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SHORT COMMUNICATION

Anesthetic effects of different volumes of lidocaine for spermatic cord block in cattle

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Abstract

Objective To evaluate three volumes of lidocaine for spermatic cord block to perform castration in cattle.

Study design Randomized blinded clinical study.

Animals Thirty mixed-breed Nellore cattle, aged 28–40 months and weighing 395 ± 21 (352–452) kg [mean ± standard deviation (range)].

Methods Cattle were restrained in a chute and allowed to stand without sedation. Three milliliters of 2% lidocaine without epinephrine were infiltrated subcutaneously at each site of scrotal incision in all animals. The animals were allocated to three groups of 10 animals each. Lidocaine 2% was injected into each spermatic cord using a volume of 2, 3 or 4 mL in groups A, B, or C, respectively. The total volumes of lidocaine used were 10, 12, and 14 mL in groups A, B, and C, respectively. The duration of surgery and the retraction of the testicle (scored as positive or negative according to retraction of the testicle) during the procedure were recorded. The data were statistically analyzed by one-way ANOVA followed by Tukey's and chi-square tests. Differences were considered significant when $p < 0.05$.

Results The mean surgical time was shorter in group C than in groups A and B ($p < 0.001$). In groups A, B and C, 90%, 60% and 10% of the animals showed retraction of the testicle, respectively. Fewer animals retracted the spermatic cord in group C than in group A ($p = 0.002$) and B ($p = 0.02$).

Conclusions and clinical relevance Optimal spermatic cord block was achieved by injection of 4 mL of 2% lidocaine 5 minutes before castration and following incisional infiltration of lidocaine, in adult cattle weighing about 400 kg.

Keywords analgesia, castration, cattle, lidocaine, orchidectomy, pain.

Introduction

Castration is a common surgical procedure in bovine practice (Greene 2003; Coetzee 2011). The pain and distress involved in castration (Oliveira et al. 2014) have raised ethical concerns and motivated investigations about the surgical, anesthetic and analgesic techniques currently employed for this procedure (Boesch et al. 2008; Anderson & Edmondson 2013). Local or regional anesthesia are currently used in bovine practice because the techniques are safe, effective, easy to administer and inexpensive (Greene 2003; Edmondson 2008).

Nerve fibers of the spermatic cord can be blocked by direct injection of local anesthetic solution. Determination of the minimum volume required to achieve an effective block may avoid unnecessary costs for the production unit.

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The aim of this study was to evaluate the efficacy of three volumes of lidocaine for spermatic cord block to provide analgesia for castration in cattle. We hypothesized that the largest volume of local anesthetic tested would be the most effective in spermatic cord block for castration in cattle.

Materials and methods

The study was approved by the Animal Care and Use Committee of the Faculty of Veterinary Medicine and Animal Science, Universidade Estadual Paulista, Botucatu, São Paulo, Brazil (protocol no. 155/2014). Thirty Nellore cross-bred cattle, from the same herd, aged from 28 to 40 months, and weighing [mean ± standard deviation (range)] 395 ± 21 kg (352–452 kg), were randomly assigned to one of three groups, with 10 animals in each group (www.randomizer.org). Animals were excluded if they were not within the predefined age and body weight limits.

Cattle were restrained in a chute and allowed to stand without sedation. The scrotum was cleaned with soap and water and antisepsis was performed with chlorhexidine solution. Surgery was performed using bilateral scrotal incisions with an open technique and was done by the same surgeon in all animals.

Three milliliters of 2% lidocaine without epinephrine (Lidovet; Bravet Ltda, Brazil) were infiltrated subcutaneously along each proposed scrotal incision line in all animals. Lidocaine was injected into each spermatic cord in the following volumes: 2 mL in group A, 3 mL in group B, and 4 mL in group C. Thus the total volumes of lidocaine used in each animal were 10, 12 and 14 mL in groups A, B and C, respectively.

To perform the block, each spermatic cord was palpated and a 21 gauge, 30 mm needle (Solidor; Lamedid Comercial e Servicos Ltda, Brazil) was inserted as proximally as possible in the middle of the spermatic cord. The syringe was aspirated before injection of lidocaine to ensure that the needle was not in a blood vessel. Injection of lidocaine was performed by one individual for all animals. Surgery started 5 minutes after injection into the second spermatic cord. The surgeon was not present when the block was performed and was considered blinded to the treatments. The surgeon assessed the relaxation of each testicle subjectively and scored retraction of the testicle as positive (+) or negative (−). The duration of surgery was recorded. Complications of intravenous injection or excessive bleeding at the sites of lidocaine injection were noted.

Sodium diclofenac (1 mg kg^{-1}; Diclofenaco 50; Ourofino Animal Health, Brazil) and benzathine benzyl penicillin (10,000 IU kg^{-1}) and dihydrostreptomycin (9 mg kg^{-1}; Agrovet; Novartis Brazil, Brazil) were administered intramuscularly at the completion of surgery in all animals.

Statistical analysis

The statistical analyses were performed using Graph Pad Prism Version 5 (GraphPad Software, CA, USA; www.graphpad.com). Mean surgical time data were analyzed by one-way ANOVA followed by Tukey's test. Retraction of the testicle data were analyzed by chi-square test and ANOVA followed by Kruskal–Wallis test. The significance level for all tests was set at $p < 0.05$.

Results

No complications attributable to the lidocaine injection were observed. The age and weight of animals in the three groups were similar. The mean surgical time was shorter in group C than in groups A and B ($p < 0.001$), and there was no difference between groups A and B (Table 1). The durations of surgery were 1.8 and 3.2 minutes shorter for treatment C than for treatments B and A, respectively. When testicle retraction was observed, it was bilateral in all animals. Retraction of the testicle occurred in nine out of 10 animals (90%) in group A, six out of 10 animals (60%) in group B, and one out of 10 animals (10%) in group C (Table 1). When data were compared by chi-square test, retraction of the testicle occurred in significantly fewer animals in group C compared with group A ($p = 0.002$) and in group C compared with B ($p = 0.02$). When data were compared by Kruskal–Wallis test, there was a significant difference in the number of animals showing testicle retraction between groups A and C ($p < 0.001$) and between groups B and C ($p < 0.05$), but not between groups A and B ($p = 0.57$).

Considering the power of the test of 80%, and the different percentages of testicle retraction between groups A (90%) and C (10%) and between groups B (60%) and C (10%), the minimal number of animals should have been 7 and 17, respectively.

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