Preterms, neonates and children up to six month of age are prone to exhibit burst suppression while receiving even moderate dosages of anesthetics.

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Background:

In clinical practice dosages of volatile and iv. anaesthetics are adjusted to patients age and body weight. Without neuromonitoring the resulting level of anaesthesia can only be assumed and changes in heart rate, blood pressure, vegetative symptoms or spontaneous movements are frequently used as surrogate parameters for adjustment of anaesthetics in the individual patient. To explore whether routinely applied dosages of anaesthetics result in adequate or unwanted too deep levels of anaesthesia, namely burst suppression, and whether results are age depended we retrospectively analyzed collected EEG data of children aged 0-6yrs undergoing general anesthesia.

Methods:

The protocol was approved by the Ethical board and the need for informed consent was waived. Using the Narcotrend® database we identified all children who underwent surgery between July 2013 and March 2015 and received general anaesthesia with EEG monitoring. Details of anaesthesia were collected from anaesthesia records and episodes of burst suppression were identified and counted using the Narcotrend® data. Patients were grouped according to age. Collected data on anaesthesia and EEG were analyzed for values present at predefined time points (induction, 10 min thereafter, before surgical incision, 5 and 15 min after incision and time of wound closure). Average values for mean arterial pressure, heart rate, sevoflurane and continuously administered propofol were calculated as mean of values recorded for the 6 time points.

Results:

During the study period 172 children underwent general anaesthesia with EEG monitoring for various surgical interventions (inguinal and umbilical hernia, circumcision, orchidopexia, central venous access and laparotomy). Children usually received propofol or sevoflurane for induction, fentanyl for analgesia, and anaesthesia was maintained with sevoflurane in most cases, only in 18 children propofol was used continuously. If appropriate caudal anaesthesia with ropivacaine 0.2% with or without clonidine was performed. (Table 1)

Table 1. Details on 172 children receiving general anaesthesia. MAP, mean arterial pressure; et, endtidal; values are given as mean ±SD or median (Q1, Q3).

Age groups (months)	Preterms (n=18)	< 1 (n=8)	1-6 (n=13)	7-12 (n=12)	13-36 (n=45)	37-72 (n=76)
Weight (kg)	2.65±1.09	3.35±0.36	6.3±1.82	8.4±1.47	11.77±2.55	18.76±3.34
Anaesthesia (min)	159±68	106±54	99±42	89±27	88±39	84±40
MAP (mm Hg)	49±9	48±5	49±10	51±6	54±9	54±6
HR (bpm)	142±15	140±10	127±8	124±11	109±15	93±11
Sevoflurane et vol %()	1.1 (0.7, 1.7)	1.7 (1.3, 2.0)	2.3 (1.9, 2.6)	2.4 (2.2, 2.8)	2.2 (1.6, 2.4)	2.0 (1.5, 2.3)
Propofol (mg/kg/h)					4.9 (4.0, 8.0)	5.9 (4.4,7.9)
Propofol (mg/kg) induction	0 (0, 1.4)	0 (0, 2.0)	2.0 (0,2.9)	3.6 (2.5, 5.0)	3.6 (2.0, 4.5)	3.2 (2.0, 4.8)
Fentanyl (µg/kg)	1.8 (0, 4.8)	4.0 (2.7, 6.3)	2.6 (2.0, 5.3)	3.2 (2.1, 4.2)	2.9 (2.0, 3.9)	2.6 (2.0, 4.2)
Caudal anaesthesia (n)	7	2	10	4	21	45
Clonidin (1-3 µg/kg) (n)	0	0	0	1	16	32

Preterms, neonates and children 1-6 months showed in 94.4%, 100% and 69.2% burst suppression while in children aged 7-12 months, 13-36 months and 37-72 months burst suppression was detected in 58%, 31% and 23% (Fig. 1). In all preterms and neonates burst suppression occurred at multiple time points throughout anaesthesia while this was only true for 46%, 8%, 4% and 1% in children aged 1-6 months, 7-12 months, 13-36 months and 37-72 months. (Fig. 2).

Despite in all children aged preterm to six month median MAC values were between 0.4 to 0.8 (Fig. 3) burst suppression was frequently detected and enduring in preterms and neonates. Thus, EEG based monitoring should be used to guide administration of hypnotics especially in the very young children