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# SEDATIVE AND ANALGESIC EFFECTS OF DETOMIDINE IN CAMELS (*Camelus dromedarius*)

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## ABSTRACT

Detomidine hydrochloride was administered intravenously to three groups of camels, using three different doses (25, 50 or 75 µg/kg). The levels of sedation and analgesia were graded and recorded. Sedation and analgesia were dose dependent. Detomidine at a dose rate of 75 µg/kg produced profound sedation and analgesia. Significant hyperglycemia and bradycardia were recorded after administration of detomidine and till recovery. No significant changes in hemoglobin concentration (Hb%), PCV, WBCs and RBCs counts and serum concentration of creatinine and blood urea nitrogen levels were recorded at any dose level.

**Key words :** Analgesia, camel, detomidine, sedation

Drugs for sedation and tranquilisation are very useful in camel husbandry, medicine and surgery. Deep sedation as well as analgesia is a mandatory for dealing with camels either for some routine examinations or many surgical interventions. Several anaesthetics, tranquilisers and analgesics have been used in camels (Fouad and Morcos, 1965; Khamis *et al*, 1973; Peshin *et al*, 1980; Sharma *et al*, 1983; El-Amrousi *et al*, 1986; White *et al*, 1986 and Fahmy *et al*, 1995). Chlorpromazine hydrochloride, propionil promazine and acepromazine have also been evaluated as sedatives in camels (Said, 1972; Khamis *et al*, 1973; Ali *et al*, 1989). Despite advances in the field of tranquilisers and their uses in domestic animals, experience with their application on the camel have not been exhaustive (Fouad, 2000).

Alpha-2 adrenoceptor agonists (Xylazine, detomidine, medetomidine and romifidine) have been extensively used in the field of veterinary anaesthesiology for their sedative properties (Hall and Clark, 1991). These drugs have been used as sole agents for restraint or calming of camels or to reduce stress (Ali, 1988). If these agents are inadequate to complete involved surgical procedures, supplementation with local analgesics or general anaesthesia has been used.

Xylazine was the initial alpha-2 adrenogenic agent which had been introduced for sedation in camels (Denning, 1972; Sharma *et al*, 1982). Xylazine (0.25mg/kg, i.m.) is adequate for many

clinical uses in camels and seems to be superior to chlorpromazine and propionyl promazine (Khamis *et al*, 1973).

Detomidine, a relatively new alpha-2 adrenoceptor agonist, is a sedative, muscle relaxant and analgesic that has been shown to be effective in a wide range of animal species (Hall and Clark, 1991; Raekallio *et al*, 1991 and El-Maghraby and Atta, 1997). Generally, detomidine induces stronger and longer lasting sedation and analgesia in comparison with other members of the same group such as xylazine (Jochle *et al*, 1989). Preliminary trials indicated that intramuscular injection of detomidine (50µg/kg) in camels revealed marked sedation and analgesia (Hall and Clark, 1991). Intravenous administration of detomidine in dromedary camels has not been evaluated in the available literature. The purpose of the controlled study reported here is to evaluate objectively the efficacy of various doses of detomidine in dromedary camels with special reference to its sedative, analgesic, haematological and biochemical effects.

## Materials and Methods

Fifteen adults apparently healthy camels (9 males and 6 females), aged 6 to 15 years and weighing 300 to 450 kg were used. Resting rectal temperature, pulse, and respiratory rates were measured and a complete blood count was made

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before each treatment.

Camels were randomly divided into three groups (5 camels in each group). One per cent detomidine hydrochloride (Domosedan: Orion Corporation, Animal Health Division) was injected intravenously at the dose levels of 25, 50 and 75  $\mu\text{g}/\text{kg}$ , respectively in the three groups. Drooping of the head, external conchae of the ear, lower lip and/or upper eyelid, prolapse of the penis and frequency of urination were recorded. Sedation was graded as mild, moderate or deep. Analgesia was assessed by recording the response of the animal to needle pricks and electrical stimulation. Needle pricks were applied at the shoulder, flank area and perineum. Electrical stimulation was applied through two electrodes fixed around a closely clipped fetlock joint of both fore limbs and connected to a variable output stimulator (BioScience stimulator, 10550). The amplitude of the electrical current output was increased until the response of the animal by moving or raising one of the examined limbs. The amplitude of the current to which response occurred was recorded and accordingly analgesia was graded from 0 to 3 as described in horses by Jochle and Hamm (1986). The time of onset, degree, duration of sedation and analgesia and the recovery time were recorded and monitoring continued upto 3 hours after drug administration.

Heart and respiratory rates were recorded at 0 (to serve as a control), 15, 30, 45 and 60 minutes and at apparent recovery time. Blood samples were collected from the jugular vein at 0, 15, 30 and 60 minutes and at recovery time for determination of haemoglobin (Hb%), packed cell volume (PCV %) and RBCs and WBCs counts. Blood serum was also analysed for urea nitrogen and creatinine concentrations.

Statistical analysis of the data was done by one-way ANOVA followed by pairwise comparison of probabilities (Bonferroni correction). Values of  $p < 0.05$  were considered to be statistically significant.

## Results

Intravenous injection of detomidine induced apparent sedative effect within 2-3 minutes. No difference in latency was detected between the three doses of detomidine. All animals remained calm and appeared to be unaware of their surroundings. Drooping of the lower lip, head, upper eyelid and external concha of the ear were recorded (Figs 1 and 2). Mild salivation and lacrimation were also detected. Ataxia varied from mild to moderate, the



Fig 1. A camel after sedation with intravenous detomidine hydrochloride. Notice the drooped head and abduction of the limbs.



Fig 2. The sedative effect of detomidine in a camel. Notice drooping of the lower lip, lower eyelid and external concha of the ear.

Table 1: The effect of various doses of detomidine on the duration and grade (mean  $\pm$  SD) of sedation and analgesia.

Dose of Detomidine	Sedation		Analgesia		Recovery (min)
	Duration	Grade	Duration	Grade	
25 $\mu\text{g}/\text{kg}$	26 $\pm$ 4.43	Mild	20 $\pm$ 6.17	0-1	55 $\pm$ 10.2
50 $\mu\text{g}/\text{kg}$	40 $\pm$ 2.17	Mild-Moderate	28 $\pm$ 4.13	2	40 $\pm$ 5.0
75 $\mu\text{g}/\text{kg}$	55 $\pm$ 3.11	Deep	37 $\pm$ 5.19	3	45 $\pm$ 9.78



Table 2. Heart rate, respiratory rates and temperature (means  $\pm$  SD) of camels injected with different doses of detomidine.

Dose	Time (min)	Respiratory rate	Temperature	Heart Rate
Detomidine 25 $\mu$ g/kg	t <sub>0</sub>	13.66 $\pm$ 1.5	37.3 $\pm$ 0.64	44.6 $\pm$ 2.06
	t <sub>15</sub>	11.33 $\pm$ 1.15	37.7 $\pm$ 0.7	29.66 $\pm$ 4.93 *
	t <sub>30</sub>	12.33 $\pm$ 3.21	37.36 $\pm$ 0.05	30 $\pm$ 3.60 *
	t <sub>60</sub>	12 $\pm$ 1.57	37.53 $\pm$ 0.05	31.33 $\pm$ 4.16 *
	Recovery	16.66 $\pm$ 3.05	37.7 $\pm$ 0.1	34.66 $\pm$ 2.30
Detomidine 50 $\mu$ g/kg	t <sub>0</sub>	14.33 $\pm$ 5.0	37.5 $\pm$ 0.66	46.33 $\pm$ 12.4
	t <sub>15</sub>	13.33 $\pm$ 2.08	37.9 $\pm$ 0.65	30.66 $\pm$ 5.03 *
	t <sub>30</sub>	12.66 $\pm$ 3.05	38 $\pm$ 0.6	31.33 $\pm$ 6.02 *
	t <sub>60</sub>	12.33 $\pm$ 0.57	38.06 $\pm$ 0.55	36.55 $\pm$ 3.46
	Recovery	14.33 $\pm$ 0.57	37.8 $\pm$ 0.6	33.33 $\pm$ 4.16
Detomidine 75 $\mu$ g/kg	t <sub>0</sub>	13.66 $\pm$ 1.69	37.8 $\pm$ 0.18	37.66 $\pm$ 4.18
	t <sub>15</sub>	13.0 $\pm$ 2.64	38.1 $\pm$ 0.2	22.33 $\pm$ 5.13 *
	t <sub>30</sub>	12.0 $\pm$ 2.0	38.1 $\pm$ 0.15	23.66 $\pm$ 7.23 *
	t <sub>60</sub>	11.33 $\pm$ 1.15	38.2 $\pm$ 0.1	24.66 $\pm$ 6.65 *
	Recovery	13 $\pm$ 1.73	38.1 $\pm$ 0.0	31.33 $\pm$ 11.37

\* Statistically different (P<0.05) by pairwise analysis.

degree of ataxia increased by increasing the dose of detomidine. Although all camels remained in a standing position after administration of detomidine at dose rate of 25 or 50  $\mu$ g/kg, camels which received 75  $\mu$ g/kg attained sternal recumbency within 10 minutes. Frequent urination commencing about 40 - 60 minutes after administration of detomidine was observed. Protrusion of the penis was not observed in any animal. The sedative effect persisted for 26  $\pm$  4.43, 40  $\pm$  2.17 and 55  $\pm$  3.11 minutes after intravenous injection of detomidine at 25, 50 and 75  $\mu$ g/kg, respectively. The degree of sedation was more or less dose dependent and rated from mild to deep. The depth of sedation induced by dose of 75  $\mu$ g/kg was greater than that induced by either by 25 or 50  $\mu$ g/kg (Table 1).

The period of analgesia was shorter than the period of sedation (table 1). The analgesic effect persisted for 20  $\pm$  6.17, 28  $\pm$  4.13 and 37  $\pm$  5.19 minutes after intravenous administration of detomidine at doses of 25, 50 and 75  $\mu$ g/kg, respectively. Intravenous administration of detomidine at a dose of 25  $\mu$ g/kg induced a poor analgesic effect which ranged from 0 (no obvious analgesia) to grade 1 analgesia. The analgesic effect

of 75  $\mu$ g/kg b.wt. was excellent (grade 3) as indicated by lack of response to painful and electrical stimulations.

Significant bradycardia was recorded in all camels after intravenous injection of all three doses (Table 2). Twenty beats/minute was the lowest rate recorded. Auscultation also showed irregular rhythm and dropped beats. Respiratory rate and rectal temperature were not affected. There were no significant changes in the blood biochemical parameters except glucose. A significant (P< 0.05) hyperglycemia was observed 15 minutes after detomidine administration which persisted till recovery.

## Discussion

Alpha-2 agonists are used to sedate animals for a variety of diagnostic and surgical procedures. These include procedures such as dental working, radiology, endoscopy and minor surgeries with local analgesia (if necessary). While many veterinarians still prefer the intramuscular route of administration, intravenous administration of alpha-2 agonists gives the most reliable sedation and rapid onset of action (Hall and Clark, 1991 and Short, 1992). This might be due to the variability in the response which may be influenced in part by unpredictable drug absorption from the IM administration site.

The onset of sedation started soon (2-3 minutes) after intravenous injection of detomidine. No difference in latency period was detected between the different doses of detomidine. The analgesic effect of detomidine in camels was nearly dose dependent. While the low dose (25 g/kg) showed mild analgesic effect, the higher doses (50 g/kg and 75 g/kg) produced moderate to deep analgesic effect. It should be pointed that the high dose was associated with high degree of ataxia and even recumbency. Usually, increasing the dose of alpha-2 agonist increases ataxia without preventing the response of the animal to painful stimulation (Short, 1992).

Salivation was minimal in all the three tested dosage in this study. Increased salivation after detomidine injection has been reported in cattle (Short, 1992). A significant bradycardia has been observed after intravenous administration of detomidine. Similar findings had been reported in other species after sedation with detomidine (Short



Table 3. Some haematological and biochemical values (means  $\pm$  SD) after I/V administration of Detomidine 25, 50 and 75  $\mu$ g/kg body weight.

Dose	Time (minute)	Glucose mmol/L	BUN mmol/L	Creatinine mmol/L	Total protein gm/dl	RBC X 10 <sup>6</sup>	Hb gm/dl	PCV %	WBC X 10 <sup>3</sup>
Detomidine 25 $\mu$ g/kg	t <sub>0</sub>	4.9 $\pm$ 0.88	8.3 $\pm$ 2.1	157 $\pm$ 3.07	6.6 $\pm$ 0.71	6.9 $\pm$ 1.01	10.96 $\pm$ 0.77	24 $\pm$ 1.5	15 $\pm$ 5.8
	t <sub>15</sub>	5.96 $\pm$ 0.35	8.7 $\pm$ 1.7	139 $\pm$ 33.7	6.14 $\pm$ 0.34	7.3 $\pm$ 0.34	9.5 $\pm$ 1.9	21.7 $\pm$ 2.1	11.5 $\pm$ 3.6
	t <sub>30</sub>	5.78 $\pm$ 0.87	11.1 $\pm$ 4.2	146 $\pm$ 12.2	6.17 $\pm$ 0.67	7.4 $\pm$ 0.8	8.8 $\pm$ 1.01	22 $\pm$ 2.0	16.3 $\pm$ 5.9
	t <sub>60</sub>	7.76 $\pm$ 0.74 *	12.0 $\pm$ 6.7	132 $\pm$ 29.8	7.04 $\pm$ 0.08	7.35 $\pm$ 0.35	8.8 $\pm$ 0.77	22.5 $\pm$ 0.7	15 $\pm$ 2.7
	Recovery	6.95 $\pm$ 1.94 *	8.55 $\pm$ 1.5	144 $\pm$ 11.0	7.4 $\pm$ 1.6	7.48 $\pm$ 0.73	8.6 $\pm$ 0.81	21 $\pm$ 2.3	14.8 $\pm$ 6.5
Detomidine 50 $\mu$ g/kg	t <sub>0</sub>	5.44 $\pm$ 1.83	9.7 $\pm$ 2.76	159 $\pm$ 9.18	6.31 $\pm$ 0.32	7.48 $\pm$ 0.54	10.5 $\pm$ 0.76	25 $\pm$ 1.15	10.37 $\pm$ 1.0
	t <sub>15</sub>	7.29 $\pm$ 2.50 *	9.01 $\pm$ 0.6	166 $\pm$ 6.69	6.6 $\pm$ 1.9	7.16 $\pm$ 0.77	10.1 $\pm$ 0.93	23 $\pm$ 0.8	8.7 $\pm$ 0.49
	t <sub>30</sub>	7.17 $\pm$ 1.08 *	9.0 $\pm$ 2.7	145 $\pm$ 20	5.7 $\pm$ 0.37	7.33 $\pm$ 0.90	9.8 $\pm$ 0.59	24 $\pm$ 1.0	9.9 $\pm$ 3.2
	t <sub>60</sub>	11.35 $\pm$ 1.4 *	10.4 $\pm$ 5.1	153 $\pm$ 9.17	6.3 $\pm$ 0.19	7.3 $\pm$ 1.15	9.2 $\pm$ 0.9	22 $\pm$ 1.5	10.4 $\pm$ 6.5
	Recovery	11.49 $\pm$ 0.8 *	8.7 $\pm$ 2.3	160 $\pm$ 17.0	6.7 $\pm$ 0.50	7.6 $\pm$ 1.23	10.0 $\pm$ 0.75	22.6 $\pm$ 1.15	8.7 $\pm$ 1.65
Detomidine 75 $\mu$ g/kg	t <sub>0</sub>	6.05 $\pm$ 0.71	8.1 $\pm$ 0.74	139 $\pm$ 16.2	7.2 $\pm$ 0.45	6.82 $\pm$ 0.38	8.2 $\pm$ 1.1	21 $\pm$ 1.15	11.4 $\pm$ 5.09
	t <sub>15</sub>	7.01 $\pm$ 0.57 *	9.2 $\pm$ 2.30	132 $\pm$ 24	6.2 $\pm$ 0.67	8.57 $\pm$ 1.8	8.56 $\pm$ 1.96	23 $\pm$ 1.0	11.8 $\pm$ 1.37
	t <sub>30</sub>	7.47 $\pm$ 0.83 *	9.14 $\pm$ 2.4	160 $\pm$ 29	6.17 $\pm$ 1	7.02 $\pm$ 0.75	8.66 $\pm$ 1.28	21.6 $\pm$ 2.0	9.8 $\pm$ 2.85
	t <sub>60</sub>	9.6 $\pm$ 1.5 *	9.74 $\pm$ 3.5	160 $\pm$ 17	6.01 $\pm$ 0.34	7.4 $\pm$ 0.66	9.5 $\pm$ 1.32	24 $\pm$ 0.0	11.1 $\pm$ 4.40
	Recovery	9.8 $\pm$ 2.0 *	8.9 $\pm$ 3.66	155 $\pm$ 42	6.11 $\pm$ 1.04	6.8 $\pm$ 0.49	9.06 $\pm$ 0.51	21 $\pm$ 1.0	9.6 $\pm$ 2.38

\* Statistically different ( $P < 0.05$ ) by pairwise analysis.

*et al.*, 1986 and El-Maghraby and Atta, 1997). Bradycardia has been also documented in dromedary after premedication with xylazine (Khamis *et al.*, 1973; Bolbol *et al.*, 1980 and White *et al.*, 1987). These significant changes in heart rate after the use of detomidine in camel are contrary to the findings of some other reports for xylazine (Peshin *et al.*, 1980). Bradycardia following administration of alpha-2 adrenoceptor agonist may be due to central stimulation that mediated through the vagus nerve (Hall and Clarke, 1991).

The reported respiratory depression associated with detomidine is a common adverse effect of alpha-2 agonists. This result might be in agreement with the findings of other studies in horses (Short *et al.*, 1986). However, the decrease of respiratory rate was not significant. This result might be in agreement with that reported after the use of xylazine (Peshin *et al.*, 1980). Although alpha-2 agonists have a relaxing effect on the gastrointestinal tract and are associated with decreased motility (Hall and Clark, 1991), no marked tympany was noticed on camels of this study.

The significant hyperglycaemia seen

following detomidine administration concurs with the results reported after camel sedation with xylazine in some studies (Peshin *et al.*, 1986 and Ali *et al.*, 1989). It may be attributed to increased adrenergic activity, decrease in the secretion or effects of insulin or increase in the secretion or effect of glucagons (Custer *et al.*, 1977 and Ali *et al.*, 1989).

The frequent urination after administration of alpha-2 agonists was thought to be through inhibition of antidiuretic hormone release and hyperglycemia (Hall and Clark, 1991). The absence of penis protrusion even in deeply sedated camels is consistent with the result observed after sedation of camels with xylazine (Khamis *et al.*, 1973). The later authors attributed this observation to some anatomical features; where the preputial orifice of the dromedary is relatively narrow, surrounded by muscular tissues of the prepuce, which are directed backwards enabling the protrusion of the penis only in its erected state.

In conclusion, detomidine seems to be safe and effective sedative and analgesic agent for camels. The intravenous administration of detomidine in a dose rate of 75  $\mu$ g/kg produced profound sedation and analgesia. Detomidine could



be used for variety of diagnostic and minor surgical procedures in camels.

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