Libyan Journal of Basic Sciences (LJBS)
Vol: 18, No: 1 , P:118-135 , December. 2022 https://ljbs.omu.edu.ly/ eISSN 2707-6261

Clinical and Hematological Effects of Ketamine alone and Ketamine-Acepromazine in Combination in Local Breed Dogs

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DOI: https://doi.org/10.54172/sw5ew296

Abstract

To select the best general anesthetic mixture for use during surgical procedures on the local breed of dogs in Al-Bayda, Libya, an experimental study was carried out to compare the effects of ketamine alone and in combination with acepromazine on anesthetic parameters, on physiological and hematological parameters. Twenty dogs of a local breed were used in the experimental investigation, and they were randomly divided into 2 groups of ten dogs each. Using physical recording and laboratory analysis, information was gathered to examine the physiological consequences of anesthetic combinations, including anesthetic effects and hematological effects. According to the study's findings, acepromazine and ketamine together resulted in a general anaesthetic duration of (55.50 ± 7.849) min and an animal recovery time of (72.8 ± 10.454) min, whereas ketamine alone produced a general anesthetic duration of (29.50 ± 5.986) min. The result also showed that the physiological and hematological parameters remained significantly unchanged during the anesthesia in both groups. Since acepromazine and ketamine have a longer duration of action on the dog brain than other anesthetic combinations, they were a good choice for surgical procedures on local breed dogs. However, other anesthetic combinations may also be used.

Keywords: Acepromazine, Ketamine, Corneal Reflex, Pedal Reflex and Palpebral reflex.

Introduction

For surgical treatments to be successful and to produce the desired hypnosis, analgesia, and muscle relaxation, balanced anesthesia is essential (*1*, *2*). For performing the primary procedures in small animal practice, longer-lasting general anesthesia is necessary. To guarantee a quick and secure recovery, an ideal anaesthetic regimen for such surgeries necessitates the administration of medications with minimum cardiac depressive effects, optimal hypnosis, and adequate muscle relaxation(*3*, *4*).

It is possible to define dissociative anesthesia as discontinuous unconsciousness associated with significant analgesia. It is characterized by catalepsy, analgesia, and amnesia (*5*, *6*). Dissociative anesthesia can result in a state of anesthesia in which the patient appears to be disconnected from their surroundings and selectively impairs the neuronal activity of the thalamo-neocortical axis and the central nucleus of the thalamus while simultaneously stimulating a specific region of the limbic system (*7*).

Dissociative anesthetics have the potential to completely change how dogs and cats are managed during anesthesia. Muscle rigidity and the existence of several reflexes, including swallowing, laryngeal, corneal, palpebral, and conjunctival reflexes, which are typically absent when other general anesthetic agents are administered, are characteristics of the dissociative state produced by these drugs (*8*). Recent research findings suggested that dissociative drugs function via excitement of the central nervous system rather than by depression. The liver only partially metabolizes the dissociative drugs, with renal excretion of metabolites. The kidneys primarily excrete the dissociative agents intact Since ketamine alone has a limited muscle-relaxing effect, it is often coupled with powerful phenothiazine derivatives like acepromazine and 2-agonists like xylazine or detomidine (*9*).

Ketamine hydrochloride, a phencyclidine congener, is a special dissociative general anesthetic that doesn't significantly irritate tissue

and causes less circulatory depression when injected intramuscularly or intravenously (*10*).

Acepromazine, a phenothiazine chemical and the 2-acetyl derivative of promazine, is the most frequently prescribed sedative in veterinary medicine (*11*). It acts on the central nervous system (CNS) by depressing connections between the brain stem and the cerebral cortex (*7*). Along with an anti-emetic effect, it also results in general calmness and a decrease in motor activity.

Therefore, the objects objective of this paper is to compare the physiological, hematobiochemical, and anesthetic effects of using ketamine alone and ketamine in combination with Acepromazine for surgical procedures in Libyan local breed dogs.

Materials and Methods:

Study design:

A complete randomized design was used to determine A Comparison between the effects of Ketamine with the effects of Ketamine-Acepromazine in combination in local breed dogs. The experimental protocol was approved by the Libyan national committee for biosafety and bioethics (Reference No: LNCBB04-2022).

Animals:

The study involved 20 healthy local breed dogs aging from 6 to 18 months and weighing between 6 and 13 kg. Dogs are brought to the Department of Animal Medicine and Surgery at Omar Al-Mukhtar University's University Veterinary Hospital in Al-Bayda, Libya. These dogs were kept under sanitary and uniform management conditions.

All of the animals' body weights were recorded, and blood, urine, and feces samples were tested to measure their health, as well as cardiovascular, and respiratory systems. This study only included animals who were free of parasite infestations and had a blood picture that was within the normal range. The animals were kept in good health both before and during the study. Before the anaesthetic treatment, the animals were fasted overnight and given no water for 6 hours.

The animals were divided into two groups, each one with ten animals. Ten dogs were randomly allocated to a ketamine-only induction regimen

(Group **I**) and the other ten dogs to a Ketamine-Acepromazine combination, induction regimen (Group **II**). The dogs were kept in separate kennels and fed Dry Food (Havens Company). Each dog was denied food and drink for 6 and 12 hours, respectively, before anesthesia. These dogs were confined to a quiet kennel and left alone. Before premedication, the heart rate, respiration rate, and temperature were all monitored. Before premedication, blood samples were obtained. All dogs were given 0.04 mg/kg body weight of atropine sulphate subcutaneously to reduce salivary and bronchial secretions fifteen minutes before induction of anesthesia with Ketamine alone or Ketamine-Acepromazine in combination (Table.1).

Table 1: Doses Anaesthetic of given to each group

Groups	No. of Animals	Pre anaesthetic Dose and route	Anaesthetic dose and route for Induction	Anaesthetic dose and route after one week
I	10	Atropine@0.04mg/kg s/c.	KETAMINE @ 5mg per kg IM.	KETAMINE @ 10mg per kg IM.
II	10	Atropine@0.04mg/kg s/c.	Acepromazine and ketamine 5mg per kg IM, 0.05mg per kg IM	Acepromazine and ketamine 10 mg per kg IM, 0.1mg per kg IM.

Base parameters were recorded and blood samples were collected for normal haematological levels before the anaesthesia treatment.

Parameters Studied:

Clinical parameters:

- **The onset of sedation/analgesia:**

The period from the delivery of anaesthetic until the dog became calm and quiet, with a reduced reaction to external stimuli, was recorded as the beginning of sedation. There were four levels of sedation: none, minor, moderate, and deep.

- **The duration of anaesthesia:**

The duration of anaesthesia was noted as the time taken from the onset of sedation/analgesia till the return of pedal reflex and pinprick reflexes after surgical anaesthesia.

- **Complete recovery**:

The period spent from the commencement of sedation/analgesia until the animal made its first movement, such as raising its head, attaining sternal posture, and attempting to stand, was recorded as complete recovery.

- **Body reflexes:**

- **Rightening reflex :**

During the evaluation after the administration of the anesthetic combinations, the rightening reflex was triggered by pinching or squeezing a digit of the forelimb, and it was observed if the dog flexed the leg or withdrew the digit from the investigator.

- **Pedal reflex:**

After administering the anesthetic combinations, the dog was examined while the pedal reflex was being observed by pinching or squeezing a digit of the hind limb and observing whether the dog flexed the leg or withdrew the digit from the investigator.

- **Palpebral reflex:**

The palpebral reflex was tested by lightly taping the lateral canthus or medial canthus of the eye and observing whether the dog blinks in response after administration of the anesthetic combinations.

- **Corneal reflex :**

A drop of sterile water was used to test the dog's corneal reflex, which involves contacting the cornea and watching to see if the dog blinks or pulls its eye into the orbital fossa.

Physiological Parameters:

Dogs in all groups were maintained under strict monitoring after receiving ketamine alone and in combination with acepromazine. We kept track of the induction time, anesthetic duration, and recovery time. Following the injection of the anesthetic combinations, rectal temperature, respiration rate, and heart rate were measured at 5, 10, 15, 20, 25, 30 & 60 minutes.

- **Hematological Parameters:**

Each experimental dog had three ml of blood drawn from the cephalic vein before the premedication (atropine sulphate) and 30-45 minutes after the anesthetic agents were administered because this is when the effects were at their peak. In order to estimate hemoglobin, mean corpuscular volume,

hematocrit, mean corpuscular hemoglobin concentration, white blood cells, red blood cells, and differential leukocyte counts, blood samples were transferred into sterile test tubes with Ethylene Diamine Tetraacetic Acid (EDTA) as an anticoagulant as soon as they were collected. According to the procedures of (*12-14*).

Data Collection:

Data were collected on physiological effects (rectal temperature, heart rate, and respiratory rate), anesthetic effects (induction period, duration of anesthesia, recovery period,) and hematological effects (packed cell volume, red blood cells, white blood cells, hemoglobin concentration, and differential leukocyte counts.

Data Analysis:

The recorded data was loaded into a Microsoft Excel spreadsheet and analyzed using the Statistical Package for Social Sciences (SPSS) version 23 to determine the Mean and SD (Standard Deviation) (*15*). Comparing physiological and hematological measurements made before and throughout the administration of the drug combination for each group was done using a paired t-test. Analysis of Variance in One Way. To compare the means of induction time, anesthesia duration, and recovery time between the groups, an analysis of variance (ANOVA) with a 95% confidence interval (CI) was employed to assess the level of significance of the difference in mean values among the three groups. Values of $p>0.05$ were considered non-significant. And values of $p\leq 0.05$ were considered statistically significant (*16*).

Results:

Anesthetic Effects of Ketamine alone and Ketamine- acepromazine Combination:

In this study, onset of action, duration of action and recovery time of the ketamine alone at a respective dose of 5 mg/kg body weight given intramuscularly were 2.70 ± 0.483, 29.50 ± 5.986, and 49.50 ± 9.265 minutes, respectively, whereas the recorded onset of action, duration of action and recovery time of the ketamine alone at a respective dose of 10 mg/kg body weight given intramuscularly were 2.90 ± 5.986, 33.90 ± 8.875 and 82.60 ± 6.569, respectively, whereas the recorded onset of action, duration of action and recovery time of the anesthetic combination of acepromazine – ketamine at 0.05 mg/kg and 5mg/kg body weight given intramuscular, respectively were 3.80 ± 0.919, 55.50 ± 7.849 and 72.8 ± 10.454 minutes. The recorded

onset of action, duration of action, and recovery time of the anesthetic combination of acepromazine – ketamine at 0.1 mg/kg and 10 mg/kg body weight given IM, respectively were 2.20 ± 0.422, 62.40 ± 8.501and 82.60 ± 6.569 minutes. In this study, the onset of action was shorter whereas the duration of action and recovery time was longer in the anesthetic combination of acepromazine – ketamine at 0.1 mg/kg and 10 mg/kg, respectively when compared to the anesthetic combination of acepromazine – ketamine at 0.05 mg/kg and 5 mg/kg, So, in this study, the duration of anesthesia was longer in ketamine -acepromazine combination as compared with ketamine alone (Table 2).

Table 2: Effects of ketamine alone (Group I), and acepromazine-ketamine combination (Group II) on the onset of action, duration, and recovery time.

Anesthetic agents	Doses (mg/kg)	Onset of action (min)	Duration of action (min)	Recovery time (min)
Group **I**	5mg	2.70 ± 0.483	29.50 ± 5.986	49.50 ± 9.265
	10mg	2.90 ± 5.986	33.90 ± 8.875	57.80 ± 11.574
Group **II**	0.05mg	3.80 ± 0.919	55.50 ± 7.849	72.8 ± 10.454
	0.1mg	2.20 ± 0.422	62.40 ± 8.501	82.60 ± 6.569

Body Reflexes Activity:

Rightening Reflex:

To determine the level of anesthesia, the current study measured the various bodily reflex activities during anesthesia. During the evaluation after the administration of the anesthetic combinations, the rightening reflex was triggered by pinching or squeezing a digit of the forelimb, and it was observed if the dog flexed the leg or withdrew the digit from the investigator. The reaction at doses of 5mg and 10mg of ketamine alone was gone at 14.5 ± 7.59 and 3.5 ± 1.65 minutes whereas the reaction of ketamine – acepromazine combination at doses of (5mg and 0.05mg) was gone at 7.5 ± 1.841 and doses of (10mg and 0.1mg) was gone at 2.5 ± 0.527 (Table 2). In this study, the loss of reaction of righting reflex was shorter in ketamine -acepromazine combination at doses of 10mg and 0.1mg as compared with ketamine

alone the rightening reflex persisted in both groups of this investigation throughout the anesthesia.

Palpebral Reflex:

After administering the anaesthetic combinations, the palpebral reflex was evaluated by lightly taping the medial or lateral canthus of the eye and watching to see if the dog responded by blinking. The reaction at doses of 5mg and 10mg of ketamine alone was gone at 14.5 ± 7.59 and 3.5 ± 1.65 minutes whereas the reaction of ketamine – acepromazine combinations at the dose of (5mg and 0.05mg) was gone at 7.5 ± 1.841 and the dose of (10mg//0.1mg) was gone at 2.5 ± 0.527 (Table 2). In this study, the loss of reaction of palpebral reflex was shorter in ketamine -acepromazine combination at doses of 10mg and 0.1mg as compared with ketamine alone the palpebral reflex persisted in both groups of this investigation throughout the anaesthesia.

Corneal Reflex, Eye Position, and Pupil Size:

A drop of sterile water was used to test the dog's corneal reflex, which involves contacting the cornea and watching to see if the dog blinks or pulls its eye into the orbital fossa. The time for corneal reflex loss in this observation was the same as the time for palpebral reflex loss in all four groups (Table 2). Throughout the anesthetic, the eyes in both groups remained open with a central, dilated pupil. The corneal reflex in both groups in this investigation remained unaltered during the anaesthetic.

Pedal Reflex:

After administering the anaesthetic combinations, the dog was examined while the pedal reflex was being monitored by pinching or squeezing a digit of the hind limb and observing if the dog flexed the leg or withdrew the digit from the investigator. The reaction at doses of 5mg and 10mg of ketamine alone was gone at 14.5 ± 7.59 and 3.5 ± 1.65 minutes whereas the reaction of ketamine – acepromazine

combinations at doses of (5mg and 0.05mg) was gone at 7.5 ± 1.841 and the dose of (10mg and 0.1mg) was gone at 2.5 ± 0.527 (Table 3). In this study, the loss of reaction of pedal reflex was shorter in ketamine -acepromazine combination at the dose of 10mg and 0.1mg as compared with ketamine alone the pedal reflex persisted in both groups of this investigation throughout the anaesthesia (Table 3).

Table 3: Loss of body reflexes activity.

		Loss of body reflexes in minutes			
group	Doses (mg/kg)	Righting reflex	Palpebral reflex	Corneal reflex	Pedal reflex
I	5mg	14.5 ± 7.59	14.5 ± 7.59	14.5 ± 7.59	14.5 ± 7.59
	10mg	3.5 ± 1.65	3.5 ± 1.65	3.5 ± 1.65	3.5 ± 1.65
II	5mg / 0.05mg	7.5 ± 1.841	7.5 ± 1.841	7.5 ± 1.841	7.5 ± 1.841
	10mg / 0.1mg	2.5 ± 0.527	2.5 ± 0.527	2.5 ± 0.527	2.5 ± 0.527

Physiological Effects of Ketamine alone and Ketamine – Acepromazine Combination:

In this study, the heart rate was increased significantly (P = 0.013) at the dose of 5mg of ketamine alone from 95.0 ± 15 .4 up to 122.2 ± 23.3 minutes, whereas at the dose of 10mg of ketamine increased non-significantly (P = 0.055) (Table 4). And at the doses of the combination of ketamine – Acepromazine showed a increase non-significantly in both doses 5mg/0.05 (P = 0.265) and 10mg/0.1mg (P = 0.185). (Table 5).

The respiratory rate was increase significantly in group I of ketamine alone in both doses, 5mg (P = 0.020) and 10mg (P = 0.015) (Table 4) whereas the respiratory rate was increased non-significantly in group II of ketamine – Acepromazine combination at both doses, 5mg/0.05mg (P = 0.199) and 10mg/0.1mg (P = 0.806) (Table 5).

The recorded rectal temperature was decrease non-significantly in group I, 5mg (P = 0.357) and 10mg (P = 0.139). (Table 4). Whereas it decreased significantly in group II, 5mg/0.05mg (P = 0.000) and 10mg/0.1gm (P = 0.01). (Table 5).

Table 4: (Group I.) Effects of ketamine alone on heart rate (HR), respiratory rate (RR), and rectal temperature (RT).

Parameters	Doses (mg/kg)	Time interval in minutes							
		0	5	10	15	20	25	30	60
HR (beam/min)	5mg	95.0 ± 15.4	115.4 ± 23.8	114.3 ± 23.8	109.6 ± 20.4	116.1 ± 16.6	122.2 ± 22.3	118.4 ± 24.0	112.0 ± 29.1
	10mg	103.6 ± 27.2	133.0 ± 27.25	120.5 ± 27.0	138.1 ± 34.6	144.9 ± 34.1	126.8 ± 33.6	116.1 ± 19.0	119.5 ± 23.8
RR (breath/min)	5mg	22.4 ± 6.2	31.1 ± 13.1	35.5 ± 19.4	33.2 ± 24.9	33.6 ± 14.5	26.1 ± 9.3	21.8 ± 5.2	25.6 ± 8.3
	10mg	23.3 ± 6.76	31.8 ± 8.76	24.4 ± 6.44	32.8 ± 10.75	26.4 ± 6.78	30.4 ± 5.64	33.2 ± 9.80	26.8 ± 6.47
R T (℃)	5mg	38.6 ± 0.42	38.3 ± 0.43	37.8 ± 0.86	37.6 ± 0.57	37.2 ± 0.7	37.0 ± 0.67	36.7 ± 0.65	36.8 ± 1.17
	10mg	38.0 ± 1.05	38.4 ± 0.59	38.3 ± 0.65	38.1 ± 0.58	37.9 ± 0.62	37.8 ± 0.62	37.4 ± 1.21	37.6 ± 0.86

HR=Heart rate, RR=Respiratory rate, RT=Rectal temperature.

Table 5: (Group II.) Effects of acepromazine- ketamine combination on heart rate, respiratory rate, and rectal temperature.

Parameters	Doses (mg/kg)	Time interval in minutes							
		0	5	10	15	20	25	30	60
HR (beam/min)	5mg 0.1mg	95.0 ± 15.49	115.4 ± 23.86	114.3 ± 26.29	109.6 ± 20.45	116.1 ± 16.65	122.2 ± 22.37	118.4 ± 24.01	112.0 ± 9.20
	10mg 0.1mg	103.6 ± 27.00	111.3 ± 34.19	106.6 ± 17.75	104.9 ± 12.80	114.6 ± 15.32	123.7 ± 14.06	123.1 ± 17.87	106.6 ± 17.18
RR (breath/min)	5mg 0.05mg	22.4 ± 6.25	31.1 ± 13.13	35.5 ± 19.46	33.2 ± 24.29	33.6 ± 14.51	26.1 ± 9.33	21.8 ± 5.20	25.6 ± 8.35
	10mg 0.1mg	23.9 ± 8.27	28.3 ± 10.96	27.6 ± 9.93	27.2 ± 7.91	29.5 ±9.84	29.9 ± 9.02	29.60 ± 7.42	26.20 ± 5.95
R T (℃)	5mg 0.05mg	38.6 ± 0.42	38.3 ± 0.43	37.8 ± 0.86	37.6 ± 0.57	37.2 ± 0.70	37.0 ± 0.67	36.7 ± 0.65	36.8 ± 1.17
	10mg 0.1mg	38.5 ± 0.76	38.7 ± 0.68	38.5 ± 0.42	38.5 ± 0.44	38.2 ± 0.40	37.8 ± 0.47	37.5 ± 0.50	37.7 ± 1.39

HR=Heart rate, RR=Respiratory rate, RT=Rectal temperature.

Hematological Effects of Ketamine alone and Ketamine – Acepromazine Combination:

In the current study, blood samples were taken before and during the administration of ketamine alone and the anesthetic combinations of acepromazine ketamine for evaluating haemoglobin concentration.

Haematocrit, red blood cells, mean corpuscular volume, mean corpuscular haemoglobin concentration, white blood cells, neutrophils, lymphocytes, monocytes, basophils, eosinophils, and platelets.

In group I and at the dose of 5mg of ketamine alone, MCH ($P = 0.596$), N% ($P = 0.236$), B% ($P = 0.896$), and PLT ($P = 0.24$), were decreased non-significantly, whereas the MCV ($P = 0.075$), WBC ($P = 0.084$), L% ($P = 0.095$), and E% ($P = 0.312$), where increased non-significantly. And Hg, HTC, RBC, MCHC and RBC ($P<0.05$) where decreased significantly (Table 5).

In group I and at dose of 10mg of ketamine alone, WBC ($P = 0.75$), and L% ($P = 0.229$) were increased non-significantly, and N% ($P = 0.116$), M% ($P = 0.768$) and B% ($P = 0.896$) were decreased non-significantly. Whereas Hg, HTC MCV, MCH, E% and PLT ($P<0.05$) were decreased significantly, and MCHC ($P<0.05$) were increased significantly (Table 5).

In group II and at the dose of 5mg/0.05mg of ketamine/acepromazine combinations, RBC ($P = 0.525$), and MCHC ($P = 0.343$) were decreased non-significantly. M% ($P = 0.050$), and B% ($P = 1.000$), were increased non-significantly. Whereas Hg, HTC, MCV, N%, and B% ($P<0.05$) were decreased significantly and WBC ($P<0.05$) were increased significantly (Table 5).

In group II and at the dose of 10mg/0.1mg of ketamine/acepromazine combinations, MCH ($P = 0.404$), MCHC ($P = 0.059$) WBC ($P = 0.854$), N% ($P = 0.082$), and E% ($P = 0.407$) were decreased non-significantly, and B% ($P = 0.242$) were increased non-significantly. Whereas Hg, HTC, RBC, MCV, L% and PLT ($P<0.05$), were increased significantly (Table 5).

Table. 5 Effects of ketamine alone and ketamine-acepromazine combination on haematological parameters.

Groups	Doses mg/kg		HBg/dl	HTC	RBC	MCV /fl	MCH /pg	MCHC /g/dl	WBC /ul	N%	L%	M%	B%	E%	PLT
I	5mg	BA	13.6 ±2.35	38.0 ±6.63	5.6 ±0.85	64.4 ±8.46	28.1 ±13.7	35.8 ±0.53	181526 ±9986.1	27.7 ±8.2	52.0 ±6.6	18.5 ±8.1	0.7 ±0.4	1.0 ±1.0	123.1 ±52.6
		DA	13.2 ±2.59	36.4 ±6.62	5.4 ±0.91	66.5 ±3.44	23.9 ±1.21	35.8 ±0.54	18355.0 ±7435.7	23.8 ±6.0	61.3 ±7.2	13.0 ±7.6	0.3 ±0.4	1.6 ±0.9	115.8 ±33.6
	10mg	BA	12.8 ±1.52	34.2 ±4.20	5.0 ±0.62	67.8 ±2.75	25.6 ±1.04	37.6 ±1.30	12.092. ±8743.3	24.0 ±8.69	55.8 ±6.84	18.1 ±2.76	0.6 ± +0.51	1.5 ±1.17	153.6 ±69.4
		DA	12.6 ±2.64	32.7 ±7.17	4.8 ±1.12	67.0 ±2.28	25.4 ±0.82	37.7 ±0.93	13160.0 ±8304.2	23.9 ±7.65	61.5 ±12.8	14.4 ±5.83	0.6 ±0.51	1.4 ±1.17	111.4±59.9
II	5mg 0.05mg	BA	12.1 ±0.97	33.3 ±2.97	4.9 ±0.25	66.9 ±3.42	24.5 ±1.09	36.8 ±0.94	15070.0 ±3914.6	22.2 ±7.1	59.9 ±9.7	15.9 ±5.2	0.5 ±0.5	1.5 ±1.1	254.7 ±110.3
		DA	10.6 ±0.63	30.0 ±1.67	4.5 ±0.18	66.3 ±3.44	24.1 ±1.43	36.4 ±0.86	11780.0 ±3681.0	23.3 ±9.36	56.4 ±9.91	17.5 ±3.88	0.6 ±0.51	1.1 ±0.99	242.8 ±129.6
	10mg 0.1mg	BA	13.6 ±1.05	35.5 ±4.38	5.5 ±0.64	69.0 ±1.09	24.2 ±0.99	35.3 ±1.84	18260.0 ±5767.1	18.3 ±4.37	63.2 ±5.93	16.5 ±1.62	0.5 ±0.52	1.4 ±0.96	297.2 ±41.50
		DA	11.53 ±0.77	32.4 ±3.09	4.8 ±0.44	68.1 ±1.15	23.6 ±0.78	35.0 ±1.02	12160.0 ±1338.0	19.0 ±4.50	63.2 ±5.93	15.8 ±3.57	0.6 ±0.51	1.0 ±0.47	249.7 ±83.26

Hg = Hemoglobin concentration, HTC = haematocrit, RBC = red blood cells, MCV = mean corpuscular volume, MCH = mean corpuscular haemoglobin, MCHC = mean corpuscular haemoglobin concentration, N% = Neutrophil, L% = Lymphocyte, M% = Monocyte, E% = Eosinophil, B%= Basophil.

Discussion:

Ketamine is typically combined with acepromazine, diazepam, and xylazine to reduce the side effects. It is rarely used alone because it is associated with inadequate muscle relaxation, tachycardia, and catalepsy or muscle rigidity. The dogs in Group 2 had the longest periods of anesthesia compared to the other groups. Because acepromazine and ketamine are highly soluble in lipid and can be redistributed into muscles and adipose tissues, this may be caused by their widespread distribution in the body (*17*). This finding's distinction from earlier research may be the result of variations in the breed and physiological condition of the dogs or the anesthetic agent dose. The hypothalamic thermoregulatory center being blocked may explain the drop in body temperature following the administration of ketamine alone and acepromazine-ketamine.

In the present study, the average duration of anesthetic induction after administration of acepromazine - ketamine at a dose of 0.01 mg/kg and 5 mg/kg, and ketamine alone at 5 mg/kg respectively were 55.5 ± 7.849 and 29.5 ± 5.98 minutes. This finding agrees with the studies by (*18*) reported 35.7 minutes of the average duration of anesthesia after administration of acepromazine and ketamine combination, also the onset of action was similar in the present finding when compared to observations separated by (*18*) he had reported average 4.2 minutes after administration of acepromazine and ketamine combination, in the present study the onset of action was reported at the 3.80 ± 0.909 & 2.70 ± 0.483. The slower onset of action in the present finding, when compared to the other studies, might be due to a difference in the breed of the dog or a difference in the physiological status of the dog.

In this study, after administration of ketamine alone heart rate was increased significantly after administration both doses 5mg and 10mg, respiratory rate was increased significantly after administration of both doses 5mg and 10mg, and rectal temperature was decreased non-significantly in both doses of ketamine alone. And the administration of ketamine – acepromazine combinations heart rate was

increased non-significantly after administration of both doses 5mg/0.05mg and 10mg/0.1mg, and respiratory rate was increased non-significantly after administration of both doses 5mg/0.05mg and 10mg0.1mg, significantly after administration of both doses 5mg and 10mg, and rectal temperature was decreased significantly in both doses of ketamine – acepromazine combination.

After administration of ketamine alone and at the dose of 5mg, mean corpuscular haemoglobin, Neutrophil, Basophil, and Platelet were decreased non-significantly, whereas the Mean corpuscular volume, White blood cells, Lymphocyte, and Eosinophil, were increased non-significantly. And Haemoglobin, Haematocrit, Red blood cells, mean corpuscular Haemoglobin concentrations, and Red blood cells ($P<0.05$) were decreased significantly. And at the dose of 10mg, White blood cells, and lymphocytes were increased non-significantly, and neutrophils, monocytes, and Basophile were decreased non-significantly. Whereas Haemoglobin, Haematocrit, Mean corpuscular volume, Mean corpuscular haemoglobin, Eosinophil, and Platelet ($P<0.05$) were decreased significantly, and Mean corpuscular Haemoglobin concentrations, ($P<0.05$) were increased significantly. Pooling of circulating blood cells in the spleen and other reservoirs secondary to decreased sympathetic activity could be the reason for a decrease in hemoglobin concentration, packed cell volume, total erythrocyte count, total leukocyte count, lymphocyte, monocyte, eosinophil, and basophil (*19*).

After administration of ketamine/acepromazine combinations, at the dose of 5mg/0.05mg, Red blood cells, Mean corpuscular and Haemoglobin concentrations were decreased non-significantly, and Monocytes were increased non-significantly, Whereas Haemoglobin, Haematocrit, Mean corpuscular volume, Neutrophil, and Basophil ($P<0.05$) were decreased significantly and White blood cells ($P<0.05$) were increased significantly.

After administration of ketamine/acepromazine combinations at the dose of 10mg/0.1mg, Mean corpuscular volume, Mean corpuscular haemoglobin concentration, White blood cells, Neutrophil, and

Eosinophil were decreased non-significantly, and Basophil was increased non-significantly. Whereas Haemoglobin, Haematocrit, Red blood cells, mean corpuscular volume, Lymphocyte, and Platelet ($P<0.05$), were increased significantly.

Following administration of the acepromazine and ketamine combination, the decrease in hemoglobin concentration, packed cell volume, total erythrocyte count, total leukocyte count, lymphocyte, monocyte, eosinophil, and basophils may have been caused by the fluid moving from the extravascular compartment to the intravascular compartment to maintain normal cardiac output in the dogs (*20*). This finding agrees with the findings of (*21*), who had observed increased neutrophils following administration of acepromazine at 0.04 mg/kg and ketamine at 10 mg/kg in combination to dogs. They also reported decreased hemoglobin concentration, packed cell volume, total erythrocyte count, total leukocyte count, lymphocyte, monocyte, eosinophil, and basophil counts.

Conclusion:

The results of the present study concluded that acepromazine-ketamine combination is useful anesthetic protocol for rapid induction, prolonged duration of anesthesia; acepromazine-ketamine combination is useful anesthetic protocol for short duration of anesthesia and rapid recovery. All drug combinations do not affect the physiological and hematological parameters of the animals during the study time and all of them can be safe for surgical procedures if used safely and appropriately.

Acknowledgment :

The authors would like to thank the University Veterinary Hospital (UVH), Omar Al-Mukhtar University, Al-Bayda, Libya for the facilities provided and help rendered during the study.

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التأثيرات السريرية والدموية للكيتامين وحده ومزيج الكيتامين مع الاسيبرومازين في سلالات الكلاب المحلية

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المستخلص العربي

من أجل اختيار أفضل مزيج مخدر عام لاستخدامه أثناء العمليات الجراحية أجريت دراسة تجريبية لمقارنة تأثيرات الكيتامين بمفرده وبالاقتران مع الايسيبرومازين على سلالة الكلاب المحلية في مدينة البيضاء ، ليبيا، على معايير التخدير وعلى المعايير الفسيولوجية والدموية. تم استخدام عشرين كلبًا من سلالة محلية في البحث التجريبي وتم تقسيمهم عشوائيًا إلى مجموعتين من كل مجموعة عشرة كلاب. باستخدام التحليل ألمختبري لعينانت الدم وتسجيل ردات الفعل للحيوان وبداية وقت التخدير وطول فترة التخدير ووقت استيقاض الحيوان، تم جمع المعلومات لفحص النتائج الفسيولوجية لتركيبات التخدير، بما في ذلك آثار التخدير والتأثيرات الدموية. وفقًا لنتائج الدراسة، نتج عن الأسيبرومازين والكيتامين معًا مدة تخدير عامة قدرها (55.50 ± 7.849) دقيقة ووقت استيقاض للحيوان (72.8 ± 10.454) دقيقة، في حين أن الكيتامين وحده أنتج مدة تخدير عامة تبلغ (29.50 ± 5.986) دقيقة. وأظهرت النتائج أيضًا أن المعلمات الفسيولوجية والدمية ظلت دون تغيير معنوي أثناء التخدير في كلا المجموعتين. نظرًا لأن الايسيبرومازين والكيتامين لهما مدة عمل أطول على دماغ الكلب مقارنة بمجموعات التخدير الأخرى، فقد كانا خيارًا جيدًا للإجراءات الجراحية على كلاب السلالات المحلية. ومع ذلك، يمكن أيضًا استخدام تركيبات تخدير أخرى.

الكلمات المفتاحية: اسيبرومازين ، كيتامين ، انعكاس القرنية ، انعكاس الدواسة و منعكس الجفن.