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Anaesthetic Efficacy of Nalbuphine HCl Alone and in-Combination with Propofol and Ketamine HCl in Dogs

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Abstract.

Present study was conducted on 18 adult clinically healthy dogs, which were divided randomly into three groups A, B and C with 6 animals in each. In group A nalbuphine HCl @ 1mg/kg B.wt.; in group B, nalbuphine HCl @ 0.5mg/kg B.wt, along with propofol @ 4mg/kg B.wt. and in group C, nalbuphine HCl @ 1mg/kg B.wt. along with ketamine HCl @10mg/kg B.wt. were administered. The depth of anaesthesia was gauged by observing various body reflexes. The effects of above treatments on rectal temperature, respiration and pulse rates were also recorded. The mean duration of anaesthesia (in minutes) in animals of group A, B and C was 0.0±0.0, 10.17± 1.49 and 16.17± 2.89 respectively. The longest duration of anaesthesia was recorded in dogs with nalbuphine HCl 1mg/kg. B.wt. along with ketamine HCl @ 10mg/kg. B.wt (group C). However the quality of induction and recovery was superior in-group B in which nalbuphine HCl was given @ 0.5mg/kg B.wt. along with propofol @4mg/kg B.wt.

Keyword: Anaesthetic efficacy, Nalbuphine HCl, Propofol, Ketamine HCl.

Introduction

The dog as an animal occupies a unique and privileged place in our lives as a friend, helper and protector and with no other animal has such a relationship ever existed. A considerable body of literature is available on the efficacies of various anaesthetics in different animals. There is a risk in applying generalization in canines derived on the basis of other animals. Keeping its fidelity and faithfulness in view, canine rearing is on the increase. The professionals should enable themselves to cope with the aspiration of the owners of the dogs to treat their animals in quiet calm and painless regimen.

Anaesthetics are available for both parenteral as well as inhalation routes in canine surgery.

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Due to the meager facilities available for field veterinarians in Pakistan, intravenous anaesthetics are preferred because of their early and safe induction. A few anaesthetics have been used for several decades, e.g. Pentothal sodium, chlorpromazine etc. These anaesthetics often become unavailable in the market. Their unavailability in the market creates a great difficulty for practicing veterinarians. Because of the uncertain availability of Pentothal sodium at present, there is a dire need of the hour that efforts are made to find some other safe and suitable alternative anaesthetics. The proposed study had been designed to evaluate the efficacy of nalbuphine alone and in-combinations with propofol and ketamine HCl and to assess the cost effectiveness of anaesthetic treatment.

Materials and Methods

Experimental animals

A total of 18 adult, stray dogs of either sex were selected. These animals were divided into three numerically equal groups A, B and C. All animals were thoroughly examined to ascertain their health status, and only clinically healthy animals without any physical abnormality were included in the trial.

Preparation of animals

Food and water were withheld 24 and 12 hours respectively prior to the induction of anaesthesia to avoid regurgitation and respiratory embarrassment. Dogs were cast in lateral recumbency, with head slightly lower than the hindquarters. They were allowed to relax for some time to overcome excitement created during casting. The base line respiration, pulse rate and temperature were recorded.

Anaesthetics administration

The animals of the group A were administered nalbuphine HCl intravenously @1mg/kg B.wt, while in group B nalbuphine HCl was given @0.5mg/kg b.w intramuscularly and propofol @4 mg/kg b.w intravenously. Nalbuphine HCl and ketamine HCl were given @1 mg/kg and 10mg/kg b.w through intravenous route respectively in group C.

The total calculated dose of the respective anaesthetic solution was administered slowly through cephalic vein. With the start of intravenous injection, the time was noted, and this was used as reference to describe the changes in various parameters. A team of trained

personals was deputed to perform the meticulous job of recording the observations of various clinical parameters at 2 minutes interval till the complete normalization of the reflexes.

Criteria of anaesthetic evaluation.

During the induction of anaesthesia, animals were closely monitored The effects of experimental anaesthetic agents on various body reflexes were recorded at 2 minutes interval while respiration, temperature and pulse rate were recorded at 10 minutes interval.

In this study, the following parameters were recorded:

1. Body reflexes, which include corneal reflex, pupil reflex, mandibular tone, muscular tone, pharyngeal reflex, tongue pinch reflex, tail flaccidity and anal pinch reflex.
2. Induction time.
3. Duration of anaesthetic stage.
4. Recovery period and nature of recovery.
5. State of respiration, temperature and pulse rate before, during and after induction of anaesthesia.
6. Rate and nature of salivation.
7. Untoward effect, if any during the various phases of the trial.

Results and Discussion

In group A nalbuphine HCl was used as an anaesthetic agent @ 1mg/kg body weight intravenously. No side effect was observed after the administration of this drug. This finding is similar to Ho *et al.* (1998) and Schmidt *et al.* (1985). The respiratory depression was very low, this finding is similar to Paqueron *et al.* (1997) and Somrat *et al.* (1999). No behavioral effects were observed in any dog. There were no significant cardiovascular effects observed in group A. All these findings are similar to Schmidt *et al.* (1985). Heart rate was increased after the administration of nalbuphine HCl but no dysrhythmia was observed. These findings are similar to Jacobson *et al.* (1994). Nausea and vomiting in any dog of group A were not observed. These findings are similar to Cepeda *et al.* (1996) and Wang *et al.* (1998).

In group B, nalbuphine HCl was injected @ 0.5mg/kg body weight intramuscularly along with propofol @ 4mg/kg B.wt intravenously. The induction of anaesthesia was rapid and smooth, which is similar to the finding of Genevois *et al.* (1988) and Flecknell *et al.* (1990). Changes in heart rate after the administration of anaesthetic drug were insignificant, which is similar to the finding of Short and Buflari *et al.* (1999). Respiration rate decreased after the administration of anaesthetic agents, which is similar to the findings of Portella *et al.* (1996). Changes in body temperature were insignificant. This is similar to the findings of Kelwala and Parsania (1992). Recovery from anaesthesia was smooth and swift which is similar to the finding of Short (1999). No apnea was observed in any dog of group B, which is similar to the findings of Healy and Cohen (1995). These results show that propofol can be safely used for the induction of anaesthesia in canine in short surgical procedures which need significantly quick recovery and an earlier return of psychomotor function. No nausea and vomiting were reported during propofol anaesthesia, which is quite similar to the findings of Ronald and Miller (1981)

In group C, nalbuphine HCl @1mg/kg.body weight intravenously along with ketamine HCl @ 10mg/kg.body weight intravenously were used as anaesthetic agents. Induction was rapid and smooth in all animals. Corneal, canthal and anal sphincter reflexes were reduced to moderately sluggish (2P) after the administration of anaesthetic agent. Ketamine HCl was also used alone as an anaesthetic agent in the past by various workers (Short, 1999; Kumar *et al.*, 1995; Muir and Hubbel, 1991). Body temperature in this group increased slightly during anaesthesia, which is in accordance with finding of Kelawala *et al* (1992). Heart rate increases in all animals during anaesthesia. These finding are in accordance with result of Short. (1999) Kelawala *et al.* (1992) Portella *et al.* (1996) Muir and Hubbel (1991). Respiration rate decreased after the induction of anaesthesia but increased during the recovery period. This in agreement with the finding of Kumar *et al.*, (1995) Kelawala *et al.* (1992) Portella *et al.* (1996). These results showed that administration of ketamine with nalbuphine HCl prevents respiratory depression. Nalbuphine HCl also reduced the dose of ketamine HCl required for the induction of anaesthesia but its administration with ketamine HCl changed the nature and duration of recovery from anaesthesia. These results also indicated that ketamine HCl and nalbuphine HCl combination produced increase in heart rate, body temperature. Salivation of mild degree was also observed in one animal during anaesthesia.

While comparing the results of the three groups, ketamine HCl along with nalbuphine HCl showed longest duration of anaesthesia but recovery was not smooth including salivation in one dog. On the other hand, propofol along with nalbuphine HCl showed rapid coordinated induction and recovery but it is more expensive than ketamine. Heart rate was increased up to grater extent by ketamine HCl along with nalbuphine HCl than propofol along with nalbuphine HCl.

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