SHORT COMMUNICATION

Effects of Tiletamine-Zolazepam and Isoflurane for Induction and Maintenance in Xylazine Premedicated Dogs

Devangini A. Ratnu,[1] Ruchikkumar R. Anjana,[1] Pinesh V. Parikh,[1 *] Divyesh N. Kelawala[1]

Abstract

This study was aimed to evaluate the quality of induction and recovery from anesthesia promoted by the tiletamine-zolazepam and isoflurane for induction and maintenance with xylazine premedication in dogs. For this, clinical cases of six dogs were selected randomly. Animals were premedicated with atropine sulphate (0.04 mg/kg, i/m) and xylazine (0.5 mg/kg, i/m). Anesthesia was induced with a combination of tiletamine-zolazepam (2 mg/kg, i/v) and maintained by isoflurane (1.5-2.5%). Different physiological parameters, *viz.*, rectal temperature (°C), heart rate (beats/min), respiratory rate (breaths/min), and SpO_2 (%), were recorded at every 10 minutes. The quality of anesthesia was assessed based on analgesia, muscle relaxation, body reflexes, quality of induction & recovery. The quality of induction and recovery was smooth and safe. No complications were encountered in animals indicating that the anesthetic protocol employed was safe and effective for surgical procedures.

Keywords: Anesthesia, Dog, Isoflurane, Tiletamine-zolazepam, Xylazine.

Ind J Vet Sci and Biotech (2021): 10.21887/ijvsbt.17.4.19

Introduction

In small animal practice, most animals are premedicated before induction of anesthesia. However, the essential role of premedication in the anesthetic regimen is sometimes overlooked (Murrell, 2007). Xylazine, a non-narcotic compound, is a sedative and analgesic and muscle relaxant by central nervous system depression and inhibition of the intraneural transmission of impulses (Mohammad, 2015). Tiletamine is an arylcyclohexylamine and structurally related to phencyclidine (PCP) and ketamine. It is a potent ligand at the PCP-binding site of the NMDA receptor and is pharmacologically classified as a non-competitive NMDA receptor antagonist that induces dissociative anesthesia (Saha *et al.,* 2007). The use of tiletamine alone can cause a cataleptic state and convulsion. Therefore it is usually combined with the tranquilizer and anticonvulsant, zolazepam (Ferrari *et al*., 2005). Zolazepam is a benzodiazepine tranquilizer, similar to diazepam, which acts as a positive allosteric modulator of the gamma-aminobutyric acid (GABA), a receptor (Walzer and Huber, 2002). Tiletamine-zolazepam (TZ) has been used alone or with other anesthetic agents in dogs (Krimins *et al.,* 2012; Koli *et al*., 2021). This drug combination is marketed under the trade names Zoletil® and Telazol® and is approved by USFDA for use as an injectable veterinary anesthetic agent (USFDA, 2015) and is licensed for use only in combination with tiletamine (Ferrari *et al*., 2005).

Inhalation anesthetics are used widely for the anesthetic management of animals (Steffey *et al.,* 2015). Isoflurane and sevoflurane are the most common inhalant anesthetics used in small animal anesthesia. They produce less cardiovascular depression. Balanced anesthesia typically involves administering a sedative or analgesic before anesthesia, allowing for the administration of lower doses of inhalant anesthetics (Matthews *et al*., 2003; Koli *et al*., 2021). The present study was aimed to evaluate the quality of induction and recovery from anesthesia promoted by the tiletamine-zolazepam and isoflurane for induction and maintenance in xylazine premedicated dogs.

[1]Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, Anand Agricultural University, Anand, Gujarat, India

Corresponding Author: Pinesh V. Parikh, Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, Anand Agricultural University, Anand, Gujarat, India, e-mail: parikhpv@gmail.com

How to cite this article: Ratnu, D.A., Anjana, R.R., Parikh, P.V., Kelawala, D.N., (2021). Effects of Tiletamine-Zolazepam and Isoflurane for Induction and Maintenance in Xylazine Premedicated Dogs. Ind J Vet Sci and Biotech, 17(4), 86-88.

Source of support: Nil

Conflict of interest: None.

Submitted:09/06/2021 **Accepted:**29/09/2021 **Published:** 10/10/2021

Materials And Methods

The study was conducted in the Department of Veterinary Surgery and Radiology of the College of Veterinary Science and Animal Husbandry, Anand (Gujarat). Six clinical cases of canines with various surgical abnormalities were included in the study. All the animals were prepared by withholding food and water for 12 hours before induction of anesthesia. Ceftriaxone & tazobactam combination (25 mg/kg) and meloxicam (0.2 mg/kg) were administered intramuscularly 2–3 hours prior to surgical procedures.

Xylazine @ 0.5 mg/kg, i/m and atropine sulphate @ 0.04 mg/kg, i/m were given 10 minutes before anesthesia followed by induction with tiletamine-zolazepam combination @ 2 mg/kg, i/v, and maintenance with isoflurane (1.5–2.5%). Endotracheal intubation with a cuffed endotracheal tube (Cuffed Murphy type having 5–7 mm internal diameter) was performed immediately after induction. Physiological parameters, namely, rectal temperature (°C), heart rate (beats/min), respiratory rate (breaths/min) and SpO_2 (%), were recorded. The quality of anesthesia was assessed by induction, analgesia, body reflexes, muscle relaxation, quality of recovery, and any complications. All the data were expressed as Mean ± SE and were analyzed by one-way ANOVA.

Results and Discussion

All animals were stabilized by providing supportive medication before anesthesia and surgical interventions. Premedication minimized the stress & anxiety of the patients and allowed for easier placement of an intravenous catheter. The induction was found to be successful and safe in all the patients. Tiletamine-zolazepam combination produced hypersalivation in dogs, and hence the use of atropine 10 minutes before the induction has been recommended to control salivation. The present findings of induction were in accordance with those observed by Pablo and Bailey (1999). Tiletamine-zolazepam combination produced the rapid and good quality of anesthesia for 30–40 minutes in all animals. A similar finding was observed by Peter *et al.* (1989). The quality of sedation was achieved well with strong analgesic effect in all the patients, according to the observation of Hampton *et al*. (2019) and Koli *et al*. (2021). Muscle relaxation was found to be adequate in all the animals. The palpebral, peddle, and swallowing reflexes were noticed after induction but absent after maintenance in all the patients. Similar findings were reported in dogs by Hampton *et al*. (2019). Movement in response to surgical incision was not encountered in any dog under study. The present observations with respect to induction, quality of anesthesia and recovery with TZ in dogs closely concurred with the findings of Koli *et al*. (2021).

The findings of rectal temperature, heart rate, respiratory rate, and SpO_2 recorded during the study are presented in Table 1. The values of rectal temperature and respiratory rate in dogs were decreased at every 10 minutes of anesthesia with a significant ($p < 0.05$) drop from 30 min onwards. The findings were in line with Kwon *et al.* (2003), Pereira *et al.* (2019) and Koli *et al*. (2021). The decrease in temperature may also be due to generalized sedation, decreased metabolic rate, and CNS depression (Lu *et al.*, 2014). The heart rate and SpO_2 levels were increased non-significantly after induction and gradually decreased during maintenance of anesthesia with a significant ($p < 0.05$) drop at 30 min. A similar finding was observed by Pereira *et al.* (2019).

The quality of recovery was smooth and safe in all the animals, as reported by Walzer and Huber (2002) and Koli *et al.* (2021). In the present study, mortality was not encountered during anesthesia. These compounds have adverse effects like dose-dependent respiratory depression, erratic and prolonged recovery, cardio depressive and hypothermic effects that persist for days. Intravenous administration of tiletamine-zolazepam combination produced smooth and safe induction, recovery from anesthesia, excellent skeletal muscle relaxation, and retention of pharyngeal and palpebral reflexes in dogs.

Conclusion

The anesthetic protocol used, *i.e.*, induction with a combination of tiletamine-zolazepam (2 mg/kg, i/v) and maintained by isoflurane (1.5-2.5%) in atropine sulfate (0.04 mg/kg, i/m) and xylazine (0.5 mg/kg, i/m) premedicated dogs was found to be helpful in canine surgical operation that requires more prolonged duration of anesthesia and

Table 1: Mean (± SE) rectal temperature, heart rate, respiratory rate and saturation of peripheral oxygen during different stages of anesthesia.

Parameter	Before induction	After induction	During maintenance (min)					After recovery
			10	20	30	40	50	
Rectal temperature (°C)	$38.16^{a} \pm 0.65$	$36.66^{a} \pm 0.78$	$37.03^{a} \pm 0.46$	$36.93^{a} \pm 0.49$	$29.06^{b} \pm 5.99$	$28.96^{b} \pm 5.94$	$28.6^{b} \pm 5.86$	$35.36^{a} \pm 0.70$
Heart rate (beats per min)	$139.33^{a} \pm 10.91$	$150.33^{a} \pm 11.87$	$142.66^{a} \pm 7.42$	$114.66^{ab} \pm 8.17$	$94.33^{b} \pm 19.90$	$93.66^{b} \pm 19.29$	$93.00^{b} \pm 19.91$	$117.5^{ab} \pm 15.92$
Respiratory rate (breaths per min)	$25.33^{ab} \pm 5.83$	$22.50^{b} \pm 3.73$	$34.5^{a} \pm 11.04$	$29.5^{ab} \pm 7.03$	$27.83^{ab} \pm 9.24$	$23.83^{b} \pm 8.82$	$24.16^{b} \pm 10.14$	$39.66^{a} \pm 9.22$
Saturation of peripheral O_2 (%)	$95.51^{a} \pm 2.37$	$97.50^{a} \pm 1.11$	$98.16^{a} \pm 0.60$	$97.33^{a} \pm 0.66$	$81.66^{b} \pm 16.34$	$82.00^{b} \pm 16.40$	$82.00^{b} \pm 16.40$	$95.5^{a} \pm 2.30$

Means with uncommon superscripts within the row differ significantly ($p < 0.05$).

strong analgesic effects. It is a safe and successful anesthetic protocol with smooth induction and recovery without any complications.

Acknowledgement

The authors are grateful to the Dean of Veterinary College and authorities of Anand Agricultural University, Anand-388 001, for the facilities provided.

References

Ferrari, L., Turrini, G., Rostello, C., Guidi, A., Casartelli, A., Piaia, A., & Sartori, M. (2005). Evaluation of two combinations of Domitor, Zoletil 100, and Euthatal to obtain long-term non-recovery anesthesia in Sprague-Dawley rats. *Complementary Med*icine, *55,* 256.

Hampton, C.E., Reibold, T.W., LeBlanc, N.L., Scollan, K.F., Mandsager, R.E., & Sisson, D.D. (2019). Effects of intravenous administration of tiletamine-zolazepam, alfaxalone, ketamine-diazepam, and propofol for induction of anesthesia on cardiorespiratory and metabolic variables in healthy dogs before and during anesthesia maintained with isoflurane. *American Journal of Veterinary Research, 80*(1), 33-44.

Koli, P.H., Parikh, P.V., Mahla, J.K., & Barot, H.M. (2021). Clinical attributes of tiletamine-zolazepam induced anesthesia with and without xylazine premedication in dogs. *The Indian Journal of Veterinary Sciences & Biotechnology, 17*(4), 61-65.

Krimins, R.A., Ko, J.C., Weil, A.B., Payton, M.E., & Constable, P.D. (2012). Hemodynamic effects in dogs after intramuscular administration of a combination of dexmedetomidine-butorphanol-tiletamine-zolazepamordexmedetomidine-butorphanol-ketamine. *American Journal of Veterinary Research, 73*(9), 1363-1370.

Kwon, Y.S., Jeong, J.H., & Jang, K.H. (2003). Comparison of tiletamine/zolazepam, xylazine-tiletamine/zolazepam and medetomidin-tiletamine/zolazepam anesthesia in dogs. *Journal of Veterinary Clin*ics, *20*(1), 33-41.

Lu, D.Z., Jiang, S., Yu, S.M., & Fan, H.G. (2014). A comparison of anesthetic and cardiorespiratory effects of tiletamine-zolazepam/xylazine and tiletamine-zolazepam/xylazine/tramadol in dogs. *Pakistan Veterinary Journal*, *34*(1), 63-67.

Matthews, N.S., Hartsfield, S., Mercer, D., Beleau, M.H., & MacKenthum, A. (2003). Recovery from sevoflurane anesthesia in horses: Comparison to isoflurane and effect of medication with xylazine. *Veterinary Surgery, 27*(5), 480-485.

Mohammad, T.Al.B. (2015). A Comparative study between of effect of tramadol and xylazine as premedication those followed by ketamine anesthesia in dogs. *Kufa Journal for Veterinary Medical Sciences*, *6*(2), 177-182.

Murrell, J. (2007). Choice of premedicants in cats and dogs. *In Practice*, 29, 100-106.

Pablo, L.S., & Bailey, J.E. (1999). Etomidate and telazol. *Veterinary Clinics of North America: Small Animal Practice, 29,* 779-792.

Pereira, S.A.R.S., Henrique, F.V., Medeiros, L.K.G., Silva, J.K.C., Goes, A.B., Vaz, A.F.M., Souza, A.P., & Nóbrega, N.P.I. (2019). Anesthetic quality and cardiovascular and respiratory effects of continuous intravenous infusion of tiletamine-zolazepam in bitches. *Pesquisa Veterinária Brasileira, 39*(3), 214-220.

Peter, H., William, W.M., John, A.E.H., & Jan, S. (1989). Cardiorespiratory effects of the intravenous administration of tiletamine-zolazepam to dogs. *Veterinary Surgery, 18*(2), 160-165.

Saha, D.C., Saha, A.C., Malik, G., Astiz, M.E., & Rackow, E.C. (2007). Comparison of cardiovascular effects of tiletamine-zolazepam, pentobarbital, and ketamine-xylazine in male rats. *Journal of American Association of Laboratory Animal Science, 46,* 74.

Steffey, E.P., Mama, K.R., & Brosnan, R.J., (2015). *Inhalant Veterinary Anesthesia and Analgesia*. In: K. A. Grimm, L. A. Lamont, W. J. Tranquilli, S. A. Greene, & S. A. Robertson (Eds.), *Lumb and Jones* (5th ed.), John Wiley & Sons.

USFDA. (2015). Animal drugs at FDA. Retrieved from http://www.accessdata. fda.gov/scripts/ animaldrugsatfda/details.cfm?dn=106-111

Walzer, C., & Huber, C. (2002). Partial antagonism of tiletamine-zolazepam anesthesia in cheetah. *Journal of Wildlife Diseases*, *38,* 468.