

Effect of xylazine and ketamine on pulse rate, respiratory rate and body temperature in dog

Abstract

Five healthy male dogs were selected in this study to find out the effects of Xylazine hydrochloride (0.2mg/kg) and Ketamine (8mg/kg) anesthetic protocol on pulse rate, respiratory rate and body temperature simultaneously. These parameters were recorded before administration of the drugs and then after 5 minutes of administration, followed by 15 minutes each interval for two hours. The average control values for pulse rate, respiratory rate and body temperature were recorded 83.20+7.29, 25.20+3.42 and 101.6+1.14 respectively. Significant increase in pulse rate (116.40+3.84) and respiratory rate (52.00+6.32) were observed after 5 minutes of anesthetic administration while body temperature remained normal from 0 to 120 minutes. Decrease in pulse rate (106.80+36.3) and respiratory rate (48.00+6.96) were observed beyond 15 minutes, while normal pulse rate (86.40+2.60) and respiratory rate (28.40+2.19) recorded at 105 minutes. In conclusion, Xylazine and Ketamine have significant effects on pulse and respiratory rate. However, body temperature remains normal with use of these drugs.

Keywords: xylazine, ketamine, respiratory, anesthesia, dog

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Abbreviations: WHO, world health organization

Introduction

For surgical intervention, anesthesia is an indispensable and most important pre-requisite in both humans and animals, which provide safety and maximum performance for the surgeon. Effect of anaesthesia depends on route of administration.¹ For canine surgery, it is given through inhalation or parenteral route. Intravenous administration is preferred and considered the safe route for early induction of anaesthesia. Important anaesthetic agent used by most of veterinarians is "Thiopental sodium" as the sole for surgical intervention. Its irregular availability and deficiency in the market make it difficult for veterinarians to perform surgery on canine.² In such situation scientists, surgeons and veterinarians look for some other safe, suitable and reliable anaesthetic agents that can provide equivalent and better spectrum of anaesthesia for surgery.³ Anesthesia is required in surgical procedures for the patient to be unaware, without pain and immobile. Ketamine 2-(2-chlorophenyl)-2-(methethylamino), an arylcycloalkylamine which is structurally similar to cyclidine, like phencyclidine, eticyclidine, rolicyclidine and tenocyclidine.⁴ It is an antagonist for NMDA-receptor, used in human and veterinary medicine. Ketamine also has effect on neurotransmitter system. It can produce state of dependence, which has been shown in various animal models. It is supported from the data of humans reported by WHO. The report explains that during monitoring effects in recreational users are quite different from adverse effects in patients. It produces depression of CNS due to pharmacological effect that results disturbances in thinking, hallucination, motor function and perception.⁵

Ketamine hydrochloride, having pKa of 7.5 is white crystalline and water-soluble. Ketamine free base has 10 times greater lipid solubility than thiopentone. It is commercially available for injection as an aqueous solution in the form of mixture hydrochloride salt, a pharmaceutical form. Xylazine is [2-(2,6 dimethyl phenyl amino)-

4h-5,5 dihydro-1,3 thizine] thizine derivative classified as 2-alpha adrenergic agonist with sedative, analgesic and muscle relaxant properties. It can be used alone or in combination for minor surgical procedures.^{4,5} Extensive studies have been carried out in various animal species such as sheep,⁶ goat,⁷ mare⁸ and cattle to explore the sedative and analgesic role of Xylazine,⁹ and in combination with general and inhalant anaesthetics in rabbits.¹⁰ Xylazine alone as sedative and analgesic has been commonly used in Dogs. Dog is a domesticated carnivorous mammal having typically an acute sense of smell, a whining, howling and barking voice with non-retractile claws and a long snout. All dogs are descended from wolves, by domestication and artificial selection. They have been bred from wolves originally by human for a long time. Dog is probably the first domesticated animal ever to be. Dog perform many roles for people, such as hunting, herding (also known as a stock dog or working dog), pulling loads, protection, companionship (A companion or pet animal is an animal which kept primarily for protection or company of person's), assisting police and military.^{11,12} The study was conducted to find out time dependent effects and functional significance of Xylazine and Ketamine on various physiological parameters i.e. pulse rate, respiratory rate and body temperature in dog.

Materials and methods

The study was conducted to find out the various physiological effects i.e. pulse rate, respiratory rate and body temperature through the use of Ketamine in combination with Xylazine in healthy dog. Five healthy dogs of about 17-20Kg body weight (male) were brought and placed under the same experimental conditions and the procedure was approved by ethical committee of the university at Veterinary Teaching Hospital, Department of Animal Health, Faculty of Animal Husbandry and Veterinary Sciences, The University of Agriculture Peshawar, Pakistan. The dogs were weighed with automatic weighing balance. Ketamine and Xylazine were administered at the dose rate of 8mg/kg and 0.2mg/kg through intravenous route respectively. The dogs were sedated first with Xylazine (0.2mg/kg) and then the

anaesthesia was induced through Ketamine (8mg/kg). The following parameters were noted before induction of sedative and anaesthetic drugs and after induction at 05 minutes and then after every 15 minutes up to 120 minutes.

Pulse rate

Pulse rate was recorded by auscultation of heart with the help of stethoscope before induction of anaesthesia, after 5 minutes and then after every 15 minutes up to 120 minutes.

Respiratory rate

Respiratory rate was observed through holding the hand in front of nostrils before induction of anaesthesia, after 5 minutes and then after every 15 minutes up to 120 minutes.

Body temperature

Body temperature was noted per rectum with clinical thermometer before induction of anaesthesia, after 5 minutes and then after every 15 minutes up to 120 minutes.

Analysis of data

The data was maintained using Microsoft Excel (MS Excel 2007, Microsoft Corporation, Redmond, WA). Descriptive Statistical analysis and various associations among experimental and control groups were determined using commercially available statistical package statistix 8.1 (Analytical Software, Tallahassee, FL). Results mentioned as means SEM. P values <0.05 were considered significant. The Kolmogorov Smirnov test will be employed to test the normal distribution of the data. Multiple comparisons were performed using One-way ANOVA, followed by post-hoc testing using the Tukey's test (Table 1).

Table 1 Body weight of dogs with calculated dose of xylazine and ketamine

Dog	Dog weight (Kg)	Xylazine dose/Kg	Ketamine dose/dog
1	19	3.8mg	152mg
2	20	4.0mg	160mg
3	19	3.8mg	152mg
4	15	3.0mg	120mg
5	17	3.4mg	136mg

Results

The present study was conducted in five healthy dogs to observe the effects of Xylazine and Ketamine anesthetic protocol on pulse rate, respiratory rate and body temperature. The results of the study described on the basis of time interval and divided into two phases. Phase 1, time interval from 0 to 5 minutes. Phase 2, time interval from 5 minutes to 120 minutes. The results are given below under separate heading.

Pulse rate

Table 2 showed that the average control pulse rate in Phase 1 was 83.20±7.29 before induction of anaesthesia. After sedation and induction of anesthetic drugs in Phase 1, the pulse rate significantly increased from control value to 116.40±3.84 after 5 minutes. Maximum decrease in pulse rate was observed in Phase 2 at 120 minutes, which was recorded 83.20±3.34. This value indicates that

significant difference was found from 05 to 105 minutes. Significant increase in pulse rate was observed in Phase 1, and then in Phase 2 the pulse rate decreased and this decrease remained till 120 minutes. This indicates that the two drugs i.e. Xylazine and Ketamine have significant effect on pulse rate.

Respiratory rate

Table 2 showed that the average control respiratory rate in Phase 1 was 25.20±3.42. After sedation and induction of anesthetic drugs in Phase 1, maximum significant increase in respiratory rate 52.00±6.32 was noted from the normal control value at 05 minutes. In Phase 2, the respiratory rate then decreased after 15 minutes and reached to the normal value at 105 minutes. This also indicates that there was significant effect of Xylazine and Ketamine on respiratory rate.

Body temperature

Table 2 showed that Xylazine and Ketamine have no effect on body temperature (Figure 1).

Table 2 Effect of xylazine and ketamine on pulse rate, respiratory rate and body temperature

Time interval (Minutes)	Pulse rate	Respiratory rate	Body temperature
0	83.20±7.29 ^G	25.20±3.42 ^G	101.6±1.14 ^A
5	116.40±3.84 ^A	52.00±6.32 ^A	101.80±1.09 ^{AB}
15	106.80±3.63 ^B	48.00±6.96 ^{AB}	100.20±0.83 ^B
30	102.00±4.00 ^{BC}	44.80±6.57 ^{BC}	100.00±0.70 ^B
45	100.80±4.60 ^C	41.80±4.49 ^{CD}	100.00±0.70 ^B
60	97.20±4.60 ^{CD}	38.20±4.91 ^{DE}	100.00±0.70 ^B
75	94.40±4.77 ^{DE}	34.20±4.26 ^{EF}	100.20±0.44 ^B
90	91.20±4.60 ^{EF}	30.80±2.16 ^{FG}	100.80±0.83 ^{AB}
105	86.40±2.60 ^{FG}	28.40±2.19 ^{FG}	100.60±0.54 ^{AB}
120	83.20±3.34 ^G	26.00±1.87 ^G	100.40±0.54 ^B
P value	0	0	0.054

A-----G Means±standard error in the same column with different superscripts are significantly different (P≤0.05).

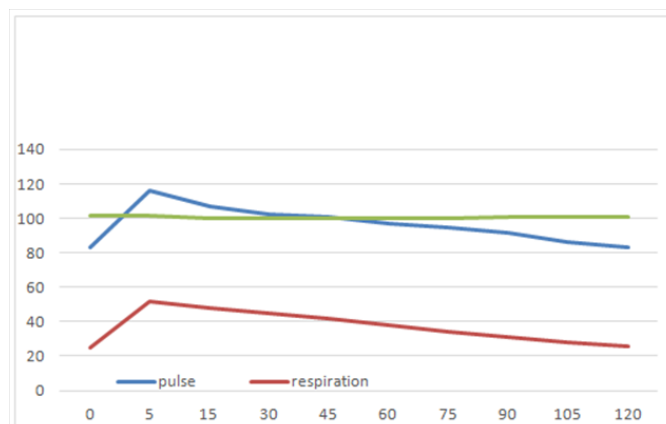


Figure 1 Effect of xylazine and ketamine on pulse rate, respiratory rate and body temperature.

Discussion

The effects of Xylazine and Ketamine on dog pulse rate and respiratory rate was quite significant, while there was no effect of these drugs on body temperature. The estimated effect on pulse rate was increase in pulse rate, which confirmed with significant increase in Phase 1. The estimation for respiratory rate was rapid increase in respiration after anesthetic induction, and the effect was significant. In addition, estimated effect for body temperature was the same as described in the results. However, increase in pulse and respiratory rate both were under controlled conditions. In another experiment, the effects of Xylazine and Ketamine on breathing rate and heart rate have been described in dogs. The results shows decrease in heart rate and breathing rate with only Xylazine use, while in combination with Ketamine shows significant increase in breathing rate and heart rate. These results are fully satisfying our result of experiment.¹³ Also Xylazine effects with or without atropine on arterial blood pressure, pulse pressure and heart rate of dog have been described through Intravenous administration. The drug induced initial increase in blood pressure and then gradual decrease, and significant decrease in heart rate. However, no significant change in pulse pressure recorded. In comparison, decrease heart rate shows contrast to our experiment, which might be due to drug dosage difference, and Xylazine use with or without atropine.¹⁴

Conclusion and suggestions

On the basis of data collected from the present study, it is suggested that Xylazine and Ketamine anesthetic protocol can be safely used in dogs for induction and maintenance of anesthesia at recommended dose. Attention should be given to respiratory and pulse rate during the procedure.

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Conflicts of interest

Authors declare that there are no conflicts of interest.

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