



OBSERVATION OF PHYSIOLOGICAL CHANGES AFTER DETOMIDINE ADMINISTRATION IN PATERI GOAT

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ABSTRACT

The objective of this study was to determine the physiological effects of detomidine on Pateri goats. A total of six female Pateri goats were randomly treated with three different dose rates of Detomidine at 40 µg, 50 µg and 60 µg/kg body weights. The effects of Detomidine on respiratory and heart rate, rectal temperature and serum glucose level were investigated. Following detomidine intravenous administration in goats, it produced dose dependent effect on physiological parameters. Respiratory and heart rate decreased after intravenous administration in all goats. The heart rate decreased at 5 min with all dose rates and returned to the base line at 60 min. This change in heart rate was dose dependent and there was no significant ($P>0.05$) change observed with 40 µg and 50 µg/kg of Detomidine. However, there was significant difference ($P<0.05$) at 75 min between the 40 µg and 60 µg/kg of Detomidine in all goats. However, significant ($P<0.01$) increase in serum glucose level occurred with all dose rates at 30 min compared with control groups. It is concluded that Detomidine has produced no adverse effect on physiological parameters.

Key words: Pateri goat, detomidine, respiratory rate, heart rate, glucose

INTRODUCTION

Goats undergo many surgical procedures, such as hernia, dystocia and traumatic injuries. Presently, Detomidine is used to provide good sedation and analgesia in horses (1, 2) at a dose rate of 10-20 µg/kg in horses (3). It is a highly potent drug, used for sedation in all animals, but has significant effect on physiological parameters. Results of several studies on the use of Detomidine have shown some impact on physiological parameters, with detomidine decreasing the heart rate, respiratory rate and then vital parameters returning to normal level slowly (4).

Meanwhile, Detomidine with 40 µg/kg decreases the respiratory rate, heart rate and rectal temperature, when used in sheep and goats respectively (5, 6). Beside this it increases the serum glucose level in goats (7, 8). Generally, goats kept for milk purpose on which various surgical procedures are performed and they need safe pre-anesthetics (9). Sedative and analgesics are used on goats for minor surgery, in order for animals to get relief from pain. Our practice suggests that application of Detomidine is a good choice for minor operations in goats. To our knowledge, there are limited reports available concerning the assessment of the physiological effects of Detomidine in goats. The purpose of this study was to assess whether Detomidine can be used in goats and have limited effects on physiological parameters. The hypothesis was that goats receiving Detomidine may have minimal effects on their physiological parameters in the case of minor and major clinical surgical procedures. The physiological effects of Detomidine are investigated to learn about the side effects and for future application.

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MATERIAL AND METHODS

This study was carried out in the Department of Surgery and Obstetrics, Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University Tandojam. Six healthy Pateri female goats, aged between 6 to 8 months with body weight of 23.03 ± 3.50 kg (mean \pm SE) were used. All animals were purchased from the local market for this experiment. Goats received routine physical examination and they were found to be bright, alert and responsive during the study time. All animals were fed bursem grass and provided fresh water *ad libitum*. They were ear tagged from 1 to 6 for identification and were adapted for two weeks. The goats were randomly treated with three different dose rates of Detomidine (Dermosidan, 10mg/ml, Farnos Group Ltd, Turku, Finland) as 40 μ g/kg, 50 μ g/kg and 60 μ g/kg body weights. Each goat received three dose rates with 10 days interval between each treatment. After weighing the goats, hairs around left and right jugular vein sites were clipped using automatic hair clipper and prepared aseptically. The left jugular vein was used for intravenous administration of the drug using an 1 ml disposable syringe. The right jugular vein was used for blood sample collection using a 3 ml disposable syringe, transferred into plain tube and labeled as a control (before treatment) and treatment sample at intervals after drug administration. Physiological parameters were recorded before and after treatment, i.e., respiratory rate (RR) breaths/min were examined by counting thoracic movement in one minute, heart rate (HR) beats/min was taken from the left side of the thorax using a stethoscope and taken from all animals five minutes before the experiment as a control and then at 5, 15, 30, 45, 60, 75, 90, 105 and 120 min. after treatment

in all goats. The rectal temperature $^{\circ}$ C (RT) was obtained from each animal at five minutes before and then every 15 min. up to 120 min. post Detomidine administration using a clinical thermometer. For determination of the glucose level, venous blood samples 3 ml were collected each time from the jugular vein as a control and then at 30, 90 and 1440 min. after the administration of Detomidine. The blood samples were centrifuged at 4000 revolutions/min for 15 minutes and then the serum glucose was determined using a reflotron glucose test strip (Boehringer Mannheim, Germany) on Reflotron Plus blood chemistry machine (Boehringer Mannheim Diagnostics, Germany).

Statistical analysis

The results obtained were analyzed using one way analysis of variance (ANOVA) with Tukey-Kramer multiple comparison test. All statistical tests were conducted at 95% confidence level.

RESULTS

Respiratory rate (RR)

The mean control values of respiratory rate (RR) breathe/min with three treatments were 18.66 ± 0.98 , 19.33 ± 1.11 and 18.66 ± 0.98 in all goats respectively (Table 1). The Control values were not significantly different, respectively. RR decreased significantly at 30, 15 and 5 minutes after administration of 40 μ g/kg, 50 μ g/kg and 60 μ g/kg of Detomidine, respectively in all goats. The maximum decrease in RR occurred at 30 min. in all dose rates. Then RR slowly returned to the base line by 60 min., 90 min. and 105 min. after treatment of 40 μ g/kg, 50 μ g/kg and 60 μ g/kg of Detomidine respectively, in all goats (Table 1).

Table 1. Mean (\pm SE) respiratory rate with various dose rates of Detomidine in goats

Time (minutes)	Detomidine dose rates		
	40 μ g/kg	50 μ g/kg	60 μ g/kg
0	18.66 \pm 0.98	19.33 \pm 1.11	18.66 \pm 0.98
5	16.83 \pm 1.01	15.66 \pm 0.95	13.33 \pm 0.98**
15	14.83 \pm 0.65	14.66 \pm 0.95*	12.00 \pm 0.51**
30	13.00 \pm 0.51**	12.00 \pm 0.51**	11.33 \pm 0.42**
45	13.50 \pm 0.50**	13.66 \pm 0.80**	11.66 \pm 0.61**
60	14.83 \pm 0.40	14.00 \pm 0.73**	12.00 \pm 0.73**
75	15.50 \pm 0.50	14.66 \pm 0.66*	12.66 \pm 0.71**
90	17.00 \pm 0.44	15.00 \pm 0.85	14.16 \pm 0.90*
105	18.00 \pm 1.03	18.00 \pm 0.89	15.33 \pm 1.08
120	18.66 \pm 0.98	19.00 \pm 1.00	18.66 \pm 0.98

* =Significant difference at (P<0.05) between the values and corresponding control

** = Significant difference at (P<0.01) between the values and corresponding control

Table 2. Mean (\pm SE) heart rate with various dose rates of Detomidine in goats

Time (minutes)	Detomidine dose rates		
	40 μ g/kg	50 μ g/kg	60 μ g/kg
0	76.33 \pm 1.58	81.66 \pm 2.10	76.16 \pm 2.59
5	50.16 \pm 4.24 ^{aa}	48.33 \pm 2.10 ^{aa}	47.33 \pm 1.60 ^{aa}
15	51.33 \pm 3.16 ^{aa}	50.83 \pm 2.34 ^{aa}	47.33 \pm 1.14 ^{aa}
30	54.66 \pm 2.44 ^{aa}	53.33 \pm 3.49 ^{aa}	43.50 \pm 0.88 ^{aa}
45	57.33 \pm 2.40 ^{aa}	56.16 \pm 3.16 ^{aa}	47.50 \pm 1.02 ^{aa}
60	62.50 \pm 3.33 ^{aa,bb}	58.50 \pm 3.32 ^{aa}	49.50 \pm 1.08 ^{aa,bb}
75	66.66 \pm 2.95 ^{bb}	64.00 \pm 3.81 ^{aa,c}	51.50 \pm 1.08 ^{aa,bb,c}
90	69.00 \pm 3.64 ^{bb}	68.66 \pm 3.56 ^{a,cc}	57.16 \pm 1.01 ^{aa,bb,cc}
105	74.00 \pm 2.42 ^b	71.66 \pm 3.40	62.50 \pm 1.25 ^{aa,b}
120	76.33 \pm 1.58	78.33 \pm 2.27	76.16 \pm 1.60

a = Significant difference at ($P < 0.05$) between the values and corresponding control

aa = Significant difference at ($P < 0.01$) between the values and corresponding control

b = Significant difference at ($P < 0.05$) between the values of 40 μ g/kg and 60 μ g/kg at corresponding time

bb = Significant difference at ($P < 0.01$) between the values of 40 μ g/kg and 60 μ g/kg at corresponding time

c = Significant difference at ($P < 0.05$) between the values of 50 μ g/kg and 60 μ g/kg at corresponding time

cc = Significant difference at ($P < 0.01$) between the values of 50 μ g/kg and 60 μ g/kg at corresponding time

Heart rate (HR)

The mean control values of heart rate (HR) beats/min in goats were 76.33 \pm 1.58, 81.66 \pm 2.10 and 76.16 \pm 2.59 per min. respectively. Table 2 shows that mean control values were not different significantly from each other. However, PR decreased at 5 min. with all doses and returned to base line at 60 min., 90 min. and 105 min. after 40 μ g/kg, 50 μ g/kg and 60 μ g/kg administration of Detomidine respectively. Detomidine showed that there was no significant difference in the PR rate in goats after all the treatment, but significant difference ($P < 0.01$) was observed from 60 to 90 min. and at 105 min. a significant difference ($P < 0.05$) was observed between 40 μ g/kg and 60 μ g/kg of Detomidine respectively.

Rectal temperature ($^{\circ}$ C)

Mean control values of rectal temperature (RT) were 39.26 \pm 0.01 $^{\circ}$ C, 39.31 \pm 0.1 $^{\circ}$ C, 39.30 \pm 0.0 $^{\circ}$ C in all goats respectively (Table 3). There were no significant difference observed between 40 μ g/kg, 50 μ g/kg and 60 μ g/kg of Detomidine in all goats respectively.

Serum glucose level

There was no significant difference in corresponding control values between all groups. However, there was significant difference ($P < 0.05$) in the serum glucose level after Detomidine administration because this increase of glucose was dose dependent. Maximum increase in the serum glucose happened at 30 minutes when using all

Table 3. Mean (\pm SE) rectal temperature ($^{\circ}$ C) in goats after Detomidine administration at difference dose rates

Time (minutes)	Detomidine dose rates		
	40 μ g/kg	50 μ g/kg	60 μ g/kg
0	39.26 \pm 0.01	39.31 \pm 0.1	39.30 \pm 0.0
15	39.10 \pm 0.1	39.05 \pm 0.1	38.96 \pm 0.1
30	38.90 \pm 0.1	38.80 \pm 0.1	38.58 \pm 0.2
45	38.85 \pm 0.1	38.48 \pm 0.3	38.26 \pm 0.2
60	38.91 \pm 0.1	38.30 \pm 0.3	37.98 \pm 0.19
75	38.85 \pm 0.2	38.18 \pm 0.3	37.98 \pm 0.19
90	38.85 \pm 0.2	38.26 \pm 0.2	38.16 \pm 0.31
105	38.85 \pm 0.2	38.65 \pm 0.3	38.20 \pm 0.3
120	39.01 \pm 0.1	39.15 \pm 0.1	39.13 \pm 0.14

Table 4. Mean (\pm SE) glucose level after administration of Detomidine in goats

Time (minutes)	Detomidine dose rates		
	40 μ g/kg	50 μ g/kg	60 μ g/kg
0	66.91 \pm 2.32	64.80 \pm 2.39	64.01 \pm 2.70
30	125.67 \pm 3.75 ^{aa, dd}	139.33 \pm 4.39 ^{dd}	154.83 \pm 4.56 ^{aa, dd}
90	83.56 \pm 3.01 ^{b, d, fff}	101.52 \pm 2.49 ^{b, fff, dd}	127.17 \pm 5.80 ^{dd, dd, mm}
1440	65.50 \pm 2.23	63.96 \pm 2.69	62.13 \pm 2.42

^{aa} = Significant difference at (P<0.01) between the values of 40 μ g/kg and 60 μ g/kg at corresponding time

^b = Significant difference at (P<0.05) between the values of 40 μ g/kg and 50 μ g/kg at corresponding time

^d = Significant difference at (P<0.05) corresponding control

^{dd} = Significant difference at (P<0.01) corresponding control

^{mm} = Significant difference at (P<0.01) between the values of 40 μ g/kg and 60 μ g/kg at corresponding time

^{fff} = Significant difference at (P<0.01) between the values of 50 μ g/kg and 60 μ g/kg at corresponding

three doses and then the serum glucose level started to return gradually from 90 minutes up-to 24 hours. The mean values for the serum glucose level were significantly decreased at 30 minutes (P<0.05) with 40 μ g/kg as compared to values with 50 μ g/kg of Detomidine (Table 4). Similarly mean values were significantly lower at 30 minutes (P<0.01) and 90 minutes with 40 μ g/kg as compared to values with 50 μ g/kg of Detomidine. Similarly mean values were significantly lower at 30 min. (P<0.01) and 90 min. with 40 μ g/kg as compared to corresponding values with 60 μ g/kg of Detomidine. Mean values were significantly lower at 90 min. (P<0.01) with 50 μ g/kg as compared to corresponding values with 60 μ g/kg of Detomidine.

DISCUSSION

Data on the physiological effects of detomidine in goat is limited. The respiratory rate (RR) decreased significantly in all goats in this study, which is similar to the findings observed in goats (6), in horses (4, 10, 11) and in calves (12). However, on the other hand in sheep it was observed that Detomidine had accelerated the respiratory rate in the first 15 min. with Detomidine (5, 7). The heart rate decreased after Detomidine administration of 40 μ g/kg, 50 μ g/kg and 60 μ g/kg in all goats. Similarly, decrease in the heart rate has been reported in horses (4, 10, 13) as well in sheep's (5) and in buffalo's (14). While rectal temperature in this study slightly decreased after administration of Detomidine, this decrease was not significant compared to the control values. Previous study by Singh et al. (6) reported that in goats rectal temperature decreased with 40 μ g/kg of Detomidine. In other animals Detomidine also had an effect on body temperature, with decreases in calves (12) and in sheep's (7).

In this study increase in serum glucose occurred in all goats and this increase of the serum glucose is also in agreement with results published by Ambrósio, A. M. et al. (15), 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. This effect on the blood glucose was due to Detomidine in this study. Similarly it was reported that glucose increased in sheep with Detomidine at 30 μ g/kg, 60 μ g/kg and 90 μ g/kg dose rates (7). Increase in the serum glucose level was also reported by other recherches in goats (6, 8).

CONCLUSION

The study revealed that Detomidine has no adverse effects on physiological parameters. In addition, the effects on physiological parameters remained dose dependent, proving Detomidine is useful for goats. Further physiological study is needed to confirm these findings.

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