WALIA journal 30(1): 9-11, 2014
Available online at www.Waliaj.com
ISSN 1026-3861

Effects of the ketamine/xylazine cocktail anaesthesia on haematological parameters in Lori-Bakhtiari sheep

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Abstract: The effects of the ketamine/xylazine cocktail intravenous (IV) an aesthesia on haematological parameters were evaluated in ten Lori-Bakhtiari sheeps 5 females and 5 males with mean body weight of 20 ± 2kg. Each sheep was given a recommended dose of the drugs combination: xylazine at 0.01mg/kg and ketamine at 5mg/kg body weight IV. Pre injection blood samples were obtained and at 15 minutes interval during an aesthesia in EDTA bottles and later analyzed. The parameters evaluated were packed cell volume (PCV), haemoglobin concentration (Hb), red blood cells (RBC), white blood cells (WBC), and differential leucocytes (neutrophils, eosinophils, basophils, lymphocytes and monocytes). The ketamine-xylazine combination produced a significant decrease in PCV values from 30 minutes (23.41±1.00 %) to 90 minutes (24.00±1.55%) compared with baseline value (29.63±1.47%); Hb also decreased significantly at 45mins. RBC and WBC values showed no significant difference compared with baseline values. Neutrophils decreased significantly at 45mins (34.97±3.34) compared to baseline value (41.09±4.08). There were no significant differences in lymphocytes, monocytes, and eosinophils values from baseline. The ketamine and xylazine combination produced decreases in PCV, Hb and neutrophils. The sheep recovered from an aesthesia uneventfully.

Key words: ketamine/xylazine; Anaesthesia; Haematological parameters

1. Introduction

Several drugs are used intravenously, singly or in combination with other drugs to achieve an anaesthetic state as components of balanced anaesthesia. These drugs include the following; barbiturates (thiopental, methohexital), benzodiazepines (midazolam, diazepam), opioids (morphine, fentanyl, alfentanil, remifentanil), propofol, ketamine and miscellaneous drugs (droperidol, etomidate, xylazine (Hall *et al.,* 2001; Yamashita *et al.*, 2007). Ketamine produces dissociative anaesthesia that is characterized by catatonic, amnesia and analgesia with or without actual loss of consciousness. The drug is an arylcyclohexylamine chemically related to phencyclidine, ketamine is the only intravenous anaesthetic that possesses analgesic properties and produces cardiovascular stimulation (Muir *et al.*, 2000; Hall *et al.,* 2001). Apart from the required actions of sedation, hypnosis and analgesia, xylazine has the usual marked cardiovascular effects of bradycardia and decrease cardiac output (Sinclair, 2003). Indeed, xylazine/ketamine combinations have been found to provide excellent immobilization and relaxation in a wide range of species of animals (Hall *et al.,* 2001). Kilic (2008) investigated the suitability of detomidine-midazolam-ketamine combination for umbilical surgery in calves. The study reported satisfactory immobilization for umbilical surgery, although some hypoxaemia and respiratory acidosis occurred, body temperature of the calves decreased significantly ($p<0.05$) during anaesthesia from 38.50C to 37.90C. Haemoglobin, PCV, and RBC decreased significantly ($p<0.05$) for a short time. However, they returned to the baseline at 24 hours. Muscle relaxation was good and no complications were encountered. Similarly, in a report by Afshar *et al.,* (2005) on the effect of xylazine-ketamine on arterial blood pressure, heart and respiratory rates in sheeps, it was found that heart rate decreased at 15 to 60 min but respiratory rate did not change significantly. The aim of this study is therefore to evaluate the effect of intravenous anaesthesia using ketamine/xylazine cocktail on haematological parameters in Lori-Bakhtiari sheep.

2. Materials and methods

Ten Lori-Bakhtiari sheeps comprising five females and five male swith a mean ±SD body weight of 20±2kg (range, 16-23kg) were used for the study. The sheeps were assessed to be in good health based on physical examination, haematological values that appeared normal and screened free of endo- and ecto-parasitism.

Drugs used in the study were xylazine at 0.01mg/kg and ketamine at 5mg/kg, administered combined intravenously (IV). The sheeps were

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observed during and after intravenous injection of the drugs. The onset of action of the drugs was observed after the injection, the time to spontaneous recumbency and duration of anaesthesia/recumbency were noted.

The pre-injection blood samples (2ml) were taken from the jugular vein into EDTA bottles and later analyzed. During anaesthesia, blood samples (2ml) were also taken in sterile 5ml EDTA bottles at 15 minutes intervals until analysis. Haematological parameters determined were packed cell volume (PCV), haemoglobin concentraion (Hb), red blood cell (RBC) and white blood cell (WBC) counts. PCV, WBC and Hb were determined using a method described by Dennis & Joanna (2002). Differential leucocytes count (DLC) was also determined from Giemsa stained slides.

All data were expressed as mean ± Standard Deviation (SD). The means of PCV, WBC, HB, differential leucocytes count, MCV, MCH and MCHC were compared using analysis of variance. Probability level of 5 percent ($p<0.05$) was used to declare significant differences between means in all cases.

3. Results

The combination of ketamine-xylazine produced significant decrease in PCV and Hb at 30mins (24.00±1.23%) and (8.50±0.64g/dl), respectively while there was no significant difference in RBC, WBC, MCV, MCH and MCHC values (Table 1).

There was a significant decrease in neutrophils count at 45 minutes (34.97±3.34), while lymphocytes, monocytes and eosinophils counts increased insignificantly throughout the observation period (Table 2).

Table 1: Effects of ketamine/xylazine cocktail in intravenous anesthesia on haematological parameters in Lori-Bakhtiari sheeps

Time (mins)	PCV (%)	Hb (g/dl)	RBC (x106/µl)	WBC (x103/µl)	MCV(fl)	MCH(pg)	MCHC(g/dl)
Baseline	29.50±1.52	10.03±0.41	12.90±2.68	10.55±0.69	23.67±4.36	8.02±1.45	33.85±1.51
15mins	25.33±3.01	9.10±1.01	11.45±3.53	9.10±1.59	23.13±4.13	8.30±1.67	35.35±2.21
30mins	24.00±1.23 *	8.50±0.64*	9.77±2.09	8.70±1.11	25.16±3.71	8.98±1.50	35.62±1.43
45mins	24.67±3.01*	8.83±0.76*	10.70±3.31	9.10±1.26	24.07±4.41	8.75±2.09	35.97±2.56
60mins	24.67±1.75*	8.78±0.61 *	10.87±3.19	9.70±1.60	23.78±4.72	8.50±1.97	35.47±1.78
75mins	24.40±2.61*	8.66±0.48*	9.90±3.24	9.42±1.20	25.68±4.15	9.38±1.87	35.66±1.70
90mins	25.00±2.55*	9.20±0.51	10.33±3.08	9.94±1.45	25.06±3.76	9.30±1.75	36.96±1.90

Data are expressed as mean ± SD, n = 10
*Values decreased significantly (P<0.05) from baseline.

Table 2: Effects of ketamine/xylazine cocktail in intravenous anesthesia on differential leucocytes in Sahel Goats

Time (mins)	Neutrophils (%)	Lymphocytes (%)	Monocytes (%)	Eosinophil (%)	Basophils (%)
Baseline	41.09±4.08	51.50±2.59	2.50±1.38	4.50±2.35	0
15	35.83±2.93	55.83±4.54	3.33±2.07	5.00±2.37	0
30	35.40±2.51	56.60±1.82	3.20±0.84	4.80±1.79	0
45	34.97±3.34 *	55.83±4.02	3.83±1.84	5.17±2.23	0
60	37.50±5.96	54.67±5.99	3.50±2.17	4.33±2.25	0
75	37.00±1.58	54.60±4.34	3.00±1.00	5.40±2.88	0
90	40.20±1.10	52.80±2.59	1.60±0.89	5.4±1.67	0

Data are expressed as mean ± SD, n = 10
*Values decreased significantly (P<0.05) from baseline.

4. Discussion

The combination of ketamine-xylazine intravenous injection produced total intravenous anaesthesia in sheeps and effects were observed during treatment on haematological parameters.

The result showed that intravenous injection of xylazine and ketamine combination produced a significant decrease in PCV and Hb with a non significant decrease in RBC, WBC, MCV, MCH and MCH in sheeps. Neutrophils decreased significantly at 45mins compared with baseline, while lymphocytes, monocytes and eosinophils showed no significant difference throughout the study. This is similar to the report of Kilic (2008), who also reported a significant decrease in PCV, Hb and RBC for a short time in all the calves after using detomidine-midazolam-ketamine for umbilical surgery. However, the values of the Hb, RBC returned to the baseline and values of WBC showed a non-significant increase at 24 hours. The report of Gweba *et al.,* (2010) of decrease in haemoglobin concentration and packed cell volume in sheeps, agrees with our study. However in contrast to their study, this study also recorded insignificant decrease in white blood cells.

It has been suggested that pooling of circulating blood cells in the spleen and other reservoirs secondary to decreased sympathetic activity to be the reason for decrease in PCV, Hb and WBC (Kilic, 2008). During anaesthesia or sedation, the decrease in PCV and Hb is attributed to the shifting of fluid from extravascular compartment to intravascular

compartment to maintain normal cardiac output in animals (Kilic, 2008).

In the present study, haemoglobin, PCV, and RBC decreased significantly during anaesthesia in the sheeps. Kilic (2008) also reported that haemoglobin, PCV, and RBC decreased significantly ($p<0.05$) for a short time in calves following detomidine-midazolam-ketamine anaesthesia. Lugo-Roman *et al.,* (2010) also observed decreases in haemoglobin, PCV, and RBC during ketamine or ketamine-xylazine anaesthesia in rhesus macaques.

In conclusion, the ketamine and xylazine combination produced satisfactory anaesthesia in sheeps. However, the combination also produced decreases in PCV, Hb and neutrophils and so should be avoided in critical or cardiovascular compromised patients. The sheeps recovered from anaesthesia uneventfully.

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