139

PLASMA PROSTAGLANDIN E AND $F_{2\alpha}$ IN PREMATURE INFANTS WITH PATENT DUCTUS ARTERIOSIS. Manchandia, M.R., Michelakis, A.M., Karna, P., Dolanski, E.A. (Spon. by W.B. Weil, Jr.)Coll. of Hum. Med., Michigan State University, Depts. of Pharmacology, Medicine and Human Development, E. Lansing.

The aim of the project was to determine the relation between the level of PGE and $PGF_{2\alpha}$ and the presence or absence of PDA in premature infants. In infants with clinical PDA, ages 1-26 days, the PGE and $PGF_{2\alpha}$ were 1443.10±153.78 and 766.50±70.60pg/ml, respectively; statistically insignificant from cord levels of term infants previously obtained in this laboratory. After improvement of the ductal shunt, PGE significantly decreased ($p < 0.01$) to 297.57±60.14 and $PGF_{2\alpha}$ ($p < 0.01$) to 164.66±54.53pg/ml. This decrease occurred spontaneously, with Indocin^R administration or by surgical ligation, and is comparable to levels in term infants at 3 days of age without evidence of ductal shunts. Representative examples follow:

	PGE	$F_{2\alpha}$(pg/ml)		PGE	$PGF_{2\alpha}$
PDA c CHF (day 3)	2100	926	Spont. Closure	224	152
Pre Indocin^R(26 days)	1980	632	Post Indocin^R(6hrs p)	634	234
Pre Op(PDA)(6 days)	1417	894	Post Ligation(24hrs)	248	152

Since catabolism of prostaglandins occurs in the lung with the majority being removed in a single pass, the high PG levels in premature infants with PDA may be due to continuation of in utero shunting of blood away from the lung and/or decreased catabolism. The decrease in PG levels with the decreased ductal shunt may be secondary to improved lung perfusion. These data suggest the patency of the ductus arteriosus may be the etiology of the elevated PG levels and not result from the elevated levels.

140

CONTINUOUS COMPUTERIZED DIASTOLIC PRESSURE ANALYSIS (DPA) IN NEONATES. Jay M. Milstein, James Foerster, Perry Gee, Boyd W. Goetzman, and Richard P. Wennberg. University of California, Davis - Sacramento Medical Center, Sacramento, California.

DPA and determination of an aortic diastolic time constant, τ, has been utilized to evaluate two groups of neonates: the first with left to right ductal shunting; and the second with no ductal shunting. In earlier studies performed manually, τ, which is the reciprocal of the slope of the log of the diastolic pressure plotted against time, was 400 ± 57 msec (1 S.D.) in group I and 657 ± 62 msec in group II. A microcomputer system suitable for continuous τ determinations is described.

Arterial pressure pulses are obtained from umbilical aortic catheters which are connected to a standard amplification system. The analog signal is then transmitted to an analog-to-digital convertor of a microcomputer which samples at the rate of 100 times/sec. These data are then used to determine the instantaneous slopes between successive samples on each pressure cycle to enable the automated recognition of the dicrotic notch and the onset of systole. Once the diastolic portion of each beat is identified and meets certain quality criteria, eight equally spaced points are selected in diastole and a least squares fit is made to an exponential curve and the τ is determined. Current on-line τ determinations are performed over 25 second intervals every ten minutes and the mean τ and standard deviation are recorded. Subsequent trend analysis as a means to determine the predictive value of τ is anticipated.

141

PRE-ATHEROSCLEROTIC AORTIC LESIONS IN CYSTIC FIBROSIS Thomas J. Moss (Spon. by Arthur J. Moss), Garth E. Austin, Arthur J. Moss, UCLA School of Medicine, Departments of Pediatrics and Pathology, Los Angeles.

The purpose of this study was to evaluate the frequency and extent of aortic precursor lesions (fatty streaks, early fibromusculoelastic lesions, late fibromusculoelastic lesions) found at autopsy in cystic fibrosis. Patients with this disease suffer from fat malabsorption and thus provide a unique experimental model for evaluation of the hypothesis that low fat intake may prevent atherosclerosis. Other patients with debilitating disorders but with no apparent impairment of fat absorption served as controls. Autopsy material from 35 patients, 9 with cystic fibrosis and 26 with leukemia and other malignancies were studied.

Fatty streaks were less common in the cystic fibrosis group ($p. < .001$) as were the late fibromusculoelastic lesions ($p. = .007$). There was no significant difference in the frequency, length, or thickness of the early fibromusculoelastic lesions. The findings suggest that fat is responsible for progression but not initiation of the fibromusculoelastic precursor lesions.

The results support the concept that early restriction of dietary fat may prevent, delay, or otherwise modify atherosclerosis in the adult.

142

ECHOCARDIOGRAPHIC CHANGES IN CHILDREN WITH PULMONARY HYPERTENSION DUE TO UPPER AIRWAY OBSTRUCTION. E. Nussbaum, S.S. Hirschfeld, R.E. Wood, and T.F. Boat Case Western Reserve University, Rainbow Babies and Childrens Hospital, Department of Pediatrics, Cleveland, Ohio.

When right ventricular ejection time (RVET) and RV pre-ejection period (RPEP) are measured by echocardiography, a RPEP/RVET ratio greater than 0.35 has been associated with increased pulmonary vascular resistance (Circulation 52:642, 1975). 4 children with alveolar hypoventilation due to enlarged tonsils and adenoids, or posteriorly displaced tongue, were studied. Onset of upper airway obstruction ranged from birth to 2-1/2 years. The patients had a low PaO_2 (39-78 mm Hg), elevated $PaCO_2$ (50-56 mm Hg) during sleep, right atrial and right ventricular hypertrophy by electrocardiogram (ECG) and vectorcardiogram (VCG), and cardiomegaly by roentgenogram. Pulmonary artery pressures (PAP) during cardiac catheterization ranged from 80/30 to 80/50 mm Hg (m=55) and RPEP/RVET was greater than 0.5 in each case (normal 0.24±0.06). One patient, who was not catheterized, had an RPEP/RVET of 0.37. Oxygen administration or intubation during cardiac catheterization reduced PAP to 40/10 (m=30) and 50/10 (m=30) in two cases, and RPEP/RVET decreased simultaneously to less than 0.3. The other children underwent tonsillectomy and adenoidectomy. RPEP/RVET decreased postoperatively from 0.5 to 0.3 and 0.37 to 0.3 respectively, and sleeping blood gases, ECG, VCG and chest roentgenogram reverted to normal. Echocardiography is non invasive, reflects changes in PAP and can be used for sequential evaluation of children with upper airway obstruction. Further experience may yield objective criteria for operative intervention.

143

REDUCED ALPHA ADRENERGIC RESPONSIVENESS OF FETAL AND NEONATAL AORTIC SMOOTH MUSCLE IN UNANESTHETIZED SHEEP. Massimo Pagani, Hank Baig, Israel Mirsky, W. Thomas Manders and Stephen F. Vatner (Spon. by Alexander S. Nadas, Dept. Cardiol., Children's Hosp. Med. Ctr., Boston, MA)

To study effects of age on alpha adrenergic activation of aortic smooth muscle without complicating influences of anesthesia and recent surgery, 9 adult, 7 newborn (2-3 days) and 5 near term fetal sheep were instrumented with pressure and ultrasonic dimension gauges for measurement of aortic pressure and diameter and calculation of wall stress(σ) in the proximal third of the descending thoracic aorta. After recovery from surgery the conscious animals received methoxamine to stimulate aortic smooth muscle. Methoxamine, 50 µg/kg/min i.v., shifted σ-radius relationships in the adults towards a higher σ at any given radius ($\Delta\sigma = 3.50 \pm 0.40 \times 10^5$ dynes/cm^2, $p < .01$). This shift in σ-radius relationship was not observed with twice the above dose of methoxamine in newborns ($\Delta\sigma = 0.75 \pm 0.19 \times 10^5$ dynes/cm^2) or four times the dose in the fetus ($0.82 \pm 0.54 \times 10^5$ dynes/cm^2). Additionally the effects of alpha adrenergic stimulation on arterioles were studied with i.v. methoxamine, 200 µg/kg, in 5 unanesthetized adults and newborns, previously instrumented with electromagnetic flow probes on the ascending aorta. Total peripheral resistance increased in the adult more than in the newborn (524 ± 46% and 169 ± 39% respectively, $p < .01$). Thus vascular smooth muscle responses to alpha adrenergic stimulation, as reflected by aortic σ-radius relationships and systemic vasoconstriction, are significantly greater in conscious adult sheep than in fetal or neonatal lambs.

144

HYPOVOLEMIA AND PERSISTENT FETAL CIRCULATION. Charles L. Paxson, Jr. and Edward B. Clark, U. Neb. Coll. Med., Omaha, Neb. (Spon. G. C. Rosenquist)

Animal studies have demonstrated that acute blood loss may produce an increase in pulmonary vascular resistance. We postulate that hypovolemia may be one factor in the etiology of persistent fetal circulation (PFC). Circulating red cell volume (using 51 Cr labeling techniques) was measured in 5 neonates who presented with clinical findings of PFC (tachypnea, extrapulmonary right-to-left shunting and normal cardiovascular anatomy at catheterization and/or autopsy).

Birth weights of the 5 infants ranged from 2420-4140 (mean 3772) grams; gestational ages were 35-41 (mean 39) weeks, and all infants had normal 5-minute Apgar scores. Blood loss was not suspected in any of the 5 infants, nor were any transfused prior to their red cell volume studies. The initial hematocrits, glucose concentrations and calcium values were ≤ 55%, ≥ 95mg/dl, and ≥ 7.8mg/dl respectively. Four of the 5 infants expired despite vigorous resuscitative efforts, including transfusion.

Red cell volume in all infants was deficient (30-42%, mean 36%). These data suggest that diminished circulating red cell volume may be involved in the etiology of persistent fetal circulation.