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## Evaluation of isoflurane and sevoflurane anaesthesia for ovariohysterectomy in dexmedetomidine and butorphanol pre-medicated dog

**KN Tayade, Dr. MG Thorat, Dr. RV Raulkar, Dr. SD Chepte, PD Salve and MB Pawar**

### Abstract

The present study was conducted on 12 dogs presented to TVCC, PGIVAS, Akola for ovariohysterectomy. These dogs were divided in two groups of six animals each. Dogs in both the groups were pre-medicated with Dexmedetomidine @ 20 mcg/kg BW, Butorphanol @ 0.2 mg/kg BW and induction was carried out with Ketamine @ 4 mg/kg BW. Dogs in group A and group B were maintained on isoflurane and sevoflurane respectively. Ovariohysterectomy was done with routine method. Quality of induction was good in both the groups with the exception of excellent in one case of group B. Quality of maintenance was good in all animals of group A. In group B, quality of maintenance was excellent in three cases and good in three cases. Time to recovery was lower in sevoflurane group. The quality of recovery from anaesthesia was graded to be good in all the cases of group A. In group B quality of recovery was graded to be good in two cases whereas it was excellent in four cases. It was concluded that the recovery characteristics of sevoflurane anaesthesia were superior to that of isoflurane anaesthesia.

**Keywords:** dogs, isoflurane, induction and recovery, sevoflurane, dexmedetomidine, butorphanol

### Introduction

Surgical management of canine patients is considered to be painful and require an ideal anesthetic which produces sleep, amnesia, analgesia and muscle relaxation to facilitate well-being of the surgical patient (Slingsby and Pearson, 2000) [1]. Balanced anesthesia is induced by the appropriate use of multiple drugs. Drugs are targeted to specifically attenuate individual components of the anesthetic state; that is, consciousness, analgesia, muscle relaxation, and alteration of autonomic reflexes. Considering the advantages of dexmedetomidine as a sedative, butorphanol as an opioid analgesic which have associated property of sedation, they were used as pre-anaesthetics in the present study while ketamine was used as induction agent. The inhalant anaesthetics Isoflurane and Sevoflurane were used for maintenance in anaesthetic plane. The purpose of the present study was to study characteristics of anaesthesia with sevoflurane and established volatile anaesthetic isoflurane with premedication using butorphanol and dexmedetomidine for routine veterinary clinical conditions with the objective to evaluate isoflurane and sevoflurane anaesthesia for ovariohysterectomy in dexmedetomidine and butorphanol premedicated dog.

### Materials and Methods

#### Pre-anesthetic evaluation

The present clinical study was carried out on clinical cases of female dogs referred to Teaching Veterinary Clinical Complex, Post Graduate Institute of Veterinary and Animal Sciences, Akola for elective ovariohysterectomy. A total of 12 female dogs were selected for this study. These cases were then randomly divided in two groups as Group A and Group B, consisting 6 cases each irrespective of their age, breed and body weight. Dogs were examined thoroughly day before the anesthetic procedure for their pre-evaluation of health status. Dogs fit for anesthesia were fasted for food and water 12 hours prior to surgery.

#### Calculation of dose rates

Total dose = Dose rate (mg/kg) x Body weight/Conc. of drug (mg/ml)

**Table 1:** Anaesthetic protocol followed during the study

Group 'A' (n = 6)	Group 'B' (n = 6)
Pre-anaesthesia Inj. Dexmedetomidine @ 20 mcg/kg BW I/M Inj Butorphanol @ 0.2mg/kg BW I/M.	Pre-anaesthesia Inj. Dexmedetomidine @ 20 mcg/kg BW I/M Inj Butorphanol @ 0.2mg/kg BW I/M.
Induction Inj Ketamine @ 4 mg/kg BW	Induction Inj Ketamine @ 4 mg/kg BW

### Surgical technique

All dogs were subjected to standard ovariohysterectomy procedure by double-clamp ligation method explained by Fossum *et al.* (2007) [2].

### Parameters studied

Anaesthesia was assessed based upon the reflexes exhibited during the procedure. The quality of induction of anaesthesia, quality of maintenance of anaesthesia, duration of maintenance of anaesthesia, quality of muscle relaxation, time for extubation, time for head lift, time for standing up, time for complete recovery and quality of recovery was judged.

### Results and Discussion

#### Quality of induction of anaesthesia

Quality of induction of anaesthesia was good in all animals of group A and 5 animals in group B. They were unresponsive to the pedal reflex and needle prick but showed slight responses to palpebral reflex. One animal in group B showed excellent quality (Gag reflex was lost, No response to all reflexes and presence of normal respiratory movement.) of induction. This may be because of versatility of ketamine as anaesthetic agent which causes smooth induction without appreciable tissue irritation. (Sandhu, 2013) [3] These findings were in corroboration with the findings of Barletta *et al.* (2011) [4], Pavlidou *et al.* (2013) [5].

#### Quality of maintenance of anaesthesia

The quality of maintenance of anaesthesia was assessed on the basis of various signs exhibited by the bitch during handling of uterus. There was no pain or discomfort observed in either of the groups during the surgical procedure. All dogs in Group A showed good quality (No signs of pain or discomfort but slight movement of animal during the procedure, especially while handling the uterus and loosening of suspensory ligament, along with normal cardiopulmonary function) of maintenance of anaesthesia. Three animals in group B showed excellent quality (No movement during handling of uterus, No signs of pain exhibited during loosening of suspensory ligament, removal of uterus, along with stable cardiopulmonary function) of maintenance whereas three animals showed good quality of maintenance. Sevoflurane does not cause any airway irritation and bronchoconstriction. It reverses bronchospasm and has a pleasant smell (Sandhu, 2013) [3]. This was similar to the findings of Grosenbaugh *et al.* (2011) [6] and Basha *et al.* (2018) [7].

#### Duration of maintenance of anaesthesia

The mean value of duration of maintenance of anaesthesia was  $58.33 \pm 2.74$  minutes in group A and  $55.33 \pm 2.50$  minutes in group B. The operating surgeon was same for all the surgeries in group A and B therefore no significant difference was found in duration of maintenance of anaesthesia. Similar observations were recorded by Basha *et al.*, (2018) [7].

**Table 2:** Mean values of duration of maintenance of anaesthesia in both the groups

	Group A (Time in minutes)	Group B (Time in minutes)
Mean $\pm$ S.E	$58.33 \pm 2.74$	$55.33 \pm 2.50$

#### Quality of muscle relaxation

Quality of muscle relaxation was judged by the surgeon on the basis of various parameters such as progressive decline of muscle tone, ease of exteriorization of uterus along with ovaries and was graded as poor, fair, good and excellent. It was observed that muscle relaxation was good in four while it was fair in two dogs from group A. In group B, muscle relaxation was good in three while it was excellent in three dogs. Isoflurane produces good muscle relaxation and adequate for intra-abdominal operations at normal levels of anaesthesia (Sandhu, 2013) [3]. Nasibova and Polukhov (2021) [8] stated that in addition to direct action on the contractility of striated muscles, sevoflurane significantly enhances and prolongs the neuromuscular effects of non-depolarizing muscle relaxants, which can significantly reduce their dosage.

#### Time required for recovery from anaesthesia

The time required for recovery from anaesthesia was studied into three stages i.e. time for extubation, time for head lift, time for standing up.

#### Time to extubate

Time to extubate was the time interval from the last bolus of anaesthetic drug administered till the relapse of swallowing reflex followed by extubation of trachea. It is depicted in table 3.

**Table 3:** Mean values of time to extubate in both the groups

	Group A (Time in minutes)	Group B (Time in minutes)
Mean $\pm$ S.E	$12.17 \pm 0.40$	$9.5 \pm 0.50$

The mean value of time to extubate was  $12.17 \pm 0.40$  min. group A while  $9.5 \pm 0.50$  min in group B. The value of group A was significantly ( $P < 0.05$ ) longer in terms of time to extubate. In both the groups swallowing reflex was observed after disconnection from anaesthetic apparatus. The extubation was carried out at the onset of swallowing reflex. Both sevoflurane and isoflurane have similar properties in terms of maintenance of anaesthesia however sevoflurane is somewhat superior to isoflurane in terms of quality and overall duration of recovery. Sevoflurane has a lower blood: gas partition coefficient. This was in corroboration with findings of Haitjema and Cullen (2001) [9], Lin *et al.* (2008) [10] and Lozano *et al.* (2009) [11].

#### Time for head lift

It is the time required by the dog to lift its head up after disconnecting anaesthetic apparatus during recovery of anaesthesia. It is given in Table 4.

**Table 4:** Mean values of time for head lift in both the groups

	Group A (Time in minutes)	Group B (Time in minutes)
Mean $\pm$ S.E	33.33 $\pm$ 1.54	21.50 $\pm$ 1.18

The mean time for head lift observed in group A was 33.33  $\pm$  1.54 min. whereas it was 21.50  $\pm$  1.18 min. in group B. The values were found to be significantly ( $P < 0.05$ ) higher in group A. The time to head lift was lower in group B. The time to head lift was lower in group B because sevoflurane has a lower blood: gas partition coefficient. This was in corroboration with findings of Dominguez *et al.*, (2001) [12], Bennet *et al.* (2008) [13] and Lin *et al.* (2008) [10].

### Time for standing up

It is the time needed by the dog to stand up after disconnection of anaesthetic apparatus during recovery of anaesthesia. The mean values of time for standing up are given under table 5.

**Table 5:** Mean values of time for standing up in both the groups

	Group A (Time in minutes)	Group B (Time in minutes)
Mean $\pm$ S.E	38.67 $\pm$ 0.88	31.50 $\pm$ 1.15

The time required for standing up was 38.67  $\pm$  0.88 min. in group A whereas 31.50  $\pm$  1.15 min. in group B. There was significant ( $P < 0.05$ ) difference in values of time required for standing up between the groups. It was higher in group A as compared to Group B. The time required to standing up was lower in group B because sevoflurane has a lower blood: gas partition coefficient. Similar observations were recorded by Dominguez *et al.* (2001) [12], Lin *et al.* (2008) [10] and Lopez *et al.* (2009) [14].

### Time for complete recovery

The mean time required by the dog for complete recovery from disconnection of anaesthetic apparatus in both groups is given in Table 6.

**Table 6:** Mean values of time for complete recovery in both the groups

	Group A (Time in minutes)	Group B (Time in minutes)
Mean $\pm$ S.E	67.83 $\pm$ 1.11	59.50 $\pm$ 0.62

Mean value of complete recovery time was 67.83  $\pm$  1.11 min. in group A while 59.50  $\pm$  0.62 min. in group B. It was significantly higher ( $P < 0.05$ ) in group A as compared to group B. Quicker recovery in Sevoflurane group may be due to the lower blood: gas partition coefficient of sevoflurane as compared to isoflurane. Similar findings have been reported by Sahu *et al.* (2011) [15]. However, Read *et al.* (2002) [16], Bennet *et al.* (2008) [13] and Leece *et al.* (2008) [17] observed that there were no significant difference in time to recovery between sevoflurane and isoflurane.

### Conclusion

From the present study it can be concluded that the recovery characteristics of sevoflurane anaesthesia are superior to that of isoflurane anaesthesia. Also, both isoflurane and sevoflurane are advantageous inhalant anaesthetics in terms of ease of administration during maintenance and recovery subjected for ovariohysterectomy procedure. Further it can be

concluded that dexmedetomidine-butorphanol-ketamine-isoflurane and dexmedetomidine-butorphanol-ketamine-sevoflurane protocols can be used as balanced anaesthesia for ovariohysterectomy in dogs.

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