Review Article

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UTERINE TORSION IN BUFFALOES - A COMPLETE REVIEW

Rishipal Yadav[1,*], Pooja Yadav[2] and Gyan Singh[3]

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ABSTRACT

Uterine torsion is a common obstetrical emergency in buffaloes. It is termed as the rotation of uterus around its longitudinal axis. The incidence of uterine torsion is very common in buffaloes in the advance stage of gestation. Parturition is the most important event in the lifetime of buffalo. Uterine torsion results in unsuccessful parturition which might be associated with the death of fetus in the late gestation. This review discusses about the definition, types, incidence, etiology, hematological changes, biochemical changes, treatment, and management of uterine torsion.

Keywords: *Bubalus bubalis*, buffaloes, uterine, torsion, biochemical

INTRODUCTION

Torsion is rotation of gravid uterus on its axis, and it is the common cause of dystocia in all species of domestic animals. Uterine torsion occurs more frequently in some species than others due to differences in the uterine muscle strengths, the location and distribution of the various ligaments that support the uterus, and the different mesenteric suspension in various species (Noakes *et al*., 2019). When compared to cattle, uterine torsion is thought to be a more prevalent maternal cause of dystocia in buffaloes (Purohit *et al*., 2012b). Pre-cervical uterine torsion is defined as the uterus rotating on its long axis cranial to the anterior cervix, and post-cervical uterine torsion is defined as the uterus rotating between the cervix and vagina (Purohit *et al*., 2011a, 2011b). In buffaloes, post cervical uterine torsion is more frequent than pre-cervical uterine torsion (Purohit and Gaur, 2014). Between 53 to 83% of buffaloes brought to referral clinics were found to have uterine torsion (Malhotra, 1990; Singh, 1991; Purohit and Mehta, 2006; Srinivas *et al*., 2007; Purohit *et al*., 2011a; Purohit *et al*., 2012b). This higher prevalence may be explained by longer broad ligaments and lack of muscle tone in them (Ghosh *et al*., 2013). Siddiquee

[1]Department of Veterinary Gynaecology and Obstetrics, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, India, *E-mail: drishiyadav.96666@gmail.com
[2]Department of Veterinary Surgery and Radiology, and Department of Veterinary Clinical Complex, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, India
[3]Department of Veterinary Clinical Complex, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, India

and Mehta (1992) reported a rare case of torsion in buffalo carrying twin fetuses. Uterine torsion must be considered as an emergency because it ensures fetal death rapidly followed by the development of uterine adhesions with visceral organs (Purohit and Gaur, 2014).

Incidence of uterine torsion

Reported cases of uterine torsion are mostly from asian countries (Yadav *et al*., 2021; Ahmed *et al*., 1980) and Egypt (El-Naggar, 1978). Manju (1984) found that overall incidence of uterine torsion over the last 12 years at Veterinary Clinics, H.A.U., Hisar was found to be 43.44%, also maximum cases observed during the months of July to October. Post cervical uterine torsion occurred in 92.86% of the total cases. Malik (1987) found that uterine torsion constitutes 6.8% of the total reproductive disorders in buffaloes brought to reffered clinics. Kumar (1991) reported that incidence of post-cervical uterine torsion was 89.88% in buffaloes. According to Jeengar and colleagues' research (2015a), uterine torsion in buffaloes mainly affected pluriparous buffaloes (56%) and occurred at full term (72%), in a clockwise direction (92%) and in the postcervical region (80%). Most of it was 180^{o} (48%) with 360^{o} (32%) and >360^{o} (20%) following. Higher incidence has been shown in pleuriparous buffaloes (Sharma *et al*., 1995; Matharu and Prabhakar, 2001; Amin *et al*., 2011) with maximum number of cases during second and third calvings (Nanda *et al*., 1991; Murty *et al*., 1999). According to Ali *et al*., 2011, uterine torsion in buffaloes (126) occurred in multiparous (81.7%), primiparous (18.3%), late in pregnancy (58.4%), and at full term (41.6%), clockwise (96%) and anticlockwise (4%), post-cervical (98.4%), and pre-cervical (1.6%), and was of high (>270) (52.3%), moderate (180 to 270) (31%), and mild (180) (16.7%). The reasons for more incidences in pleuriparous buffaloes may include larger abdominal cavity, stretching of pelvic ligaments, loose and long broad ligaments together with loosening of uterine tissue and decreased uterine tone in aged bovines (Roberts, 1986; Drost, 2007; Aubry *et al*., 2008). However, an exception to this, Mahmoud, and co-workers (2020) reported that the incidence of torsion was mostly at first parity that accounting for 50% of cases and torsion mostly occurred at full term. Right-sided torsion i.e., clockwise was there in 90% of reported cases of uterine torsion. Yadav and co-workers (2021) reported that the highest incidence was observed in buffaloes in first parity (39.53%) followed by second (30.23%) and third parity (17.83%). The long duration of time taking place in complete cervical dilatation in first parity might be reason behind this. Prasad and co-workers (2000) concluded that out of 109 cases of dystocia, 62 (56.88%) were due to uterine torsion and 87.09% towards the right side (clockwise) and 12.90% towards the left side (anti-clockwise). Severity of the torsion was maximum at 180^{o} , which was recorded in 64.53% of the cases, followed by 270^{o}, 90^{o} and 360^{o} with 20.96, 8.06 and 6.45% cases, respectively. Srinivas and co-workers (2007) reported that out of the 142 cases of documented maternal dystocia, uterine torsions accounted for 83.33% of cases, and among these, right-sided post cervical uterine torsions at term were frequent in pluriparous buffaloes Hussein (2013) found that uterine torsion on the right side was present in 97.3% of instances, and post-cervical uterine torsion was observed in 94.6% of those cases. The degrees of uterine torsion were light and high in 24.3% and 75.7% of those cases, respectively.

A large variability in the mortalities of dam and fetus has been reported in cows and buffaloes with uterine torsion. The determinants of the outcome might be the factors such as duration of the condition and severity of the torsion. (Frazer *et al*., 1996; Amer *et al*., 2008; Amin *et al*., 2011; Ali *et al*., 2011). Results of Ali *et al*. (2011), Jeengar *et al*. (2015a); Prasad *et al*. (2000); Mahmoud *et al*. (2020) revealed that clockwise uterine torsion is seen more frequently than anti-clockwise in buffaloes. The frequency of the uterus to rotate counterclockwise was greater in cows than in buffaloes (Noakes *et al*., 2019), this may be because cow foetuses are quite small, which allows the uterus to slip under the rumen with ease (Ali *et al*., 2011).

Etiology

It is yet unknown what causes uterine torsion to occur more frequently in buffaloes. The occurence of uterine torsion is thought to be associated with many pre-disposing factors. However, Ghuman (2010) identified unstable anatomical arrangement of bovine uterus which might be responsible for high occurrence of uterine torsion in bovines, it include - broad ligaments are attached to the minor curvature of the uterus while the greater curvature is free; broad ligaments are attached to the sub-ilial region; uterine horns are not fixed by the broad ligament, and in late pregnancy, the wide ligament lengthens only slightly in comparison to the pregnant horn, which protrudes significantly past the point of attachment. Singh and co-workers (1995) described didelphus uterus as one of the causes of uterine torsion in the buffaloes. Brar and co-workers (2008) found that 25% of females born to mothers who experienced uterine torsion have underdeveloped muscles in their broad ligaments. Buffalo's larger rumen and spacious pendulous abdomen provides greater space for the pregnant uterus to rotate while rumen is unfilled, might be responsible for more common occurrence of uterine torsion in buffaloes than in cattle (Singh, 1991). According to Sane *et al*. (1982), external damage, a lack of exercise, and abnormal animal movement are the three main causes of uterine torsion. Drost (2007) discovered that uterine torsion in buffaloes is caused by a number of factors, including hilly terrain, sudden movement of the dam, unsteady walking, the fact that bovines fall to the ground on their forelegs first when lying down, slipping, reduced rumen volume prior to parturition, a lack of foetal fluids, and the active movements of the foetus during first stage labour. The higher prevalence of the issue in buffaloes is also thought to be related to the buffaloes' propensity for wallowing (Singh, 1995). Nanda and Sharma (1986) discovered that none of the buffaloes with uterine torsion who were sent to a referral hospital had a history of wallowing.

CLINICAL SIGNS AND DIAGNOSIS

Buffaloes with uterine torsion often present with several clinical signs such as straining, pain, inappetence, restlessness, arching of back, colic, depression and constipaton (Sharma *et al*., 1995; Murty *et al*., 1999; Ali *et al*., 2011). There is pulling of one or both vulvar lips in post-cervical uterine torsion (Purohit and Gaur, 2014).

Per-vaginal and rectal examination of buffalo is helpful in the diagnosis of uterine torsion. Post-cervical uterine torsion is generally diagnosed by simple vaginal examination excepting few cases where the obstetrician is unsure and for confirmation rectal examination is done by palpation of the broad ligaments (Lyon *et al*., 2013). The direction of spiral folds in the cranial, vaginal examination indicates the direction of uterine torsion in buffaloes (Noakes *et al*., 2019). However, pre-cervical uterine torsion is always diagnosed by per-rectal examination.

Changes in hematological and biochemical parameters

A blood analysis may help to identify the severity and prognosis of uterine torsion. Several haematological and biochemical characteristics contribute to ruling out certain diseases, and if anomalies are found, they may help determine a prognosis and line of treatment (Amer *et al*., 2008; Hussein and Abd Ellah, 2008; Amin *et al*., 2011; Ali *et al*., 2011). The hemogram and leukogram of torsion affected buffaloes revealed that MCHC, monocytes, lymphocytopenia, neutropenia, and monocytosis all showed substantial increase in conjunction with eosinopenia. (Pattabiraman and Pandit, 1980; Kaur and Singh, 1993; Malhotra *et al*., 1993; Amer and Hashem, 2008; Ali *et al*., 2011). In buffaloes affected by uterine torsion, there were increases in ALB, AST, CPK, and BUN as well as decreases in globulin and P. When compared to buffaloes with uterine torsion at full term (57.6$\pm$24 U/l and 38.4$\pm$22 U/l, respectively), the AST and CPK activities were higher in buffaloes with uterine torsion during gestation (145.6$\pm$23 U/l and 267.6$\pm$69 U/l, respectively) (Ali *et al*., 2011). Greater concentrations of the CPK and AST were seen in animals with severe degrees of torsion or those bearing a dead foetus (Amin *et al*., 2011). Pregnant cows and buffaloes with varying degrees of uterine torsion have been found to have high quantities of several biochemical components, including LDH, AST, glucose, BUN, creatinine, CPK, cortisol, and gamma glutamyl transferase (Frazer, 1988; Ghuman *et al*., 1997; Pattabiraman and Pandit, 1980; Phogat *et al*., 1991; Singla *et al*., 1992b; Kaur and Singh, 1993; Kuhad *et al*., 1996; Amer and Hashem, 2008; Jeengar *et al*., 2015b). There aren’t many studies on the impact of uterine torsion on peripheral hormone levels in buffaloes, particularly progesterone and estrogen (Bugalia *et al*., 1995; Sosa and Agag, 1997; Amer and Hashem, 2008).

Monocytosis and presence of band cells in torsion affected buffaloes has been obsereved by many researchers indicating long standing uterine infection followed toxemia in animals (Feldman *et al*., 2000; Hoffman *et al*., 2004; Ali *et al*., 2011). Ali and co-workers (2011) also observed a decrease in MCHC which may be due to blood loss originated from severe twisted uterine blood vessels. Due to uterine torsion, there is great destruction of the muscular cells of uterus and this destruction result in the increases in enzymatic activities of AST and CPK (Coles, 1986; Kraft and Dürr, 2005; Ali *et al*., 2011). Payne (1987) concluded that in torsion affected animals there is reduced blood flow to kidneys causing dehydration and dead fetuses also release toxic substances which lead to nephropathy. Nephropathy causes increased levels of BUN and creatinine (Ali *et al*., 2011). There is oozing of fluids from uterine blood vessels which can elevate dehydration (Ali *et al*., 2011; Noakes *et al*., 2019). This acute dehydration also leads to an increase in Albumin and decrease in Globulin in torsion affected buffaloes (Rothschild *et al*., 1975; Guyton, 1983).

Patho-physiological changes following uterine torsion

The degree and duration of uterine torsion seem to correlate with an increase in the patho-physiological alterations in the uterus. Ghuman (2010); Thangamani (2018) have reviewed patho-physiological alteration that occurs following uterine torsion. There is a summary of clinically studied parameters.

Changes associated with uterus and uterine blood flow

Hussein (2013) and Devender *et al*. (2018) using color Doppler sonography validated that compared to normal pregnancy, blood flow volume in the middle uterine artery ipsilateral to cases of uterine torsion was significantly lower. However, on detorsion the blood flow volume increased significantly in the middle uterine artery ipsilateral to uterine torsion (Devender *et al*., 2018). Depending on the severity and degree of uterine torsion, the central uterine artery is compressed, reducing the amount of oxygen reaching the foetus. (Schultz *et al*., 1975; Schönfelder *et al*., 2005b). Moreover, it causes myometrium and endometrium to suffer irreparable damage as well as hypoxia, cell death, and a loss of uterine wall elasticity and viability, which causes the uterine wall to become necrosed, brittle, fragile, and prone to rupture (Baker, 1988; Tamm, 1997; Noakes *et al*., 2019; Ghuman, 2010). McEntee (1990) found that inflammatory changes occurring in uterus followed by torsion and infection can cause adhesions of uterus with surrounding abdominal tissues. These adhesions associated with brittle and fragile uterus might be the reasons behind the unsuccessful results of schaffer's method of detorsion in chronic cases of uterine torsion.

Malik (1987) revealed that epithelial lining of endometrium was generally absent; uterine glands were in various stages of degeneration and necrosis; myometrium showed various types of degeneration; uterine muscles were exhausted, ruptured, and haemorrhagic and endometrium also showed congestion, haemorrhages and sometimes adhesions. Plasma markers such as haptoglobin and creatine kinase are useful in determining the damage to uterine tissue and its regenerating capacity after detorsion (Schönfelder, 2005c; Schönfelder, 2007; Ghuman *et al*., 2009).

Changes associated with cervix

During the time of calving induction, a predictable series of physiological changes take place that lead to cervical dilatation during parturition and are responsible for cellular and biochemical changes inside the cervix (Breeveld-Dwarkasing *et al*., 2003b). But, in torsion affected buffaloes these sequential changes are prohibited due to ischemic cervix and a break in the sequence result in insufficient dilation of cervix. Hemorrhage, congestion, edoema, sporadic patches of necrosis, and an unbroken cervical wall were the histopathological findings in Grade 1 cervix of torsion-affected buffaloes, major findings in Grade 2 cervix comprised severe necrosis, fibrosis, and tearing of cervical wall (Honparke *et al*., 2009). Barber (1995) reported that early uterine detorsion may stop cervical fibrosis. Therefore, the extent and duration of uterine torsion are crucial determining factors in buffalo cervical deterioration.

TREATMENT

In buffaloes, uterine torsion is a medical emergency, and treatment needs to start right away. In order to detort the twisted uterus in buffaloes, some treatment options include rotating the foetus per vaginum, rolling the buffalo with or without a plank, and surgical correction (Purohit *et al*., 2011a, b; Noakes *et al*., 2019).

Rotation of the fetus per vaginum

This method of detorsion is only applicable in mild cases of uterine torsion. It can be performed only in those cases where obstetrician's hand can reach up to the fetus and there is sufficient fluid present in uterus such that manipulation is possible (Ghuman, 2010; Purohit *et al*., 2011b). Purohit and Gaur (2014) described that after grasping the fetus by bony prominences swung them from side to side before pushing right over in the opposite direction of torsion. Mernard (1994) suggested that administration of clenbuterol before manipulation is helpful in detorsion and probability of successful detorsion is increased. Detorsion rods and Caemmerer's torsion fork or a Kuhns crutch are helpful in detorsion (Noakes *et al*., 2019; Purohit and Gaur, 2014). Ghuman (2010) concluded that the success rate of detorsion by this method is higher when dam is standing, the cervix is dilated, and the fetus is alive.

Rolling of buffalo

If the dam is recumbent, the torsion is severe enough that the foetus cannot be approached, the torsion happened before the estimated period of parturition, or per vaginal manipulation cannot undo the torsion, rolling is advised. (Roberts, 1986; Noakes *et al*., 2019; Ghuman, 2010). When rolling is administered without a plank, uterine detorsion is successful in 18 to 100% of cases (Roberts and Hilman, 1973; Sloss and Dufty, 1980; Frazer *et al*., 1996; Kruse, 2004). The principle behind rolling the buffalo is rolling the animal around its uterus such that the uterus remains static. Both the hind legs and fore legs are tied separately using two different ropes. Sudden rolling of the animal is given in the same direction as the torsion of the uterus keeping the head of animal in downward direction. This sudden and jerky rolling helps in the overtaking of the static or slowly rotating gravid uterus (Ghuman, 2010; Purohit *et al*., 2011b; Noakes *et al*., 2019). After each rolling vaginal examination must be done to check detorsion has been done or not.

Schaffer (1946) described a method of detorsion by rolling the dam to the same direction of torsion and fixing the uterus with plank. After diagnosis of torsion, animal is casted in the lateral recumbency as the side of uterine torsion and a wide plank of wood or ladder, 3 to 4 meter long and 20 to 30 cm wide, is kept on the flank of dam such that one end of plank extends over the paralumbar fossa and the other end rests on ground (Noakes *et al*., 2019). Then, rolling is given in the direction of torsion. The front and hind legs are pulled up and over the recumbent dam. During rolling, an assistant stands on the plank to fix the uterus of dam. Each rolling is followed by vaginal or rectal examination. Disappearance of the vaginal spiral folds or rectal pouch indicates the successfulness of detorsion which can be immediately palpated by the examiner. If the vaginal spirals are still present, then after returning the dam to her position as before rolling slowly, the whole procedure is repeated (Roberts and Hillman, 1973, Singla *et al*., 1992a; Ghuman, 2010; Noakes *et al*., 2019). Success rate of this method is 84 to 90% which is quite higher than simple rolling in bovines (Ghuman, 2010). However, caesarean section is suggested if torsion is not resolved even after 3 or more rollings to avoid more damage to dam or rupture of uterus (Nanda *et al*., 1991).

This method is not successful in Indian buffaloes due to their thick skin and pendulous abdomen. Therefore, Sharma's modified Schaffer's method was discovered by modifying existing Schaffer's method. The plank's dimensions were changed to 11.9 feet long, 9 inches wide, and 2 inches thick. Two to three medium-weight assistants supported the buffalo while it was being rolled; one assistant stayed on the lower end of the plank while the other moved along it. A third assistant adjusted the pressure by pressing the upper end of the plank (Ghuman, 2010). Modified Schaffer's approach has a 50% higher success rate than Schaffer's method (Singh and Nanda, 1996; Srinivas *et al*., 2007).

Surgical correction

When the modified Schaffer's procedure fails to relieve uterine torsion in buffaloes or cervical dilatation fails after detorsion, a caesarean section is carried out. In these circumstances, the uterus is manually detorted after being sutured (Drost, 2007). Prabhakar and co-workers (2007) found that, after uterine torsion has been corrected, buffaloes frequently experience cervical dilation failure. Ghuman (2010) suggested that the expense of the procedure and the value of the animal should be carefully taken into account when undertaking a caesarean section. The paramedian, median, or left flank laparotomy site are all possible. While left flank laparotomies are only occasionally performed when the gestation period is not complete, the paramedian location is more preferred (Roberts, 1986).

CONCLUSION

The incidence of uterine torsion in buffaloes is high. Animal condition will deteriorate if torsion is not promptly diagnosed and corrected. Avoid rolling more than three times. Precise aetiology must be discovered through research in order to lower the occurrence of uterine torsion in the future.

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