SHORT COMMUNICATION

Sokoto Journal of Veterinary Sciences
(P-ISSN 1595-093X/ E-ISSN 2315-6201)
Umar & Wakil /*Sokoto Journal of Veterinary Sciences* (2013) 11(1): 66-69.
http://dx.doi.org/10.4314/sokjvs.v11i1.11

Effects of the combination of ketamine and medetomidine anaesthesia on haematological parameters in Sahel goats

MA Umar* & Y Wakil

Department of Veterinary Surgery & Theriogenology, Faculty of Veterinary Medicine
University of Maiduguri

*Correspondence: Tel.: 2348033499693, E-mail: ahmedtjumar@gmail.com

Abstract

The effects of the combination of ketamine and medetomidine intravenous (IV) anaesthesia on haematological parameters were evaluated in six sahel goats comprising of 5 females and 1 male with mean body weight of 19 ± 1.4kg. Each goat was given a recommended dose of the drugs combination: medetomidine at 0.01mg/kg and ketamine at 5mg/kg body weight IV. Pre injection blood samples were obtained and at 15 minutes interval during anaesthesia 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-medetomidine combination produced a significant decrease in PCV values from 30 minutes (24.00±1.23%) to 90 minutes (25.00±2.55%) compared with baseline value (29.50±1.52%); Hb also decreased significantly at 45mins. RBC and WBC values showed no significant difference compared with baseline values. Neutrophils decreased significantly at 45mins (35.17±3.25) compared to baseline value (41.50±3.67). There were no significant differences in lymphocytes, monocytes, and eosinophils values from baseline. The ketamine and medetomidine combination produced decreases in PCV, Hb and neutrophils. The goats recovered from anaesthesia uneventfully.

Keywords: Anaesthesia, Goats, Haematology, Ketamine, Medetomidine.
Received 04-01-2013 Accepted 19-04-2013

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, medetomidine (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, medetomidine has the usual marked cardiovascular effects of bradycardia and decrease cardiac output (Sinclair, 2003). Indeed, medetomidine/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 38.5^{0}C to 37.9^{0}C. 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 goats, 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 combination of ketamine and medetomidine on haematological parameters in sahel goats.

Materials and methods

Animals

Six sahel goats comprising five females and one male with a mean ±SD body weight of 19±1.4kg (range, 17-21kg) were used for the study. The goats were assessed to be in good health based on physical examination, haematological values that appeared normal and screened free of endo- and ecto-parasitism.

Anaesthesia

Drugs used in the study were medetomidine (Dormitor®, Meiji Seika Ltd, Tokyo, Japan) at 0.01mg/kg and ketamine (ketamine 50mg/ml®, Trittau, Germany) at 5mg/kg, administered combined intravenously (IV). The goats were 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.

Haematological Analysis

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.

Data analysis

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 (ANOVA, Graph pad, 2000). Probability level of 5 percent ($p<0.05$) was used to declare significant differences between means in all cases.

Results

The combination of ketamine-medetomidine 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 (35.17±3.25), while lymphocytes, monocytes and eosinophils counts increased insignificantly throughout the observation period (Table 2).

Table 1: Effects of combination of medetomidine and ketamine intravenous anaesthesia on haematological parameters in Sahel goats

Time (mins)	PCV (%)	Hb (g/dl)	RBC ($x10^6$/µl)	WBC ($x10^3$/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 = 6

*Values decreased significantly ($P<0.05$) from baseline.

Table 2: Effect of combination of medetomidine and ketamine intravenous anaesthesia on differential leucocytes in Sahel Goats

Time (mins)	Neutrophils (%)	Lymphocytes (%)	Monocytes (%)	Eosinophil (%)	Basophils (%)
Baseline	41.50±3.67	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	35.17±3.25 *	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 = 6

* Value decreased significantly (P<0.05) from baseline.

Discussion

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

The result showed that intravenous injection of medetomidine and ketamine combination produced a significant decrease in PCV and Hb with a non significant decrease in RBC, WBC, MCV, MCH and MCH in goats. 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 goats, 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 goats. 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-medetomidine anaesthesia in rhesus macaques.

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

References

Afshar FS, BaniAdam A & Marashipour SP (2005). Effect of xylazine-ketamine on arterial blood pressure, arterial blood pH, blood gases, rectal temperature, heart and respiratory rates in goats. *Bulletin Veterinary Institute Pulawy*, **49**: 481- 484.

Dennis MM & Joanna MB (2002). *Clinical Textbook for Veterinary Technicians* (5th Edition). W.B. Saunders, Pp 143-152.

Graph pad (2000). Graphpad software: instant guide to choosing and interpreting. Statistical tests. Graphpad software Inc San Diego, USA.

Gweba M, Onifade KI & Faleke OO (2010). Effect of xylazine sedation on some clinico-physiological and haematological parameters in Sokoto red goats. *Nigerian Veterinary Journal*, **31**(2) 177-181.

Hall LW, Clarke KW & Trim CM (2001). *Veterinary Anaesthesia* (10th Edition). W.B. Saunders, London, Pp 113-131.

Kilic, N (2008). Cardiopulmonary, biochemical and haematological changes after detomidine-midazolam-ketamine anaesthesia in calves, *Bulletin Veterinary Institute Pulawy*, **52**: 453-456.

Lugo-Roman LA, Rico PJ, Sturdivant R, Burks R & Settle TL (2010). Effect of Serial Anaesthesia using Ketamine or Ketamine-Medetomidine on Haematology and Serum Chemistry Values in Rhesus macaques (Macaca mulatta). *Journal of Medical Primatology*, **39(**1**)**: 41- 49.

Muir WW, Hubbell, JAE, Skarda, RT & Bednarski RM (2000). *Handbook of Veterinary Anesthesia* (3rd Edition). Mobsy Inc, St. Louis. Pp 57-72.

Sinclair MD (2003). A review of physiological effects of $\propto_2$-agonists related to the clinical use of medetomidine in small animal practice. *Canadian Veterinary Journal* **44**: 885-897.

Yamashita K, Wijayathilaka T.P, Kushiro T, Umar M.A, Taguchi K, Muir W.W (2007). Anesthetic and Cardiopulmonary Effects of Total Intravenous Anesthesia Using Midazolam-Ketamine and Medetomidine Drug Combination in Horses. *The Journal of Veterinary Medical Science*, **69(1)**: 7-13.