Veterinary
Anaesthesia and Analgesia
Formerly the Journal of Veterinary Anaesthesia

Veterinary Anaesthesia and Analgesia, 2016 doi:10.1111/vaa.12353

SHORT COMMUNICATION

Comparison of lidocaine, levobupivacaine or ropivacaine for distal paravertebral thoracolumbar anesthesia in ewes

Alice R Oliveira, Marcelo A Araújo, Paulo HA Jardim, Stephanie C Lima, Paula V Leal & Fabrício O Frazílio
Faculty of Veterinary Medicine and Animal Science, Federal University of Mato Grosso do Sul (UFMS), Campo Grande, MS, Brazil

Correspondence: Fabrício O Frazílio, Faculty of Veterinary Medicine and Animal Science, Federal University of Mato Grosso do Sul (UFMS), 2443 Senador Filinto Müller Av, Campo Grande-MS 79070-900, Brazil. E-mail: fabricio.frazilio@ufms.br

Abstract

Objective To compare the effects of lidocaine, levobupivacaine, or ropivacaine on the onset time and duration of anesthesia of the flank of ewes, using the distal paravertebral thoracolumbar approach.

Study design Randomized experimental study.

Animals Twenty-six healthy mixed-breed ewes (46 ± 3.1 kg).

Methods Thoracolumbar paravertebral nerve blocks were performed using the distal approach in sheep for ruminal fistulation. The 13th thoracic (T13), first lumbar (L1) and second lumbar (L2) nerves were infiltrated with 2% lidocaine (group GLI, $n = 9$), 0.5% levobupivacaine (group GLE, $n = 8$) or 0.5% ropivacaine (group GRO, $n = 9$); 1.5 mL on the dorsal branch and 2.5 mL on the ventral branch, total volume of 12 mL per ewe. Anesthesia onset time and duration were assessed by application of superficial and deep pin pricks, and skin clamping with a hemostat. Heart rate, respiratory rate, rectal temperature and systemic arterial pressures were recorded prior to nerve block (T0), after the anesthetic agent injection and onset time (T1) and predetermined time points during the surgical procedure (T2–T6).

Results Incomplete nerve blocks were present in five of the 26 ewes enrolled in the study and they were not included in the statistical analyzes. Onset times in GLI, GLE and GRO were 1.5 ± 0.5, 3.1 ± 1.5 and 2.1 ± 0.8 minutes, respectively, with GLE significantly longer than GLI. The durations of anesthesia for GLI, GLE and GRO were 80 ± 27, 649 ± 68 and 590 ± 40 minutes, respectively, with the duration of GLI significantly shorter than GLE and GRO. There were no clinically important changes in cardiopulmonary variables.

Conclusion and clinical relevance Administration of levobupivacaine and ropivacaine at the distal paravertebral site to block nerves T13, L1 and L2 produced a longer duration of anesthesia of the ewe's flanks compared with lidocaine.

Keywords cardiopulmonary, paravertebral, regional anesthesia, sheep.

Introduction

Thoracolumbar paravertebral block is performed to anesthetize the surgical site for a flank laparotomy. This technique is preferable to infiltration anesthetic techniques because of the smaller volume of anesthetic agent required, production of a more extensive anesthesia of the abdominal wall and reduced postoperative swelling and hematoma (Rostami & Vesal 2011). Compared with lumbosacral epidural anesthesia, the paravertebral block provides anesthesia of the flank without respiratory depression, hypothermia or pelvic limb paralysis (Skarda & Tranquilli 2007).

Two approaches are described for the process of thoracolumbar paravertebral nerve block: proximal (Farquharson 1940) and distal (Cakala 1961). In the proximal approach, the needle is inserted perpendicularly to the back of the animal at a distance off midline that corresponds to the intervertebral foramina of the 13th thoracic (T13), first lumbar (L1) and second lumbar (L2) nerves. In the distal approach, the needle is inserted horizontally to the tip of the transverse processes of L1, L2 and L4 and inserted above and below the transverse processes for infiltration of anesthetic solution around and along the dorsal and ventral branches of T13, L1 and L2.

Advantages of the distal approach include the absence of scoliosis, no risk of penetrating a major blood vessel and minimal weakness or ataxia in the pelvic limbs. Disadvantages include the need for larger doses of anesthetic and a potentially greater failure rate as a result of variation in the anatomical pathway of the nerves at this location (Skarda & Tranquilli 2007).

Paravertebral thoracolumbar block is commonly performed in large animal practice; however, there are few controlled studies of this technique in sheep. The primary aim of this study was to assess the onset times and durations of anesthesia of the flank when using lidocaine, levobupivacaine or ropivacaine to perform the distal paravertebral thoracolumbar nerve block in ewes. A second aim was to evaluate the effects of this nerve block on selected cardiopulmonary variables. The hypotheses were that levobupivacaine and ropivacaine administration would result in the longest duration of nerve block and that there would be no clinically important cardiopulmonary differences between the agents.

Material and methods

Animals

The study was approved by the local Committee of Ethics in Animal Use (no. 660/2015). Twenty-six mixed-breed adult ewes [mean weight ± standard deviation (SD) 46.0 ± 3.1 kg] were enrolled into the study. The animals were considered healthy based on physical examination and complete blood counts. The animals were acclimated for 2 weeks in pens before testing, and were fed hay, grain and *ad libitum* water. The animals were not fasted.

Experimental protocol

The ewes were randomly assigned into a block study design of three groups using a computerized random number generator (Microsoft Office Excel 2007; Microsoft, WA, USA). The distal approach of thoracolumbar paravertebral anesthesia was accomplished using one of three anesthetic agents: group GLI, lidocaine (Xylestesin, 2%; Cristália Produtos Químicos e Farmacêuticos Ltda, SP, Brazil); group GLE, levobupivacaine (Novabupi, 0.5%; Cristália Produtos Químicos e Farmacêuticos Ltda) and group GRO, ropivacaine (Ropi, 0.5%; Cristália Produtos Químicos e Farmacêuticos Ltda).

The ewes were restrained in a standing position. The area between the spinous processes of the lumbar vertebrae and the ventral flank was clipped and scrubbed. The left ear pinna was clipped and scrubbed with povidone for insertion of a 22 gauge catheter (Insyte; Becton Dickinson Industrias Cirúrgicas Ltda., SP, Brazil) in the caudal auricular artery.

Ten minutes after animal preparation, baseline (T0) variables were recorded: heart rate (HR), respiratory rate (f_R), rectal temperature (RT), and systolic (SAP), diastolic (DAP) and mean (MAP) arterial pressures. HR was counted over 1 minute using a stethoscope on the precordial area, f_R was determined by observation of thoracic and abdominal movements, and RT was measured using a digital clinical thermometer (Becton Dickinson Industrias Cirúrgicas Ltda.). Arterial pressures were recorded from the auricular artery catheter through saline-filled tubing to a pressure transducer (DX 2010, invasive pressure module; Dixtal Biomédica, AM, Brazil) placed at the level of the xiphisternum with the animal in a standing position. The transducer was calibrated with a mercury column, zeroed before use and the dynamic response evaluated by the square wave (fast flush) test.

To perform the block, the 13th rib was used as a reference to locate the L1 transverse process. The tip was palpated and the needle (45 mm) of an 18 gauge catheter (B. Braun; Germany) was inserted at about 15 degrees above then below horizontal to block the dorsal and ventral branches, respectively, of T13. The needle was kept close to the transverse process and inserted 30–35 mm in depth. To achieve a fan-shaped infiltration pattern, after injecting anesthetic agent, the needle was slightly withdrawn before redirecting it first cranially and

