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Rectal Palpation Associated Cumulative Trauma Disorders and Acute Traumatic Injury Affecting Bovine Practitioners*

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Abstract

A survey was conducted to determine the prevalence, time of onset and anatomical location of musculoskeletal injuries among bovine practitioners. The survey response rate was low and respondents had significantly more years in practice than the sampled population. Musculoskeletal injuries were reported by seventy-one percent of respondents. Palpation associated acute traumatic injury was reported by thirty percent of respondents. The anatomical locations most frequently affected, in descending order, were the shoulder, elbow, wrist, neck, knee and hip. Current palpation level of activity was not associated with the presence of symptoms. Symptoms were reported significantly more frequently on the same side of the body as the arm used to perform rectal palpation.

Introduction

Occupational arm, neck and shoulder syndrome affecting large animal practitioners have been described.[1] The syndrome was first reported in 1996 by a western Canadian orthopedic surgeon. In this report, shoulder, arm and neck pain appeared to be associated with performance of rectal palpations and calving assistance. In this case report, the repetitive nature of multiple procedures, performed with the arm extended, appeared to cause traction type injury to the roots of the cervical spinal nerves 5 to 7 at the spinal foramina. It was hypothesized that symptoms occurred on the side contralateral to the palpation arm because the neck was bent away from the arm in use. Correction of technique and rest were recommended to avoid permanent neurological impairment.

Repetitive motion or cumulative trauma disorders (CTD) are disorders of the musculoskeletal and nervous systems that are caused or aggravated by repetitive motion, forceful exertions, vibration, mechanical compression, or sustained or awkward postures occurring over extended periods of time.[13] Muscles, tendons and joints of the upper extremities are most frequently affected. The number of CTDs reported by private industry has increased steadily over the last decade. According to a Bureau of Labor Statistics report, Worker's Compensation claims for CTD have increased 300% in the recent decade.[13] Industries with the highest level of CTDs are motor vehicle and equipment manufacturers, followed by meat packers. The U.S. Department of Health and Human Services[4] has published a complete review of epidemiological evidence for work-related musculoskeletal disorders. Annual survey data compiled by OSHA includes data on injury and illness logs required from all U.S. industries with one or more employees. In 1990, CTDs represented only 3% of all illnesses and injuries reported by industry in the U.S.[5] Total cases of all injury and illness by industry showed dairy farms and veterinary services as among the highest risk industries in 1996 with 12.9 and 8.1 cases per hundred workers, respectively.[6] No data on the incidence of CTD, in specific, or all illness and injuries have been reported for the subcategory of bovine practitioners. Questionnaire and interview of employees, sometimes along with physical examination, are used to estimate incidence of occupation CTD disease.[11]

Members made frequent requests for assistance and information to an organized veterinary medicine association, the American Association of Bovine Practitioners (AABP). Practitioners described CTD associated

Dedicated to Dr. Bob Love, who lost his life as a result of dedicated work in our profession.

with palpation that resulted in a change of technique, practice focus and occupation. Several practitioners reported severe, chronic pain and impairment. Documentation of the association between professional activity and symptoms was requested from AABP by members to support medical insurance and workers compensation claims. The author was contacted and agreed to conduct a member survey.

The purpose of this study was to describe the prevalence, anatomical location and time of onset of self-reported CTD among responding bovine practitioners. Association of disease status with potential risk factors was also examined.

Materials and Methods

This investigation was a descriptive study of exposed persons. Exposed persons were defined as veterinary practitioners that were members of the AABP. Systematic search for exposed persons was done by mailed survey (Figure 1) to all AABP members conducted in 1996. No individual contact was made. The study group consisted of all respondents.

Resources available to conduct the study included a pool of exposed professionals and the voluntary efforts of the author. Since minimal resources could be devoted to conduct of the study, the minimum desired survey participation rate was arbitrarily set at 10%.

For the purpose of analysis, any self-reported musculoskeletal injury was considered to be CTD. Palpation associated acute traumatic injury (ATI) was also reported. Denominators used to calculate rates varied for each question with the number of complete, legible responses.

Survey results were summarized using computer software for epidemiologic analysis, Epi Info. Data on quantitative variables were statistically evaluated via analysis of variance or two-sample t-test. Differences with respect to dichotomous variables were statistically evaluated by chi-square tests. Odds ratios were calculated according to the methods described by Cornfield. Confidence limits were determined by Fisher exact methods when expected cell values were less than five. A significance level of 0.05 was used in all statistical tests.

Results and Discussion

The mailing resulted in a survey response of 434 responses from an estimated 4,000 clinical practitioners on the mailing list. The mean age of respondents was 46.3 years (SD=10.5). The mean number of years in practice was 19.5 (SD=10.6). The distribution of years in practice differed significantly ($F = 68.57$, $p<0.01$) from the membership database (n=4952, mean 14.2, SD=12.6). The membership database includes not only practitioners but also academic and industrial veterinarians. Bias due to a higher response rate among injured practitioners cannot be ruled out in this study design.

The prevalence of CTD among respondents was high (308/432, 71%). Many practitioners also reported ATI associated with palpation (132/432, 31%). Based on the self-reported year of first symptoms and graduation year, the mean years to CTD was 12.3 (SD 9.1). A similar survey of electricians found that the average number of years in trade was five. At least one musculoskeletal symptom was reported by 82% of respondents.[14]

The historical incidence of diagnosed pathology (187/432, 43%) was lower than the prevalence of any musculoskeletal problem. Fewer respondents (100/432, 23%) reported a history of orthopedic surgery. This is consistent with other studies in which physical examination estimates of prevalence are approximately half of self-reported symptom estimates.

Exposure was measured by the current number of hours palpating per week (mean=13.5, median=12, SD=9.9 range=0-65) and cows palpated per day (mean=136.0, median=75, SD=174.6 range=0-1800). Several practitioners reported lifetime totals in excess of one million head. No association was found between either hours per week (Odds Ratio = 1.30, 95% CI 0.67 – 2.52) or cows per day (Odds Ratio = 0.95, 95% CI 0.55 – 1.63) and the likelihood of reporting CTD. Since current activity level may be influenced by prior CTD status, a better estimate of historical occupational risk should be developed.

This study cannot rule out the possibility that prevalence of CTD may be underestimated or historical risky behaviors modified. The healthy worker effect is a bias in estimation of disease prevalence due to attrition of affected individuals. The attrition rate and behavioral changes due to injury were reported to be high. Many respondents reported changes in technique or professional activity selection. The arm used to palpate was changed by 8% of those with self-reported CTD, technique was changed by 29%, and 11% changed occupation.

A large proportion of practitioners (137/439, 31%) participated in recreational activities that may contribute to CTD. Popular hobbies included team sports (43/137), outdoors sports (25/137) and rodeo or equestrian activities (11/137). No association was found between potentially injurious hobbies and ATI (OR = 1.25, 95% CI 0.79 - 1.98) or these hobbies and CTD (OR = 1.16, 95% CI 0.72 – 1.87). In studies of other professions and trades, hobbies were not found to be a risk factor for CTDs.[16,17] In fact, both of these studies found active leisure pursuits were protective.

CTD occurred most frequently in the shoulder (53%), but all major joints appeared to be affected, including the elbow (32%), wrist (24%), neck (23%), knee (18%) and hip (10%). No comparative data exist for practitioners of similar age groups that do not perform palpations or from

Figure 1. Survey — Repetitive Motion Disorder Among Bovine Practitioners as a Result of Rectal Palpation

Rectal palpation can represent a major proportion of professional time and physical activity for the bovine practitioner. Repetitive motion can create musculoskeletal injury and associated pain debilitating enough to require major surgery or undesired changes in professional tasks. This survey is intended to characterize the prevalence of these problems within our profession and to attempt to determine the most common injuries and level of activity associated with pathological conditions. Each of us may be faced with this issue at some point in our professional lives. Please take time to participate.

1. In what year did you start bovine practice?
2. What is your current age?
3. Approximately how many hours per week do you perform rectal palpations currently? In the average practice year?
4. How many cows do you palpate in a typical day?
5. Which arm(s) do you routinely use for palpation? One or both. Left or right.
6. Have you changed the arm you use to palpate? Y or N
7. Have you altered your technique as a result of injury? Y or N
8. Have you changed the nature of your practice because of injury? Y or N
9. Do you have hobbies that may contribute to musculoskeletal injury? Y or N. Specify_____
10. Do you have a history of palpation associated *traumatic* injury? Y or N
11. Do you have or have you had any musculoskeletal problems, including undiagnosed discomfort? Y or N.
    Specify _____

Location:		
	Neck	L R
	Knee	L R both
	Wrist	L R both
	Shoulder	L R both
	Hip	L R both
	Elbow	L R both

12. When did this problem first occur (what year)?
13. Have you been diagnosed with musculoskeletal pathology? Y or N
14. Have you had surgery for an orthopedic injury? Y or N. Specify_____
15. What other therapy have you used to attempt to alleviate symptoms? _____
    Did it help? Y or N

other professional groups. Similar self-reported rates of CTD have been found among manual laborers such as farmers, meat packers, chicken deboners, carpenters, electricians and garment manufacturers.[5,9,10,12,14,15]

Side of injury can be used to evaluate risk associated with palpation (Table 1). It is common for veterinarians to perform rectal palpation with the non-dominant arm. Therefore, risk from other activities, which presumably are performed with the dominant limb, is less likely to be confounding. The risk of incurring CTD on the side of palpation was significant for most body regions. For example, practitioners who palpate with the left arm are 30 times more likely to have left shoulder symptoms than right-armed palpators. Neck symptoms do not appear to be contralateral to the arm used as previously reported.[1] The relationship between handedness and palpation arm could not be examined, since the dominant hand was not requested in the survey.

Surgery, anti-inflammatory medication and chiropractory were the most commonly reported methods selected for abatement of symptoms (Table 2). All three modalities resulted in relief. Recommended conservative therapies for CTD include rest, heat and ice, nonsteroidal anti-inflammatory drugs, physical therapy, and splints.[14]

Future studies could examine the effects of handedness, height, gender and technique on CTD. These variables have all been associated with CTD in other studies.[17] Differences in risk among beef and dairy practitioners should be examined, due to the seasonal nature of beef obstetrical and gynecological work.

A more precise definition of injury would improve the assessment of risk and disease prevalence. In other studies in which physical examination estimates of prevalence are approximately half of self-reported symptom estimates,[3,7,19] CTD is not differentiated from other musculoskeletal disorders without precise historical information and physical examination.

A cohort study could be designed to compare incidence of injury for persons performing rectal palpations and an appropriate control group. Case – control methodology could be used as an alternate approach with more timely results.

Table 1. Association of palpation arm and side of injury among bovine veterinarians with self-reported CTD.

Body Region	Left arm palpation				Right arm palpation			
	Side of symptoms				Side of symptoms			
	Left	Right	None	OR* (95% CI)	Left	Right	None	OR** (95% CI)
Shoulder	111	13	31	30.8 (11.6-82.0)	5	38	23	14.8 (7.0-31.5)
Elbow	68	11	19	5.9 (1.9-18.1)	4	25	5	22.0 (8.2-59.0)
Wrist	44	8	22	13.1 (1.7-102.5)	1	18	3	37.1 (10.1-136.8)
Neck	39	8	14	2.7 (0.9-8.4)	5	14	2	13.3 (4.1-42.6)
Knee	21	14	23	2.1 (0.5-8.0)	3	2	12	0.42 (0.1-2.1)
Hip	17	6	10	1.7 (0.4-7.8)	3	5	2	4.5 (1.1-9.8)

* = The risk of left-sided CTD for left versus right armed palpation
** = The risk of right-sided CTD for right versus left armed palpation

Table 2. Treatment selection and efficacy among bovine practitioners with self-reported CTD in at least one body region.

Therapy	Frequency of use (% of CTD affected)	Frequency of improvement among users (% of users)
Surgery	77 (24.1%)	54 (70.1%)
Anti-inflammatory products	86 (26.9%)	76 (96.5%)
Chiropractor	30(9.4%)	26 (86.7%)

Ergometric studies comparing palpation technique and disease risk may help define recommendations for bovine practitioners.[18] Proper rest to work ratios can also decrease CTD risk up to seven fold without sacrificing productivity.[8] Training and conditioning new workers can reduce the risk of developing debilitating symptoms.[2] An effort to educate veterinarians and others at similar risk, such as artificial inseminators, could prevent future practitioners from unnecessary suffering and involuntary career changes.

Conclusion

Self-reported musculoskeletal injury, presumptive CTD, is a common ailment of bovine practitioners responding to the survey. A strong association was found between limb used for this activity and side of symptoms. Current activity level may not represent exposure risk adequately.

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Abstract

Monitoring follicular development in cattle by real-time ultrasonography: a review

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The application of real-time ultrasonography to monitoring ovarian function in mammals has advanced the understanding of follicular dynamics and its regulation. Follicular development is a wave-like sequence of organised events. The waves consist of the synchronous growth of small (4 to 5 mm) antral follicles, followed by the selection and growth of one dominant follicle which achieves the largest diameter and suppresses the growth of the subordinate follicles. In the absence of luteal regression, the dominant follicle eventually regresses (becomes atretic) and a new follicular wave begins. The dominant follicle regulates the growth of the subordinate follicles, because the appearance of the next wave is accelerated if the dominant follicle is ablated, and delayed if the lifespan of the dominant follicle is prolonged. During bovine oestrous cycles, two or three successive waves emerge, on average, on the day of ovulation (day 0) and day 10 for two-wave cycles, and on days 0, 9 and 16 for three-wave cycles. During the oestrous cycle there are thus two or three successive dominant follicles, and the last of these ovulates. Ovarian folliculogenesis is a complex process involving interactions between pituitary gonadotrophins, ovarian steroids and non-steroidal factors. Subtle changes in the hormonal milieu regulate folliculogenesis and the emergence of a follicular wave is preceded by a small increase in the concentration of plasma follicle-stimulating hormone. The mechanisms that promote the selection of a dominant follicle have not been elucidated, but considerable progress has been made in understanding follicular development and its regulation. Most treatments designed to control the development of follicular waves have been based on the physical or hormonal removal of the suppressive effect of the dominant follicle, and the consequent controlled induction of the emergence of a new follicular wave. The studies reviewed here describe current methods for regulating the bovine ovarian cycle, interesting models for future studies, and information that may be used for improving reproductive efficiency.

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Johne's Disease Update

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Abstract

Mycobacterium paratuberculosis causes a granulomatous enteritis in cattle that is commonly known as Johne's Disease or paratuberculosis. Young calves acquire the infection *in utero* or within the first few months of age by the fecal-oral route. Available diagnostic tests have limitations, but when used with appropriate management practices, a control/eradication program can be designed to meet the needs of the producer. Control programs are aimed at minimizing or eliminating exposure to the organism. There is no curative treatment for paratuberculosis.

Introduction

This paper will focus on key points pertaining to the organism and the disease, diagnostic aids, and current recommendations for control programs. Johne's Disease or paratuberculosis is caused by *Mycobacterium paratuberculosis* , a gram positive intracellular acid-fast bacillus. The organism is fastidious and requires special media for growth *in vitro* and takes several weeks for results. Because of the organism's slow growth and mycobactin requirement for growth, routine aerobic fecal cultures will not yield the organism. Due to the genetic similarity between *M. paratuberculosis* and *M. avium*, some researchers have recently renamed the microorganism *M. avium* subspecies *paratuberculosis*.[39]

M. paratuberculosis can infect ruminant species such as cattle, sheep, goats, llamas, and deer.

Transmission

Paratuberculosis is generally introduced into naïve cattle herds through purchased additions. Recently purchased animals that appear clinically normal may be shedding large numbers of the organism. Transmission is primarily through the fecal-oral route. Contaminated feedstuffs, fecal soiled bottle nipples or medicators, and fecal contaminated teats are thought to be the most common sources for the fecal-oral route of transmission.

Other potential routes of transmission include *in utero* and colostrum and milk feeding to neonates.[37,44,48,49] Evidence of *in utero* transmission was found by isolation of *M. paratuberculosis* from fetal tissues. In one study, 9 of 34 (26.5%) fetuses were identified as being infected from culture positive cows.[37] In another study, 5 of 58 (8.6%) culture positive fetuses were from dams that were heavy fecal shedders.[49] Investigators have also isolated *M. paratuberculosis* in colostrum (22.2%) and milk (8.3%). The positive samples were from cows that were fecal culture positive.[44] Other investigators identified *M. paratuberculosis* in 9 of 77 (11.7%) milk samples from asymptomatic cows.[48]

Additionally, *M. paratuberculosis* has been isolated from semen and uterine flushings.[22,31,32] In a case report of a clinically normal semen donor bull, *M. paratuberculosis* was isolated from 8 of 31 semen samples over a 21 month period of time. Even though the organism was recovered from the semen, the authors suggested that if appropriate control procedures were instituted at the bull stud, the threat of spread of paratuberculosis was remote. They recommended that purchased bulls come from herds with no history of paratuberculosis. The bulls should be cultured semi-annually. Bulls that culture positive for *M. paratuberculosis* should be isolated from other cattle and any frozen semen collected after the last negative fecal culture should be destroyed.[22]

Embryo transfer has been used to minimize the spread of certain diseases and can be used to export