Uterine prolapse in cows: Effect of raising the rear end on the clinical outcomes and reproductive performance

M. Ishii[1], T. Aoki[1], K. Yamakawa[1], T. Uyama[1], S. El-khodery[2], M. Matsui[1], Y. Miyake[1]

[1]Obihiro University of Agriculture and Veterinary Medicine, Obihiro, Hokkaido, Japan
[2]Faculty of Veterinary Medicine, Mansoura University, Mansoura, Egypt

ABSTRACT: The aim of this study was to evaluate the effect of raising the rear end when replacing the prolapsed uterus in cows on the outcome and reproductive performance. A total of 76 cows with uterine prolapse were investigated, 10 of which had died before treatment. According to the posture, cows were divided into standing (Standing: n = 11) and recumbent (Recumbent: n = 55). Recumbent cows were subdivided randomly into lying (Lying: n = 24), lifting up using a cow-lift (Cow-lift: n = 18), and raising hind legs using a tractor (Raising: n = 13). Recovery rate after treatment of all cows was 60.6%. The recovery rate of Recumbent (52.7%) was significantly ($P < 0.01$) lower than Standing (100%). Among the recumbent cows, Lying showed the lowest recovery rate (37.5%), which was significantly lower than the recovery rate (64.5%) of the combined Cow-lift and Raising groups. The mean nonpregnant term of Raising (144 days) was significantly ($P < 0.05$) shorter than of Cow-lift (297 days). In conclusion, the method of replacing the uterus by raising the hind legs during treatment of uterine prolapse in cows could improve the recovery rate and breeding performance.

Keywords: cow; raising hind legs; posture; uterine prolapsed; replace

Uterine prolapse has been recorded in all animal species, although it is most commonly seen in pluriparous dairy cows (Roberts, 1986). 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 (Risco et al., 1984; Potter, 2008). In the period immediately after prolapse occurs 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 (Potter, 2008). It is regarded as a veterinary emergency because without treatment, the cow is likely to die (Murphy and Dobson, 2002; Miesner and Anderson, 2008). Due to the very low incidence (0.002 to 0.003%), only a limited number of comprehensive studies concerned with the survival rate and fertility of affected cows have been reported (Gardner et al., 1990; Jubb et al., 1990; Murphy and Dobson, 2002). The calving-to-conception interval was 50 days longer for rebred prolapse cases compared with matched control (Murphy and Dobson, 2002). The replacement of a fully prolapsed uterus in a cow causes considerable damage to the animal. Unless the uterus is very recently prolapsed, it becomes swollen, hardened and friable, making replacement more difficult. The method of raising the rear end of the cow using a tractor was reported as a quick, easy and essentially practical method of dealing with a prolapsed uterus (White, 2007). Although various methods of treatment of prolapsed uteri were presented, no reports have been carried out to compare the results between each treatment method (Roberts, 1986; Jackson, 1995; Hibberd, 2004; Munro, 2004; White, 2007; Potter, 2008). Moreover, to the best of the authors' knowledge, the effect of modified posture during treatment on the outcome has not been described. Therefore the aim of the present study was to evaluate the effect of raising the rear

end of the cow on the clinical outcome of uterine prolapse. Fertility and reproductive performance of the treated cows were also investigated.

MATERIAL AND METHODS

Cows and techniques

The present study was carried out in Eastern Hokkaido, Japan, during the period of 2000 to 2007. A total of 76 dairy cows (Holstein) in which the uterus had been fully prolapsed within 24 hours after calving were included. Cows were located on 42 dairy farms in two districts. Ten cows had died before treatment. Replacement of the prolapsed uterus was performed on 66 cows. The uterine prolapse treatments were carried out by 10 veterinarians, each case treated by one veterinarian. Each veterinarian selected the cow posture for the replacement of prolapsed uterus depending on the situation and condition of each case. According to the posture at the time of the replacement treatment, cows under investigation were allocated into a standing group (Standing: n = 11) or a recumbent group (Recumbent: n = 55). Furthermore, Recumbent was allocated into two groups: a lying group (Lying: n = 24) in which the cows lay sideways or sat in sternal recumbency during treatment, and the rear-end-raising group (n = 31). The rear-end-raising group was subdivided into (i) the lifting-up group (Cow-lift: n = 18) in which the cows were lifted up by holding the pelvis using a cow-lift (FHK; Sapporo; Figure 1) and (ii) raising-hind-legs group (Raising: n = 13) in which the cow's hind legs were tied 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 (Figure 2). When there was only hard rope, the legs were wrapped by soft cloth under the rope. Treatment preparation and the method used to replace the uterus were performed fundamentally in the same way. To the cows which fell and were unable to stand up and showed clinical symptoms of suspected hypocalcemia, calcium solution (84–140.25 g as calcium gluconate) were intravenously administered (n = 38).

According to parity, cows were divided into the primiparous group, the second calving group, and the third or more calving group. The survival and fertility after uterine prolapse were compared taking into consideration the differences in the posture, parity and veterinarian at the time of replacing the uterus.

Cows that died within one week after treatment were defined as unrecovered cows owing to uterine prolapse, while cows that survived more than one week after treatment were calculated as recovery

Figure 1. Cow-lift: the cow is lifted up holding the pelvis using a cow-lift

Figure 2. Raising: the cow's hind legs are tied together with a rope and the rear part of the cow is raised about one meter by tractor

cows in this study. Mortality rates include dead cows before treatment and unrecovered cows after treatment. When calculating fertility, the insemination rates include all cows that received artificial insemination after treatment. Cows were checked for pregnancy by rectal palpation 40–70 days after insemination. The conception rate was defined as the percentage of pregnant cows/inseminated cows. The term nonpregnant was defined as the number of days from calving to the last artificial insemination which resulted in pregnancy. The reproductive performance was compared with differences in posture.

Statistical analysis

Data were analyzed statistically using Stat View (SAS Institute, Cary, NC, USA). Each value (mean or proportion) was tested by a pair. When the population assessed showed a normal distribution, differences in mean values were tested by the *t*-test. Welch's test was applied when a difference in distribution existed. Differences in proportion were tested on a 2 × 2 contingency table by a χ^2-distribution.

RESULTS

Prognosis of the uterine prolapse

Ten cows out of 76 (13%) died before intervention. Forty cows survived after replacing the uterus with a 60.6% recovery rate (i.e. 40/66). The overall mortality rate in diseased cows was 47.4% (36/76) (Table 1). The recovery rates after treatment were not significantly different between each veterinarian (data not shown). Eleven cows were able to stand up at the time of the replacement of the prolapsed uterus (Standing) with a 100% recovery rate, whereas 55 cows were recumbent (Recumbent), with a significant lower recovery rate ($P < 0.01$) than Standing. Within Recumbent, the recovery rate of Lying was the lowest, 37.5% (9/24). However, the recovery rate of Cow-lift was 61.1% (11/18), and Raising was 69.2% (9/13). Recumbent subgroups

Table 1. Recovery rates of uterine prolapse cows according to posture at the treatment

Posture at the treatment		Recovery rate (%)
All	(n = 66)	60.6
Standing	(n = 11)	$100^{A,a}$
Recumbent	(n = 55)	52.7^{B}
Lying	(n = 24)	$37.5^{B,x}$
Rear-end-raising	(n = 31)	64.5^{y}
Cow-lift	(n = 18)	61.1^{b}
Raising	(n = 13)	69.2^{b}

All = all of the uterine prolapse cows; Standing = standing possible cows; Recumbent = standing impossible cows; Lying = lying or sitting cows; Rear-end-raising = cow-lift or raising; Cow-lift = lifting up holding the pelvis using cow-lift; Raising = raising hind legs using tractor; n = number of cows
Different letters indicate significant difference in the recovery rate (A vs. B = $P < 0.01$, a vs. b, or x vs. y = $P < 0.05$)

Table 2. Comparison of recovery rate with parity according to posture at the treatment

Parity	Posture at the treatment	Recovery rate (%)
Primiparous	Recumbent (n = 17)	64.7
2nd	Recumbent (n = 14)	50.0
3rd or more	Recumbent (n = 24)	45.8
	Lying (n = 12)	25.0[a]
	Rear-end-raising (n = 12)	66.7[b]

Standing = standing possible cows; Recumbent = standing impossible cows; Lying = lying or sitting cows; Rear-end-raising = cow-lift or raising = lifting up holding the pelvis using cow-lift or raising hind legs using tractor; (n) = number of cows
Different letters indicate significant difference in the recovery rate of 3rd or more calving group (a vs. b = $P < 0.05$)

showed significantly lower ($P < 0.05$) recovery rates than Standing (Table 1). This technique is safe and a follow up revealed that no adverse effect had occurred to the treated animals (no injury, no trauma and no fractures).

Comparison with parity

According to parity, the mortality rates were 37.5% in primiparous (1st calving) cows, 50% in second (2nd) calving cows and 55.2% in the third (3rd) or more calving cows. The recovery rates after treatment were 71.4% (15/21) in 1st calving cows, 56.3% (9/16) in 2nd calving cows and 55.2% (16/29) in 3rd or more calving cows. Regarding parity, there was no significant difference between groups. In Recumbent, the recovery rate decreased gradually with increasing parity (1st: 64.7%, 2nd: 50.0%, 3rd or more: 45.8%). In 3rd or more calving cows, the recovery rate of Lying (25.0%) was significantly lower than that of combined Cow-lift and Raising (66.7%; $P < 0.05$) (Table 2).

Reproductive performance

The insemination rate of cows that survived after treatment of uterine prolapse was 77.5% (31/40). The conception rate of inseminated cows was 80.6% (25/31), whereas the pregnancy rate of survived cows was 62.5% (25/40). In comparison with the posture, the insemination and conception rates showed no significant differences. The pregnancy rate of Standing (72.7%) was significantly higher than that of Recumbent (30.9%; $P < 0.01$). In ad-

Table 3. Reproductive performance of uterine prolapse treated cows

	Insemination rate (%)	Conception rate (%)	Pregnancy rate of survived cows (%)	Nonpregnant term (days)
All	77.5 (31/40)	80.6 (25/31)	62.5 (25/40)	189.2 (25)
Standing	90.9 (10/11)	80.0 (8/10)	72.7 (8/11)	177.9 (8)
Recumbent	72.4 (21/29)	81.0 (17/21)	58.6 (17/29)	194.6 (17)
Lying	77.8 (7/9)	71.4 (5/7)	55.6 (5/9)	153.6 (5)
Cow-lift	72.7 (8/11)	75.0 (6/8)	54.5 (6/11)	279.2[a] (6)
Raising	66.7 (6/9)	100.0 (6/6)	66.7 (6/9)	144.2[b] (6)

Nonpregnant term = mean days from calving until the last artificial insemination; All = all of the uterine prolapse cows; Standing = standing possible cows; Recumbent = standing impossible cows; Lying = lying or sitting cows; Cow-lift = lifting up holding the pelvis using cow-lift; Raising = raising hind legs using tractor; ( ) = number of cows
Different letters indicate significant difference in the nonpregnant term (a vs. b = $P < 0.05$)

dition, the pregnancy rate of Standing was significantly higher than that of Lying (20.8%; $P < 0.01$) and Cow-lift (33.3%; $P < 0.05$). The mean nonpregnant term of survived cows was 189.2 days. The mean nonpregnant term of Cow-lift (279.2 days) was significantly longer than that of Raising (144.2 days; $P < 0.05$) (Table 3).

DISCUSSION

In this study, 10 out of 76 cows (13.2%) had died before treatment. This result is higher than that previously reported by Gardner et al. (1990), who reported that four (2%) out of 200 cows with uterine prolapse had died before treatment. However, the recovery rate in this study was 60.6%, which was also lower than those previously recorded (Gardner et al., 1990; Jubb et al., 1990; Murphy and Dobson, 2002). Some possible factors may have led to these results, including the treatment technique, the environment such as the stole form of the barn, temperature, or milk product capacity of the cows, etc, although the precise cause was not clarified.

According to the posture when replacing the uterus, the recovery rate of Standing ($n = 11$) was 100%, and it was significantly higher than other groups. The recovery rate of Recumbent, in which the uterus was replaced lying sideways or sitting in sternal recumbency, was the lowest (37.5%). However, the recovery rate in Rear-end-raising groups was significantly higher than Lying. This finding is in agreement with that previously described on the same issue (Roberts, 1986; White, 2007). It was reported that replacement of the uterus should be done with sitting in sternal recumbency as "frog-legged positioning" (Potter, 2008) or "New Zealand methods" (Jackson, 1995). The latter recommended pulling the hind legs and holding such that the cow sits in sternal recumbency, also when a cow tries to stand (Jackson, 1995). From the results of this study, when a cow can stand up, it will be expected that replacement of the uterus with standing posture will give a higher recovery rate. Therefore, it is suggested not to force to sit down and hold in sternal recumbency. This means that a cow that can stand up is in a good physical and clinical condition. It would thus be reasonable to expect that the recovery rate of standing cows would be higher than that of cows that had fallen and could not stand up. However, for cows which could not stand up, the recovery rate is expected to increase by lifting the cow up or by raising its hind legs. Actually, raising hind legs reduces abdominal pressure of the cow and makes it easy to replace a prolapsed uterus. This technique is safe and has no adverse effect on the treated animals. Putting excessive pressure on the uterus while replacing a prolapsed uterus might cause unrecoverable damage to the uterus. Similarly, it is important to choose a posture in which it will be able to replace the uterus under weak pressure. Replacing the prolapsed uterus is considered to be a technique that requires strong physical strength in large animal medical treatments. On the other hand, in many cases, large animal clinicians may be physically unfit (in terms of effort) to treat more than one case at the same time. Therefore, replacing the prolapsed uterus with Rear-end-raising posture will benefit the clinicians' performance in requiring less physical strength.

In comparison with parity in this study, the mortality rate of 1st calving cows was lower and the survival rate was higher than 3rd or more calving cows. Moreover, the recovery rate of Recumbent decreased with increased parity, and even though the rate of Lying of third or more calving cows fell by 25%, it was still significantly lower than Rear-end-raising. The results suggest that damage to the uterus occurs at the time of replacing 3rd or more calving uterus because the uterus is heavier and more power is required to replace the prolapsed uterus than in a primiparous cow.

In the present study, after treatment, the reproductive performance almost agreed with Murphy and Dobson (2002) and Jubb et al. (1990). Since the mean non-pregnant term of uterine prolapse was extended to 189 days, the influence on the reproductive results in uterine prolapse was considered to be serious. In the reproductive results according to posture, the pregnancy rate of Standing was significantly higher than that of Recumbent. Moreover, the pregnancy rate of Standing was significantly higher than Lying and Cow-lift. These results suggest that serious damage in the uterus of the cow might be caused when they receive replacement treatment of the prolapsed uterus in the Lying or Cow-lift postures. Furthermore, the pregnancy rate of Raising was the highest within Recumbent, and the non-pregnant term of Raising was significantly shorter than Cow-lift. Accordingly, the method of replacing the uterus by raising the hind legs was considered to cause only slight damage to the uterus.

In conclusion, in cows with uterine prolapse, posture of the animal at examination may be helpful to predict the prognosis and future breeding performance. In recumbent cows, raising the hind legs could improve the recovery rate and breeding performance after treatment. However, further studies need to be done using larger number of animals to establish the clinical benefits of such techniques.

Acknowledgments

The authors wish to thank their colleagues (Kohji Ito, Hiroshi Ogata, Hiromichi Shimizu, Yoshizumi Takeuchi, Toshinori Nozawa, Ryo Kajiya, Yasuyuki Yamamoto, Taku Okamoto, and Tsuyoshi Jitsukawa) at the Kushiro District Agricultural Mutual Aid Association for their generous offer of data.

REFERENCES

Gardner IA, Reynolds JP, Risco CA, Hird DW (1990): Patterns of uterine prolapse in dairy cows and prognosis after treatment. Journal of the American Veterinary Medical Association, 197, 1021–1024.

Hibberd RC (2004): Replacing the prolapsed bovine uterus. Veterinary Record, 155, 96.

Jackson PG (1995): 13 postparturient problems in large animals. In: Jackson PG (ed.): Handbook of Veterinary Obstetrics. 2nd ed. WB Saunders, London. 209–232.

Jubb TF, Malmo J, Brightling P, Davis GM (1990): Survival and fertility after uterine prolapse in dairy cows. Australian Veterinary Journal, 67, 22–24.

Miesner MD, Anderson DE, (2008): Management of uterine prolapse in bovine. Veterinary Clinic North American Food Animal Practice, 24, 409–419.

Munro IB (2004): Replacing the prolapsed bovine uterus. Veterinary Record, 155, 344.

Murphy AM, Dobson H (2002): Predisposition, subsequent fertility, and mortality of cows with uterine prolapse. Veterinary Record, 151, 733–735.

Potter T (2008): Prolapse of the uterus in the cow. UK Veterinary Journal, 13, 1–3. http://www.ukvet.co.uk/ukvet/articles/Cattle_uterus%20prolapse.pdf

Risco CA, Reynolds JP, Hird D (1984): Uterine prolapse and hypocalcemia in dairy cows. Journal of the American Veterinary Medical Association, 185, 1517–1519.

Roberts SJ (1986): 11 injuries and diseases of the puerperal period. In: Roberts SJ (ed.): Veterinary Obstetrics and Genital Diseases. 3rd ed. Vermont, Woodstock. 353–397.

White A, (2007): Uterine prolapse in the cow. UK Veterinary Journal, 12, 1–3. http://www.ukvet.co.uk/ukvet/articles/Cattle_uterine%20prolapse.pdf

Received: 2009–11–09
Accepted after corrections: 2010–03–18

Corresponding Author:

Mitsuo Ishii, Research Center for Animal Hygiene and Food Safety, Obihiro University of Agriculture and Veterinary Medicine, Nishi 2-sen Inada-cho, Obihiro, Hokkaido 080-8555, Japan
Tel. +81 155 49 5377, Fax +81 155 49 5377, E-mail: mishii@obihiro.ac.jp