

Comparison of the effects of lidocaine versus lidocaine and xylazine for proximal paravertebral nerve blocks in adult dairy cattle

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Introduction

Paravertebral nerve blocks provide regional anesthesia to the abdominal flank by anesthetizing the 13th thoracic (T13) spinal nerve and first (L1) and second (L2) lumbar spinal nerves. The anesthesia provided to the associated abdominal muscles and peritoneum of the affected dermatomes make these useful for standing abdominal surgeries performed in adult cattle. While lidocaine is the typical local anesthetic used, the duration of action produced may be variable leading to the anesthetic effects wearing off before the end of longer surgeries. Xylazine, an alpha-2 adrenoceptor agonist, has been reported to augment anesthetic and analgesic effects when used with lidocaine in other blocks (Grubb et al., 2002; Shokry and Elkasapy, 2018). Xylazine is a relatively inexpensive drug and has a short withdrawal time, making it a good option for cattle. Increasing the duration of action of the block will not only provide longer coverage during prolonged surgeries, but also aid in post-operative pain control. The objective was to compare the length of duration of the analgesic effects of proximal paravertebral nerve blocks using lidocaine alone compared with lidocaine and xylazine in adult dairy cattle. The hypothesis was that the duration of action of the lidocaine-xylazine group would be longer than the lidocaine only group.

Materials and methods

Seven university-owned adult Holstein cows with no prior abdominal surgery and no lesions in the flank or transverse process regions were used. A cross over randomized study was performed where each cow was randomly assigned to either the lidocaine group or the lidocaine-xylazine group and the side the block was performed. After a 7-day washout period, the block was repeated from the other group and the opposite side. The researchers performing the nerve blocks and mechanical nociceptive testing were blinded to the groups. The efficacy and duration of the blocks were tested using a 23-gauge needle in 3 spots (dorsal, middle and ventral) in the region where an incision is made for an abdominal surgery to provide a deep mechanical nociceptive stimulus (needle pin prick). The reaction was recorded using a grading scale (DeRossi et al., 2010). Reaction to the stimuli was recorded prior to the block (baseline) and was repeated up to 8 hours following the block. Wilcoxon Signed-Rank tests and Wilcoxon Rank-Sum tests were used to compare differences between the lidocaine and lidocaine-xylazine groups. A *P*-value under 0.05 was used as a cut off for significance.

Results

The average weight of the 7 Holstein cows was 700 (range: 490-816) kilograms and their average age was 4.4 (range: 2-6) years old. Two of the 14 proximal paravertebral nerve blocks did not work, bringing the number of successful blocks in the lidocaine group to 5/7 (71%) and 7/7 (100%) for the lidocaine-xylazine group. The pain scores were consistently lower (i.e. more painful) for each of the 3 spots tested in the lidocaine group compared to the lidocaine-xylazine group throughout the 8-hour post-block testing. There was a significant difference between the 2 groups at the 4-hour post-block time point for the proximal ($P = 0.031$) and ventral ($P = 0.016$) spots in the region of a flank incision. The median time for the pain scores to return to baseline was shorter for the lidocaine group (4 hours) compared with the lidocaine-xylazine group (6 hours). This difference in time to return to baseline, or when the analgesic effects were no longer present, was significantly different ($P < 0.001$).

Significance

The addition of xylazine to lidocaine for proximal paravertebral nerve blocks in adult dairy cattle significantly decreased the reaction to mechanical nociceptive stimuli 4 hours after the block was performed and it significantly increased the duration of action of the nerve blocks.

