133 PROSTAGLANDINS (PG's) AND THE FETAL DUCTUS ARTERIOSUS (PDA). By Stanley E. Kirkpatrick, Morton P. Printz, and William F. Friedman. Div. of Pediat. Cardiol., Univ. of Calif., San Diego, School of Medicine.

Multiple problems exist with in vitro analysis of PDA reactivity. Accordingly, 42 studies were performed from 1 to 27 days postoperatively in 14 fetal lambs instrumented chronically with PDA sonomicrometer dimension crystals and with pressures determined in main pulmonary artery and ascending and descending aorta. The PDA was found to be dilated maximally in utero, but was not a passive channel. PDA diameter varied with hydrostatic alterations. Alpha and beta adrenergic agonists and adrenergic and cholinergic antagonists had no influence on ductal caliber. Similarly, angiotensin 1 and 2 and blockade of conversion to angio 2 with SQ20881 did not influence the PDA. In contrast, exquisite sensitivity was found to alterations in the PG milieu. Inhibition of PG synthesis by a single I.V. dose of as little as 0.005 mg/kg of indomethacin (indo.) caused profound PDA constriction. The latter responses were accompanied by striking reductions in circulating PGE levels, measured by radioimmunoassay, but reversal of constriction by infusion of PGE1 and 2 did not elevate circulating levels. Thus, ductal reactivity appeared to be associated with alterations in PG synthetase activity within the PDA. Of major interest was the finding of a direct correlation after fetal administration of indo. between fetal and maternal circulating levels of PG's. These findings suggest that PG's may directly influence PDA calibre and that past theories concerning the mechanism of spontaneous or delayed PDA constriction must be revised.

134 ANTICOAGULATION IN CARDIOPULMONARY BYPASS C. Thomas Kisker, John A. Young, Donald B. Doty, Barbara J. Taylor. University of Iowa College of Medicine, Departments of Pediatrics and Surgery, Iowa City.

Prolonging the whole blood clotting time (WBCT) 2 to 3 times normal is said to provide a "safe" level of anticoagulation during cardiopulmonary bypass. To test this level of anticoagulation 9 monkeys were anticoagulated with heparin at the start of cardiopulmonary bypass so that WBCT's ranged from 201 sec to > 1000 sec (normal 91 sec). WBCT, platelet count (P), fibrinogen concentrations (F), and fibrin monomer concentrations (FM) were measured at 10, 30, 60, 90, and 120 minutes during bypass. Antithrombin III levels (AT_3) were measured before and after bypass. Six monkeys developed increased FM indicating active coagulation beginning from 10 to 60 minutes on bypass. WBCT's were > 200 sec in all animals at the time of FM detection. P fell below 100,000/mm^3 in the 6 animals with elevated FM, but remained above 100,000/mm^3 in the other 3 animals. The mean value of AT_3 decreased from 69% before, to 24.4% after bypass in the 6 animals with elevated FM, but was 61% after bypass in the others. F decreased from 167 mgm% to 80.5 mgm% in monkeys with elevated FM and to 117 mgm% in those with normal FM concentrations. Excessive bleeding did not occur in the animals without increased FM though WBCT's were in excess of 1000 sec. The results suggest that prolonging the WBCT 2 to 3 times normal is not sufficient anticoagulation to prevent activation of clotting during cardiopulmonary bypass.

135 REGIONAL BLOOD FLOW IN POLYCYTHEMIA AND HYPERVOLEMIA. U.R. Kotagal, W.J. Keenan, J.H. Reuter, J.J. Steichen and L.I. Kleinman, Univ. of Cincinnati, College of Medicine, Dept. of Peds., Cincinnati, Ohio.

Cardiovascular effects of polycythemia and hypervolemia were studied in newborn dogs 1-25 days old using the radioactive microsphere reference organ technique. Group I puppies (n=6) were made polycythemic and hypervolemic by transfusion with packed RBC's. GrII, (n=5) hypervolemic alone by transfusion with an equivalent amount of whole blood and GrIII, (n=7) polycythemic alone by exchange transfusion with packed RBC's. In GrI, transfusion raised the Hct from 48 to 70* and increased the viscosity by 75%*. Cardiac output (C.O.) (ml Kg^{-1} min^{-1}) decreased from 242±14 to 156±19*. Mean BP and peripheral vascular resistance (R) also increased*. There was a decrease in blood flow (ml g^{-1} min^{-1}) to the GI tract from 1.3±.2 to .6±14**, due to an increase in R. The %C.O. to the gut decreased from 18.2±4 to 12.4±2*. Cerebral blood flow decreased from .32±.05 to .22±.04* due to an increase in cerebral R*, despite an increase in %C.O. there. Renal blood flow and renal R were not significantly altered. GrII had no significant changes in C.O., its distribution nor flow to cerebrum, gut, and kidney. Gr III had a decrease in C.O.** and an increase in BP* and R*. GI blood flow decreased from 1.58±.12 to .92±.04** and cerebral flow from .32±.04 to .19±.04** but there was no redistribution of C.O. from the gut to the brain as in GrI. Renal blood flow was unchanged but renal R increased from 63.9±3.4 to 72.2±3* and %C.O. to the kidney increased**. Thus, hyperviscosity reduces blood flow to the gut and brain and this reduction is not appreciably affected by accompanying hypervolemia. *p<.05 **p<.01

136 ECHOCARDIOGRAPHIC MEASUREMENT OF PEAK RATES OF LEFT VENTRICULAR WALL MOTION IN CHILDREN. John D. Kugler Michael R. Nihill, and Howard P. Gutgesell, Baylor College of Medicine, Texas Children's Hospital, Department of Pediatrics, Houston, Texas. (Sponsored by Paul C. Gillette)

To evaluate their usefulness as indices of left ventricular(LV) function, the peak rate of change of LV diameter ($\Delta D/\Delta t$) was determined in 62 normal children (N) and 15 with congestive cardiomyopathy (CCM). From digitized echocardiograms of the septum and LV posterior wall, continuous plots of LV diameter were generated and the peak $\Delta D/\Delta t$ computed. The peak shortening rate (PSR) and peak relaxation rate (PRR) were determined in each subject and compared to conventional echocardiographic indices of LV function: % change in LV diameter (%ΔLVD) and mean velocity of circumferential fiber shortening (Vcf).

In N, PSR was directly proportional (r = 0.70) to LV end-diastolic diameter (EDD) and when indexed for EDD, PSR was directly related (r = 0.48) to heart rate (HR), but not to age (r = -0.17). The PRR was not related to EDD, HR or age. In CCM, PRS/EDD was decreased(0.90 ± 0.42 SD vs 2.2 ± 0.54 in N, p< 0.001),and 13/15 pts were more than 2 SD below normal. The PRR was also reduced in CCM (42.22 ± 21.22 mm/sec vs 84.60 ± 32.88 mm/sec in N, p< 0.001), although PRR was within 2 SD of normal in 14/15 patients. All pts with CCM had decreased %ΔLVD and Vcf.

This study indicates that echocardiographically determined peak rates of LV wall motion are related to EDD and,to a lesser extent, HR. When corrected for these variables, PSR and PRR are decreased in pts with CCM.

137 PROSTHETIC (TEFLON) AORTO-PULMONARY SHUNT FOR CYANOTIC NEWBORN BABIES

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The right pulmonary artery-aortic shunt often results in undesirable sequelae related to unequal flow to both lungs. Subsequent repair of the anastomosis may also be difficult. Expanded microporous polytetrafluoroethylene (PTFE) is useful for constructing conduits for small-vessel bypass. In past 18 months, 11 babies, age 1 to 18 days (8), weight 2.1 to 3.6 Kg (2.9), underwent PTFE aorto-pulmonary shunt. All were critically-ill, cyanotic and with complex cardiac anomalies including pulmonary atresia (6) or severe pulmonary stenosis (5). A 4 mm-diameter PTFE conduit, 2 to 6 cm (4) long, was anastomosed to ascending aorta and pulmonary trunk or its bifurcation. Preshunt arterial O_2 saturation was 72% (range, 33-80), and postshunt saturation 87% (range, 78-90). One baby with asplenia died from ventricular fibrillation during surgery; 3 others died from non-surgical causes (CVA, pseudomonas sepsis, inadequate atrial defect). The 7 long-term survivors (2-17 months follow-up, mean=12) are clinically well. Hemodynamic studies in 2 showed comparable flows to both lungs. Clinical observations and animal flow studies have demonstrated optimal length of the 4 mm-diameter PTFE as 2.5 to 4 cm. The PTFE shunt is effective for palliation in newborn babies.

138 LEFT VENTRICULAR DYSFUNCTION IN RHEUMATIC MITRAL REGURGITATION: AN ECHOCARDIOGRAPHIC ASSESSMENT DaHae Lee; P. Jacob Varghese; Jon Shematek; and Catherine A. Neill. Johns Hopkins Hospital, Baltimore, Maryland

Echocardiograms (E) in mitral regurgitation (MR) are thought to show exaggerated interventricular septal excursion (IVSE) and posterior wall excursion (PWE), suggesting that LV function is unimpaired. E from 15 patients (pts) with rheumatic MR were compared to those from 20 normal (N) children to delineate any segmental variation in LV function. The following measurements are defined: (1)Fractional shortening (FS)= (D-S)/D X 100 where D and S are end-diastolic and end-systolic diameters; (2)Posterior wall fractional shortening (PFS)=PWE/D X 100; (3)Septal fractional shortening (SFS)= IVSE/D X 100; (4)Ratio of SFS/PFS (R). Pts were divided into group A with LA/Ao ratio ≥1.5:1 and group B with LA/Ao <1.5:1.

FS was similar in all groups: 39±5 in A, 37±4 in B, and 38±4 in N. In contrast SFS was increased in A(22±2) compared to B and N(17±3), and R was significantly increased (p<.001) in A(1.1±0.3) compared to B and N(both 0.6±0.1). On the other hand, PFS was diminished significantly (p<.001) in A(20±3) compared to N and B (28±3).

In summary, in MR with LA/Ao ratio>1.5:1, SFS and R were clearly increased and PWE diminished. Hyperdynamic septal motion may, therefore, be a compensatory mechanism for posterior wall dysfunction in mitral regurgitation. Furthermore, frequently used estimates of LV function, including FS and ejection fraction, would fail to detect this regional dysfunction.