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Haemato-biochemical response to detomidine-propofol combination in atropinized goats

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Abstract

The study was conducted to evaluate the effect on various haemato-biochemical parameters in response to detomidine-propofol anaesthesia in six healthy non-descript goats of either sex weighing between 20-25 kg. Detomidine (15 µg/kg I/M) was given 10 min. later followed by propofol (5mg/kg I/V) anaesthesia. Prior to this atropine sulphate (0.04 mg/kg I/M) was injected. There was non-significant decrease in Hb and PCV. There was significant increase in neutrophils with significant decrease in lymphocyte. There was significant increase in serum glucose level with slight alternation in serum urea, creatinine, AST and ALT. It is concluded that detomidine-propofol combination produced no deleterious effect on vital organs and changes remained within physiological limits, thus can be safely used in atropinized goats.

Keywords: Atropine sulphate, biochemical parameter, detomidine, goats, haematological parameter, propofol

Introduction

Goat is a multi-functional animal and plays a significant role in the economy and nutrition of landless small and marginal farmers in the country due to its unique qualities such as, high fertility rate, short kidding interval, good quality chevon, milk and hairs (Mackenzie, 1967)^[17]. Goats undergo many surgical procedures, such as hernia, dystocia, traumatic injuries and they need safe pre-anaesthetics (Zeedan *et al.*, 2014)^[27]. Balanced anaesthesia is a technique in which several drugs are combined at reduced dosages to decrease adverse effects of each drug and used to limit cardiopulmonary depression (Toner, 2005)^[25]. General anaesthesia with rapid, smooth induction and lesser recumbency time are desirable in goats due to complications like salivation, regurgitation, tympany and cardiopulmonary depression. To minimize these complications, search for new drug combination is ongoing. Propofol is highly lipophilic drug derived from series of alkyl phenol and is non-barbiturate, short acting intravenous anaesthetic agent commonly used for undertaking major and minor surgical procedures in veterinary and human anaesthetic practice, which induces smooth and quick anaesthesia, fast and uneventful recovery without any cumulative effect (Bodh *et al.*, 2013)^[4]. Detomidine HCl is a new synthetic alpha-2 adrenoreceptor agonist and is imidazole derivative with sedative and analgesic properties (Anonymous, 1996)^[2] which is primarily used as sedative in horses. It can also be used prior to induction of anaesthesia with other anaesthetics such as ketamine, thiopental and propofol (Hall and Clarke, 1991)^[7]. Since the report regarding use of propofol anaesthesia in combination with detomidine as premedicants in goats are limited. Therefore, the aim of this study was to evaluate the effects on various haemato-biochemical parameters in response to detomidine-propofol anaesthesia in atropinized goats.

Materials and methods

The study was conducted in six healthy non-descript goats of either sex weighing between 20-25 kg. Detomidine (15 µg/kg I/M) was given 10 min. later followed by propofol (5mg/kg I/V) anaesthesia. Prior to this combination, atropine sulphate (0.04 mg/kg I/M) was injected.

After administration of propofol, the blood was collected from jugular vein in a clean sterile glass vial containing ethylene diamine tetra acetic acid 1 mg/ml from goats before premedication (0 min.) and 30, 60, 120 minutes and 6 hrs. After induction of anaesthesia for estimation of following haematological parameters viz., haemoglobin (Hb), packed cell volume (PCV), total leucocyte count (TLC) and differential leucocyte count (DLC).

Five ml of venous blood was collected without anticoagulant in sterilized dry test tube and allowed to clot at room temperature. After two hours, serum was separated with the help of pasture pipette and the following biochemical parameters were estimated at 0 min., and 30, 60, 120 minutes and 6 hrs interval post anaesthesia. The biochemical parameters which includes are serum glucose (mg/dl), serum urea nitrogen (mg/dl), creatinine (mg/dl) aspartate aminotransferase (AST) (U/L) and alanine aminotransferase (ALT) (U/L).

The data was analyzed as per the standard procedure outlined by Snedecor and Cochran (1994) [23]. One way analysis of variance and Duncan's multiple range test was used.

Results and Discussion

The effects on haematological parameters after administration of detomidine-propofol in atropinized goats at various time intervals (Mean±S. E.) are shown in Table 1. A non-significant decrease from 10.73±0.42 gm % to 8.5±0.23 gm % in the value of haemoglobin was observed at 120 minutes and a non-significant decrease in the value of PCV from 32.66±0.33 to 30.50±1.58% was recorded at 60 min. However, the values returned to preadministration level at 6 hr of study period. The decrease in the haemoglobin and PCV level could be attributed to splenic pooling of blood constituents shifting of fluids from extra vascular compartment to intravascular compartment to maintain normal cardiac output and other reservoirs induced by adrenergic property of α_2 -agonists as also observed with most of the anaesthetics. Ratnesh (2010) [21] and Kumar *et al.* (2011) [15] also observed non-significant variations in Hb and PCV in buffalo calves after propofol administration.

A non-significant decrease from 32.75±0.60 to 31.28±0.95 $\times 10^3 \text{cu. mm}^{-1}$ in TLC was recorded at 120 min. The decrease in TLC during propofol anaesthesia in all the animals might be due to sequestration of blood cells in spleen and lungs during anaesthesia (Best and Taylor, 1966) [3] or due to increase in plasma volume during anaesthesia on account of vasodilatation resulting in vascular pooling. Similar variation in Hb, PCV and TLC findings were also observed by Kelawala *et al.* (1991) [11] in goats; Singh *et al.* (2014) [22] and Goyal *et al.* (2015) [6] in buffalo calves after administration of propofol which fluctuated below the base level after propofol administration. Neutrophils count showed a significant ($p < 0.05$) increase, from 35.00±1.63 to 44.83±1.32% upto 60 minutes and lymphocyte count also showed a significant ($p < 0.05$) decrease from 65.10±0.36 to 62.83±0.47 % upto 60 minutes. Both values returned to near base values at 6 hrs. There was a corresponding neutrophilia in response to lymphocytopenia. This rise in neutrophils count and decrease in lymphocyte count might be attributed to the adrenocortical stimulation and subsequent effect of glucocorticoids on circulating neutrophils and lymphocytes (Soliman *et al.*, 1965). Similar observations were also made after administration of xylazine, ketamine and medetomidine in goats by Hugar, (1993) [8]. Neutrophilia and decrease in lymphocytes was observed by Kumar *et al.* (1997) [14] and Kammar *et al.* (2014) [10] in goats after administration of detomidine. Goyal *et al.* (2015) [6] also observed similar findings after propofol anaesthesia in buffalo calves. The eosinophils increase was non-significant in animals after administration of detomidine-propofol from 2.16±0.30 to 2.40±0.25 at 120 minutes. Kammar *et al.* (2014) [10] in goats reported slight fluctuation in eosinophils after administration

detomidine which returned to base value. A non-significant decrease in monocyte (from 2.04±0.21 to 1.62±0.47%) was observed at 60 min. after administration of detomidine-propofol. Thereafter, increased gradually and returned to base values at 6 hrs of the study period. Khan *et al.* (2003) [12] reported slight changes in the monocytes in buffalo calves after administration of detomidine.

The effect on biochemical parameters after administration of detomidine-propofol in atropinized goats at various time intervals (Mean±S. E.) are shown in Table 2. There was no significant change in all biochemical parameters after administration of propofol except for serum glucose level, which was significantly ($p < 0.01$) increase (from 79.93±3.73 to 94.45±0.63 mg/dl) after detomidine-propofol administration upto 120 min. as compared to base values. Thereafter, the values decreased and returned to normalcy by 6 hrs.

In the present study, increase in serum glucose level occurred is also in agreement with results of Ambrosio *et al.* (2012) where serum glucose increased because detomidine has an anti-insulin effect and stimulates the alpha-2 receptors in pancreas resulting in increased blood glucose level (Kammer *et al.*, 2014) [10]. Increase in the serum glucose level was also reported by Malhi *et al.* (2015) [18], Tunio *et al.* (2016) [26] after administration of detomidine in goats and Kelawala *et al.* (1991) [11] also reported increase in serum glucose level in goats after administration of propofol. Ratnesh (2010) [21] also observed a significant increase while Kumar *et al.* (2011) [15] and Singh *et al.* (2014) [22] observed a non-significant increase in glucose level after propofol anaesthesia in buffalo calves. A significant hyperglycaemia has also been reported during propofol administration in buffalo calves (Potliya, 2015 a, b) [19, 20]. Increased glucose is probably an indication of stress. Hyperglycaemia observed in the present study might be attributed to an alpha2-adrenergic inhibition of insulin release from beta pancreatic cells and to an increased production of glucose via alpha1-adrenoceptors in liver (Brockman, 1981) [5]. Moreover, during the period of anaesthesia, there is decrease in basal metabolic rate of the animal and muscular activity is negligible, so utilization of glucose by muscles is also decreased probably causing slight increase in glucose concentration. However, since hyperglycaemia produced was transient in nature and within the normal physiological limit, therefore, a clinical significance cannot be fixed. However, Goyal *et al.* (2015) [6] observed decrease in glucose level in bovines after propofol anaesthesia and ketamine administration alongwith midazolam and dexmedetomidine as preanaesthetic agent.

A non-significant increase in serum urea nitrogen, creatinine and AST was observed at 60 minutes after administration of detomidine-propofol anaesthesia. Later on, the values returned to near preadministration level at 6 hrs of the study period. The increase in serum urea nitrogen and creatinine after anaesthesia might be attributed to temporary inhibitory effect of these drugs on renal blood flow and consequent decrease in glomerular filtration rate resulting in increase in their levels. However, it is difficult to ascribe this to possible renal damage, because all the reported values were within normal physiological limits (Kilic, 2008) [13]. Goyal *et al.* (2015) [6] reported increased in BUN, creatinine and AST level in buffalo calves after propofol administration. An increase in serum AST levels might be due to the immediate response to cardiac insufficiency (Lehninger, 1990). In the present study, significant ($p < 0.05$) increase ALT was reported up to 120 min. after administration of detomidine-propofol

anaesthesia. The increase in the ALT activities might be due to alterations in cell membrane permeability in response to haemodynamic changes by the anaesthetic agents. Similarly,

Lim *et al.* (2000) [16] and Jain *et al.* (2007) [9] also reported increase in ALT level in dogs after propofol administration.

Table 1: Effect on Haematological parameters after administration of detomidine-propofol in atropinized goats at various time intervals (Mean±S. E.)

Parameters	0 min.	30 min.	60 min.	120 min.	6 hr
Haemoglobin (gm %)	10.73±0.42	9.46±0.48	9.0±0.03	8.5±0.23	10.6±0.14
Packed Cell Volume (%)	32.66±0.33	30.83±2.05	30.50±1.58	31.66±1.93	32.26±0.21
Total Leucocytes Count (x 10 ³ cumm ⁻¹)	32.75±0.60	32.06±0.60	31.86±0.88	31.28±0.95	31.85±1.03
Neutrophils (%)	35.00±1.63	37.83±2.00	44.83*±1.32	36.66±1.42	34.83±1.16
Lymphocyte (%)	65.10±0.36	64.77±2.40	62.83*±0.47	64.00±0.57	64.83±0.70
Eosinophil (%)	2.16±0.30	2.26±0.54	2.33±0.49	2.40±0.25	2.22±0.33
Monocyte (%)	2.14±0.21	1.89±0.22	1.62±0.22	1.78±0.49	2.00±0.16

* $P < 0.05$ = Significant at 5% level when compared to base value

Table 2: Effect on Biochemical parameters after administration of detomidine-propofol in atropinized goats at various time intervals (Mean±S. E.)

Parameters	0 min.	30 min.	60 min.	120 min.	6 hr
Glucose (mg/dl)	79.93±3.73	86.29**±0.70	92.79**±0.40	94.45**±0.63	80.21±1.30
Serum Urea Nitrogen (mg/dl)	25.04±1.02	26.67±0.87	27.01±0.76	25.85±0.56	25.30±0.78
Creatinine (mg/dl)	0.98±0.04	1.10±0.05	1.18±0.04	1.06±0.04	1.02±0.04
AST (U/L)	74.03±1.25	76.26±1.25	78.53±1.03	75.34±1.36	74.18±.29
ALT(U/L)	25.81±2.43	30.14±2.85	31.79±0.20	32.66*±0.43	24.12±2.77

* $P < 0.05$ = Significant at 5% level when compared to base value

** $P < 0.01$ = Significant at 1% level when compared to base value

Conclusion

It is concluded that detomidine-propofol combination produced no deleterious effect on vital organs and changes remained within physiological limits, thus can be safely used in atropinized goats.

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