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DETERMINATION OF TOTAL RESPIRATORY SYSTEM COMPLIANCE FROM RESONANT FREQUENCY IN INTUBATED SUBJECTS

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Total respiratory system compliance (C) is derived from resonant frequency (f_r) and inertance (I) according to $C=(4\pi^2 \cdot I \cdot f_r^2)^{-1}$ by analogy with electrical circuit theory. It was hypothetized that I of a narrow endotracheal tube (ETT, I calculable from length and diameter) far supersedes that of the bronchial tree (unknown). For measurement of f_r a resonant oscillation was induced by overcompensating the ETT's and airways' resistances using a negative ventilator resistance. Our new method (C_r) was validated against the "constant flow inflation method compliance"(C_i).

In each of *10 tracheotomized rabbits* (4.4±.5 kg) C_i and C_r values (mL/kPa) were obtained in 3 experimental situations(TAB.).

TAB.	before relaxation	after relaxation	surfactant depleted
C_i	45.3± 9.4	47±7.1	25.5±5.2
C_r	49.5±11	51±8.2	27 ±5.9

Linear regression equation of the paired values was $C_r=1.1C_i-.74$ ($r=.97$; $p<.0001$). In *18 critically ill infants* (body weight 880-6520g) the regression equation for the paired C_i (range 3-42) and C_r (1.8-43) values was $C_r=.97C_i+.13$ ($r=.98$; $p<.0001$). Median difference between individual paired data was .14mL/kPa (range -4.2 to 3.8). CONCLUSION: C_r proved accurate. This method also works with the respiratory muscles in function.

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PULMONARY EFFECTS OF CLOSURE OF PATENT DUCTUS ARTERIOSUS (PDA) IN PREMATURE INFANTS WITH SEVERE RESPIRATORY DISTRESS SYNDROME (RDS)

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In preterm infants PDA is generally thought to compromise pulmonary function. Aggressive treatment directed to close the PDA is therefore generally thought to be indicated in these patients. Altogether 8 infants with mean gestational age 26.5 weeks (range 25-30) and mean birth weight 830 g (range 535-1140 g) were studied. Pulmonary mechanics were measured with commercial equipment (PEDS) approx. 24 h. before and 24 as well as 48 h. after treatment (6 surgery, 2 pharmacologic). Data (mean±SEM) are given for lung compliance-C_L/kg, pulmonary resistance-R and FiO_2(*p <0.05)

	-24h.	+24h.	+48h.
C_L(ml/cmH2O)/kg	0.427±0.07	0.349±0.07	0.456±0.06
R (cmH2O/l/s)	238±45	235±42	194±40
FiO_2	0.58	0.55	0.41*

Closure of PDA resulted in significant improvement in oxygenation. No significant changes in pulmonary mechanics were found.

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CEREBRAL BLOOD FLOW DURING EXPERIMENTAL HYPOXEMIA WITH AND WITHOUT HYPOVOLEMIA IN THE NEWBORN PIGLET.

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The effect of hypoxemia (HO, 10% O2) with and without hypovolemia (HV, bleeding 20% 20 min (20') after HO) on cerebral blood flow (CBF) was studied in 14 newborn piglets with the microsphere method. Surgery and experiments were performed under general anesthesia with 70% N2O. The piglets were ventilated paralyzed with pancuronium. CBF was measured in brainstem (BR), cerebellum (CE) and cerebrum (CR) at baseline (BS), during HO and after HV, and 30 (30') and 60 min (60') after HO. Results were (ml/100g/min, mean ± SD.):

		BS	HO	HV/20'	30'	60'
HO+HV	BR	66±15	279±74*	60±6	66±15	71±25
	CE	73±20	199±57*	57±8*	70±13	76±23
	CR	72±19	188±39*	56±8*	65±10	72±23
HO	BR	70±16	179±115*	77±21	65±17	62±16
	CE	73±19	109±80	86±21	76±27	65±12
	CR	74±18	98±68	83±27	76±27	67±19

* p<0,05 from BS

HO significantly increases CBF. HV following HO reduces blood flow significantly in both CE and CR compared to BS. BR seems more stable to this insult.

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LIVER TRANSPLANTATION (TX) STABILIZES KIDNEY FUNCTION IN ADVANCED RENAL FAILURE OF PRIMARY HYPEROXALURIA (PH)

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It is controversial if patients with advanced PH should be treated by isolated liver (L) TX or by combined kidney (K) TX + LTX. We observed 2 PH children with deficiency of hepatic alanine: glyoxylate transferase who were managed differently. No. 1 presented at 6 weeks with a serum creatinine (SCR) up to 3.8 mg/dl. Despite transient improvement by vitamin B6 the disease progressed. At age 1.8 yrs isolated LTX was performed. General condition improved but somatic development remained retarded requiring continuous tube feeding. Renal function stabilized: 1.8yrs post-TX SCR 2.5 mg/dl, creatinine clearance 15 ml/min/1.73 m^2 vs 10 before TX. Serum oxalate (OX) decreased slowly but remained slightly elevated. Urinary OX and glycolate excretion dropped, interrupted by transient peaks. Patient No. 2 needed dialysis treatment at 4 yrs and underwent combined LTX + KTX 1 year later. GFR and OX in serum and urine rapidly normalized; 9 months post TX the condition is excellent.

Our experience demonstrates that isolated LTX is able to maintain K function in severe PH, even if performed in advanced renal failure, but enzyme replacement seems to be insufficient to compensate fully, in contrast to combined LTX + KTX.

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EARLY ULTRASONOGRAPHIC DETECTION OF ATRIAL THROMBI IN NEONATES WITH CENTRAL VENOUS CATHETERS

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Central venous catheters (CVC) are often required for neonates in Neonatal Intensive Care Units (NICU) though they may be associated with a high incidence of complications. From August 1988 to the present, we have performed weekly ultrasound monitoring of the catheter, heart and large veins of newborn infants with surgically inserted CVCs in order to detect early ultrasound signs of catheter related thrombosis. We have performed 248 ultrasound examinations in 50 newborns with birth weight ranging between 400 and 3800 grams. A total of 55 CVCs were monitored for a total of 1403 CVC days. The mean age at CVC insertion was11±14 days with 80% of the CVCs placed before the 7th day of life. The mean duration of the CVCs was 29±29 days. CVCs were mainly used for total parenteral nutrition and infusion of medication, not for routine blood sampling or transfusion. RESULTS: 50 of the 55 CVCs studied (90.1%) were free of signs of thrombosis. Three CVCs showed fibrin sleeves (FS) around the tip, 2 of which progressed to atrial thrombosis (AT). Four CVCs (7.3%) were associated with AT, 2 as a result of the progression of FS, and 2 in which AT was seen as primary. Two of the ATs were diagnosed within 7 days of catheter placement. Urokinase treatment (4400 IU/Kg IV bolus+ 4400 IU/Kg/h IV maintenance) led to complete resolution of the AT in all the 3 cases treated, with no side effects. CONCLUSIONS: 1) Weekly ultrasound monitoring of CVCs in newborns showed 7.2% to have asyntomatic AT. 2) Urokinase promptly resolved AT in the 3 treated cases without the need of CVC removal. 3) FS could be an early sign of AT and must be closely monotored. Further data are needed to verify if FS shoud be treated before AT develops.

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THE EFFECT OF ORAL OR PARENTERAL ADMINISTRATION OF MEDIUM CHAIN TRIGLYCERIDES (MCT) ON THE EXCRETION OF DICARBOXYLIC ACIDS (DCA) IN LOW BIRTH WEIGHT INFANTS

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Significant urinary excretion of DCA is found in newborns fed MCT containing diets. This may misled in the dignosis of inborn error of metabolism and represents an energy loss. Since the liver plays a key role in MCT metabolism after oral administration , we studied the differential excretion of DCA in Low Birth Weight Infants (LBWI) fed similar amounts of MCT (35% of the fat intake as octanoic C8:0 and decanoic C10:0 acids) given orally or intravenously. We studied 2 groups of LBWI, 11 fed orally (PO_MCT)and 5 intravenously (IV_MCT). Birth weight, gestational age and postnatal age were 1547±184 vs 1438±425 g, 31.6±1.2 vs 30.2±2.3 wk, 15.2±2.56 vs 10.8±5.9 days,in the PO_MCT and IV_MCT groups respectively. MCT intakes resulted in 1.71±0.28 and 1.44±0.95 g (NS). Energy intake was higher in the PO group 113±11vs 84±4 Kcal/Kg/d for IV group. RESULTS of the urinary DCA (µMol/Kg/day) are reported in the table .

	ADIPIC*	SUBERIC•	SEBACIC ¶
PO_MCT	3.63±1.87	2.78±1.32	1.78±2.06
IV_MCT	0.85±1.13	1.30±1.28	0.48±0.36

* p =0.008 ,• p =0.053, ¶ p =0.19

CONCLUSIONS:1) Significantly higher amounts of DCA are found in the urine of the PO_MCT group. 2) The lower DCA excretion following intravenous administration of MCT may result from different metabolic fates such as chain elongation, deposition, and/or incresed beta-oxidation. 3) the impact of a large MCT load that bypasses the liver should be further evaluated.