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

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 anesthesia 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 looks 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-(methylamino), an arylocycloalkylamine 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 in recreational users is 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 dimethyle 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], mare [8] 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...
Effect of Xylazine and Ketamine on Pulse Rate, Respiratory Rate and Body Temperature in Dog

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

| Time Interval (Minutes) | Pulse Rate  | Respiratory Rate | Body Temperature |
|------------------------|-------------|------------------|------------------|
| 0                      | 83.20±7.29g | 25.20±3.63g      | 101.14±1.54g    |
| 5                      | 116.40±3.84g| 52.00±6.32g      | 101.80±1.09g    |
| 15                     | 106.80±3.63g| 48.00±6.96g      | 100.20±0.93g    |
| 30                     | 102.00±4.00g| 44.80±6.57g      | 100.00±0.70g    |
| 45                     | 100.80±4.60g| 41.80±4.49g      | 100.00±0.70g    |
| 60                     | 97.20±4.60g | 38.20±4.91g      | 100.00±0.70g    |
| 75                     | 94.40±4.77g | 34.20±4.26g      | 100.20±0.44g    |
| 90                     | 91.20±4.60g | 30.80±2.16g      | 100.80±0.14g    |
| 105                    | 86.40±2.60g | 28.40±2.19g      | 100.60±0.54g    |
| 120                    | 83.20±3.34g | 26.00±1.87g      | 100.40±0.54g    |

Table 2: Effect of Xylazine and Ketamine on Pulse Rate, Respiratory Rate and Body temperature.

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              |

Copyright: ©2017 Ullah et al.
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.

Acknowledgements

Authors declare that there are no acknowledgements.

Conflicts of Interest

Authors declare that there are no conflicts of interest.

References

1. Reddy S, Patt RB (1994) The benzodiazepines as adjuvant analgesics. J Pain Symptom Manage 9(8): 510-514.
2. Russo H, Brès J, Duboin MP, Roquefeuil B (1995) Pharmacokinetics of thiopental after single and multiple intravenous doses in critical care patients. Eur J Clin Pharmacol 49(1-2): 127-137.
3. Harvey RC (2008) Anesthesia and Analgesia in Dogs and Cats and Ferrets. In Anesthesia and Analgesia in Laboratory, Academic Press, USA, pp. 365-384.
4. Gianni AJ, Underwood RH, Gianni MC, Price WA (1985) Phencyclidine and the dissociative. Psychiatric Medicine 3(3): 197-217.
5. Jansen KL (2000) A review of the Nonmedical Use of Ketamine: Use, Users and Consequences. J Psychoactive Drugs 32(4): 419-433.
6. Lin HC, Tyler JW, Wallace SS, Turmon JC (1993) Telazol and xylazine anesthesia in sheep. Cornell Vet 83(2): 117-124.
7. Aithal HP, Amarpal K, Pratap, Singh GR (1997) Clinical effects of epidurally administered ketamine and xylazine in goats. The Official Journal of the International Goat Association 24(1): 55-64.
8. Skarda RT, Muir WW (1996) Analgesic, hemodynamic, and respiratory effects of caudal epidurally administered xylazine hydrochloride solution in mare. Am J Vet Res 57(2): 193-200.
9. Tantawy M, Ibrahim H, El Amrusi S (1982) Some Clinical studies on xylazine in Buffaloes. Assiut Veterinary Medical Journal 9: 147-150.
10. Baniadam A, Afshar SF, Ahmadifard Y (2004) The effect of xylazine-ketamine on temperature, heart and respiratory rate, arterial blood pressure and blood gases, in sheep. Journal of Veterinary Research 59(3): 265-270.
11. Vila C (1997) Multiple and ancient origins of the domestic dog. Science 276(5319): 1687-1689.
12. Wang X, Tedford RH (2008) Dogs: Their Fossil Relatives and Evolutionary History. Columbia University Press, New York, USA, p. 1.
13. Haskins SC, Patz JD, Farver TB (1986) Xylazine and xylazine ketamine in dogs. Am J Vet Res 47(3): 636-641.
14. Klide AM, Calderwood HW, Soma LR (1975) Cardiopulmonary effects of xylazine in dogs. Am J Vet Res 36(7): 931-935.