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RESEARCH PAPER

Propofol *versus* thiopental: effects on peri-induction intraocular pressures in normal dogs

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Abstract

Objective To determine the effects of propofol or thiopental induction on intraocular pressures (IOP) in normal dogs.

Study design Prospective randomized experimental study.

Animals Twenty-two random-source dogs weighing 19.5 ± 5.3 kg.

Methods Dogs were randomly assigned to receive propofol 8 mg kg^{-1} IV (group P) or thiopental 18 mg kg^{-1} IV (group T) until loss of jaw tone. Direct arterial blood pressure, arterial blood gasses, and IOP were measured at baseline, after preoxygenation but before induction, before endotracheal intubation, and after intubation.

Results There were no significant differences between groups with regard to weight, body condition score, breed group, or baseline or before-induction IOP, arterial blood pressure, or blood gases. The baseline IOP was 12.9 mmHg. Before endotracheal intubation, IOP was significantly higher compared to baseline and before induction in dogs receiving propofol. After intubation with propofol, IOP was significantly higher compared to thiopental and was significantly higher compared to before induction. After intubation, IOP was significantly lower compared to before intubation in dogs receiving thiopental. Propofol increased IOP before intubation by 26% over the before-induction score and thiopental increased IOP by 6% at the same interval. The IOP in group P remained 24% over the before induction score whereas thiopental ultimately decreased IOP 9% below baseline after intubation. There was no significant relationship between any cardiovascular or blood gas parameter and IOP at any time. There was no significant relationship between the changes in any cardiovascular or blood gas parameter and the changes in IOP between time points.

Conclusions and clinical relevance Propofol caused a significant increase in IOP compared to baseline and thiopental. Thiopental caused an insignificant increase in IOP which decreased after intubation. Propofol should be avoided when possible in induction of anesthesia in animals where a moderate increase in IOP could be harmful.

Keywords blood gas, blood pressure, hyperoxemia, hyperoxia, intubation, IOP.

Introduction

Propofol and thiopental are both used for anesthetic induction in dogs (Quandt et al. 1998). Propofol is a nonbarbiturate, nonsteroid, short-acting, general anesthetic that is associated with a rapid smooth induction, a rapid recovery, and may cause

hypotension and apnea. Propofol is often chosen for patients with hepatopathy and for those where a rapid recovery is desirable. Propofol may increase postoperative infection rates, has a short shelf life, and is relatively expensive (Stoelting 1999).

Thiopental is an ultra-short-acting thiobarbiturate used to induce general anesthesia. Its use is associated with a rapid induction and recovery that are most often smooth but can be associated with significant hyperesthesia. In healthy dogs it may increase heart rate and transiently decrease myocardial contractility but there may be occasional ventricular arrhythmias. It is known to decrease intracranial pressure and is the drug of choice in disease states such as intracranial disease. Thiopental can cause sloughing if administered extravascularly and is relatively inexpensive (Stoelting 1999).

Abrupt increases in intraocular pressure (IOP) associated with anesthesia can cause dramatic effects in patients with near-perforating corneal lesions or glaucoma. Prolapse of ocular contents can complicate the surgical procedure and may worsen the prognosis for recovery (Chmielewski et al. 1997). Minimal increases in IOP can lower axoplasmic flow within the optic nerve in animals with glaucoma, predisposing it to further injury (Williams et al. 1983). It has been documented in humans that both propofol and thiopental decrease IOP (Mirakhur & Shepherd 1985; Mirakhur et al. 1987). However, previous work in dogs suggests that propofol may cause an increase in IOP after induction (Hofmeister et al. 2006a). Thiopental has not been investigated for its effects on IOP in dogs. Therefore, the purpose of this study was to compare the effects of induction with thiopental or propofol on IOP in normal dogs.

Materials and methods

Random-source (obtained from municipal pounds) dogs being used for a junior surgical exercises laboratory were used in the study. The protocol was approved by the University Animal Care and Use Committee and husbandry was provided according to established institutional guidelines. Age was not recorded, as a definitive age could not be established for most patients. Body condition score (BCS) was assigned using a previously published system (Lund et al. 1999).

A complete ophthalmic examination, consisting of Schirmer tear test (Schering-Plough, Animal Health Corp. Union, Kenilworth, NJ, USA), fluorescein staining (Fluor-I-Strip-A.T., Bausch & Lomb, Pharmaceuticals, Inc., Tampa, FL, USA), applanation tonometry, biomicroscopy, and indirect ophthalmoscopy with pupillary dilatation was performed by an experienced individual blinded to the treatment groups. Dogs deemed unhealthy on physical examination or with an abnormal packed cell volume (reference range: 35–57%), total protein (reference range: 5.2–7.3 g dL^{-1}), arterial blood gas (PaO_2 <80 mmHg or $PaCO_2$ >45 mmHg), or ophthalmic examination were prospectively excluded from the study. A prospective power analysis based on previous publications of similar methodology (Hofmeister et al. 2006a,b) was used to determine the number of dogs required to document a 4 mmHg change in IOP with an α of 0.05 and β of 0.2. The results of this analysis confirmed that no more than 11 dogs were needed for each group.

Twenty-two dogs were randomly assigned to one of two treatment groups: propofol 8 mg kg^{-1} IV (Abbott Laboratories, North Chicago, IL, USA) until loss of jaw tone (group P) or thiopental 18 mg kg^{-1} IV (Hospira Inc., Lake Forest, IL, USA) until loss of jaw tone (group T). All dogs were medicated between 1900 and 2200 hours to eliminate the effects of diurnal changes on IOP (Ofri et al. 2000). Any adverse reactions were noted.

A 20-SWG 2.5 cm intravenous catheter was placed in a cephalic vein (SureFlo; Terumo Medical Corporation, Elkton, MD, USA). An indwelling 22-SWG 2.5 cm intra-arterial catheter was placed in the dorsal pedal or coccygeal artery after subcutaneous infiltration of 0.2 mL of 2% lidocaine (Abbott Laboratories). Continuous direct arterial blood pressure monitoring was instituted using a zero-calibrated pressure transducer (TruWave; Edwards Lifesciences Inc., Irvine, CA, USA) connected to a multiparameter physiologic monitor (Advisor V9204; Surgivet, Waukesha, WI, USA). Heart rate was obtained from the arterial pressure tracing. Animals were allowed to rest alone for at least 20 minutes in a cage after instrumentation and before handling for induction.

All dogs were preoxygenated for at least 5 minutes before the induction of anesthesia. Anesthesia was induced with the selected drug at 10% (for propofol) or 20% (for thiopental) of the total volume administered every 6 seconds until loss of jaw tone. Jaw tone was assessed by a single, experienced, blinded individual. Atracurium 0.1 mg kg^{-1} IV (Baxter Healthcare Corporation, Deerfield, IL, USA)

