The Pharma Innovation Journal 2023; SP-12(8): 1146-1149

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; SP-12(8): 1146-1149

www.thepharmajournal.com
Received: 13-06-2023
Accepted: 28-07-2023

H Zorinpuii
MVSc. Scholar, Department of Veterinary Surgery and Radiology, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram, India

Bedanga Konwar
Professor and Head, Department of Veterinary Surgery and Radiology, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram, India

Hitesh Bayan
Assistant Professor, Department of Veterinary Surgery and Radiology, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram, India

MC Lallianchhunga
Assistant Professor, Department of Veterinary Physiology and Biochemistry, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram, India

Kalyan Sarma
Professor, Department of Veterinary Medicine, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram, India

JB Rajesh
Assistant Professor (SG), Department of Veterinary Medicine, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram, India

Corresponding Author:
JB Rajesh
Assistant Professor (SG), Department of Veterinary Medicine, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram, India

Epidural analgesia using dexmedetomidine with or without Lidocaine and Ropivacaine for elective ovariohysterectomy in dogs

H Zorinpuii, Bedanga Konwar, Hitesh Bayan, MC Lallianchhunga, Kalyan Sarma and JB Rajesh

Abstract
The study was conducted to find out the analgesic effects and the clinico-physiological and haematological effects of dexmedetomidine with or without Lidocaine and Ropivacaine in elective ovariohysterectomy in canines. Study conducted on 18 dogs brought for elective ovariohysterectomy and were randomly grouped into three comprising 6 animals in each. Epidural injection was administered after premedication in all groups. Group A animals with dexmedetomidine @ 10 µg/kg BW and in group B and C a in addition to dexmedetomidine, Lidocaine (2%) 4 mg/kg b. wt and Ropivacaine (0.5%) 2 mg/kg b. wt respectively. Complete analgesia at different regions in Group B and C and mild to moderate analgesia was observed in Group A. Onset of analgesia and onset of motor blockade was shortest in Group C. Duration of analgesia, duration of motor blockade and recovery time was longer in Group C compared to Group B and A. Rectal temperature decreased significantly (p<0.01) in all the groups. The results were recorded and discussed.

Keywords: dexmedetomidine, dogs, local anaesthetics, elective ovariohysterectomy

Introduction
Elective ovariohysterectomy in bitch is a surgical procedure widely employed in veterinary practice to reduce the chances of pyometra, uterine tumors or other pathologies (Bencharif *et al*., 2010) [4]. Other benefits include population control and elimination of undesirable behaviours associated with hormonal cycling (DeTora and McCarthy, 2011) [9]. General anaesthetics depress many of the centrally acting functions such as the respiratory and cardiovascular centers. Other than these effects, there are incidences of anaphylactic shock or death. If the animal is not properly fasted before general anaesthesia there are chances of vomition and aspiration pneumonia. Other complications like vital organ damage, seizures, clotting disorders or visual impairment are rarely reported with general anaesthesia (DeLay, 2016) [8].
Extradural or epidural anaesthesia can be preferred over general anaesthesia for performing ovariohysterectomy to avoid the bad effects of general anaesthesia, as it is also safe and cost effective (Shah *et al*., 2017) [25]. The drugs used for epidural anaesthesia are local anaesthetic agents (Freire *et al*., 2010) [10], α_2 agonists and other potent sedatives (Soares *et al*., 2004) [26] and their combinations with sedative agents (Odette and Smith, 2013 [21] and Carregaro *et al*., 2014) [7].
The synergistic effect of epidural dexmedetomidine with local anaesthetics prolongs the duration of analgesia, sensory/motor block and post-operative analgesia (Salgado *et al*., 2008) [23]. Dexmedetomidine cause additional analgesic and sedative benefits than medetomidine and produces sedation and analgesia and the effect is twice that of the medetomidine (Ahmad *et al*., 2018) [1]. Ropivacaine is 3 to 4 times more potent than lidocaine, analgesic affects last longer and provides prolonged duration; has intermediate vasoconstrictive properties, so it does not require adrenalin in its formulation (Bleckner *et al*., 2010) [5]. Ropivacaine is less lipophilic than bupivacaine and penetrate less to large myelinated motor fibres (Kuthiala and Chaudhary, 2011) [18].

Materials and Methods
Eighteen female dogs brought to the Teaching Veterinary Clinical Complex for elective ovariohysterectomy were selected and grouped into three comprising 6 animals in each group.

All the animals were fasted overnight (12 hours) and routine clinical examination was carried out prior to epidural analgesic trial. Following premedications, propofol (1%) was used for induction as and when needed and epidural injection was administered. The procedure followed is mentioned in Table 1.

Table 1: The procedure followed is mentioned

Group	Pre-medicant dose & route	Sedative dose & route Epidural	Epidural analgesic drugs
A	Glycopyrrolate @ 0.01 mg/kg b. wt., I/M.	Midazolam @ 0.7mg/kg b. wt. I/V.	Dexmedetomidine @10µg/kg b. wt.
B			Dexmedetomidine @10µg/kg b. wt. + lidocaine @ 4mg/kg b. wt.
C			Dexmedetomidine @10µg/kg b. wt. + Ropivacaine @ 2mg/kg b. wt.

Epidural drug administration was done monitored and anal sphincter score was graded as per the method described by Shah *et al.* (2017) [25]. All the animals were evaluated for the physiological parameters before administration of Premedicant at 0 minute (base line), 10, 30, 60, 90 and 120 minutes respectively following administration of epidural analgesic drugs. The blood samples were collected in sterile vials containing EDTA prior to premedication at 0 minute (base line), thereafter 30, 60, 90 and 120 minutes after administration of epidural analgesic drug for haemoglobin, packed cell volume (PCV), total erythrocyte count (TEC), total leukocyte count (TLC) and differential leukocyte count (DLC).

Results and Discussion

The onset of analgesia and motor blockade was shortest in Group C and longest in Group A. Duration of analgesia was longest in Group C followed by Group B. Similar finding were also reported by Bajwa *et al.* (2011) [3] and Kalappa *et al.* (2016) [14] in human and Kumari *et al.* (2017) [17] in goats. The faster onset of analgesia recorded with dexmedetomidine and ropivacaine might be due to the high volume of the drugs; as increased volume caused spreading of drugs uniformly which leading to faster onset of analgesia (Setayesh *et al.*, 2001) [24].

Compared to group B and group C, time required for onset of motor blockade was longer in group A. Similar trends of motor blockade onset timing was also recorded by Bajwa *et al.* (2011) [3] in human. Alpha2-agonist tends to inhibit Aδ and C fibres which were responsible for pain perception more potently than Aα fibres responsible for motor function and proprioception (Butterworth and Strichartz, 1993) [6].

Compared to group A, longer duration of analgesia was exhibited by group B and C animals. Similar findings were also observed by Hiroki *et al.* (1997) [11] in dogs. Longer duration of analgesia recorded in the current study with dexmedetomidine-lidocaine and dexmedetomidine-ropivacaine might be due to reduction in the systemic absorption of local anaesthetics due to the combination of dexmedetomidine, as dexmedetomidine mediated vasoconstriction in smooth muscle and venous plexus (Nishikawa and Dohi, 1990) [19].

Duration of motor blockade was higher in Group C compared to Group A and B. Similar findings of prolonged duration of motor blockade with dexmedetomidine and ropivacaine were also observed by Kaur *et al.* (2017) [13] in human. Prolonged motor blockade recorded in group C might be due to greater uptake of ropivacaine by nerve membrane due to the volume and also due to the presence of epidural fat which act as a deposit site for slow release of drug (Shah *et al.* 2017) [25].

Table 2: Mean ± SE values of onset of analgesia, duration of analgesia, onset of motor blockade, duration of motor blockade and recovery time recorded in Group A, B and C

Groups	Onset of analgesia (min)	Onset of motor blockade (min)	Duration of analgesia (min)	Duration of motor blockade(min)	Recovery time (in min)
A	3.18 ± 0.07^{C}	3.51 ± 0.10^{B}	51.50 ± 0.88^{A}	154.17 ± 1.16^{A}	207.50 ± 1.05^{A}
B	2.23 ± 0.08^{B}	2.23 ± 0.07^{A}	72.33 ± 1.05^{B}	225 ± 1.29^{B}	238.33 ± 1.05^{B}
C	1.33 ± 0.05^{A}	2.00 ± 0.11^{A}	110.17 ± 1.44^{C}	240.83 ± 1.24^{C}	286.67 ± 1.97^{c}
Significance	**	**	**	**	**

Longest recovery time was recorded in group C with unassisted walk after completion of surgical procedure as compared to group A and group B. Prolonged recovery time with dexmedetomidine-ropivacaine was also observed by Kamble *et al.* (2016) [12] in buffalo calves. This can be due to the ropivacaine which was having the long-acting duration (4-6 hours) due to higher protein binding to α_1- acid glycoprotein (Hiroki *et al.*, 1997) [11].

Mild to moderate analgesia observed in Group A and in Group B and C, Complete analgesia was achieved at tail, perineum and thorax after 5 minute and 3 minutes respectively. Complete analgesia was recorded with epidural anaesthesia following3 and 5 minutes in group C and B respectively. Similar finding of complete and prolonged analgesia was also reported by Amarpal *et al.* (2007) [2] in buffalo calves. This finding might be due to the high volume of drugs; as increased volume caused spreading of drugs uniformly which led to faster onset of analgesia (Setayesh *et al.*, 2001) [24].

Moderate relaxation of anal sphincter was observed in Group A whereas in Group B and C animals, profound relaxation was observed. Recovery time was longest in Group C followed by Group B and A. Few minutes following midazolam administration; moderate sphincter relaxation was observed in three groups which might be due to muscle relaxant effect of midazolam which was mediated by glycine receptors in the spinal cord (Ritcher, 1981) [22].

The haemoglobin (Hb), pack cell volume (PCV), total erythrocyte count (TEC), Total leukocyte count (TLC) and differentiate leukocyte count (DLC) did not show any significant difference in three groups although some minor variations observed between the groups.

The rectal temperature was recorded with significant fall from 0 minute till the end of last observation period (120 minutes) in all the groups. Similar findings were also documented by Kinjavdekar (1998) [15] in goats, Amarpal *et al.* (2007) [2] in

buffalo calves, and Kumar *et al.* (2016) [16] in dogs following epidural anaesthesia. Decreased rectal temperature recorded in the current study was due to stimulation of alpha$_2$ C receptors caused by dexmedetomidine (Lemke, 2004) [20], as it decreased heat production owing to decreased muscular activity and metabolic rate.

Conclusion
Epidural injection of dexmedetomidine – ropivacaine and dexmedetomidine – lidocaine did not produce Clinico-physiological and haematological changes in dogs undergoing elective ovariohysterectomy. On the basis of analgesia, motor blockade, anal sphincter relaxation and recovery time, dexmedetomidine-ropivacaine produced better epidural analgesia than dexmedetomidine alone and dexmedetomidine-lidocaine for elective ovariohysterectomy.

Acknowledgement
This manuscript is a part of MVSc thesis of first author and second author is the Major Advisor of the student. The authors are thankful to the Vice Chancellor, Central Agricultural University (I) for the facilities provided for the study.

Reference
1. Ahmad RA, Amarpal, Gujoo MB. Dexmedetomidine: Systemic effects and clinical application in animals. Journal of Pharmaceutical Innovation. 2018;**7**(1):272-278.
2. Amarpal PA, Kinjavdekar P, Aithal HP, Singh GR, Pawde AM, Singh T, *et al*. Comparison of two doses of ropivacaine for lumbosacral epidural analgesia in buffalo calves (*Bubalus bubalis*). Veterinary Record. 2007;160:766-769.
3. Bajwa SJS, Bajwa SK, Singh JKG. Dexmedetomidine and clonidine in epidural anaesthesia: A comparative evaluation. Indian Journal of Animal Sciences. 2011;55:116-121.
4. Bencharif D, Amirat L, Garand A, Tainturier D. Ovariohysterectomy in the Bitch. Obstetrics and Gynecology International. 2010;10:1155-1161.
5. Bleckner LL, Bina S, Kwon KH, McKnight G, Dragovich A, Buckenmaier CC. Serum ropivacaine concentrations and systemic local anesthetic toxicity in trauma patients receiving long-term continuous peripheral nerve block catheters. Veterinary Anaesthesia Analgesia. 2010;110(2):630-634.
6. Butterworth JF, Strichartz GR. The alpha2-adrenergic Agonists clonidine and guaifacine produce tonic and phasic block of conduction in rat sciatic nerve fibers. Veterinary Anaesthesia Analgesia. 1993;76:295-301.
7. Carregaro AB, Freitas GC, Lukarsewski Tamiozzo FS, Santos R. Evaluation of analgesic and physiologic effects of epidural morphine administered at a thoracic or lumbar level in dogs undergoing thoracotomy. Veterinary Anaesthesia Analgesia. 2014;41:205-211.
8. DeLay J. Peri-anesthetic mortality in domestic animals: a retrospective study of postmortem lesions and review of autopsy procedures. Veterinary Pathology. 2016;53(5):1078-1086.
9. DeTora M, McCarthy RJ. Ovariohysterectomy versus ovariectomy for elective sterilization of female dogs and cats: is removal of the uterus necessary? Journal of the American Veterinary Medical Association. 2011;239(11):1409-1412.
10. Freire CD, Torres ML, Fantoni D, Cavalcanti RL, Noel-Morgan J. Bupivacaine 0.25% and methylene blue spread with epidural anaesthesia in dog. Veterinary Anaesthesia Analgesia. 2010;37:63-69.
11. Hiroki I, Yukinaga W, Shuji D. Direct effects of ropivacaine and bupivacaine on spinal pial vessels in canine: Assessment with closed spinal window technique, Laboratory investigation. Anaesthesiology. 1997;87:75-81.
12. Kamble S, Jain R, Shukl BP, Pandey SS, Rajput N, Ganguly S. Comparative assessment of biochemical alterations after epidural administration of ropivacaine and ropivacaine-dexmedetomidine combination as an epidural analgesia in buffalo calves. Journal of Immunology Immunopathology. 2016;18(1):63-66
13. Kaur S, Attri JP, Kaur G, Singh TP. Comparative evaluation of ropivacaine versus dexmedetomidine and ropivacaine in epidural anaesthesia in lower limb orthopaedic surgeries. Saudi Journal of Anaesthesia. 2017;8(4):463-469.
14. Kalappa S, Sridhara RB, Kumaraswamy S. Dexmedetomidine as an adjuvant to pre-emptive caudal epidural ropivacaine for lumbosacral spine surgeries. Journal Clinical Diagnosis. 2016;10(1):22-24.
15. Kinjavdekar P. Spinal analgesia with ketamine hydrochloride for anaesthesia in horses. American Journal of Veterinary Research. 1998;38:195-201.
16. Kumar A, Kandpal M, Jadon NS. Clinico-physiological and hemato-biochemical effects of dexmedetomidine along with ketamine in dogs. Indian Journal Veterinary Surgery. 2016;37(2):88-92.
17. Kumari S, Sharma AK, Kumari L, Sinha MP. Hemato-biochemical effects of lumbosacral epidural anaesthesia with ropivacaine and dexmedetomidine in goats. Indian Journal of small Ruminant. 2017;23(1):117-119.
18. Kuthiala G, Chaudhary G. Ropivacaine: A review of its pharmacology and clinical use. Indian Journal of Anaesthesia. 2011;55(2):104.
19. Nishikawa T, Dohi S. Clinical evaluation of clonidine added to lidocaine solution for epidural anaesthesia. Anaesthesiology. 1990;73:853-859.
20. Lemke KA. Perioperative use of selective alpha-2 agonists and antagonists in small animals. Canadian Veterinary Journal. 2004;45:475-480.
21. Odette O, Smith LJ. A comparison of epidural analgesia provided by bupivacaine alone, bupivacaine + morphine, or bupivacaine + dexmedetomidine for pelvic Orthopaedic surgery in dogs. Veterinary Anaesthesia Analgesia. 2013;40:527-536.
22. Ritcher JJ. Current theories about the mechanism of action of benzodiazepines and neuroleptic drugs. Anaesthesiology. 1981;54:66-72.
23. Salgado PFS, Sabbag AT, Silva PC. Synergistic effect between dexmedetomidine and 0.75% ropivacaine in epidural anaesthesia. Revista da Associação Médica Brasileira. 2008;54:110-115.
24. Setayesh AR, Kholdebarin AR, Saber M. The Trendelenburg position increases the spread and accelerates the onset of epidural anaesthesia for caesarean section. Canadian Journal of Anesthesia. 2001;48:890-893.
25. Shah AM, Kinjavdekar P, Amarpal Sharma D, Pawde MA, Rafee AM, Bhat RA, *et al*. Epidural analgesia using

dexmedetomidine and its combinations with local anaesthetics for elective ovariohysterectomy in dogs. Indian Journal of Veterinary Surgery. 2017;38(1):1-6.
26. Soares JH, Ascoli FO, Gremiao ID, Segura IG, Filho FM. Isoflurane sparing action of epidurally administered xylazine hydrochloride in anesthetized dog. American Journal of Veterinary Research. 2004;65:854-859.