ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol.13, Issue, 10 (A), pp.2424-2430, October, 2022

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

EFFECT OF GLYCOPYRROLATE, XYLAZINE, ACEPROMAZINE, DEXMEDETOMIDINE AND BUTORPHANOL IN DIFFERENT COMBINATIONS ON PROPOFOL- ISOFLURANE ANAESTHESIA ON CLINICO-PHYSIOLOGICAL PARAMETERS IN DOGS

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DOI: http://dx.doi.org/10.24327/ijrsr.2022.1310.0495

ARTICLE INFO

Article History:

Received 15th September, 2022
Received in revised form 23rd September, 2022
Accepted 15th October, 2022
Published online 28th October, 2022

Keywords:

Dogs, Isoflurane, Preanaesthetics, Propofol

ABSTRACT

The present study was conducted to evaluate the effect of pre-anaesthetic combinations on clinico-physiological parameters such as glycopyrrolate-xylazine-butorphanol, glycopyrrolate-dexmedetomidine-butorphanol and glycopyrrolate-acepromazine-butorphanol on propofol induction and isoflurane maintenance general anaesthesia in 18 dogs of either sex presented to the Department of Veterinary Surgery & Radiology, College of Veterinary Science & Animal Husbandry, Kamdhenu University, Junagadh for varieties of surgeries. The heart rate showed non-significant reduction in xylazine group, non-significant higher in acepromazine group following pre-medication. During the maintenance period, heart rates remained within clinically normal range which could be due to less isoflurane required. The respiratory rate showed non-significant reduction following pre-medication and increased non-significantly during induction and maintenance in all the three groups. The rectal temperature showed non-significant decrease throughout the period when compared to the base values attributed to the hypothermic effects of general anaesthesia. The recovery was smooth, fast and uneventful without any complication during observation periods in all the groups. Among all the three groups, significant difference at various observation periods in any parameters was not observed. Hence, it is concluded that the glycopyrrolate-dexmedetomidine-butorphanol with propofol induction and isoflurane maintenance was better followed by glycopyrrolate-acepromazine-butorphanol and glycopyrrolate-xylazine-butorphanol anaesthetic protocol for different orthopedic and soft tissue surgeries in dogs.

INTRODUCTION

Anaesthesia is an integral part of surgery and a successful surgery can be performed only with a safe anaesthesia. Veterinary anaesthesia is still in a growing stage in which the surgeon itself should play the role of an anaesthetist when compared to human anaesthesia. Unlike humans our patients are more fractious and we need to use general anaesthesia for most of our surgical and diagnostic procedures. Veterinarians are fortunate in a respect that now older and less practicable anaesthetics have been replaced by compounds those are very effective and safe when used properly. No single anaesthetic agent can produce all these effects, hence in practice a combination of drugs is used to produce surgical anaesthesia, each having its own mode of action. Orthopedic surgery is associated with considerable tissue manipulation and induces severe peri and post-operative pain. Balanced anaesthesia in soft tissue surgery and orthopaedic procedures optimize outcome and minimize the risk and the cost of anaesthetic drugs used (Hall *et al*., 2001).

The inhalation agents are widely used in veterinary medicine and the main advantages are their elimination independent of the hepatic and renal systems, reduced biotransformation, in addition to low rates of morbidity and mortality when compared to other anaesthetic drugs. However, inhalation anaesthesia also has some disadvantages, including need of expensive and bulky apparatus and the danger of chronic exposure of operating room personal to low concentration of volatile anaesthetic agents. In spite of all these shortcomings, inhalation anaesthetics offer comparative safety as they provide better control over the depth of anaesthesia and facilitate early recovery (Tranquilli *et al.*, 2007).

Pre medication plays an important part of any balanced anaesthesia protocols which helps in preparing the patient for surgery, enhances intraoperative cardiovascular stability, provides perioperative analgesia and aids in smooth induction and recovery from anaesthesia. It also reduces the dose of induction and maintenance anaesthetic drugs with expected reduction in adverse effects.

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Glycopyrrolate is a synthetic quaternary ammonium compound, anticholinergic with no central effects. It has a powerful and prolonged antisialagogue activity and is about five times as potent as atropine. Glycopyrrolate blocks peripheral muscarinic receptors, thus inhibiting cholinergic transmission (Hall *et al*., 2001).

Acepromazine is a potent phenothiazine derivative with anti-dopaminergic property that produces tranquilization or sedation and muscle relaxation and decrease spontaneous activity. Preanaesthetic administration decreases the amount of general anaesthetic dose. It has antiemetic, anticonvulsant, antiarrhythmic and antispasmodic properties (Thurmon *et al*., 1996; Gross, 2001). It is used in combination with some opioids in neuroleptanalgesia as it lacks analgesic properties. The drug has marked sedative properties. Other central effects of acepromazine include hypothermia and a moderate anti-emetic effect. It is also said to reduce the threshold at which epileptiform seizures occur (Hall *et al*., 2001). Xylazine is a typical α_2 adrenoceptor agonist and exerts its effects accordingly. Sedative doses of xylazine decrease heart rate and cardiac output significantly in dogs, while blood pressure and peripheral vascular resistance initially (Kinjavdekar *et al* 2013).

Dexmedetomidine, an α_2 adrenergic agonist and the active optical enantiomer isolated from the racemic compound medetomidine. In dogs and cats, dexmedetomidine produces dose dependent levels of sedation and the intensity of these effects is similar to that produced by twice the dose of Medetomidine. As with other alpha 2 adrenergic receptor agonists, higher doses of dexmedetomidine (20 mcg/kg) may induce profound hypnosis, substantially reducing injectable and inhalant anaesthetic requirements for producing anaesthesia (Kuusela *et al*., 2001).

Opioids are the most commonly used analgesics because they produce excellent intra and post operative analgesia without loss of consciousness. It has also been reported that opioids reduce the MAC (Minimal Alveolar Concentration) of inhalant anaesthetics (Muir *et al*., 2001; Valverde *et al*., 2003). Butorphanol a synthetic opioid is a partial agonist at μ and an agonist at kappa opioid receptors. Opioids are traditionally included in balanced anaesthesia protocols for their analgesic effects, but they also have sedative effects (Lemke, 2007). Butorphanol is used in cats, dogs for analgesia and sedative combinations with α 2 adrenoceptor agonists (Marini *et al.*, 1992).

Propofol is an intravenous anaesthetic agent unrelated to barbiturates, eugenols, or steroid anaesthetic agents. The active ingredient 2, 6 diisopropylphenol, exists as oil at room temperature. It is rapidly acting agent producing anaesthesia of short duration without side-effects. Inductions are smooth and excitement free. Recoveries are very smooth and rapid. Rapidity of recovery is due to propofol's rapid metabolism (Cullen and Reynoldson, 1993, Ummenhofer *et al*. (1998)).

Inhalant anaesthetics allow precise control of anaesthetic drug concentration at the central nervous system and quick onset and rapid recovery. It also produces unconsciousness, some degree of muscle relaxation but not adequate analgesia. It is reported that procedures carried out under inhalant anaesthetics alone may produce hyperalgesia during the post-operative period because of central sensitization of the central nervous system caused by the surgical trauma. Isoflurane is the most commonly used volatile anaesthetic because it has low solubility index and associated with quick onset of anaesthesia and faster recovery. It depresses cardiopulmonary system in a dose dependent manner but is less arrhythmogenic (Ranpariya *et al*, 2013 and Singh et al 2013).

General anaesthesia with proper combination of best choice preanesthetics, intravenous and inhaled agents allows adequate surgical access to the operative site. It reduces intraoperative patient awareness, allows proper muscle relaxation for longer periods of time. It facilitates complete control of the airway, breathing and circulation. It could be used in such patients those were sensitive to local anaesthetics, could be administered without moving the patient from supine position. It could be adapted easily to procedures of unpredictable duration or extent of surgical procedure as well as it could be administered rapidly and is reversible. Different anaesthetics agents will be very much helpful in future drug of choice for all type of patients which includes elective surgery, high risk patient's surgery, emergency surgery and cosmetic surgeries. It can reduces anaesthetics morbidity and mortality with non-stressful conditions, physiological changes that occur in body composition, the brain, kidney, heart, liver, and lungs produce no or only minimal functional impairment. The present study was planned with the following objectives.

OBJECTIVES

To evaluate the clinico-physiological effects of these pre-anaesthetic combinations on propofol-isoflurane anaesthesia in clinical cases of dogs. To select the best preanaesthetic combination for propofol-isoflurane anaesthesia in clinical cases of dogs.

MATERIALS AND METHODS

The present clinical study was carried out on eighteen client-owned mixed breed dogs of either sex at the Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, Junagadh Agricultural University, Junagadh during the year 2016 to 2017. All eighteen dogs selected for present study were treated for variety of major surgeries like elective sterilizations, orthopaedic surgeries, tumour removal, cataract surgeries etc. They were randomly divided into three groups I, II, and III consisting of six dogs in each group. All the dogs were fasted 12 hours and water was withheld for 6 hours prior to surgery. All the surgeries were conducted in a temperature controlled environment with the operation theatre temperature maintained at 20º C. Pre-anaesthetic evaluation was performed by observing the general health status and physical examination. The clinical status of the dogs was assessed by recording Heart Rate, (HR) Respiratory Rate (RR), Rectal Temperature (RT), Mucous Membrane (MM) color and Capillary Refill Time (CRT). The animals in group I were premedicated with a combination of glycopyrrolate (0.01 mg/kg), xylazine (0.5 mg/kg) butorphanol (0.2 mg/kg). This drug mixture was taken in a single syringe and administered IM 15 min. prior to induction. The animals in group II were premedicated with a combination of glycopyrrolate (0.01 mg/kg), dexmedetomidine (0.005 mg/kg) and butorphanol (0.2 mg/kg). This drug mixture was taken in a single syringe and administered intramuscularly 15 min. prior to induction. The animals in group III were premedicated with a combination of glycopyrrolate (0.01 mg/kg), acepromazine (0.05 mg/kg) and butorphanol (0.2 mg/kg). This drug mixture was taken in a single syringe and administered IM 15 min. prior to induction. All three group

animals were administered propofol for induction intravenously "to effect'' and maintained with isoflurane in oxygen.

RESULTS

Major veterinary surgeries were associated with greater degree of soft tissue and bone manipulation which induces severe peri-operative and post-operative pain and hence appropriate pre-medication was essential to reduce the further deleterious effect of pain. Depending upon the length and kind of the surgical procedure, an appropriate opioid might be given systemically as a pre-medication for the control of pain. Balanced anaesthesia in orthopedics and soft tissue surgeries used to optimize outcome and minimize the risk and cost of anaesthetic drugs. Hence, present study was undertaken to evaluate the clinicophysiological, haemodynamics and haemato-biochemical effects of glycopyrrolate-xylazine-butorphanol, glycopyrrolate-dexmedetomidine-butorphanol, and glycopyrrolate-acepromazine-butorphanol combination on propofol induction and isoflurane maintenance anaesthesia in clinical cases of dogs.

Total eighteen dogs of either sex were used selected and divided into three groups as a Group I, Group II and Group III of six dogs in each group. All the dogs were operated for different surgeries like intramedullary pinning, cross pinning, bone plating, amputation, tumour excision, ovariohysterectomy etc. The selected dogs under study weighed an average of 20.44 ± 2.22 kg (Mean ± SE) with maximum weight 36 kg whereas the lowest weight recorded was 7 kg from different breeds of canines. The average range of age was 70.11 ± 11.45 months (Mean ± SE) with the higher limit of 156 months (13 years) and lower up to 4 months was recorded.

Evaluation of Clinico-Physiological Parameters

Evaluation of dogs for quality of sedation after pre-medication

Quality of sedation scores among the all three groups at different time intervals were shown in the Table 1. All the animals of three groups had no sedation effect at base (0) time but slight to profound sedation shown at 10 and 15 min. interval after premedication and profound sedation was noticed after 15 min In the Group I at 10 min. interval 2 dogs (33.33 %) had no sedation followed by at 15 min. 1 dog (16.66 %) had no sedation, 5 dogs (83.33 %) showed moderate sedation. In the Group II at 10 min. interval 5 dogs (83.33 %) showed slight sedation and 1 dog (16.66 %) showed moderate sedation followed by at 15 min. interval 1 dog (16.66 %) showed slight sedation and 5 dogs (83.33 %) showed moderate sedation whereas in the Group III at 10 min. interval 6 dogs (100 %) showed moderate sedation followed by at 15 min. 4 dogs – (66.66 %) showed moderate sedation and 2 dogs (33.33 %) showed profound sedation. In present study observed that moderate sedation prior to induction of anaesthesia made easy handling and surgical preparation of the animals.

In all the three groups combination pre-medications produced moderate and deep sedation with excellent analgesia and muscle relaxation quite enough to perform intubation after propofol induction. During present study group III in which glycopyrrolate – acepromazine - butorphanol combination produced profound sedation in 6 dogs (100 %) after 15 min. and similar results were noticed by Kojima *et al.* (1999) acepromazine-butorphanol combination produced deep sedation with mean onset of sedation in 16 min.

Table No.1 Criteria for evaluation of dogs for quality of sedation in group I, II and III

Quality of sedation score	Number of animals in different time intervals (minutes)											
	Group – I				Group – II				Group – III			
	base	10	15	20-120	base	10	15	20-120	base	10	15	20-120
0-No sedation	6	2	1	0	6	0	0	0	6	0	0	0
1-Slight	0	2	0	0	0	5	1	0	0	0	0	0
2- Moderate	0	2	5	0	0	1	5	0	0	6	4	0
3-Profound	0	0	0	6	0	0	0	6	0	0	2	6

In the Group II at 10 min. interval 3 dogs (50.00 %) showed resistance to open the jaw, while 3 dogs (50.00 %) showed less resistance whereas in the Group III at 10 min. interval 2 dogs (33.33 %) showed resistance to open jaw and 4 dogs (66.66 %) showed less resistance to open jaw but at 15 min. interval 5 dogs (83.33%) showed less resistance to open jaw and 1 dog (16.66 %) showed no resistance. In the present study sedation prior to induction of general anaesthesia made the easy handling and intubation of the animals.

Table No 2 Criteria for evaluation of dogs for quality of jaw relaxation in group I, II and III

Quality of jaw relaxation	Number of animals in different time intervals (minutes)											
	Group I				Group II				Group III			
	base	10	15	20-120	base	10	15	20-120	base	10	15	20-120
0 Not allow opening	6	2	0	0	6	0	0	0	6	0	0	0
1 Resistance to opening	0	4	2	0	0	3	0	0	0	2	0	0
2 Less resistance to opening	0	0	4	0	0	3	6	0	0	4	5	0
3 No resistance	0	0	0	6	0	0	0	6	0	0	1	6

In the Group I at 10 min. interval 2 dogs (33.33 %) showed intact and strong palpebral reflex while 4 dogs (66.66 %) showed intact but weak reflex followed by at 15 min. interval 1 dog (16.66 %) showed intact and 5 dogs (83.33 %) showed very weak reflex.

In the Group II at 10 min. interval 1 dog (16.66 %) showed intact reflex, 4 dogs (66.66 %) showed intact but weak and 1 dog (16.66 %) showed very weak reflex. After 15 min. interval 1 dog (16.66 %) showed intact but weak and 5 dogs (83.33 %) showed very weak palpebral reflex Whereas in the Group III at 10 min. 2 dogs (33.33 %) showed intact but weak, and 4 dogs (66.66 %) showed very weak and at 15 min. interval all six dogs (100 %) showed very weak palpebral reflexes

Table No 3 Criteria for evaluation of dogs for quality of palpebral reflex in group I, II and III

Quality of palpebral reflex	Number of animals in different time intervals (minutes)											
	Group I				Group II				Group III			
	0 (base)	10	15	20-120	0 (base)	10	15	20-120	0 (base)	10	15	20-120
0- Intact and strong	6	2	1	0	6	1	0	0	6	0	0	0
1- intact but weak	0	4	0	0	0	4	1	0	0	2	0	0
2- very weak	0	0	5	0	0	1	5	0	0	4	6	0
3- Abolished (no-response)	0	0	0	6	0	0	0	6	0	0	0	6

In the Group I at 10 min. interval 1 dog (16.66 %) showed intact and strong palpebral reflex and 5 dogs (83.33 %) showed intact but weak reflex. After 15 min. interval 1 dog (16.66 %) showed intact and strong reflex 5 dogs (83.33 %) showed intact but very light reflex. In the Group II at 10 min. interval 4 dogs (66.66 %) showed intact but weak reflex and 2 dogs (33.33 %) showed intact but very light reflex. After 15 min. interval 6 dogs (100 %) showed intact but very light reflex whereas in the Group III at 10 min. interval 3 dogs (50 %) showed intact but weak reflex and 3 dogs (50 %) showed intact but very light reflex. After 15 min. interval 6 dogs (100 %) showed intact but very light pedal reflex.

Table No. 4 Criteria for evaluation of dogs for quality of pedal reflex in group I, II and III

Quality of pedal reflex	Number of animals in different time intervals (minutes)											
	Group I				Group II				Group III			
	0 (base)	10	15	20-120	0 (base)	10	15	20-120	0 (base)	10	15	20-120
0- Intact and strong	6	1	1	0	6	0	0	0	6	0	0	0
1- Intact but weak	0	5	0	0	0	4	0	0	0	3	0	0
2- Intact but very light	0	0	5	0	0	2	6	0	0	3	6	0
3- Abolished (no response)	0	0	0	6	0	0	0	6	0	0	0	6

In the Group II at 10 min. interval 4 dogs (66.66 %) allowed endotracheal tube but chewed and 2 dogs (33.33 %) showed difficult endotracheal intubation with coughing. After 15 min. interval 6 dogs (100 %) permitted endotracheal intubation with coughing whereas in the Group III at 10 min. interval 2 dogs (33.33 %) allowed endotracheal intubation but chewed and 4 dogs (66.66 %) found difficulty during endotracheal intubation mainly due to coughing. At 15 min. interval 6 dogs (100 %) found difficulty during endotracheal intubation with coughing.

Table No. 5 Criteria for evaluation of dogs for quality response to intubation in group I, II and III

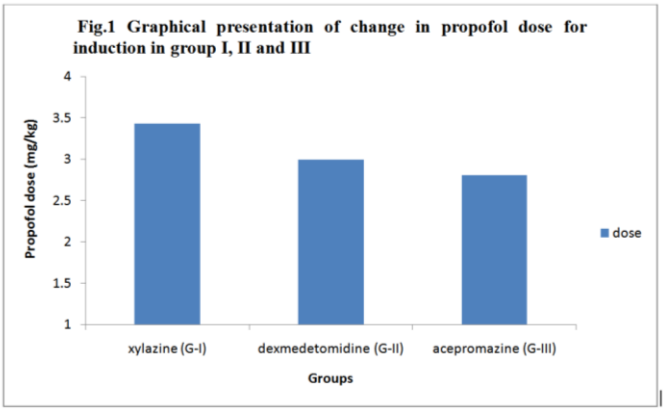
Quality of response to intubation	Number of animals in different time intervals (minutes)											
	Group I				Group II				Group III			
	0 (base)	10	15	20-120	0 (base)	10	15	20-120	0 (base)	10	15	20-120
0- Did not permit entry of tube	6	2	1	0	0	0	0	0	6	0	0	0
1-Allowed entry but chewed	0	4	3	0	0	4	0	0	0	2	0	0
2- Difficult intub. with coughing	0	0	2	0	0	2	6	0	0	4	6	0
3- Easy intub. without coughing	0	0	0	6	0	0	0	6	0	0	0	6

Propofol used for induction in the Group I, Group II and Group III was 3.43 ± 0.24, 3.00 ± 0.12 and 2.81 ± 0.09 mg/kg b.wt. respectively.The induction doses of propofol used for the Group II and Group III were non-significantly lower than Group I. There were no significant differences among the groups for the requirement of induction agent. The Group III showed minimum dose followed by Group-II and Group-I. In present study propofol administered slowly I/V till it sluggish all reflexes and complete jaw relaxation.

Table No.6 Changes in the dose of induction agents in group I, II and III

Parameters	Group- I	Group- II	Group- III
Propofol dose (mg/kg)	3.43 ± 0.24[a]	3.00 ± 0.12[a]	2.81 ± 0.09[a]

Values with different alphabets differ significantly (P < 0.05) among the groups at corresponding intervals



Endotracheal intubation

In present study all the dogs in three different groups were intubated successfully after propofol induction with the help of a laryngoscope.

Maintenance of Anaesthesia

In the present study all the dogs in three different groups were immediately shifted to the surgery table and connected to the anaesthetic machine after induction and intubation. None of the animals showed breath holding or any type of complication during the initial times of inhalant anaesthesia and the vaporizer settings were changed according to maintain the surgical plane of anaesthesia.

PARAMETERS MONITORED DURING ANAESTHESIA

Physiological Parameters

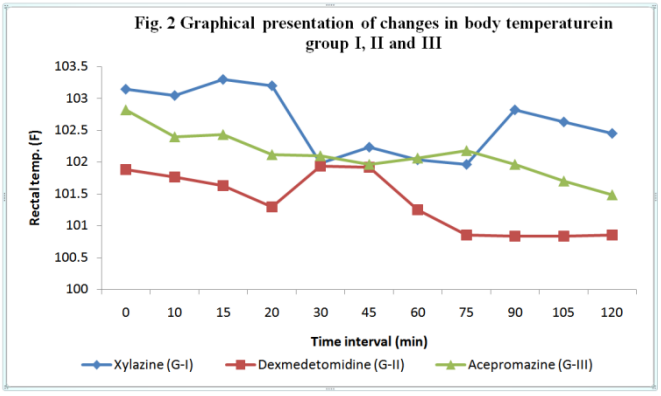
Body temperature

In the present study mean body temperature recorded during anaesthesia were presented in Table 7 and Fig. 2. Mean values of body temperature were non- significant between the groups at different time before premedication and values recorded was 103.15 ± 0.35° F, 101.88 ± 0.30° F and 102.81 ± 0.52° F in the Group I, Group II and Group III respectively. In the present study body temperature were decreases non-significantly from pre-medication values at 60 min. after induction and toward the base value at the recovery time and values recorded were 102.03± 0.59° F, 101.25 ± 0.51° F and 101.4 ± 0.56° F in the Group I, Group II and Group III respectively. Body temperature after recovery in the groups were 102.45 ± 0.43° F, 100.85 ± 0.46° F and 101.48 ± 0.48° F respectively. In the present study change in body temperature showed a slight decrease 15 min. interval after premedication which was statistically non-significant.

Table No. 7 Changes in body temperature (°F) following pre-medication in group I, II and III (Mean ±SE; n=6).

Gr.	Body temperature (°F) at different time intervals (min)										
	0	10	15	20	30	45	60	75	90	105	120
Gr. I	103.15 ± 0.35[a]	103.05 ± 0.39[a]	101.3 ± 0.42[a]	103.2 ± 0.73[a]	101.98 ± 0.60[a]	102.23 ± 0.44[a]	102.03 ± 0.59[a]	101.96 ± 0.65[a]	102.81 ± 0.72[a]	102.63 ± 0.53[a]	102.45 ± 0.43[a]
Gr. II	101.88 ± 0.30[a]	101.76 ± 0.32[a]	101.63 ± 0.33[a]	101.3± 0.32[a]	101.93 ± 0.19[a]	101.91 ± 0.38[a]	101.25± 0.51[a]	100.85± 0.52[a]	100.83 ± 0.42[a]	100.83 ± 0.37[a]	100.85 ± 0.46[a]
Gr. III	102.81 ± 0.52[a]	102.4 ± 0.54[a]	102.43 ± 0.53[a]	102.11 ± 0.69[a]	102.1 ± 0.55[a]	101.97 ± 0.70[a]	101.4 ± 0.56[a]	102.18 ±0.59[a]	101.97 ± 0.69[a]	101.7 ± 0.52[a]	101.48 ± 0.48[a]

Values with different alphabets differ significantly (P < 0.05) among the groups at corresponding intervals



significantly lowered toward the base value at recovery time. In the present study no significant difference in mean values of body temperature at different intervals among the group.

Respiratory rate

In the present study mean values of respiratory rate per minute in all group were presented in the Table 8 and Fig.3. In the Group I premedication produced non-significant decrease in the respiratory rate at 10 min. interval after pre-anaesthetic (24 ± 3.94 compared to 27.16 ± 3.28 and 29.66 ± 1.30 compared to 32 ± 1.15/min) which further decreased non-significantly upon 15 min. of induction compared to base values (23 ± 3.13 compared to 27.16 ± 3.28 and 29.33 ± 1.35 compared to 32 ± 1.15 /min in group I and Group II.

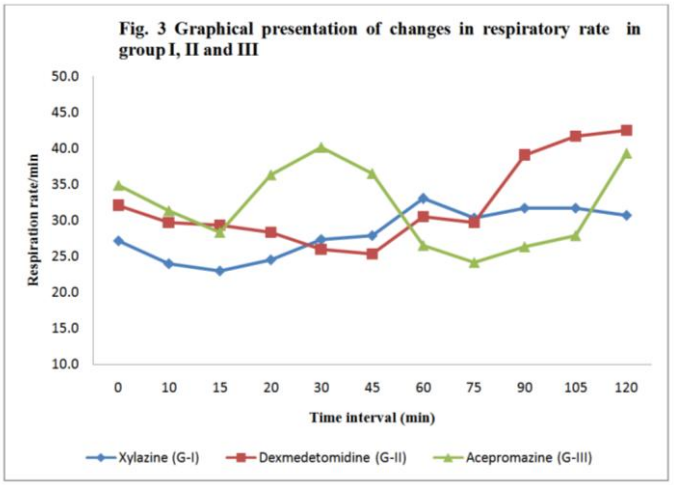
In the Group III upon 20 min. interval of induction respiratory rate increased non-significantly compared to base value (36.33 ± 3.69 compared to 34.8 ± 3.63/min). changes in respiratory rate was non-significant during entire observation period between groups except in the group III there was higher respiration after 5 min. of induction which was lowered in the group I and group II upon induction when compared to the basal respiratory rate.

In the present study, in all three different groups there was non-significant decrease in respiratory rate during isoflurane maintenance period, and which was increased non-significantly from 5 min. onwards till recovery time. Respiratory rate showed a non-significant reduction in the Group I and Group II as compared to the Group III.

Table No. 8 Changes in respiratory rate (respiration/min) following pre-medication in group I, II and III (Mean ±SE; n=6).

Gr.	Respiratory rate (Respiration/min)at different times intervals (min)										
	0	10	15	20	30	45	60	75	90	105	120
Gr. - I	27.16 ± 3.28[a]	24 ± 3.94[a]	23 ± 3.13[a]	24.5 ± 4.84[a]	27.33 ± 4.71[a]	27.83 ± 4.13[a]	33.00 ± 7.99[a]	30.33 ± 7.74[a]	31.67 ± 8.54[a]	31.66 ± 7.74[a]	30.66 ± 7.0[a]
Gr. - II	32 ± 1.15[a]	29.66 ± 1.30[a]	29.33 ± 1.35[a]	28.3 ± 2.55[a]	26 ± 2.97[a]	25.33 ± 3.96[a]	30.5 ± 4.48[a]	29.67 ± 4.70[a]	39 ± 10.1[a]	41.66 7 ± 13.8[a]	42.5 ± 13.41[a]
Gr. - III	34.8 ± 3.63[a]	31.33 ± 3.92[a]	28.33 ± 2.89[a]	36.33 ± 3.69[a]	40.16 ± 3.44[a]	36.5 ± 4.08[a]	26.5 ± 4.04[a]	24.16 ± 2.32[a]	26.33 ± 3.50[a]	27.83 ± 4.76[a]	39.33 ± 6.99[a]

Values with different alphabets differ significantly (P < 0.05) among the groups at corresponding intervals



In the present study during isoflurane maintenance all the three different groups showed a similar degree of dose dependent respiratory depression throughout the maintenance period. However the values were within normal range and adequate to maintain normal ventilation.

Heart rates

In the present study mean values of heart rates per min. recorded were presented in the Table 9 and Fig. 4. There was non-significant changes occur in mean heart rate among all three different groups. In the Group I, the premedication produced a non-significant decrease in the mean heart rate at 15 min. interval after premedication (123.67 ± 09.68 compared to 133.33 ± 11.64 beats/min) which upon induction produced a further increase and further decrease after 30 and followed by 60 min. of induction and maintenance when compared to base values and increased further onward recovery period not reach base values.

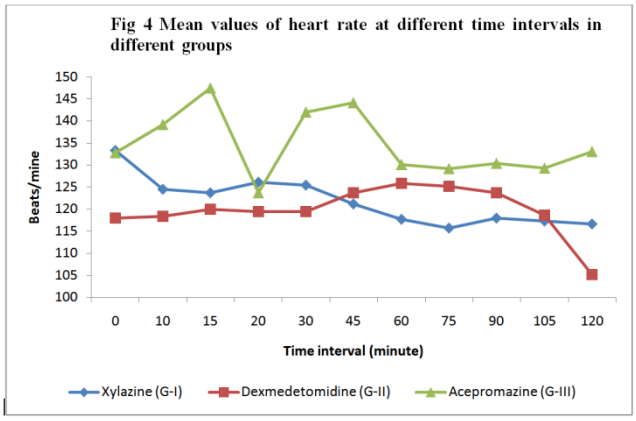
In the Group II non-significant changes in the mean values of heart rate at different time intervals and remain within normal range while in group III there was non-significantly increase in mean values of heart rate (147.5 ± 11.99 compared to 132.83 ± 8.190 beats/min) compared to base value at 15 min. interval of premedication administration could be due to glycopyrrolate which induces tachycardia followed by reduction in heart rate (137 ± 10.15 and 137 ± 10.15 beats/min) at 45 and 60 min respectively after isoflurane maintenance and increased onward 5 min. interval till recovery. In the present study the heart rate showed a non-significantly decreasing and non-significantly

increasing trend in Group I, Group II and Group III respectively.

Table No. 9 Changes in heart rate (beats/min) following pre-medication in group I, II and III (Mean ±SE; n=6).

Gr.	Heart rate (beats/min) at different times intervals										
	0	10	15	20	30	45	60	75	90	105	120
Gr.-I	133.33 ± 11.64ᵃ	124.5 ± 9.96ᵃ	123.66 ± 9.68ᵃ	126.16 ± 9.30ᵃ	125.5 ± 8.59ᵃ	121.16 ± 7.84ᵃ	117.66 ± 6.65ᵃ	115.66 ± 6.16ᵃ	118.00 ± 8.21ᵃ	117.33 ± 7.79ᵃ	116.66 ± 6.08ᵃ
Gr.-II	118 ± 3.57ᵃ	118.33 ± 5.30ᵃ	120 ± 5.26ᵃ	119.5 ± 8.56ᵃ	119.5 ± 9.21ᵃ	123.66 ± 6.52ᵃ	125.83 ± 8.27ᵃ	125.16 ± 12.16ᵃ	123.66 ± 11.08ᵃ	118.66 ± 13.37ᵃ	105.16 ± 5.38ᵃ
Gr.-III	132.83 ± 8.190ᵃ	139.16 ± 10.18ᵃ	147.5 ± 11.1ᵃ	123.66 ± 23.6ᵃ	142.0 ± 15.88ᵃ	144.16 ± 19.30ᵃ	137.0 ± 10.15ᵃ	129.16 ± 12.21ᵃ	130.33 ± 11.43ᵃ	129.33 ± 11.12ᵃ	133.0 ± 12.51ᵃ

Values with different alphabets differ significantly (P < 0.05) among the groups at corresponding intervals



In the present study during isoflurane maintenance all the dogs in three different groups showed a non-significant decrease in heart rate as compared to induction. From induction to recovery there were consistent non-significant reductions in heart rates in all the dogs in three different groups.

SUMMARY AND CONCLUSIONS

The present study was conducted to evaluate effect of clinico-physiological various preanesthetics, to select best preanesthetics combination of glycopyrrolate – xylazine - butorphanol, glycopyrrolate – dexmedetomidine - butorphanol and glycopyrrolate – acepromazine - butorphanol combinations on propofol induction and isoflurane maintenance general anaesthesia in clinical cases of dogs operated for various orthopaedic and soft tissue surgeries.

The quality of sedation, jaw relaxation, palpebral reflex, pedal reflex and response to intubation was superior with acepromazine (Group III) compared to xylazine (Group I) and dexmedetomidine (Group II). In the present study, glycopyrrolate-acepromazine – butorphanol combination had a better sedation quality. Mean effective dose of propofol used for induction in Group I, Group II and Group III were 3.43 ± 0.24, 3.00 ± 0.12 and 2.81 ± 0.09, respectively. The induction dose of propofol used for acepromazine (group III) was found non-significantly lower as compared to xylazine (Group I) and dexmedetomidine (Group II). Acepromazine and dexmedetomidine showed sparing effect the on induction dose of anaesthesia with propofol. None of the animals showed any complications while induction of anaesthesia in all the three different groups Rectal temperature showed a non-significant decreasing trend throughout the surgical procedure when compared to the base values in all the three groups. It may be to the hypothermic effects of general anaesthesia.

Respiratory rate showed a non-significant decreasing trend after pre-medication and increasing trend during induction and maintenance period throughout the surgical procedure in all the three different groups as compared to the base values. Heart rate showed a non-significant decrease immediately after pre-medication in xylazine (Group I) while, heart rate increased non-significantly in dexmedetomidine (Group II) and acepromazine (Group III). During the maintenance with isoflurane the heart rate at different time intervals remained within normal range. The Heart rate fluctuation throughout the observation period, was non-significant and within the normal range.

References

1. Ahmad, R. A.; Amarpal, A.; Kinjavdekar, P.; Aithal, H. P.; Pawde, A. M. and Kumar, D. 2003. Potential use of dexmeditomidine for different levels of sedation, analgesia and anaesthesia in dogs. *Veterinari Medicina*. 58(2): 87-95.
2. Cagnardi, P.; Villa, R.; Gallo, M.; Beccaglia, M.; Luvoni, G. C.; Vettorato, E. and Ravasio, G.
3. Galloway, D. S.; Ko, J. C. H.; Reaugh, H. F.; Mandsager, R. E.; Payton, M. E.; Inoue, T. and Portillo, E. 2004. Anesthetic indices of sevoflurane and isoflurane in unpremedicated dogs. *J. Am. Vet. Med. Assoc.* 225: 700 - 704.
4. Greene, S. A.; Hartsfield, S. M. and Tyner, C. L. 1990. Cardiovascular effects of butorphanol in halothane anesthetized dogs. *Am. J. Vet. Res.* 51: 1276 - 1279.
5. Hellyer, P. W.; Freeman, L. C. and Hubbell, J. A. 1991. Induction of Anesthesia with

Diazepam-Ketamine and Midazolam-Ketamine in Greyhounds. *Vet. Sur.* 20(2): 143-147.

6. Kinjavdekar, P.; Tyagi, S. K.; Amarpal.; Aithal, H. P.; Pawde, A. M.; Malik, V.; Sharma, R. and Pathak, M. C. 2013. Evaluation of continuous propofol infusion in xylazine/medetomidine and butorphanol premedicated canine orthopaedic patients. *Indian Journal of Canine Practice.* 5(1): 147- 153
7. Ko, J. C.; Steven, M. and Mandsager, R. E. 2002. Sedative and cardiopulmonary effects of medetomidine, medetomidine-butorphanol and medetomidine-ketamine in dogs. *J. Am. Vet. Med. Assoc.* 2(16): 1578-1583.
8. Kuusela, E.; Raekallio, M.; Vaisanen, M.; Mykkanen, K.; Ropponen, H. and Vainio, O. 2001. Comparison of medetomidine and dexmeditomidine as premedicants in dogs undergoing propofol-isoflurane anaesthesia. *Am. J. Vet. Res.* 62(7): 1073-1080.
9. Lemke, K. A. 2007. Anticholinergics and sedatives. *In*: Lumb and Jones Veterinary Anesthesia and Analgesia, 4th ed. (Tranquilli W. J., J. C. Thurmon, K. A. Grimm, Eds.). Blackwell
10. Mutoh, T.; Nishimura, R.; Kim, H. Y.; Matsunaga, S. and Sasaki, N. 1997. Cardiopulmonary effects of sevoflurane, compared with halothane, enflurane, and isoflurane, in dogs. *Am. J. Vet. Res.* 58(8): 885-890.
11. Popovic, N. A.; Mullane, J. F. and Yhap, E. O. 1972. Effects of acetylpromazine maleate on certain cardio respiratory responses in dogs. *American journal of veterinary research.*
12. Pottie, R. G.; Dart, C. M. and Perkins, N. R. 2008. Speed of induction of anaesthesia in dogs administered halothane, isoflurane, sevoflurane or propofol in a clinical setting. *Aus. Vet. J.* 86: 26-31.
13. Ranpariya, J. J.; Barvalia, D. R.; Padaliya, N. R. and Javia, C. B. 2013. Safety and efficacy of Butorphanol-Acepromazine-Glycopyrrolate as premedicant combination to midazolam – ketamine induction and isoflurane maintenance in canine orthopaedic surgery. *Ind. J. Field Veterinarians.* 9 (1): 30-34.
14. Salunke, V. M., Bokre, A.P. and Panchbhai, V. J. 2002. Use of propofol in case of canines. In articles presented in 26th animal congress of ISVS, 21.
15. Schurig, J. E.; Cavanagh, R. L. and Buyniski, J. P. 1978. Effect of butorphanol and morphine on pulmonary mechanics, arterial blood pressure and venous plasma histamine in the anesthetized dog. *Archives Internationales de Pharmacodynamie et de Therapie.* 233(2): 296-304.
16. Singh, K.; Mahajan, S. K.; Sangwan, V.; Gopinathan, A.; Kumar, A.; Anand, A. and Saini, N. S. 2013. BAG-Propofol-isoflurane Anaesthesia in Orthopaedic Dog Patients. *Indian Vet. J.* 90(5): 30-33.
17. Stephan, D. D.; Vestre, W. A.; Stiles, J. and Krohne, S. 2003. Changes in intraocular pressure and pupil size following intramuscular administration of hydromorphone hydrochloride and acepromazine in clinically normal dogs. *Vet. Ophtha.* 6(1): 73-76.
18. Trim, C. M. 1983. Cardiopulmonary effects of butorphanol tartrate in dogs. *Am. J. Vet. Res.* 44(2): 329-331.
19. Ummenhofer, W. C.; Kindler, C.; Tschaler, G.; Hampl, K. F.; Drewe, J. and Urwyler, A. 1998. Propofol reduces succinyl choline induced increase of masseter muscle tone. *Can. J. Anaesth.* 45: 417–423.
20. Valverde, A.; Cantesell, S.; Hernandez, J. And Brotherson, C. 2004. Effects of acepromazine on the incidence of vomiting associated with opioid administration in dogs. *Vet. Anaesth. And Analg.* 31(1): 40-45.
21. Venugopal, A.; Chandrasekhar, E. L. and Haragopal, V. 2002. Effects of propofol-ketamine anaesthesia with or without premedication in dogs. *Indian J. Vet. Surg.* 23(2): 106-107.
22. Vesal, N.; Ali, A.; Sorchani.; Behrooz.; Nikahval and Karampour, A. 2011. Clinical evaluation of the sedative properties of acepromazine xylazine combinations with or without atropine and their effects on physiologic values in dogs. *Veterinarski Arhiv.* 81(4): 485-498.
23. Zoran, L. D.; Riedesel, D. H. and Dyer, D. C. 1993. Pharmacokinetics of propofol in mixed breed dogs and greyhounds. *Am. J. Vet. Res.* 54: 755-760.