◇ This Month in

ANESTHESIOLOGY

■ Predicting Propofol Induction Rates. Kazama *et al.* (page 299)

Using a previously developed pharmacokinetic model, Kazama *et al.* explored the relationship between various patient characteristics and the amount of propofol required for the induction of anesthesia, when given as a near-bolus (rapid infusion). They also compared their findings with those noted in an earlier study based on much slower infusion rates. Study authors calculated lean body mass (LBM) for each of the 82 patients (ages 10–85 yr) recruited for the study. In addition to routine perioperative monitoring, venous blood was drawn to measure hemoglobin concentration. Cardiac output, central blood volume (CBV), and hepatic blood flow (HBF) were measured with indocyanine green pulse spectrophotometry.

Following baseline measurements, patients were given oxygen via mask for 5 min, followed by diluted propofol infusion (0.5 mg/ml) administered at a speed of 150 mg · kg^{-1} · h^{-1} as a function of their LBM. Amount of propofol required to reach loss of consciousness was determined for each patient. Immediately after loss of consciousness, administration of undiluted propofol was begun at 4 mg · kg^{-1} · h^{-1}. Intubation was facilitated with fentanyl and vecuronium, and any occurrences of hypotension were treated with ephedrine.

Stepwise multiple linear regression models were used to investigate the association between patient characteristics and induction dose. These were compared with previously reported parameters at a low infusion rate (40 mg · kg^{-1} · h^{-1}) and with predicted induction doses with two previously reported pharmacokinetic models. Age, LMB, and CBV were predictive of induction dose at a high rate (150 mg · kg^{-1} · h^{-1}). A pharmacokinetic model previously reported by Schuttler, incorporating patient characteristics, provided the same accurate induction dose as predetermined physiologic characteristics at a low administration rate. Neither this model nor another reported by Schnider, however, could predict accurate induction doses at a high rate of propofol infusion.

■ Propofol Preservative May Play Role in Smokers' Airway Resistance During Intubation. Rieschke *et al.* (page 323)

Sulfite sensitivity, in the form of bronchospasm, occurs in patients with reactive airways. Rieschke *et al.* compared the effects of EDTA-containing propofol (ECP) to sulfite-containing propofol (SCP) on total respiratory system resistance (Rrs) in a group of 40 patients with histories of prolonged smoking (a pack a day or more, for at least 5 yr).

Half the patients were assigned to receive 1% injectable emulsion of ECP, and the other half SCP. Propofol formulations were dispensed from opaque syringes provided by the local hospital research pharmacy. General anesthesia was induced and maintained using the investigated propofol formulation and fentanyl followed by vecuronium for muscle relaxation. All patients were intubated with a 7.5-mm endotracheal tube, and mechanical ventilation was begun immediately afterwards. An anesthesiologist blinded to propofol formulation assignments noted any perioperative or postintubation signs of bronchospasm.

Respiratory measurements (including Rrs, peak inspiratory pressure, and dynamic compliance) were obtained by inserting a flow/pressure adapter probe between the endotracheal tube outlet and ventilator Y tubing. The investigators found higher postintubation Rrs in smokers who had been assigned to receive SCP. The effect occurred immediately after intubation and lasted for approximately 10 min. Results from this study suggest that susceptibility to sulfite preservative in propofol is increased in patients with a prolonged history of smoking. The clinical significance of this effect, however, will require further investigation.

■ Practice Makes Perfect: Using Mannequins to Train for Cricothyroidotomy. Wong *et al.* (page 349)

Wong *et al.* enrolled 102 anesthesiologists, 51% of whom had previous experience performing cricothyroidotomy, in their study to determine the minimum training required to successfully perform the procedure. Participants in the study were first shown a demonstration video on the Seldinger technique. They each then performed 10 consecutive cricothyroidotomies on mannequins with anatomically correct airways. Each attempt was timed from the start of skin palpation to tracheal insufflation. The procedure was considered successful if the cricothyroidotomy airway was correctly placed in the trachea in 40 s or less (a time frame chosen by the authors based on a review of the literature).

Cricothyroidotomy times were consistently longer for the >45 yr age group than the <44 yr age group. By the

fifth attempt, 96% of all participants were able to perform the procedure in less than 40 s. The authors established in this series a minimum number of five attempts to successfully attain the necessary skills for the procedure. The study's limitations include use of a mannequin instead of human subjects or cadavers, as well as lack of real-time emergency situation and complications (such as bleeding and edema). It is also not clear from this study what the appropriate retraining interval might be for optimal cricothyroidotomy skill retention. Nevertheless, the results suggest that individuals are unlikely to be successful in performing emergency cricothyroidotomies unless they have had some formal training in the procedure.

■ Do Elevated Tissue Glutamate Concentrations Shorten Duration of Local Anesthetics? Cairns *et al.* (page 521)

To determine whether elevated tissue glutamate concentrations affect the duration of lidocaine-induced blockade of masseter muscle afferent fibers, Cairns *et al.* conducted a series of experiments in rats. Following initial surgeries to enable in vivo recording of trigeminal primary afferent fiber activity, afferent fiber mechanical thresholds were determined. Masseter muscle was then injected with one of the following solutions: hypertonic glutamate; glutamate combined with kynurenate, a broad-spectrum excitatory amino acid receptor antagonist (EAA); isotonic saline; or dextrose. Mechanical stimuli were again applied to the muscle at 1-min intervals for 10 min, after which lidocaine was injected and mechanical stimuli were resumed.

In a second set of experiments, the authors used a novel magnetic resonance imaging methodology to investigate the effect of the injections on masseter muscle tissue extracellular water content. A final set of experiments involved determination of masseter muscle blood flow using radiolabeled microsphere blood flow measurements. The team found that injection of either glutamate or dextrose significantly shortened the duration of lidocaine blocks when compared with the effects of isotonic saline injection. The duration of the block was shorter after glutamate than after dextrose. Injection of glutamate also significantly decreased the mechanical threshold of muscle afferent fibers. Glutamate alone, glutamate with kynurenate, and dextrose injections all produced edema lasting longer than 60 min. Peak extracellular water decreased more rapidly when kynurenate was coinjected with glutamate. Both glutamate and dextrose increased muscle blood flow for 30 min postinjection, while kynurenate attenuated the glutamate-induced increases in blood flow.

Although glutamate does not necessarily produce tissue inflammation, it does increase edema and blood flow and sensitizes muscle afferent fibers, all of which are characteristic of tissue inflammation. These changes are mediated through the activation of peripheral EAA receptors, and the authors' findings suggest that activation of peripheral EAA receptors can shorten the duration of local anesthesia with lidocaine.

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