**181** HIGH FREQUENCY JET VENTILATION REDUCES AIR LEAKAGE FROM PNEUMOTHORACES OF INFANTS AND ANIMALS. F. Gonzalez, T.Harris, and P.Richardson, (Spon. by M. Simmons), Dept. of Peds., Univ. Utah, Salt Lake City, UT.

The first objective of this study was to determine if leakage ($\dot{V}$) through a pneumothorax and chest tube of infants with pulmonary disease is less during high frequency jet ventilation (HFJV) than during conventional ventilation (CV). We measured $\dot{V}$ in 5 infants, who had chest tubes placed to relieve tension pneumothoraces while managed alternately on CV and HFJV. In all infants, $\dot{V}$ was less during HFJV than CV (49±26 vs 157±81 ml/min, mean±SE). However, we also noticed that significantly lower mean tracheal airway pressure ($\overline{Ptaw}$) were used during HFJV than CV (9±1 vs 15±2 cm $H_2O$, $p<0.01$). $PaCO_2$ was also less (35±8 vs 45±9 mmHg; $p<0.03$) although $PaO_2$ values were not significantly different. We then turned to an animal model of RDS to determine the effects of $\overline{Ptaw}$ and mode of ventilation on $\dot{V}$. In 9 saline lavaged cats we induced pneumothoraces by application of high airway pressures. First we adjusted CV and HFJV settings so that $\overline{Ptaw}$ was lower during HFJV; we then adjusted the ventilators to produce similar $\overline{Ptaw}$. When $\overline{Ptaw}$ was lowered from 13±0.3 (CV) to 10±0.5 cm $H_2O$ (HJFV), $\dot{V}$ decreased significantly ($p<0.01$) from 651±86 to 294±84 ml/min. When $\overline{Ptaw}$ was held constant (12.7±1 cm $H_2O$) mean $\dot{V}$ values were identical 489±100 ml/min and arterial blood gases were also unaltered. These results suggest that HFJV may be used to reduce the rate of pulmonary air leakage in infants with pulmonary diseases and that reduced $\overline{Ptaw}$ is the cause of the reduced $\dot{V}$.

**184** LASER DOPPLER MONITORING OF TISSUE PERFUSION. Erik A. Hagen (spon by Willa H. Drummond), University of Florida College of Medicine, Gainesville.

Laser doppler (LD) velocimetry theoretically offers a non-invasive objective measurement of tissue perfusion, an important clinical parameter that is currently only subjectively assessed. The laser doppler (Med Pacific)uses a skin sensor to measure reflected light from a helium-neon laser that penetrates tissue about 15 mm over a 1 $mm^2$ area. It utilizes the doppler principle to calculate the root-mean-square frequency of the reflected light. Because of the extremely small cross sectional area of the vessels in the microcirculation that this technique samples, this continuously monitored number represents changes in tissue blood flow. We used the LD to assess tissue perfusion on 10 critically ill neonates (480 to 1600 gm) in the NICU to evaluate the feasibility of its clinical application. During the study we recorded temperature, heart rate, blood pressure and hematocrit to determine what factors might influence perfusion. We monitored the infants during procedures that were stressful or would alter cardiac output such as ET tube suctioning, blood transfusion and intubation. The LD was very sensitive, in fact, too sensitive to changes in tissue blood flow. There was no correlation between any of our measured parameters and changes in perfusion as measured by the LD. Obvious stress with procedures such as suctioning and intubation caused immediate decreases in perfusion, but changes in the readings from minute to minute varied just as much. In fact, moving the skin sensor as little as 1 mm would cause as much as a 300% change in readings. The LD appears to be an extremely sensitive monitor of local tissue perfusion, being more indicative of effects of local factors (skin temperature changes or application pressure) rather than changes in cardiac output. Non-invasive measurement of perfusion as measured by laser doppler still appears to be problematic.

† **182** PERIPHERAL ARTERIAL INFUSIONS: HISTOLOGIC FINDINGS. Regina A.Gargus, Anthony E. Napolitano, Allen S.Mills Barry V.Kirkpatrick.(Spon. by H.M.Maurer). Medical College of Virginia, VCU, Depts. of Peds. & Path., Richmond, VA.

Historically, heparinized NS has been used in peripheral arterial lines. The use of dextrose in these lines could potentially increase total daily calories in the critically ill neonate. A study was undertaken to examine the histologic effects of peripheral arterial catheter placement and continuous fluid infusion. Teflon catheters (24g) were placed by surgical cutdown technique into peripheral paw arteries of 20 anesthetized pups. Timed (8h) infusions with the assigned fluid (D5W,D10W) at 2cc/h were used, with control arteries placed to heparin lock or infused with heparinized NS. Arteries were resected, preserved in formalin, then examined histologically (H&E stain) by the pathologist (blinded to specimen fluid group). One or more abnormalities were noted in 73% of the 80 arterial specimens examined.

| Fluid Group | Total # Arteries | Without Lesions | Focal Mural and/or Advential Lesions | | |
|---|---|---|---|---|---|
| | | | Hemorrhage | Necrosis | PMN Infiltra. |
| Hep.Lock | 15 | 5 | 4 | 4 | 9 |
| NS | 20 | 5 | 6 | 5 | 13 |
| D5W | 27 | 6 | 7 | 7 | 16 |
| D10W | 18 | 6 | 2 | 4 | 10 |

Conclusions: Focal tissue trauma occurs with catheter placement into small peripheral arteries. There was no histologically identifiable difference between control and dextrose infusion groups ($p=0.8005$). These results suggest that further investigation is needed to determine the safety of arterial dextrose infusion and the long term effects of catheter trauma in peripheral arteries.

† **185** NEUROHYPOPHYSEAL AUTOREGULATORY RESPONSE TO INCREASED INTRACRANIAL PRESSURE. Daniel F. Hanley, David A. Wilson, Richard J. Traystman (Spon. by: Mark C. Rogers). The Johns Hopkins Medical Institutions, The Johns Hopkins Hospital, Departments of Anesthesiology/Critical Care Medicine and Neurology, Baltimore, MD 21205

Neural lobe blood flow (NLQ) increases 210% 3-5 minutes after reducing arterial blood pressure from 120 to 80 mmHg and returns to control levels after 10 minutes sustained hypotension. The initial spike appears to be coupled with a transient rise in arginine vasopressin (AVP). In this study we examined neurohypophyseal autoregulation using a method of reducing cerebral perfusion pressure (CPP) that does not stimulate AVP release. Regional cerebral blood flow (rCBF) was measured by the microsphere method in 5 pentobarbital anesthetized dogs. Injections were made during normotension and 3, 5, 10 and 15 minutes after reducing CPP to 80 mmHg by increasing intracranial pressure (ICP). Plasma AVP was measured by radio immunoassay. Average cerebral blood flow was not different from control levels at any time during reduced CPP. Neither NLQ (503 ± 120, 441 ± 128, 544 ± 141, 578 ± 158 and 458 ± 99 1/min/100gm), nor AVP (9 ± 1, 8 ± 2, 10 ± 3, 9 ± 2 and 10 ± 3 pg/ml) changed during the period of reduced CPP. These findings demonstrate that NLQ is autoregulated. They suggest that multiple factors determine the overall NLQ response to a change in CPP. The initial spike seen during hemorrhage appears to be the result of transient changes in AVP neurosecretory rate. NLQ transients obtained using methods of lowering CPP that do not trigger AVP release show no spike component. Supported by: NS-20020.

● **183** TREATMENT OF ENDOTOXIN SHOCK IN NEWBORN ANIMALS WITH INDOMETHACIN, DOBUTAMINE AND DOPAMINE. Masakatsu Goto and Andrew J. Griffin (Spon. by Anthony F. Cutilletta) Loyola Univ. Stritch Sch. of Med, Dept. of Pediatrics Maywood, IL.

The hemodynamics of combination therapy: indomethacin(IND) and dobutamine(DOB) or dopamine(DOP) in endotoxin(ETX) shock were studied in newborn mongrel puppies. 51 puppies (2-10days, 270-800gm) were divided into 4 groups: Group 1(n=14) received 1.5mg/kg E.coli. Group 2(n=11) received ETX+IND(1.5mg/kg). Group 3 (n=11) received IND+DOB(5mcg/kg/min). Group 4(n=15) received ETX +IND+DOP(5mcg/kg/min). The heart rate, mean arterial pressure (MAP), cardiac output(CO), systemic vascular resistance and minute work were obtained before and serially to 120 min. IND was injected 5 min. after ETX. DOB and DOP were infused from 5 min. to 120 min. Results: Treatment with IND maintained MAP and diminished the fall in CO. After IND+DOB, both MAP and CO decreased, but the response to ETX was attenuated. IND+DOP, however maintained both MAP and CO.

| | MAP(mmHg) | | CO(ml/min/kg) | |
|---|---|---|---|---|
| Min | 0 | 120 | 0 | 120 |
| ETX | 53±2 | 27±2 | 370±30 | 124±12 |
| ETX+IND | 49±3 | 55±4 | 347±36 | 215±25 |
| ETX+IND+DOB | 57±3 | 38±3 | 294±23 | 200±35 |
| ETX+IND+DOP | 57±2 | 70±3 | 324±20 | 286±23 |

These data suggest that the hemodynamic effects of ETX shock may be modified or reversed optimally by a combination of IND+DOP. This combination may be useful in the clinical treatment of septic shock in the newborn.

● **186** OXYGEN TRANSPORT IN HYPOTHERMIC DOGS WITH AND WITHOUT HEMODILUTION Marc B. Hershenson, James A. Schena, Robert K. Crone, (Spon. by Allan W. Walker) Harvard Medical School, The Children's Hospital, Department of Anesthesia, Boston.

Although hypothermia decreases cardiac output, oxygen consumption by the tissues is thought to decrease proportionately, so that tissue hypoxia does not occur. Hemodilution has been shown to increase cardiac output and tissue oxygenation. We hypothesize that hemodilution may be harmful by increasing cardiac output and oxygen need in excess of oxygen delivery. Oxygen consumption ($VO_2$) and arterial and venous blood gases were measured directly in 5 anesthetized dogs before and after cooling to 30°C and again after hemodilution (H) with Dextran 75. Cardiac index (CI), oxygen delivery ($DO_2$), oxygen extraction rate (O2 ext) and oxygen equivalent (O2 eq) were then calculated. Results are shown in the table below. (H=hemodilution, $VO_2$ units are cc/kg/min, *$p<.05$, ** $p<.01$).

| | Hb | CI | $DO_2$ | $PvO_2$ | $VO_2$ | O2ext | O2eq |
|---|---|---|---|---|---|---|---|
| 38°C | 10.3 | 7.16 | 627 | 43.8 | 8.0 | .19 | 6.0 |
| 30°C | 10.3 | 4.45* | 359 | 31.8** | 4.7** | .17 | 6.1 |
| 30°&H | 7.8 | 7.01 | 574 | 27.4** | 6.9 | .23 | 6.2 |

Although neither hypothermia nor hemodilution alone result in increased oxygen extraction, mild hypothermia and hemodilution together produce increased O2 extraction in order to avoid tissue hypoxia. It is possible that although hemodilution increased cardiac output, microvascular flow remained impaired necessitating increased oxygen extraction.