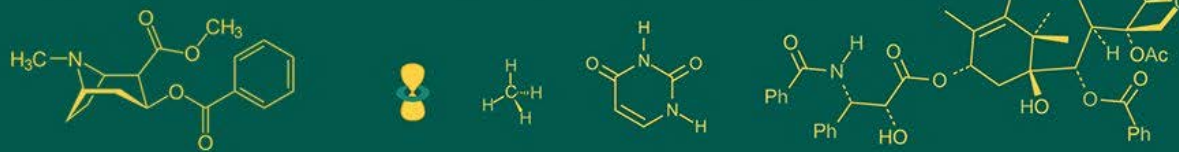


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Newton Biswas
 Division of Animal
 Reproduction, ICAR-Indian
 Veterinary Research Institute,
 Bareilly, Uttar Pradesh, India

Sushil Kumar
 Division of Animal
 Reproduction, ICAR-Indian
 Veterinary Research Institute,
 Bareilly, Uttar Pradesh, India

Renu Sharma
 Division of Animal
 Reproduction, ICAR-Indian
 Veterinary Research Institute,
 Bareilly, Uttar Pradesh, India

MH Khan
 Division of Animal
 Reproduction, ICAR-Indian
 Veterinary Research Institute,
 Bareilly, Uttar Pradesh, India

Corresponding Author:
Sushil Kumar
 Division of Animal
 Reproduction, ICAR-Indian
 Veterinary Research Institute,
 Bareilly, Uttar Pradesh, India

Comprehensive clinical analysis of uterine torsion severity and outcomes in buffaloes: Correlation of key clinical features with prognostic indicators

Newton Biswas, Sushil Kumar, Renu Sharma and MH Khan

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Abstract

A critical analysis of 20 cases of uterine torsion was conducted. These cases were presented in the Referral Veterinary Polyclinic (ICAR-IVRI) over a period of one year. They were evaluated for their severity and treated accordingly. The outcomes in terms of dam survivability and live fetus were recorded. The four clinical features of uterine torsion and their different levels of severity were correlated and compared with the outcomes of the cases. This analysis can be used to predict the outcomes of uterine torsion cases based on their severity. The degrees of severity were derived based on the correlation between the different clinical features of uterine torsion and their variable attributes. The clinical features such as Straining Time (<12 h, 12 ≤ 24 h, >24 h), Degree of Torsion (90-180, 180-270, >270), Consistency of Torsion Point (soft, tough, adhered), and Presence of Foul Smell (no smell, mild, severe) were analyzed to establish correlation with the outcomes of cases and further help the clinicians to choose the mode of treatment based on the severity. The results revealed that Consistency of Torsion Point, Degree of Torsion, and Presence of Foul Smell are highly associated with fetal outcomes, with more severe cases (tougher torsion points, greater torsion angles, and severe smells) leading to poorer outcomes. Straining Time also plays a significant role, with shorter times (<12h) being associated with better fetal survivability ($p < 0.05$). There is a strong positive correlation between Degree of Torsion and Severity, indicating that the higher the torsion degree, the more severe the case.

Keywords: Correlated, positive, between, consistencies

1. Introduction

Uterine torsion in buffaloes is the single largest cause of maternal dystocia. It accounts for about 52 to 83% of maternal causes of dystocia in buffaloes (Srinivas *et al.* 2007; Purohit and Gaur, 2014; Ferrari *et al.*, 2021) ^[18, 11, 4]. It is an obstetrical emergency condition (Yadav *et al.*, 2023) ^[20]. It mostly occurs in the third trimester of pregnancy, when the gravid uterine horn gets twisted on its longitudinal axis. Based on the location of the torsion point, it can be divided into two types: pre-cervical, when the point of torsion is located anterior to the cervix, and post-cervical, where the point of torsion is present caudal to the cervix in the anterior vagina (Purohit *et al.*, 2011a, b) ^[12, 13]. Post-cervical torsion cases are most prevalent (96%). The direction of torsion can be dextrorotatory or levorotatory. However, about 96% of cases are dextrorotatory (Satish *et al.*, 2019) ^[15]. The degree of rotation varies from 90° to 720° (Purohit and Gaur, 2014) ^[11], with 270°-360° being frequently reported (Patelvyva *et al.*, 2019) ^[10]. Uterine torsion typically takes place either prior to or in the latter part of the first stage of parturition, and unproductive straining is a common feature (Ghuman, 2010; Ghosh *et al.*, 2013) ^[7, 6]. A substantial variability in the fetal and maternal mortalities has been reported in the cases of uterine torsion in buffaloes. Factors such as the condition's duration and the torsion's severity have been suggested as determinants of the outcome (Frazer *et al.*, 1996; Amin *et al.*, 2011) ^[5, 1]. Therefore, it is important to analyze and establish the relationship between critical clinical features of uterine torsion that would help clinicians make prompt decisions and gain positive outcomes.

2. Materials and methods

2.1 Clinical examination and selection of cases

A total case of 20 buffaloes of various breeds, mostly Murrah, and other non-descript breeds

were presented in the Referral Veterinary Polyclinic (ICAR-IVRI) over a period of one year. These cases had a history of complete gestation, frequent unproductive straining, inappetence, and restlessness. After being presented, the animals were thoroughly examined. The general appearance, rectal temperature, mucus membrane, and dehydration level were evaluated and managed accordingly. A definitive diagnosis of uterine torsion was achieved only in the OPD after careful per-rectal and per-vaginal examinations. After diagnosis, all the cases of pre-cervical torsions were invariably referred for laparo-hysterectomy. The only cases of post-cervical torsion were attempted to correct. The cases that showed no signs of improvement were referred for laparo-hysterectomy. Most of the animals were in their second to fourth parity. The clinical signs such as straining time, degree of torsion, consistency of torsion point, and presence and intensity of foul smell were recorded. After assessing all the conditions, Sharma's modified method was applied to detort the animal. Outcomes such as maternal and fetal survivability were recorded, and aggregate data for all 20 cases were used for analysis.

2.2 Selection of critical clinical features and their intensity: Data collection

A format (Figure 1) consisting of the critical clinical features such as straining time, degree of torsion, consistency of torsion point, and presence and intensity of foul smell with their different levels of severity were grouped and tabulated for data collection. The format also included information about the method of treatment and the outcome of the case.

Table 1: Format for data collection

Features	Case ()		
	Severity		
Straining Time	<12h	12 ≤ 24 h	>24 h
Degree of Torsion	90-180	180-270	>270
Consistency of Torsion point	Soft	Tough	Adhered
Presence of foul smell	No	Mild	Severe
Detorted/C-section; Dam- Live/dead, Fetus- Live/dead			

2.3 Statistical Analysis

Chi-Square test for independence was applied to test the relationship between categorical features (Such as degree of torsion, consistency, etc.) and outcomes (Detorted, live dam, live fetus). ANOVA (Analysis of Variance) was applied to determine if the severity level (Low, moderate, high) affects outcomes differently. Correlation analysis was done to calculate the correlation between severity and the features (e.g., degree of torsion) using the Pearson correlation method. The data was analysed, and conclusions were drawn.

3. Results

3.1 Torsion Cases Overview

A total of 20 cases of uterine torsion were examined, involving varying degrees of torsion, time since straining began, consistency at the torsion point, and presence of foul smell. The cases were categorized based on the outcomes of dam survival, fetus survival, and whether the torsion was corrected by detortion or C-section.

3.2 Detortion Outcomes: Out of 20 cases, 15 cases (75%) were successfully detorted. Detortion was associated with

various levels of severity and other features. Cases where detortion occurred were distributed across all straining times and degrees of torsion:

- Straining time <12 h: 10 cases
- Straining time 12-24 h: 1 case
- Straining time >24 h: 4 cases

3.3 Fetal Survival

Out of 20 cases, 7 cases (35%) resulted in the birth of a live fetus. Live fetal outcomes were more frequently associated with shorter straining times and lower degrees of torsion:

- Straining time <12 h: 7 live fetuses
 - Straining time 12-24 h: 0 live fetuses
 - Straining time >24 h: 0 live fetuses
- Live fetal outcomes were also correlated with soft consistency at the torsion point and the absence of foul smell.

3.4. Dam Survival

A total of 14 dams (70%) survived. Dam survival was observed in cases where detortion was successful and in C-section procedures. However, C-section was associated with a higher likelihood of fetal death.

3.5. Dam Survival after C-section

Among the cases that underwent a C-section, 2 dams (10%) survived. These dams were presented with higher severity features (Straining time >24 h, torsion >270°), and all their fetuses were stillborn.

3.6. Relationship between Features and Severity

- **Straining Time:** Cases presented within 12 hours were associated with both higher dam and fetus survival rates. Longer straining times (>24 hours) were linked with dam survival only through C-sections, and all fetuses in these cases were dead.
- **Degree of Torsion:** Cases with a lower degree of torsion (90-180°) were more likely to result in both a live dam and live fetus. Torsion greater than 270° was consistently associated with dead fetuses.
- **Consistency of Torsion Point:** Soft torsion points were predominantly associated with live fetuses and lower severity. Tough or adhered torsion points were found in cases of moderate to high severity.
- **Presence of Foul Smell:** The presence of a mild or severe foul smell was associated with higher severity and fetal death.

3.7. Statistical Analysis

A chi-square test was performed to determine the relationships between the following features and fetal outcomes:

- **Straining Time vs. Fetal Survival**
The chi-square test revealed a statistically significant association between shorter straining times (<12h) and fetal survival, with a p-value < 0.05.
- **Degree of Torsion vs. Fetal Survival:** There was a statistically significant relationship between lower degrees of torsion (90-180°) and fetal survival (p-value < 0.05).
- **Consistency of Torsion Point vs. Fetal Survival:** The consistency of the torsion point was significantly associated with fetal survival. Soft consistency was more likely to result in live fetuses (p-value < 0.05).

- **Presence of Foul Smell vs. Fetal Survival:** The presence of foul smell (mild or severe) was associated with fetal death. The chi-square test results confirmed a

significant relationship between foul smell and fetal mortality (p-value < 0.05).

Table 1: Presentation of all the cases in tabulated form, to predict the severity of the cases

Case	Straining Time	Degree of Torsion	Consistency	Foul Smell	Severity	Detorted	Live Dam	Live Fetus
1	<12h	90-180	Soft	No	Low	Yes	Yes	Yes
2	<12h	180-270	Soft	No	Moderate	Yes	Yes	Yes
3	>24h	180-270	Tough	Mild	Moderate	Yes	Yes	No
4	>24h	>270	Adhered	Severe	High	No	No	No
5	>24h	90-180	Tough	Mild	Low	Yes	Yes	No
6	<12h	90-180	Soft	No	Low	Yes	Yes	Yes
7	<12h	180-270	Tough	Mild	Moderate	Yes	Yes	Yes
8	>24h	180-270	Adhered	Severe	High	No	Yes	No
9	>24h	>270	Tough	Severe	High	No	No	No
10	<12h	180-270	Tough	Mild	Moderate	Yes	Yes	No
11	<12h	>270	Tough	Mild	High	Yes	Yes	No
12	12-24h	180-270	Tough	Mild	Moderate	Yes	Yes	No
13	>24h	180-270	Adhered	Severe	High	No	No	No
14	<12h	>270	Tough	Severe	High	No	Yes	No
15	<12h	90-180	Soft	No	Low	Yes	Yes	Yes
16	>24h	180-270	Adhered	Severe	High	No	No	No
17	<12h	180-270	Tough	Mild	Moderate	Yes	Yes	No
18	<12h	90-180	Soft	No	Low	Yes	Yes	Yes
19	<12h	90-180	Soft	No	Low	Yes	Yes	Yes
20	12-24h	>270	Tough	Severe	High	Yes	Yes	No

Discussion

The present study of 20 cases of uterine torsion highlights the critical role of early diagnosis and prompt intervention in improving fetal survival rates. Our findings showed that cases presented within 12 hours of straining were significantly associated with live fetuses, confirming the importance of timely action. Similar findings have been reported in earlier studies (Ferrari *et al.*, 2021; de Carvalho *et al.*, 2022) [4, 3], where delayed intervention in uterine torsion cases resulted in higher fetal mortality due to prolonged compression of the uterine vasculature and fetal asphyxia.

Research by Frazer *et al.* (1996) [5] demonstrated that early intervention, typically within 12 hours, significantly reduces the risk of fetal death and necrosis of the uterine tissues. In our study, all live fetuses were delivered in cases where the straining time was under 12 hours, reinforcing the importance of early detection and treatment.

This study found a clear correlation between the degree of torsion and fetal survival. Cases with lower degrees of torsion (90-180°) were associated with higher fetal survival, while higher degrees of torsion (Greater than 270°) led to fetal death in all cases. These results are in line with prior studies that highlight the detrimental effects of higher torsion degrees on fetal outcomes. According to Roberts (1986) [14], increased torsion angles cause greater compression of the placental blood supply, leading to hypoxia and fetal death.

Furthermore, Yadav *et al.* (2021) [19] observed that fetal mortality rates rose significantly as the degree of torsion increased, particularly beyond 180°. The present findings echo this observation, as all cases with torsion greater than 270° resulted in fetal death.

The consistency of the torsion point proved to be another important prognostic factor. Softer torsion points were linked to better outcomes, particularly in terms of successful detortion and fetal survival. In contrast, tough or adhered torsion points were associated with higher severity,

prolonged interventions, and fetal death. These findings are supported by a study conducted by Aubry *et al.* (2008) [2], which reported that adhered torsion points often indicate chronic torsion and are associated with poorer prognoses.

The adhered consistency of the torsion point likely reflects tissue necrosis and adhesions, making detortion more difficult and increasing the risk of C-section. Cases requiring C-section in this study were often those where the torsion point had become adhered, further complicating fetal outcomes.

The presence of foul smell, particularly when classified as severe, was a strong predictor of fetal death in this study. Mild or severe foul smells were associated with higher degrees of torsion, indicating tissue damage and infection. These findings align with previous research that links foul smell with prolonged torsion and necrosis of the uterine tissues.

Research by Schuenemann *et al.* (2011) [16] found that uterine infection or necrosis, which is often indicated by the presence of foul smells, directly correlates with higher fetal mortality rates. In such cases, rapid intervention becomes even more critical, as delays can lead to sepsis in the dam, increasing the risk of both maternal and fetal death.

In terms of maternal outcomes, our study found that 14 out of 20 dams survived, with the majority undergoing detortion. However, C-sections were performed in cases where detortion was not feasible due to severe torsion or adhered torsion points. C-sections, although life-saving for the dam, were often associated with fetal death. This is consistent with the findings of Singh *et al.* (2024) [17], who noted that C-sections are typically performed as a last resort when the fetus is already compromised due to prolonged torsion.

Murthy *et al.* (2015) [9] also reported similar findings, where the success rate of C-sections in terms of fetal survival was low, but it remained a necessary intervention to preserve the life of the dam. Our results show that while C-section

ensures dam survival, the prolonged nature of these cases reduces the likelihood of delivering a live fetus.

The findings of this study are consistent with the broader body of veterinary obstetrics research. A comparison of our results with previous literature indicates that factors such as straining time, degree of torsion, and presence of foul smell are critical in predicting outcomes in cases of uterine torsion. Early detection and intervention remain key to ensuring favorable outcomes for both the dam and fetus.

Studies by Frazer *et al.* (1996)^[5] and Jeengar *et al.* (2015)^[8] both emphasize that earlier presentations are associated with significantly better outcomes for the fetus, as observed in our study where all live fetuses were delivered in cases presented within 12 hours. The findings also corroborate the work of Roberts (1986)^[14], who highlighted the detrimental effects of torsion greater than 180° on fetal viability.

Conclusion

This study highlights the critical importance of early intervention in uterine torsion cases. Features such as straining time, degree of torsion, consistency of torsion point, and presence of foul smell are strongly correlated with fetal outcomes. Shorter straining times, softer torsion points, and lower degrees of torsion were associated with more favourable outcomes for both the dam and fetus. Statistical analysis confirmed these relationships, underlining the need for timely diagnosis and intervention in reducing fetal mortality.

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