



Studies on the Types and Prognostic Approaches for Uterine Torsion among Cattle

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ABSTRACT

In the present study 20 cases of uterine torsion in cows presented to the TVCC of the department were evaluated for type, direction and degree of torsion as well as for liver and kidney function tests to determine prognosis. Of the total, 65% cases were of pre-cervical type and 35% post-cervical. In 75% cases direction of torsion was to the right side than to the left (25%). Forty per cent cases were of 180-360° than 90-180° (25%) and few were of $\leq 90^\circ$ (20%) and $> 360^\circ$ (15%). Ninety five per cent cases were reported at full term pregnancy. Out of all 65% cases could be delivered per-vaginum while 35% needed laparohysterotomy. The values of plasma GOT/AST at the time of presentation of case, 1-hr and 24-hr following delivery and in control group on delivery were 150.68 ± 3.03 , 119.46 ± 1.27 , 89.33 ± 1.23 and 69.96 ± 1.00 U/L, respectively. The corresponding values of plasma GPT/ALT were 112.90 ± 3.95 , 85.18 ± 0.96 , 62.44 ± 1.72 and 39.35 ± 1.20 U/L. The values of plasma bilirubin for the corresponding stages/groups were 1.68 ± 0.07 , 1.13 ± 0.03 , 0.75 ± 0.03 and 0.34 ± 0.02 mg/dl, respectively. The value of plasma creatinine at the time of presentation, and 1-hr and 24-hr following delivery and in control group were 2.03 ± 0.06 , 1.51 ± 0.04 , 0.80 ± 0.02 and 0.40 ± 0.02 mg/dl, while the values of BUN were 56.61 ± 1.44 , 35.71 ± 0.37 , 29.04 ± 0.27 and 17.56 ± 0.70 mg/dl, respectively.

Keywords: Cattle, uterine torsion, type, liver and kidney function tests.

Uterine torsion is the twisting of gravid uterus on its longitudinal axis that may also involve a portion of anterior vagina (post-cervical torsion). It has been pointed out as the major cause of dystocia among dairy cattle (Aubry *et al.* 2008). Together with some other species like mares (Ravi *et al.* 2013), reproductive disorders have become area of concern in domestic species too also in past few years major efforts to enhance productive performance in domestic animals have led to slight ignorance towards reproductive performance (Jamuna *et al.* 2013), while some of these are shown to contribute significantly in bovine morbidity and mortality (Uttam *et al.* 2015), uterine torsion is among those reproductive disorders revealing deadly outcomes if not attended timely. It develops toxemia, severely damages liver and kidney (Jeenger *et al.* 2015a) and even may prove fatal, also deteriorates subsequent fertility (Ghuman 2010).

A lot work has been done over the hepatic and renal damage due to torsion among buffaloes (Jeenger *et al.*

2015a) but a lot more research is lacking on the extent and duration of hepatic and renal damage among cattle. So, keeping in view the deadly outcomes a lot more research work is required to evaluate prognosis of torsion affected cattle based on extent of hepatic and renal damage together with duration to have recovery so that appropriate therapeutic regime may be applied including supportive therapy. Hence, the present study was planned to evaluate the type, direction and degree of uterine torsion in cows together with prognostic tools in the form of hepatic and renal function tests to predict the future outcome.

MATERIALS AND METHODS

The study was undertaken on 20 cows presented with torsion of uterus to the TVCC of the College at Bikaner during the months from July 2014 to December 2014. Detailed history was taken together with gynaeco-clinical examination of all the 20 animals, and the observations recorded. Animals were given rolls based on degree and



duration of torsion and in case of failure of detorsion or cervical dilation, laparohysterotomy was performed. Out of all 65% animals could be delivered per-vaginum while 35% needed laparohysterotomy.

Type of uterine torsion

The type of uterine torsion was recorded by per-vaginal and per-rectal examination for location of torsion (pre-cervical or post-cervical), direction of torsion (clockwise or anti-clockwise), degree of torsion ($\leq 90^\circ$, $90-180^\circ$, $180^\circ-360^\circ$ and $>360^\circ$). The stage of gestation was ascertained by history and examination of the signs approaching parturition including relaxation of sacro-sciatic ligaments and udder development or reversion of these signs after initiation due to delay in presentation. The classification was done as pre-term (below 270 days) and full term (280 ± 9 days).

Prognostic tests

Blood samples in EDTA vials were collected from cows with uterine torsion ($n=20$) at the time of presentation, and at 1-hr and 24-hr after fetal delivery. Blood samples were also collected from normal parturient cows ($n=10$) immediately after parturition. Plasma was separated out by centrifugation and stored at -20°C till further assay.

The levels of GOT/AST, GPT/ALT and total bilirubin as liver function tests, and creatinine and blood urea nitrogen (BUN) as kidney function tests were estimated in the plasma samples from torsion affected cows and normal parturient cows by using standard procedures and ready to use available kits of Accurex Biomedical Pvt. Ltd (for GOT, GPT and Total bilirubin), Precision Biotech, India (for Creatinine) and Labcare, India (for BUN) on a biochemistry analyzer.

Statistical analysis

The data were analyzed using conventional analysis of variance and critical difference test (Snedecor and Cochran, 1989).

RESULTS AND DISCUSSION

The findings on type, direction and degree of uterine torsion are presented in Table 1.

Type, Direction and Degree of Uterine Torsion

In the present study, the incidence of pre-cervical torsion (65%) was found to be higher than that of post-cervical (35%) ones in cows (Table 1), and corroborated with the earlier observations of Purohit *et al.* (2011). Although some authors have reported equal frequency of pre and post-cervical torsions (Singh *et al.* 1992) while in others view pre-cervical torsion predominantly occurs in cows than buffaloes (Kolla *et al.* 1999; Noakes *et al.* 2009) especially during the last trimester (Frazer *et al.* 1996). Probably post-cervical torsions are easy to diagnose at field level by local practitioners thus these are resolved easily, while pre-cervical torsions are mostly confused with cervical non-dilation that lead to increased incidence of pre-cervical torsions among the total cases of torsions referred to the departmental clinic.

Further the incidences of right sided uterine torsion (75%) was found to be higher than to the left side (25%) in cows under study, as has been documented in buffaloes by Srinivas *et al.* (2007) and Jeenger *et al.* (2015b). Right ovary being more active (Roberts, 1986) most of the pregnancies occur to the right side of cornua, so there are always greater chances of gravid cornua getting twisted to its side. Also the location of rumen on the left side prevents rotation of the uterus to the left side and absence of a muscular fold on right broad ligament increases the possibility toward right side torsion (Singh 1991).

In the present study, 20, 25, 40 and 15 per cent of the affected cows evinced uterine torsion of $<90^\circ$, $90-180^\circ$, $180-360^\circ$ and $>360^\circ$, respectively (Table 1). Minor torsions (45 to 90°) may be detected during routine pregnancy diagnosis, and probably undergo spontaneous correction (Roberts, 1986) and if degree of torsion is greater than 45° it may result in dystocia (Sloss and Dufty, 1980). During the present study 8/20 (40%) animals evidenced uterine torsion of $180^\circ-360^\circ$, which is in accordance with the reports of Aubry *et al.* (2008) and Pascal *et al.* (2008). Torsions of less than 180° are generally managed in the field and account for only 6 to 15% of referral cases (Sloss and Dufty 1980; Manning *et al.* 1982). Interestingly, in one referral population, 66% torsions were of 360° (Williams, 1948). Proportion of above 360° torsion (15%) was less than other degrees in our study, as has been reported previously (Aubry *et al.* 2008; Jeenger *et*

al. 2015b). Torsions of around 45° do not usually create much difficulty as these get corrected while applying careful traction on to the fetus or may be corrected by rotating approachable fetus, while torsions of around 90° are corrected by giving sudden roll without plank if case is presented without much delay and adhesions are not formed. Torsions with degree 180 to 360 or >360° need rolling with plank carefully as this process pushes animal in severe stress and creates much injuries in and around cornua resulting in reproductive failure during later stages.

Most animals (95%) in the present study were at full term pregnancy. Manning *et al.* (1982) and Jeenger *et al.* (2015b) also opined that in most cases uterine torsion occurs during the first or second stage of parturition. However uterine torsion may occasionally be diagnosed at 5 to 8 months of gestation (Roberts 1986; Ruegg 1988) during routine pregnancy diagnosis without revealing any kind of symptoms by the animal, but as the pregnancy advances fetal fluid becomes less in comparison to the fetal size, also fetal weight and movements increase at this stage of pregnancy, thus chances of gravid cornua getting twisted increases. Also at this stage gravid cornua becomes highly unstable and with any kind of sudden movement it undergoes twisting.

Table 1: Incidence of type (form), direction, degree and stage of gestation of uterine torsion in cattle

Parameters	n (%)
Location of torsion	
Pre-cervical	13/20 (65%)
Post-cervical	7/20 (35%)
Direction of uterine torsion	
Right side (clockwise)	15/20 (75%)
Left side (counter clockwise)	5/20 (25%)
Degree of torsion	
≤90°	4/20 (20%)
90°-180°	5/20 (25%)
180°-360°	8/20 (40%)
> 360°	3/20 (15%)
Stage of gestation	
Pre term	1/20 (5%)
Full term	19/20 (95%)

Prognostic Tests

The plasma profile of GOT, GPT, Bilirubin, Creatinine and BUN estimated as liver and kidney function tests in uterine torsion affected and healthy parturient cows as prognostic markers are presented in Table 2.

Following uterine torsion, the serum or plasma activities of glutamic oxalacetic transaminase (GOT), glutamic pyruvic transaminase (GPT), bilirubin, creatinine and blood urea nitrogen (BUN) get enhanced significantly and may take around 10 days to get back to normal following successful management of uterine torsion (Schönfelder *et al.* 2007). GOT, GPT and Billirubin are effective prognostic tools (Jeenger *et al.* 2015a) to depict health and recovery status of the animal.

In the present study, GOT level was elevated at the time of presentation of uterine torsion affected cows (150.68 ± 3.03 U/L) compared to normal parturient cows (69.96 ± 1.00 U/L). Similar observations have been documented by Amin *et al.* (2011) and Jeenger *et al.* (2015a). Following uterine torsion, in an attempt to deliver fetus animal undergoes severe muscle exhaustion produced by strong abdominal contractions leading to severe cellular damage and necrosis of uterine cells resulting in leakage of these enzymes, thereby enhancing GOT levels in plasma/serum (Hussein and Abd Ellah, 2008; Jeenger *et al.* 2015a). This increased GOT level decreased by 1-hr and 24-hr subsequent to fetal delivery (119.46 ± 1.27 and 89.33 ± 1.23 U/L, respectively) as has been reported in other studies also (Singla *et al.* 1992; Amer *et al.* 2008). In previous study on buffaloes (Jeenger *et al.* 2015a) these values reached near to the control group after 24-hr, but in present study even after 24-hr these values were significantly higher to that of the control group, thus perhaps animals included in the present study were under more severe stress and hepatic damage thus needing more time for recovery. Also probably the impact of torsion is much severe among cattle than buffaloes thereby needing more time for recovery. Endotoxins liberated due to muscle damage affect liver badly thus animal undergoes poor prognosis (Farrag *et al.* 1984).

The GPT level was significantly higher at the time of presentation of uterine torsion affected cows (112.90 ± 3.95 U/L) to that of normal parturient cows (39.35 ± 1.20 U/L) and corroborated with the observations of Jeenger *et al.* (2015a). Uterine hypoxia and increased release of

Table 2: Mean values of liver and renal function parameters in the plasma of torsion affected and normal parturient-control- cows (Mean \pm SE)

Parameters	Normal parturient cows (n=10)	Torsion affected cows (n=20)		
		At presentation	1-hr after fetal delivery	24-hr after fetal delivery
Liver function tests				
GOT (U/L)	69.96 \pm 1.00 ^a	150.68 \pm 3.03 ^d	119.46 \pm 1.27 ^c	89.33 \pm 1.23 ^b
GPT (U/L)	39.35 \pm 1.20 ^a	112.90 \pm 3.95 ^d	85.18 \pm 0.96 ^c	62.44 \pm 1.72 ^b
Bilirubin (mg/dl)	0.34 \pm 0.02 ^a	1.68 \pm 0.07 ^d	1.13 \pm 0.03 ^c	0.75 \pm 0.03 ^b
Renal function tests				
Creatinine (mg/dl)	0.40 \pm 0.02 ^a	2.03 \pm 0.06 ^d	1.51 \pm 0.04 ^c	0.80 \pm 0.02 ^b
BUN (mg/dl)	17.56 \pm 0.70 ^a	56.61 \pm 1.44 ^d	35.71 \pm 0.37 ^c	29.04 \pm 0.27 ^b

Mean values within the row with different superscripts differ significantly ($P < 0.01$).

catecholamines from the adrenal medulla associated with uterine torsion and its stress could be responsible for the significantly higher levels of GPT, noticed in torsion affected cows as compared to normal parturient cows. This is also encountered in other stressful conditions causing the release of catecholamines from adrenal medulla (Altland and Highman, 1961) and tissue hypoxia which have been demonstrated to be responsible for increased circulating level of GPT by increasing the permeability of cell membrane (Highman and Altland, 1960). GPT values decreased significantly by 1-hr and 24-hr of fetal delivery (85.15 \pm 0.96 and 62.44 \pm 1.72 U/L), but were still significantly higher from control group (39.35 \pm 1.20 U/L), the probable reason may be that the cases of torsion referred to clinics were of extreme nature either due to delay in presentation to clinics or previous handling by local practitioners leading to long term ill-effects over hepatic functions that may take 7-10 days to get stabilized (Schonfelder *et al.* 2007).

The value of total bilirubin in uterine torsion affected cows (1.68 \pm 0.07 mg/dl) was significantly higher to that of the normal parturient cows (0.34 \pm 0.02 mg/dl). Bilirubin level decreased significantly by 1-hr and 24-hr after fetal delivery (1.13 \pm 0.03 mg/dl and 0.75 \pm 0.03 mg/dl, respectively) however, these values were still significantly higher ($p < 0.01$) than the values of total bilirubin in normal parturient cows. The present finding signifies the extreme nature of stress leading to long term hepatic dysfunction caused by torsion in cows thus recovery taking 7-10 days (Schonfelder *et al.* 2007).

Increased concentrations of creatinine in uterine torsion affected cows (2.03 \pm 0.06 mg/dl) compared to normal parturient cows (0.40 \pm 0.02 mg/dl) were observed. Creatinine subsequently decreased 1 hr and 24 hr after fetal delivery (1.51 \pm 0.04 mg/dl and 0.80 \pm 0.02 mg/dl respectively) but values after 24 hr of delivery were still significantly higher than the control group (Hussein and Abd Ellah, 2008). Stress conditions resulting in reduced blood flow to the kidneys and reproductive tract together with nephropathy due to toxic substances liberated from the dead fetus in some cases leading to higher levels of plasma creatinine (Arthur *et al.* 1989).

Significantly increased concentrations of blood urea nitrogen (BUN) seen in the present study in the uterine torsion affected cows (56.61 \pm 1.44 mg/dl) compared to that of the normal parturient cows (17.56 \pm 0.70 mg/dl) probably suggested severe dehydration and stress concomitantly reducing the blood flow to kidneys that together with toxin liberation from dead fetus result in nephropathy (Payne, 1987). This value decreased 24-hr after fetal delivery (29.04 \pm 0.27 mg/dl) as was noted by Singh *et al.* (2009) and Jeenger *et al.* (2015a). In previous studies the value of BUN 24-hrs following delivery was near to control group, but perhaps in present study animals were so severely affected that values were still significantly higher to that of the control group.

Thus attributing to the higher values of creatinine and BUN management of animal should always be directed toward normalization of kidney functions by giving ample fluid therapy together with steroids wherever required.

Probably gluconeogenesis under effect of increased cortisol level may also be responsible for increased level of creatinine and BUN (Payne 1987).

Present study depicted the severity of hepatic and renal damages following uterine torsion in cows. It was also observed that 24 hrs period was not sufficient for these values to get back to normal as reported by some previous studies in cattle and buffaloes. So supportive therapy in the form of ample fluid, corticosteroid, hepatobiliary drugs should be provided till recovery, based on liver and kidney function tests.

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