1696 VENTRICULAR SHUNT SURVIVAL IN CHILDREN WITH NEURAL TUBE DEFECTS. Gregory S. Liptak (Spon. by Robert A. Hoekelman) Univ. of Rochester School of Med., Strong Memorial Hosp. (SMH) Dept. of Pediatrics, Rochester, N.Y.

Although ventricular shunting has revolutionized care of children with hydrocephalus, problems with shunts are extremely common. Shunt malfunctions can cause serious morbidity and accounted for 1% of admissions to SMH in 1982. Children thus admitted average 9 days in hospital (mean cost, $4,543). To document shunt problems in children with hydrocephalus, 66 children born since 1973 who had neural tube defect and shunted hydrocephalus were studied via life-table analysis. 45% required revision (mean no. of revisions, 1.5; range, 1-5). 30% of the shunts failed within 9 mos. after insertion; 50% failed within 4 yrs. Shunts inserted in the 1st yr. of life were much more likely to fail than those inserted after 1 yr. of age ($p<.05$). Children with 1 or more shunt failures were not more likely to have subsequent failures. Similarly, the type of shunt (ventriculo-peritoneal, ventriculo-atrial), brand of shunt (Hakim, Pudenz, other), and shunt pressure (low, medium) were not correlated with the risk of failure. The interval between closure of the lesion and shunt insertion, and head circumference percentile at time of insertion were also not correlated with shunt failure. 48% of children requiring revision had symptoms of increased intracranial pressure; 14% had bacterial shunt infections. 74% of the revisions required head surgery. Thus, although ventricular shunts have resulted in dramatic improvement in care of children with hydrocephalus, major improvement in such shunts are needed to decrease morbidity caused by their frequent failures.

†1699 VALIDATION OF THE PULSED DOPPLER TECHNIQUE FOR ASSESSMENT OF CEREBRAL BLOOD FLOW VELOCITY. Bo P.W. Lundell, Daniel P. Lindstrom, Thomas G. Arnold, Kathleen A. Kennedy, Hakan Sundell. Vanderbilt University School of Medicine, Dept. of Pediatrics, Nashvile, TN.

Non-invasive measurements of intracranial blood flow velocities can be made through the fontanel by the Doppler technique. A range gated 2 and 5 MHz instrument with a 2-4 mm long sampling volume was used in an in vitro model, simulating intracranial blood flow in newborns. The Doppler instrument measured the maximum and the cross-sectional mean frequency Doppler shifts. Calibration signals were used to transform the frequency shift to velocity. The computed time average of the mean frequency Doppler signal was the best measure of absolute flow ($r=0.985$, $p<0.001$) in artificial blood vessels with 1.0-2.8 mm diameters, over a wide range of flows, 4-94 ml/minute. A fontanel was created surgically in newborn lambs and the blood flow velocities in the basal intracranial arteries were measured with the Doppler instrument. Simultaneous recordings of the carotid blood flow were made by electromagnetic flow cuffs. Occlusions of one or both carotid arteries induced changes in intracranial blood flow velocities, closely correlated to the carotid blood flow on the same side ($r=0.89$, $p<0.01$). The pulsatility index was not a useful indicator of changes in blood flow. The range gated Doppler instrument can measure blood flow velocities in very small arteries, at a defined depth under the fontanel. The time average of the mean frequency Doppler signal is the closest estimate of absolute blood flow, when the diameter of the blood vessel under study cannot be measured.

1697 HYPOXEMIA AT BIRTH: A RISK FACTOR OF PERI- AND INTRAVENTRICULAR HEMORRHAGE (IVH) IN PREMATURE INFANTS. Cheng-Hurd Liu, James M. Adams, Gregory J. Buffone, Arnold J. Rudolph. Baylor College of Medicine, Department of Pediatrics and Pathology, Houston, Texas (Spon. by Thomas N. Hansen)

Umbilical cord blood gases, hemoglobin and lactate were measured, prior to the first breath, in 38 consecutively delivered inborn premature infants with gestational age ≤ 32 weeks. All infants were intubated, resuscitated in the delivery room and maintained on mechanical ventilation. IVH was documented by ultrasound in the first week of life in 11 infants (28.9%). IVH infants and non-IVH infants did not differ significantly in mean birth weight, gestational age, 5 min. Apgar score, or hemoglobin concentration. IVH occurred significantly more frequent in infants who had low 1 min. Apgar scores. Umbilical cord blood gas-tensions and lactate levels were as follows:

	pH	PO_2 (torr)	PCO_2 (torr)	O_2Sat%	Lactate (mmol/L)
Umbilical IVH	7.19±0.12	16±5	52±10	23±18	4.1±2.3
Artery non-IVH	7.26±0.10	20±5*	51±8	37±15*	3.2±1.5
Umbilical IVH	7.26±0.13	29±4	44±10	60±15	
Vein non-IVH	7.31±0.11	28±6	43±6	60±16	

(*Difference Significant, $P < 0.05$)

Our data suggest IVH is more frequent in babies with hypoxemia and reduced O_2 saturation. In utero animal studies suggest autoregulation of cerebral blood flow depends upon arterial O_2 saturation. Perhaps O_2 saturation plays a central role in the pathogenesis of IVH associated with birth asphyxia.

1700 PRIMITIVE REFLEX ASSESSMENT AS A PREDICTOR OF OUTCOME IN VERY LOW BIRTH WEIGHT (VLBW) INFANTS. Paul J. Marquis, Nancy A. Ruiz, Mary S. Lundy, and Robert G. Dillard (Spon. by William B. Lorentz). Bowman Gray School of Medicine, Department of Pediatrics, Winston-Salem, NC.

103 VLBW infants (≤1.5 Kg.) were evaluated at 4 and 12 months (corrected for gestation). The 4 month evaluation included assessment of primitive reflexes using a standardized, quantitative scale. The resulting primitive reflex profile (PRP) has a range from 0 to 12. Intertester reliability for the PRP was 0.88. The gross motor scale of the Denver Development Screening Test (DDST) was also administered at the 4 month evaluation. The results of the 4 month evaluation were compared to neurodevelopmental outcomes at 12 months as determined by a neurological examination and the Bayley Scales' Mental and Psychomotor Developmental Indices (MDI, PDI).

The PRP at 4 months correlated significantly with both mental development (MDI) ($r=-.438$, $p<.001$) and motor development (PDI) ($r=-.427$, $p<.001$) at 12 months. Coupled with the motor scale of the DDST, primitive reflex assessment at 4 months was highly predictive of neurodevelopmental abnormality (cerebral palsy, MDI≤69, or PDI≤69) at 1 year.

DDST	PRP	N	ABNORMAL (1 Yr)	p (Fisher's exact)
Pass	< 8	59	6.8%	-
Pass	≥ 8	14	14.3%	NS
Fail	< 8	17	23.5%	.011
Fail	≥ 8	13	84.6%	<.001

Retention of strong primitive reflexes at 4 months correlates significantly with poor outcome in VLBW infants.

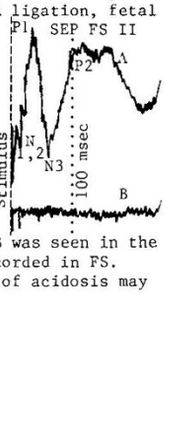
†1698 CORTICAL DEPENDENCE OF MID AND LATE EVOKED RESPONSES IN HUMAN BRAIN: HYDRANENCEPHALLY. Ira T. Lott, David McPherson, Arnold Starr and Dvora Cyrlak. University of California Irvine Medical School, Departments of Pediatrics and Neurology.

In animals, middle and late auditory evoked potentials (AEPs) originate in the cerebral cortex. An infant with hydranencephally provided an opportunity to make this previously undescribed anatomic correlation in humans. On CT scan, no tissue above the level of the thalamus was noted. Macrocephally was present along with markedly increased transillumination. Evoked potential testing was carried out at 1 week, 3 and 8 months of age according to standard techniques. Brain stem AEPs were essentially intact, except for increased conduction times (I-V) on the left. Middle AEPs showed normal N_o and P_o, suggesting that these components may depend upon the thalamus rather than the cortex. By contrast, N_1, P_1, N_2, P_2, long latency AEPs and the cortical visual evoked responses were all completely absent (isoelectric) suggesting no electrical tissue response above the level of the thalamus. Further confirmation was noted in the absence of any components after 14 m sec recorded from the scalp on somatosensory AEPs. In this hydranencephalic infant, the absence of middle and long latency auditory, visual and somatosensory evoked responses strongly suggests that, in man, these middle and late potentials are dependent upon intact cerebral hemispheres.

1701 SOMATOSENSORY EVOKED CORTICAL POTENTIALS (SEP) IN A MODEL OF FETAL HYPOXIA. James Matson, Robert Person, James Carson, John Bodensteiner, and Marc Hille (Spon by G.B. Humphrey). University of Oklahoma Health Sciences Center, Oklahoma Childrens Memorial Hospital, Department of Pediatrics, Oklahoma City.

SEP's were studied in four chronically instrumented fetal sheep (FS) (GA 110-131 days) during normoxia and partial occlusion of maternal internal iliac arteries (IIA). Two animals had ovarian arteries (OA) ligated. SEP electrodes: recording-subdural at C-4 (international 10-20 system); reference-nasal bone; ground-right forelimb. Stimulating electrodes: left radial nerve. SEP configuration was consistent, latencies and amplitudes were variable. In two animals without OA ligation, fetal hypoxia could not be induced by occluding the maternal IIA's. In two animals with OA ligation, prolonged partial occlusion of IIA's resulted in the following ABG's:

FS	pH	pCO_2	pO_2	mins occlusion	GA
I	6.90	47.8	15.2	1140	130
II	7.16	72.2	11.3	66	121



In FS I no change in SEP occurred. In fetus II SEP was extinguished. SEP A is during normoxia (FS II). Latencies (mean ± SD, n=17) are N1=7.1 ± 0.68, N2=15.5 ± 1.32, P1=30.5 ± 3.00, N3=65.8 ± 12.03, P2=129.8 ± 18.20. SEP B was seen in the hypoxic period. 1) SEP can be reproducibly recorded in FS. 2) GA, degree of hypoxia, type and time course of acidosis may affect SEP during hypoxia.