

## Propofol Anesthesia for Children Undergoing Magnetic Resonance Imaging: a Comparison with Isoflurane, Nitrous Oxide, and a Laryngeal Mask Airway

### BACKGROUND:

- Both propofol infusions with oxygen delivered through nasal cannula and isoflurane/N<sub>2</sub>O (nitrous oxide) delivered via a laryngeal mask airway (LMA) are used to provide anesthesia for children undergoing magnetic resonance imaging scans.

### OBJECTIVE

- The study's objective was to compare the incidence of perianesthetic airway events in children undergoing MRI scanning with propofol infusion plus oxygen via nasal cannula and isoflurane with 70% N<sub>2</sub>O in oxygen delivered via laryngeal mask airway.

### METHODS

- **Design:** Single site, single blinded, randomized parallel trial.
- **Inclusion criteria:** ASA physical status I or II, fasting and unpremedicated, and scheduled for elective MRI under anesthesia, approximately 1 hour in duration.
- **Exclusion criteria:** Less than 1 year old or less than or equal to 10 kg, greater than 10 years old or greater than 50 kg, a BMI of <5 or > 95%, requiring tracheal intubation or tracheal tube in situ, recent exacerbation of asthma or pneumonia within the past 2 weeks, anticipated or known difficult airway, sleep apnea, more than 2 psychotropic or anticonvulsant medications, congenital (unrepaired) heart disease, GERD, ADHD with treatment, allergy or contraindication to propofol or isoflurane, and the anticipated scan time greater than 1.5 hours. In addition, patients who had a recent URTI upper respiratory tract infection or cognitive impairment were also blocked from randomization.
- **Primary outcome measure:** Frequency of adverse airway events.
- **Secondary outcome measures:** The secondary outcomes were to compare the cardiorespiratory responses and recovery profiles between the 2 regimens, as well as the effects of a recent history of a URTI and CI on the frequency of adverse events.
- 150 patients (75 per group) received either
  - Propofol 300 mcg/kg/min with oxygen via nasocannula
  - OR
  - Isoflurane 1.5%/70%N<sub>2</sub>O/30%O<sub>2</sub> via laryngeal mask airway
- A sample size of 72 children in each group resulted in an 80% power and an alpha of 0.05 for the primary outcome measure. To account for study failures and dropouts, 75 children were enrolled in each group.
- Data handling method was intent-to-treat

### RESULTS

- All patients completed the study (75 in each group)
- There were no dropouts

**Primary outcome measure:** The frequency of all adverse airway events during emergence and recovery after propofol (12%) was significantly less than that after isoflurane/N<sub>2</sub>O/LMA (49%). Relative Risk=0.31 (95% CI 0.17 to 0.56) (P= 0.0001).

### **Secondary outcome measures:**

- SBP: Mean systolic blood pressure during the MRI decreased (P=0.034). Seventeen children experienced a decrease in arterial blood pressure >25% below baseline: 8 who were anesthetized with propofol and 9 who were anesthetized with isoflurane/N<sub>2</sub>O. Only 1 child

who received isoflurane/N<sub>2</sub>O required interventions, which included a fluid bolus and a decrease in the concentration of isoflurane by 0.25%.

- RR: The propofol RR was statistically significantly less than isoflurane/N<sub>2</sub>O (P=0.019). Two children from the isoflurane had transient apnea, but it spontaneously resolved itself. No patient was diagnosed with hypercapnia or hypoventilation.
- HR: HR in the children anesthetized with propofol was not statistically significantly less than the overall HR levels in those anesthetized with isoflurane/N<sub>2</sub>O. (P=0.22). Isoflurane had the lowest recorded HR at 56, while propofol had a low of 62 bpm.
- ETCO<sub>2</sub>: The mean EtCO<sub>2</sub> in the children anesthetized with propofol was statistically significantly less than the EtCO<sub>2</sub> in those anesthetized with isoflurane/N<sub>2</sub>O.
- N/V: The frequency of nausea and/or vomiting after propofol, 3%, was significantly less than that after isoflurane/N<sub>2</sub>O, 17%, (P = 0.0049). Two children who received propofol required ondansetron compared with 12 who received isoflurane/N<sub>2</sub>O/LMA.

**Author's conclusion:** Adverse events, most notably airway events, after propofol anesthesia with nasal cannula were less frequent than after isoflurane/N<sub>2</sub>O/LMA, although hemodynamic responses and recovery characteristics were similar. These data favor the use of a propofol infusion with supplemental oxygen by nasal cannula for healthy children without active URTIs undergoing anesthesia for MRI scans and other nonpainful procedures approximately 1 hour in duration, particularly in remote locations.

#### STRENGTHS

- No conflicts of interest
- No dropouts
- Inclusion and exclusion criteria allowed for extrapolation to the population of interest

#### LIMITATIONS

- Single blinded
- Alternative therapy dosed much higher than normal range whereas isoflurane was dosed normally
- Different masks between the regimens caused more adverse effects in one regimen
- No data provided to account for adherence
- Higher doses of propofol caused more sedation and lower values for secondary outcomes
- Limited data for isoflurane dosage in children
- Use of 1 anesthesiologist, and 1 observer may limit external validity of the study

#### CONCLUSION

- Although the study showed the isoflurane therapy was comparable to the propofol therapy, the isoflurane treatment may not be comparable in actual practice.
  - Dosing for isoflurane in children is still in clinical trials
  - Using nitrous oxide with isoflurane in children is questionable
  - Propofol is likely to be the better choice due to pricing, more sedation, and less airway events

#### Future research

- Further research is needed in this field. Although propofol has FDA approved dosages in pediatric patients, isoflurane does not. Clinical trials are ongoing to find how these patients should be dosed, how frequently, and in comparison to MAC to assure safety and efficacy are still present.

**Reference:** Heard C, Harutinians M, Houck J, Joshi P, Johnson K, Lerman J. Propofol anesthesia for children undergoing magnetic resonance imaging: a comparison with isoflurane, nitrous oxide, and a laryngeal mask airway. *Anesth Analg.* 2015 Jan ;120(1):157-64.

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