Veterinary
Anaesthesia and Analgesia
Formerly the Journal of Veterinary Anaesthesia

Veterinary Anaesthesia and Analgesia, 2010, **37,** 269–272 doi:10.1111/j.1467-2995.2010.00531.x

RESEARCH PAPER

Effects of ketamine-diazepam and ketamine-acepromazine combinations on intraocular pressure in rabbits

Masoud Selk Ghaffari & Amir P. Moghaddassi
Department of Clinical Studies, School of Veterinary Medicine, Islamic Azad University, Karaj Branch, Karaj, Iran

Correspondence: Masoud Selk Ghaffari, Department of Clinical Studies, School of Veterinary Medicine, Islamic Azad University, Karaj Branch, Karaj, Iran. E-mail: selkghaffari@gmail.com

Abstract

Objective To determine the effects of ketamine-diazepam and ketamine-acepromazine combinations on intraocular pressure (IOP) in rabbits.

Study design Randomized clinical trial.

Animals Sixteen adult New Zealand white rabbits approximately one year old, weighing 2.3 ± 0.2 kg were used in this study.

Methods The animals were randomly divided into two groups of eight each (KA and KD). The pre-treatment IOPs were recorded in both groups (T0). All rabbits in group KA received intramuscular ketamine-acepromazine (ketamine 30 mg kg^{-1} + acepromazine 0.5 mg kg^{-1}). Ketamine-diazepam (ketamine 30 mg kg^{-1} + diazepam 1 mg kg^{-1}) was administered intramuscularly in members of group KD. The IOP values were measured at 5 (T_5), 15 (T_{15}), and 20 (T_{20}) minutes after drug administration in both treatment groups.

Results Significant increases in IOP values were observed in both treatment groups at T_5, T_{15}, and T_{20} in comparison to the baseline values. In group KA the mean ± SD IOP at T_5, T_{15}, and T_{20} were 37 ± 13 ($p < 0.001$), 35 ± 4 ($p < 0.001$) and 34 ± 4 mmHg ($p < 0.001$). The post-treatment mean ± sd values in group KD were 23 ± 8 ($p = 0.002$), 23 ± 5 ($p < 0.001$) and 23 ± 6 mmHg ($p = 0.001$) at 5, 15, and 20 minutes respectively.

Conclusion and clinical relevance Both ketamine-diazepam and ketamine-acepromazine combinations increased IOP after intramuscular administration in rabbits.

Keywords ketamine, diazepam, acepromazine, intraocular pressure, rabbit.

Introduction

The use of certain drugs, such as general anaesthetics, may cause an alteration in intraocular pressure (IOP). Ketamine is a dissociative agent that can be used as a sole agent for induction of anaesthesia or in combination with other agents for induction and maintenance of anaesthesia in rabbits (Harcourt-Brown 2002). Ketamine has been shown to increase in IOP in cats, dogs and rabbits when used as a sole agent for induction of anaesthesia (Bar-Ilan & Pessah 1986; Hofmeister et al. 2006). Combinations of ketamine with other agents for induction of anaesthesia have not been investigated for their effects on IOP in rabbits. The purpose of this study was to compare the effects of induction of anaesthesia with ketamine-diazepam or ketamine-acepromazine on intraocular pressures in rabbits.

Materials and methods

Sixteen adult New Zealand white rabbits approximately 1 year old, weighing 2.3 ± 0.2 kg (range 2–2.5 kg) were used in this study. The experiments

were carried out under supervision of Iran SPCA based on Iranian Ethic codes (framework) for studies on laboratory animals. Prior to entering the study, all rabbits were determined to be free of disease by means of physical and ocular examination, including biomicroscopy and indirect ophthalmoscopy. Intraocular pressure (IOP) was measured using applanation tonometry with the Tono-Pen Vet™ tonometer (Reichert Inc. Depew, NY, USA) after topical instillation of one drop of proparacaine 0.5 % ophthalmic solution. The tonometer was factory-calibrated prior to initiation of the study and was hand-calibrated prior to data collection. Intraocular pressure was measured in both eyes of all rabbits. Only IOP readings with a 5% error were recorded. Animals were randomly allocated to one of two groups of eight each (KA and KD). The mean weights for rabbits in group KA and KD were 2.3 ± 0.2 and 2.2 ± 0.2 kg, respectively. There was no significant difference in the mean weight of the two treatment groups (independent samples *t*-test $p = 0.31$).

The pre-treatment IOP values were recorded in both groups (T0). All rabbits in group KA received intramuscular (IM) ketamine-acepromazine (ketamine 30 mg kg^{-1} + acepromazine 0.5 mg kg^{-1}) and those in group KD received IM ketamine-diazepam (ketamine 30 mg kg^{-1} + diazepam 1 mg kg^{-1}). Oxygen was administered by face mask at 3–4 L $minute^{-1}$ from the point of onset of sedation. The IOP values were measured at 5 (T_5), 15 (T_{15}), and 20 (T_{20}) minutes after drug administration in both groups. Recovery from anaesthesia was uneventful in both groups.

Statistical analysis was performed using the software package SPSS 15.0 for windows. Data are reported as mean ± SD and each eye in an animal was treated as a replicate (n = number of animals in each group). An independent samples *t*-test was used to determined pre-treatment differences between treatments. Post-treatment differences within each treatment group were evaluated using a paired samples *t*-test. A *p*-value of <0.05 was considered statistically significant.

Results

The mean values of IOP in both treatment groups are shown in Fig. 1. All data are expressed as mmHg. The baseline IOPs for rabbits in group KA and KD were 13 ± 2 and 16 ± 4 mmHg, respectively, and these were not statistically significantly different ($p = 0.093$). A significant increase in IOP was observed in both treatment groups at T_5, T_{15}, and T_{20} in comparison to the baseline values. In group KA the mean ± SD IOP at T_5, T_{15}, and T_{20} were 37 ± 13 ($p < 0.001$), 35 ± 4 ($p < 0.001$) and 35 ± 4 mmHg ($p < 0.001$) versus 23 ± 8 ($p = 0.002$), 23 ± 5 ($p < 0.001$) and 23 ± 6 mmHg ($p = 0.001$), respectively, in KD. The intraocular pressure following anaesthesia was consistently higher in KA than in KD. It was 36 ± 16 mm Hg for KA vs 23 ± 0 mm Hg for KD ($p = 0.004$).

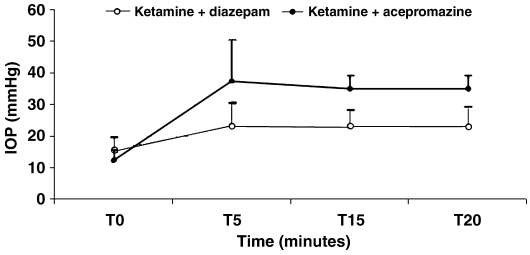

Figure 1 Mean ± sd IOP values before (0) and at 5, 15, and 20 minutes after intramuscular administration of ketamine-diazepam and ketamine-acepromazine combinations.

Discussion

The baseline values of IOP (mean ± SD), established during the pretreatment period for all rabbits were within the reference interval reported for intraocular pressures in normal rabbits (15–23 mmHg) (Harcourt-Brown 2002).

In the present study, peak values of IOP during both ketamine-acepromazine(Group KA) and ketamine-diazepam (Group KD) anaesthesia were observed 5 minutes after administration of the drugs. We found that ketamine-diazepam produced the greatest increase in IOP of 7 mmHg or about 46 % compared to baseline values at 5 minutes post-treatment. There was an even greater increase in IOP values in the KA group of 25 mmHg, or about 198 % compared with baseline at 5 minutes after injection. Thus both KA and KD significantly increased intraocular pressure in clinically normal rabbits.

During the last few years several authors have evaluated the effects of anaesthetic drugs on IOP values in domestic species (Bar-Ilan & Pessah 1986; Artru 1991; Stephan et al. 2003; Hofmeister et al. 2006). Anaesthetics and tranquilizers usually cause IOP to decrease, with the exception of ketamine,

