Research in
ISSN : P-2409-0603, E-2409-9325
AGRICULTURE, LIVESTOCK and FISHERIES
An Open Access Peer Reviewed Journal

Open Access **Res. Agric. Livest. Fish.**
Research Article **Vol. 4, No. 3, December 2017: 209-214.**

EVALUATION OF DIFFERENT PREMEDICANTS IN CANINE ANAESTHESIA

AKM Muktadir Billah*, Sharmin Sultana[1], Md. Akhtar Hossain, Mirza Abul Hashim, Tahmina Begum[1], Bayzer Rahman[1] and Maksudur Rashid[1]

Department of Surgery and Obstetrics, Faculty of Veterinary Science, Bangladesh agricultural University, Mymensingh-2202, Bangladesh; [1]Department of Livestock Services, Dhaka, Bangladesh

***Corresponding author:** AKM Muktadir Billah; E-mail: muktadirtm@gmail.com

ARTICLE INFO

Received
21 November, 2017

Accepted
26 December, 2017

Online
31 December, 2017

Key words
Diazepam-xylazine
Atropine-xylazine
Ketamine hydrochloride
Anaesthesia

ABSTRACT

Fifteen experimental trials were made in fifteen dogs in three different groups to study the degree of sedation produced by different premedicants, to evaluate and to compare their effects on various clinical parameters including different reflexes in dogs. These animals were premedicated with xylazine (1.1mg/kg), atropine (0.05mg/kg)-xylazine (1.1mg/kg) and diazepam (0.2mg/kg)-xylazine (1.1mg/kg) to observe their effect on different clinical and anaesthetic parameters. Diazepam-xylazine combination produced deep sedation while mild sedation was recorded with atropine-xylazine premedication. Respiration rate, heart rate and rectal temperature significantly decreased ($P<0.05$) in dogs of all three groups after fifteen minutes of premedication. Diazepam-xylazine produced marked reduction ($P<0.05$) on clinical parameters while atropine-xylazine produced mild to moderate reduction ($P<0.05$) on clinical parameters in dogs. All experimental dogs in different groups were anaesthetized with ketamine hydrochloride after fifteen minutes of premedication. The respiration rate, heart rate and rectal temperature reduced significantly ($P<0.05$) in xylazine-ketamine, atropine-xylazine-ketamine and diazepam-xylazine-ketamine combination at 5, 10 and 15 min after induction when compared with pre-induction control values. The longest duration of anaesthesia (61.6 minutes) was obtained with diazepam-xylazine-ketamine combination while the shortest anaesthetic period (28.4 minutes) was observed in xylazine-ketamine combination. Diazepam-xylazine-ketamine combination produced longest recovery period (56.4 minutes) while the shortest recovery period (46.2 minutes) was observed with xylazine-ketamine combination. Atropine-xylazine-ketamine combination appears to be a safe combination for anaesthesia in dogs.

To cite this article: Billah AKMM, S Sultana, MA Hossain, MA Hashim, T Begum, B Rahman and M Rashid, 2017. Evaluation of different premedicants in canine anaesthesia. Res. Agric. Livest. Fish., 4 (3): 209-214.

INTRODUCTION

Small animal practice in Bangladesh is still in its preliminary stage and it is mostly limited in some large cities (Hossen, 2004). Cats and dogs are frequently subjected to general anaesthesia for any type of surgical procedure (Gaynor et al., 1995). General anaesthesia is a state of unconsciousness and loss of protective reflexes resulting from the administration of one or more anaesthetic agents (Dewachter et al., 2009). An ideal anaesthetic produces sleep, amnesia, analgesia and muscle relaxation. As all these characteristics cannot be provided by a sole agent, a combination of drugs is usually preferred. This technique is referred to as "balanced anaesthesia" (Thurmon and Short, 2007). Anaesthesiologists may use premedicants prior to administration of general anaesthetics. Premedication with tranquilizers and sedatives reduces the dose of general anaesthetics. These agents may calm a pet excited in an unfamiliar surroundings. Pre-anesthetics may also ensure anesthesia and recovery smoother (Kastner, 2007). An appropriate selection of premedication drugs can significantly improve intraoperative cardiovascular stability, perioperative analgesia and the quality of recovery (Murrell, 2007$_b$). Having taken into consideration all these information the present study was conducted to investigate the effect of premedication as an adjunct to anaesthesia in dogs.

MATERIALS AND METHODS

Fifteen street dogs were captured from Bangladesh Agricultural University campus, Mymensingh and its surrounding area. The dogs were of either sex and were apparently healthy at the time of experiment. Their body weights ranged from 14 to 22 kg with a median weight of 18 kg. These animals were divided into 3 groups consisting of 5 dogs in each group.

Anesthetic procedure

The dog was controlled by squeezing in a restraining cage. Jaw of the dog was tied with a piece of gauze and then fastened around the neck. The hind limbs were tied together with a piece of gauze. Intramuscular injections were made in the gluteal muscle and intravenous injections in radial vein.

Experimental design

A series of 15 experimental trials were made using 15 dogs in three different groups. Group I was anaesthetized with Xylazine hydrochloride @ 1.1 mg/kg IM and Ketamine hydrochloride @ 5.5 mg/kg IV. Group II was anaesthetized with Atropine sulphate @ 0.05 mg/kg IM, Xylazine hydrochloride @ 1.1 mg/kg IM and Ketamine hydrochloride @ 5.5 mg/kg IV. Group III was anesthetized with Diazepam injected @ 0.2 mg/kg IV, Xylazine hydrochloride @ 1.1 mg/kg IM and Ketamine hydrochloride @ 5.5 mg/kg IV.

Monitoring the clinical parameters

Respiration rate, heart rate, rectal temperature, condition of pupil and position of eyeball were recorded prior to administration of any drug. These parameters along with different reflexes were also recorded at 5, 10, and 15 minutes of induction of anaesthesia. Respiration rate was recorded by visually counting the movements of abdomen over a period of one minute, heart rate by indirect auscultation of the heart, rectal temperature by inserting a clinical thermometer into the rectum.

Reflexes monitored

Palpebral reflex was observed by a gentle touch to the inner canthus of the eye with the tip of a cotton bud and the presence of reflex was indicated by closure of the eyelids. Pedal reflex was tested by needle pricking to the foot pad. Jaw reflex was evaluated subjectively by pulling the lower and upper jaw with the help of fingers. The presence of this reflex was detected by an immediate closure of the jaws after removing the fingers. Tail reflex was evaluated by needle pricking at the lower part of the tail.

Statistical analysis

Student's paired t-test was performed to compare the effect of different premedicants and anaesthetics at each of the assessment time were conducted by using Statistical Package for Social Sciences (SPSS) information for windows.

RESULTS AND DISCUSSION

Clinical parameters recorded during premedication

Xylazine

The mean values of respiration rate, heart rate and rectal temperature before xylazine injection were 26.4±0.81, 98.6±2.03 and 102.44±0.39^{0}F, respectively. These values decreased ($P < 0.05$) to 22.4±0.67, 86.2±3.10 and 101.92±0.48^{0}F, respectively 15 minutes after administration of xylazine. Xylazine produces marked cardiopulmonary depression (Tranquili and Benson, 1992; Dart, 1999). The hypothermic effect of the xylazine is thought to be the result of depletion of catecholamines in the thermoregulatory centre of the hypothalamus (Muir *et al*., 1975; Booth, 1988).

Atropine and xylazine

Before administration of this premedicant combination, the mean values of respiration rate, heart rate and rectal temperature were 26.6±0.82, 94.8±1.35 and 102.1±0.49^{0}F, respectively which decreased ($P < 0.05$) to 23.8±1.28, 86±1.70 and 101.6±0.53^{0}F, respectively 15 minutes after administration of atropine-xylazine. Use of xylazine can cause cardiovascular abnormalities arising from a decrease in sympathetic tonus (Lemke, 2004; Boutureira and Trim, 2007). In order to reduce the undesired effects of xylazine, the addition of atropine sulphate in the xylazine protocol has been widely reported (Magoon *et al.,* 1998; Brock, 2001). Atropine increases the heart rate due to its cholinergic blockade properties and causes bronchodilation (Lukasik, 1999).

Diazepam and xylazine

The mean respiration rate, heart rate and rectal temperature before diazepam and xylazine injection were 25.8±0.86, 95.4±1.86 and 102.14±0.24^{0}F, respectively. These values decreased ($P < 0.05$) to 21.8±0.58, 83.4±1.77 and 101.24±0.34^{0}F, respectively 15 minutes after administration of diazepam-xylazine combination. Clinical doses of diazepam have very little effect on the cardiac and respiratory system (Lukasik, 1999). While respiratory effects are minimal, they can enhance respiratory depression caused by other drugs, e.g. xylazine (Lumb and Jones, 1996). High intravenous doses can cause a decrease in respiration and blood pressure and cardiac output (Paddleford, 1999) and when combined with xylazine it produces marked depression on heart rate (Lukasik, 1999). The body temperature significantly decreased ($P<0.05$) with xylazine administration (Kilicalp *et al.,* 2008).

Effects of premedicants on sedation

Xylazine produced moderate sedation while Atropine-Xylazine produced mild to moderate sedation and in Diazepam-Xylazine combination all dogs became calm and quite in nature and produced marked sedation.

Effects of different anaesthetics protocol on various clinical parameters in dogs

Xylazine-Ketamine combination

The mean values of respiration rate, heart rate and rectal temperature prior to induction were 22.4±0.67, 86.2±3.10 and 101.92±0.48^{0}F, respectively. At 15 minutes of induction, these values reduced to 18.2±1.28, 80.6±1.72 and 101.74±0.45^{0}F, respectively. These reductions were significant ($P < 0.05$) when compared with the pre-induction values.

Heart rate significantly decreased at 5, 15 and 30 minutes but returned to near about baseline values at 60 minutes in xylazine-ketamine anaesthesia (Clarke *et al.,* 1982; Allen *et al.,* 1986; Atalan *et al.*, 2002). Respiratory rate decreased significantly at 5 to 45 min following anaesthetic induction and rectal temperature began to decrease significantly at 10-45 min of anaesthesia (Sindak *et al.,* 2010). The decrease in rectal temperature might be due to the depression of the thermo-regulator center (Gleed, 1987; Short, 1987).

Atropine-xylazine-ketamine combination

The mean values of respiration rate, heart rate and rectal temperature prior to induction were 23.8±1.28, 86±1.70 and 101.6±0.53^{0}F, respectively. These values decreased ($P < 0.05$) to 17.4±0.92, 75.2±1.59 and 101.22±0.42^{0}F, respectively 15 minutes after induction.

Atropine-xylazine-ketamine combination caused hypo-ventilation as reflected by increased Pa_{CO2} and a decrease in cardiac output. Intramuscular injection of xylazine and ketamine with or without atropine caused significant decrease in respiration rate in dogs (Kumar *et al*., 1979). Heart rate decreased after ketamine and xylazine administration in dog and that animals receiving atropine showed a comparatively lesser decrease in heart rate as compared with ketamine and xylazine alone (Lele and Bhokre, 1985; Haskins *et al.*, 1986$_c$). Administration of ketamine and xylazine at the dose rate of 10 mg/kg and 0.22 mg/kg, respectively, with atropine premedication at the dose rate of 0.05 mg/kg in dog's results decreased rectal temperature in both experimental and clinical cases (Muller, 1977; Pandey et al., 1991). It may be attributed to inhibitory effect of the anesthetics on metabolism and heat dissipation (Kumar et al*.,* 1990).

Diazepam-xylazine-ketamine combination

The mean values of respiration rate, heart rate and rectal temperature before induction were 21.8±0.58, 83.4±1.77 and 101.24±0.34^{0}F, respectively. All these parameters registered maximum decrease at 15 minutes of induction. The reduced values were significantly ($P<0.05$) different when compared with the pre-induction values.

Diazepam and ketamine combination has great influence on heart rate which kept reducing until deep anaesthesia was produced and when combined with xylazine this effect was more marked (Paddleford, 1999). The decreasing effect of diazepam on heart rate may be due to suppression of the limbic system of the brain (Dipalma, 1981). The decrease in heart rate during xylazine anaesthesia might be due to a central and peripheral suppression of the sympathetic trunk (Peshin and Kumar, 1979)

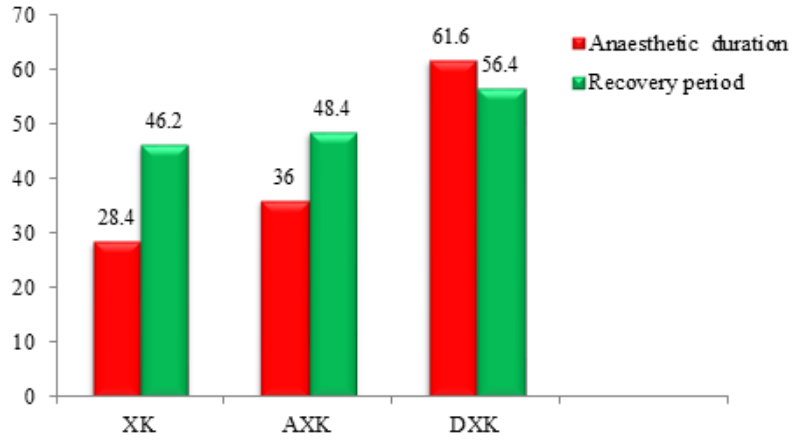
Ketamine (15-20 mg/kg) either alone or in combination with either diazepam (0.6 mg/kg, IM) or xylazine (1 mg/kg, SC) or both in dog decreased the respiratory rate (Muller, 1977; Paddleford, 1999). The administration of ketamine in dogs premedicated with diazepam caused reduction of rectal temperature (Muller, 1977; Pandey et al., 1991).

Influence of different anaesthetics on duration and recovery period in dogs

Duration and recovery period in dogs with different anaesthetics are presented in Figure 1. Of 3 anesthetic combinations, the longest duration (61.6 minutes) was obtained with diazepam-xylazine-ketamine anaesthesia as against xylazine-ketamine anaesthesia which produced the shortest anaesthetic duration of 28.4 minutes. The longest recovery period (56.4 min) was again obtained with diazepam-xylazine-ketamine anaesthesia. The shortest recovery period, on the other hand, was found with xylazine-ketamine combination (46.2 minutes).

Effects of anaesthetics on reflexes in dogs

In anaesthesia with xylazine-ketamine combination, pedal, jaw and tail reflexes were absent throughout the course of anaesthesia. The location of eyeball was central in 80% of anaesthetized animals. Depth of anaesthesia was equivalent to light or plane I of surgical anaesthesia. Like xylazine-ketamine combination, pedal, jaw and tail reflexes were also abolished with atropine-xylazine-ketamine anaesthesia. Palpebral reflex was active in 80% of dogs. Eyeball was placed centrally and pupil was dilated throughout the course of anaesthesia. Depth of anaesthesia was equivalent to plane II of surgical anaesthesia. In diazepam-xylazine-ketamine combination, palpebral, pedal, tail and jaw reflexes were absent throughout the course of anaesthesia. Depth of anaesthesia produced by this combination was judged as surgical.



XK= Xylazine-ketamine; AXK= Atropine-xylazine-ketamine; DXK= Diazepam-xylazine-ketamine

Figure 1. Duration of anaesthesia and recovery period with different anaesthetic combination in dogs

Miscellaneous observations

In diazepam-xylazine-ketamine combination, there was vomiting in 80% of dogs after administration of premedicants. Forty percent of animals in this group manifested breath holding. There was evidence of irregular respiration in 60% of dogs with xylazin-ketamine combination. Xylazine induces vomiting in approximately 25 % of dogs (Tranquili and Benson, 1992) while 50% of dogs have been reported to show emetic sign with xylazine-ketamine anaesthesia (Atalan *et al.*, 2002; Hazra *et al*., 2008). With atropine-xylazine -ketamine anaesthesia, no vomition occurred (Cullen, 1999).

CONCLUSION

In conclusion, Atropine-xylazine-ketamine combination appears to be a safe combination for anaesthesia in dogs in all aspects.

REFERENCE

1. Allen DG, DH Dyson, PJ Pascoe and MR O'Grady, 1986. Evaluation of xylazine-ketamine combination- in the cat. Canadian Journal of Veterinary Research, 50: 23-26.
2. Atalan G, I Demirkan, V Gunes, M Cihan, F Celebi and M Citil, 2002. Comparison of Xylazine + Ketrimine-HCl Anesthetic Agents with Acepromazine + Butorphanol +Ketamine Combinations for their clinical and cardiorespiratory effects in dogs. Veteriner Cerrahi Dergisi. 8: 35-40.
3. Booth N, 1988. Intravenous and other parenteral anesthetics. In: Veterinary Pharmacology and Therapeutics. Edited by Both N and McDonald L. 6th edition, Iowa State University Press. Ames IA. pp. 212-274.
4. Boutureira J and CM Trim, 2007. Acute pulmonary edema after diazepam-ketamine in a dog. Veterinary Anaesthesia and Analgesia, 34: 371-6.
5. Brock KA, 2001. Preaneasthetic use of atropine in small animals. Australian Veterinary Journal, 79: 24-25.
6. Clark D, M Martin and CE Short, 1982. Cardiopulmonary responses to xylazine-ketamine anaesthesia in the dogs. Journal of American Animal Hospital, 18: 815.
7. Cullen LK, 1999. Xylazine and Metomidine in small animals: these drugs should be used carefully. Australian Veterinary Journal, 77: 722-723.
8. Dipalma JR, l98l. Drills Pharmacology in: Veterinary Medicine. Oliver and Boyd Ltd. Edinburgh. pp. 101-323.
9. Dewachter P, Mouton-Faivre C and Emala CW, 2009. Anaphylaxis and Anesthesia: Controversies and New Insights. Anesthesiology, 111: 141-50.

10. Gleed RD, 1987. Tranquilizers and Sedatives. *In*: Principles and Practice of Veterinary Anaesthesia. Baltimore. USA. Williams and Wilkins. pp. 16-27.
11. Gaynor JS, CI Dunlop and AE Wagner, 1995. Complications and mortality associated with anaesthesia in dogs and cats. Journal of the American Animal hospital Association, 34: 13-17.
12. Haskins SC, TB Farver and JD Patz, 1986$_{C.}$ Diazepam in dogs. American Journal of Veterinary Research, 47: 795.
13. Hazra S, D Dipak, B Roy, A Bose, S Nandi and A Konar, 2008. Use of ketamine xylazine, and diazepam anesthesia with retrobulbar block for phaco emulsification in dogs. Veterinary Ophthalmology, 11: 255-259.
14. Hossen JR, 2004. Study of hemato-biological parameters in anaesthetized in dogs. MS Thesis. Department of Surgery and obstetrics. Bangladesh Agricultural University, pp. 191.
15. Kastner SBR, 2007. *Intravenous araesthetic*. Manual of canine and Feline Anaesthesia and Analgesia, 41-43.
16. Kilicaip D, I Yurdakul and A Belge, 2008. Carclio vascular Effects of Xylazine Hydrochloride and Chloral Hydrate Anaesthesia in Dogs. Veteriner Cerrahi Dergisi, 14: 9-13.
17. Kumar A and H Singh, 1979. Ketamine and xylazine anaesthesia in bovine paediatric surgery. Indian Veterinary Journal, 56: 219-222.
18. Kumar N, A Kumar and H Singh, 1990. Clinical and physiologiacal effects of ketamine with and without diazepam or meperidine premedication in dogs. Indian Veterinary Journal, 67: 242-246.
19. Lele CM and AP Bhokre, 1985. Evaluation of xylazine as an anaesthetic agent combination with certain anaesthetic drugs in dogs. Indian Veterinary Journal, 62: 575-682.
20. Lemke KA, 2004. Preoperative use of selective alpha-2 agonists and antiagnosts in small animal. Canadian Veterinary Journal, 45: 475-80.
21. Lukasik VM, 1999. Premedication and sedation *In*: Manual of Small animal anaesthesia and analgesia. Edited by Seymour C, Church lane, Shurdington, Cheltenham, UK. pp. 71-85.
22. Lumb WW and EW Jones, 1996. Veterinary Anaesthesia (3rd edition) Lea and Febiger: Philadelphia .pp. 210 -240.
23. Magoon KE, WH Hsu and FB Hembrough, 1998.the influence of atropine on the cardiopulmonary effects of xylazine-ketamine combination in dogs. Arch international Pharmacodynamics and Therapeutics, 293: 143-53.
24. Muir WW, LH Werner and R Hamlin, 1975. Effects of xylazine and acetylpromazine upon induced ventricular fibrillation in dogs anesthetized with thaimylal and halothane. American Journal of Veterinary Research, 36: 1299-1303.
25. Muller R, 1977. Anesthesia of dogs with ketamine-xylazine-diazepam with special reference to the effect on respiration and blood circulation. Veterinary Bulletins, 47: 52-83.
26. Murrell JC, 2007$_{b}$. Premedication and sedation. *In: BSAVA Manual of Canine und Feline anestesthesia and Analgesia*; Ediled by Seyrnour c and Duke-Novakovski (second edition). British Small Animal veterinary Association' clor:cester pp' i l0- I 32.
27. Short CE, 1987. Pain, analgesics and related medication. In: principles and practice of Veterinary anesthesia.Baltimore,Williams and Wilkins Company. pp. 28-86.
28. Sindak N, I Camkerten and C Ceylan, 2010. Clinical Evaluation of Ketarnine- xylazine in Bozova Greyhounds. Journal of Animal and Veterinarv Advances, 9: 2015-2019.
29. Paddleford RR, 1999. Manual of Small Animal Anaesthesia. Churchill living stone. New York. pp. 12-219.
30. Pandey SK, IJ Sharma and SK Tiwari, 1991. Clinical and hematological response to diazepam-ketarnine anaesthesia in canine surgical patients. Indian Journal Veterinary of Surgery, 12: 102-104.
31. Peshin PK and A Kumar, 1979. Physiological and sedative effects of xylazine in buffaloes. Indian Veterinary Journal, 56: 864-871.
32. T'hurmon JC and CE Short, 2007. History and overview of Veterinary anesthesia. *In: Lumb & Jones veterinary Anesthesia and Anaglesia.* Edited by: Tranquilli WJ, Thurmon JC and Grimm KA (Fourth edition). Blackwell Publishing Oxford Ltd 2-6.
33. Tranquili WJ and GJ Benson, 1992. Advantages and guildlines for using alpha-2 agonists as anaesthetic adjuvants. Veterinary Clinics of North American Small Animal Practices, 22: 289-294.