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INTERCOSTAL RETRACTOMETER FOR ESTIMATION OF INTRA-
PLEURAL PRESSURE. Gregory P. Heldt, William H. Tooley,
John A. Clements and Malcolm B. McIlroy. Cardiovas-

cular 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 gauge.

Twelve studies were performed in 3 infants with hyaline mem-
brane disease, averaging 1180 g weight, and 30 wks G.A. Compari-
son with estimated intrapleural pressure was made using an eso-
phageal 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 H₂O over
a range of 30 cm H₂O. This calibration method also allows for
the detection of artifacts due to inappropriate positioning of
the device. The regression line of retractometer output vs eso-
phageal pressure had an average slope of 0.4 and predicted the
esophageal pressure to within ± 1.7 cm H₂O (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 subcut-
aneous tissue, roughly in proportion to the thickness of the
tissue. (Supported in part by Contract HR 6-2093)

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EVALUATION OF ANTIBIOTIC THERAPY IN PATIENTS WITH CF.
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The effect of secondary bacterial infections of the broncho-
pulmonary 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 accord-
ing 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 im-
provement was reflected by the changes in the post minus the pre
scores. Preliminary summary of the data from these patients in-
dicates that the parameters of the clinical exam were most sensi-
tive 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 ir-
reversible changes in parameters measured by roentgenological and
pulmonary function exams. The same scoring system applied to in-
fants and young children without permanent damage may yield
different results.

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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
Papagaroufalos, 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 limit-
ed ventilation for respiratory failure in HMD had a 25% incidence
of pulmonary air leak (PAL). Mortality was 80% with PAL, 20% with-
out. 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 PaCO₂ ≤ 40 mm Hg
(mechanical over ventilation - MOV) and whose FiO₂ and breaths
per minute were lowered rather than peak airway pressure, as
PaO₂ improved. 5/6 of the infants with early ventilation who died
without MOV were severely asphyxiated at 1 min (Apgar ≤ 3) compar-
ed with 1/5 of the infants who died with MOV. Deaths in Non-MOV
infants may be associated with adverse perinatal factors predis-
posing the lung to injury.

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F CINCINNATI: A NEW ALPHA₁-ANTITRYPSIN VARIANT IN
TWO NEGRO FAMILIES. George Hug, Gail Chuck and
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of Cincinnati, Cincinnati, OH 45229 USA and Dept. of Immuno-
haematology, Ullevål Hosp., Oslo 1, NORWAY.

Serum of children repeatedly hospitalized for asthma was com-
pared with that of controls in regard to trypsin inhibitor capa-
city (TIC, normal 0.82mg/cc ± 0.21 IS.D.), α_1 -antitrypsin con-
centration (3.2mg/cc ± 0.9) and phenotype determined by thin layer
polyacrylamide gel isoelectric focusing (PAG-IEF). The same un-
usual phenotype was observed in two unrelated Negro families:

In one the variant appeared in mother and son (the only ones ex-
amined), 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 out-
side 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 in-
dividuals had asthma; 4 had repeated pneumonia and six had signs
of allergic disease.

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CARDIOPULMONARY CONSEQUENCES OF POSITIVE END-EXPIRA-
TORY PRESSURE (PEEP). Bernard H. Holzman and Emile M.
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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 H₂O. Each pressure was sustained for 20 mins
during which time a steady state was achieved. [To obviate proto-
col bias pressure changes were also made at random. The re-
sponse to reduction of PEEP was also monitored, as was a control
group kept at 1.0 cm H₂O PEEP]. Increasing levels of PEEP pro-
duced [1] no change of tidal volume and inspiratory time; [2] a
progressive fall of respiratory rate and minute volume; [3] pro-
gressive 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 trans-
mitted 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 re-
lated to FRC and compliance. The former tend to compromise alveo-
lar 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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RESTORATION OF LUNG PRESSURE-VOLUME (PV) CHARACTERI-
STICS WITH VARIOUS RATIOS OF DIPALMITOYL LECITHIN
(DPL) AND PHOSPHATIDYL GLYCEROL (PG). Machiko Ikegami

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Department of Pediatrics, Los Angeles, California.

We have demonstrated that DPL is the most effective phospho-
lipid 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 origi-
nal total lung capacity (ZTLC) at 5 cm H₂O 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 suspen-
sions 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 combina-
tion 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.