Cohort Study of Milk Production and Days to First Insemination Following Roll-and-Toggle LDA Correction

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Introduction

Although surgical correction of abomasal displacement is clearly medically effective, individual dairy producers must decide for each affected animal if correction is economically feasible.[1-6] The roll-and-toggle procedure has been studied as a less expensive alternative to surgical correction.[7,8] Studies have suggested that closed repositioning techniques such as the roll-and-toggle procedure have achieved clinical results which are comparable to surgical repair and may therefore be more cost-effective.[9,10] The purpose of this study was to assess the impact of roll-and-toggle LDA correction on milk production and interval to first insemination.

Materials and Methods

In 1996, all roll-and-toggle procedures performed by a Danish veterinary practice before November 1996 were entered into a computer record. Concurrent diseases such as mastitis, metritis, and ketosis were not recorded in this study. The post-correction care of all cases was IM procaine penicillin G 10 mill IU and 10 mg of dexamethazone given immediately following LDA correction. No subsequent supportive treatment was administered. Toggle sutures were left in place and fell out without assistance.

Twenty-six LDA cases corrected by the roll-and-toggle procedure were each matched with 2 controls. Controls were herdmates with the same parity which had calved closest to the calving date of the LDA case. Each group of 3 matched cows (one case and two controls) was given a number from one to 26 (BLOCK) to indicate the matching relationship in the statistical analysis. On December 16, 1996, production and animal events records were retrieved from the Danish Cattle Data Base (DCDB) for the 26 LDA cases and their 52 matched controls. Under this system, cows have their milk production measured at approximately monthly intervals. Statistical analysis was performed using SAS.[11]

The computer records were searched to retrieve the number of days from calving to first insemination (DFI), and the first 6 monthly measures of daily milk production after calving. The total lactational 305-day adjusted milk production from the previous lactation (before LDA onset in the cases) was obtained for the 24 LDA cows and their controls which were in their second or greater lactation. Milk production in the previous lactation was tested with a general linear model for association with LDA (0 or 1) and BLOCK (1 to 26) as independent class variables.

DFI was only available for 18 of the LDA cases. Because DFI was also missing from many of the control cows, only one matched control per LDA case could be used for the analysis of DFI (dependent variable) in a general linear model containing LDA (0 or 1) and BLOCK (1 to 26) as independent class variables.

The analysis of the 6 monthly milk weights was that of a repeated measures general linear model. However, cows with the most recent calvings in 1996 did not yet have 6 milk weight measurements at the time that the data were compiled and analysed. Also, one LDA case died with endocarditis 28 days after surgery, and

one was culled 160 days after surgery; therefore, not all of the 6 milk weights were available for these cows. In these instances, control milk weights were considered missing if the corresponding milk weight was not present for their matched case. For example, the cow which died only contributed the first monthly milk weight after calving, and therefore her two matched controls also only contributed the first monthly milk weight after calving.

A repeated measures analysis was conducted for the entire 6 milk weight measures (19 blocks) and for the first 5 milk weight measures (21 blocks). Independent class variables were LDA (0 or 1) and BLOCK (1 to 26). The interaction between time and LDA was assessed with the Greenhouse-Geisser test. Each of the 6 consecutive monthly milk weights was also analysed as the sole dependent variable with LDA and BLOCK as class independent variables.

Results

The LDA cases occurred between 4 and 39 (mean= 26) days after calving. The parity (lactation number) ranged from 1 to 5 (mean=2.9). The average DFI was 73 for the controls and 92 for the LDA cases (P = .028). The average milk production in the previous lactation was 7811 (SD=1443) kg for controls and 8107 (SD=1588) kg for LDA cases (P=.31).

The repeated measures analysis for the first 6 and first 5 months showed no significant main effects of LDA (P=.94 and P=.70, respectively). However, the interaction between time and LDA was significant at P < .0001 in both instances. When each of the 6 milk tests was consecutively analysed as the single unrepeated dependent variable, the type III sum of squares significance of LDA was .0001, .029, .95, .093, .018, and .15, respectively (Table 1). As can be seen in Figure 1, LDA cows began their lactation making significantly less milk than their matched controls, and then came to exceed the production of their matched controls after the third monthly milk test.

Table 1.

	Controls[1]			LDA Cases		
Month	N	Mean	SD	N	Mean	SD
1	52	30.9	8.0	26	23.7	10.4
2	48	34.9	6.9	24	31.5	9.5
3	48	32.9	7.8	24	32.8	7.8
4	44	29.8	7.0	22	32.3	5.5
5	42	27.8	6.7	21	31.3	4.7
6	38	25.7	6.2	19	27.8	4.4

[1]Time (1-6)*LDA(0 or1) interaction was significant at P<.0001 by Greenhouse-Geisser test for repeated measures.

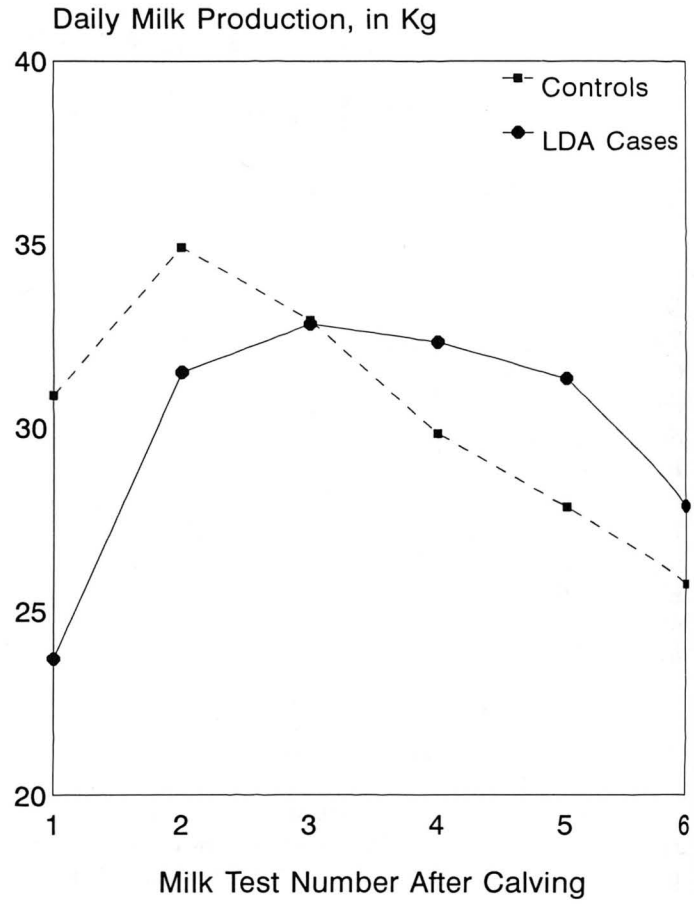

Figure 1. Average Daily Milk Production of LDA Cases and Controls.

Discussion

The relationship between milk production and LDA has long been debated.[12] Some evidence exists that higher producing cows may be at greater risk of developing LDA.[12] In the current study, LDA cases made more milk in their previous lactation than did their matched controls, although the difference was not statistically significant. It is more certain that milk production is lost in the first few months following LDA occurrence.[10,12,13]

Ehrlich[13] conducted a study with a design very similar to the current study. Cases and controls were matched by herd, parity, calving date, and previous lactation production. The LDA was corrected by an open surgical technique. Ehrlich found that subsequent milk production among LDA cases was lower than milk production among controls for the first four months after surgery. Beginning with the sixth month after surgery, he found that production was higher in the LDA cases than it was in the controls. These results are very similar to what was found in the current study (Figure 1), where milk production was initially decreased among

the LDA cases, but then later rose to surpass the milk production of the matched controls. Several factors may account for these findings. There is some evidence that higher producing cows, as measured on a previous lactation, are at greater risk of developing LDA. It can also simultaneously be true that, regardless of their previous production level, cows beginning a high production lactation are at greater risk of developing LDA. When the LDA is corrected, it can be hypothesized that these high producing cows return to their high level of production. Another possibility is that cows which develop LDA early in lactation do not exhaust their fat reserves in the first few months following calving and therefore experience a delayed peak production after their LDA has been corrected.

The observed increase in DFI among LDA cows is most likely due to the metabolic stress of the LDA condition during the time that they should have been returning to estrus. This is an additional cost component which must be considered when estimating the total cost of LDA.

Economic comparison of the pyloro-omentopexy versus the roll-and-toggle procedure for treatment of LDA showed that the roll-and-toggle procedure yielded a $150 advantage over an open surgical repair.[10] That study included the cost of the LDA correction procedure, the cost of culling, and the impact on daily milk production in the subsequent 120 days. No significant difference in milk loss following LDA correction was observed between surgical and roll-and-toggle cases.

In the current study, minimal post-operative care was given to the 26 LDA cases. We suspect that at least some improvement in milk production might have been realized had additional supportive treatment been administered. As it was, the LDA cases repaired by the roll-and-toggle procedure quickly returned to full milk production following their recovery, and even came to exceed the production of their matched controls.

Summary

Cows with corrected LDA were found to have a longer interval to first service when compared with matched controls and were found to have depressed milk production for the first few months after calving. Subsequent to the third month after calving, LDA cows produced more milk than did their matched controls. These findings support the results of other studies in indicating that use of the roll-and-toggle procedure quickly returns cows to full milk production similar to that seen following LDA correction with more expensive surgical interventions. Questions remain regarding what Ehrlich[13] has referred to as "super-normal milk production" following LDA correction.

References

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