Is evaluation of bovine limb local anesthesia effective by administration of nociceptive thresholds?

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Background and Introduction: Bovine lameness has been remarkable nowadays due to its direct impact on bovine industry as well as animal welfare issues. As about 80 % of bovine lameness and limb disorders occurs at the hind limb, to identify the best and most appropriate foot local anesthesia method, two local anesthesia method of Intravenous Regional Anesthesia (IVRA) and four-point Nerve Block Anesthesia (NBA) were chosen to compare their efficacies as well as onset of full (complete) analgesia by means of nociceptive thresholds (electrical, thermal and mechanical pin pricks and force [in Newton]).

Materials and Methods: We divided our study into two investigations. To evaluate the efficacy of anesthesia, eight healthy non lactating and pregnant Holstein Frisian cows in a cross-over study design were selected. All cows received IVRA by injection of 20 ml Procaine without epinephrine into the Digitalis Lateralis Communis IV or in case of accessing this vein by difficulty, injection into the vein Digitalis Dorsalis Communis III. To desensitize by NBA method, after some anatomical dissections, we suggested our modified four-point NBA by injection of Procaine without epinephrine preneurally to the nerves superficial and deep fibular as well as lateral and medial metatarsal nerves. The nociceptive thresholds were examined by electrical, thermal and mechanical nociceptive thresholds at different locations of hind limb respectively at dorso-lateral coronary band, dorso-medial coronary band and six different sites of lateral and medial heel bulb, dorsal surface of fetlock joint and coronary band of the claws. The efficacy of anesthesia in our first study examined by those three nociceptive thresholds while the start of complete anesthesia examined only by electrical and mechanical thresholds.

Results: our statistical evaluations revealed no significant differences between two groups regarding the efficacy (duration) of local anesthesia ($P > 0.05$) while there was a noticeable difference between two groups ($P < 0.05$) related to the onset of local anesthesia that demonstrated the faster onset of full anesthesia after our modified four-point NBA comparing to the IVRA method, identified by electrical nociceptive thresholds.

Discussion and conclusion: Only evaluation of local anesthesia full onset by electrical thresholds was remarkable. That demonstrates the effectiveness of electrical thresholds in comparison to thermal and mechanical pin pricks and force to access the onset of complete anesthesia. Thermal and mechanical pin pricks were applied successfully but we did not see any significant difference between two groups related to those devices. However, due to different receptors that reply to our different stimuli, the used locations of thermal and mechanical nociceptive thresholds did not reveal any superiority and criteria to apply these means to evaluate the quality as well as quantity of local anesthesia methods.

Key word: IVRA, modified four-point NBA, electrical, thermal and mechanical threshold, hind limb