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CLINICAL AND HAEMATO-BIOCHEMICAL EFFECTS OF KETAMINE AND THIOPENTAL AS INDUCTION AGENTS FOR ISOFLURANE ANAESTHESIA IN DOGS*

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Abstract
Six dogs of each group following premedication Ketamine and Thiopental sodiumwere used as induction agents. Immediately after induction, the dogs.were intubated and anaesthesia was maintained with inhalation of Isoflurane for castration and ovariohysterectomy procedures.Clinical and haemato-biochemical effects of ketamine and thiopental as induction agents for isoflurane anaesthesia in dogs were studied. Statistical analysis of the data revealed that the difference in the rectal temperature of the dogs was significant (P < 0.05) among the various time intervals and groups. It also revealed that the Heart and respiratory rates differed significantly when compared among the three time intervals and the two groups. Haematological examination revealed that significant differences in the various parameters like TEC, TLC, Hb, PCV, DLC etc between the two groups and the three intervals, the values were still within the normal physiological limits, thereby rendering them clinically insignificant. AST, ALT, BUN and Serum Creatinine remained within normal limits.
Key words: Ketamine,thiopental,Isoflurane,clinical,haemato-biochemica,dogs

I. INTRODUCTION

Inhalation anaesthetics are used widely for the anaesthetics management of animals.Isoflurane is generally considered the most widely used inhalation anaesthetic in veterinary medicine, having replaced halothane (Steffey and Mama, 2007). It offers the importance of safety of the patient and provides greater control of anaesthetic depth to the anaesthetist (Paddleford, 1999 and Hall *et al.*, 2001) However, it is common practice in animals to induce anaesthesia with intravenous or parenterally administered anaesthetics and then to maintain anaesthesia with an inhalation agent. Several induction agents have been used in veterinary anaesthesia, Ketamine (Udegbunam *et al*., 2009), Thiopental sodium (Natalini *et al.*, 2007; Muhammad *et al.*, 2009 and Altug *et al*., 2009), Fentanyl (Paddleford, 1999 and Hall *et al*., 2001) etc., are some of the induction agents employed in canine practice.The present study aimed on Clinical and haemato-biochemical effects of ketamine and thiopental as induction agents for isoflurane anaesthesia in dogs.

II. MATERIALS AND METHODS

The present study was carried out on 12 clinical cases of dogs aged between 1 year to 10 years presented for routine surgical procedures viz. castration and ovariohysterectomy operations. All the dogs were uniformly premedicated.In the six

dogs of group I, Ketamine[a] was used as an intravenous anesthetic induction agent. In dogs of group II, anaesthesia was induced by intravenous administration of Thiopental sodium[c] as a 2.5 percent solution. Immediately after induction, the dogs.were intubated and anaesthesia was maintained with inhalation of Isoflurane during the entire surgical procedure. The physiological parameters like temperature, heart rate, respiratory rate were studied before induction, during anaesthesia and after recovery from anaesthesia.Haematological parameters like TEC, TLC, PCV, Hb, DLC and Biochemical parameters like AST, ALT, BUN and Serum Creatinine were recorded before anaesthesia, during anesthesia and after recovery and were compared.

III. RESULTS AND DISCUSSION

The physiological parameters were studied before anaesthesia, during anaesthesia and at thirty minutes of anaesthetic recovery. The mean rectal temperature before induction, during anaesthesia and after recovery in the dogs of group I was found to be 102.40 ± 0.49^0F, 102.27 ± 0.39^0F and 102.07 ± 0.42^0F respectively. In the dogs of group II, the mean rectal temperature was found to be 102.48 ± 0.44^0F, 99.77 ± 0.39^0F and 99.98 ± 0.35^0F.The average heart rate before induction, during anaesthesia and after recovery in the dogs of group I was found to be 106.83 ± 7.13beats per minute, 135.83 ± 6.26beats per minute and 121.02 ± 5.17 beats per minute respectively. In the dogs of group II, the mean heart rate was found to be 102.33 ± 9.73, 98.09 ± 7.08 and 99.27 ± 8.21beats per minute respectively. The average respiratory rates before induction, during anaesthesia and after recovery in the dogs of group I were found to be 26.50 ± 1.06 breaths per minute, 20.83 ± 1.00 breaths per minute and 21.17 ± 1.25 breaths per minute respectively. In the dogs of group II, the mean respiratory rates were found to be 29.33 ± 1.58, 28.67 ± 1.55 and 28.17 ± 1.46 breaths per minute.

Statistical analysis of the data revealed that the difference in the rectal temperature of the dogs was significant ($P < 0.05$) among the various time intervals and groups. It also revealed that the Heart and respiratory rates differed significantly when compared among the three time intervals and the two groups. The results showed that in all the dogs of groups I and II, anaesthesia resulted in a significant drop in the rectal temperature during and after anaesthesia as compared to the values before induction. Although the heart rates between the groups were found to differ from each other, they were still well within the normal range and hence were considered in consequential. The results however, showed that ketamine induction in the dogs of group I caused a significant reduction of the respiratory rate during the maintenance of anaesthesia and during the recovery period. However, the respiratory rates were still with in the normal range. The respiratory rate returned to normal as the dogs after they fully recovered from anaesthesia. Since these parameters did not result any clinical changes or complications and since they returned to normalcy soon, the changes were considered clinically irrelevant. Similar findings were reported by Likiw *et al*. (1991), Paddleford (1999), Thurmon *et al.* (1999), Hall et *al.*(2001), Lin(2007), Mohammad *et al.*(2009) and Okana *et al.* (2010).

The mean ± standard error TEC values before induction, during anaesthesia and after recovery in the dogs of group I were recorded to be 7.32 ± 0.78, 6.42 ± 0.85and 6.21 ± 0.65millions per cumm respectively. The similar values in the dogs of group II were found to be 7.05 ± 0.91, 6.85 ± 0.75and 6.95 ± 0.61million per cumm respectively.The mean ± standard error TLC values before induction, during anaesthesia and after recovery in the dogs of group I were recorded to be 19.07 ± 2.70, 17.23 ± 2.06 and 17.69 ± 2.34thousands per cumm respectively. The similar values in the dogs of group II were found to be 19.61 ± 5.25, 17.52 ± 5.76and 14.93 ± 3.12thousands per cumm respectively.

The mean ± standard error Haemoglobin (Hb) levels before induction, during anaesthesia and after recovery in the dogs of group I recorded to be 12.92 ± 1.09g/dl, 11.37 ± 1.17 g/dl and 11.08 ± 0.38 g/dl respectively. The similar levels of Hb in the dogs of group II were found to be 13.20 ± 0.84, 12.95 ± 0.65 and 13.03 ± 0.79 g/dl respectively. The mean ± standard error Packed cell volume (PCV) levels before induction, during anaesthesia and after recovery in the dogs of group I recorded to be 39.71 ±

3.05, 33.22 ± 1.65 and 27.02 ± 1.66% respectively. The similar levels of PCV in the dogs of group II were found to be 39.02 ± 2.25, 36.09 ± 2.05 and 39.18 ± 2.17% respectively.

Table.1 Mean values of haematological parameters in dogs anaesthetized with Ketamine and Isoflurane (Group-I; n=6) Thiopental and Isoflurane (Group-II; n=6)

PARAMTER	**Group- I**			**Group-II**		
	Before	**During**	**After**	**Before**	**During**	**After**
TEC (**10^5/cmm**)	7.32 ± 0.78 [a]	6.42 ± 0.85 [b]	6.21 ± 0.65 [b]	7.05 ± 0.91 [a]	6.85 ± 0.75 [a]	6.95 ± 0.61 [a]
Hb(g/dl)	12.92 ± 1.09 [a]	11.37 ± 1.17 [b]	11.08 ± 0.38 [b]	13.20 ± 0.84 [a]	12.95 ± 0.65 [a]	13.03 ± 0.79 [a]
TLC(**10^3/cmm**)	19.07 ± 2.70 [a]	17.23 ± 2.06 [b]	17.69 ± 2.34 [b]	19.61 ± 5.25 [a]	17.52 ± 5.76 [b]	14.93 ± 3.12 [b]
PCV (%)	39.71 ± 3.05 [a]	33.22 ± 1.65 [b]	33.02 ± 1.66 [b]	39.02 ± 2.25 [a]	36.09 ± 2.05 [a]	39.18 ± 2.17 [a]
DLC (**%**)						
N	73.17 ± 5.35 [a]	68.78 ± 4.37 [b]	69.20 ± 3.96 [b]	77.48 ± 2.42 [a]	74.30 ± 2.36 [a]	73.05 ± 1.67 [a]
L	19.22 ± 2.79 [a]	16.06 ± 2.54 [b]	16.87 ± 2.06 [b]	19.33 ± 2.08 [a]	20.90 ± 1.25 [a]	21.52 ± 1.68 [a]
M	5.62 ± 0.87 [a]	5.42 ± 0.49 [a]	5.35 ± 0.51 [a]	5.64 ± 0.87 [a]	5.08 ± 0.67 [a]	5.70 ± 0.33 [a]
E	1.67 ± 0.21 [a]	1.66 ± 0.19 [a]	1.66 ± 0.21 [a]	1.67 ± 0.12 [a]	1.66 ± 0.26 [a]	1.66 ± 0.42 [a]

*-Significant (P≤0.05%) - Means with different superscripts differ significantly.

The mean percentage values for the differential leucocyte counts (DLC) were concerned, the results and statistical analysis concerning the haematological studies of the present study were presented in table 1. Haematological examination revealed that while statistical analysis showed significant differences in the various parameters like TEC, TLC, Hb, PCV, DLC etc between the two groups and the three intervals, the values were still within the normal physiological limits, thereby rendering them clinically insignificant. This underscored the fact that the anaesthetic protocols studied were safe and uneventful as far as these observations were concerned. Hall *et al.*(2001), Ohata *et al.*(2001), Jadon *et al.* (2008), and Udegbunam *et al.* (2009) and also made similar observations.

In the dogs of group I, the mean levels of serum AST before induction, during anaesthesia and after recovery were recorded to be 57.08 ± 5.46 units/ml, 64.06 ± 7.073units/ml and 67.26 ± 7.29 units/ml respectively. The similar values in the dogs of group II were found to be 59.06 ± 6.07, 62.23 ± 5.11 and 65.11 ± 6.05 units/ml respectively.The mean serum ALT levels before induction, during anaesthesia and after recovery in the dogs of group I recorded to be 30.07 ± 2.31 units/ml, 34.62 ± 4.06units/ml and 36.11 ± 3.88 units/ml respectively. The similar values in the dogs of group II were found to be 29.05 ± 3.09, 30.66 ± 3.12 and 34.15 ± 4.07 units/ml respectively.

Table.2 Mean values of biochemical parameters in dogs anaesthetized with of Ketamine And Isoflurane (Group-I; n=6); Thiopental and Isoflurane (Group-II; n=6)

PARAMETERS	**Group- I**			**Group-II**		
	Before	**During**	**After**	**Before**	**During**	**After**
AST (IU/L)	57.08 ± 5.46 [a]	64.06 ± 7.03 [a]	67.26 ± 7.29 [a]	59.06 ± 6.07 [a]	62.23 ± 5.11 [a]	65.11 ± 6.05 [a]
ALT (IU/L)	30.07 ± 2.31 [a]	34.62 ± 4.06 [a]	36.11 ± 3.88 [a]	29.05 ± 3.09 [a]	30.66 ± 3.12 [a]	34.15 ± 4.07 [a]
BUN (mg/dl)	16.73 ± 2.76 [a]	19.71 ± 2.01 [a]	21.23 ± 2.41 [a]	16.06 ± 2.33 [a]	18.31 ± 2.17 [a]	19.62 ± 3.02 [a]
Serum Creatinine(mg/dl)	0.72 ± 0.06 [a]	0.77 ± 0.04 [a]	0.81 ± 0.08 [a]	0.70 ± 0.07 [a]	0.76 ± 0.05 [a]	0.81 ± 0.07 [a]

*-Significant (P≤0.05%) - Means with different superscripts differ significantly.

In the dogs of group I, the mean levels of BUN before induction, during anaesthesia and after recovery were recorded to be 16.73 ± 2.76 mg/dl, 19.71 ± 2.01mg/dl and 21.23 ± 2.41 mg/dl respectively. The similar values in the dogs of group II were found to be 16.06 ± 2.33, 18.31 ± 2.17 and 19.62 ± 3.02 mg/dl respectively.In the dogs of group I, the mean levels of serum creatinine before induction, during anaesthesia and after recovery were recorded to be 0.72 ± 0.06 mg/dl, 0.77 ± 0.04 mg/dl and 0.81 ± 0.08 mg/dl respectively. The similar values in the dogs of group II were found to be 0.70 ± 0.07, 0.76 ± 0.05 and 0.81 ± 0.07 mg/dl respectively.

The data pertaining to the values of the biochemical estimations in the present study and their statistical analysis by analysis of variance are presented in table 2. The results of the present clinical study clearly revealed beyond any doubt in all the twelve dogs of the two groups that all the biochemical parameters studied, i.e., AST, ALT, BUN and Serum Creatinine remained within normal limits. Statistical analysis of the data obtained also revealed that the changes in the individuals within a group or changes within the individual groups across the time intervals were not significant. Hence, this also conclusively proved that the two anaesthetic protocols studied were safe and did not result in any damage to the heart, liver or kidneys during the anaesthetic period. Similar observations were also made by Lin (2007), Jadon *et al*. (2008).Altug *et al.* (2009) and Udegbunam *et al.* (2009).

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