Nig. J. Anim. Prod. 2017, 44(3):56 - 61
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Nigerian Journal of Animal Production

Anaesthetic and electrocardiograpic profiles in prolonged inhalation anaesthesia in Nigerian indigenous dogs

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Abstract

Electrocardiograph during anaesthesia provides information on cardiac electrical activity which may affect cardiac function. This study was carried out to evaluate the effect of prolonged volatile anaesthesia using halothane and isoflurane on the electrographic and anaesthetic profiles in Nigerian dogs. They were prepared for anaesthesia and connected to a 5-lead patient monitor (GMI®). Venous access was secured and lactated ringer's solution administered at a maintenance flow rate of 5mlkghr^{-1}.Tracheae were intubated following induction with thiopentone and anaesthesia maintained with 0.5% halothane (group A) and 2.0% isoflurane (group B) in 2liters/minute oxygen respectively with the animals breathing spontaneously. The readings were taken, prior to induction of anaesthesia (control) and every 30 minutes thereafter for six hours during anaesthesia. Data were presented as mean and standard deviation.Differences were considered significant at $p \leq 0.05$. The values of S-T segment (sec) and P-waves (sec) were both low, 0.068 ± 0.013 and 0.064 ± 0.017 and 0.020 ± 0.001 and 0.020 ± 0.001 respectively for isoflurane and halothane. However the values of P-waves (mV) and P-R intervals (sec) were significantly higher in group A, (0.193 ±0.136 and 0.046 ±0.01) compared to group B, 0.193 ± 0.98 and 0.039 ± 0.01 respectively. Isoflurane produced prolongation of Q-T intervals (sec) and QRS complex (sec), 0.123 ± 0.018 and 0.023 ± 0.008 compared to halothane, 0.121 ± 0.023 and 0.021 ± 0.005. The ECG parameters measured revealed no adverse effect of halothane or isoflurane on the heart in Nigerian local dogs.There was prolonged QT interval in group B. In conclusion, halothane appears a better drug of choice in prolonged anaesthesia in Nigerian dogs.

Keywords: Anaesthetic, electrographic profiles, Nigerian indigenous dogs

Introduction

Electrocardiogram (ECG) is a test that measures the electrical activity of the heart. The heart is a muscular organ that beats in rhythm to pump the blood through the body (Davey, 2011). The signals that make the heart's muscle fibres contract come from the sino-atrial node, which is the natural pacemaker of the heart (Larsson, 2010). The ECGs from normal, healthy hearts have a characteristic shape. Any irregularity in the heart rhythm or damage to the heart muscle can change the electrical activity of the heart so that the shape of the ECG is changed. Monitoring the Electrocardiograph during anaesthesia provides information on cardiac

electrical activity which may affect cardiac function. Nigerian local dogs are indigenous to Nigeria; they are mainly used for hunting in the wild by the local people and are also used as guard dogs and pets in the urban areas (Olayemi *et al.,* 2009).A number of scholars have worked on this breed of animal, reporting variations in clinical parameters between this breed and other breeds in the temperate (Awah and Nottidge, 1998, Olayemi *et al.,* 2009). Some have reported variations in the anatomical make-up of this breed and some other foreign breed (Nnaji *et al.,* 2010; Igado, 2011).This study evaluated the effects of halothane and isoflurane anaesthesia on anaesthetic indices and the ECG in Nigerian local dogs

Materials and methods

The study was conducted at the Veterinary Teaching Hospital, College of Veterinary Medicine, Federal University of agriculture, Abeokuta, Nigeria. Clinical trials were carried out on twenty healthy adult dogs, averaging 11.05 ± 1.88kg. They were grouped into twoby simple randomization. Group A was treated with halothane and group B with isoflurane. Five self-adhesive electrodes were attached to the median sides of the skin of the fore limbs at the elbows, the hind limbs at the stifles and the thorax at the left sixth inter-coaster space near the sternum. These areas were clipped to prevent air trapping between the skin and electrodes, the electrodes were placed on the clipped areas and the 5 leads of the multi-parameter patient monitor (GMI®) were connected to the patient. Records of the electrocardiograph parameters, the heart and pulse rates were taken with speed 50mm/sec.Venous access was secured at the left cephalic vein and lactated ringers solution was administered at a maintenance flow rate of 5mlkghr^{-1} (AAHA/AAFP; Davis *et al*., 2013). Premedication was achieved with intravenous injection of 2% Atropine Sulphate (Martindale Pharmaceutical, UK) at 0.04mgkg^{-1}, thirty minutes afterwards anaesthesia was induced with 2.5% thiopental sodium (May & Baker Ltd) at 15mgkg^{-1}intravenously.Tracheae were intubated with the aid of laryngoscope using appropriate sized endotracheal tubes (5.5-8.5ID) and anaesthesia was maintained with 0.5% halothane(Pharco Pharmaceutical, Egypt) (group A) and 2.0% isoflurane (Nicholas Pharmaceuticals India Ltd, India) (group B) in 2liters/minute oxygen and closed circle breathing system. The animals were placed in right lateral recumbency, breathing spontaneously. The readings were taken, one, prior to induction of anaesthesia (control) and every 30 minutes thereafter for six hours during anaesthesia on the patient monitor.

Anaesthetic indices taken in the course of this study included the time to intubation, time to extubation, time to sternal and time to stand. Monitoring was undertaken throughout anaesthetic period. Data obtained were analyzed using one-way ANOVA for repeated measures. Differences were considered significant at $p \leq 0.05$.

Result and discussion

The quality of anaesthesia obtained in this study for both drugs, halothane and isoflurane were good. Higher dose of isoflurane was required to maintain surgical plane of anaesthesia compare to halothane in this breed 0.5% and 2.5% respectively. The dose of halothane used in this study agrees with the works of Allen *et al.,* 1998 and Muir *et al*., 2007 but the dose of isoflurane used to maintain anaesthesia in this study disagrees with the work of these scholars.

Recovery from anaesthesia was

significantly (p>0.05) shorter in the halothane group, 23.5 ± 15.8 minutes compare to the isoflurane group, 34.2 ± 27.8. This is believed to be due to the dose of isoflurane group used for maintenance of anaesthesia. Recovery was smooth and uneventful in both groups.

The side effects observed in this study were breath holding, shivering, oedematous head and tongue in a dog in the isoflurane group and hypothermia in one of the animals in the halothane group. There were no incidences of difficult intubation, kinked tube or obstruction due to excessive secretion, morbidity or mortality recorded in this study.

The study showed that all the ECG parameters measured were within normal range for the two drugs considered except for the values of S-T segment (sec) and P-waves (Duration)(sec) that were both low, 0.068 ± 0.013 sec and 0.064 ± 0.017 sec and 0.020 ± 0.001 sec and 0.020 ± 0.001 sec respectively for isoflurane and halothane respectively as reported by Goodwin *et al*., 1996.Although the value of P-R intervals (sec) was significantly higher in the halothane group, 0.046 ±0.01 sec compared to isoflurane group, 0.039 ± 0.01 sec. both values are low, this could be due to transient myocardial ischaemia as seen in lowered value of the ST segment. (the lower the value compare to the baseline value, the higher the value of the PR interval).

However the value of P-waves (mV) was significantly higher in halothane group, 0.193 ±0.136 mV and 0.046 ±0.01 sec compared to isoflurane group,0.193 ± 0.98 mV and 0.039 ± 0.01 sec respectively while the values of Q-T intervals (sec), 0.123 ± 0.018 sec and QRS complex (sec), 0.023 ± 0.008 sec were significantly prolonged in group B,compared to group A, 0.121 ± 0.023 sec and 0.021 ± 0.005 sec respectively,(Mitchalodis *et al.,*1998; Niyazi *et al*.2001; Brooker *et al.,* 2003).

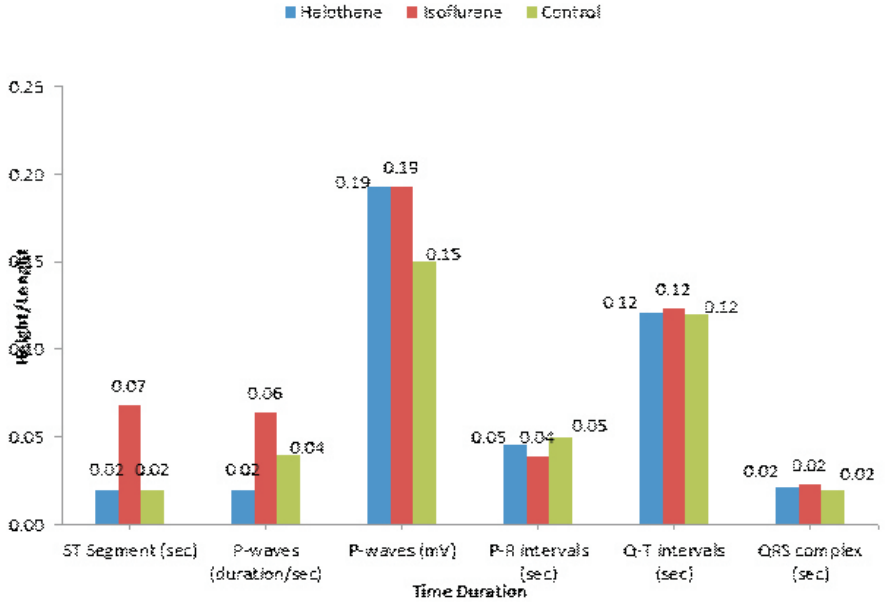

Fig. 1: Effects of Halothane and Isoflurane Anaesthesia on the Electrocardiograph of the adult Nigerian dog

There was marked increase in the heart rates in both drugs studied over the six hours period of study, 147 ± 23.82 beats/minute compare to the baseline value of 91 ± 30.25 beats/minute in the halothane group and in isoflurane group ,145 ± 23.06 beats/minute compare to baseline value, of 107± 16.62 beats/minute.

Although there was later a decline to117.5 beats/minute this was still significantly different from the control value. However, there was no significant difference between groups A and B. The findings agrees with the report of Hikasa*et a*l.,1998a and Hikasa*et al*., 2010 in an experiment carried out on goats, they reported that using 1-1.5 MAC of halothane, isoflurane and sevoflurane in goat gave an increase in heart rate in each group from baseline and the significant increase observed during anaesthesia is due to the influence of atropine sulphate premedication.The heart rates in both groups returned to normal values towards the last two hours of the experiment 120.23 ± 23.82 beats/minutesin the halothane group and isoflurane group, 120.75 ± 23.06 beats/ minutes compared. This is in agreement with the findings of Williams; Picker *et al*., 2001.

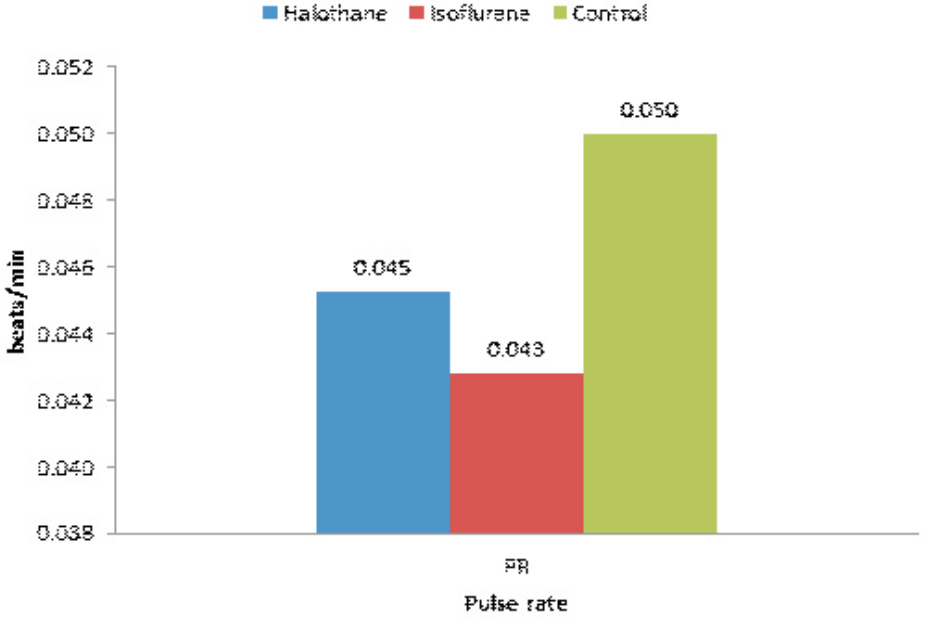

Fig. 2: Effects of Halothane and Isoflurane Anaesthesia on Pulse rate of the adult Nigerian dog

Conclusion

The study on the eletrocardiograph revealed no adverse effect of halothane or isoflurane on the heart in Nigerian indigenous dogs different from what is seen in literature in other breeds of dogs. However, the atrial depolarization, start of atrial depolarization, ventricular depolarization and time taken by ventricular depolarization and repolarization were higher in isoflurane treated group than in halothane treated group. Judging by the responses however, halothane seemed to be a better inhalation

anaesthetic in a prolonged anaesthetic protocol in this breed of dogs (especially in patient with long QT syndrome). It is recommended that more work be done on this breed to develop a saver inhalation anaesthetic protocol considering that the dose of isoflurane used in this study to maintain anaesthesia is relatively high.

Acknowledgement
The authors thanked the anaesthetic nurses and technicians and theater staff of the Federal Medical Center, Abeokuta, Ogun state. Nigeria and the theater staff of the Teaching Hospital of the College of Veterinary Medicine, College of Veterinary Medicine for the technical support.

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Received: 26th February, 2017
Accepted: 21st June, 2017