DOI: 10.22055/IVJ.2022.319921.2421
DOR: 20.1001.1.17356873.1401.18.1.5.3

Canine uterine artery hemodynamic during Bromocriptine-induced estrus

Fardin Koohifayegh[1], Farzaneh Hoseini[2], Farid Barati[2*] and Morteza Hosseininejad[2]

[1] DVM graduated student, Department of Clinical Sciences, Faculty of Veterinary Medicine, Shahrekord University, Shahrekord, Iran
[2] Associate professor, Department of Clinical Sciences, Faculty of Veterinary Medicine, Shahrekord University, Shahrekord, Iran

Received: 14.12.2021 Accepted: 31.05.2022

Abstract

Bromocriptine ((BRM); as a dopaminergic agent) reduces the serum prolactin, and is one of the most routine drugs to induce a successful estrus cycle in bitches. Some clinical side effects are accompanying this drug. This study aimed to investigate the hemodynamics of the uterine artery (UA) following administration of the increasing doses of BRM. In a case-control study, five non-pregnant bitches of mixed breeds in the anestrus stage received daily oral doses of BRM on days 1 and 2 (100, µg/kg), days 3 and 4 (200 µg/kg), and days 5 onward (400 µg/kg) until turning into proestrus. Three bitches, with expressed estrus without any intervention, were considered as control. The vaginal cytology, the ultrasound examination, and the serum progesterone (P4) assay were performed at 2-3 day intervals. Proestrus was induced within 6.6±1.17 days following BRM treatment. BRM significantly lowered the serum P4 to 15.1±0.78 compared to the control group (21.5±1.13 ng/mL) during induced estrus. BRM significantly changed UA hemodynamics over the days before proestrus. Mean UA pulse index, resistance index, and peak systolic velocity in BRM-induced estrus were significantly lower than the control group. The results of this study showed lower serum P4 levels and some alterations in the canine uterine hemodynamic during BRM-induced estrus compared to naturally expressed estrus. Induced cycle in dogs with lower serum P4 levels and altered UA hemodynamics must be considered for subsequent pregnancy outcomes in the BRM induced-estrus.

Keywords: Dogs, Bromocriptine; Estrus Cycle; Uterine Artery

[*] **Corresponding Author**: Farid Barati, Associate professor, Department of Clinical Sciences, Faculty of Veterinary Medicine, Shahrekord University, Shahrekord, Iran
E-mail: fabrtir@yahoo.com

Refrences

Alvarez-Clau, A., & Liste, F. (2005). Ultrasonographic characterization of the uterine artery in the nonestrus bitch [Article]. *Ultrasound in Medicine and Biology*, *31*(12), 1583-1587. https://doi.org/10.1016/j.ultrasmedbio.2005.08.003

Batista, P. R., Gobello, C., Corrada, Y., Pons, E., Arias, D. O., & Blanco, P. G. (2013). Doppler ultrasonographic assessment of uterine arteries during normal canine puerperium. *Animal Reproduction Science*, *141*(3-4), 172-176. https://doi.org/10.1016/j.anireprosci.2013.07.013

Beijerink, N. J., Dieleman, S. J., Kooistra, H. S., & Okkens, A. C. (2003). Low doses of bromocriptine shorten the interestrous interval in the bitch without lowering plasma prolactin concentration. *Theriogenology*, *60*(7), 1379-1386. http://www.ncbi.nlm.nih.gov/pubmed/14511790

Bergeron, L. H., Nykamp, S. G., Brisson, B. A., Madan, P., & Gartley, C. J. (2013). An evaluation of B-mode and color Doppler ultrasonography for detecting periovulatory events in the bitch. *Theriogenology*, *79*(2), 274-283. https://doi.org/10.1016/j.theriogenology.2012.08.016

Blanco, P. G., Arias, D., Rube, A., Barrena, J. P., Corrada, Y., & Gobello, C. (2009). An experimental model to study resistance index and systolic/diastolic ratio of uterine arteries in adverse canine pregnancy outcome [Conference Paper]. *Reproduction in Domestic Animals*, *44*(SUPPL. 2), 164-166. https://doi.org/10.1111/j.1439-0531.2009.01369.x

Blanco, P. G., Arias, D. O., & Gobello, C. (2008). Doppler ultrasound in canine pregnancy. *Journal of Ultrasound in Medicine*, *27*(12), 1745-1750. https://doi.org/10.7863/jum.2008.27.12.1745

Blanco, P. G., Rodríguez, R., Rube, A., Arias, D. O., Tórtora, M., Díaz, J. D., & Gobello, C. (2011). Doppler ultrasonographic assessment of maternal and fetal blood flow in abnormal canine pregnancy. *Animal Reproduction Science*, *126*(1-2), 130-135. https://doi.org/10.1016/j.anireprosci.2011.04.016

Bollwein, H., Heppelmann, M., & Lüttgenau, J. (2016). Ultrasonographic Doppler use for female reproduction management. *Veterinary Clinics: Food Animal Practice*, *32*(1), 149-164.

Bollwein, H., Kolberg, B., & Stolla, R. (2004). The effect of exogenous estradiol benzoate and altrenogest on uterine and ovarian blood flow during the estrous cycle in mares. *Theriogenology*, *61*(6), 1137-1146.

Bollwein, H., Meyer, H., Maierl, J., Weber, F., Baumgartner, U., & Stolla, R. (2000). Transrectal Doppler sonography of uterine blood flow in cows during the estrous cycle. *Theriogenology*, *53*(8), 1541-1552.

Campbell, S., Bourne, T. H., Waterstone, J., Reynolds, K. M., Crayford, T. J., Jurkovic, D., Okokon, E. V., & Collins, W. P. (1993). Transvaginal color blood flow imaging of the periovulatory follicle. *Fertility and Sterility*, *60*(3), 433-438.

Gobello, C., de la Sota, R. L., & Goya, R. G. (2001). Study of the change of prolactin and progesterone during dopaminergic agonist treatments in pseudopregnant bitches.. *Animal Reproduction Science*, *66*(3-4), 257-267. http://www.ncbi.nlm.nih.gov/pubmed/11348786

Jöchle, W., Arbeiter, K., Post, K., Ballabio, R., & D'ver, A. (1989). Effects on pseudopregnancy, pregnancy and interoestrous intervals of pharmacological suppression of prolactin secretion in female dogs and cats. *Journal of Rreproduction and Fertility. Supplement*, *39*, 199.

Johnston, S. D., Root Kustritz, M. V., & Olson, P. S. (2001). *Canine and Feline Theriogenology*. Saunders, London, UK, PP: 32-40.

Johnston, S. D., & Root, M. V. (1995, September). Serum progesterone timing of ovulation in the bitch. In *Proceedings of the Annual Meeting of the Society of Theriogenology: 29-30 September 1995; Nashville, Tennessee/USA* (pp. 195-203).

Kooistra, H. S., Okkens, A. C., Bevers, M. M., Popp-Snijders, C., van Haaften, B., Dieleman, S. J., & Schoemaker, J. (1999). Bromocriptine-induced premature oestrus is associated with changes in the pulsatile secretion pattern of follicle-stimulating hormone in beagle bitches. *Journal of Reproduction and Fertility*, *117*(2), 387-393. http://www.ncbi.nlm.nih.gov/pubmed/10690207

Kutzler, M. A. (2005). Induction and synchronization of estrus in dogs. *Theriogenology*, *64*(3), 766-775. https://doi.org/10.1016/j.theriogenology.2005.05.025

Kutzler, M. A. (2007). Estrus induction and synchronization in canids and felids [Review]. *Theriogenology*, *68*(3), 354-374. https://doi.org/10.1016/j.theriogenology.2007.04.014

Kutzler, M. A. (2018). Estrous Cycle Manipulation in Dogs. *Veterinary Clinics: Small Animal Practice*, *48*(4), 581-594.

Manku, M., Nassar, B., & Horrobin, D. (1973). Effects of prolactin on the responses of rat aortic and arteriolar smooth-muscle preparations to noradrenaline and angiotensin. *The Lancet*, *302*(7836), 991-994.

Molinari, C., Grossini, E., Mary, D. A., Uberti, F., Ghigo, E., Ribichini, F., Surico, N., & Vacca, G. (2007). Prolactin induces regional vasoconstriction through the β2-adrenergic and nitric oxide mechanisms. *Endocrinology*, *148*(8), 4080-4090.

Nogueira, I. B., Almeida, L. L., Angrimani, D. S. R., Brito, M. M., Abreu, R. A., & Vannucchi, C. I. (2017). Uterine haemodynamic, vascularization and blood pressure changes along the oestrous cycle in bitches [Article]. *Reproduction in Domestic Animals*, *52*, 52-57. https://doi.org/10.1111/rda.12859

Okkens, A. C., Bevers, M. M., Dieleman, S. J., & Willems, A. H. (1985). Shortening of the interoestrous interval and the lifespan of the corpus luteum of the cyclic dog by bromocryptine treatment. *Veterinary Quarterly*, *7*(3), 173-176. https://doi.org/10.1080/01652176.1985.9693979

Resnik, R., Brink, G. W., & Plumer, M. H. (1977). The effect of progesterone on estrogen-induced uterine blood flow. *American Journal of Obstetrics and Gynecology*, *128*(3), 251-254.

SAS Institute Inc. (2009). *SAS/STAT ® 9.2 User's Guide*. In SAS Institute Inc.

Stumpe, K., Higuchi, M., Kolloch, R., KRÜCK, F., & Vetter, H. (1977). Hyperprolactinaemia and antihypertensive effect of bromocriptine in essential hypertension: Identification of abnormal central dopamine control. *Lancet*, *310*(8031), 211-214.

Temizkan, O., Temizkan, S., Asicioglu, O., Aydin, K., & Kucur, S. (2015). Color Doppler analysis of uterine, spiral, and intraovarian artery blood flow before and after treatment with cabergoline in hyperprolactinemic patients. *Gynecoogyl Endocrinology*, *31*(1), 75-78. https://doi.org/10.3109/09513590.2014.958989

Tinkanen, H., Kujansuu, E., & Laippala, P. (1994). Vascular resistance in uterine and ovarian arteries: its association with infertility and the prognosis of infertility. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, *57*(2), 111-115.

Verstegen, J., Onclin, K., Silva, L., & Concannon, P. (1999). Effect of stage of anestrus on the induction of estrus by the dopamine agonist cabergoline in dogs. *Theriogenology*, *51*(3), 597-611.

Villalón, C. M., Ramírez-San Juan, E., Sánchez-López, A., Bravo, G., Willems, E. W., Saxena, P. R., & Centurión, D. (2003). Pharmacological profile of the vascular responses to dopamine in the canine external carotid circulation [Article]. *Pharmacology and Toxicology*, *92*(4), 165-172. https://doi.org/10.1034/j.1600-0773.2003.920406.x

Weiner, Z., Thaler, I., Levron, J., Lewit, N., & Itskovitz-Eldor, J. (1993). Assessment of ovarian and uterine blood flow by transvaginal color Doppler in ovarian-stimulated women: correlation with the number of follicles and steroid hormone levels. *Fertility and Sterility*, *59*(4), 743-749.