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PARTIAL MECHANICAL UNLOADING OF THE ELASTIC WORK OF SPONTANEOUS BREATHING IN CATS WITH NORMAL AND XANTHINEOXIDASE INJURED LUNGS.

Anders Jonzon<sup>1</sup>, Andreas Schulze<sup>2</sup>, Peter Schaller<sup>2</sup>, Gunnar Sedin<sup>1</sup>.  
- Dept. of Pediatrics, Uppsala University, Uppsala, Sweden (1) and Dept. of Biomed. Eng. & Pediatrics, Dresden Medical Academy, Germany (2).

A ventilator with an adjustable internal compliance ( $C_v$ ) has been constructed (Schaller et al 1991). In addition to a baseline "CPAP" it generates a pressure at the endotracheal tube (ETT) proportional to the instantaneous inspired volume. Thus, a decreased compliance of the patient's lung ( $C_l$ ) can theoretically be compensated during spontaneous breathing by adjusting  $C_v$  to a negative value. To test this hypothesis we assessed how stepwise changes in  $C_l$  influenced the compliance of the combined ventilator-ETT-lung system ( $C_{tot}$ ) and integrated inspiratory phrenic nerve activity in 13 chloralose anesthetized cats.  $C_{tot}$  improved according to the relation  $1/C_{tot} = 1/C_l + 1/C_v$ . With a time lag of no more than 2 or 3 breathing cycles phrenic nerve activity decreased with elastic unloading to a new level. It decreased in a hyperbolic relation to the percentually scaled improvement in  $C_{tot}$  both before ( $r=0.85$ ) and after ( $r=0.69$ ) lung injury. We conclude that elastic unloading effectively decreases inspiratory activity and work of breathing for a given alveolar ventilation in stiff lungs.

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Long term pulmonary functional outcome of bronchopulmonary dysplasia (BPD) and of premature birth (PB).

S. PARAT, G. MORIETTE, M.F. DELAPERGIE, A. DENJEAN, P. ESCOURROU, J.P. RELIER, C. CAULTIER. Service de Médecine Néonatale de Port-Royal (G1 Cochin) - 75014 PARIS, and Laboratoire de physiologie - INSERM C1F 0909 ; 92141 CLAMART - FRANCE.

At the age of 8 years, lung function was evaluated in 15 survivors from BPD. The results were compared with those of 2 groups of children without neonatal lung disease : 1) prematurely born (PB), and 2) born at term (TB). Gestational age (GA) and birth weight (BW) were similar in BPD (29.8±2.8 weeks ; 1368±548) and in PB (30.3±1.9 weeks ; 1420±397). Heights at test were similar in the 3 groups.

Lung resistance (RL) and dynamic lung compliance (CL<sub>dyn</sub>) were measured using the esophageal balloon technique. RL (cm H<sub>2</sub>O/l/s) was significantly increased ( $p<0.001$ ) in BPD (11.0±2.76) and in PB (9.3±1.8) as compared to TB (5.2±1.1). CL<sub>dyn</sub> (ml/cmH<sub>2</sub>O) was significantly decreased : 1) in BPD (42.7±11.4) ( $p<0.001$ ) and in PB (54.4±17.2) ( $p<0.003$ ), as compared to TB (75.6±20.4) ; 2) in BPD, as compared to PB ( $p<0.05$ ). FRC (ml ; helium dilution method) were similar in the 3 groups (BPD : 907±205 ; PB : 933±233 ; TB : 1020±246). Bronchial hyper-reactivity to methacholine (forced oscillometry) was observed in 2/13 BPD. In the 11 BPD tested on a cycle ergometer, maximal work load (W<sub>max</sub>) and oxygen consumption, and blood gases at W<sub>max</sub> were in the normal range.

**IN CONCLUSION** : we observed persistent functional abnormalities during childhood, following BPD, but also following PB without lung disease. Therefore, PB by itself appears to play a determinant role in long term pulmonary function.

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