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SHORT COMMUNICATION

Sedative/Analgesic Efficacy of Medetomidine in Goats

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ABSTRACT

Sedative and analgesic efficacy of three intravenous doses of medetomidine, i.e., 4, 5 and 6 µg/kg BW was studied in six goats. A randomized cross over experimental design was used. Onset of sedation, onset of optimal sedation, duration of optimal sedation and degree of sedation were measured and found to be dose dependent. Dose 4 µg/kg produced light sedation whereas 5 and 6 µg/kg produced moderate and deep sedation, respectively. Total duration of sedation was 60.58±2.21, 83.50±3.75 and 104.33±4.30 min after administration of 4, 5 and 6 µg/kg medetomidine, respectively. The duration of sedation was significantly ($P \leq 0.01$) longer with 6 µg/kg as compared to 4 and 5µg/kg. Onset and duration of analgesia were dose dependent. The mean values for onset of analgesia were 25.00±3.00, 24.16±1.74 and 12.00±1.50 min and duration of analgesia was 8.00±2.00, 17.16±1.81 and 31.50±2.61 min after administration of 4, 5 and 6 µg/kg medetomidine, respectively. Skin analgesia and muscle relaxation were produced in all animals with higher doses (5 and 6 µg/kg) and only in 2 animals with 4 µg/kg of medetomidine. It was concluded that medetomidine is a highly potent drug which can be effectively used in the dose rates of 4 to 5µg /kg I/V for sedation in goats.

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INTRODUCTION

Medetomidine (Domitor®, Orion Corporation, Espoo, Finland), is a new sedative drug developed primarily for use in dogs and cats. It is very potent, efficacious and selective alpha$_2$ agonist (Lumb and Jones, 1996). Medetomidine can be administered by intravenous, intramuscular or subcutaneous injection. It produces a reliable degree of sedation, muscle relaxation and analgesia in various species of animals (Hall and Clarke, 1991). Mostly the drug has been used in dogs and cats (Clarke and England, 1989; Golden *et al*., 1996). However few reports of its use in sheep (Mohammad *et al.,* 1993; Muge *et al.,*1996 ; Celly *et.al*.,1999), cattle (Arnemo and Soli, 1993; Bryant *et al.,*1998), buffalo calves (Kalhoro *et al*., 2000) and in goats (Mohammad *et al.*, 1989; Carroll, *et al.,* 2005; Kinjavdekar *et al.,* 2007) have also been published.

There has been no comprehensive study on the sedative and analgesic efficacy of various doses of medetomidine in goats. It was, therefore, decided to conduct a study on various dose rates and sedative and analgesic effects of medetomidine in goats.

MATERIALS AND METHODS

Six female Barri goats having 10 to 16 months of age and 30 to 45 kg BW were used in this study. The goats were purchased from local market. Animals were kept at the Indoor Patient Ward, Department of Surgery and Obstetrics, Sindh Agriculture University, Tandojam during the experiments. Animals were allowed to adapt to their surroundings before start of experiments and were left loose for exercise in the mornings and evenings. Goats were fed alpha alpha (*Medicago sativa*) and burseem (*Trifolium alexandrinum*) fodders. All goats were ear tagged, dewormed with Oxafax^R (Glaxo, Wellcome Pakistan) (5 mg/kg) and vaccinated with contagious caprine pleuropneumonia vaccine (0.5 ml s/c) (Veterinary Research Institute, Brewery Road, Quetta, Pakistan), and enterotoxaemia vaccine (1 ml/sc) (Veterinary Research Institute, Brewery Road, Quetta, Pakistan).

Experimental design

A randomized cross over experimental design was used. Each of six goats received medetomidine in 3 different doses i.e. 4, 5 and 6 µg/kg WB intravenously. At

least 10 days interval was allowed between two treatments in each animal. Immediately after administration of medetomidine, various parameters of sedation and analgesia such as onset of sedation, onset of optimal sedation, total duration of sedation, level of sedation and onset and duration of analgesia were recorded. The occurrence of muscle relaxation and recumbency, if any, were also recorded. Level of sedation was quantified as 0 (no sedation; goat appeared alert), 1 (light sedation; goat standing quietly, staggering a bit with its head lowered below shoulders but above knees), 2 (moderate sedation; goat appeared drowsy, and staggering with its head lowered beyond knees) and 3 (deep sedation; goat lowering its head beyond knees, staggering and eventually going into lateral recumbency).

Statistical analysis

Statistical analysis was performed using the computer program Graph Pad Instat; GPIS (1990, Graph pad Software, San Diego, USA) and one way analysis of variance and Tukey-Kramer Multiple Comparison test.

RESULTS

Sedative effects

The onset of sedation was dose dependent, with higher dose of medetomidine (6 µg/kg) producing more rapid effect. Statistically sedation occurred significantly quicker (P≤0.01) with 5 and 6 µg/kg as compared to 4 µg/kg. There was no significant difference in onset of sedation with 5 and 6 µg/kg of medetomidine. The onset of optimal sedation was more rapid with the increasing dose. Statistically onset of optimal sedation was significantly rapid (P≤0.01) with 6 µg/kg as compared to 4 and 5 µg/kg. Comparison of 4 with 5 µg/kg showed no significant difference in onset of optimal sedation (Table 1).

Table 1: Sedative and analgesic effects of medetomidine in goats

Parameter	Medetomidine Dose (µg/kg b wt)		
	4	5	6
Onset of sedation (sec)	250±40.00a	120±15.96b	57.50±7.15b
Onset of optimal sedation (min)	22.50±2.50a	21.50±1.54a	10.00±1.50b
Duration of optimal sedation (min)	11.50±1.50	23.83±2.21	42.50±2.59
Total duration of sedation (min)	60.58±2.21a	83.50±3.75a	104.33±4.30b
Level of sedation	Light	Moderate	Deep
Onset of skin analgesia (min)	25.00±3.00a	24.16±1.74a	12.00±1.50b
Total duration of skin analgesia (min)	8.00±2.00a	17.16±1.81a	31.50±2.61b
Duration of recumbency (min)	No recumbency	39.33±3.87a	55.16±4.34b

Values (Mean±SE) bearing different letters in a row differ significantly (P≤01).

Medetomidine produced dose dependent effects on duration of optimal sedation and total duration of sedation. The duration was increased with increasing dose of medetomidine. There was significant difference in total duration of sedation with 4, 5 and 6 µg/kg of medetomidine. Statistically total duration of sedation was significantly longer (P≤0.01) with 6 µg/kg as compared to 4 and 5 µg/kg.

The degree of sedation was light in all animals treated with 4 µg/kg of medetomidine. 5 µg/kg of medetomidine produced variable results. Three animals (No. 1, 3 and 6) showed moderate sedation, two animals (No. 4 and 5) deep sedation and one animal (No. 2) light sedation. 6 µg/kg of medetomidine produced signs of deep sedation in all animals. Statistical analysis showed that the degree of sedation was significantly different (P≤0.01) with all three doses.

The dose rate of 4 µg/kg I/V induced no recumbency in any animal, where as higher dose (6 µg/kg) produced recumbency in all animals. Dose 5 µg/kg produced recumbency in only two animals. Analysis of variance showed that the duration of recumbency was significantly different. Further analysis by Tukey-kramer multiple comparison test showed that the duration of recumbency was significantly longer (P≤0.01) with 6 µg/kg than with 5 µg/kg of medetomidine.

Analgesic effects

The dose rate of 4 µg/kg produced skin analgesia in only 2 animals (Nos.1and 4), where as higher doses (5 and 6 µg/kg) produced analgesia in all animals. The onset and duration of analgesia were dose dependent. The duration of analgesia was increased with increasing dose of medetomidine (Table 1). Analysis of variance showed that the duration of skin analgesia was significantly different with 3 doses. Further analysis by Tukey-kramer multiple comparison test showed that the duration of analgesia was significantly longer (P≤0.01) with 6µg/kg as compared to 4 and 5 µg/kg b wt of medetomidine.

DISCUSSION

In the present study, medetomidine produced dose dependent levels of sedation in goats. Light, moderate and deep sedation were produced with 4, 5 and 6 µg/kg medetomidine, respectively. Deep and rapid onset of sedation has been reported in dogs with 20 and 40 fg/kg (I/m) of medetomidine (Clarke and England, 1989). Higher dose (6 µg/kg) produced recumbency in all animals. The onset of sedation in goats was dose dependant as has been reported with medetomidine in buffalo calves (Kalhoro *et al*., 2000). Vainio *et al.* (1989) reported that sedation occurred within 1.5 minutes of administration of medetomidine in dogs.

The duration of optimal sedation and total duration of sedation were both significantly longer with higher doses (5 and 6 µg/kg) of medetomidine. Higher doses (5 and 6 µg/kg) produced quicker and longer duration of skin analgesia in goats. Similar observations have been reported in other species such as in dogs (Clarke and England, 1989; Vainio *et al*., 1989) and in buffalo calves (Shahani, 1998; Kalhoro *et al.*, 2000).

It is concluded that medetomidine is a highly potent drug which produces effective sedation in very small doses. Its sedative and analgesic effects are all dose dependent. The dose rates of 4 to 5 µg/kg b wt can be safely used for light to moderate sedation in goats.

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