DOI: 10.22055/ivj.2024.462991.2725

Comparison of intraperitoneal medetomidine and paraincisional bupivacaine on post-operative pain management of ovariohysterectomy in dogs

Seyed Mohamad Sajjadi Dezfouli[1], Ali Baniadam[2], Soroush Sabiza[2*] and Seyedeh Misagh Jalali[2]

[1] DVSc Student in Veterinary Surgery, Faculty of Veterinary Medicine, Shahid Chamran University of Ahvaz, Ahvaz, Iran
[2] Associate Professor, Department of Clinical Sciences, Faculty of Veterinary Medicine, Shahid Chamran University of Ahvaz, Ahvaz, Iran

Received: 22.06.2024 Accepted: 24.09.2024

Abstract

Providing effective pain relief after surgery in veterinary medicine is a crucial aspect of ethical and clinical care, particularly during procedures like spaying. Various analgesic drugs have been used for this purpose, but the management of analgesia in different animals during and after surgery requires different strategies. In this study, the effect of medetomidine and bupivacaine with different methods of administration in ovariohysterectomy surgery was investigated in bitches. Twenty-Five native breed bitches (1-4 years, 15-25 kg) were divided into 5 groups of 5 based on the type of drug and the method of administration: control group, medetomidine IM, medetomidine IP, medetomidine IP and bupivacaine SC, and bupivacaine SC alone. In all groups, defined drugs for each group were administered at three stages: prior to the skin incision, simultaneously with ligation of the first ovarian pedicle, and before suturing the *linea alba*. Before, during and after surgery, sedation quality, pain quality, anesthesia depth, recovery quality, vital signs (body temperature, respiratory rates, cardiovascular parameters), and biochemical, parameters were measured at predetermined times. After surgery, analgesia was measured by Simple Descriptive Scores (SDS), Visual Analogue Scale (VAS), University of Melbourne Pain Scale (UMPS), and Glasgow Composite Measure Pain Scale-Short Form (CMPS-SF) tests. The obtained data were analyzed with SPSS software and appropriate statistical tests. The results indicated that administering the same dose of intramuscular medetomidine compared to intraperitoneal medetomidine resulted in significant differences in pain (measured by CMPS-SF and VAS test), heart rate, and cortisol levels at specific times after surgery. Administering bupivacaine alone significantly reduced surgical pain and decreased recovery time compared to administering medetomidine alone or in combination with bupivacaine. Animals receiving intraperitoneal medetomidine required a rescue dose, while no rescue dose was needed in other groups. The doses used in all groups did not disrupt the animals' physiological functions, and cardiovascular, respiratory, and rectal temperature parameters remained within the normal range. The activity of serum enzymes related to general tissue integrity also stayed within the normal range. Evaluation of pain using VAS, UMPS, and CMPS-SF methods did not show a preference for the effectiveness of administering the same dose of intraperitoneal medetomidine over intramuscular medetomidine (alone or with bupivacaine at the surgical incision) for managing pain, recovery after surgery, and physiological parameters of cardiovascular, respiratory, and rectal temperature.

Key words: Pain management, Ovariohysterectomy, Female dogs, Medetomidine, Bupivacaine

[*] **Corresponding Author**: Soroush Sabiza, Associate Professor, Department of Clinical Sciences, Faculty of Veterinary Medicine, Shahid Chamran University of Ahvaz, Ahvaz, Iran
E-mail: s.sabiza@scu.ac.ir

Refrences

Abdulkhaleq, L. A., Assi, M. A., Abdullah, R., Zamri-Saad, M., Taufiq-Yap, Y. H., & Hezmee, M. N. M. (2018). The crucial roles of inflammatory mediators in inflammation: A review. *Vet World, 11*(5), 627-635. doi: 10.14202/vetworld.2018.627-635

Al Shoyaib, A., Archie, S. R., & Karamyan, V. T. (2019). Intraperitoneal Route of Drug Administration: Should it Be Used in Experimental Animal Studies? *Pharmaceutical Research, 37*(1), 12. doi: 10.1007/s11095-019-2745-x

Aujla, R. S., & Patel, R. (2019, 2024 Feb 27). Creatine phosphokinase. Retrieved 2024 Jan, from https://www.ncbi.nlm.nih.gov/books/NBK546624/

Baniadam, A., MASOUMI, p., Ezzati Givi, M., & Razi Jalali, M. (2021). Comparison of analgesic and cardiopulmonary effects in epidural injection of lidocaine, bupivacaine and dexmedetomidine following ovariohysterectomy in the dog. *Iranian Veterinary Journal, 17*(3), 14-23. doi: 10.22055/ivj.2021.253465.2313

Bencharif, D., Amirat, L., Garand, A., & Tainturier, D. (2010). Ovariohysterectomy in the Bitch. *Obstetrics and Gynecology International, 2010*, 542693. doi: 10.1155/2010/542693

Bussen, S., Sütterlin, M., & Steck, T. (1999). Endocrine abnormalities during the follicular phase in women with recurrent spontaneous abortion. *Hum Reprod, 14*(1), 18-20. doi: 10.1093/humrep/14.1.18

Campagnol, D., Teixeira-Neto, F. J., Monteiro, E. R., Restitutti, F., & Minto, B. W. (2012). Effect of intraperitoneal or incisional bupivacaine on pain and the analgesic requirement after ovariohysterectomy in dogs. *Vet Anaesth Analg, 39*(4), 426-430. doi: 10.1111/j.1467-2995.2012.00728.x

Chilkoti, G. T., Kumar, M., Mohta, M., Saxena, A. K., Sharma, N., & Singh, J. (2019). Comparison of postoperative analgesic efficacy of low-dose bolus intravenous dexmedetomidine and intraperitoneal dexmedetomidine with bupivacaine in patients undergoing laparoscopic cholecystectomy: A randomised, controlled trial. *Indian J Anaesth, 63*(2), 106-113. doi: 10.4103/ija.IJA_440_18

Hampton, R. F., Jimenez-Gonzalez, M., & Stanley, S. A. (2022). Unravelling innervation of pancreatic islets. *Diabetologia, 65*(7), 1069-1084. doi: 10.1007/s00125-022-05691-9

Hannibal, K. E., & Bishop, M. D. (2014). Chronic stress, cortisol dysfunction, and pain: a psychoneuroendocrine rationale for stress management in pain rehabilitation. *Phys Ther, 94*(12), 1816-1825. doi: 10.2522/ptj.20130597

Jiang, M., Mieronkoski, R., Syrjälä, E., Anzanpour, A., Terävä, V., Rahmani, A. M., . . . Liljeberg, P. (2019). Acute pain intensity monitoring with the classification of multiple physiological parameters. *Journal of clinical monitoring and computing, 33*, 493-507.

Kamohara, H., Kamohara, T., & Hikasa, Y. (2022). A randomized clinical trial on effects of alfaxalone combined with medetomidine and midazolam in preventing stress-related neurohormonal and metabolic responses of isoflurane-anesthetized cats undergoing surgery. *Am J Vet Res, 83*(11), 1-10. doi: 10.2460/ajvr.22.03.0041

Kandi, S., Panigrahy, L. K., Dhamudia, H. C., Patel, P. K., & Sethi, P. (2022). Efficacy of intravenous dexmedetomidine versus intraperitoneal dexmedetomidine in laparoscopic cholecystectomy–A prospective randomized double-blinded study. *Asian Journal of Medical Sciences, 13*(8).

Kania, B. F., Wrońska, D., & Bracha, U. (2021). Pain, Pathophysiological Mechanisms, and New Therapeutic Options for Alternative Analgesic Agents in Sheep: A Review and Investigation. *Animals (Basel), 11*(3). doi: 10.3390/ani11030909

Karna, S., Chambers, P., Singh, P., Lopez-Villalobos, N., & Kongara, K. (2022). Evaluation of analgesic interaction between morphine, maropitant and dexmedetomidine in dogs undergoing ovariohysterectomy. *New Zealand Veterinary Journal, 70*(1), 10-21.

Kongara, K., Chambers, J., & Johnson, C. (2012). Effects of tramadol, morphine or their combination in dogs undergoing ovariohysterectomy on peri-operative electroencephalographic responses and post-operative pain. *New Zealand Veterinary Journal, 60*(2), 129-135.

Lambertini, C., Kluge, K., Lanza-Perea, M., Bruhl-Day, R., & Kalchofner Guerrero, K. S. (2018). Comparison of intraperitoneal ropivacaine and bupivacaine for postoperative analgesia in dogs undergoing ovariohysterectomy. *Vet Anaesth Analg, 45*(6), 865-870. doi: 10.1016/j.vaa.2018.06.012

Mair, A. R., Pawson, P., Courcier, E., & Flaherty, D. (2009). A comparison of the effects of two different doses of ketamine used for co-induction of anaesthesia with a target-controlled infusion of propofol in dogs. *Vet Anaesth Analg, 36*(6), 532-538. doi: 10.1111/j.1467-2995.2009.00500.x

Muir, W., Lerche, P., Wiese, A., Nelson, L., Pasloske, K., & Whittem, T. (2009). The cardiorespiratory and anesthetic effects of clinical and supraclinical doses of alfaxalone in cats. *Vet Anaesth Analg, 36*(1), 42-54. doi: 10.1111/j.1467-2995.2008.00428.x

Murdoch, F., Maker, G., Nitsos, I., Polglase, G., & Musk, G. C. (2013). Intraperitoneal medetomidine: a novel analgesic strategy for postoperative pain management in pregnant sheep. *Laboratory Animals, 47*(1), 66-70.

Murdoch, F. R., Maker, G. L., Nitsos, I., Polglase, G. R., & Musk, G. C. (2013). Intraperitoneal medetomidine: a novel analgesic strategy for postoperative pain management in pregnant sheep. *Lab Anim, 47*(1), 66-70. doi: 10.1177/0023677212473712

Raekallio, M. R., Virtanen, M., Happonen, I., & Vainio, O. M. (2017). Adverse reactions of α2-adrenoceptor agonists in cats reported in 2003–2013 in Finland. *Veterinary Anaesthesia and Analgesia, 44*(4), 803-810. doi: https://doi.org/10.1016/j.vaa.2016.07.008

Ramesha, H., Mahesh, V., Nagaraja, B., Sudha, G., Ranganath, L., & Srinivasa Murthy, K. (2022). *Comparative studies on medetomidine and dexmedetomidine as pre-anaesthetics for propofol-isoflurane general anesthesia in dogs.* (PhD PhD dissertation), Karnataka Veterinary, Animal and Fisheries Sciences University India.

Rezaeipour, A., Naddaf, H., Jalali, S. M., & Sabiza, S. (2022). Evaluation of intraperitoneal administration of morphine on post-operative pain management after ovariohysterectomy in dogs. *Vet Med Sci, 8*(1), 150-156. doi: 10.1002/vms3.668

Saponaro, V., Crovace, A., De Marzo, L., Centonze, P., & Staffieri, F. (2013). Echocardiographic evaluation of the cardiovascular effects of medetomidine, acepromazine and their combination in healthy dogs. *Research in veterinary science, 95*(2), 687-692.

Shafiei, F. T., McAllister, R. K., & Lopez, J. (2018, 2023 Aug 17). Bupivacaine. Retrieved 2024 Jan, from https://www.ncbi.nlm.nih.gov/books/NBK532883/

Shankar, S., Gupta, B. K., Singh, M. K., Pandey, A. R., Dwivedi, V., & Sachan, S. (2022). Intraperitoneal bupivacaine alone or with dexmedetomidine for post-operative analgesia following laparoscopic cholecystectomy: a prospective randomized comparative study. *Anaesthesia, Pain & Intensive Care, 26*(3), 347-351.

Sinclair, M. D. (2003). A review of the physiological effects of α2-agonists related to the clinical use of medetomidine in small animal practice. *The Canadian veterinary journal, 44*(11), 885.

Turner, P. V., Brabb, T., Pekow, C., & Vasbinder, M. A. (2011). Administration of substances to laboratory animals: routes of administration and factors to consider. *Journal of the American Association for Laboratory Animal Science, 50*(5), 600-613.

Walters, E. T. (2018). Defining pain and painful sentience in animals. *Animal Sentience, 3*(21), 14.