

NOTE

**PRELIMINARY COMPARISON OF LIDOCAINE
AND XYLAZINE AS CAUDAL EPIDURAL
ANESTHESIA FOR EMBRYO COLLECTION IN
COWS**

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ABSTRACT

The purpose of this study was to compare the effects of sacrococcygeal epidural administration of either lidocaine or xylazine in cows undergoing embryo collection procedure. Lidocaine HCl (0.2 mg kg^{-1} , 2%) or xylazine HCl (0.07 mg kg^{-1}), diluted to a 5-ml volume with 0.9% NaCl, was injected into the epidural space of ten adult female cows in order to facilitate rectal manipulation of the uterus during embryo collection procedure. The procedure was started approximately 20 min after epidural injection. Epidural xylazine induced sufficient relaxation of the tail and rectum, and sedation for completion of the procedure. No changes in uterine tone were detected. Epidural administration of xylazine was accompanied by bradycardia, decreased respiratory rate, salivation and ataxia. No other adverse effects were observed.

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مقایسه اولیه لیدوکائین و زایلازین به صورت اپیدورال در
جمع آوری رویان از گاو

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چکیده

هدف این مطالعه، ارزیابی اثر داروهای لیدوکائین و زایلازین به صورت اپیدورال در طی عملیات جمع آوری رویان از گاو بود. در این بررسی لیدوکائین (۲/۰ میلی گرم در کیلو گرم، ۲ درصد) یا زایلازین (۰۷/۰ میلی گرم در کیلو گرم) در فضای اپیدورال ده گاو ماده بالغ تزریق شد تا دستکاری رحم از طریق راست روده در حین عملیات جمع آوری رویان تسهیل شود. قبل از تزریق، حجم داروها با استفاده از محلول ۰.۹٪ NaCl به ۵ میلی لیتر رسانیده شد. عملیات جمع آوری رویان در حدود ۲۰ دقیقه بعد از تزریق دارو شروع شد. تزریق زایلازین بصورت اپیدورال باعث شل شدن دم و راست روده شد و آرامش کافی برای انجام عملیات مورد نظر فراهم نمود. هیچگونه تغییری در تون رحم مشاهده نشد. تجویز اپیدورال زایلازین با کاهش ضربان قلب و تنفس، ترشح بزاق و عدم تعادل همراه بود. ولی هیچ گونه عارضه سوء دیگری مشاهده نشد.

INTRODUCTION

Epidural administration of local anesthetics is often used for a variety of obstetrical and surgical procedures in cattle. It is also used to prevent straining during obstetrical procedures (4, 7, 15). By prevention of straining and peristaltic movements of the rectum, it facilitates rectal palpation of the uterus and catheter placement into the uterine horn. Defecation and anal sphincter tone are abolished. Since local anesthetics block both sensory and motor neural fibers, recumbency may result if too much drug is injected. In addition to epidural anesthesia, it is often necessary to sedate the animal in order to aid in animal restraint during the procedure.

Recent studies have shown that epidural administration of α_2 -agonists produces caudal analgesia in several species. These agents activate α_2 -receptors in the substantia gelatinosa of the dorsal horn of the spinal cord, thereby inhibiting the spinal transmission of painful stimuli (12).

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Epidural administration of xylazine hydrochloride, an α_2 -agonist agent, induces caudal analgesia in horse (5, 6, 12, 13), cattle (17, 18), pig (11), and sheep (1). Epidural xylazine has been used to provide analgesia for abdominal laparotomy, udder surgery, cesarean section and castration in cattle (2, 3, 19). In horses, xylazine epidural injection has been used to produce caudal analgesia for rectovaginal laceration repair and replacement of prolapsed rectum (12).

Compared with local anesthetics, the advantages of epidural α_2 -agonists include longer duration of action and reduced hindlimb weakness. In addition, these drugs produce sedation due to their central effects and the animal stands quietly without moving about. It is believed that xylazine may cause abortion by increasing uterine contractibility in pregnant cows, thus its use is contraindicated in late pregnancy (8). While xylazine-induced uterine contractility has been reported in cows (9,14) and mares (16) it seems that pregnant bovine uterus is more sensitive than non-pregnant uterus.

The purpose of this study was to compare the effects of epidural administration of lidocaine and xylazine in cows undergoing embryo collection procedure.

MATERIALS AND METHODS

Ten healthy adult cross-bred cows weighing 373-590 kg (473.7 ± 65.16 , mean \pm SD) were used in this study. Seven days after insemination of superovulated cows, lidocaine HCl (Abbott Laboratories, 2%, without epinephrine) or xylazine HCl (Rompun, Bayer, 2%) was administered epidurally at sacrococcygeal space before embryo collection. Animals were randomly divided into equal groups according to the drug administered epidurally: Group 1 received lidocaine, 0.2 mg kg^{-1} , and group 2 was treated by xylazine 0.07 mg kg^{-1} ; which were diluted in 0.9% NaCl to a volume of 5 ml cow^{-1} . Each cow was used only once. After the animal was properly restrained in cattle stocks, the hair over the epidural injection site was clipped and the skin was given surgical scrub. Using an 18-gauge, 5-cm hypodermic needle, xylazine or lidocaine was slowly administered into the epidural space between the first and second coccygeal vertebrae. Correct

needle placement was verified by the hanging drop technique and minimal resistance to injection.

The time of epidural injection was noted. Approximately 20 min after epidural injection, the procedure of embryo collection was started. A Foley catheter was inserted into the uterine horn for flushing and collection of embryos. The heart rate (HR) and respiratory rate (RR) were recorded before (baseline) and at 10-min intervals after epidural administration of the drugs. The effects of the drugs were assessed by flaccidity of the tail, lack of anal sphincter tone and peristalsis movements during the procedure. The operator was blinded to the agents given. Only one operator was involved to keep errors at minimum.

Data were analyzed using two-way analysis of variance (ANOVA) followed by Student's t-test for mean comparison. A value of $P < 0.05$ was considered significant. Data were reported as means \pm SEM.

RESULTS

Epidural administration of lidocaine and xylazine induced flaccidity of the tail and relaxation of anal sphincter within 5 min. One cow in lidocaine group still had anal sphincter tone 30 min after epidural injection, therefore, an additional dose was given.

No detectable differences were observed between two groups regarding loss of anal sphincter tone and peristaltic movements of the rectum, and uterine tone. Straining was not encountered. Epidural administration of xylazine was associated with sedation, ataxia, and salivation. Two cows became recumbent after xylazine administration but regained standing position upon stimulation. All cows remained standing during embryo collection.

Epidural administration of xylazine significantly ($P < 0.05$) decreased heart rate (Fig. 1) and respiratory rate (Fig. 2). Respiratory rate was significantly lower following xylazine administration vs lidocaine, for 40 min after epidural injection.

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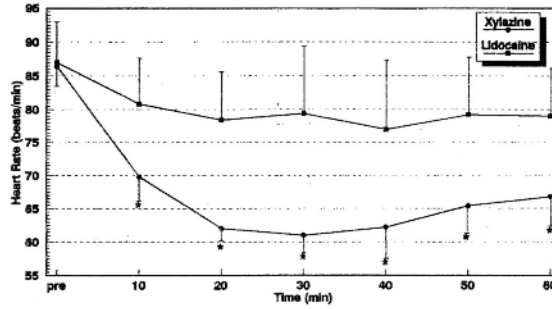


Fig. 1. Heart rate in cattle after epidural administration of xylazine or lidocaine. Data are expressed as mean \pm SEM.

* Significant difference from baseline.

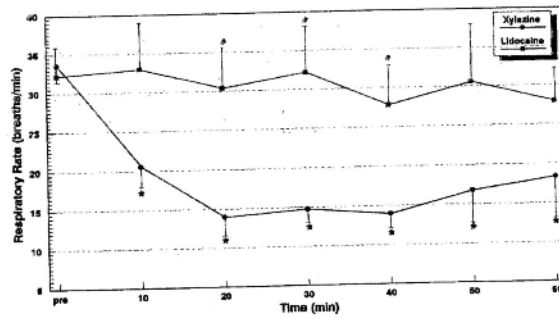


Fig. 2. Respiratory rate in cattle after epidural administration of xylazine or lidocaine. Data are expressed as mean \pm SEM.

* Significant difference from baseline.

Significant difference from xylazine group.

DISCUSSION

The results of this study showed that epidural administration of xylazine provides adequate relaxation of tail and rectum and facilitates manipulation of the uterus during embryo collection. It also induces sedation which would be helpful in completion of the procedure. The onset of action was similar for both groups, which is in agreement with a previous study (9).

Previous studies have shown that intravenous or epidural administration of xylazine increases intrauterine pressure, which is thought to be due to activation of myometrial α_2 -adrenoreceptors (9, 14, 16). Intrauterine pressure was higher following epidural administration of xylazine (29.9 mm Hg) compared to epidural lidocaine or saline (21.0 and 20.4 mm Hg, respectively). It was interesting that the duration of uterine contractility was shorter than the duration of caudal analgesia (9). Increase in intrauterine pressure was also reported following intravenous administration of xylazine in mares (16). Compared with epidural lidocaine, no detectable increase in intrauterine pressure was observed when palpation was performed in xylazine group. There was no difficulty regarding introduction of catheter or recovery of injected fluids. It has been shown that xylazine-induced uterine contractility is antagonized by α_2 -adrenoreceptor agonists, idazoxan and yohimbine, *in vitro* (10).

We believe that hindlimb ataxia and recumbency observed in xylazine group was mainly via central action, since the recumbent cows stood following stimulation and were able to remain standing during the procedure. Systemic administration of tolazoline, an α_2 -adrenoreceptor antagonist, lowered the incidence of hindlimb ataxia induced by epidural xylazine (17). Ataxia may also be partly due to local anesthetic action of xylazine (8). In contrast, epidural lidocaine induces ataxia and recumbency solely by paralyzing hindlimb motor nerves. Side effects (salivation, ataxia, etc.) may be avoided to some extent if a lower dose of xylazine, i.e., 0.05 mg kg⁻¹, is administered.

Systemic effects of xylazine (sedation and cardiopulmonary depression) which were observed in this study are attributable to the rapid vascular absorption of the drug from the epidural space. Following systemic absorption, xylazine slows heart rate by increasing parasympathetic activity and by decreasing sympathetic outflow (18). It has been reported that epidural administration of xylazine depresses respiratory center (17,18), thereby decreasing respiratory rate and arterial PO₂. Epidural xylazine causes an increase in arterial PCO₂.

In conclusion, caudal epidural administration of xylazine induced effective relaxation of tail and rectum, and sedation in cows undergoing

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embryo collection procedure 20 min after injection. However, epidural xylazine injection was associated with bradycardia and pulmonary hypoventilation for at least 60 min. These side effects were acceptable and seemed to have no adverse effects on the procedure. Further investigation is necessary to determine any effects of epidural xylazine on the number of embryos recovered.

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