217

PROSTAGLANDIN E_1 (PGE_1) IS AN EFFECTIVE PULMONARY VASODILATOR IN INFANTS AND CHILDREN. Kenneth M. Weesner, Robert G. Dillard, Robert C. McKone (Spon. by Jimmy L. Simon). Bowman Gray School of Medicine, Department of Pediatrics, Winston-Salem, NC.

Decreasing pulmonary artery pressure (PAP) or resistance (PVR) is important in some patients (pts) with secondary pulmonary hypertension. PGE_1 is an attractive pulmonary vasodilator not only because of its 1st pass metabolism in the lungs but also because of its bronchodilator properties. We administered PGE_1 to 6 pts. 3 had lung disease (ages 6,9,16 mo); they received IV PGE_1 at 0.025 or 0.05 $\mu\text{g/kg/min}$. Three patients with congenital heart disease (CHD) with L-R shunts (ages 2,4,8 mo), received PGE_1 into a branch PA at 0.05 and/or 0.01 $\mu\text{g/kg/min}$. Hemodynamic measurements, arterial blood gas determinations, and oxygen saturations were made at baseline and every 10 minutes during infusion. Results are as follows:

Pt. Group	Infusion($\mu\text{g/kg/min}$)	ΔPAP	ΔPVR	ΔQp	ΔHR	ΔPO_2
Lung 1	0.025	17%↓	24%↓	13%↑	5%↓	0
2	0.025	29%↓	57%↓	5%↑	0	10%↑
3	0.05	41%↓	47%↓	12%↑	5%↓	100%↑
CHD 1	0.05	0	0	13%↑	10%↓	0
	0.1	0	0	22%↑	0	0
2	0.05	0	21%↓	7%↑	0	350%↑
3	0.05	0	50%↓	177%↑	0	0
	0.1	0	76%↓	200%↑	0	0

We conclude PGE_1 is a useful vasodilator for diagnostic or therapeutic purposes in some pediatric pts. with secondary PAH.

† 218

SYSTEMIC AND PULMONARY VASCULAR EFFECTS OF DOBUTAMINE IN NEWBORN LAMBS - Becky Williams, James E. Fewell, and Donald E. Hill. University of Arkansas for Medical Sciences, Department of Pediatrics, Little Rock, Arkansas.

Dobutamine is potentially a useful drug for therapy of myocardial dysfunction complicating perinatal asphyxia. To study the effect of the drug on an immature cardiovascular system, we infused dobutamine in stepwise doses from 2.5 to 20 mcg/kg/min into 7 newborn lambs chronically instrumented for measurement of systemic and pulmonary artery pressures (SAP, PAP), right and left atrial pressures and pulmonary blood flow (Qp). The infusion was performed first with the lambs breathing room air, and then breathing a 10% O_2 mixture. With normoxia, dobutamine produced a significant increase in Qp from 270 ± 69 to $390 \pm 92 \text{ ml/min/kg}$ (mean $\pm$ S.D.) ($p < 0.01$). This was due to an increase in heart rate (HR) from 180 ± 28 to $310 \pm 26 \text{ beats/min}$ ($p < 0.01$). While SAP and PAP did not change, both systemic and pulmonary vascular resistances (SVR, PVR) decreased. During hypoxemia, dobutamine infusion tended to raise Qp and HR, but the changes were not statistically significant. No change was seen in SAP or SVR. PAP rose from 23 ± 2.8 to $29 \pm 7.0 \text{ mm Hg}$ ($p < 0.01$), but PVR did not change. Thus, dobutamine in normoxic lambs caused an increase in cardiac output with concomitant fall in PVR and SVR. In addition, it had a marked chronotropic effect in these newborn animals. Dobutamine did not alter the pulmonary vascular response to hypoxia. The drug has properties desirable for therapy of newborns with myocardial dysfunction, but if the chronotropic effect is noted in human infants, this may limit dobutamine's utility.

219

PULSED DOPPLER-ECHO ASSESSMENT OF DUCTAL FLOW IN INFANT COARCTATION OF THE AORTA. Allen D. Wilson, John P. Thomas, William J. Gallen (Spon. by Jürgen Herrmann), Med. College of Wisconsin, Milwaukee Children's Hospital, Dept. of Pediatrics, Milwaukee, Wisconsin.

Descending aortic blood flow in infants with coarctation of the aorta (CoA) may depend on either 1) pan-ductal patency for pulmonary artery-to descending Ao (R→L) ductal flow (as in interrupted aortic arch (IAA), or 2) partial ductal patency (at the aortic end) for maintaining flow across the coarctation itself. In our experience pts. with R→L ductal dependency are at very high risk for showing sudden decrease in descending aortic flow and cardiovascular collapse. In order to determine whether Doppler-ECHO would identify this high-risk sub-group we compared Doppler-ECHO recordings against angiograms and cath data from our 11 infants with CoA presenting at 1 to 60 days of age (1/82 - 11/83).

Four of 11 had ventricular septal defect (VSD), and Doppler agreed with angio in 3 of 4 (no ductal shunt in 2, small L→R in 1). In the fourth infant Doppler suggested L→R shunt but angio showed bi-directional shunting. Of 7 of 11 infants with CoA without VSD, 2 were not catheterized (no ductus in 1 and small L→R ductal shunt in 1 by Doppler). The remaining 5 infants showed large (smooth) R→L ductal shunt by both Doppler and angio in 1/5, and no shunt by both Doppler and angio in 4/5. (Doppler recording also confirmed R→L ductal shunt in 2 of 2 infants with IAA.)

In conclusion, Doppler-ECHO can identify ductal R→L shunting pattern in infants with CoA and IAA and provide another criterion for starting or continuing PGE_1 .

220

TIME COURSE OF APPEARANCE AND REGRESSION OF ANEURYSMS IN KAWASAKI SYNDROME. Allen D. Wilson, John P. Thomas, William J. Gallen, (Spons. by Jürgen Herrmann) Medical College of WI., Milwaukee Children's Hospital, Dept. of Pediatrics

Seven of 76 pts. with Kawasaki syndrome (9.2%) have developed aneurysms of one or both proximal coronary arteries identified by 2D-ECHO. On the Asai clinical coronary risk scale, 5 of 7 pts. scored 8 points or greater, however 2 pts. scored only 5 points. The most sensitive single predictors were $\text{ESR} \geq 110 \text{ mm/hr}$. (5 of 7 pts.) and normalization of $\text{ESR} \geq 30$ days (6 of 7 pts.). Initial appearance of definite proximal aneurysm(s) varied from 8 to 33 days (mean 24 days). Both pts. who had 2D-ECHO's early in their illness (8 and 13 days) however, showed suspicious early dilation of the coronary artery which later developed definite aneurysm (26 days RCA and 24 days LCA respectively). One pt. had extensive anterolateral LV infarction at day 49 of his illness and died after 2 years of chronic CHF. The other 6 have been followed 1 mo. to 20 mo. and have shown no signs of infarction (ECG/thallium) and no signs of segmental dysfunction (ECHO). Four of 7 pts. have shown "fill-in" densities of the proximal aneurysms in the pattern of a "window-shade" with smooth-appearing endothelial edge (26 days to 14 months post-illness). Only 1 pt. has shown complete return of proximal coronary appearance to normal. In our experience coronary dilation and aneurysm formation occur earlier than in previously reported series. Combined 2D/M-Mode echocardiography in the first several weeks of the illness should provide baseline coronary measurement and detect proximal coronary dilation which seem to precede the aneurysm formation.

221

LEFT VENTRICULAR (LV) END SYSTOLIC WALL STRESS-SHORTENING RELATIONSHIPS IN PRETERM INFANTS AND INFANTS OF DIABETIC MOTHERS (IDM). Steven M. Yabek, Terrence Dillon, William Berman, Jr., Sue Corlew, Dept. of Pediatrics, University of New Mexico School of Medicine, Albuquerque.

Preterm infants and those with hypertrophic cardiomyopathy (HC) are frequently described as having a hypercontractile LV. Relationships between the extent of LV shortening and the force opposing shortening (wall stress (σ)) reflect intrinsic LV function. The method for determining LV end systolic (ES) meridional σ was validated in 8 children with normal LV undergoing catheterization (GpI). We then evaluated $\text{ES}\sigma$ in 20 preterm infants (4.8days) without PDA (GpII), 23 preterm infants (4.8days) with PDA (GpIII) and 11 term IDM (2.1days) with HC (GpIV). $\text{ES}\sigma$ was calculated from echo measurements of ES LV dimension (DES) and wall thickness (hES) and intraarterial or Doppler blood pressures. Results are shown (* $p < 0.05$ vs GpI; * $p < 0.05$ GpIII vs GpII) (1SD):

Group	%AD	Vcf (circ/s)	DES/hES	$\text{ES}\sigma$ (gm/cm ²)
I	0.30±0.07	1.22±0.21	3.52±0.74	81.7±18
II	0.32±0.04	1.92±0.32*	2.36±0.36*	32.8±8.6
III	0.38±0.06**	2.07±0.44*	2.65±0.73*	33.2±10
IV	0.41±0.06*	2.15±0.47*	1.83±0.44*	23.4±8.3*

Preterm infants and IDM have a disproportionately thick LV. Their enhanced LV ejection performance is related to the reduced $\text{ES}\sigma$ (afterload). Compared to GpI, GpIII infants have even better ejection indices at the same $\text{ES}\sigma$ suggesting an effect of the increased preload or augmented inotropy, the latter possibly due to increased sympathetic tone.

● 222

EFFECTS OF ACUTE HYPOXIA ON CELLULAR ELECTRICAL PROPERTIES OF THE SINUS NODE (SN) AND ATRIUM. Steven M. Yabek, Rinya Kato, Bramah N. Singh, Wadsworth V.A. Hospital, Los Angeles & Department of Pediatrics, University of New Mexico, Albuquerque.

The heart rate and arrhythmogenic effects of acute hypoxia (H) are incompletely understood. Some studies have suggested a differential effect of H dependent upon the extent to which Ca and Na participate in the action potential (AP). We studied the effects of acute, severe H on SN and atrial parameters using rabbit preparations and standard microelectrode techniques. AP from true SN pacemaker cells (dependent on the slow inward Ca current (I_{Si})) were most affected by H. There were significant ($p < 0.05$) decreases in spontaneous rate, AP amplitude (APA), maximum diastolic potential (MDP) and slope of phase 4 depolarization. Corrected SNRT and SACT were markedly increased. H produced SN entrance block, pacemaker shifts and ectopic activity in many preparations. AP from subsidiary SN cells (a two component AP dependent on Na and Ca) were less affected by H. There were only moderate decreases in APA and MDP. AP from atrial muscle are very dependent on the fast Na current for depolarization. H produced no changes in APA, MDP or V_{max} . AP duration (at 50 and 90% repolarization) and atrial effective refractory period were significantly shortened by H. The decrease in AP duration (due to shortening of the plateau) may be related to H induced decreases in the $\text{Ca } I_{\text{Si}}$. In summary, many of the arrhythmias resulting from clinical H can be explained by the observed changes in cellular electrophysiology. There appears to be a high sensitivity of Ca dependent channels (and AP) to the effects of H.