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Studies on the prognostic test for uterine torsion in Surti buffaloes (*Bubalus bubalis*)

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Abstract
Fifty-five female buffaloes suffering from uterine torsion were presented to the clinic of Veterinary Gynaecology and Obstetrics, CVAS, Navania, Udaipur, Rajasthan for treatment. Three times blood samples were obtained from 55 buffaloes with uterine torsion (at the time of presentation of the animal, 1 h and 24 h after fetal delivery) and 10 healthy buffaloes to investigate the relationship between concentrations of aspartate amino transferase (AST), alanine aminotransferase (ALT), Bilirubin, serum creatinine and blood urea nitrogen (BUN). The aim of this study was to investigate related alterations in these blood constituents. There were significant (p<0.01) increases in AST, ALT, Bilirubin, serum creatinine and BUN in the affected buffaloes, possibly due to high uterine tissue damage. It may be inferred that torsion may lead to imbalance in biochemical profiles that affect the proper functioning of the uterine musculature. Buffaloes subjected to uterine torsion are associated with hepatic and renal dysfunction. In conclusion, concentration of above parameters can be used as a prognostic indicator for the occurrence of uterine torsion in buffaloes.

Keywords: AST, ALT, bilirubin, creatinine, BUN

Introduction
Uterine torsion is the rotation of a pregnant uterus on its longitudinal axis which leads to narrowing of the birth canal, causing dystocia (Bai *et al*., 2016) [5]. Uterine torsion is major cause of bovine dystocia (Jeengar *et al*., 2015b) [17] and may result in serious outcomes if delayed as in previous studies also reproductive disorders are found to a major contributing factor in bovine morbidity and mortality (Uttam *et al*., 2015) [36]. Handling of uterine torsion cases earlier as possible, it develops toxemia, severely damages liver and kidney (Jeenger *et al*., 2015a) [16] and even affect subsequent fertility of animals (Ghuman, 2010) [11]. Due to uterine torsion in buffalo damage of liver and renal failure also reported in researches (Jeenger *et al*., 2015a) [16]. When physical examination fails to yield a diagnosis or prognosis in difficult cases, blood analysis may help to identify the problem. Biochemical parameters can exclude some diseases, and if there are abnormalities, they might aid in establishing a prognosis and developing a therapeutic plan (Amer *et al.*, 2008;Hussein and Abd Ellah, 2008;Amin *et al.*, 2011) [2, 15, 3]. In the present study is required to evaluate prognosis of torsion affected buffalo based on level of hepatic and renal damage collectively with duration to have recovery so that appropriate therapeutic regime may be applied. Hence, the present study was planned to evaluate prognostic tools in the form of hepatic and renal function tests to predict the future outcome.

Materials and Methods
Animals and Clinical examination
The present investigation was conducted on 55 buffaloes presented with uterine torsion at Clinics of Veterinary Gynaecology and Obstetrics, CVAS, Navania (Udaipur) with a history of dystocia or due to a general medical problem like colic, straining or reduced food intake. Clinical examination included per-vaginal followed by per rectal examination of buffaloes to determine the torsion. Ten normal parturient buffaloes presented at the Clinic of Veterinary Gynaecology and Obstetrics, CVAS, Navania (Udaipur) were included as control.

Blood analysis

Blood was collected in sterile test tubes from buffaloes with uterine torsion (n=55) at the time of presentation and 1 hr and 24 hr after fetal delivery. Serum was separated and stored at -20 °C till further assay. Blood was also collected from normal parturient buffaloes (n=10) immediately after parturition and separated. The liver function tests (AST, ALT, Serum total bilirubin) and Renal function test (creatinine, blood urea nitrogen) were performed on the serum samples. For serum processing IDEXX Vet Test Chemistry Analyser (IDEXX Laboratories) was used.

Statistical analysis

Data were collected, arranged, summarized and then statistically analyzed. Analysis included mean values, standard error and analysis of variance (ANOVA) using F-test (Snedecor and Cocharan, 1994) [33].

Results and Discussion

The evaluation of liver and renal function tests performed on blood collected from buffaloes with uterine torsion (n=55) and normal parturient buffaloes (n=10) are presented in the table no.1. The liver and kidney function parameters were significantly higher than the normal buffaloes and they gradually decreased and were found to be normal after detorsion and fetal delivery.

Normal parturition in bovines has insignificant influence on the plasma enzymes (Schönfelder *et al.*, 2007; Hussein and Abd Ellah, 2008) [30, 15] however, following uterine torsion and after its correction by detorsion or surgical treatment, the activities of aspartate aminotransferase (AST), alanine aminotransferase (ALT), total bilirubin, serum creatinine and blood urea nitrogen (BUN) are significantly increased and usually gets stabilized within 10 days after treatment of uterine torsion (Schönfelder *et al.*, 2007) [30].

AST, ALT and Billirubin were recommended as part of a metabolic profile test to monitor the health status of the liver (Mullen, 1976; Bouda *et al.*, 1980; Lotthammer, 1982; Pearson, 1990) [22, 7, 19, 27]. In the present study, AST level was elevated at the time of presentation of uterine torsion affected buffaloes (88.86±1.60 U/L) compared to normal parturient buffaloes (62.42±0.45 U/L). Similar elevated level of AST was also seen in previous findings in uterine torsion cases (Mahmoud *et al.*, 2014; Jeengar *et al*, 2015b; Tripathi and Mehta 2016; Murakami *et al.*, 2017) [20, 17, 35, 23]. Significant increases in AST activities may be attributed to muscle exhaustion produced by strong abdominal contractions due to uterine torsion (Hussein and Abdh Ellah, 2008) [15] and are often a reflection of cellular destruction or diseases (Oliveira *et al.*, 1998; Hoeben *et al.*, 2000) [24, 14]. Great muscular effort or damage results in leakage of such enzymes due to necrosis or damage of uterine cells (Coles, 1986; Malik, 1986; Kraft and Dürr, 2005) [8, 21, 18]. AST level decreased 24 hr after fetal delivery (78.89±0.27 U/L). Similar findings were seen in previous studies (Amer *et al.*, 2008; Jeengar *et al*, 2015b; Tripathi and Mehta, 2016) [2, 17, 35]. It was indicated that uterine torsion affects the liver of the animal due to endotoxins resulting from muscle damage (Farrage *et al.*, 1984) [10].

Table 1: Mean values of Liver and Renal function parameters in the serum of torsion affected and normal parturient buffaloes (Mean ± S. E.)

Parameters		Normal parturient buffaloes (Control) (n=10)	Torsion affected buffaloes (n=55)		
			At presentation	1 hr after fetal delivery	24 hr after fetal delivery
Liver function test	AST (U/L)	62.42±0.45^{a}	88.86±1.60^{d}	81.87±0.28^{c}	78.89±0.27^{b}
	ALT (U/L)	34.54±0.43^{a}	47.65±0.54^{d}	44.18±0.51^{c}	39.09±0.54^{b}
	Bilirubin (mg/dl)	0.91±0.01^{a}	1.80±0.03^{d}	1.45±0.03^{c}	1.09±0.03^{b}
Renal function test	Creatinine (mg/dl)	0.97±0.03^{a}	2.74±0.02^{d}	1.62±0.02^{c}	1.51±0.02^{b}
	BUN (mg/dl)	17.82±0.34^{a}	28.23±0.21^{c}	25.40 ±0.24^{b}	22.03±0.20^{b}

Mean values within the same row with different superscriptions are significantly different (p<0.01)

In the present study, ALT level was elevated at the time of presentation of uterine torsion affected buffaloes (47.65±0.54 U/L) compared to normal parturient buffaloes (34.54±0.43 U/L). Similar elevated level of ALT was also seen in previous findings in uterine torsion cases (Bostedt, 1973; Singla *et al.*, 1992) [6, 32]. Uterine hypoxia and increased release of catecholamines from the adrenal medulla associated with uterine torsion and its stress could be responsible for the significantly higher levels of ALT, noticed in torsion affected buffaloes as compared to normal parturient buffaloes. This is also encountered in other stressful conditions causing the release of catecholamines from adrenal medulla (Altland and Highman, 1961) [1] and tissue hypoxia which have been demonstrated to be responsible for increased circulating level of ALT by increasing the permeability of cell membrane (Highman *et al.*, 1959; Highman and Altland, 1960) [13, 12]. ALT values decreased subsequently and reached to normal after 24 hr of fetal delivery (39.09±0.54 U/L) which supports the previous findings (Jeengar *et al*, 2015b; Tripathi and Mehta 2016) [17, 35].

The consequences of the present study showed that there were higher concentration of total serum billirubin in uterine torsion affected buffaloes (1.80±0.03 mg/dl) compared to normal parturient buffaloes (0.91±0.01 mg/dl). The possible causes may be attributed to stress on animals which influenced the concentration of bilirubin in serum. Bilirubin level decreased subsequently in serum and reached nearly normal values after 24 hr of fetal delivery (1.09±0.03 mg/dl). Similar conclusion were seen in previous studies (Jeengar *et al.*, 2015b; Tripathi and Mehta, 2016) [17, 35].

The increased concentrations of serum creatinine in uterine torsion affected buffaloes (2.74±0.02 mg/dl) compared to normal parturient buffaloes (0.97±0.03 mg/dl). Serum creatinine subsequently decreased after fetal delivery and reached to near normal level after 24 hr of fetal delivery (1.51±0.02 mg/dl). The present result supports the previous findings (Amer *et al.*, 2008; Singh *et al.*, 2009; Swelum *et al.*, 2012; Purohit *et al.*, 2013; Mahmoud *et al.*, 2014; Jeengar *et al*, 2015b; Tripathi and Mehta 2016) [2, 31, 34, 29, 20, 17, 35]. The increased levels of serum creatinine could be related to stress conditions exerted on the affected buffaloes with concomitantly reduced blood flow to the kidneys and

reproductive tract. At the same time, these results might be attributed to nephropathy resulting from toxic substances liberated from the dead fetus in some cases of uterine torsion (Arthur *et al.*, 1989) [4].

The results of studies, Increased concentrations of blood urea nitrogen (BUN) in uterine torsion affected buffaloes (28.23±0.21 mg/dl) compared to normal parturient buffaloes (17.82±0.34 mg/dl) were recorded during the present study which decreased 24 hr after fetal delivery (22.03±0.20 mg/dl) similar findings have been previously recorded in cattle and buffaloes (Deosi and Dhaliwal, 2004; Schönfelder *et al.*, 2007; Purohit *et al.*, 2013; Mahmoud *et al.*, 2014) [9, 30, 29, 20]. The increased levels of BUN, in uterine torsion affected buffaloes, could be related to dehydration status, stress condition exerted on the affected buffaloes with concomitantly reduced blood flow to kidneys, and nephropathy resulted from toxic substances liberated from dead fetuses (Payne, 1987) [26]. In addition, it has been recorded that an elevation of BUN and creatinine might be due to concomitant breakdown of tissues during gluconeogenesis under effect of increased cortisol level (Payne, 1987) [26].

Conclusion

Uterine torsion in buffalo can cause serious outcomes. It seems that uterine torsion buffaloes are associated with hepatic and renal dysfunction. The level of AST, ALT, Bilirubin, Serum Creatinine and BUN can be used as an indicator for occurrence and prognosis of mechanical handling of uterine torsion in buffaloes.

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