ID: 170

**TITLE:** TIMING OF NEONATAL SEIZURE TREATMENT INITIATION: A RETROSPECTIVE COHORT STUDY.

**AUTHORS:** Wievineke M.J. Apers 1; Linda S. de Vries 2; Floris Groenendaal 3; Mona C. Toet 4; Lauren C. Weeke 5.

**AFFILIATIONS:** 1 Neonatology Dept., Wilhelmina Children’s Hospital, University Medical Center Utrecht, Utrecht, Netherlands.

**CONTENT:**

Neonatal seizures are common and can be caused by a variety of underlying disorders. There is increasing evidence that neonatal seizures may result in further brain damage. The aim of this retrospective study was to describe the time interval between diagnosis of amplitude-integrated electroencephalography (aEEG) confirmed seizures and administration of anti-epileptic drugs (AEDs).

In this single-center retrospective cohort study, full-term infants (n=106) admitted to a level III neonatal intensive care unit between 2012-2017 with seizures confirmed on two-channel aEEG and corresponding raw electroencephalography (EEG) trace, and treated with AEDs, were studied. The time-interval between the first seizure on the aEEG registration, confirmed by the researcher, and AED administration was calculated. Factors associated with early treatment and recognition of seizures by the clinician were analyzed.

The median time interval of initiating treatment of aEEG confirmed seizures was 01:50h (range 00:15h – 84:33h). Treatment of aEEG confirmed seizures was initiated <1h in 34/106 infants (32%), 1-2h in 21/106 infants (19.8%), 2-4h in 23/106 infants (21.7%), 4-8h in 14/106 infants (13%) and ≥ 8 hours in 14/106 infants (13%). The first aEEG confirmed seizure was detected by the BrainZ seizure detection algorithm (SDA) in 51%. Seizures treated 1h (67% versus 42%, p=0.02). 70.8% Of the first seizures were recorded in the patient files. Seizure detection by the SDA (OR 4.1, CI-95% 1.3-12.4) together with the presence of clinical signs (OR 16.8, CI-95% 4.7-59.7) were associated with recording of the first seizure on aEEG by the clinician.

Even though 32% of the seizures were treated <1h, there is room for improvement. Timely treatment occurred more often when seizures were detected by the SDA. Development of the SDA and training of staff for electrographic seizure recognition could improve time to treatment.

**COI:** Part of the data were obtained from two EEG machines that were provided to the department as part of a clinical trial: the NicoletOne for the NEMO project (European Community’s 7th Framework Program (HEALTH-F5-2009-4.2-1, grant agreement no. 241479, the NEMO project) and the Nihon Kohden monitor for the ANSeR study funded by a Welcome Trust Strategic Translational Award (098983).
ID: 289
TITLE: HYPOXIC ISCHAEMIC ENCEPHALOPATHY IN EXTREME PREMATURITY: A DIAGNOSTIC CONUNDRUM
AUTHORS: Adam King 1; Tim Scorrer 1; Olie Chowdhury 1
AFFILIATIONS: 1 Department of Neonatal medicine, Queen Alexandra Hospital, Portsmouth Hospitals NHS Trust, UK

CONTENT:

Hypoxic ischaemic encephalopathy (HIE) may occur in extremely preterm newborns, but may not be recognised because of the lack of a clear definition in this population, and the fact that their immaturity affects their clinical assessment and need for support compared to term infants. Our literature search found no consistent diagnostic criteria for HIE in the preterm infant. Term infants are assessed for evidence of perinatal hypoxia and encephalopathy based on specific criteria. Modifying these term criteria, we have identified a group of infants who may be described as having a diagnosis of HIE at an extremely premature gestation.

BadgerNet, the UK neonatal patient data management system, was searched for all infants born <28 weeks’ gestation in the ten year period between 01/01/2009 and 31/12/2018 and admitted to our medical neonatal intensive care unit based at a large district general hospital in England. Inclusion criteria were (1) recorded diagnosis of HIE or asphyxia; (2) ten minute Apgar score ≤5; (3) cord pH <7.00, (4) base deficit ≥16. These criteria correspond to cooling criteria A in term newborns. Each individual patient record within the database was then reviewed to assess whether the clinical course was consistent with a hypoxic insult. Data relating to demographic details, pattern of cranial injury and outcome were collected and analysed using Microsoft Excel.

Of 587 extremely preterm infants, 33 (5.6%) met inclusion criteria. Only 4 infants had a recorded diagnosis of HIE or asphyxia; the majority were included based on Apgar score, and/or cord gas values. The 33 infants analysed were born at a median gestation of 25+6 weeks (range 23+2 – 27+6 weeks) with a median birth weight of 769 grams (range 550–1151 g); 85% had antenatal steroid cover. Delivery was by emergency Caesarean in 12 cases, forceps assisted in 2 and vaginal in 19. Of the vaginal births, 11 (53%) were breech presentation. In total, 25 (76%) survived to discharge. Abnormal neurology was noted on inpatient records in 6 (18%), of whom 2 survived to discharge. Significant intracranial pathology was confirmed in 9 infants (27%). Of 22 infants eligible for assessment at 2 years of age, records were complete in 8: of these, 5 were noted to have delayed development.

HIE is difficult to recognise and as such may not be considered in the differential diagnosis for unwell preterm newborns, as diagnostic criteria used in term infants are not readily applicable. Our study attempts to characterise this small but not insignificant group of extremely preterm infants who may have suffered HIE. We propose this subject requires further research, to better define this population, their characteristics and outcomes.

COI: None Declared
ID: 385

TITLE: NEONATAL HYPOXIC-ISCHEMIC BRAIN INJURY AND HEART RATE VARIABILITY – POTENTIAL PITFALLS INVESTIGATED IN A PIGLET MODEL

AUTHORS: Mette Vestergård Pedersen 1; Ted Carl Kejlborg Andelius 1; Mads Andersen 1; Hannah Brogård 1; Nikolaj Bøgh 2; Camilla Omann 2; Kasper Jacobsen Kyng 1; Tine Brink Henriksen 1

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CONTENT:

Heart rate variability (HRV) has been suggested as a novel biomarker for diagnosis and prognosis in neonatal hypoxic-ischemic encephalopathy (HIE). However, several factors may influence HRV measures and obscure the prognostic value of point-of-care HRV. Therefore, we aimed to investigate the influence of seizures and cardiac arrhythmias on HRV measures in normothermic piglets subjected to a hypoxic-ischemic (HI) insult. We also aimed to investigate the influence of temperature changes on HRV in piglets without HI subjected to hypothermia.

To investigate the effect of seizures and cardiac arrhythmias, six newborn piglets were anaesthetized and subjected to a standardized global HI insult. Seizures and cardiac arrhythmias were identified from aEEG and ECG which was recorded continuously prior to, during, and for 24 hours after HI. HRV measures were calculated prior to, during, and after seizures and cardiac arrhythmias.

To investigate the effect of temperature changes, four newborn piglets without HI were anaesthetized and subjected to active whole-body cooling. Two piglets went from normothermia to hypothermia (33.5-34.0°C) and two piglets went from hypothermia to normothermia. HRV measures were calculated during the temperature changes. All HRV measures were calculated in 5-minute epochs using Kubios Premium®.

This abstract includes preliminary results from three of the six piglets subjected to HI: Three seizure events and three cardiac arrhythmias were detected and analyzed (Figure 1A). During seizures standard deviation of normal-to-normal interval (SDNN) increased during one event. Power in low frequency domain (LF) decreased during one event but increased in another. Power in high frequency domain (HF) increased during one event. During all cardiac arrhythmia events SDNN, LF, and HF increased. Final results from six piglets subjected to HI will be presented at the conference.

Preliminary results from two piglets without HI subjected to hypothermia: SDNN increased during initiation of hypothermia in one piglet and during rewarming in another piglet (Figure 1B). Final results from four piglets without HI subjected to hypothermia will be presented at the conference.

Our preliminary results show that HRV is affected by cardiac arrhythmia and might be affected by seizures. This underlines the importance of scrutinizing the ECG and EEG prior to the analyses of HRV measures. Temperature changes might also influence HRV, which may hamper the use of HRV in neonates with temperature instability or changes e.g. during cooling or re-warming.

IMAGES:
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COI: None declared
**ID:** 469  
**TITLE:** VITAL SIGN PATTERNS AND TIMING OF SEVERE IVH IN VLBW INFANTS  
**AUTHORS:** Karen Fairchild 1, Maryam Abubakar 1, Santina Zanelli 1, Amit Mathur, 2, Zachary Vesoulis 2  
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**CONTENT:**

Severe intraventricular hemorrhage (sIVH, grade 3-4) occurs in about 10% of very low birthweight (VLBW) infants and may be present at birth or occur or worsen in the first minutes to days after birth. Our groups previously reported an association between abnormal vital sign patterns (heart rate, blood pressure, and oxygenation) and sIVH but their temporal and causal relationship remains to be elucidated. In this study, we sought to further characterize vital sign patterns in the first week after birth in infants with early or later timing of cranial ultrasound (CUS) evidence of sIVH.

The study included all VLBW preterm infants admitted to the NICU 2009-2016 with every-two-second vital sign data including invasive arterial blood pressure measurements stored for the first 7 days after birth. Timing of CUS screening was based on clinician discretion with CUS day 1-2 for some infants and days 3-5 and 7-10 for all infants. Infants with sIVH were divided into 2 categories: early sIVH (on day 1-2) and late sIVH (no sIVH day 1-2 and sIVH day 3 or later). Each infant with sIVH was matched by GA to 2 infants with no IVH. Infants with grade 1-2 IVH were excluded. Hourly mean arterial blood pressure (MABP), heart rate (HR), and systemic oxygenation from pulse oximetry (SpO2) were analyzed using the Kruskal-Wallis test followed by the Dunn Test for post-hoc comparison.

129 VLBW infants were included (GA mean 25.0 +/- 2.5 weeks): 9 and 23 infants in the early and late sIVH groups, respectively and 97 in the GA-matched no IVH group. Infants with sIVH had significantly higher mean HR over the first week from birth compared to those with no IVH: early sIVH 169± 7, late sIVH 162± 7, no IVH 153± 12 (P <.0.01). There was a trend toward higher HR beyond day 2 in infants with early versus late sIVH. Infants with sIVH also had lower SpO2 : early sIVH 92.2 ± 0.82, late sIVH 91.5 ± 1, no IVH 93.9 ± 0.75 (P < .0.01). There was no significant difference in mean SpO2 between early and late sIVH groups. Mean MABP was not significantly different between groups (Figure).

In this cohort, infants with sIVH had significantly higher mean HR and lower SpO2 in the first week after birth compared to GA-matched infants with no IVH. Ongoing studies are examining more specific abnormalities of vital signs and their interactions in relation to timing of discovery of sIVH on cranial ultrasound.

**IMAGES:**  
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Figure: Relationship between vital signs in the first 7 days after birth and early or late sIVH. Upper panels: Hourly mean values for HR, MABP, and SpO2 in infants with early sIVH (day 1-2, n=9, red), late sIVH (day 3 or beyond, n=23, blue) and GA-matched control infants with no IVH (n=97, green). Lower panels: Box and whiskers plot of mean HR, MABP, and SpO2 for the week from birth. Red dots indicate outliers.*Asterisks indicate a significant difference in infants with sIVH versus no IVH.

**COI:** None declared.
ID: 708

TITLE: HIGH SEIZURE BURDEN AND DISSOCIATION BETWEEN CLINICAL AND EEG SEIZURES IN NEONATAL ENCEPHALOPATHY IN A HOSPITAL SETTING IN GHANA

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CONTENT:

Neonatal encephalopathy (NE) is a significant problem worldwide with the highest rates in sub-Saharan Africa. Neonatal seizures, a common feature of NE, are difficult to diagnose even with access to EEG. Access to full video EEG is rare in both low and high resource settings and seizures are typically managed clinically. The aim of this study was to assess neonatal seizure burden and the relationship between EEG and clinical seizures in a setting with high rates of birth-associated NE.

This prospective pilot observational cohort study was conducted at Korle Bu Teaching Hospital, Accra, Ghana, in June-July 2017. Infants ≥36 weeks with moderate to severe NE were enrolled as soon as possible after birth. 11 infants (82% male) were recruited: mean 39+3 weeks (SD 12d) and 3083 (SD 421)g. Multichannel 9 lead video EEG (Lifelines iEEG, Kvikna Medical) was commenced after enrollment (median 9 (IQR 4-12)h) and recorded for ≥48h. The EEG screen was obscured, excluding impedance tests. A clinical seizure record was kept as standard care. Neurological assessments were performed for 4 days. EEGs were assessed (SM, GB) and all seizures annotated, quantifying seizure number, mean duration, burden (SB) (min), and instantaneous SB (ISB) (min/h). Videos were retrospectively reviewed (KM).

4 (36%) infants had EEG seizures. For these 4 infants, SB was median (IQR) 194 (86-289) min, and number 88 (47-162). EEG seizure onset was at 35 (32-45) h, and the time of max ISB was 45 (35-65) h. 3 infants with EEG seizures had video recorded; clinical seizure correlation ranged from 17-57%, including clonic, automatism, and autonomic seizures. 9 infants were suspected of seizures by the treating team. Anticonvulsants (AED) were given to 8 (72%) infants (2 phenobarbitone (PB), 1 PB & phenytoin (PT), 5 PB, PT & midazolam). Five (63%) of these infants had no EEG seizures. The infant with greatest EEG SB had 1 documented clinical seizure and received no AED. Age at first AED was 2.7 (2.0-3.2) h, which was prior to EEG onset for all bar 1 infant. There was no correlation between EEG seizures (number, SB, ISB) and day 4 Thompsons score (R2≤0.04). 1 of 3 infants that died had EEG seizures.

In a mid resource setting with high rates of NE, seizure burden is high. Apparent clinical seizure activity is frequently dissociated from EEG seizures. Electrographic seizures peak on day 2 to 3, however this may be contributed to by the common use of AED early after birth (prior to EEG commencement). Pragmatic therapies to reduce seizure burden in low and mid resource settings may include prophylactic AED.
Table 1. Description of seizures for the 4 infants with EEG seizures. ISB = instantaneous seizure burden.

Figure 1. Seizure burden (SB) min/h plots for the 4 infants with EEG seizures, Baby A - D. EEG commencement is indicated by the start of the orange baseline line. Anticonvulsant boluses (columns) and maintenance/infusion therapy (rows) are indicated in yellow (phenobarbitone), purple (phenytoin) and green (midazolam). Baby D did not receive anticonvulsants.

COI: None declared
ID: 758  
**TITLE:** IMPACT OF CARDIO-RESPIRATORY EVENTS ON CEREBRAL OXYGEN STATUS IN PRETERM INFANTS DURING THE FIRST 72 HOURS OF LIFE.  
**AUTHORS:** Silvia Martini 1, Luigi Corvaglia 1, Viviana Perrone 1, Giulia Frabboni 1, Marek Czosnyka 2, Peter Smielewski 2, Anna Giulia Cimatti 1, Arianna Aceti 1, Giacomo Faldella 1, Topun Austin 3  
**AFFILIATIONS:** 1 Neonatal Intensive Care Unit, St. Orsola-Malpighi University Hospital, Bologna, Italy  
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**CONTENT:**

Cardio-respiratory events (CRE), defined as intermittent episodes of hypoxemia and/or bradycardia, are particularly common among preterm infants. It has been previously shown that, in the neonatal population, CRE may result in transient brain hypoxia and hypoperfusion, thus representing a possible risk factor for neurodevelopmental sequelae. In the preterm population, the first 72 hours (h) of life are characterized by a significant cardio-respiratory and hemodynamic instability. In this study we aimed to evaluate changes in cerebral oxygenation (CrSO2) and cerebral oxygen extraction (cFTOE) in response to different CRE types during this transitional period.

Non-invasively ventilated newborns (<32 weeks’ gestation or <1500 g) underwent a continuous monitoring of heart rate (HR) and arterial oxygen saturation (SpO2) by pulse oximeter and of CrSO2 by Near Infrared Spectroscopy (NIRS) over the first 72h. Data were simultaneously recorded by ICM+ software (Cambridge Enterprise Ltd, UK) and cFTOE was calculated. CRE≥10sec were divided into isolated desaturation (ID, SpO2<85%), isolated bradycardia (IB, HR<100bpm or <70% baseline) and combined desaturation/bradycardia (DB). Percent CrSO2 and cFTOE changes (%delta) between pre-event baseline and event nadir were compared between ID, IB and DB with Kruskal-Wallis test. Generalized estimating equation was used to adjust the results for other variables. Significance level was set at p<0.05.

A total of 558 events from 22 neonates (mean gestational age 30±2 weeks) were analysed. Of these, ID were 343 (61.5%), IB 61 (10.9%) and DB 154 (27.6%). As shown in Figure 1, %delta SpO2 was significantly higher in DB compared to ID, whereas no difference in %delta HR was observed between IB and DB. A significant difference in %delta cTOI (p <0.001) was observed among ID, IB and DB, with greatest negative variations during DB and smallest during IB. A significant decrease was observed in %delta cFTOE with DB and ID compared to IB, whereas no significant difference was seen between ID and DB. The effect of different CRE types on %delta cTOI (p <0.001) and %delta cFTOE (p <0.001) was confirmed even after adjustment for patients’ identity, gestational age, antenatal Doppler status, antenatal steroids, patent ductus arteriosus and type of ventilatory support.

CRE have a significantly different influence on cerebral O2 status in preterm infants <72 h. Combined bradycardias and desaturations have the highest impact on cTOI, suggesting that a concomitant HR reduction could further contribute to decrease O2 supply. Moreover, both ID and DB showed a significant cFTOE decrease from baseline compared to IB, consistently with a transient reduction in O2 delivery with no compensatory increase of O2 extraction.

**IMAGES:**

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Figure 1. Percentage changes from baseline of arterial oxygen saturation (%delta SpO2), heart rate (%delta HR), cerebral oxygenation (%delta cTOI) and cerebral fraction of tissue oxygen extraction (%delta cFTOE) among different types of cardio-
respiratory events (isolated desaturation, isolated bradycardia and combined desaturation and bradycardia) and results of pairwise comparison.

**COI:** None declared.
ID: 830

TITLE: VISUALLY EVOKED CEREBRAL HEMODYNAMIC RESPONSES IN PRETERM-BORN NEONATES: CLASSIFICATION ACCORDING TO SUBGROUPS AND ANALYSIS OF FRONTOTEMPORAL-OCCIPITAL FUNCTIONAL CONNECTIVITY

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CONTENT:

How neuro-vascular coupling develops in preterm neonates is still largely understudied.

In our study we measured visually (flicker light) evoked hemodynamic responses (HRs) in preterm neonates (n = 25, gestational age: 31.71 ± 3.373 weeks, postnatal age: 25.48 ± 23.94 days) at the visual cortex (VC) and left frontotemporal lobe (FTL) using functional near-infrared spectroscopy (fNIRS) neuroimaging.

We found that the HR characteristics show a large inter-subject variability and could be classified into three groups according to the changes of oxyhemoglobin concentration at the VC (increase (A), decrease (B) or inconclusive (C)). In group A and B, the HRs at the left FTL were correlated with those at the VC indicating a frontotemporal-occipital functional connectivity (fto-FC). Neonates in group A had the largest weight compared to B, and had the lowest baseline total haemoglobin concentration and haematocrit compared to C.

To the best of our knowledge, this is the first fNIRS study showing that (i) the HRs of preterms need to be classified into subgroups, that (ii) the subgroups differed in weight and hematocrit at measurement, and that (iii) HRs can be observed also at the FTL during visual stimulation in preterms. These findings add novel insights how the neuro-vascular coupling develops in preterm neonates.

COI: None declared
TITLE: HEART RATE PATTERNS IN HYPOXIC ISCHAEMIC ENCEPHALOPATHY

AUTHORS: Natalie Gallagher 1
          Charalampos Kotidis 2
          Christopher Dewhurst 3

AFFILIATIONS: Neonatal Unit, Liverpool Women's Hospital, Liverpool, England

CONTENT:

HIE remains the most common cause of death and neurodisability in term babies. At Liverpool Women’s Hospital all babies have their physiological monitoring parameters reported in monitoring charts at 1Hz. In infants with HIE we have previously observed three distinct patterns of heart rate, blood pressure and oxygen saturation recordings; (i) normal variability, (ii) reduced variability and (iii) sinusoidal patterns. We assessed whether these patterns were associated with markers of the severity of hypoxic ischaemic encephalopathy and outcome.

Infants born over a 2 year period with HIE were identified from our electronic patient record system. The physiological monitoring traces in the first 72 hours of life were reviewed and classified into three categories; (i) normal variability (ii) reduced variability (iii) sinusoidal pattern. “Normal variability” was defined as a chaotic pattern, with no rhythmic changes and variability >10bpm in the hour. “Reduced variability” as a trace with a change of 10bpm. The presence of reduced variability and sinusoidal patterns were then compared with recordings where these patterns were absent. Comparisons were made between cord/worst pH, worst base deficit, HIE grading, presence of seizures and hypotension. The outcomes of abnormal MRI, death and cerebral palsy at 2 years were compared.

A total of 67 babies were identified, 11 had normal variability, 26 had reduced variability, 12 had a sinusoidal trace and 18 had periods of both a sinusoidal trace and reduced variability. MRI data was available on 41 babies with 2 year outcomes available from 23 babies. All of the babies with normal variability survived and of the 5 assessed at 2 years non had cerebral palsy. Of the 44 babies with reduced variability, 11 died and 7/12 assessed at 2 years had cerebral palsy. Of the 33 babies with a sinusoidal trace all survived and 6/13 had cerebral palsy. There were statistically significant differences when those with reduced variability were compared with those without for 5 minute Apgar, HIE grade, death and the combined outcome of death and cerebral palsy. There was no statistically significant difference when those with a sinusoidal trace were compared to those without.

In the first 72 hours of life reduced variability (observed in 66%) and sinusoidal patterns (50%) were associated with the severity of HIE, increased mortality and cerebral palsy. All of the babies who died had reduced variability. All of the babies with normal variability survived without cerebral palsy. The simple visual inspection of physiological parameters may be helpful in identifying infants at increased risk of morbidity and mortality.

IMAGES:
https://www.eiseverywhere.com/eselectv3/v3/events/351149/submission/files/download?fileID=37ba19ec5334397c3d95b66a19b24523-MjAxOS0wNSM1Y2UyNjY2ZDA3M2Ex

Fig. 1 Sinusoidal pattern

COI: None declared
ID: 952

**TITLE:** OXIDATIVE STRESS LINKED WITH CLINICAL OUTCOMES AND BIOMARKERS OF NEUROLOGIC DAMAGE IN INFANTS UNDERGOING CARDIAC SURGERY

**AUTHORS:** Stephanie Hadley 1; Debora Cañizo Vázquez 2; Miriam Lopez Abad 3; Laura Elena Carrara 4; Marta Camprubí Camprubí 5; Joan Sanchez-de-Toledo 6.

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6 Cardiology Dept, Sant Joan de Déu Hospital, Barcelona, Spain

**CONTENT:**

Infants with CHD are particularly vulnerable to brain injury, and cardiac surgery during infancy seems to increase the risk of pre-existing white matter damage and long-term neurocognitive impairment. Though there is evidence demonstrating a strong oxidative stress response to cardiac surgery, its impact on neurologic damage in CHD remains unclear. The aim of this study was to characterize the relationship between oxidative stress, serum neurologic biomarkers, and clinical outcomes in infants undergoing cardiac surgery.

This was a prospective, observational study. Patients 6 months of age or younger undergoing cardiac surgery, with or without cardiopulmonary bypass (CPB), were eligible for inclusion. Patients were divided into neonatal (<30 days) and pediatric (30 days - 6 months) groups for analysis. Pre- and post-surgical clinical data were recorded. Urine 8-iso-Prostaglandin F2α, a biomarker of oxidative stress (OS), was quantified immediately before surgery and at 0- and 24-hours post-surgery using enzyme-linked immunoassays (Cell BioLabs, Inc., San Diego, CA). Serum brain damage biomarkers, enolase (NSE) and S100B protein, levels were also analyzed before surgery and at 0- and 72-hours post-surgery. Values are expressed as median [IQR].

63 patients (aged 21 days [8-96]) undergoing surgery between November 2017-February 2019 were included. All pediatric patients had CPB surgery (n=25). Neonatal patients were categorized based on surgery: CPB (n=12), coarctectomy (n=14), or other (n=12).

Neonatal CPB patients had the highest OS at all 3 time points (Table 1). CPB patients had higher post-operative OS than non-CPB (p=0.018). In pediatric patients, 24 hr OS was correlated with ICU length of stay (LOS) (rho=0.503, p=0.017) and overall LOS (rho=0.466, p=0.033). In CPB patients, 24 hr OS was associated with higher 24 hr inotropic support (rho=0.532, p=0.002), days of mechanical ventilation (rho=0.447, p=0.015), and ICU LOS (rho=0.420, p=0.017). Post-operative OS was correlated with S100B (rho=0.647, p=0.004; rho=0.472, p=0.015) and NSE (rho=0.512, p=0.036; rho=0.426, p=0.038) in pediatric and neonatal patients, respectively.

Infants undergoing cardiac surgery, particularly neonatal CPB patients, experience significant peri-operative OS. Elevated levels of OS are correlated with both biomarkers of cerebral damage and poorer clinical outcomes in the immediate post-operative period. These pilot data suggest that peri-operative OS may play a role in the mechanism of brain injury in children with cardiac disease and should be investigated on a larger scale.
Table 1. Peri-operative 8-iso-Prostaglandin F2α levels.

COI: None declared.
ID: 954
TITLE: NEUROBEHAVIORAL AND VISUAL EVALUATIONS IN THE EARLY POST-OPERATIVE PERIOD FOLLOWING NEONATAL CARDIAC SURGERY
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CONTENT:

Long-term neurocognitive impairment is one of the most prevalent issues affecting neonates with congenital heart disease. Prompt identification of neurologic deficits is essential in order to provide adequate clinical follow-up and early intervention. This study aimed to identify functional neurological and optical deficits in the early post-operative period in neonates undergoing cardiac surgery.

This was a prospective, observational study. Patients less than 1 month of age undergoing surgery with or without cardiopulmonary bypass (CPB) were eligible for inclusion. Clinical data were recorded. Patients were monitored with near infrared spectroscopy (NIRS) intra-operatively and for 72 hours post-surgery. Urinary 8-iso-Prostaglandin F2α, a biomarker of oxidative stress (OS), was quantified at 0- and 24 hours post-surgery. Prior to hospital discharge, a neuropsychologist evaluated patients using the Newborn Behavioral Observations (NBO) and the ML Leonhardt Battery of Optotypes. The tests were analyzed by sub-categories: NBO as state (representing habituation to light and sound) and motor; and Leonhardt as optical interactions, optical function, optical perception, and ocular fields.

Twenty-seven neonates (median age 10 days [IQR 7-20]) were enrolled between January 2018-January 2019. Eleven underwent CPB surgery. The median age at neurologic evaluation was 31 days [21-44]. CPB patients had lower NBO state scores, representing poorer habituation to stimuli, but higher motor scores than non-CPB patients (p=0.047, 0.010). Lactate level and persistent NIRS values outside the normal range at 24 hours post-surgery were inversely correlated with NBO state score (rho=-0.643 and -0.645; p=0.045 and 0.044). Patients with aortic obstruction had poorer optical interactions than those with no obstruction (p=0.026), and patients with higher post-operative OS had worse optical function (p=0.015). Length of stay (LOS) in the ICU was inversely correlated with optical perception and ocular fields (rho=-0.415 and -0.398; p=0.035 and 0.044).

Lower NBO state scores, representing poorer habituation, were observed in patients with abnormal cerebral oxygenation, elevated 24-hour lactate levels, and CPB; however, CPB patients performed better on motor tasks than non-CPB patients. Aortic obstruction, OS, and LOS were associated with poorer post-operative visual function. Higher-powered studies are needed for more thorough neurovisual follow-up after neonatal cardiac surgery.

COI: None declared
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TITLE: THE ROLE OF AEEG RECORDINGS AND BIOMARKERS IN CHILDREN UNDERGOING CARDIAC SURGERY

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CONTENT:

Pediatric patients with congenital heart disease (CHD) are at risk for mortality and poor neurodevelopmental outcomes. The perioperative period might have a negative impact on the process of brain maturation in this population. We aim to utilize intraoperative neuromonitoring with amplitude-integrated electroencephalography (aEEG) in combination with biomarkers of brain damage and oxidative stress (OS) to identify children at risk of adverse neurological outcome following cardiac surgery.

This is a prospective observational study including patients undergoing cardiac surgery during the first six months of life. aEEG recordings were obtained during surgery and both background patterns and electrographic seizure activity (EA) were analyzed. Total seizure burden was also calculated. Serum biomarkers of brain damage such s100B protein and neuron specific enolase (NSE) and urinary OS were measured at baseline and immediately after surgery. Postoperative peak serum lactate was also analyzed.

Patients were divided in groups based on age (neonatal 1 month) and type of surgery (cardiopulmonary bypass (CPB) vs non-CPB).

Forty patients were included (26 neonatal and 14 pediatric). 69.23% of the newborns have abnormal background patterns and the most common intraoperative background pattern in this population was continuous low voltage (34.62%). 57.15% of the pediatric patients have a good prognostic patterns during the surgery.

Four pediatric (28.5%) and 9 neonatal (34.6%) patients had EA. Neonatal patients presented with more total seizure burden compared with pediatric patients (p=0.024). Patients undergoing CPB had a higher seizure burden (p=0.008), especially neonatal patients (p=0.045).

Postoperative peak serum lactate was associated with poor aEEG background patterns (p=0.037). Postoperative s100B (p=0.026), lactate (p=0.045) and OS (p=0.027) were higher in patients with electrical crisis.

Seizure burden was positively correlated with s100B (rho=0.54; p=0.004) and OS (rho =0.35; p=0.037).

Pediatric heart surgery is associated with a high risk of intraoperative seizures. Neonates present with a higher seizure burden and overall worse aEEG background patterns which suggests greater cerebral vulnerability of these patients.

Total intraoperative seizure burden is related to higher levels of biomarkers and OS which may reflect more cerebral injury.

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