/5, 40%; 4/6, 26%. Surface tension measurements were made using a dynamic alveolar model. The minimum surface tensions (γ min. dynes/cm) were as follows: 10/0, 59; 9/1, 5; 7/3, 6; 5/5, 24; 4/6, 62; 0/10, 55. These findings indicate that DPL in combination with u-PG might be a good synthetic surfactant for the treatment of Respiratory Distress Syndrome if DPL is combined with u-PG in ratios of 9/1; 7/3 and 5/5.