Conclusions Severe ROP remains a strong marker of childhood disabilities in a recent and large international cohort of infants ≤1250 g BW.

330 THE ASSOCIATION BETWEEN PRETERM BIRTH AND AUTISM COULD BE EXPLAINED BY MATERNAL AND NEONATAL MORBIDITY

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Background and Aims Children born preterm face an increased risk of autistic disorders.

We examined whether the association between preterm birth and risk of autistic disorders could be explained by pregnancy complications or neonatal morbidity.

Methods Swedish, population-based, case-control study including 1216 cases with autistic disorders born between 1987 and 2002, and 6080 controls matched with respect to gender, birth year, and birth hospital. Associations between gestational age and autistic disorders were assessed and adjusted for maternal, birth and neonatal characteristics.

Results Compared with infants born at term, the unadjusted odds ratios (ORs) for autistic disorders among very and moderately preterm infants were 2.05 [95% CI: 1.26–3.34] and 1.55 [95% CI: 1.22–1.96], respectively.

In analyses controlled for maternal, pregnancy, and birth characteristics, ORs were reduced to 1.48 [95% CI: 0.77–2.84] and 1.33 [95% CI: 0.98–1.81], respectively.

Adding also neonatal complications to the analyses, ORs were 0.98 [95% CI: 0.45–2.16] and 1.25 [95% CI: 0.90–1.75], respectively.

Reductions in risks of autistic disorders related to preterm birth were primarily attributable to preeclampsia, small-for-gestational age birth, congenital malformations, low Apgar scores at 5 minutes, and intracranial bleeding, cerebral edema, or seizures in the neonatal period. Neonatal hypoglycemia, respiratory distress, and neonatal jaundice were associated with increased risk of autistic disorders for term but not preterm infants.

Conclusions The increased risk of autistic disorders related to preterm birth is mediated primarily by prenatal and neonatal complications that occur more commonly among preterm infants.

331 THE PROGNOSTIC VALUE OF AEEG AND NIRS DURING THERAPEUTIC HYPOTHERMIA IN TERM ASPHYXIATED NEWBORNS

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Background and objective Infants with hypoxic-ischemic encephalopathy (HIE) are treated with therapeutic hypothermia (HT). Following perinatal asphyxia amplitude-integrated EEG (aEEG) and near-infrared spectroscopy (NIRS) are used to determine prognosis. We aimed to assess the prognostic value of aEEG and NIRS during HT.

Methods 40 term infants with HIE and treatment with HT were retrospectively studied. aEEG and NIRS were started immediately following admission. aEEGs were assessed by pattern recognition: background pattern (BP), presence of sleep wake cycling (SWC) and epileptic activity (EA) were appraised. Recordings during HT (72 hrs) were analysed.

Results 84% of infants had an abnormal BP (discontinuous normal voltage, burst suppression (BS), continuous low voltage (CLV) or flat trace (FT)) at admission. The LR+ (95% CI) of an severely abnormal BP (BS, CLV, FT) for mortality was 1.97 (1.24–3.12) at 6h after birth and increased to 4.5 (3.16–6.39) at 24h, 6.3 (2.04–19.4) at 48h and 6.19 (1.93–19.8) at 72h. LR+ of BS for mortality was below 1 at any time. LR+ of EA for mortality was 4.95 (2.20–11.1), the type of EA (e.g. status epilepticus) was not predictive. LR+ of SWC for survival was 10.7 (1.62–70). RcSO2 increased from 6 to 72h after birth, but was not different at any time between infants that died or survived.

Conclusion aEEG during HT can still be used to predict risk for mortality of HIE, especially beyond 24 hrs. BS is frequently not associated with a fatal outcome. RcSO2 has no additional value to predict mortality.

332 THE RELATIONSHIP BETWEEN RAPID FLUCTUATION IN SERUM SODIUM AND INTRAVENTRICULAR HEMORRHAGE (IVH) IN HYPERNATREMIC EXTREMELY LOW BIRTH WEIGHT PRETERM INFANTS

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Hypernatremia causes brain shrinkage and resultant vascular rupture with cerebral and IVH. However, it is not known if rapid fluctuation in serum sodium in hypernatremic preterm infants results in IVH or death.

Objective To determine if the rapid rise in serum sodium or rapid correction of hypernatremia predict the composite outcome of severe IVH (grade 3 and 4) or death during the first 10 days of life.

Methods Single center retrospective review of 167 preterm infants with GA ≤26 weeks who had serum sodium monitored at least every 12–24 hours and more frequently, if indicated. Logistic regression analysis identified which of the commonly cited risk factors of IVH, including rapid (>10 and >15 mmol/l/day) rise or fall in serum sodium could predict composite outcome in hypernatremic infants.

Results 98 (59%) of 167 infants studied developed hypernatremia (serum sodium>150 mmol/L), with a maximum median serum sodium of 154 mmol/l (range 150–181, IQR 152–157), occurring on median postnatal age of 4 days (IQR 3–5). Grade 4 IVH was more frequent in hypernatremic compared to normonatremic infants (p=0.032, OR 3.4, 95% CI 1.1–10.6). Among 98 infants with hypernatremia, severe IVH or death occurred in 33 and 21 infants with rapid (>10 mmol/l/day) rise and drop in serum sodium, respectively. However, rapid (>10 and >15 mmol/l/day) rise or fall in serum sodium was not associated with composite outcome on multivariate analysis.

Conclusion Correction of hypernatremia not exceeding 10 to 15 mmol/l/day in hypernatremic preterm infants was not associated with severe IVH or death.

333 AUTOMATIC IDENTIFICATION OF ACTIVITY BURSTS IN EEG OF PRETERM INFANTS

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Background EEG monitoring provides important information about the neurological status of the preterm infant but is difficult to interpret for most. We aim to automatically detect the typical bursting pattern (trace discontinu) of the preterm EEG and compare the detections with expert manual annotations.

Methods The method was based on the single channel EEG method of Palmu et al. but extended to 8-channel recordings for the first time. The EEG signal was first filtered with a Kaiser-window filter and the output of a non-linear energy operator (NLEO) was calculated. The NLEO signal was smoothed and corrected for baseline artefacts. A burst was identified if the resulting signal remained

above 1.5μV² for longer than 1s. Each EEG channel was processed separately and the final outcome was considered to be an activity burst if a burst was detected in 2 or more channels.

The method was tested on a database of 24 babies born before 30 weeks gestation (avg 26.5 + –1.7 weeks). For each baby 10 minutes of 8-channel EEG signal was analysed.

Results Agreement with the expert burst annotations was on average 77.2% over the 24 subjects (Min:59.6%, Max:90.3%, std-dev:8.5%). Most errors consisted of disagreement over the precise start and end points of a burst.

Conclusions Automatic burst detection has been applied for the first time to a large database of preterm 8-channel EEG. Promising results were obtained for automated EEG interpretation. Future work will attempt to reduce the error by use of more sophisticated methods to merge the per-channel detections.

334 RELATIONSHIP BETWEEN ACUTE KIDNEY INJURY (AKI) USING AKI NETWORK CRITERIA AND BRAIN MRI FINDINGS IN ASPHYXIATED NEWBORNS AFTER THERAPEUTIC HYPOTHERMIA

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We hypothesized that hypoxic-ischemic lesion on brain MRI would differ between infants with AKI compared to those without AKI following cooling.

Methods 88 consecutively cooled infants who had brain MRI were reviewed. All infants had renal function assessed before the start of cooling (baseline); at 24, 48, and 72h through cooling; and then on day 5 or 7 of life. Injuries to both basal nuclei and cortex on MRI were considered severely abnormal.

Results AKI was found in 34 (39%) of 88 infants with 15, 7, and 12 fulfilling AKI network criteria for stage I, II, and III, respectively. Hypoxic-ischemic lesion on brain MRI was present in 50 infants. In 26 infants (AKI 14, no AKI 12), MRI was severely abnormal.

Abnormal MRI was more frequent in the AKI group (AKI 25 of 34, 73% versus No AKI 25 of 54, 46%, p=0.012, OR 3.2, 95% CI 1.3–8.2). Multivariate analysis identified only the AKI (p=0.032, OR 2.9, 95% CI 1.1–7.6), and chest compression for resuscitation to be independently associated with primary outcome.

Severely abnormal MRI were similar between infants with stage III and stage II AKI (stage III 3 of 12, 25% versus stage II 3 of 7, 43%; p=0.617), or stage I AKI (stage III 3 of 12, 25% versus stage I 8 of 15, 53%; p=0.238).

Conclusions AKI is independently associated with the presence of hypoxic-ischemic lesions on post-cooling brain MRI. However, the severity of AKI did not correlate with the severity of brain MRI abnormalities.

335 BRAIN PLASTICITY AFTER PRETERM BIRTH: AN EEG STUDY OF AUDITORY PROCESSING

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Background and Aims Premature birth has an impact on brain maturation that can be measured at term equivalent age (TEA) with neuroimaging techniques. The aim of our study is to determine the neural pathways and processes that are activated in term babies and preterm infants (GA < 32wks) at term after listening to their mother's voice and a stranger's voice with EEG and fMRI techniques. Our secondary aim is to differentiate innate (genetically determined) and acquired (determined by experience) networks. Here we present the results of the EEG analysis of the preterm recordings.

Methods High-density (109-channel) recordings were performed for subsequent event-related potentials (ERPs) analysis on newborns while listening to their mother's voice and the voice of an unknown woman saying a short phrase. Two groups were tested: premature newborns tested at TEA (GA:28.7wks) and full term controls (GA:40wks).

Results For preterm babies, the ERP results showed significant differences on left temporal electrodes when they listened to their mother's voice compared to a stranger's voice with an increased negativity at 100ms post voice onset (t-test; p<0.05). At later stages of voice processing, significant differences were found between 220–320ms with increased positivity for the mothers voice over right temporal electrodes.

Conclusions By showing specific activation in preterm babies at term when they listen to their mother's voice, our results suggest that the maturation of the auditory network can be influenced by these early experiences resulting in an early differentiation between their mother's voice and the voice of a stranger.

336 ARTERIAL SPIN LABELING MAGNETIC RESONANCE IMAGING TO EVALUATE PERINATAL ARTERIAL ISCHEMIC STROKE

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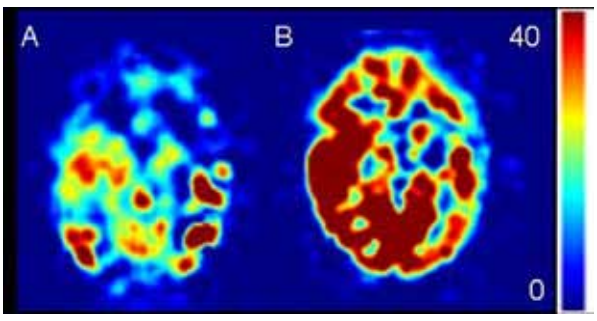
Background and Aim Studies performed in infants with perinatal arterial ischemic stroke (PAIS) have shown relations between initial neuro-imaging and neurodevelopmental outcome. However, not all variation in outcome can be explained. It is known from adult stroke studies that (luxury) perfusion of the stroke area is related to outcome. In this study, Arterial Spin Labeling (ASL) MR imaging was used to evaluate (luxury) perfusion in infants with PAIS.

Methods Conventional and ASL MR images (3T) were acquired of three PAIS patients 3–5 days after the ischemic event. Near Infrared Spectroscopy was used to monitor cerebral oxygenation. Follow-up MR imaging was conducted 2–16 weeks after the event.

Results A lower perfusion signal was measured in all infants in the area corresponding with the diffusion-restricted area on the diffusion-weighted images. Furthermore, in one infant, luxury perfusion was visualised in the cortex of the affected area. Measurements of volume flow (Phase-Contrast MR Angiography) and cerebral oxygenation were in agreement with this, suggesting an ischemia-induced vasodilatation. Follow-up ASL MR images in this infant showed a partly recovered perfusion. Initial [fig. 1A] and follow-up ASL images [Fig. 1B] of this infant are shown.



Abstract 336 Figure 1