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Effect of Prostaglandin and Gonadotropin Releasing Hormone on Uterine Involution in Dystocia Affected Buffaloes

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A B S T R A C T

The aim of this study was to evaluate the effect of the hormonal treatment on uterine involution in dystocia affected buffaloes. The experiment was carried out with total 33 buffaloes, out of which 27 were dystocia affected buffaloes presented at University clinic, GADVASU for the treatment which were further divided into 2 groups on the basis of treatment with prostaglandin and gonadotropin releasing hormone analogue (Group I: n=18, PGF2α on day 7 and GnRH on day 14 postpartum) or not (Group II: n=9, No treatment).Six normal calving buffaloes served as control group with no hormonal treatment (Group III). Rectal examination was done on day 1 (day of parturition), 7, 14 and 35 postpartum to assess various parameters. The present study demonstrated significant ($P<0.05$) involution of uterus in hormonal treated dystocia affected and normally calved buffaloes (Group I and III) as compared to non-treated buffaloes (Group II). On day 1 and 7uterine horns remained in the abdominal cavity and size of the uterine horn remained greater than the size of the cervix in all the three groups. On day 14, 44.4 and 55.6 % animals had their uterine horns located between pelvic and abdominal cavities in group I and II, respectively, whereas in group III uterine horns were in the abdominal cavity. On day 35, in group I and II 16.7 vs 83.3 and 55.6 vs 44.4 % dystocia affected buffaloes had location of uterine horns in between pelvic and abdominal cavity vs pelvic cavity, respectively, whereas uterine horns were located within the pelvic cavity in group III. On day 14, in group I and III, uterine size became equal to the size of the cervix in 22.2 and 33.3 % animals, respectively, whereas in group II 100 % animals had uterine horn size greater than cervix ($P<0.05$). On day 35, size of the uterine horn in 72.2, 44.4 and 100.0 % of animals was smaller than cervix in group I, II and III, respectively. On day 1, 7, 14 and 35, no significant difference was observed in uterine tonicity of dystocia affected and normal calving buffaloes. In all the groups, on day 14 and 35 a mild change in uterine tonicity from low to moderate was observed. In conclusion, administration of prostaglandin and gonadotropin releasing hormone may help to hasten uterine involution and subsequent ovarian activity in dystocia affected buffaloes.

Keywords

Buffalo, Dystocia, GnRH, PGF2α, Uterine Involution

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Introduction

Buffalo (*Bubalus bubalis*) is considered as an economically important dairy animal to farmers particularly in the northern region of India, as it fetches higher price of milk than cattle due to higher fat content and capable of utilizing low quality roughages and able to adapt to humid conditions prevailing in the country. The factors like low body reserves, limited energy intake and incidence of dystocia leading to uterine infections in buffalo during postpartum period results in decrease in production and future reproduction efficiency through various parameters like delay in the uterine involution and occurrence of hormonal imbalances causing late resumption of the ovarian cyclicity (Purohit *et al.,* 2012). The consequences are lengthy service and inter-calving periods in buffalo that cause huge economic loss to dairy farmers. So, it is pivotal to have normal puerperium to maintain optimum level of production and reproductive efficiency. The restoration of the uterus to its normal non-pregnant size depends on the hormonal levels, rate of myometrial contractions, bacterial infection eradication and endometrial regeneration (Sheldon *et al.*, 2008). In general, the uterine involution process completes within 35-45 days postpartum which involves the expulsion of lochial discharge and reduction in the size of the uterus (Salma *et al.*, 1999 and Noakes, 2001). The diameter of the gravid horn is halved by 5 days postpartum, and its length is halved by 15 days postpartum in normally calved buffalo (Purohit *et al.,* 2012).

Prostaglandins (PGF2α) play an important role in the process of parturition and uterine involution. The duration of the elevation of plasma concentrations of PGF2α is negatively correlated to the time taken for uterine involution. However, PGF2α levels remain low in dystocia affected animals and it is released for a shorter period of time as compared to normally calved animals (Heuwueser *et al.,* 1992). Therefore, the exogenous administration of PGF2α may be useful in dystociac buffaloes to boost the uterine involution. Gonadotropin-releasing hormone (GnRH) is responsible for stimulating follicle stimulating hormone (FSH) and luteinizing hormone (LH). During early postpartum there is a marked suppression of pulsatile LH release (William *et al.,* 1982) which is mandatory for postpartum resumption of normal cyclicity. Therefore, the current study was conducted to assess the uterine involution in dystocia affected buffaloes following the treatment with PGF2α and GnRH.

Materials and Methods

The study was conducted on 33 buffaloes. Out of which 27 were dystocia affected buffaloes presented at University clinic, GADVASU, Ludhiana, India for the treatment of dystocia which were further divided into 2 groups on the basis of treatment with prostaglandin (PGF2α analogue: Cloprostenol, 500 mcg IM, at parturition on day 1) and gonadotropin releasing hormone analogue (GnRH analogue: Buserelin acetate 20 mcg, IM, day 7 postpartum) or not i.e. Group I (n=18, Treatment group) and Group II (n=9, Non treatment group), respectively. Group III (n=6) consisted of normal calving buffaloes that served as control group.

Hormonal treatment

Schedule of hormonal regimen for dystocia affected buffaloes (Group I:n=18) was administration of PGF2α (Cloprostenol sodium, 500 mcg, IM) on 7 day and GnRH analogue (Buserelin acetate, 20 mcg, IM) on 14 day after parturition.

Supportive therapy

Intravenous fluids (5 litre of normal saline), calcium borogluconate (450ml) slow IV, antibiotics including ceftiofur 1g IM and metronidazole 1 litre IV, antioxidants viz. Vitamin E and selenium IM, anti-inflammatories viz. flunixinIM, multivitamins and rumenatorics was given as a standard protocol to all dystocia affected animals (Group I and II), however no treatment was given to normal calving animals (Group III).

Rectal examination

It was performed on day 1 (Day of parturition) followed by day 7, 14 and 35 postpartum. Location of uterine body and uterine horns, size of uterine horns and uterine tonicity were assessed on various days on the basis of grading pattern described by Scully *et al* (2013) (Table 1). Soft and flaccid uterine horns observed on rectal palpation reflected low uterine tonicity. Moderate tonicity was considered if uterine horns were soft on rectal palpation but on massaging with hand got little toned and were easy to lift and straighten up. While tonicity was graded as good if uterine horns were curled inwards, highly toned and were difficult lift and straighten up. All the data pertaining to rectal examination findings was analysed by using Chi square method.

Results and Discussion

Rectal examination is considered as a gold standard for assessment of uterine involution. During puerperal period uterine shrinkage occurs with regular myometrial contractions resulting in elimination of lochia and reduction of smooth muscle mass (Vala *et al.*, 2018). Smooth muscle plays an important role in the expulsion of uterine contents and reduction of the uterine size. The greatest changes in uterine size occur within a few days after calving. The occurrence of dystocia may delay the process of uterine involution. A comparative study was done by performing rectal examination on various experimental days viz. day 1, 7, 14 and 35 postpartum (Table 2, 3 and 4).

Location of uterine body and horns

In the present study, no significant difference about location of uterine body and horns was observed on day 1 and 7 in all the groups as uterine horns remained in the abdominal cavity (Table 2). Similar to current findings, Valla *et al* (2018) also reported that on day 7 postpartum uterine horns remain in the abdominal cavity as large, soft water bag like without any tonicity and elasticity in buffaloes.

On day 14, 44.4 and 55.6 % animals in group I and II, respectively, had their uterine horns located between pelvic and abdominal cavities whereas all the normal calving animals (Group III) had their uterine horns in the abdominal cavity. On day 35, none of the animals from all groups had their uterine horns located in the abdominal cavity. In group I and II 16.7 vs 83.3 and 55.6 vs 44.4 % dystocia affected buffaloes had location of uterine horns in between pelvic and abdominal cavity vs pelvic cavity, respectively, whereas uterine horns were located within the pelvic cavity in all normal calving buffaloes (Group III). Nakhashi *et al.*, (2012) and Vala *et al.*, (2018) also reported that the majority of normal calving animals had genitalia within the pelvic cavity between days 14 and 18 postpartum.

Size of the uterine horn

No significant difference was observed in all the three groups on day 1 and 7, as size of the uterine horn remained greater than the size of the cervix (Table 3). On day 14, in group I and III, uterine size became equal to the size of the cervix in 22.2 and 33.3 % animals, respectively, and the difference was significant ($P<0.05$) in comparison to group II animals in which uterine horn was greater than the size of cervix. On day 35, size of the uterine horn was smaller than cervix in 72.2, 44.4 and 100.0 % of animals in group I, II and III, respectively. In group I and III, size of uterine horn became significantly ($P<0.05$) smaller than the size of the cervix as compared to group II on day 35 postpartum.

Table.1 Grading of the uterine involution parameter through rectal examination

Parameter		Grade
Location of uterine body and uterine horn	Uterine body and uterine horns in pelvic cavity	3
	Uterine body and uterine horns lie between the pelvic cavity and abdominal cavity	2
	Uterine body and uterine horns in abdominal cavity	1
Size of uterine horn (in comparison to cervix)	< Cervix	3
	= Cervix	2
	> Cervix	1
Uterine tonicity	Good tonicity	3
	Moderate tonicity	2
	Low tonicity	1

Table.2 Assessment of location of uterine body and uterine horn (%) in dystocia affected and normal calving buffaloes

Group	Day	Location of Uterine Body and Uterine Horn		
		Grade		
		1	2	3
I (Treatment group, n=18)	1	100.0^{abc} (18)	0 (0)	0 (0)
	7	100.0^{abc}(18)	0 (0)	0 (0)
	14	55.6^{a} (10)	44.4^{a} (8)	0
	35	0 (0)	16.7^{ac} (3)	83.3^{ac} (15)
II (Non-treatment group, n=9)	1	100.0^{abc}(9)	0 (0)	0 (0)
	7	100.0^{abc}(9)	0 (0)	0 (0)
	14	100.0^{b} (9)	0 (0)	0 (0)
	35	0 (0)	55.6^{b} (5)	44.4^{b} (4)
III (Normal calving group, n=6)	1	100.0^{abc}(6)	0 (0)	0 (0)
	7	100.0^{abc}(6)	0 (0)	0 (0)
	14	16.7^{c} (1)	83.3^{c} (5)	0 (0)
	35	0 (0)	0 (0)	100.0^{ca} (6)

Values bearing different superscripts $^{a,\ b\ and\ c}$ along the column differ significantly on respective day between the groups (P<0.05)

Values bearing similar superscripts $^{a,\ b\ and\ c}$ along the column differ non significantly on respective day between the groups (P>0.05)

Figures in parenthesis indicate number of animals

n: Total number of animals

Table.3 Assessment of size of uterine horn (%) in dystocia affected and normal calving buffaloes

Group	Day	Size of Uterine Horn (In Comparison to Cervix)		
		Grade		
		1	2	3
I (Treatment group, n=18)	1	100.0^{abc}(18)	0 (0)	0 (0)
	7	100.0^{abc}(18)	0 (0)	0 (0)
	14	77.8^{ac} (14)	22.2^{ac} (4)	0 (0)
	35	0 (0)	27.8^{a} (5)	72.2^{a} (13)
II (Non-treatment group, n=9)	1	100.0^{abc}(9)	0 (0)	0 (0)
	7	100.0^{abc}(9)	0 (0)	0 (0)
	14	100.0^{b} (9)	0 (0)	0 (0)
	35	0 (0)	55.6^{b} (5)	44.4^{b} (4)
III (Normal calving group, n=6)	1	100.0^{abc}(6)	0.0^{abc}	0 (0)
	7	100.0^{abc}(6)	0.0^{abc}	0 (0)
	14	66.7^{ca} (2)	33.3^{ca} (4)	0 (0)
	35	0 (0)	0 (0)	100.0^{c} (6)

Values bearing different superscripts a, b and c along the column differ significantly on respective day between the groups (P<0.05)
Values bearing similar superscripts a, b and c along the column differ non significantly on respective day between the groups (P>0.05)
Figures in parenthesis indicate number of animals
n: Total number of animals

Table.4 Assessment of uterine tonicity (%) in dystocia affected and normal calving buffaloes

GROUP	DAY	UTERINE TONICITY		
		GRADE		
		1	2	3
I (Treatment group, n=18)	1	100.0^{abc}(18)	0 (0)	0 (0)
	7	100.0^{abc}(18)	0 (0)	0 (0)
	14	0 (0)	100.0^{abc}(18)	0 (0)
	35	0 (0)	100.0^{abc}(18)	0 (0)
II (Non-treatment group, n=9)	1	100.0^{abc}(9)	0 (0)	0 (0)
	7	100.0^{abc}(9)	0 (0)	0 (0)
	14	0 (0)	100.0^{abc}(9)	0 (0)
	35	0 (0)	100.0^{abc}(9)	0 (0)
III (Normal calving group, n=6)	1	100.0^{abc}(6)	0 (0)	0 (0)
	7	100.0^{abc}(6)	0 (0)	0 (0)
	14	0 (0)	100.0^{abc}(6)	0 (0)
	35	0 (0)	100.0^{abc}(6)	0 (0)

Values bearing different superscripts a, b and c along the column differ significantly on respective day between the groups (P<0.05)
Values bearing similar superscripts a, b and c along the column differ non significantly on respective day between the groups (P>0.05)
Figures in parenthesis indicate number of animalsn: Total number of animals

Uterine tonicity

On day 1, 7, 14 and 35, no significant difference was observed in uterine tonicity of dystocia affected and normal calving buffaloes (Table 4). In all the groups, on day 14 and 35 a non-significant change in uterine tonicity from low to moderate was observed.

In conclusion the dystocia affected buffaloes suffer from various derangements leading to delayed uterine involution which may subsequently delay resumption of ovarian activity that may further lead to reduced reproduction and production efficiency. The findings of the current study indicated that postpartum treatment with prostaglandins and gonadotropin releasing hormone may hasten the uterine involution following dystocia in buffaloes.

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