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Clinical Observations of Local Dogs Under Anaesthetic Effect of Ketamine Hydrochloride

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Abstract: The effect of Ketamine hydrochloride which is a drug mainly used in birds and cats but was tried on Nigerian dogs. Nine local dogs were administered low (11 mg kg^{-1}) and high (33 mg kg^{-1}) doses of Ketamine hydrochloride parenterally (intramuscularly and subcutaneously). Anaesthetic induction period varied from 2 min for Subcutaneous (SQ) and 1 min for intramuscular routes. Duration of anaesthesia ranged from 32.5 to 265 min for low and high dosages respectively. Clinically, ptyalism was observed in all dogs but was minimal in those that pre-medication (atropine sulphate) was given. It was also observed that forelimbs of animals in group B were spastic. Pharyngeal, pedal, spinal and blink reflexes were lost. Defecation was observed immediately after administration of the drug and there was emesis during recovery. Slight decrease in average rectal temperature of 0.2°C was observed. The dogs tolerated the drug (11 and 33 mg kg^{-1}) to a certain extent and no significant complication was associated with the local dogs; therefore, ketamine hydrochloride could be employed for restraint of uncooperative dogs for minor surgical procedures not requiring muscle relaxation.

Key words: Local dogs, ketamine hydrochloride, parenteral routes, duration of anaesthesia

INTRODUCTION

The routes of administration for general anaesthetics have been by either inhalation (gaseous and volatile liquid vapour) or parenterally (intravenous) (Hall, 1978). Other anaesthetics such as Ketamine Hydrochloride (KHCL) and Telitamine hydrochloride (dissociative anaesthetics) were later introduced and can be administered Intravenously (IV) or Intramuscularly (IM) as well as orally and naso-pharyngeally (Green, 1979; Anis *et al*., 1983; De Leeuw *et al*., 2004).

Ketamine hydrochloride is a short-acting general anaesthetic with hallucinogenic and pain killing qualities, it is rapid acting, non-barbiturate (dissociative) anaesthetic agent that has been employed in many procedures that do not require muscular relaxation (Lee *et al.,* 2003; Anonymous[1], 2004). Some of the indications include: short diagnostic and surgical procedures that do not require muscular relaxation, or pre-medication prior to induction of anaesthesia seen in other agents. The drug could be used for maintenance of anaesthesia in young animals (Anonymous[2], 2004).

Trials have been conducted on different species of animals with KHCL alone and in combination with either sedatives or tranquillizers in an attempt to establish the best anaesthetic response (Cranna, 1976; Flaherty *et al*., 1997).

In cats, it has been used as a sole anaesthetic for restraint or minor surgical procedures providing anaesthesia for short duration (Anonymous[3], 2004). However, procedures like ovariohysterectomy, exploratory laparatomy and Caesarean section are only feasible when the drug is administered at high dose rate (33 mg kg^{-1}). At a lower dose rate (11 mg kg^{-1}), procedures like castration, reconstruction of skin defects and restraint for venupuncture, radiography and cytocentesis have been carried out (Green, 1979; Anis *et al*., 1983). The drug can also be used for the restraint of wild cats, subhuman primates, birds, reptiles, sheep and swine for physical examinations (Anonymous[3], 1975).

This study was undertaken to clinically observe the effects of KHCL on Nigerian local breed of dogs and its possible use as an anesthetic minor and at times major surgeries.

MATERIALS AND METHODS

Experimental animals: Nine local dogs comprising of 4 males and 5 females, aged between 4-48 months were acquired for this study. Dogs were divided into two groups based on their age.

Group A: Consisted of 4 dogs (2 males and 2 females) with age range between 4-6 months. Within the group 2

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dogs (male and female) were administered with the drug at dose of 11^{-1} subcutaneously while the other two were given at dose rate of 33^{-1} IM.

Group B: This group had five dogs (2 males and 3 females) aged above 12 months. Higher dose rate of 33^{-1} was given intramuscularly and subcutaneously. Two dogs (male and female) were given atropine sulphate (0.2^{-1}) as pre-medication prior to the administration of KHCL while the remaining 3 (a male and 2 females) were administered with only KHCL.

Observations made were:

- Reaction to the administration of drug
- The induction period
- Rectal temperature change
- Reflexes like spinal, blinking and swallowing
- Duration of anaesthesia
- Muscular tonicity/relaxation
- Gastrointestinal tract
- Urogenital tract and ix. Respiration

Depth of Anaesthesia: In all groups; pinching the foot web to observe for the sign of pain was used to assess the depth of anaesthesia. Muscular relaxation was assessed by visual observation and physical manipulation of the limbs for frigidity and or relaxation.

RESULTS

Group A: During administration of the drug, all dogs struggled and wailed, ndicating sign of pain. Puppies immediately became ataxic and went on lateral recumbency. The mean induction period was 1 min for the intramuscular and 1.5 for the subcutaneous routes. The swallowing reflex was partially lost initially, but the licking of the muzzles stopped after 45 min of drug administration. The hind limbs were rigid in 50 % of the animals while the remaining 50 % had their fore limbs pedal intermittently. Their eye lids remained opened and mydriasis was apparent.

At recovery, use of the forelimbs preceded that of the hind quarters, though the animals were still ataxic. Micturation was observed in 50 % of the females while the males demonstrated intense muscle tremors. 50 % of the puppies showed frigidity while the remaining 50 % were 'shy'. Mean body temperature fell by 0.2°C. The physical mean duration of anaesthesia was 27 and 53.5 min for the intramuscular and subcutaneous routes respectively. There were no gastrointestinal upset or any respiratory changes seen.

Group B: Dogs struggled after administration of the drug, especially those animals that were administered intramuscularly. Immediately after administration of the drug, all animals in this group sat on their hind quarters, then on sternal and finally, lateral recumbency. The mean induction period was 1 min for the intramuscular route and 2 min for the subcutaneous route. Animals licked their muzzles intermittently but later stopped. Forelimbs showed involuntary movement and the eye lids were wide opened, mydriatic. There was profuse ptyalism and the saliva was stringy though minimal in those administered with atropine sulphate as pre-medication. Sixty percent of the animals in this group defecated and 20 % vomited, while micturation was observed in 80 % during recovery. Twenty percent had convulsionary contractions while 100% showed frigidity with photophobia. There was tremulous response to slight noise and moving objects. The mean rectal temperature during anaesthesia fell by 0.2°C while the mean duration of anaesthesia was 124.4 and 265 min for intramuscular and subcutaneous routes respectively. There was no significant change in the respiratory rates of the animals.

DISCUSSION

The anaesthetic effects of ketamine hydrochloride were studied in nine local dogs. Mean induction time was 1.25 and 1.5 min for groups A and B respectively; but a fast induction period of 1 mine was seen in group A when the drug was administered intramuscularly; this could be as a result of fast absorption typical of the cyclohexamines, where analgesia preceded immediately by catalepsy as reported by Soma (1974).

There was complete analgesia, tested through foot web pinching and this agrees with report of (Anon[2], 2004), that analgesia has always been an added advantage of KHCL in either man or animals.

Mean anaesthetic duration for groups A and B was found to be 27.0 and 124.4min for the lower dose rate; 53.25 and 265 min for the higher dose rate respectively. The duration was found to be longer (265 min) in the older dogs when subcutaneous route was used. The longer duration could be attributed to the age of the animals in this group, where detoxification in younger animals is faster compared to old ones; as it relates to liver activities which earlier reported by Roncada *et al.*, (2003).

Van Pelt (1977) reported an increase in rectal temperature during anaesthesia, which he attributed to increased tonicity of muscles. In this study, although muscle tonicity was observed in all dogs, there was a fall in the mean rectal temperature of 0.2°C, the drop has been a usual finding in general anaesthesia (Van Pelt, 1977).

Defaecation, vomiting and micturation were mainly seen in the older animals (group B) and this could be as a result of irritation of the various organs or the depression of the nuclear centers by the drug.

Convulsion was observed in 20 % of the dogs in group B while other group members showed tremor during recovery, this observation corroborates the reports of Nam, (1977) and Cranna, (1976), who attributed the convulsion to the increased tonicity of the muscles. However, Hall and Clarke (1991) reported that normal dosage of KHCL could cause convulsion in dogs.

Cranna (1976) and De Leeuw *et al.,* (2004) reported profuse ptyalism in dogs anaesthesized with KHCL. In this study ptyalism was observed in both groups but more salivation in older animals. Ptyalism was minimal in animals that were given atropine sulphate. It may therefore mean that, the swallowing reflex was partially lost initially and later completely. Since the swallowing reflex was lost, it made the situation such that, there was secretion of excessive saliva.

In all groups, there was mydriasis which resulted from increased intraocular pressure and this may lead to exposure keratitis and corneal abrasion due to lack of lubrication of the cornea since blinking reflex was lost, as was reported by Cranna, (1976) and Anonymous[2], (2004). Since mydriasis was observed in all groups, there is then the need to prevent complications that may arise by applying an inert eye ointment when using KHCL as an anaesthetic agent in dogs.

At recovery dogs fell on lateral recumbency each time they attempted to walk and they were very sensitive to noise and frightened at any slightest noise. Most dogs were staring with mydriatic eyes to moving objects. These observations might have occurred due to lack of coordination from the brain.

Anonymous[2], (2004) reported that the recovery period in dogs under KHCL anaesthesia is 4-6 h, in this study animals in group A physically recovered in 4 h while those in group B took 7-8 h. The discrepancy in the hours may be related to the rate of eliminating the drug, which is faster in the younger animals then older animals as reported by Roncada *et al*., (2003).

CONCLUSION

We have made some clinical observations on Nigerian dogs under anaesthesia induced by KHCL and the study showed that there was complete analgesia in the dogs while the rate of induction and duration of anaesthesia were short. However, observed side effects like ptyalism and mydriasis could be overcome by administering atropine sulphate and use of inert ointment respectively. Ketamine hydrochloride at a lower dose rate could be used for minor surgical procedures while laparatomy and open reduction can be done with high dose rate when pre-medications are incorporated to enhance its potency.

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