

childhood, originating from a skeletal or dental malrelationship. Children with this malocclusion exhibit disknetic reverse chewing patterns which are characterized by a completely altered neuromuscular activation and coordination.

**Aim:** The aim of this study was to characterize the mandibular kinematics and the neuromuscular of children with unilateral posterior crossbite.

**Material and methods:** Eighty-two children (8.6 +/- 1.3 yr of age) with unilateral posterior crossbite and 12 children (8.9 +/- 0.6 yr of age) with normal occlusion were selected for the study. Electromyography (EMG) and kinematics were concurrently recorded during mastication.

**Results:** The percentage of reverse chewing in the group of patients was 59.0 +/- 33.1% (soft bolus) and 69.7 +/- 29.7% (hard bolus) when chewing on the crossbite side. When chewing on the non-affected side, the number of reverse cycles was 16.7 +/- 24.5% (soft bolus) and 16.7 +/- 22.3% (hard bolus). The reverse cycles on the crossbite side were significantly narrower with respect to the cycles on the non-affected side and resulted in lower EMG activity of the masseter of the crossbite side; the activity of the contralateral masseter was larger for reverse than non-reverse chewing cycles.

**Conclusions:** The clinical significance of these results is that, in children with unilateral posterior crossbite, the neuromuscular coordination is completely altered establishing a severe functional and muscular asymmetry which should be corrected as early as possible to let the children a balanced growth.

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**NEAR-INFRARED-SPECTROSCOPY TO DETERMINE CEREBRAL OXYGENATION IN NEONATES: DO ABSORPTION AND SCATTERING COEFFICIENTS CORRELATE WITH SKIN, BONE, AND CEREBROSPINALFLUID THICKNESS?**

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**Background:** Taking into account both the attenuation of light and the phase-shift, frequency domain near-infrared-spectroscopy (FD-) NIRS enables to measure the absolute scattering ( $\mu_s'$ ) and absorption ( $\mu_a$ ) coefficients of tissue.

**Aim:** To evaluate the effect of skin, bone, and cerebrospinalfluid thickness on  $\mu_a$  and  $\mu_s'$ .

**Methods:** The Oxiplex TS (ISS Inc., Champaign, IL, USA) FD-NIRS and proprietary data analysis software were used in clinically stable neonates: gestational age 34 (30 4/7-39 6/7) [weeks], postnatal age 11 (1-45) [days], weight 2,810 (2,650-3,860) [g]. The optode was placed over the right temporo-parietal-region and four measurements of at least 2 minutes each were performed per subject at 1Hz sampling rate. To determine the thickness of the tissues, cranial ultrasound was performed (Toshiba Aplio, applying a 7-14MHz longitudinal transducer). All data are median (min.-max.).

**Results:** For all patients  $\mu_s'$  and  $\mu_a$  at 692nm were 7.92(4.55-8.92) $\text{cm}^{-1}$  and 0.086(0.076-0.1345) $\text{cm}^{-1}$ , and at 834nm were 6.20(3.67-7.51) $\text{cm}^{-1}$  and 0.102(0.090-0.135) $\text{cm}^{-1}$ . Skin thickness was 1,5(1.1-1,7)mm, bone thickness was 2,9(2,6-2,3) mm and cerebrospinalfluid thickness was 3,1(2,4-3,7)mm. In univariate linear regression analysis  $\mu_a$  correlated negatively with skin thickness (692nm:  $r^2=0.91$ ; 834nm:  $r^2=0.74$ ), and to a lesser extend with cerebrospinalfluid thickness.  $\mu_s'$  correlated positively with bone thickness (692nm:  $r^2=0.49$ ; 834nm:  $r^2=0.79$ ).

**Conclusion:** Skin, bone, and cerebrospinalfluid thickness were correlated with  $\mu_s'$  and  $\mu_a$ . It is unclear whether this correlation is causal or confounding and if it affects the accuracy of NIRS measurements.

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**INTENSIVE CARE MANAGEMENT AND FOLLOW-UP OF SEVERE TRAUMATIC BRAIN INJURY IN CHILDREN**

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**Introduction:** Traumatic brain injury (TBI) is the leading cause of paediatric morbidity and mortality in developed countries. Acquired disability can be evaluated by King's Outcome Scale for Childhood Head Injury (KOSCHI).

**Objectives:** Evaluate care and outcome in children with severe TBI.

**Methods:** Analysis of clinical and demographic data of children admitted between January 2008

and December 2009 with the diagnosis of severe TBI. KOSCHI was used to assess recovery.

**Results:** Of 92 admissions for trauma, 47 had severe TBI. The median age was 8 years, PRISM score was 13 and PTS was 6. The leading cause was road traffic accident (57%). Specialized medical teams provided pre-hospital care in 68% of cases. Raised intracranial pressure (ICP) signs were present in 34 cases. Neurosurgical intervention was necessary in 16 children and 10 had invasive ICP monitoring. All children were ventilated, 42 had hyperosmolar therapy (mannitol or NaCl 3%), 5 barbiturate-induced coma and 12 vasoactive drugs. Transcranial doppler (TCD) was performed in 27 children, 18 had raised pulsatility index. There was a good correlation between TCD information and ICP readings. Eight children (17%) died. In the follow-up period 8 children were in KOSCHI category 1, 2 in category 2, 5 in category 3, 11 in category 4 and 21 in category 5.

**Conclusions:** KOSCHI provides a practical scale for paediatric head injury outcome. A high percentage of patients were discharged without any sequelae and mortality rate was low. Treatment in a PICU and early neurosurgical consultation were determinant for the good outcome.

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#### RECOVERY OF SLEEP-WAKE CYCLING ON AMPLITUDE-INTEGRATED ELECTROENCEPHALOGRAPHY IN POST-SURGICAL TERM NEONATES

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**Background:** Sleep characteristics have been used for prediction of neurodevelopmental outcome and may also be useful to determine quality of recovery after surgery. Cerebral monitoring has not previously been routinely used to observe effects of anaesthesia and surgery on the developing brain.

The aim of this prospective study was to evaluate the influence of anesthesia on the recovery of SWC in term newborns after surgery.

**Methods:** Term neonates admitted to NICU who underwent major intra-abdominal surgery were studied. The Brainz® monitor was applied post-

operatively using the standard C3, C4 and P3, P4 positions. Subjects were monitored until mature SWC were observed and the time of onset and quality of SWC together with the background pattern were then assessed.

**Results:** Forty-seven patients were recruited. Surgery was performed for congenital diaphragmatic hernia (15), esophageal atresia (12), duodenal and jejunal atresia (7), ileal obstruction (3), exomphalos (3), gastroschisis (4), malrotation (1), meconium ileus (1) and a patent urachus (1). When patients returned to the NICU morphine and midazolam infusions were commenced. Emergence of SWC was observed at a median of 13 hours after surgery (range 1 to 136 hours). SWC became mature at a median of 30 hours (range 4 to 175 hours). All patients were still on morphine and midazolam infusions at this stage.

**Conclusion:** The emergence of sleep-wake cycling on aEEG after surgery can be observed as early as one hour post-operatively and appears not to be affected by high dose infusions of morphine and midazolam.

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#### THE INFLUENCE OF MUSIC ON AEEG-ACTIVITY IN NEUROLOGICALLY HEALTHY NEWBORNS ≥ 32 WEEKS GESTATIONAL AGE - A PILOT STUDY

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**Background:** Music is a valuable resource in the NICU. In pursuit of further evidence aEEG may provide a clear picture of the impact of recorded music on newborn brain activity.

**Aim:** To evaluate the influence of music on aEEG-activity in neurologically healthy neonates born ≥ 32 weeks' gestational age.

**Methods:** Twenty neurologically healthy infants admitted to the NICU at The Royal Children's Hospital, Melbourne with minor abnormalities requiring further investigation were included in this study. Ten subjects were randomized in the assessment group (music stimulation) and 10 subjects were only monitored by aEEG (without music stimulation). The source of music was Music