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Abortion rate during the second half of gestation of cows undergoing surgery in lateral recumbency as compared with cows of a control population

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Summary

In a retrospective study, we compared the abortion rates of 59 cows in the second half of gestation, admitted to the Clinic for Food Animals and Horses (1993-1996) with a strictly focal problem (head region, udder and teats, locomotor system) requiring surgery in lateral recumbency, to the abortion rate of a control cow population. Before surgery, a uterus relaxant was given in 42 cases, and 17 cows were untreated as to pregnancy. Cows included in the reproduction health program of the Department of Fertility and Reproduction were used as a control population. Data of 1,736 cows pregnant in the second half of gestation per year were available for the same time period (1993-1996). Abortion rate was 5.08% for the cows undergoing surgery in lateral recumbency as compared with 5.18% for the cows of the control population. There was no significant difference between the two populations ($P > 0.05$). Thus, the risk for abortion in the cows in question is not elevated as compared with the control population.

Key words: **cattle – surgery in lateral recumbency – risk for abortion**

Abortrate während der zweiten Trächtigkeitshälfte von Kühen, die in Seitenlage operiert wurden, verglichen mit einer Kontrollpopulation

Im Rahmen einer retrospektiven Studie wurde das Abortrisiko (zweite Trächtigkeitshälfte) von in Seitenlage operierten Kühen untersucht. In die Studie eingeschlossen waren 59 zwischen 1993 und 1996 an die Nutztierklinik überwiesene Tiere mit einem streng fokalen Problem (Kopf, Euter, Bewegungsapparat). In 42 Fällen wurde ante operationem ein Uterusrelaxans verabreicht. Als Vergleichsgruppe dienten uns die Kühe aus den Herden, die durch die Abteilung für Fortpflanzungsstörungen betreut wurden (Daten von 1736 Kühen in der zweiten Trächtigkeitshälfte pro Jahr). Die Abortrate der operierten Kühe (5,08%) unterschied sich nicht signifikant von derjenigen der Kontrollgruppe (5,18%).

Schlüsselwörter: **Rind – chirurgische Eingriffe in Seitenlage – Abortrisiko**

Introduction

The negative effects of environmental or management stress on reproduction in general are well documented (Moberg, 1975; Vincent, 1972; Zöldag, 1983). Examples of environmental stress are excessive cold or heat, wind or humidity, whereas management related stress can result after intra- or interspecies interaction, after manipulation, transportation, trauma, as the result of the inferior social status of an animal in the herd or of inadequate herd density (Moberg, 1975). Concerning gestation, effects of vaccination for foot and mouth disease (El-Bele-

ly et al., 1994), and cardiopulmonary effects of positioning cows in dorsal recumbency during the third trimester of pregnancy (Dunlop et al., 1994) have been studied. In cattle and horses, Vandeplassche et al., (1976) found, that stress owing to laparotomies increased the risk for abortion. However, animals undergoing laparotomies often show a disturbed general condition and, therefore, abortion may more likely occur due to systemic imbalances than due to the surgical intervention itself (Vandeplassche et al., 1976). To our knowledge, the effect of surgical intervention in lateral recumbency on late pregnancy, with cattle suffering from a strictly focal problem, has not been studied. Stress can alter maternal or fetal adrenal function or both and, consequently lead to elevated levels of plasma corticoids in the cow (El-Belely et al., 1994; Zöldag, 1983). Increased plasma cortisol levels may influence the foetomaternal placental unit, change the oestrogen-to-progesterone ratio and are, as a consequence, able to raise prostaglandin levels and sensitize the myometrium to oxytocin (El-Belely et al., 1994; Vandeplassche et al., 1976). Various methods have been established to prevent abortion in cows at risk (Vandeplassche et al., 1976). They are either based on the substitution of progesterone, using progesterone itself or a synthetic gestagene compound, or they are based on substances inhibiting the prostaglandin synthesis (Daels et al., 1991; Pascoe and Stover, 1989; Vandeplassche et al., 1976).

The purpose of our retrospective clinical study was to calculate the abortion rate of cows undergoing surgery in lateral recumbency in our clinic. According to Vandeplassche (1982), an abortion is the termination of a pregnancy with the expulsion of a not viable fetus. Our question was, whether this abortion rate was elevated as compared with the abortion rate of a Swiss cow population. As abortion data for the Swiss cow population are lacking, we compared the abortion rate of our patients with the abortion rate of a control cow population, representative for the Swiss cows. In a second step, we intended to compare the incidence of abortions for the different months of pregnancy in both groups, and to analyze the abortion rate for each of the surgical manipulations including anaesthesia and therapy with regard to pregnancy in the clinic cases.

Animals, materials and methods

Animals undergoing surgery (= clinical patients)

Fifty-nine cows and heifers 5 to 8½ months of pregnancy, admitted to the Clinic for Food Animals and Horses (1993–1996), have been included in this study. On the day of admission, a general physical examination was performed, and pregnancy was confirmed by rectal palpation. For inclusion in this study, the animals had to be in good general condition, suffering from a strictly focal problem, such as diseases of the locomotor system, udder and teat lacerations or problems of the head region. Anaesthesia was performed according to the primary problem (general anaesthesia, local infiltration, retrograde intravenous). Month of pregnancy and surgical intervention, anaesthesia and side of recumbency were recorded. In some cases, as a precautionary measure, a uterus relaxant was administered. Telephone follow-up inquiries with the owner on the further course of gestation were performed six months to three years after surgery. In case of abortion, we protocolled previous calvings of the cow, abortion history on the farm during the period in question, and we contacted the referring veterinarian to exclude detectable infectious causes of abortion.

Control cows

Cows included in the reproduction health program of the Department of Animal Reproduction served as a control population representative for the Swiss cow population (as abortion data for the Swiss cow population do not exist). Data of 5,208 lactations between 1993 and 1996 were available. As we recorded only one lactation per year in the clinical patients, we chose as a reference population the mean lactation per year in the control population (mean number of cows in the second half of gestation per year = 1,736). Each month of gestation was recorded separately.

Statistical analysis

The odds ratio of the abortion rate between cows undergoing surgery in lateral recumbency and control cows was calculated and significance tested by Fisher's exact test. Level of significance chosen was $\times = 0.05$.

Results

Age and breed of the clinical patients

Age ranged from two to 13 years (mean = 5.6 years). All Swiss breeds were represented (Simmental × Red Holstein, Holstein Friesian, Brown Swiss, Eringer).

Nature of disease

Twenty eight cows were admitted for diseases of the locomotor system (diseases of claws requiring either bone curettage, sesamoid bone resection, or claw amputation, and carpal hygroma). Udder or teat surgery was performed on 26 cows (laceration of udder or teat and teat stenosis). Finally, five cows were suffering from a problem localized in the head region (ocular squamous cell carcinoma, mandibular fracture, tongue lesion).

Anaesthesia was performed according to the nature of the problem: In four cases general anaesthesia was per-

formed. It was induced with xylazine hydrochloride (20 mg/kg body weight [bw] i.m.) and ketamine hydrochloride (2 mg/kg bw i.v.), and was maintained with halothane and oxygen in a semi-closed circle system. Local infiltration including Peterson-block was carried out in eight cases, ring block at the base of the teat in 24 cases and retrograde intravenous limb anaesthesia using a superficial vein in 23 cases. Surgery was performed 21 times in right and 38 times in left lateral recumbency.

Clinic stay and therapy (including therapy concerning pregnancy)

Therapy after surgery for the cows with teat and udder problems consisted of passive milk drainage every second day, followed by injection of intramammary antibiotics for ten days. Cows with a mandibular fracture and cows undergoing eye exstirpation received intramuscular injections of antibiotics for three to five days (penicillin and / or gentamicin, dosage according to manufacturer's proposal). Finally, cows with locomotor problems were under intramuscular antibiosis for three to seven days (penicillin), bandages were changed once to twice a week and initially most of these cows received phenylbutazone orally. The cows stayed at the clinic between three and 50 days (mean = 12 days). As to pregnancy, in 42 cases therapy before surgery included one intramuscular injection of 200 mg of isoxsuprinum hydrochloridum. Seventeen cows were left untreated. The administration of a uterus relaxant before surgery was at the surgeon's clinical judgement.

Abortions in clinical patients

Three of the 59 cows included in our study had an abortion (5.08%) (Table 1). One cow was in the sixth month of pregnancy, two cows in the seventh month. Two cows suffered from a locomotor problem (retrograde intravenous anaesthesia), one cow had been admitted because of a teat laceration (ring block at the base of the teat). As to pregnancy, one cow was not treated, two cows received a uterus relaxant before surgery. Two cows aborted within one week after surgery, and one cow within two weeks after surgery. All fetuses were in fresh condition, one of the cows was delivering dead twins. Diagnostic tests ordered by the referring practitioners did not reveal infectious causes of abortion in any of the three cases.

Table 1: Number of abortions in clinical patients as compared with control cows with regard to month of pregnancy

Month of pregnancy	Abortion in control cows (mean per year = 1,736)	Abortion in clinical patients (n = 59)
5-6	30	1*
6-7	17	2**
7-8.5	43	0
Total	90 (5.18%)	3 (5.08%)

* primary problem teat laceration, local anaesthesia at the teat base, no premedication as to the gravid uterus

** primary problem in the locomotor system, retrograde intravenous anaesthesia of a superficial vein, administration of a uterus relaxant before surgery

Abortion in control cows

The overall abortion rate between 5 and 8½ months of pregnancy was 5.18% with the highest rate between 7 and 8½ months of pregnancy. In the control population, possible causes of abortion were not differentiated.

Statistical analysis

Abortion rate was 5.08% for the clinical patients as compared with 5.18% for the cows of the control population. There was no significant difference between the two populations ($P = 0.634$).

Discussion

Abortion rate in populations free from brucellosis is about 2-4% (Paisley et al., 1978; Vandeplassche, 1982). Thus, the abortion rate of 5.08% of the clinical patients as well as the abortion rate of the control population (5.18%) were above this average. However, there was no significant difference between the two populations. We do not have an explanation for the relative high abortion rate, especially since we only considered the second half of gestation. It might be due to the fact that data of our control population are collected very precisely as we control them every 2 weeks.

Compared to the study of Vandeplassche et al. (1976) with 36 cows undergoing standing laparotomy revealing an abortion rate of 33%, the abortion rate in our clinical patients undergoing surgery in lateral recumbency was negligible. The main difference between these two studies is the fact, that none of our cows suffered from a "general illness" leading to bacteremia, or an elevation of the rectal body temperature above 40 °C. Therefore, the two studies may not be compared. Nevertheless, any clinic stay may constitute a risk of abortion: transport, stress due to an unknown environment, fixing the animal on an operation table including surgery and anaesthesia. Little information is available about correlation between psychological stress and abortion. Lehrer et al. (1974) describe a marked quantitative effect of frightening on uterine motility in ewes. According to Vandeplassche (1982), the extent of a cow's opposition and excitement during surgery may be correlated with the risk of abortion.

Several authors recommend pretreatment as a routine precaution measure in pregnant cows undergoing sur-

gery. To prevent luteolysis, the synthesis of prostaglandin may be blocked either by natrium salicylatum (3× 10 grams / day) (Vandeplassche et al., 1976), or by flunixine meglumine (2.2 mg/kg bw, i.v. or orally) (Daels et al., 1991; Odensvik, 1995; Pascoe and Stover, 1989). The use of isoxsuprin for uterine relaxation (100 mg i.v. or i.m.) is recommended especially when xylazine is used for anaesthesia (Vandeplassche, 1982). As the study described was a retrospective study, therapy as to the pregnant uterus of the clinical patients was not performed at random. Therefore, it remains unknown whether some of the cows treated with a uterus relaxant would have aborted without any treatment.

Progesterone levels under 2 ng/ml usually result in interruption of pregnancy and might, therefore, be used to identify a threatening abortion before clinical signs or changes in behaviour are evident (Vandeplassche et al., 1976). If this is observed, cows are recommended to be treated with progesterone (100 mg–200 mg/day i.m.) or a progestativum (acetate of chlormadinone 10 mg/day orally) (Joechle et al., 1972; Vandeplassche et al., 1976). This therapy should be continued until the expected date of birth (Vandeplassche et al., 1976). If a synthetical progesterone like altrenogest is administered, endogenous plasma progesterone levels can be monitored without a cross-reaction (Shoemaker et al., 1989). Plasma progesterone levels unfortunately were not monitored in our patients, as this is a retrospective study. In six cases we administered five intramuscular injections of 250 mg progesterone in oil on alternate days, beginning with the first day after surgery and followed by oral administration of 10 mg acetate of chlormadinone every day until the expected time of parturition. These six cows are not included in our study as we tried to avoid further data stratification (all of them delivered a living calf).

It remains to suppose, that the two cows in our study aborting after surgery in spite of the application of a uterus relaxant might have suffered from stress-induced luteolysis. Taking the time between stress effect and fetal expulsion in consideration, Vandeplassche et al. (1976) described expulsion of fetuses within four days, whereas Zöldag (1983) referred abortion linked to transport within seven days. In later gestation, fetal death normally occurs as early as three and up to ten days after onset of stress (Vandeplassche, 1982). However, weeks may pass between the onset of stress and fetal expulsion (Ahlers and Grunert, 1997; Paisley et al., 1978). Two cows in our study aborted within one week and one cow within two weeks after surgery. The longer the period between stressor and abortion, the greater the uncertainty that there is a causal connection (Ahlers and Grunert, 1997). Initially, it was our purpose to analyze the observed abortions in clinical patients according to the initial problem,

Influence d'une procédure chirurgicale en position couchée latérale sur le taux d'avortement chez la vache

Dans une étude rétrospective, nous avons comparé le taux d'avortement de vaches soumises à une procedure chirurgicale en position couchée latérale avec celui d'une population contrôle. Les vaches opérées (n = 59) se trouvaient dans la deuxième moitié de la gestation et ont été admises à la Clinique des Animaux de Rente et Chevaux de l'université de Berne (1993–1996) pour un problème strictement focal (tête, pis et trayons, système locomoteur distal). Dans 42 cas, un relaxant utérin a été administré avant la chirurgie. Les vaches inclues dans le service de reproduction du Département de Fertilité et Reproduction ont été choisies comme population contrôle. Les données de 1736 vaches dans la deuxième moitié de la gestation / année étaient disponibles pour la même période. Le taux d'avortement était de 5,08% pour les vaches ayant subi une chirurgie et de 5.18% pour le groupe contrôle. Cette différence n'était pas significative (P = 0.634). Le risque d'avortement en cas de chirurgie en position couchée latérale n'est pas plus élevé que dans la population de référence.

Influenza di un intervento chirurgico eseguito sul decubito laterale in vacche in stadio avanzato di gravidanza

In un studio retrospettivo, abbiamo paragonato la percentuale di aborto di 59 vacche nella seconda metà di gravidanza, ammesse alla Clinica degli Animali da Reddito e Cavalli, dell'università di Berna (1993–1996), con un problema ben localizzato (regione della testa, mammella e capezzoli, sistema locomotorio), che ha richiesto un intervento chirurgico in posizione di decubito laterale, con la percentuale di aborto di una popolazione di vacche di controllo. Prima dell'intervento chirurgico, un rilassante uterino è stato dato in 42 casi. Le vacche incluse nel programma sanitario di riproduzione del Departemento di Fertilità e Riproduzione sono state usate come controllo. I dati di 1736 vacche gravide nella seconda metà di gestazione / anno erano disponibili per lo stesso periodo di tempo. La percentuale di aborto è stata del 5,08% per le vacche che hanno subito un intervento chirurgico in posizione di decubiti laterale contro il 5.18% per le vacche della popolazione di controllo. Non è stata riscontrata una differenza significativa tra le due popolazioni (P = 0.634). Così, il rischio di aborto per le vacche in questione non è elevato con la popolazione di controllo.

the anaesthesia and especially the administration of a uterus relaxant or not. However, the low incidence of abortions did not justify further classification and statistical analysis. Thus, the results of our study purely suggest, that the risk for abortion during the second half of gestation in cows undergoing surgery in lateral recumbency is not higher than in a Swiss control cow population.

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