DOPPLER ULTRASONOGRAPHIC EVALUATION OF UTERINE TORSION IN DOES

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Abstract

The study was conducted to evaluate the efficiency of Doppler ultrasonography for diagnosis of uterine torsion in does. Ten does suffering from uterine torsion were examined clinically and using Doppler ultrasonography at the time of presentation and one hour after correction of torsion and subsequent foetal extraction. Pulsatility index (PI) and resistive index (RI) in the arteries ipsilateral and contralateral to the side of uterine torsion were recorded. Mean pulsatility and resistive indices of left and right middle uterine arteries of ten does at the initiation of kidding was measured and their average was taken as control. The PI and RI was highest in ipsilateral uterine artery of torsion affected does than contralateral and normal kidding does; the value was lowest in normal does. The difference in PI and RI were highly significant ($p<0.01$) between ipsilateral and contralateral uterine arteries of affected does as well as with uterine arteries of normal does. After foetal delivery no significant difference ($p>0.05$) existed in these values.

Key words: *Doppler, pulsatility index, resistive index, uterine torsion, doe, uterine artery*

Uterine torsion is a serious pre-partum complication among does, leading to deadly outcome on delayed intervention. Factors such as duration of torsion as well as degree of torsion were considered as the major determinants of outcome. Limitations of rectal and vaginal examinations among goats make confirmative diagnosis of torsion a difficult task and are often diagnosed during an exploratory laparotomy only. Doppler ultrasonographic examination of the middle uterine artery in bovine uterine torsion has shown some encouraging results in the confirmative diagnosis. Even though, plenty of literatures are available on Doppler investigation of the middle uterine arteries in pregnant does, especially during the peri- partum period, there is paucity of studies regarding blood flow indices of the middle uterine arteries among torsion affected does. Hence, the present study was conducted with the objective of assessing the efficacy of Doppler ultrasonography in the diagnosis of uterine torsion among does

Materials and methods

Full term pregnant does, presented to University Veterinary Hospital Kokkalai and Mannuthy, with the history and symptoms suggestive of dystocia were considered for the study. These does were subjected to detailed

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clinico-gynaecological examination and those animals diagnosed to have uterine torsion or which were suspected for uterine torsion and subsequently diagnosed during exploratory laparotomy, were included in the experimental group (Group A). Ten full term pregnant does maintained at University Goat and Sheep Farm, Mannuthy, which had normal kidding were included in control group (Group B).

Doppler indices (pulsatility index and resistive index) of left and right middle uterine arteries of all the animals were recorded by pulse wave Doppler ultrasonography, using 5-10 MHz frequency linear array trans-rectal transducer (SV3513, Esaote Europe B.V, Netherland), as per the following procedure.

During ultrasonographic examinations, the does were restrained by one person in standing position and the rectum was evacuated by using lubricated gloved fingers of the operator. The probe was protected by a latex glove and was lubricated with coupling gel. Middle uterine artery was identified trans-rectally, lateral and cranial to urinary bladder, very near to external iliac artery. To achieve this, probe was directed to dorsal aspect of rectum, towards abdominal aorta; a further 90^{o} rotation to either side identified the middle uterine arteries on both sides (Elmetwally, 2012). By focussing the Doppler gate over the middle uterine artery, pulse wave function was activated to obtain wave forms, which were recorded. While tracing the wave forms manually, with the help of velocity trace option mode, measurements were obtained automatically. Mean of the three waves in a single waveform was taken as measurement.

Torsion was relieved either by rolling the doe or by caesarean section, according to the situation warranted. The data obtained were tabulated and analysed statistically (Snedecor and Cochran, 1994).

Results and discussion

Mean recorded pulsatility index (PI) and resistive index (RI) of the animals under study, before and after foetal extraction/kidding are presented in the table.

The PI and RI were highest in the middle uterine artery, ipsi-lateral to the side of torsion, among Group A animals (1.73 ± 0.15 and 0.77 ± 0.03, respectively) than contra-lateral (0.99 ± 0.04 and 0.56 ± 0.03, respectively) and normal does (0.71 ± 0.02 and 0.47 ± 0.02, respectively); the value was lowest in normal does. There existed highly significant difference in mean PI and RI ($p<0.01$) between

Table 1. Pulsatility index and Resistive index (Mean ± SE) before and after foetal extraction/kidding in torsion-affected and normal kidding does

Animal group (n=10)	Pulsatility index		p-value
	Before foetal extraction/ kidding	One hour after foetal extraction/ kidding	
Group A (Ipsi-lateral middle uterine artery)	1.73 ± 0.15^{a}	1.21 ± 0.09	0.002^{**}
Group A(Contra-lateral middle uterine artery)	0.99 ± 0.04^{b}	1.06 ± 0.03	$<0.001^{**}$
Group B (control)	0.71 ± 0.02^{c}	1.08 ± 0.04	$<0.001^{**}$
p-Value	0.001^{**}	0.200^{ns}	
	Resistive index		
Group A(Ipsi-lateral middle uterine artery)	0.77 ± 0.03^{a}	0.64 ± 0.03	0.184^{ns}
Group A(Contra-lateral middle uterine artery)	0.56 ± 0.03^{b}	0.59 ± 0.01	0.001^{**}
Group B (control)	0.47 ± 0.02^{c}	0.61 ± 0.02	$<0.001^{**}$
p-Value	0.001^{**}	0.360^{ns}	

Mean ± S.E. bearing small letter a, b, c as superscript differ significantly within a column

*** Significant at 1% level ($p \leq 0.01$); ns – non significant*

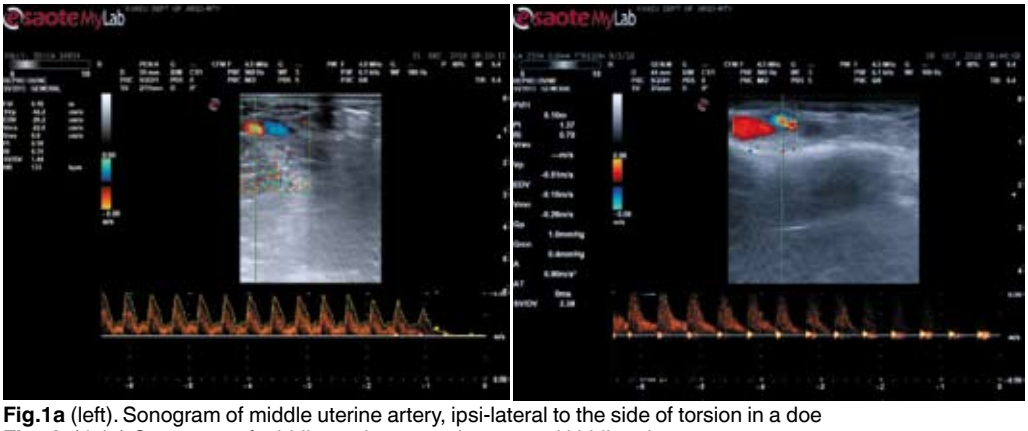

Fig.1a (left). Sonogram of middle uterine artery, ipsi-lateral to the side of torsion in a doe
Fig.1b (right).Sonogram of middle uterine artery in a normal kidding doe

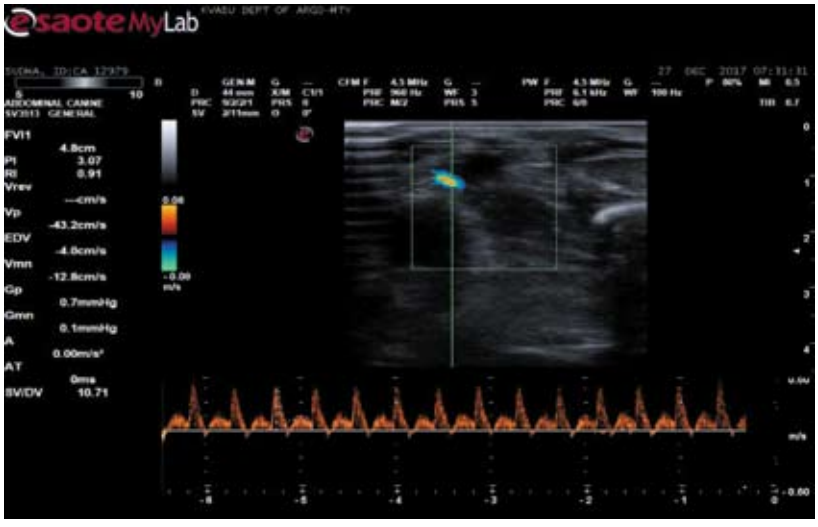

Fig.2. Sonogram of middle uterine artery, ipsilateral to the side of torsion in a higher degree uterine torsion, presented beyond 48 h.

ipsi-lateral and contra-lateral uterine arteries of affected does as well as with mean PI and RI of normal does. One hour after foetal extraction/ kidding, there existed no significant difference ($p>0.05$) between these values. Higher PI and RI values in the affected does might be due to poor vascular perfusion through the constricted blood vessel, which is in agreement with the findings of Hussein (2013), among torsion affected buffaloes.

One hour after foetal extraction, highly significant ($p<0.01$) reduction in PI and a non-significant reduction in RI was noticed in ipsi-lateral artery of torsion affected does. No such study among torsion affected does are reported earlier, though Devender *et al*. (2018) reported significant increase in blood flow volume of ipsi-lateral middle uterine artery, after detorsion in buffaloes, which was attributed to removal of vascular compression. Similar to the present observation, Singh *et al*. (2016a) also failed to observe any difference in resistive index among buffaloes, even with changes in the blood flow volume during peri-partum period. Dickey (1997) opined that pulsatility index would be a better choice than resistive index, to study the haemodynamic properties among torsion affected animals.

One hour after foetal extraction/ kidding, highly significant increase ($p<0.01$) in PI and RI was noticed in contra-lateral uterine artery and in normal does. Elmetwally and Bollwein (2017) and Singh *et al*. (2016a) recorded an increase in PI following normal

delivery, among does and buffaloes, respectively. Krueger *et al.* (2009) reported that considerable vasoconstriction of the caruncular blood vessels occurring in the immediate post-delivery period might be the reason for increased PI noticed after normal delivery. Screening of the literature failed to identify any study regarding resistive index among torsion affected does. Batista *et al*. (2013) stated that following whelping, RI increases in canine, which was attributed to regression of the uterus and subsequent decreased perfusion to the organ.

In all the torsion cases studied, cardiac wave pattern showed high systolic flow and absence of diastolic flow (Fig.1a), different from that recorded in normal pregnancy (Fig.1b). Presence of diastolic notch in two higher degree, delayed cases of uterine torsion might be an indication of very high blood flow resistance to uterus (Fig.2). Singh *et al.* (2016b) opined that hindrance in blood flow through the vessel was responsible for the presence of pre-diastolic notch in the ipsi-lateral middle uterine artery among torsion affected cattle.

Doppler ultrasound evaluation of uterine blood flow in torsion affected does was found to be helpful in diagnosis of the condition. Velocimetric indices could be useful to differentiate the side of torsion also.

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