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Caudal Epidural Anesthesia in Adult Dairy Cows with Procaine 2%: Comparison of 3 Volumes for Perineal Anesthesia

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Abstract

16 adult cows (480-780 kg) received randomly 5, 10 or 15 ml of procaine 2% (G5, G10, G15) by caudal epidural injection to assess anaesthetic blockade of the perineal area by a pressure algometer. 2 Cows were excluded resulting in 4 cows in G5, 6 cows in G10 and 4 in G15. Statistical analysis included a Wilcoxon Mann Withney test and a fisher exact test with a p value set at 0.05. Anaesthesia failed to develop in 1 cow/4 in G5 and was deemed insufficient for the other 3 cows with a longer onset and a shorter duration than for G10 and G15 ($p<0.05$). G10 and G15 had a similar onset (within 10 minutes), duration (40-110 min) and spread of blockade to the perineal area, the tail and the caudal aspect of the thighs. Ataxia developed in one cow/6 in G10 and 3 cows /4 in G15. The volume of 10 ml of procaine 2% administered by caudal epidural injection in adult cows was deemed to be the best compromise between efficacy and side-effect. This result needs to be confirmed by a clinical study on cows submitted to obstetrical manoeuvres or perineal surgery.

Keywords: Caudal Epidural; Perineal Surgery; Semitendinous Muscle; Perineal

Introduction

Historically, lidocaïne and xylazine are the most commonly used drugs for perineal analgesia via caudal epidural injection in cows during obstetrical manipulations and surgical procedures of the perineal region area [1-3]. Currently procaine is the only local anaesthetic agent bovine-approved in the EU. However compared to lidocaine, procaine is generally considered as less potent with a slower onset and a shorter duration [4]. Moreover scarce data is available on its efficacy in cows [5-7]. The objectives of the study were to compare the effects of 3 volumes of procaine 2% for perineal blockade by caudal epidural injection in adult dairy cow.

Materiel and Methods

All procedures were performed in accordance with the European directive (86/609), conformed to the Guide for the Care and Use of Laboratory Animals (NIH Publication No. 85-23, revised 1996), received approval by the regional ethical review committee. Sixteen adult dried dairy cows from a single herd were selected to randomly receive one of 3 volumes of procaine 2% (Procamidor, Axience): 5 (G5, 5 cows), 10 (G10, 6 cows) or 15 ml (G15, 5 cows). Volumes were selected based on the recommendation of 5 ml of lidocaine per cow [8] and Procaine 2% marketing authorization information (Procamidor, Axience). Cows were placed in restraining stocks by group of 2 and received an epidural

injection between the first and second coccygeal vertebras after surgical preparation of the site. Appropriate placement of the needle was confirmed by the hanging drop technique [6]. Absence of voluntary tail movement, perineal analgesia spread with a pressure algometer (ProdPlus by TopCat Metrology Ltd), onset and duration of anaesthesia as well as degree of ataxia were assessed every 2 minutes for the first 10 minutes, every 5 minutes from 10 to 30 minutes then every 10 minutes until return of perineal skin sensitivity. Skin anaesthesia was tested with the pressure algometer in the sagittal plan at the base of the tail and on the perineum, on each vulva labia at 5, 10, 15 and 20 cm laterally from the vulva opening, between the thighs. A Wilcoxon Mann Whitney test and a Fisher exact test were used to compare between groups continuous variables and ataxia prevalence, respectively. The results are presented as mean ± SD or min-max with a level of significance set at $p<0.05$.

Results and Discussion

Cows weighted 480 to 780 kg with no difference in weight between groups. Two cows were excluded from the study due to blood contamination of the epidural space in the 5 ml group and a placid behaviour impeding algometer testing in the 15 ml group. Skin sensitivity testing included a baseline measurement before the injection. A positive response to the algometer was indicated by a movement of the tail, head or hindlegs upon stimulation. Reactions at baseline were seen for an applied force ranging from 0.02 to 0.3 N. Once anaesthesia started, a mild reaction was initially seen for an increased applied force (3-9 N) before having no reaction to a force of 11 to 20 N. Anaesthesia was considered effective once no reaction was observed. In G5, 3 cows out of 4 developed tail paralysis, skin anaesthesia around the vulva over a small surface (3 to 5 cm from midline) with a very variable onset (39.3 ± 30.6 min, 7-68 min) and a short duration (6.3 ± 3.5 min, 3-10 min). Vulva block duration was significantly shorter than in G10 ($p = 0.03$) and G15 ($p = 0,05$) groups. Onset, duration and spread of the blockade were not statistically different between G10 and G15 (Table 1). Tail and perineal anaesthesia developed within 10 minutes, lasted 40 to 110 minutes. Vulva anaesthesia was similar in onset and duration for the 5 and 10 cm zones bilaterally but had a slower onset and a similar duration at the 15 cm zone. Skin desensitisation at level of the thigh and the udder was more progressive but skin anaesthesia on midline 20 cm below the vulva was similar in onset and duration to vulva anaesthesia. All blocks had a small degree of left –right asymmetry except one cow in the 10 ml group that had a right only block. The maximal area blocked corresponded in a majority of cows to the anatomical landmark of the muscle groove between the gluteobiceps muscle and the semitendinous muscle on the latero-caudal aspect of the thigh. No ataxia was evidenced in G5 versus moderate to severe ataxia in 3 cows out of 4 from G15 and one cow in G10. None of the cows fell due to restrain in stocks. Ataxia developed in 6 to 15 minutes and lasted the anaesthesia time in G15 (70-110 min). The G10 ataxic cow had a unilateral right block and a missing toe on the left hindleg rendering the right leg the most weight-bearing. It is possible that the unilateral spread of the anaesthetic led to a more cranial spread resulting in right hindleg weakness and ataxia with the added instability of the missing toe on the left side.

Compared to published results with lidocaine, procaine 2% perineal anaesthesia may develop slightly slower (4-10 min versus 2,5-6 min), shows a similar duration of effect between 40 and 110-120 minutes, has an equivalent spread (large perineal area) and may have a decreased risk of ataxia with the 10 ml volume [9-11].

In conclusion, the 5 ml dosage failed to produce reliable anaesthesia with an adequate spread for perineal interventions. Optimal dose of procaine 2% for caudal epidural analgesia in adult dairy cows weighing 480 to 780 kg appears to be 10 ml. The higher dose of 15 ml led to moderate to severe ataxia that precludes its use without restraining stocks. These results needs to be confirmed by a clinical study on cows submitted to obstetrical and perineal surgical procedures.

Para meters	Group	Onset in min	Duration in min
		mean ± SD	mean ± SD
Se : Skin sensitivity		(mini-maxi)	(mini-maxi)
Tail paralysis	10 ml	3.7 ± 2.4 (1.5-7)	86 ± 2 (83-89)
	15 ml	3.25 ± 1.7 (1-5)	75 ± 22 (60-110)
Se Tail base = 0	10 ml	7.7 ± 2.9 (4-10)	73 ± 9 (65-86)
	15 ml	5 ± 1.4 (4-7)	79 ± 30 (41-113)
Se Perineum = 0	10 ml	5.7 ± 1.5 (4-7)	73 ± 9 (63-83)
	15 ml	5 ± 1.4 (4-7)	85 ± 25 (56-113)
Se Vulva 5-10 cm =0	10 ml	8.75 ± 1.5 (7-10)	80 ± 33 (40-110)
	15 ml	6.2 ± 2.2 (4-9)	82 ± 18 (56-95)

Table 1: Onset and duration of caudal epidural anaesthesia in minutes evaluated by the observation of tail paralysis and skin sensitivity testing at level of the tail base, perineal area and the vulva (5 and 10 cm bilaterally to midline) for the 10 and 15 ml groups

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