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Uterine prolapse in buffaloes: A review

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ABSTRACT

Uterine prolapse is an emergency postpartum problem occurring within 24 h of parturition and resulting in death or serious complications in unattended cases. Poor myometrial contractions during the post-partum period and traction during difficult births are two postulated etiologies and low serum calcium appear to be a significant risk factor for uterine prolapse in buffaloes. Shortly after eversion the uterus gets inflamed and edematous and shock may ensue in cases with excessive bleeding. Prompt replacement of prolapsed uterus with sufficient care assures good prognosis. The etiology, risk factors, clinical findings and approaches for therapy of uterine prolapse in buffaloes are mentioned in this review.

1. Introduction

Uterine prolapse is a post partum obstetrical emergency of buffaloes occurring during the third stage of parturition[1] that can be easily recognized. Delay in repositioning sometimes makes it difficult to repair and when coupled with trauma and shock, it may culminate in death[2]. It is one of the serious life-threatening complications that occur during the period immediately following parturition; however, it is rarely delayed beyond 48 h of parturition[3]. Many reports on the occurrence of the problem have appeared for buffaloes in India[4–6], Pakistan[7,8], Iraq[9,10], Italy[11] and Bulgaria[12,13]; however, similar reports on Egyptian buffaloes could not be traced and for buffaloes in South America it was mentioned that the condition is rare[14,15]. Various predisposing factors have been suggested for uterine prolapse in the cow, *i.e.* hypocalcaemia, prolonged dystocia, fetal traction, fetal oversize, retained fetal membranes, chronic disease and paresis[16,17]. For buffaloes, hypocalcaemia[7,9] and pelvic or rump measurements[13] have been studied and reported as significant risks for occurrence of uterine prolapse. Subsequent to

prolapse, the tissues appear almost normal, but within a few hours they become enlarged and edematous. Some animals will develop hypovolaemic shock secondary to internal blood loss, laceration of the prolapsed organ or incarceration of abdominal viscera[17]. Uterine prolapse is regarded as a veterinary emergency because without treatment the cow is likely to die[18,19]. In buffaloes, it was considered that complicated cases of uterine prolapse may involve multiple organs and intra-abdominal hemorrhage complicated with shock due to exposure of visceral organs might be responsible for the death of animals[20,21]. A limited number of comprehensive studies concerned with the survival rate and fertility of affected cows have been reported[18,22,23], yet similar studies on buffaloes are not available. Many case reports on buffaloes suggested that within 24 h the uterine prolapse could be successfully replaced without complications. In this review, the incidence, possible etiologies, risk factors, clinical findings, approaches for replacement and preventive measures are discussed.

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2. Incidence

Reports on the incidence of uterine prolapse have utilized evaluation of clinical records[4,24–27] or farmers' survey[8,28–30] and have mentioned a high incidence (3%-16%) of uterine prolapse yet this incidence appears to be the relative frequency of uterine prolapse for the total clinical cases analyzed/farmers surveyed for the period of study. Logical evaluations on the incidence of uterine prolapse in buffaloes have been derived from retrospective analysis of calving records of buffaloes maintained at organized farms. Such reports analyzing 452[31] and 9 752 calving records[32] found the incidence of uterine prolapse to be 7.7% and 1.34%-2.22%, respectively.

3. Etiology

Myometrial contractions are usually high at parturition and during the immediate post partum period, and these probably maintain the uterus in normal position with sequential size reduction over the next few days. Peak values of peripheral plasma concentrations of prostaglandin metabolites occur on the day of calving in buffaloes[33,34] which then drop by day 1-3 after delivery[35]. Thus, poor myometrial contractions appear to be a logical reason for uterine prolapse in buffaloes as also mentioned for cows[19]. In a difficult birth when traction is applied over the fetus, the uterine endometrium might be pulled because of the pressure exerted over the placenta and thus uterus may be everted outwardly. This can be verified in a few case reports on buffaloes in which the uterine prolapse occurred following handling of dystocia[36–39]. A similar situation can occur with the manual extraction of retained afterbirth wherein the excessive force to separate the fetal and maternal caruncles can pull the endometrium and thus the uterus protrudes outwardly especially when the myometrial contractility is poor. A source of irritation and rupture of vagina can initiate the uterus to project outwardly. Kasrija *et al*[40] found a case of uterine prolapse in a buffalo wherein, the uterus prolapsed from a vaginal tear and a partially contracted cervix.

4. Risk factors

Various predisposing factors have been suggested for uterine prolapse in the cow, *i.e.* hypocalcaemia, prolonged dystocia, fetal traction, fetal oversize, retained fetal membranes, chronic disease and paresis[16,17]. Deficiencies of serum calcium, magnesium and phosphorus during gestation and the postpartum period have been found to be significantly associated with occurrence of uterine prolapse in buffaloes[10,12,41]. The post parturient serum calcium level of Bulgarian Murrah buffaloes that suffered from uterine prolapse was significantly lower [(8.92±2.00) mg/dL] compared to buffaloes that did not evidence post partum prolapse

[(10.68±2.00) mg/dL][12]. Buffaloes with postpartum serum calcium levels below 10.42 mg/dL were 6.7 times more likely to suffer from uterine prolapse[12]. The normal serum concentrations of calcium, phosphorus and magnesium in healthy buffaloes varied from 11.21 to 11.77 mg/dL, 4.64 to 6.55 mg/dL and 3.50 to 4.98 mg/dL, respectively[42,43]. However, lower concentrations of serum calcium [(8.10±0.83) mg/dL], phosphorus [(4.64±0.53) mg/dL] and magnesium [(3.02±0.36) mg/dL] were also recorded during early lactation in buffaloes[42], thus a single post partum record of serum concentrations of calcium, phosphorus or magnesium cannot serve as a predictor for likely occurrence of uterine prolapse. Many studies evaluating the serum concentrations of calcium, phosphorus and magnesium in prolapse affected buffaloes found that the values of serum calcium, phosphorus and magnesium were in the range of 5.56 to 7.25 mg/dL, 2.61 to 3.88 mg/dL and 1.46 to 3.00 mg/dL[7,9,10,41,44,45], respectively. In a study on dairy cows, 27% of the animals with uterine prolapse also suffered from milk fever, dystocia or retained fetal membrane[46]. Murphy and Dobson[18] opined that hypocalcaemia and dystocia cause myometrial fatigue, which may predispose cows to uterine prolapse.

In a study on buffaloes in Pakistan, the occurrence of genital prolapse did not significantly differ in animals which were kept under two feeding systems (stall fed and semi stall fed), three floor conditions (uneven floor, kacha/brick floor, sloppy floor) and two production systems (rural subsistence small holding and market oriented small holding)[8]. However, in another study stall fed pluriparous buffaloes were more prone to uterine prolapse[6]. The heritability estimate of utero-vaginal prolapse was high (0.680) and repeatability estimate was medium (0.424) in one study[31] whereas the repeatability (0.640) for utero-vaginal prolapse in buffaloes was high in another study[47]. In another study on Murrah buffaloes, the progenies of about 50% of the sires used were susceptible to utero-vaginal disorders in one herd [National Dairy Research Institute (NDRI)] but only 20% bulls were such, whose progenies were affected in another herd (Military Dairy Farm)[48]. Tiwana *et al*[47] concluded that the sires of the dam and of the calf (mate of the dam) also influence the incidence of prolapse in buffaloes. In spite of such reports, the heritability and repeatability of uterine prolapse in particular have not been observed clinically. However, previous vaginal prolapse was considered a significant risk for uterine prolapse in buffaloes[12]. Difficult births many times predispose buffaloes to uterine prolapse. In many case reports on buffaloes, uterine prolapse followed handling of dystocia[36–39]. In Bulgarian Murrah buffaloes, dystocia and prepartum vaginal prolapse were significantly associated with uterine prolapse with the odds ratio of 5.25 and 22.09, respectively[12]. There are conflicting reports on the body weight of dam at calving on the occurrence of utero-vaginal prolapse in buffaloes. Tiwana *et al*[47] found that the body weight of buffaloes at calving had non-significant effects on the occurrence of prolapse whereas a study on Bulgarian buffaloes found that the mean pre partum body weight [(543.00±80.40) kg] and post partum

body weight [(498.07±77.20) kg] of Bulgarian Murrah buffaloes affected with uterine prolapse were significantly lower compared to pre partum body weight [(596.00±54.50) kg] and post partum body weight [(550.61±41.40) kg] of buffaloes not affected with uterine prolapse[49]. Buffaloes giving birth to male calves and those delivering calves above 30 kg had significantly higher incidence of prolapse[47]. The longer gestation period was considered a significant risk for the occurrence of prolapse in Murrah buffaloes. Buffaloes with a gestation length of more than 306 days had a significantly higher incidence of utero-vaginal prolapse[47].

5. Clinical findings

Uterine prolapse commonly occurs within 2-24 h of calving (Table 1) yet it rarely occurs up to 72 h of calving[3]. In a study on cows, uterine prolapse was observed within 6 days following parturition in the majority (95.45%) of the animals[46]. Singh and Chandolia[50] recorded an unusual case of prolapse of non-gravid uterine horn in a pregnant buffalo that aborted one month following replacement of prolapsed horn. The clinical findings in buffaloes affected with prolapse depend upon the time of presentation to the clinician since the prolapse. It was mentioned in a study on beef cows that animals suffering from uterine prolapse either remain in sternal or in lateral recumbency[51]. However, in most case reports (Table 1) buffaloes were standing when presented. Buffaloes show discomfort due to unusual displacement of the uterus and severe tenesmus might be present. Eyes are congested and slight increase in temperature and respiratory rates might be evident. The exposed uterus shows edema of varying degree and in cases presented after 6-12 h or later inflammation, hemorrhages and even necrosis might be evident. Some buffaloes may show clinical signs of shock due to internal tissue damage or vessel rupture due to pressure of the inverted uterus. Studies have mentioned that buffaloes with uterine prolapse have low hemoglobin (11.5 g/100 mL)[41,45] and significantly higher total leucocyte counts {[$(10.21±0.38)×10^3/mm^3$] [41] to [$(11.21±0.38)×10^3/mm^3$] [45]}. Similarly, significantly higher neutrophils [(40.29±4.46)%] were recorded in differential leucocyte counts on blood smears in one study on buffaloes in Pakistan[7]. The low hemoglobin suggests the blood loss which is usual with uterine prolapse in buffaloes which have fragile genital tissues that bleed easily, and high leucocyte counts suggest infection. Low serum calcium was found in buffaloes with uterine prolapse[7,10,41,45].

6. Prognosis

Uterine prolapse is an emergency, but if cases are attended early the outcomes will be favorable. With increasing time in the existence of prolapse outside the vulvar lips, the prognosis will decrease, especially for replacement of the prolapse in its normal position on

account of involution of the cervix. The bubaline cervix reduced rapidly both in length and diameter within the first 5 days post partum and continued till Day 40 postpartum[71,72]. Thus, if the uterine prolapse occurs immediately post partum and is not replaced early, it will be difficult to replace due to contractions of the cervix. Severe hemorrhages can occur due to accidental injury to the cotyledons and septicemia can occur due to infections from injured tissues which can be fatal. Rarely, injury to internal tissues or rupture of vessels can result in shock that can be fatal. In a large proportion (21.4%) of Bulgarian buffaloes that had uterine prolapse subsequent to dystocia, severe hemorrhages were recorded[73]. In general, the outcome of uterine prolapse replacement is good and buffaloes recover within 3-7 days. In most case reports in Table 1, there was an uneventful recovery. The mortality rates of dairy cows affected with uterine prolapse are high. During the springs of the 1990-1992, the dairying seasons, 103 cases of uterine prolapse in dairy cows were treated and then followed to determine the survival rate and the pregnancy rate of the remaining cows. It was found that 19 (18.4%) cows died within 24 h of treatment and further 16 (15.5%) cows died or were unavailable for the study during the course of the season[74]. In another study on dairy cows, 9.09% of cows suffering from uterine prolapse died within 24 h following treatment and 18.18% subsequently developed metritis[46]. The mortality rates in large studies on dairy cows varied from 20%-25%[18,22]. The high mortality was attributed to shock, blood loss, refractory downer cow syndrome and other complications[18]. Similar studies on buffaloes are not available. However, the authors feel that similar mortality rates might be existent in buffaloes. Improper replacement and poor care during and after replacement can result in development of metritis in buffaloes. In studies on cows, a longer calving to conception interval with an additional 10[23] to 50 days[18] has been reported. A five-year (2002-2007) data analysis of 1 055 calving records of 427 Murrah buffaloes at an organized buffalo farm (NDRI, Karnal, India) revealed that prolapse had a significant effect on the service period and the number of services per conception[75]. A clinical study on uterine prolapse in buffaloes in Iraq found that the number of services per conception, pregnancy rates and days open were significantly higher in buffaloes with uterine prolapse compared to normal buffaloes[76]. A recent study analyzing 1 585 reproductive records (1992-2010) of Murrah buffaloes at NDRI, Karnal India found non-significant effects of prolapse on the calving to the first service, service period, dry period and calving interval[77].

7. Prolapse replacement and therapy

A uterine prolapse can be diagnosed by visual observation of a large mass with the cotyledons exposed sometimes with the attached placental membranes. Since edema, inflammatory changes and tissue damage rapidly follow, early replacement of the prolapsed uterus is essential. The reduction of the edema is suggested by application

Table 1

Analysis of patient condition at presentation, time of presentation, anesthesia used and therapy of uterine prolapse in different reports.

Standing/Recumbent	Clinical signs	Sex of calf	Time of presentation since parturition	Washing of prolapse	Epidural anesthesia	Rope truss/Suture	Therapy	Reference
Standing	Prolapse hanging with bleeding	Male	Immediately post partum	-	15 mL 2% lignocaine	Rope truss	Fluid therapy, antibiotics, antihistaminics	[52]
Recumbent	Discomfort, ocular membranes congested	-	4 h	Water	7 mL 2% lignocaine	Vulvar suture	Enrofloxacin 5.0 mg/kg, meloxicam 0.5 mg/kg, 2 litre DNS	[53]
Recumbent	Dull, depressed, pale eyes, retained placenta attached	-	2 h	-	5 mL 2% lignocaine	Buhner suture + Horizontal mattress	2 litre NSS, inj., oxytocin	[54]
Recumbent	Severe straining, Eyes congested	-	Immediately post partum	Water	5 mL 2% lignocaine	Interrupted suture	2.5 litre DNS, calcium boroglucoante 450 mL <i>i.v.</i> , antibiotics	[55]
-	Severe tenesmus, inflamed uterus, anorexia, weak pulse, necrotic areas	-	48 h	Saline, ice packs	5 mL 2% lignocaine	Rope truss	Enrofloxacin, anti-allergics	[56]
Standing	Uterus with fetal membranes, severe bleeding, eyes congested	Female	6 h	1:1 000 pp	5 mL 2% lignocaine	Purse string suture	Antibiotics, antihistaminics, fluid therapy	[57]
Standing	Prolapse inflamed	-	12 h	Saline + alum, ice packs	7 mL 2% lignocaine	Buhner suture	NSS 4 litres <i>i.v.</i> , oxytocin 20 IU	[58]
Standing	Eyes congested	Male	8 h	1:1 000 pp	5 mL 2% lignocain	Buhner suture	3 liter DNS <i>i.v.</i> , calcium borogluconate 450 mL <i>i.v.</i> , antibiotics and antihistaminics for 3 days	[59]
Sternal recumbency	Restless, off feed, straining, temperature 100.5 degrees F	-	8 h	1:1 000 pp	5 mL lignocaine	Horizontal mattress suture	2 litre NSS intrauterine, enrofloxacin 5 mg/kg for 3 days, progesterone 750 mg <i>i.m.</i>	[60]
Uterus+ Bladder prolapse	Straining, uterus edematous	-	10-12 h	NSS + Alum 1:1 000 pp Sugar solution	5 mL 2% lignocaine	Mattress suture	Antibiotics, calcium, mineral supplements	[61]
Recumbent Uterus + Intestines	Straining, edematous uterus	-	8 h	1: 1 000 pp	2% lignocaine Spasmolytic	Lubrication with vegetable oil prior to replacement	Intalyte 3 litres, progesterone 750 mg <i>i.m.</i>	[62]
Standing	Temperature 101 degrees F	Female	6 h	1: 1 000 pp	-	Purse string + Truss	Antibiotics 3 days	[63]
Recumbent	-	Female	16-18 h	1: 1 000 pp	-	Horizontal mattress	20 IU oxytocin, antibiotics, dextrose + Calcium borogluconate	[64]
Vaginal + Partial terine	Vaginal wall tense and bluish pink	-	24 h	NSS	2% lignocaine	Catheter to pass urine, retention sutures	Intrauterine infusion of saline oxytocin 20 IU + Antibiotics	[65]
Uterine prolapse through vaginal tear	-	-	-	-	2% lignocaine	Buhner suture	Fluids and calcium borogluconate <i>i.v.</i>	[39]
Standing	Slight temperature, uterus inflamed, congested	-	20 h	NSS, ice packs	5 mL 2% lignocaine	Buhner suture	4% lignocaine jelly externally, 4 litre NSS, 3 litre DNS, calcium, ergometrine	[66]
Standing	Placenta attached, severe bleeding, eyes congested	Female	6-8 h	1:1 000 pp	5-10 mL lignocaine	Purse string + Rope truss	Ceftiofur 1 mg/kg <i>i.m.</i> , antihistaminics, calcium	[67]
-	Severe tenesmus, arched back	Male	24 h	1:1 000 pp, ice packs, removal of dead tissue	5 mL 2% lignocaine	Purse string	Enrofloxacin, calcium borogluconate	[68]
Prolapse following dystocia	Severe tenesmus	-	4 h	Saline wash, ice packs, local oxytocin in the uterine tissue	2% lignocaine	Vulvar sutures	DNS, antibiotics and 450 mL calcium borogluconate	[69]
Uterus necrosed, edematous and bluish	Vagina severely inflamed, vulva torn and necrosed	-	24 h	Saline	2% lignocaine	Purse string	Antibiotics	[1]
Uterus prolapsed through vaginal fistula	Eyes congested, straining, vaginal bleeding	-	8-10 h	Cold water, 1:1 000 pp	10 mL 2% lignocaine	Amputation of cervix and uterus	Euthanized due to uncontrollable bleeding	[40]
Standing, Temperature 102 degrees F, uterus swollen, dry, straining	Placenta attached	Female	4 h	1: 1 000 pp	-	Hind quarters raised	25% dextrose 1 liter, calcium 200 mL <i>i.v.</i> , oxytetracycline 10 mg/kg CPM	[70]

Note: pp: potassium permanganate; DNS: dextrose normal saline; NSS: normal saline solution; CPM: chlorpheniramine maleate.

of cold ice packs or hypertonic salt or alum solutions before replacement. Intra-uterine administration of oxytocin in the uterine musculature has been suggested to reduce the size of the uterus[69]. If the general condition of the animal is poor, the animal must be first administered fluid replacements, corticosteroids or other appropriate therapy to stabilize the condition. The uterus should be lifted to relieve the pressure on the external urinary meatus to facilitate passage of urine[65]. The placement of a urinary catheter is suggested if there is difficulty in passage of urine[52]. The uterus must be kept on clean sheet of plastic or sterile cloth and this advice must be given to the owner to keep the organ moist and wrapped safely to prevent accidental injury during transport of the animal. The everted uterus must be washed with water, and the attached dirt and tissue tags must be cleaned. Lacerations on the everted mass should be cleaned and sutured with chromic catgut. Washing with 1:1 000 solution of potassium permanganate was mentioned in most case reports on buffaloes (Table 1); however, other mild antiseptics can serve similar purpose. Epidural administration of 5-7 mL of 2% lignocaine is suggested to relax the uterus and minimize the contractions. However, epidural anesthesia must be carefully administered on account of possible difficulties in standing of the animal subsequent to prolapse replacement under accidental over-dosage. Topical application of soft emollient creams is suggested along with local application of 4% lignocaine to minimize post replacement straining. The replacement of the uterus must be done gently to avoid undue force that may tear the uterine wall or the fragile cotyledons. Soft non-irritant emollient creams or vegetable oil must be applied over the entire surface of the uterus to facilitate replacement. Handling induced trauma is common and this can be minimized by prior reduction of uterine edema and enclosing the everted uterus in a plastic or porous fabric bag[19]. Manual replacement of the uterus can be done in most cases by everting the uterus outside in starting at the base and continuing up to the apex. Replacement is easier to perform if the animal is standing. A study on Holstein cows affected with uterine prolapse in Japan showed that the recovery rates were significantly better if the replacement was performed in a standing animal[78]. It is useful to raise the hind quarters to minimize the abdominal pressure if the animal is recumbent. Approaches to raise the hind quarters in cows include the use of a commercially available cow-lift or by tying the hind legs together at upper part of enarthrodial joints with a soft rope, and the rear part of the cow was raised mechanically by using a tractor or a chain block about 1 m in height[78]. For the recumbent cows, the recovery rate of cow-lift was 61.1% and raising using a tractor was 69.2%[78]. Similar reports on buffaloes are not available. Following complete replacement of the uterus, it must be evaluated. Infusion of 2-5 L of warm saline in the uterus helps in returning the organ to its normal position due to gravity[19,65]. The excessive fluid must be siphoned out.

Failure to achieve complete reduction of the prolapse can result in continued straining and uterine necrosis[19]. Recurrence of uterine prolapse is possible. To avoid such possibility, a large number of

case reports (Table 1) in buffaloes mentioned the use of different kinds of vulvar sutures or a rope truss. The authors feel that with sufficient care the rope truss is an atraumatic approach with better results. Similar views were expressed in one study on buffaloes[79].

Therapeutic care of buffaloes subsequent to uterine prolapse replacement depends upon the condition of the animal and time lapse between prolapse and its replacement. Administration of antibiotics, fluid replacements, antihistaminic, uterine motility stimulants (20-40 IU oxytocin or ergometrine *i.m.*) is suggested. Intravenous infusions of calcium borogluconate are suggested as many buffaloes may have hypocalcaemia. In addition, calcium infusions help to increase the myometrial motility and thus increase the liability of the uterus regaining its normal size and contour. Often 250 mL of the dose is suggested to be infused *i.v.* and the rest 200 mL is administered *s.c.* Many case reports in buffaloes mention the use of anti-inflammatory drugs subsequent to replacement; however, this seems less logical as the drugs may reduce prostaglandin secretions[80] and thus impair uterine involution. One study on dairy cows showed no difference in the occurrence of subsequent fertility when cows with acute puerperal metritis or clinical metritis were treated with either combinations of antibiotics and anti-inflammatory drugs or antibiotics and prostaglandins[81].

In the extreme cases of uterine prolapse of long duration (with severe necrosis, circumferential lacerations and closure of cervix) where replacement is not possible, amputation of the prolapsed uterus must be considered. Partial hysterectomy has been mentioned for chronic uterine prolapse in buffalo[82]. In a rare case, the ovary protruded from a vaginal tear subsequent to uterine prolapse replacement in a buffalo[83].

Conflict of interest statement

The authors declare that there is no conflict of interest.

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