SHORT COMMUNICATION
Open Access

Journal of Veterinary and Animal Sciences
ISSN (Print): 0971-0701, (Online): 2582-0605
https://doi.org/10.51966/jvas.2023.54.1.239-242

Doppler ultrasonography of ventral perineal artery in bitches during different stages of oestrous cycle

E. S. Nikhila, K. Magnus Paul, C. Jayakumar, Amritha Aravind and Elizabeth Kurian

Department of Animal Reproduction, Gynaecology and Obstetrics
College of Veterinary and Animal Sciences, Mannuthy, Thrissur- 680 651
Kerala Veterinary and Animal Sciences University, Kerala, India.

Citation: Nikhila,E.S., Magnus Paul,K., Jayakumar,C., Aravind,A. and Kurian,E. Doppler ultrasonography of ventral perineal artery in bitches during different stages of oestrous cycle. *J. Vet. Anim. Sci.* **54**(1):239-242
DOI: https://doi.org/10.51966/jvas.2023.54.1.239-242

Received: 29.06.2022 *Accepted: 01.11.2022* *Published: 31.03.2023*

Abstract

This study aimed to evaluate the Doppler ultrasonographic features of ventral perineal artery of bitches during different phases of oestrous cycle. Sixteen pluriparous bitches were subjected to transperineal Doppler ultrasonography during different stages of oestrous cycle by confirming the stage by exfoliative vaginal cytotlogy (EVC) and vaginoscopy. The resistivity index (RI), pulsatility index (PI), peak systolic velocity (PSV), end diastolic velocity (EDV) and systolic/ diastolic velocity (S/D) were analysed. No significant difference was found between the Doppler velocimetric parameters of ventral perineal artery during different phases of oestrous cycle by trasnperineal Doppler ultrasonography.

Keywords: *Canine, oestrous cycle, ultrasonography, doppler*

Doppler ultrasonography provides anatomical and functional vascular information such as blood flow velocity, direction and type (Nicolaides *et al*., 2000). As a non-invasive approach, it has got application in the assessment of uterine vasculature in different species of animals (Freitas *et al*., 2017). The use of colour and pulsed Doppler provides qualitative information by measuring peak systolic velocity (PSV), end diastolic velocity (EDV), mean velocity (MV), resistivity (RI) and pulsatility index (PI). Qualitative evaluation is performed by assessing the spectral morphology (Giannico *et al*., 2015). The analysis of flow through the use of indices is precise and repeatable (Scharbele, 2005).

Canines are non-seasonal, monoestrus, polytocous and spontaneous ovulators (Concannon, 2011). Their prolonged dioestrus and obligatory anoestrus extend the inter-oestrous

1. *M.V.Sc Scholar*
2. *Assistant Professor*
3. *Associate Professor and Head i/c*
4. *Assistant Professor, Dept. of Animal Reproduction, Gynaecology and Obstetrics, CVAS, Mannuthy*
5. *Assistant Professor Department of Animal Genetics and breeding*

**Corresponding author: nikhilasankar95@gmail.com, Ph: 9645009291*

interval (IEI) up-to 5- 12 months, eventually lowering the profitability of canine breeding industry (Deepak *et al*., 2021). Doppler ultrasound of uterine arteries in canines during different stages of oestrous cycle has important clinical implications (Alvarez and Liste, 2005; Freitas *et al*., 2017). Changes in oestrogen: progesterone ratio during different stages of oestrous cycle affects the mean blood flow to many vascular beds (Sprague *et al*., 2009). Caudal parts of female genital tract were supplied by branches of the internal pudental and vaginal arteries, these are the branches of internal iliac artery (Konig and Liebich, 2014). To our knowledge, utrasonographic features of ventral perineal artery in the bitches have not been reported previously. The objective of this study was to evaluate the Doppler ultrasonographic features of ventral perineal artery of canines during different stages of oestrous cycle.

The study was carried out at the Teaching Veterinary Clinical Complex (TVCC), College of Veterinary and Animal Sciences, Mannuthy. Sixteen medium to large sized breeds of dogs with apparently normal oestrous cycle with ages and weight ranges from 3-5 years and 20-40 kg respectively were examined. Stage of the oestrous cycle was determined by exfoliative vaginal cytology and vaginoscopy. Transperineal sonograms were obtained using ultrasound scanner (MyLab^{TM}X8 eXP, Esaote, Genoa, Italy) with a Linear-array transducer (Esaote L 4-15, Esaote, Genoa, Italy). The transducer was positioned on the peri-vulva area with the bitch in a lateral recumbency. The transducer was positioned vertical in relation to the perineum of the bitch to obtain sagital plane images (Rajapakshage and Niranjala, 2019). Colour Doppler was used as an aid to define the location of arteries. The sensitivity of the standard colour Doppler signal was routinely used to identify the blood flow. Power Doppler setting was sometimes required to visualize it (Fig 1).

Following the identification of the vessel, ventral perineal artery flow waveforms were registered by using pulsed wave Doppler. A correct identification of flow was considered to be achieved when the Doppler graph pattern showed at least three or four consecutive systolic peaks of the same velocity and amplitude (Fig 2). The waveforms were evaluated both by automatic and manual mode. Manual mode of evaluation was done by marking the beginning of systole and end of diastole, after obtaining at least three systolic peaks in the same speed range. Image acquisition took 15-20 minutes per animal.

Haemodynamic parameters of the ventral perineal artery are shown in Table 1. None of the parameters assessed in the current study showed significant differences during different stages of oestrous cycle. Resistivity index (RI), pulsatility index (PI), peak systolic velocity (PSV) and end diastolic velocity (EDV) showed higher values as the stage progresses. High RI indicated poor perfusion to the tissue (Barbosa *et al*., 2013).

Table 1. Pulsatility index (PI), Resisitivity index (RI), systolic/diastolic ratio (S/D), Peak Systolic Velocity (PSV) and End Diastolic Velocity (EDV) of ventral perineal artery during different stages of oestrous cycle in bitches

Parameters	**Prooestrus** (Mean ± SE)	**Oestrus** (Mean ± SE)	**Dioestrus** (Mean ± SE)	**F-value**
RI	0.73 ± 0.02	0.76 ± 0.03	0.81 ± 0.02	2.470 ^{ns}
PI	1.84 ± 0.14	2.05 ± 0.23	2.3 ± 0.22	1.359 ^{ns}
PSV	32.31 ± 3.51	36.85 ± 4.58	37.9 ± 5.74	0.020 ^{ns}
EDV	8.61 ± 1.02	9.62 ± 1.35	7.89 ± 0.99	0.933 ^{ns}
SV/DV	3.95 ± 0.25	4.27 ± 0.54	3.92 ± 0.43	0.201 ^{ns}

ns- no significant difference between means at 5 % level of significance (P ≤ 0.05)

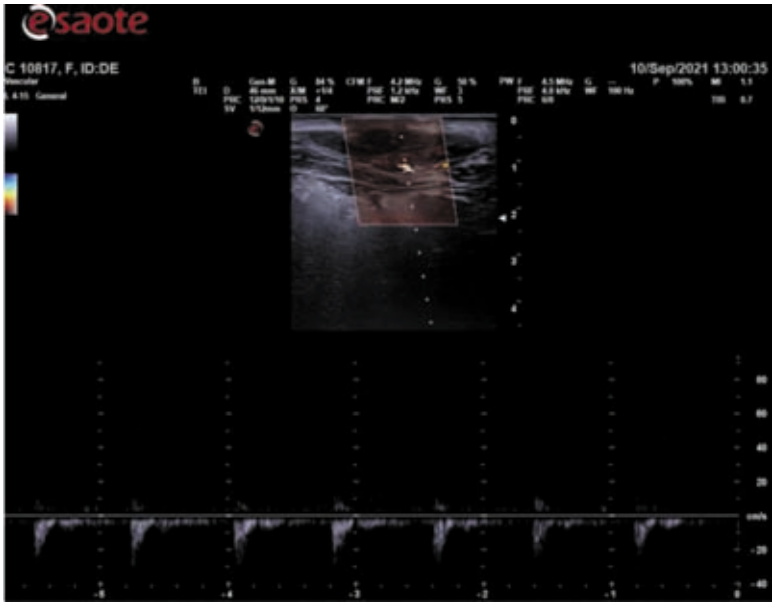

Fig. 1 Pulsed wave Doppler, power Doppler and B-mode ultrasound image of ventral perineal artery in femail dogs during dioestrum.

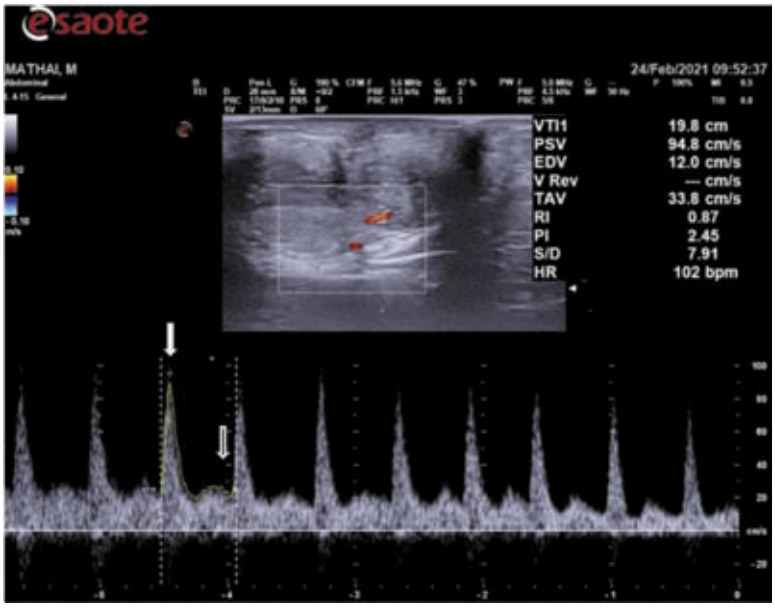

Fig. 2 Triplex Doppler of ventral perineal artery in female dog. A small volume sample is placed on the coloured ventral perineal artery, obtaining the spectral tracing of the vellel. Observe the waveform, characterized by a systolic peak (white arrow) end diastolic velocity (hollow arrow)

Ultrasonographic characterisation of uterine artery in bitches during different stages of oestrous cycle was reported previously (Alvarez and Liste, 2005; Freitas *et al*., 2017). Artefacts from colon contents and abdominal movements from normal breathing sometimes hinder the uterine artery evaluation. We feel that trans-perineal approach to evaluate ventral perineal artery makes the examination more feasible for the operator and comfortable for the bitch. However, there are no data available in the literature concerning the ultrasonographic characterisation of the ventral perineal artery in the bitch.

Future work needs to be performed in bitches to fully assess all possible changes in Doppler indices of the ventral perineal artery as the flow of the normal uterine artery differs depending upon the breed, phase of the reproductive cycle and the reproductive status in the canine (Freitas *et al*., 2017).

Summary

Doppler ultrasonography, being an alternative to invasive procedure becomes a matter of advanced thought. This imaging modality has improved the diagnosis of reproductive tract disorders in animals. In conclusion, the present study did not find any statistical difference in the Doppler velocimetric parameters of the ventral perineal artery during different stages of oestrous cycle in dogs. The results of this work should be compared with those of future studies that include a larger the sample size.

Conflict of interest

The authors declare that they have no conflict of interest.

References

Alvarez-Clau, A. and Liste, F. 2005. Ultrasonographic characterization of the uterine artery in the nonestrus bitch. *Ultrasound Med. Biol*. **3**: 1583–1587.

Barbosa, C.C., Souza, M. B., Scalercio, S.R.R.A., Silva, T.F.P,, Domingues, S.F.S. and Silva, L.D.M. 2013. Ovarian and uterine periovulatory doppler ultrasonography in bitches. *Pesq .Vet. Bras*. **33**: 1144-1150.

Concannon, P.W. 2011. Reproductive cycles of the domestic bitch. *Anim. Reprod. Sci*. **124**: 200-210.

Deepak, J., Unnikrishnan, M. P., Jayakumar, C., Hiron, M. H. and John Martin K. D. 2021. Shortening of dioestrus in female dogs using cloprostenol sodium at different stages of dioestrus. *J. Vet. Anim. Sci.* **52**: 321-324

Freitas, L.A., Mota, G.L., Silva, H.V.R. and Silva, L.D.M. 2017. Two-dimensional sonographic and Doppler changes in the uteri of bitches according to breed, estrus cycle phase, parity, and fertility. *Theriogenology*, **95**: 171-177.

Giannico, A.T., Gil, E.M.U., Garcia, D.A.A. and Froes, T.R. 2015. The use of Doppler evaluation of the canine umbilical artery in prediction of delivery time and fetal distress. *Anim. Reprod. Sci.* **154**: 105-112.

Konig, H.E. and Liebich, H.G. 2014. *Anatomy of domestic mammals: textbook and colour atlas for study and practice*. Schattauer GmbH, Stuttgart, Germany, 824 p.

Rajapakshage, B.K.W and Niranjala, D.S.D.D. 2019. Transperineal ultrasonographic characteristics of the birth canal of bitches during pregnancy and dystocia. *Jpn. J. Vet. Res.* **67**: 185-193.

Nicolaides, K.H., Rizzo, G. and Hecher, K. 2000. Methodology of Doppler assessment of the placental and fetal circulations. In Placental and Fetal Doppler, Nicolaides KH, Rizzo G, Hecher K (eds). Parthenon Publishing: Carnforth, UK; 35–66.

Scharbele W. 2005. *Ultrasonography in vascular diagnosis*- A therapy oriented textbook and atlas. (1st Ed). Berlin: Springer; Germany, 139p.

Sprague, B.J., Phernetton, T.M., Magness, R.R. and Chesler, N.C. 2009. The effects of the ovarian cycle and pregnancy on uterine vascular impedance and uterine artery mechanics. *Eur. J. Obstet. & Gynecol. and Reprod. Biol.* **144**: 170-178.

■