ARTICLES

A comparison in 101 dairy cows of right paralumbar fossa omentopexy and right paramedian abomasopexy for treatment of left displacement of the abomasum

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Abstract

Right paramedian abomasopexy and right paralumbar fossa omentopexy appear to be the most widely used means of correcting left displacement of the abomasum in dairy cattle. We compared these two procedures in a prospective study of 101 cows with uncomplicated left displaced abomasum. The surgical treatment (right paramedian abomasopexy, n = 48; or right paralumbar fossa omentopexy, n = 53) was assigned randomly. Follow-up information was obtained, at regular intervals, from one week through six months following discharge from the hospital. Milk production, reproductive performance, surgical complications, and length of time retained in the herd after surgery were obtained for each animal. There was a trend in favor of the abomasopexy group in the one-month milk yield. There were no differences between procedures either in incisional complications, other problems noted at follow-up, or in the proportion dead/culled. Based on the milk yield at one month after surgery, we concluded that there may be a slight advantage to right paramedian abomasopexy in cows with uncomplicated left displaced abomasum.

Résumé

Comparaison entre l'omentopexie effectuée dans la région de la fosse paralombaire droite et l'abomasopexie effectuée dans la région paramédiane droite pour la correction chirurgicale lors d'un déplacement à gauche de l'abomasum, chez 101 vaches laitières

Les deux techniques chirurgicales les plus souvent utilisées pour corriger un déplacement à gauche de l'abomasum chez les vaches laitières sont l'abomasopexie paramédiane droite et l'omentopexie paralombaire droite. Les auteurs ont comparé ces deux procédures lors d'une étude prospective chez 101 vaches présentant un déplacement à gauche de l'abomasum sans autres complications. Le choix du traitement chirurgical (abomasopexie paramédiane droite, n = 48; omentopexie paralombaire droite, n = 53) s'est fait au hasard. Le suivi des cas s'est échelonné à intervalles réguliers pour une période de six mois, débutant à la première semaine suivant le congé de l'hôpital. Pour chaque animal, les renseignements suivants ont été obtenus : la production laitière, le rendement reproductif, les complications chirurgicales, la durée de temps entre la chirurgie et la réforme de l'animal. Les résultats indiquent une tendance favorable pour le groupe d'animaux ayant subi une abomasopexie en ce qui concerne le facteur de production laitière après un mois. Les données n'ont pas montré de différence entre les deux groupes de traitement pour ce qui est des complications au site d'incision chirurgicale ou d'autres problèmes remarqués lors du suivi ou dans la proportion d'animaux morts/réformés. Considérant les résultats de la production laitière un mois postopératoire, les auteurs ont conclu qu'il y aurait peut-être un léger avantage à utiliser la technique chirurgicale par abomasopexie paramédiane droite chez les vaches présentant un déplacement à gauche de l'abomasum sans autres complications.

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Introduction

Left displacement of the abomasum is a well recognized, common disorder of adult dairy cattle (1-7). Clinical signs associated with left displaced abomasum include decreases in appetite, fecal output, and milk production (1). The decrease in milk production results in an economic loss for the farmer. In one study, cows experiencing left displaced abomasum produced an average of 755 kg less milk than expected during the lactation when left displaced abomasum occurred (8). Another study, done in 1966, predicted that affected cows would milk 368 kg less per lactation and that, with surgery, the total cost of left displaced abomasum could be estimated at $(US)90-152/

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Table 1. Comparisons of continuous measurements between cows randomized to abomasopexy or to omentopexy (101 cows with left displaced abomasum, Cornell University, 1987–89)

	Abomasopexy				Omentopexy				Rank sum test	
	n	Median	Minimum	Maximum	n	Median	Minimum	Maximun	z	p
Preoperative measurements										
Previous lactation milk yield ($kg \times 10^2$)	28	88	0	132	34	82	0	131	0.41	0.68
Parity	8	1	1	3	10	2	1	4	0.93	0.35
Days postpartum	43	14	2	250	50	14	2	200	0.10	0.92
Duration of signs (d)	37	2	1	14	45	3	1	36	1.43	0.15
Postoperative measurements										
Milk yield (kg/d)										
1 wk follow-up	32	27	11	41	31	26	12	55	0.35	0.73
1 mo follow-up	43	34	16	53	41	31	14	57	1.88	0.06
3 mo follow-up	41	34	19	53	45	34	11	53	0.13	0.90
6 mo follow-up	31	26	13	45	38	27	0	42	0.70	0.48

cow (7). Nevertheless, a more recent report used a decision-tree analysis to show that surgical treatment was the most cost-effective means of decreasing the financial loss incurred by abomasal displacement (9).

There is a variety of surgical procedures described to correct abomasal displacements (1,6,7,10). The purpose of these procedures is to return the abomasum to its normal position and to prevent recurrence of the displacement (6,10). The right paralumbar fossa approach with omental fixation (right paralumbar fossa omentopexy) and the right paramedian approach with abomasal fixation (right paramedian abomasopexy) appear to be the most widely used surgical techniques (7,11,12). Although favorable long-term results have been reported with each procedure, recurrence of the displacement and poor reproductive performance also have been documented (3,6,7,13,14).

While there are certain indications for doing a right paralumbar fossa omentopexy and others for a right paramedian abomasopexy, it remains controversial as to which procedure is more advantageous. To our knowledge, no randomized, prospective study comparing right paralumbar fossa omentopexy and right paramedian abomasopexy has been done. The purpose of the study reported herein was to determine, in cows with uncomplicated left displaced abomasum, if either surgical procedure (right paramedian abomasopexy versus right paralumbar fossa omentopexy) was superior in terms of the affected cow's return to milk production, reproductive performance, number of postoperative complications encountered, and survival in the herd.

Materials and methods

A description of the study was sent to all bovine practitioners within a 50-mile radius of the New York State College of Veterinary Medicine. It explained the previously-mentioned objectives of the study and the inclusion criteria: any mature (greater than two years) dairy cow with uncomplicated left displaced abomasum. Cows with systemic illnesses and those that had previous attempts at abomasal fixation were excluded from the study. Cows with metritis but which were not febrile and had a normal leukogram were accepted into the study. Financial incentive was made available to the owner to encourage participation. Informed consent was obtained from the owner or referring veterinarian prior to inclusion in the study. On presentation (or at the initial contact), a complete history was obtained including age, breed, duration of signs, stage of lactation, previous treatment, and any concurrent illness. A complete physical examination was done. Temperature and heart and respiratory rates were recorded, as well as the results of simultaneous auscultation and percussion (nature of the left-sided "ping"), the status of the udder and uterus, and any other abnormal findings. Many of these items were used to confirm eligibility for entry into the study. The surgical treatment (right paramedian abomasopexy or right paralumbar fossa omentopexy) was assigned using a randomization table. Cattle were admitted to the study from March 1987 to March 1989.

Surgical technique

Right paramedian abomasopexy

Cattle were fasted for approximately 12 hours prior to surgery. The cows were sedated with 20–40 mg of xylazine IV (Haver, Shawnee, Kansas, USA) and placed in dorsal recumbency. A right paramedian exploratory celiotomy was done. Following gas decompression, the abomasum was placed in its correct anatomical position. A 6 cm portion of the greater curvature of the abomasum (approximately 10 cm from the reticulo-abomasal junction and 4 cm from the attachment of the greater omentum) was incorporated into the closure of the internal rectus sheath [0.60 mm polyamide (Supramid, Jackson Inc., Alexandria, Virginia, USA), simple continuous pattern]. Care was taken not to penetrate the mucosa of the abomasum. The rectus muscle was closed with

Table 2. Comparisons of discrete data between cows randomized to abomasopexy and cows randomized to omentopexy (101 cows diagnosed with left displaced abomasum, Cornell University, 1987–89)

Problems/Complications	Abomasopexy	Omentopexy	Chi-square (all df = 1)	p
In hospital (missing data = 11)				
Number records	44	46	—	—
No problems	8	15	2.46	0.12
Metritis/vaginitis[a]	13	13	0.02	0.89
Mastitis/udder[a]	13	7	2.67	0.10
Incisional problem (missing data = 2)				
Yes	5	5	0.03	0.87
No	42	47	—	—
Breeding performance				
Bred by 1 mo follow-up (missing data = 22)				
Yes	7	9	0.25	0.61
No	32	31	—	—
Bred by 3 mo follow-up (missing data = 13)				
Yes	27	32	0.28	0.60
No	15	14	—	—
Pregnant by 3 mo follow-up (missing data = 57)				
Yes	7	4	0.76	0.38
No	16	17	—	—
Pregnant at 6 mo follow-up (missing data = 33)				
Yes	26	24	0.91	0.34
No	7	11	—	—
Pregnant or postpartum at 1 yr follow-up[b] (missing data = 38)				
Yes	23	23	0.39	0.53
No	7	10	—	—
Problems noted				
By 1 mo follow-up (missing data = 7)				
No	31	37	—	—
Yes; other[c]	11	10	0.30	0.59
Yes; dead/culled[d]	2	3	0.10	0.75
By 3 mo follow-up (missing data = 12)				
No	32	40	—	—
Yes; other[c]	7	6	0.39	0.53
Yes; dead/culled[d]	2	2	0.03	0.87
By 6 mo follow-up (missing data = 17)				
No	31	40	—	—
Yes; other[c]	4	4	0.12	0.73
Yes; dead/culled[d]	3	2	0.47	0.49
By 1 yr follow-up (missing data = 37)				
No	21	25	—	—
Yes; other[c]	5	3	0.77	0.38
Yes; dead/culled[d]	4	6	0.22	0.64

[a]These findings were independent categories that were not mutually exclusive
[b]Including one cow which aborted
[c]Mutually exclusive with "dead/culled," and compared to "no"; missing data were possible
[d]Mutually exclusive with "other," and compared to "no" and "other" combined; missing data were possible

0-catgut (chromic gut, Ethicon Inc., Somerville, New Jersey, USA) in a simple continuous pattern; the external rectus sheath was closed with No. 2 polyglactin 910 (Vicryl, Ethicon) in a simple interrupted pattern; the subcutaneous tissues were closed with 2–0 catgut in a simple continuous pattern; and the skin was closed with 0.60 mm polyamide in a Ford interlocking pattern.

Right paralumbar fossa omentopexy

Surgery was done while the cows were standing in a set of stocks. A right paralumbar fossa exploratory celiotomy was done first, and the abomasum was identified between the rumen and the left body wall. The abomasum was decompressed and returned to normal position by sweeping it under the rumen or applying traction to the greater omentum. A fold of greater omentum was identified 5 cm caudal to the pylorus and incorporated into the closure of the transversus abdominus muscle using 0.60 mm polyamide in a simple continuous pattern. The muscle layers were closed with 2 catgut in a simple continuous pattern, and the skin was closed with 0.40 mm polyamide in a Ford interlocking pattern.

Follow-up via telephone or written questionnaire was done at one week, one month, three months, six months, and one year following discharge from the hospital. Any incisional complication (including

edema, seroma formation, infection, or herniation) was recorded. Milk production for the present and subsequent lactation, reproductive performance, and length of time remaining in the herd were obtained for each animal. For cows in their prepartum "dry" period or that had calved so recently that no milk weight was available yet in the new lactation, milk weights of "zero" were recorded as missing values.

Statistical analysis

The continuous variables (previous-lactation 305-day mature equivalent milk yield, parity, days postpartum, duration of clinical signs, and daily milk yields) were compared between treatment groups using Wilcoxon's rank sum test (a nonparametric test was used because some variables were skewed). Milk yields were tested only through the six month follow-up to avoid confusion with new lactations. Twenty-six milk weights of "zero" were recorded as "missing": 21 because the cows were prepartum, one because the cow was just postpartum, and four because they didn't make sense (two at six months, two at two years).

All other variables were tested using 2 × 2 (one degree-of-freedom) chi-square tests. Tested variables included the presence of metritis, vaginitis, and mastitis. The incidence of postoperative incisional problems also was compared. The tests comparing the proportion of cows bred at one month and three month follow-ups excluded the two cows which freshened by three months, because these tests were intended to test breeding performance rather than maintenance of pregnancy and it was unreasonably early to test for new occurrence of pregnancy. Similarly, the test comparing the proportion of cows pregnant by the three month, six month, and one year follow-ups included (as failures) cows never bred, but excluded cows bred but not yet checked for pregnancy, cows which had already freshened postoperatively, and cows which aborted before six months postoperatively (no cows aborted before the three month follow-up). The comparison at the one year follow-up also excluded the bred cows which were not yet confirmed as either pregnant or nonpregnant. Furthermore, it considered both cows not bred and cows bred but still confirmed to be nonpregnant to be "failures," and counted both pregnant and freshened cows as "successes."

Codes for problems noted at follow-up were collapsed into four mutually-exclusive categories (Table 2): "missing" (no information); "no" (cow explicitly noted to be in the herd and to have been stable since the last follow-up); "yes other" (including metritis, mastitis, foot/leg, displaced abomasum, and other problems but the cow was still in the herd); and "dead/culled" (since the last follow-up). In these chi-square tests for follow-up through one year, "yes, other" was compared to "no", and "dead/culled" was compared to "yes" and "no" combined.

All calculations were done using the Statistix (Analytical Software, St. Paul, Minnesota, USA) computer software package. Differences were considered significant if $p < 0.05$ and interesting trends were noted at $p \leq 0.1$. Missing values were possible in all variables except for the treatment group.

Results

Cows from 48 different farms were included in the study. One farm contributed 26 cows; the most from any other farm was 5. There were no differences between treatment groups in any of the preoperative comparisons (Tables 1 and 2), except that there was a tendency for more mastitis in the cows assigned to abomasopexy. This implies that the groups as randomized were reasonably similar. Because the numbers of days fresh were similar, we did not correct for days in milk in the follow-up milk-yield or breeding-performance comparisons.

There was a trend in favor of the abomasopexy group in the one month milk yield (34 kg/day versus 31 kg/day, Table 1). All other follow-up comparisons had $p \geq 0.10$ (Tables 1 and 2). We feel that the high p values and lack of any trends (by inspection) imply that the procedures were generally equivalent; lack of significance is not due merely to small sample sizes.

There were no differences between surgeries either in incisional complications, other problems noted at follow-up, or in the proportion dead/culled. No cows regurgitated while positioned in dorsal recumbency during paramedian abomasopexy. The average length of hospital stay for both treatment groups was two to three days. Four cows were lost from the abomasopexy group and five from the omentopexy group due to herd dispersals. Excluding the cows lost due to dispersals, to date (including some two-year follow-ups) we know of 26 out of 44 and 32 out of 48 cows dead or culled out of those randomized to the abomasopexy and omentopexy groups, respectively ($X^2 = 0.57$, df = 1, $p = 0.45$).

Discussion

Following surgery, the timing of the one-month follow-up would correspond roughly to the peak of lactation in nonaffected cows (because the median days postpartum were 14, and 14 plus 30 = 44). Certainly, a 34 kg or 31 kg near-peak yield is not outstanding for a Holstein cow — implying a possible biological effect of left displaced abomasum (and/or its management) on milk yield. It is interesting that the milk advantage was in favor of the abomasopexy group, although this was the group noted to have a trend toward more mastitis prior to surgery. Apparently, the mastitis disadvantage (which should have decreased milk yield) was overcome; the abomasopexy surgery may present an even greater than 3 kg advantage over the omentopexy in cows free of mastitis. Conversely, it is possible that the higher-producing cows have greater incidence of mastitis and therefore the response of the omentopexy group was not inferior. (However, the previous-lactation mature equivalents were not significantly different.) Regardless, at subsequent follow-ups the milk yields were similar, so the advantage was not maintained throughout the lactation.

The proportion of cows confirmed to be pregnant at the three-month follow-up (25%; 11 checked pregnant but four bred and confirmed to be nonpregnant and 29 not yet bred) was undesirably low for cows over 90 days postpartum. This possible depression in breeding performance may have been either a biological

effect of the left displaced abomasum or a management response to the left displaced abomasum. Also, 19 abomasopexy and 25 omentopexy cows had been bred by then but not examined for pregnancy. As such, the actual proportions pregnant could be quite different. The overall proportion of cows dead or culled by the one-year follow-up (38%) is higher than the crude death/cull rate per lactation (rather than per year) recorded from selected Holstein herds serviced by our clinic (18.7%) (15). However, the higher rate is consistent with the previous finding of 43-times greater odds of culling for "miscellaneous reasons" in cows with left displaced abomasum compared to cows without left displaced abomasum (15).

There is little difference in the cost of doing a right paramedian abomasopexy versus a right paralumbar fossa omentopexy. Our results indicate that there is no difference in either the breeding performance after surgery or the incidence of incisional complications. Based on the milk yield at one month after surgery, our results suggest a slight preference for a right paramedian abomasopexy in a cow with an uncomplicated left displaced abomasum.

There are two major areas that could have introduced a bias into our results. First of all, there were many different farms involved in the study. This could affect care of the animal after surgery, milking practices, and breeding schedules. While we did not obtain farm-specific data, we feel that the randomization procedure should have balanced out the confounding variables.

Second, different clinicians did the surgeries. This could affect the time of the operation and the degree of tissue trauma. However, the abdominal approaches and closures all were done in the same manner, and, for these procedures, the surgical techniques in our hospital are so routine that we do not feel this is an important consideration.

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