Effect of Exogenous PGF\textsubscript{2}\alpha and Oxytocin on Postpartum Anestrus and Uterine Involution in Kundhi Buffaloes

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Abstract:

A study was designed to evaluate the effect of Prostaglandins(PG)F2α (Cloprostenol) and oxytocin on postpartum anestrus and uterine involution of Kundhi buffaloes. Total 30 multiparous Kundhi buffaloes of similar parity from potential farm in the vicinity of Tandojam city were selected. These animals were divided into three groups i.e. I, II and III having 10 numbers of animals in each group. The buffaloes of group I were treated with 2ml of PGF2α (0.150 mg Cloprostenol) intramuscularly , the buffaloes of group II was given 2ml of oxytocin (100 I.U.) intramuscularly and the buffaloes group III were treated as control group and administered 2ml of normal saline intramuscularly immediately after starting of labor pains. The time required for expulsion of fetal membranes, uterine involution and occurrence of first postpartum estrus were recorded in all groups. Significantly (p<0.01) early expulsion of placenta was observed in group I (3.1 ± 0.3 hrs) compare to group II (4.45 ± 0.5 hrs) and group III (6.3 ± 0.67 hrs). Time taken for completion of uterine involution was significantly (p<0.01) shorter in group I (29.4 ± 1.74 days) than group II (34.3 ± 2.20 days) and group III (37.8 ± 1.54 days), however, no significant difference between group II and III was found. The mean (± SEM) for postpartum estrus period in groups I, II and III were 70.6 ± 8.02, 82.5 ± 9.82 and 104.0 ± 6.72 days respectively. Significantly (p<0.05) earlier estrus was observed in PGF2α treated animals (group I) than groups II and III. The percentage of animals showed the signs of estrus in groups I, II and III were 80, 60 and 50% respectively. It was concluded that administration of PGF2α and oxytocin in postpartum buffaloes accelerate the process of uterine involution, reduce the time period of first postpartum estrus and induce early expulsion of fetal membrane in Kundhi buffalo.

Key words: Buffalo, PGF2α, oxytocin, postpartum.

Original Article

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Introduction

Despite advancement in controlling reproductive diseases in cattle and buffaloes the serious losses are still going on and infertility remains a major economic problem. Fertility in cattle and buffaloes is hampered by the major parturient problems, these incidences are high (1.2-33.8%) in buffaloes compared to cattle (2.3-11%). Retention of fetal membranes is one of the common maladies during puerperium in cows and buffaloes (Sane et al., 1982) having effects on subsequent fertility.

Reproductive efficiency in buffaloes can be obtained by optimum fertility by limiting the reproductive problems of pre and post parturient disorders whose consequences may result in retained fetal membranes, postpartum anestrus, delayed uterine involution, metritis and retention of fetal membranes and repeat breeding (Perera, 1999; Sane et al., 1982).

The uterine involution and resumption of cyclic ovarian activity are key factors of future fertility, the enhancement of uterine involution and/or earlier initiation of post-partum cyclicity improve the reproductive performance in postpartum buffaloes. Puerperal uterine soundness is essential for the early establishment of postpartum estrus cyclicity (Tiwari et al., 2004). The interval from calving to clinically completed involution of the uterus in dairy buffaloes varied widely with a minimum of 15 days (Bhalla et al., 1966) and a maximum of 74 days (Qureshi et al., 1998). The mean values also varied between 19 days (Usmani et al., 1990), 45th day postpartum (Agrawal et al., 1978) and 52 days (Samo et al., 1987).

The endocrine changes responsible for the resumption of postpartum cyclic activity are complex, the early postpartum period has been linked to temporal changes of hormones mainly prostaglandin (Perera et al., 1981). Uterine Prostaglandin F2α (PGF2α) is responsible for the cyclical regression of corpus luteum, initiation of parturition and resumption of ovarian activity in farm animals (Fairclough et al., 1975; Edqvist et al., 1978; McCracken et al., 1999).

The use of hormones is a major component of reproduction; the prostaglandin and its synthetic analogue are considered as drug of choice in reproductive management of cattle (Seguin 1981). It is widely used to manipulate the early breeding of postpartum buffaloes and pubertal heifers (Shyam 2011), these drugs have major role in the regulation of reproductive cyclicity (Singh and Madan 1985) and in parturition (Prakash and Madan 1985). Use of PGF2α is common during the early postpartum period to improve uterine involution (Lindell and Kindhal, 1983; Bretzlafl, 1987; Nakao et al., 1997) and fertility in dairy cattle (Archbald et al., 1993, 1994). PGF2α and agonists may be used in the treatment and the prevention of placental retention, such treatment and prevention may help to decrease the incidence of delayed uterine involution. In veterinary medicine, oxytocin has been used for induction or enhancement of uterine contractions at parturition, treatment of postpartum retained placenta, metritis and uterine involution after manual correction of prolapsed uterus. On the other hand it is believed that prolonged use of hormones like oxytocin causes fertility disorder i.e. poor estrus sign, low conception rate, reduced lactation period, high embryonic mortality in local herds of buffalo and cattle (Siddiqui and Saeed 2000), low pregnancy chances, increased abortion rate and calf dead soon after delivery because of non availability and poor quality of milk (McDonald 1989; Dominguez et al 1993; Hassan 1993; Qureshi 1998). Hormonal treatments may be helpful in the expulsion of fetal membranes, postpartum estrus, acceleration of the uterine involution and overall may enhance the process of puerperium period, however, studies of various drugs and hormones to enhance the period of postpartum estrus, timely/early expulsion of fetal membranes and restoration of uterus in indigenous local Kundhi buffaloes are lacking and therefore this study is designed to investigate the effect of PGF2α and oxytocin hormone on post-partum anestrus and uterine involution process of this important breed.

Materials and Methods

Animals

Thirty newly calved pluriparous Kundhi buffaloes without any reproductive problems in their last calvings reared at the potential buffalo
farm near city of Tandojam having similar managerial conditions included in this study. The animals were randomly selected from entire farm having uniform body condition, age, parity and similar reproductive status. These animals were divided into three groups having equal (10) numbers of animals in each group. Group I and II were treated as experimental groups whereas animals of group III were assigned to control group.

**Treatment**

All the buffaloes were treated immediately after starting of labor pains, the buffaloes of group I (n=10) were treated with intramuscular injection of 2ml PGF2α analogue (Dalmazine®, Cloprostenol 0.150 mg/ 2 ml, Fatro, Italy), group II received 100 I.U. of oxytocin (Indus Pharma, Karachi) intramuscularly, whereas, group 3 was given 2ml of normal saline intramuscularly.

All the animals were kept under closed observation during act of birth and from day of calving to first postpartum estrus, the experimental animals were observed twice a day viz. morning and evening for induction of estrus. The time (in hours) were recorded for expulsion of fetal membranes, at the same time these animals were also monitored both for behavioral symptoms (frequent urination, bellowing, raised tail, restlessness and licking of external genitalia by other animals) and physical changes (vulvar oedema and mucus discharge) of the reproductive tract.

The appearance of behavioral signs of estrus was considered as first postpartum estrus, the time (days) recorded for uterine involution was done by weekly per rectum palpation from commencement of treatment, the uterine involution was considered complete when both of the horns attained normal size and position of non-gravid state and having fair tone.

**Statistical Analysis**

Data were subjected to analysis of variance to ascertain difference among treatment and control groups using software package Minitab, LSD tests were applied where appropriate. Estrus response and frequency of different symptoms of estrus are expressed in percentage.

**Results**

The mean time required for the expulsion of fetal membranes (Table-1) among three groups was lower in PGF2α treated (Group-1) animals, followed by Group II animals (oxytocin treated), however, higher time was required in control animals (Group III) treated with normal saline, there was significant (p<0.01) difference between the groups. The mean time required for the completion of uterine involution (table-2) among three groups was earlier in PGF2α treated animals (Group-II) compare to oxytocin treated and control groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean (±SEM)</th>
<th>Range (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. PGF2α</td>
<td>3.10 ± 0.3</td>
<td>2-5</td>
</tr>
<tr>
<td>II. Oxytocin</td>
<td>4.45 ± 0.5</td>
<td>2-7</td>
</tr>
<tr>
<td>III. Control</td>
<td>6.30 ± 0.67</td>
<td>3-9</td>
</tr>
</tbody>
</table>

p<0.01

The mean time required for first postpartum estrus for group 1 was significantly (p<0.05) lowest i.e. PGF2α treated animals (Group-I) than groups II and III. The oxytocin treated group showed similar signs of estrus after 12 days and the animals of control group showed the signs of estrus about 12-
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34 days later than hormonal treated groups (Table-3) however, this difference was non-significant between these two groups. Among all thirty experimental animals only 14 buffaloes showed signs of estrus, higher (8) number of animals showed signs of estrus among 10 animals treated with PGF2α, followed by 6 animals in oxytocin treated and 5 animals control groups (Table-4). The frequency of estrus signs like frequent urination, nervousness and excitable, stand to be ridden, mounting, mucus discharge, bellowing, switching of tail and swelling of vulva were higher in PGF2α treated group followed by oxytocin treated and control groups (Table-4).

Table 3: Time (days) required for occurrence of first postpartum estrus.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>Range</th>
<th>±SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. PGF2α</td>
<td>70.63</td>
<td>42-102</td>
<td>8.03</td>
</tr>
<tr>
<td>II. Oxytocin</td>
<td>82.50</td>
<td>40-106</td>
<td>9.82</td>
</tr>
<tr>
<td>III. Control</td>
<td>104.00</td>
<td>80-120</td>
<td>6.72</td>
</tr>
</tbody>
</table>

Table 4: Occurrence of first postpartum estrus and frequency of estrus signs.

<table>
<thead>
<tr>
<th>No. of animals respond to treatment and estrus signs</th>
<th>Treatment groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I. PGF2α (n=10)</td>
</tr>
<tr>
<td>No. of animals and percentage (%) observed in estrus</td>
<td>8 (80%)</td>
</tr>
<tr>
<td>Frequent urination</td>
<td>70</td>
</tr>
<tr>
<td>Nervousness and Excitable</td>
<td>80</td>
</tr>
<tr>
<td>Stand to be ridden</td>
<td>60</td>
</tr>
<tr>
<td>Mounting</td>
<td>40</td>
</tr>
<tr>
<td>Mucus discharge</td>
<td>70</td>
</tr>
<tr>
<td>Bellowing</td>
<td>70</td>
</tr>
<tr>
<td>Switching of tail</td>
<td>50</td>
</tr>
<tr>
<td>Swelling of vulva</td>
<td>50</td>
</tr>
</tbody>
</table>

Discussion

The mean time (days) required for uterine involution in PGF2α treated animals were 29.40 days which are lower than oxytocin and control animals which indicates that PGF2α accelerate the uterine involution in post partum buffaloes and may plays a vital role in the resumption of fertile ovarian cyclicity. The average time taken for uterine involution in all groups in the present study fall in the range reported by Albaquerque (1986); Tiwari et al. (2004); Mavi et al. (2004) and Iqbal et al. (2003). Also in the cows, the similar results of PGF2α treatment have been reported by Kindhal et al. (1984); Lindell et al. (1983) and Young (1989). In the current study the mean time (days) required in oxytocin treated animals were 34.30 days which shows that like PGF2α the oxytocin also hastens the process of uterine involution. Higher values (34 days) of the complete uterine involution were achieved in Bulgarian Murrah buffaloes when treated with oxytocin (Anatoli et al. 2012). These differences may be due to breed, dosage difference, time of administration, climate and managerial practices.

In the present study the time required for expulsion of fetal membranes was shortest in PGF2α treated animals than two other groups and the time required for expulsion of fetal membranes was highest in control animals treated with normal saline, these results fall in the range reported by Hussain (1983) in buffaloes and Muhammad and Muhammad (2002) in cattle. Early expulsion of fetal membranes in the treatment group might have been due to prolonged uterine contraction induced by PGF2α, similar effects of prolonged uterine contractions after a single intramuscular injection of PGF2α have been reported in sheep (Edquist et al.,
1978) and in in-vitro studies on ovine (Gautam, 2002) myometrium. Current findings are in agreement with Shalaby et al. (1994) who observed a significantly shortened time between calving and expulsion of the placenta in buffaloes Herschler and Lawrence (1984) Sinha et al. (2002) and Tainturier and Zaied (1989) in cows. These results are in agreement with LeBlanc (2008) study in which the immediate post partum administration of PGF2α and oxytocin hastening the separation and expulsion of retrained fetal membranes. However, the expulsion of placenta and resumption of early postpartum estrus in buffaloes took longer time in expelling the fetal membranes (Channa et al. 2006). Oxytocin treatment after normal unassisted calving did not significantly reduce the incidence of RFM or improve reproductive performance in crossbred Zebu cows under tropical conditions (Palomares et al. 2010). The variation in results may be due to timing of administration, breed, dose and season of the year.

The mean time required for first postpartum estrus for groups 1, II and III were 70.63, 82.50 and 104.00 days respectively, the lower values i.e. 8 and 20.58 days have been reported by Dhoble and Gupta (1987), these differences can be attributed to differences in breed, climate, method and frequency of estrus detection, physiological status of cyclicality of the animals. Presence of large follicle at the time of treatment, body condition and milk yield of the animal. Moreover, low estrus response in this study may be due to nutritional effect because of scarcity of fodders during early summer days due to late cuts of berseem and high ambient temperature. This inadequate feed result in low body condition scores, and may adversely affect the follicular growth and ovulation.

On similar parameters El-Baghdady (1990) found significantly (p< 0.05) improved results in the oxytocin and PGF2α treated animals, than in those receiving PGF2α alone. Buffaloes therefore seemed to respond better to such treatment than dairy cows, the overall differences may be due to the variation of breed, different treatment, season of the year and dose and different methods used to record these observations.

Conclusion

On the basis of the results of the present it is concluded that PGF2α and oxytocin may be helpful to reduce the time period of first postpartum estrus, promote uterine involution and to induce earlier expulsion of fetal membranes in Kundhi buffaloes.

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