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INDUCTION OF BREATHING IN THE FETAL SHEEP WITH AMMONIUM CHLORIDE INFUSION Richard A. Molteni, M. Herzl Melmed, and Roger E. Sheldon (Spon. by Frederick C. Battaglia) University of Colorado Medical Center, Division of Perinatal Medicine-Depts of Pediatrics, Obstetrics-Gynecology and Physiology, Denver, Colorado.

Eight sheep fetuses (125-140 days old) were chronically catheterized and infused with 20-25 mEq/Kg of NH_4Cl in order to study the effects of acute metabolic acidemia on the fetal circulation. The fetal arterial pH decreased from 7.4-7.35 to 6.8-6.9. Regional blood flows before and during acidemia were measured by means of a microsphere method. During NH_4Cl acidemia, 8/9 animals showed increased blood flow to the diaphragm and to the intercostal muscles. In subsequent preparations, tracheal and amniotic catheters were placed and these showed that NH_4Cl induced regular respirations (60-90/min) generating negative tracheal pressures of 20-30 torr. Regular breathing began 1-2 hours after stopping the infusion of NH_4Cl and continued for 12-24 hours - after blood ammonia concentrations had returned to normal. Repeated infusions of NH_4Cl elicited the same response. Pulmonary blood flows were higher at similar right ventricular PO_2's during NH_4Cl-induced acidemia. All fetuses had normal blood pressure and heart rate, and all recovered completely.

$ml \cdot min^{-1} \cdot 100\ gm^{-1} \pm$ SEM

	diaphragm blood flow	intercostal muscles blood flow
Control	21.4 ± 2.36	22.7 ± 4.16
Acidemia	248.6 ± 52.4	125.3 ± 21.3

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THE EFFECTS OF ALTERATION OF EXPIRATORY RESISTANCE ON PULMONARY FUNCTION (PF) IN THE NEWBORN. Ara S. Moomjian, Jacob G. Schwartz, John G. Shutack, Marcia J. Wagaman, Thomas H. Shaffer, William W. Fox. (Spon. by Jean A. Cortner) Univ. of Pa. Sch. of Med., Dept. of Peds. The Childrens Hospital of Philadelphia and Temple Univ., Dept. of Physiology, Philadelphia, PA.

Studies post extubation in neonates recovering from respiratory disease have suggested that expiratory resistance (R_E) plays a role in maintaining adequate lung volume. To evaluate effects of R_E on PF, 6 previously intubated newborns who were breathing spontaneously in room air had PF measured after the application of 2 external expiratory resistances: EER_1 = 30 cm H_2O/L/sec and EER_2 = 24 cm H_2O/L/sec. PF tests including dynamic lung compliance (C_L), inspiratory resistance (R_I), R_E, functional residual capacity (FRC), tidal volume (V_T), and inspiratory:expiratory (I:E) ratio were studied in infants (mean wt. 2.26 kg., mean age studied 55 days [range 3-114]) evaluated with a face mask, pneumotachograph, solenoid valve, and EER_1 and EER_2. Patients were studied at 4 phases: 0 resistance, EER_1, 0 resistance, EER_2. There was a mean 25.6% increase of FRC with EER_1 ($p<0.01$) and mean 37.8% increase of FRC with EER_2 ($p<0.01$). I:E ratio decreased by mean 16.0% ($p<0.05$) with EER_1 and mean 22.6% ($p<0.05$) with EER_2. C_L, R_I, and V_T were unchanged at any phase. This study demonstrates that lung volume can be increased when an expiratory resistance is applied. Therefore, application of an expiratory resistance may prove to be useful in the prevention of atelectasis in neonates post extubation.

1214

RESPIRATORY MUSCLE FUNCTION IN IDIOPATHIC SCOLIOSIS. John R. Morton, Denise J. Strieder. Harvard Medical School, Children's Hospital Medical Center, Department of Pediatrics (Pulmonary Division), Boston, Massachusetts.

Patients with mild idiopathic scoliosis occasionally complain of exercise intolerance even in the presence of normal standard pulmonary function tests. We postulated that respiratory muscle compromise, possibly due to distortion of rib cage and diaphragm, might be a factor. With the technique of Black and Hyatt (Am Rev Resp Dis 99:696, 1969), we measured maximal static inspiratory ($P_{I_{max}}$) and expiratory ($P_{E_{max}}$) pressures, which in the absence of intrinsic lung disease reflect respiratory muscle function. We studied 25 girls of mean age 18 years (range: 10-30 y) who had normal lung volumes (> 80% predicted) and were free from neuromuscular and intrinsic lung disease. Primary thoracic curves averaged 50° (range: 17-90°). For comparison we also measured $P_{I_{max}}$ and $P_{E_{max}}$ in 25 healthy girls, matched for age and body surface area.

$P_{I_{max}}$ for the study group averaged 89 cm H_2O (SD:± 13 cm H_2O) and that for the control group 115 ± 22 cm H_2O. $P_{E_{max}}$ for the study group averaged 131 ± 26 cm H_2O and for the control group 166 ± 8 cm H_2O. Both differences were statistically significant ($P < 0.01$). There was no relationship between $P_{I_{max}}$ or $P_{E_{max}}$ and the angle of thoracic curvature. We conclude that respiratory muscle compromise is frequently demonstrable in girls with mild idiopathic scoliosis and may be a factor in their symptoms. (J.R.M. is the recipient of a Parker B. Francis Foundation Fellowship).

1215

ASPERGILLOSIS AND ATOPY IN CYSTIC FIBROSIS (CF): Lois A. Nelson and Robert H. Schwartz, Univ. of Roch. School of Med., Dept. of Ped., Rochester, New York.

There is an increased incidence of antibodies to Aspergillus (Asp.) antigens in the serum of patients with CF. Forty-six CF patients of varying clinical severity(age 5-46yrs.)were studied for evidence of:(1)respiratory colonization with Asp, (2)bronchopulmonary allergic aspergillosis (BPAA), and (3) atopy.

Asp. was cultured from sputums of 46%(21/46) of patients. A laboratory isolation rate of 6.5%(20/305) was found in respiratory specimens of non-CF patients ($p<0.001$).Hyphae were seen on sputum smears from 95% of culture-positive CF patients. 61% of culture-positive and 39% of all CF patients had serum precipitins to Asp. in contrast to only 2.2%(1/45) asthmatic controls.

Two (2/46) CF patients developed definite evidence of BPAA with (1)wheezing, (2)lung infiltrates,(3)Asp. on sputum culture & smear, (4)positive immediate skin test,(5)elevated serum IgE, & (6)IgE antibodies to Asp. fumigatus by RAST. An additional CF patient with BPAA proven 2 yrs. before was controlled with prednisone during the study period. Six more patients had elevated Asp. RAST. Four fulfilled 4 criteria for BPAA.

IgE was elevated in 19% of CF. Type I sensitivity to ≥2 pollens was found in 22%; to Asp. in 39%; & to ≥3 molds in 39%. Mold-sensitive patients were older & had more severe disease.

Significant pulmonary colonization with Asp. occurs in CF. CF patients are at risk to develop BPAA. The respiratory tract is a significant route of sensitization to Asp. and other molds in these patients.

1216

EFFICACY OF TOLAZOLINE HCl AS A PULMONARY VASODILATOR IN NEWBORN HYPOXEMIC(Hyp) GOATS. R.M. Nestrud, J.E. Fewell, R.W. Arrington, D.E. Hill, S.P. Barrier, J.B. Norton (Spon. by R.H. Fiser), Univ. of Arkansas for Medical Sciences, Depts. of Pediatrics & Physiology, Little Rock, Ark.

Tolazoline(TOL) has been used frequently to treat pulmonary (pulm) hypertension in newborn infants with conflicting results. Eight newborn goats(age 3-17 days) were anesthetized, intubated, and ventilated. The ductus arteriosus was ligated and direct measurements were made of pulm blood flow(Qp), pulm arterial pressure(PAP), left atrial pressure and systemic arterial pressure (SAP). Moderate Hyp (PaO_2 31±1.4 mmHg) caused the following changes: ↓ systemic resistance(Rs), ↑PAP,↑ pulm resistance(Rp), ↑Rp/Rs. Qp did not change. TOL was given as a bolus (1mg/kg) and as an infusion(inf) (2 mg/kg/hr) into the pulm artery(PA) during both Hyp and after return to normoxemia(Norm). Significant pressure changes are outlined below. Values are mean ± SEM.

	Hyp bolus	Norm bolus
PAP mmHg	15.9±1.24→11.2±.91($p<.001$)	11.1±.99→9.0±.98($p<.005$)
SAP mmHg	41±2.3 → 36±3.3($p<.025$)	54±2.5→ 38±2.2($p<.001$)

During Hyp, TOL bolus ↓Rp from 3.3±.53 to 2.0±.25 mmHg/L/min/kg ($p<.005$) and ↓Rp/Rs from .35±.03 to .27±.02($p<.001$). During Norm, no significant resistance changes occurred with TOL bolus. TOL inf produced no significant changes during either Hyp or Norm.Qp did not change significantly during the experimental periods,but with severe Hyp, cardiac output and SAP fell so severely that minor changes in resistance caused by TOL could not be evaluated. These data suggest that TOL is an effective pulmonary vasodilator during moderate Hyp when injected as a bolus into the PA.

1217

CHARACTERIZATION OF RESTRICTIVE AND OBSTRUCTIVE DISEASES USING RELATIONS AMONG STATIC PULMONARY FUNCTION PARAMETERS E. Nussbaum, F.P. Primiano, Jr., J.G. Horowitz, and M.D. Lough. Case Western Reserve University, Rainbow Babies and Childrens Hospital, Cleveland, Ohio 44106.

We studied the relationships among residual volume (RV), total lung capacity (TLC) and vital capacity (VC) in 26 children with obstructive lung disease (CF), 20 children with chest wall restriction (kyphoscoliosis) and 14 adults with restrictive pulmonary disease (sarcoidosis or diffuse interstitial fibrosis). It was found that once restrictive or obstructive processes have progressed past their initial stages, distinct relations are established among RV/TLC, VC and TLC consistent with the following model. As restrictive processes progress, changes in RV are small relative to changes in TLC. Therefore, as a first approximation, RV can be taken as a constant, K_1, and $RV/TLC \approx K_1/(K_1+VC) \approx K_1/TLC$ (i.e., RV/TLC is inversely related to VC and TLC). For obstructive processes, changes in TLC are relatively smaller than changes in RV so that $TLC \approx K_2$ and $RV/TLC \approx (K_2-VC)/K_2$ (i.e., directly related to VC). When RV/TLC was plotted against VC/(Pred.VC) or TLC/(Pred.TLC) these inverse and direct relations were clearly seen, demonstrating that in spite of an increase in RV/TLC in both groups, they were separable when related to VC or TLC. For patients in the "earlier" stages of the processes, a distinction appears to be more clearly established for RV/TLC vs TLC than for RV/TLC vs VC. This approach involves observing only two parameters, permits objective classification and longitudinal follow-up of processes involved in a disease and can be easily used in computer-based systems.