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# Tocodynamometry in canine uterine inertia#

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**Abstract**

*Early detection of uterine inertia is very crucial for the life of the foetus as well as that of the dam. Suitable methods for early detection of uterine inertia are lacking in canines compared to humans.Non-invasivetocodynamometry is a promising method, which is widely used in humans for the management of uterine inertia.In the present study non-invasive uterine contraction monitoring using the tocodynamometry was performed in dogs with Complete Primary Uterine Inertia (CPUI) and Partial Primary Uterine Inertia (PPUI), as well as in control animals with the Foetal Cause of Dystocia (FCD).In all the dogs belonging to CPUI and PPUI, the contractions were mild and infrequent with force near to the baseline, i.e., less than 15 mm of Hg. There were no reflex contractions in response to the feathering of the vaginal wall in a majority of dogs belonging to these two groups. In the FCD group, there were strong and frequent contractions lasting for two to three minutes with contraction force above 15mm of Hg, reaching up to 30-40 mm of Hg. Those dogs with less than 15 mm of Hg pressure and feeble or infrequent contractions without delivery for more than 30 min, could be considered as uterine inertia and suitable therapeutic options could be considered judiciously. Tocodynamometry was found to be an effective tool for the early detection of uterine inertia,whichhelped arriving at a quick judicious decision which is pertinent for better foetal and maternal survival.*

**Keywords:** *Tocodynamometry, Uterine inertia, Canine, Dystocia*

Uterine inertia is the functional inability of the uterus to contract and expel the foetus after the completion of the normal gestation period through an otherwise normal birth canal, which is not having obstructive dystocia (Johnston *et al*., 2001). It is the most common cause of dystocia in canines and accounts for up to 49 per cent of the total maternal causes of dystocia (Munnich and Küchenmeister, 2009), and nearly 60 to 80 per cent of dystocia end up in Caesarean (Suprith *et al*., 2020). Early detection of uterine inertia is very crucial for the life of the foetus as well as that of the dam.Clinically majority of the dogs with uterine inertia do not exhibit any signs of parturition

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misleading the veterinarians from a prompt and early diagnosis thereby jeopardising the life of foetuses.If the foetal death happens,the life of the dam will also be at risk.

Early detection of uterine inertia is of utmost importance in canine parturition for quick obstetric intervention.Faster the diagnosis and intervention, lesser the maternal and foetal stress,thereby a better survival rate. Even thoughTocodynamometry is widely used in humans for uterine contraction monitoring, it hasn't been commonly used in dogs either for contraction monitoring or as a tool for the detection of inertia. This study intended to analyse the worth of non-invasive tocodynamometer for early detection of uterine inertia in parturient dogs.

**Materials and methods**

The study population consisted of healthy, small to medium-sized females of various dog breeds (Beagle, Golden retriever, Bully and Labrador Retriever) weighing between 15 - 35 kg with at least single parity having litter size more than 3. Animals having litter size very high and very low than the average range(4-9 based on breed) for the breed were excluded from the study population. Female dogs presented at Teaching Veterinary Clinical Complex,Mannuthy and University Veterinary Hospital, Kokkali with signs of the prolonged first or second stage of labour were considered for the study.

On presentation of cases, history was collected regarding age, parity, nature of previous whelping, the incidence of dystocia, medicines administered and surgeries performed. Animals aged between 16 months to 6 years were included in the study population. Breeding dates were recorded. Information on behavioural aspects of whelping such as pawing, anorexia, lethargy and nesting behaviour was gathered. The time elapsed since the appearance of green discharge or copious clear discharge/ presentation of the water bag was recorded. The presence of green discharge, copious white discharge, or presentation of waterbag was considered as the initiation of the second stage of whelping (Pretzer, 2008). Further the body temperature, resting heart rate, respiratory rate, colour of mucous membranes and bodyweight of the animals were recorded. Vaginoscopic examination of the birth canal was performed using a fibreoptic vaginoscope/ Sigmoidoscopes (Welch Allyn®, Skaneateles Falls, NY), after lubricating the outer wall with obstetric cream, and the status of cervical relaxation was noted, to ensure the initiation of the second stage of labour.

B mode scanning (Esaote My Lab X8, Genova, Italy)was performed (Giannico*et al*., 2015) using electronic convex and linear multifrequency transducers ranging from 2.5 to 14.0 MHz frequencies, according to the size of the animal. After careful manipulation of the probe, the foetal head was located and scanned through the left or right temporoparietal window (Lorigados and Pinto, 2013), the biparietal diameter was measured and gestational age calculated to ensure foetal maturity. Foetal heart rate was detected to evaluate the degree of foetal stress(Sridevi, 2013). All the animals which had completed the gestational age as per breeding date, biparietal diameter, and having foetal heart rates above 180 bpm indicating absence of extreme foetal stress as assessed by the examination were selected for the study.

Dogs that commenced the second stage of labour as indicated by the discharge of gestational sac fluids, green discharge from marginal haematoma or open relaxed cervix with foetal bag expressed on vaginoscopy were subjected to tocodynamometric monitoring. Dogs were divided into three groups based on the criteria of uterine inertia by Bergstrom *et al.* (2010) and Tammine*net al.* (2019). Dogs without expulsion of a puppy even after four hours of green discharge or copious mucoid vaginal discharge, without straining were considered as complete primary uterine inertia. Dogs that had expelled at least one foetus and a delay of two hours without any progress of labour, without foetal obstruction were considered as the partial primary uterine inertia.Dogs with no progress of labour due to an oversized/ malpresented foetus, or foeto-maternal disproportion, with active uterine contractions, were grouped as the foetal cause of dystocia and taken as control animals.

For tocodynamometric monitoring,the animal was kept on lateral recumbency with its abdomen shaved on lateral and ventral aspects. The movement of the animal was restricted maximum during the contraction monitoring to avoid artefacts. The abdominal belt of the tocodynamometer (Amigo Medical Systems, Cochin, Kerala) was attached to the abdomen with adequate tension on the abdominal probe while the uterus and abdomen were in a relaxed state. Uterine contractions were then monitored using the tocodynamo meter (Fig.1), the frequency and amplitude of contractions were recorded and classified. Contractions were classified as 1) mild and infrequent or 2) strong and frequent, based on the frequency of contraction. Based on the amplitude of contraction it was classified as 1) base line myometrial tracing (Less than 15 mm of Hg) 2) strong myometrial contractions -more than 15 mm of Hg. The number of contractions i.e., frequency and amplitude of contractions were recorded for a duration of 20 min (Davidson, 2001; Vlemminx*et al*., 2017; Jayakumar*et al.,* 2019).

**Results and discussion**

Uterine contractions were monitored using an external tocodynamometer in a non-invasive fashion as described by Maul *et al.* (2003) and Li *et al.* (2003), Davidson (2010) and Jayakumar (2015).

In all the dogs belonging to CPUI and PPUI, the contractions were mild and infrequent with force near to the baseline, *i.e.,* less than 15 mm of Hg. There were no reflex contractions in response to the feathering of the vaginal wall in the majority of dogs belonging to these two groups (Table. 1) (Fig 2 and 3). This was in agreement with the observations of Gropett *et al.* (2010), who reported 0-3 mild contractions in 30 min of observation in uterine inertia conditions. Hanumanthappa *et al*. (2018) also reported contractions of less than 10 per cent strength in external tocodynamometry in dogs with uterine inertia. Frehner*et al.* (2018) reported the absence of Fergusons reflex in uterine inertia cases as observed in the present study, and classified inertia with one or two foetuses delivered as secondary uterine inertia.

In the FCD group, there were strong and frequent contractions lasting two to three minutes with contraction force above 15mm of Hg, reaching up to 30-40 mm of Hg (Table.1) (Fig.4). In 20 min on an average, four to five contractions of two to three minutes duration were noticed in the foetal cause of dystocia. This agreed with the observations of Groppetti *et al.* (2008) and Hanumanthappa *et al.* (2018). They recorded three to five strong contractions lasting three to four minutes in dogs whelping normally, unassisted. Observations of Jayakumar *et al.* (2019) also agreed with the results of the present study where they recorded frequent and regular

**Table. 1.** Non-invasive uterine contraction monitoring with Tocodynamometry in canine uterine inertia

| | | Strength of Uterine Contraction | | Frequency of Uterine Contraction | |
|---|---|---|---|---|---|
| | | Baseline myometrial tracing -Less than 15 mm of Hg | Strong myometrial contractions -more than 15 mm of Hg | Mild and infrequent | Strong and frequent uterine contractions |
| **CPUI** | Number of Animals | 9 | 0 | 9 | 0 |
| | Per cent | 100 | 0 | 100 | 0 |
| **PPUI** | Number of Animals | 6 | 0 | 6 | 0 |
| | Per cent | 100 | 0 | 100 | 0 |
| **FCD** | Number of Animals | 0 | 7 | 0 | 7 |
| | Per cent | 0 | 100 | 0 | 100 |
| CPUI- Complete Primary Uterine Inertia, PPUI- Partial Primary Uterine Inertia, FCD- Foetal Cause of Dystocia | | | | | |

contractions of three to four minutes duration with 30 to 40 per cent increase in contraction force from baseline. Davidson (2010) however observed more contraction in I and II stages of labour in external tocodynamometry with up to 12 contractions per hour.

The study proved the genuineness of using external tocodynamometry as a non-invasive method of detection of uterine inertia in dystocia dogs. Dogs exhibiting less than 15 mm of Hg pressure and feeble or infrequent contractions without delivery for more than 30 min, could be diagnosed as uterine inertia and suitable therapeutic options could be considered judiciously. Though the frequency of contractions could be well established by this diagnostic aid, it embraces limitations as it is highly prone to measurement errors and less sensitive and unable to detect the force of contraction as suggested by Garfield *et al*. (1998.

**Conclusion**

Whelping issues when detected early could provide the best whelping outcomes. Non-invasive maternal monitoring with tocodynamometry provides the prospect of judicious management of dystocia in dogs as


**Fig. 1** Non-invasive tocodynamic monitoring of uterine contractions

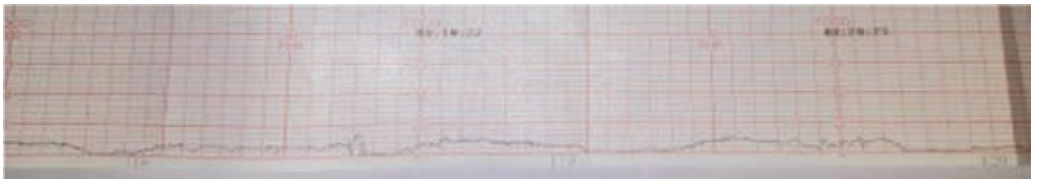

**Fig. 2** Non-invasive tocodynamic monitoring-Complete primary uterine intertia

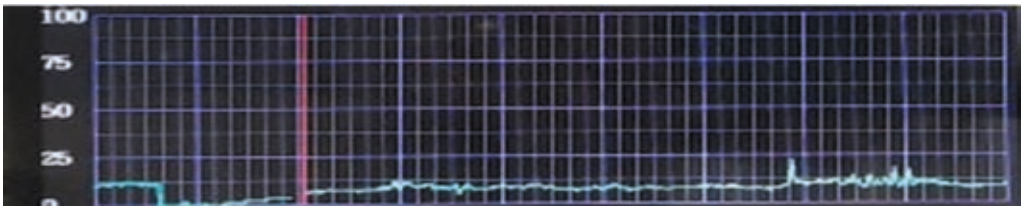


**Fig. 3** Non-invasive tocodynamic monitoring-Partial primary uterine intertia

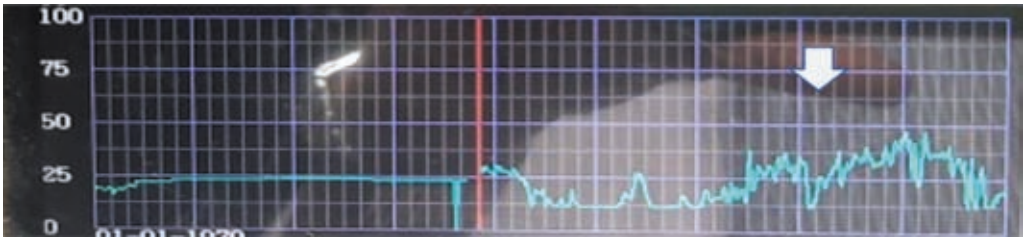


**Fig. 4** Non-invasive tocodynamic monitoring-Foetal cause of dystocia (Arrow - Contraction)

an alternative to speculations and improves dystocia outcomes. Management of dystocia from uterine inertia could be effectively accomplished by receiving objective data on the strength and frequency of uterine contractions. Also, it is demonstrated as a method for early detection of uterine inertia in dystocic dogs. Those dogs with less than 15 mm of Hg pressure and feeble or infrequent contractions without delivery for more than 30 min, could be considered as uterine inertia and suitable therapeutic options could be considered judiciously.

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**Conflict of interest**

The authors declare that they have no conflict of interest.

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