187 INCREASED CALCIUM PUMP TURNOVER RATE IN CARDIAC SARCOPLASMIC RETICULUM IN FETAL SHEEP Lynn Mahony, Larry Jones, (spon. by Morris Green), Indiana University, Indpls., Depts. of Pediatrics, Medicine and Pharmacology

We have previously reported decreased Ca uptake and Ca-dependent ATP hydrolysis in cardiac sarcoplasmic reticulum (SR) vesicles isolated from fetal sheep as compared to SR vesicles from maternal sheep. These indices of SR Ca-handling are dependent upon the relative amounts of ATPase protein present but are expressed as μmoles of Pi or Ca per mg SR protein. To determine if the apparently decreased Ca tranport capacity in the fetal vesicles is due to the presence of varying amounts of other SR proteins, we measured acylphosphoprotein (E~P) concentrations and then calculated enzyme turnover rates in SR vesicles isolated from fetal (0.7 gestation) and maternal sheep. E~P concentrations were measured using specially developed gel electrophoresis techniques. The enzyme turnover rate is the ratio between Vmax of CaATPase and E~P concentration and represents actual turnover of Ca pump sites.

	Fetal (n=4)	Maternal (n=4)
CaATPase (μmol Pi/mg protein)	36.8 ± 3.6*	53.3 ± 4.6
E~P (pmol/mg protein)	178 ± 34*	389 ± 11
Turnover (min^{-1})	3585 ± 1074**	2278 ± 144

Data are mean ± SD., *p<.01, **p<.05.

These data suggest a significantly higher apparent turnover rate for the Ca pumps on the fetal SR vesicles. We conclude that there is an intrinsic difference in Ca transport function between these SR preparations that is independent of possible differences in protein composition between the preparations.

188 DECREASED CONTRACTILITY OF THE DUCTUS ARTERIOSUS IN EXPERIMENTAL PULMONIC STENOSIS Lynn Mahony, Ronald Clyman, Michael Heymann, Depts. of Pediatrics, Indiana University, Indpls, In, University of Calif., San Francisco, Ca., and Mt. Zion Hospital, San Francisco, Ca.

Delayed closure of the ductus arteriosus (DA) after birth has been observed in newborn infants with critical pulmonic stenosis (PS) and in lambs with experimental PS. This delayed closure may be the result of decreased ability to contract when exposed to oxygen or to increased production of or sensitivity to the endogenous DA vasodilator, prostaglandin(PG)E_2. To determine if the abnormal hemodynamic pattern during fetal life associated with PS alters the responsiveness of the DA, we operated on 10 fetal lambs of gestational ages 70-77 days(term is 145 days) and placed a band around the pulmonary artery. Catheterization at 137-142 days showed severe pulmonic stenosis with RV pressure significantly higher in the experimental lambs (110 ± 8, ± SEM, n=10) than RV pressure in control lambs(61 ± 7, n=4, p<.001). We then studied isolated rings of DA from these lambs. The oxygen-induced increase in tension in rings of DA from lambs with PS was significantly decreased (2.55 ± 0.38, n=10) compared to rings from control lambs (4.03 ± 0.51, n=6, p<.03). There was no difference between the 2 groups in either the amount of PGE_2 released or in the sensitivity (ED_{50}) of the rings to PGE_2. There was also no difference in the increase in tension when endogenous PGE_2 was inhibited by indomethacin. We conclude that delayed closure of the DA in experimental PS is not caused by increased sensitivity to and production of PGE_2 in the DA (as it is in premature lambs) but rather is the result of a diminished ability of the DA to contract when exposed to oxygen.

189 PERIPHERAL FLOW DYNAMICS AFTER FEMORAL ARTERY CATHETERIZATION USING COMPUTER ASSISTED ADMITTANCE PLETHYSMOGRAPHY. Lloyd A. Marks, Jeffrey A. Brinker, Kenneth G. Zahka, Langford Kidd, Anthony F. Cutilletta. The Johns Hopkins University, School of Medicine & The Johns Hopkins Hospital, Department of Pediatrics, Baltimore.

Femoral artery catheterization (FAC) may be expected to produce changes in peripheral blood flow dynamics. We recently developed a computer assisted admittance plethysmograph (CAAP) to compute forearm and calf pulse volume (V), peak net inflow (F), and pulse transit time (PT), i.e. QRS-peak net inflow. Bilateral calf plethysmograms were obtained in 14 males (60±6y) undergoing coronary angiography. When compared to healthy younger normals (n=8,26±4y), these patients had reduced baseline values of V(39.8%,p<.005), F(39.2%,p<.005), and PT(10.5%,p<.005). Within the first hour after FAC there were increases in V(25.5%,p<.025) and F(29.0%,p<.025) in the non-catheterized leg, but no significant changes in the catheterized leg. This suggests that acute increases in V and F induced by contrast were limited by localized arterial spasm and/or thrombosis. All values returned to baseline on the day after FAC. Two children (4,10y) undergoing FAC showed greater transient lateralizing differences in V and F than the adults, suggesting that spasm and/or thrombosis may play a greater role in the smaller vessels of children. These data demonstrate that the CAAP is sensitive to altered flow dynamics associated with both the chronic changes of age and the acute changes related to FAC.

190 COMPUTER ASSISTED ADMITTANCE PLETHYSMOGRAPHY. Lloyd A. Marks, Jeffrey A. Brinker, Kenneth G. Zahka, Langford Kidd, Anthony F. Cutilletta. The Johns Hopkins University, School of Medicine & The Johns Hopkins Hospital, Department of Pediatrics, Baltimore.

The evaluation of peripheral blood flow dynamics is important for the study of vascular physiology. We have developed a computer assisted admittance plethysmograph (CAAP) to examine the peripheral pulse volume wave. An analog electrical circuit, which continuously monitors limb conductivity (G) and its rate of change (dG/dt), is coupled to a digital computer for beat selection and averaging. Pulse volume (V), in $\mathcal{l}$1/M2 (BSA) and peak net inflow (F), in cc/sec/M2 (BSA) are computed from the changes in G and dG/dt, respectively. Pulse transit time (PT), the time from QRS onset to peak inflow, is measured. Calf plethysmograms were obtained in 8 healthy male subjects (26±3.7 yrs) to determine normal values, reproducibility, and the effect of proximal cuff occlusion. At rest, V=447±30 $\mathcal{l}$1/M2, F=6.66±.39 cc/sec/M2, and PT=344±6 msec. Repeated measurements on separate days showed a variation in V of 13.1±5.0 %. Thigh cuff inflations at diastolic pressure resulted in increased V(11.7%,p<.01), increased F(28%,p <.01), and increased PT(16.5%,p <.005). Increases in cuff pressure above diastole resulted in a linear decrease in V(r=.99, p<.01), and a continued increase in PT(p<.005). CAAP appears to be a useful tool for volume pulse wave analysis which may be clinically applicable in the evaluation of peripheral blood flow dynamics.

191 DO TRANSATRIAL SEPTAL DOPPLER VELOCITIES (TASV) PREDICT QP:QS RATIOS? Gerald R. Marx, Hugh D. Allen, Stanley J. Goldberg, Celia J. Flinn, Univ. of Arizona Health Sciences Ctr, Tucson

Although large atrial septal defects (ASD) can usually be visualized by two-dimensional echocardiography (2DE), and QP:QS ratio can be measured by comparison of pulmonary and aortic flows by Doppler, a problem still exists when ASD's are not visualized, or coexist with valve stenoses or complex heart disease. Measurements of TASV might solve this problem. This study was designed to measure TASV's and compare them with QP:QS measured by Doppler, cath and nuclear studies in patients with proven ASD. Normal infants and children served as controls. Mean TASV were measured from subcostal views and were corrected for beam-flow intercept angle when necessary. Doppler QP:QS was measured in the PA and AO. Tricuspid outflow tract flow was substituted for PA flow when pulmonary stenosis existed. In ASD, Doppler QP:QS was compared to cath or nuclear data. Sixteen subjects, 7 with ASD (mean age 29.7± 27.7 mo), and 9 normals (mean age 24.7±26.9 mo, p=ns), were evaluated. In ASD, mean Doppler QP: QS ratio was 1.7±.43(SD) and by cath or nuclear study was 1.6 ±.29 (p=ns). Mean TASV was 36.5 ±9.0 cm/sec/sec (range 28 to 52) in ASD and was 17.8±4.0 cm/sec/ sec (range 13 to 24) in controls (p<.001). When mean TASV was compared to QP:QS, good correlation was found, r=.80, SEE=6.8 cm/ sec. TASV is an easily performed evaluation which provides considerable clinical utility for separation of patients with left-to-right shunts through ASD's from those with intact atrial septum, and mean TASV also provides information concerning shunt size.

192 HEMATOLOGIC AND RHEOLOGIC ASPECTS OF ERYTHROPHERESIS(EP) FOR POLYCYTHEMIA (P) William B. Moskowitz and William J. Rashkind, Univ. of Pa. Sch. of Med., Child. Hosp. Phila., Dept. of Pediatrics, Philadelphia

Fifteen EPs were performed on 11 pts (mean 8.6 yrs, range 2 mo-19 yr) with 5% albumin replacement. Hematocrit (HCT) was measured prior to, immediately after, and 6 hrs and 18-24 hrs after EP. Viscosity (V) of whole blood was measured at 37°C and at shear rates from 3 to 120 sec^{-1} serially during EP in 4 pts, using a cone plate digital viscometer. The volume of EP was calculated from the equation: EP volume=TBV $\times$[(HCT_I-HCT_D)÷HCT_I], where TBV=total blood volume, HCT_I=initial HCT, and HCT_D=desired HCT. All HCT values used were obtained from centrifuged central venous samples. The HCT achieved by EP correlated with the prospectively chosen HCT_D at an r value of 0.98. Mean exchange volume was 18.0±6.3%TBV. V was reduced by EP at all shear rates measured (p <0.0005) and approached normal values at HCT <55%. In pts with centrifuged central venous HCT>65%, HCT determined by Coulter method on central venous samples underestimated the HCT (68.3±4.6% vs 72.0±4.0%,p < 0.05); admission peripheral venipuncture Coulter HCT underestimated the HCT (66.5±4.8% vs 72.0±4.0%,p<0.01). The HCT remained unchanged 6 hrs after EP although a small but significant (p<0.05) increase occurred 18-24 hrs after EP. In pts with severe P (HCT >65%) it may be concluded that: 1) both central and peripheral venous Coulter determined HCT underestimate true central HCT; 2) using the centrifuged central venous HCT in the equation above, the EP volume to obtain the desired HCT can be determined accurately; 3) on completion of EP, HCT does not change 6 hrs after and increases only slightly after 18-24 hrs; and 4) adequate reduction in V is obtained by an EP volume sufficient to lower the HCT to 55%.