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Non-Invasive Absolute Cerebral Oximetry during Inhalational Anesthesia in Young Children

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Introduction: The FORE-SIGHT absolute cerebral oximeter uses 4 wavelengths to determine absolute cerebral oxygen saturation ($SctO_2$) at the microvascular level. Very few data are currently available on cerebral oxygen saturation values monitored during inhalational anesthesia in young children. In this study, $SctO_2$ values were monitored during induction and during maintenance of volatile anesthesia in young children.

Patients and Methods: With IRB approval and parental informed consent, 48 male children (2-6yrs) scheduled for elective minor urologic surgery were studied. Before induction of anesthesia, unilateral (right side) $SctO_2$ monitoring was applied together with a pediatric BIS EEG sensor (left side). In all children, anesthesia was induced with 6% sevoflurane (in mixture of $50\%O_2/50\%N_2O$) and maintained by sevoflurane (in mixture of $50\%O_2/50\%N_2O$) titrated to BIS values between 40 and 60. After induction of anesthesia, LMA was inserted and children were allowed to breath spontaneously. No other iv anesthetic agent was administered, except for paracetamol for postoperative pain relief.

Results: Before start of anesthesia, mean awake $SctO_2$ was 84% (SD 4.1869; range 79-89%). In all children, induction of anesthesia resulted in a significant increase in $SctO_2$ (at loss of consciousness: mean 93%; SD 5.238, range 88-97%). Mean $SctO_2$ during maintenance of anesthesia (mean 24min of procedural time) was 89% (SD 7.5411, range 85-95%). Mean $EtCO_2$ value during procedure was 43.1mmHg (range 34-52mmHg), while mean EtSevo was 2.9% (range 2.2-4.5%), titrated to mean BIS value of 49 (range 38-61). After emergence from anesthesia (and removal of LMA), $SctO_2$ and BIS values returned to baseline values. In no child, any arterial saturation value below 95% was observed, and hence no decreases in $SctO_2$ values were associated to arterial desaturation.

Discussion: Monitoring of non-invasive absolute cerebral oxygen saturation during inhalational anesthesia in young children revealed surprisingly high $SctO_2$ values, approximating peripheral pulse oximetry values. Future studies will have to reveal the possible influence of spontaneous breathing protocol (with moderate hypercapnic conditions), LMA insertion and/or solitary use of volatile agents on these observations.

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