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Physiological responses of captive sloth bears immobilized with combination of ketamine hydrochloride and xylazine hydrochloride

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Abstract

The present study was conducted to define the physiological responses of captive sloth bears immobilized with ketamine hydrochloride and xylazine hydrochloride and to assess the changes in vital signs. A total of 15 sloth bears were immobilized using combination of ketamine hydrochloride and xylazine hydrochloride at the dose rate of 5.0 milligram (mg) per kg body weight and 2.0 mg per kg body weight, respectively. The use of combination of these drugs was found satisfactory for the chemical immobilization of captive sloth bears. There were no significant differences observed in induction time and recovery time and physiological parameters such as heart rate, respiratory rate, and rectal temperature between sexes.

Keywords: Sloth bear, chemical immobilization, xylazine hydrochloride

1. Introduction

Chemical immobilization is considered a necessary component for research and management purposes of Wild-animals [1, 2]. The combinations of anaesthetics like ketamine and xylazine have been widely used for domestic and non-domestic animals [3, 4]. This combination has also been used for Ursids [5, 6, 7]. It has been observed that when Ketamine Hydrochloride has been used alone as an immobilizing or anaesthetic agent, it has led to muscle rigidity and convulsions in animals [2, 8, 9]. Hence, ketamine hydrochloride is combined with xylazine hydrochloride, which acts as a muscle relaxant and helps to reduce incidence of muscle convulsions in the animal and makes it less rigid during handling [5, 6, 10]. The combination of these two drugs, namely xylazine hydrochloride and ketamine hydrochloride has been found to generally result in smooth induction and recovery of the animal [11]. The results of the present study provide data on physiological responses obtained after immobilization of sloth bears (*Melursus ursinus*) with combination of ketamine hydrochloride and xylazine hydrochloride.

2. Materials and Methods

The present study was performed at the Bear Rescue Transit Facility, located within Nehru Zoological Park, Hyderabad (Andhra Pradesh, India) during the period of May to June 2007. A total of 15 apparently healthy-looking sloth bears included 7 male and 8 female with varying age groups and body weight were used for purpose of this study.

Prior to chemical immobilization, the sloth bear to be immobilized was kept isolated in a separate enclosure and was fasted overnight though water was made available to the bear. Blowpipe was used for darting the animal. Prior to injection, the dosage of the immobilizing drugs used was calculated for the bear based on their body weight as per the following dose rate, i.e. 5 mg of ketamine hydrochloride (Ketamil®, Troy laboratories Pty Ltd., Smithfield, NSW, Australia) per kg of body weight and 2 mg of xylazine hydrochloride (Xylazil®, Troy laboratories Pty Ltd., Smithfield, NSW, Australia) per kg body weight. The sloth bear was darted at around the shoulder or neck region, since these areas have thinner deposition of subcutaneous fats, which thereby increases the probability of the immobilizing drugs penetrating efficiently into the highly muscular area of the animal [5]. After anesthetic induction of the animal, the eyes of the bear were blind folded with a piece of cloth to avoid corneal damage. Ambient temperature during chemical immobilization of the sloth bears ranged between 26.2 °C to 31.1°C. Induction time was recorded as the time taken by the bear from being injected till the time at which the animal attained sternal or lateral recumbency.

Respiration rate, resting heart rate and rectal temperature was recorded after the animal attained full lateral recumbency. Recovery time was calculated as the time interval between recumbency and the animal's ability to maintain standing posture.

3. Results and Discussion

A total of 15 sloth bears were immobilized using combination of ketamine hydrochloride and xylazine hydrochloride drugs. The dose for ketamine hydrochloride and xylazine hydrochloride were calculated at 5.0 mg/kg body weight and 2.0 mg/kg body weight respectively. After darting, early signs of drug effects such as mydriasis and ataxia were observed before the animal slumps into sternal recumbency. Salivation was observed in most of the bears, but emesis was not observed because food was withheld from the animal for at least 12 hours prior to their chemical immobilization. The induction time ranged from 9 to 21 minutes (mean-12.04 min; median-11; SD-2.86; n-15). Finally, muscles of the neck and head were completely relaxed. The recovery time ranged from 50 to 175 minutes (mean-125.2; SD-50.73; median-135; n-15). There were no significant differences in the induction time and recovery time between sexes. (Table1). Early stages of recovery of the animal were marked with blinking of eyes, twitching of the ears and response to external stimuli. The bear's initial effort to stand on its leg showed a walk-in uncoordinated movement and slowly. They however responded to tactile and auditory stimuli and were not aggressive.

Ketamine hydrochloride and Xylazine hydrochloride have received widespread use as chemical immobilizing drugs for non-domestic carnivores⁽¹¹⁾. In the present study the use of combination of these drugs was found satisfactory for the chemical immobilization of captive sloth bears. The approximate dose of 5.0 mg of ketamine hydrochloride per kg and 2.0 mg of xylazine hydrochloride per kg produced adequate immobilization of the bears for the purpose of health check-up and sample collection. These doses were lower than the values used by other investigators working with this

combination in sloth bears^[6, 12]. The advantages of inducing chemical immobilization with a combination of ketamine hydrochloride and xylazine hydrochloride have been well documented^[5, 8, 9] and the visible advantages of using this combination has been confirmed by this study, as has been characterized by rapid inductions, smooth recoveries and adequate muscle relaxation for most procedures. The wide safety margin of these drugs permits additional injection of drug whenever necessary^[3].

The mean induction time as observed in our study is slightly longer than reported by other authors in sloth bears^(6,12). The need in some of our cases for a second dosage of anesthetics may be related to the targeted injection site and in some cases, it may be due to the fact that the injection would have remained subcutaneously and the constituents in the dart would not have entered the muscle mass. Drugs injected subcutaneously or into fat deposits resulted in reduced degree of immobilization and a prolonged recovery time due to poor absorption^[9].

Heart rate, respiratory rate and rectal temperature were measured after the animal went into complete recumbency. Heart rates ranged from 66 to 84 beats per minute (mean-73.4; SD- 5.59; median- 72; n- 15). The range of respiratory rate was from 12-28 per minute (mean-16.8; SD-4.53; median- 16; n-15) and the rectal temperature range was 36.2 °C to 39.9 °C (mean-38.2 °C; SD-0.92; median- 38.2 °C; n-15) per minute. In this study, it was observed that dosage levels of ketamine hydrochloride and xylazine hydrochloride produced no significant differences in respiration rate, pulse rate and body temperature as measured immediately after the animals went to full recumbency (Table 1). The overall mean of these values obtained in this study was in agreement with the values given by Page^[6]. So, the results of this study indicated that the combination of ketamine hydrochloride and xylazine hydrochloride was found satisfactory for the chemical immobilization of captive sloth bears without much effect on vital parameters including respiratory rate, heart rate and temperature.

Table 1: Physiological responses of captive sloth bears immobilized with combination of ketamine hydrochloride and xylazine hydrochloride

Measures	Induction time (minutes)	Recovery time (minutes)	Heart rate (per minute)	Respiratory rate (per minute)	Rectal temperature (°C)
Male Sloth Bears (n = 7)	12.14±1.22	126.52±14.06	74.14±2.14	16.29±1.01	38.20±0.46
Female Sloth Bears (n = 8)	12.00±0.96	124.00±22.24	72.75±2.05	17.38±2.06	38.28±0.22
t-value	0.09 NS	0.09 NS	0.47 NS	0.45 NS	0.15 NS

NS – Not significant

4. Summary

The use of combination of ketamine hydrochloride (5 mg per kg body weight) and xylazine hydrochloride (2 mg per kg body weight) was found satisfactory for the chemical immobilization of captive sloth bears. The induction and recovery time ranged from 9 to 21 minutes and 50 to 175 minutes respectively. There were no significant differences observed in induction time, recovery time heart rate, respiratory rate and rectal temperature between sexes.

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