Conclusion PHH remains to be one of the most severe complications of IVH. In this small group of patients, high CO2 levels, hypotension seem to be important risk factors.

THE EFFECT OF HEAD MOTION ON DATA QUALITY FOR NEONATAL DTI

Background and Aims Diffusion Tensor Imaging (DTI) has become valuable for quantitative evaluation of white matter maturation in preterm infants. Because of the occurrence of head movement, gathering good quality data is challenging in neonatal neuroimaging. This is especially of concern for DTI, where motion can result in severe signal drop-out and therefore miscalculation of DTI parameters if data outliers are not handled correctly. This study was aimed to quantify the occurrence of motion artefacts in neonatal DTI and to evaluate different methods for tensor estimation.

Methods We prospectively collected DTI data of 27 preterm infants that were scanned at 30 weeks gestational age. DTI data was acquired in 25 directions. Percentage outliers per slice was calculated. With Explore DTI, we assessed the effect of motion artefacts on tensor estimation using different methods.

Results 60% of subjects had slightly corrupted data (>15 slices with >30% outliers) of which 40% had severely corrupted data (>10 slices with >50% outliers). Corrupted data resulted in erroneous DTI parameters. This was especially true for the tensor estimation (ordinary least squares) typically performed by vendors and popular DTI software. More advanced tensor estimations showed more reliable data.

Conclusions Motion artefacts are a major problem in neonatal DTI as it can compromise accurate calculation of DTI parameters. These results press the need for careful data inclusion and the use of reliable methods for tensor estimation. Targeted acquisition, processing and quality assessment is needed in this population to obtain reliable evaluation of white matter maturation.

SEVERE NEONATAL BRAIN INJURY IN VERY LOW BIRTH WEIGHT NEONATES: TIME TRENDS OVER 20 YEARS

Background and Aim Cranial ultrasound (CUS) routine screening examinations have been routinely performed in preterm neonates for decades. The aim of this study is to explore changes over time in the occurrence of severe neonatal brain injury as a function of neonate characteristics and clinical practice features.

Methods We included 1574 neonates that were scanned at least once at 30 weeks gestational age from 1991–2006. Severe IVH was defined as grade III-IV, and ventriculomegaly III. Time trends for brain injuries, neonate characteristics and clinical practice features were explored with generalized estimation equations for logistic regression.

Results 1574 neonates were included in the 20 year study period: 1298 (82.5%) survived the NICU, 33% BW <1000g. From 1991-2006, severe IVH was in the range 4–6% overall; between 3–4% in survivors and 17–31% in non-survivors, odds ratio 7(4-11). Severe parenchymal lesions dropped from 8–9% to 3–4% overall after year 1998, OR 0.35(0.14–0.85); it was much higher in non-survivors (initially, 40%) than in survivors (down to 3% in 1999–2006, OR 5(3–8)). In the last 4 year period, a significant increase in severe IVH/PL was documented, particularly in BW <1000g, parallel to a further survival increase.

Conclusion No different time trends for severe brain injury were observed in survivors and non-survivors. Variations in characteristics (e.g. increased survival at lower gestational age) may be related with changes in neonatal brain injury outcomes over time.
Results Ninety-one healthy term infants aged 1 to 36 hours were studied (< 6 hrs – 21, 6–12 hrs – 47, 13–24 hrs – 11, and 25–36 hrs – 12). A well-developed SWC was evident as early as within the first 6 hours after birth. The mean (SD) percentage of active sleep (AS) was 52.1% (12.9), quiet sleep (QS) – 38.6% (12.5). AS was longer and QS shorter in infants delivered by elective caesarean section (CS) compared to infants delivered by vaginal delivery (AS: p = 0.01; QS: p = 0.02) or emergency CS (AS: p = 0.04; QS: p = 0.02). Five infants did not have any SWC present. Disrupted SWCs correlated significantly with the absence of a spontaneous onset of labour (p = 0.03).

Conclusion This is the first time that SWC composition has been quantified using EEG monitoring so early in the postnatal period. AS dominates and SWC is clearly present immediately after birth. SWC composition appears to be influenced by labour and mode of delivery.

Methods In this study, 25 infants diagnosed with HIE were evaluated prospectively. The diagnosis was made according to criterias of American Gynaecology and Obstetric Academy (ACOG, 2003). Serum creatinine, NT-proBNP, cystatin C and urinary β2 microglobulin in all patients were measured on the 1st and 5th days of hospitalization.

Results The mean gestational age was 38.7 weeks and the birth weight was 3255 grams. Patients were classified as stage-1 (n=5), stage-2 (n=15) and stage-3 (n=5) HIE according to Sarnat classification. Therapeutic hypothermia was established in 6 patients. Acute renal failure (ARF) developed in 3 cases with stage 3 HIE. Peritoneal dialysis was performed for 2 of them. First day serum creatinine levels were higher than the 5th day levels (p = 0.01). NT-proBNP and cystatin-C levels was significantly lower on the fifth day (p = 0.01). Although not statistically significant, urinary β2 microglobulin (mg/g cre) levels on the 1st day were higher than the 5th day (p = 0.40). On the first day of hospitalization, a statistically significant correlation between NT-proBNP and creatinine (p = 0.02), cystatin-C (p = 0.01) and urinary β2 microglobulin levels (p = 0.01) were determined. NT-proBNP and cystatin-C levels were significantly high on the first day in infants developing ARF.

Conclusion It may be beneficial to evaluate serum N-terminal proBNP ve cystatin-C with creatinin levels in HIE patients for the diagnosis, severity and follow-up of ARF.

Background Head circumference (HC) is measured in newborns to evaluate head growth. It is not known, whether HC is always an appropriate measure of head volume (HV). Digital capture of the neonatal head offers information on HC and HV.

Aims To determine

a) overall correlation of HC and HV and
b) with regard to postmenstrual age (PMA) and
c) with regard to the actual body weight (BW).

Methods Head measurements with STARscanner laser shape digitizer (Vorum research Corp., Vancouver, BC) were performed in pre-term infants prior to discharge over a 12 month period. Data on HC and HV were captured with the STARscanner Laser Data Acquisition System (Orthomenca, Orlando, FL) and analyzed in different subgroups.

Results Included were 248 neonates at time of discharge (mean HC 32.8±1.9 cm, mean HV 356±72±14.3 ml). a) There was an overall correlation between HC and HV (r = 0.90, R² = 0.81, p = 0.001). Correlation between HC and HV was: b) in infants with a PMA < 37 (r = 0.71, R² = 0.52, p = 0.001) vs. PMA ≥ 37 weeks (r = 0.92, R² = 0.85, p < 0.001) and c) in BW < 2500g (r = 0.69, R² = 0.49, p = 0.04) vs. BW ≥ 2500g (r = 0.86, R² = 0.77, p < 0.001).

Conclusions Neonates with comparable HC can show very different HV, especially in infants with low PMA or BW. Thus additional measurement of HV enables to detect variable patterns of head growth and shape. Underlying causes and the meaning for neurological outcome need to be determined.

Background and Aim Levels of serum N-terminal pro-brain natriuretic peptide (NT-proBNP), cystatin-C and urinary β2 microglobulin in newborns with hypoxic ischemic encephalopathy (HIE) were examined in this study.

Methods In this study, 25 infants diagnosed with HIE were evaluated prospectively. The diagnosis was made according to criterias of American Gynaecology and Obstetric Academy (ACOG, 2003). Serum creatinine, NT-proBNP, cystatin C and urinary β2 microglobulin in all patients were measured on the 1st and 5th days of hospitalization.

Results The mean gestational age was 38.7 weeks and the birth weight was 3255 grams. Patients were classified as stage-1 (n=5), stage-2 (n=15) and stage-3 (n=5) HIE according to Sarnat classification. Therapeutic hypothermia was established in 6 patients. Acute renal failure (ARF) developed in 3 cases with stage 3 HIE. Peritoneal dialysis was performed for 2 of them. First day serum creatinine levels were higher than the 5th day levels (p = 0.01). NT-proBNP and cystatin-C levels was significantly lower on the fifth day (p = 0.01). Although not statistically significant, urinary β2 microglobulin (mg/g cre) levels on the 1st day were higher than the 5th day (p = 0.40). On the first day of hospitalization, a statistically significant correlation between NT-proBNP and creatinine (p = 0.02), cystatin-C (p = 0.01) and urinary β2 microglobulin levels (p = 0.01) were determined. NT-proBNP and cystatin-C levels were significantly high on the first day in infants developing ARF.

Conclusion It may be beneficial to evaluate serum N-terminal proBNP ve cystatin-C with creatinin levels in HIE patients for the diagnosis, severity and follow-up of ARF.