APPLICATION TECHNIQUES OF LOCAL BLOCK ANAESTHESIA IN RUMINANTS

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Categories : Vets

Date : March 24, 2008

GAYLE D HALOWELL and TIMOTHY J POTTER continue their discussions on anaesthesia in ruminants by looking at use of local blocks

Local anaesthesia is a commonly used technique in veterinary practice and many surgical procedures in ruminants can be carried out under local blocks.

It is used routinely for procedures such as dehorning, as well as for surgeries such as caesarean section and correction of abomasal displacements. Sedation may be employed as an adjunct (see the first article of this series, *VT*37.03) but its use depends on the animal's species, temperament and health. Pre-emptive local anaesthesia can be used in combination with general anaesthesia to reduce the required dose of general anaesthetic product and minimise the potential cardiopulmonary depression that may accompany it and also assist in a quicker recovery.

Current licensing limits the drugs that may be used for induction of local anaesthesia in ruminants. The only local anaesthetic currently licensed for use in food-producing species in the UK is procaine. Lignocaine (lidocaine in North America) had become extremely widely used, and its dose rates are widely reported in the literature; however, its use in the UK is now off label. Compared with procaine, lignocaine has a far shorter period of onset, as well as having a more intense effect and a longer duration of action. Procaine's poorer spread through tissues necessitates more accurate deposition within the tissues than lignocaine.

Toxicity associated with local anaesthetics is a concern – especially in small ruminants. Excessive

plasma concentrations of local anaesthetics can block cardiac sodium channels and depress conduction of impulses through the heart. Further cardiac toxicity is caused by the inhibition of cyclic adenosine monophosphate (cAMP) production and the local anaesthetic action on calcium and potassium channels.

Clinical signs of overdose are initial sedation, followed with increasing dosage by twitching convulsions, coma and death. The toxic dose of lignocaine is 8mg/kg and for procaine 20mg/ kg. Such concentrations can be inadvertently reached, especially in smaller animals when using two per cent solutions for infiltration blocks.

Blocks for standing laparotomy

No fewer than six techniques for inducing anaesthesia of the paralumbar fossa and abdominal wall in standing ruminants have been described:

• infiltration (for example, line block or inverted L);

• proximal paravertebral thoracolumbar;

• distal paravertebral thoracolumbar;

• segmental dorsolumbar epidural;

• continuous lumbar segmental epidural; and

• thoracolumbar subarachnoid anaesthesia.

The choice of method is down to operator preference and summarises the advantages and disadvantages of the different techniques. It is beyond the scope of this article to provide a detailed description of all the available techniques. A description of the proximal vertebral is included as an example, as this is the authors' method of choice.

• **Proximal paravertebral block**

This technique involves anaesthetising the spinal nerves as they emerge from their intervertebral foramina. It is often sufficient to anaesthetise just the dorsal and ventral branches of the last thoracic (T13) and the first two lumbar (L1 and L2) nerves.

Some procedures, such as caesarean section, require inclusion of the third and fourth lumbar (L3 and L4) nerves. It should be remembered that inclusion of L3 and L4 may result in ataxia as these nerve supply motor fibres to the ischial femoral nerves.

The first step is to identify the transverse processes by careful palpation. Start caudally by identifying the process of L5, which lies just in front of the tuber coxae, then work cranially, ending up on L1, which is much smaller and often harder to palpate. Skin overlying the dorsal aspects of the transverse processes is clipped and scrubbed. A small quantity of local anaesthetic is injected just under the skin on the dorsal aspect of the transverse processes of L1, L2 and L3, 5cm from midline.

To anaesthetise L1 a 19- gauge, 3.5in spinal needle is inserted through the desensitised skin on the cranial edge of L2 and advanced ventrally ( ). If the needle impacts the transverse process it is "walked off" the cranial aspect and passed ventrally through the transverse ligament and fascia. The penetration of the intertransverse fascia can normally be felt – 15ml of local anaesthetic is then introduced. The needle is then withdrawn 1-2cm so that the needle tip lies above the fascia and 5ml of anaesthetic is injected against slight resistance to desensitise the dorsal branch of L1. To anaesthetise T13 and L2 the needle is inserted on cranial aspect of the transverse processes of L1 and L3 respectively and the method is repeated as for L1.

Caudal epidural anaesthesia

This is an inexpensive technique that does not require any specialised equipment. It is routinely used in cattle, sheep and goats – most frequently for obstetrical procedures. The aim is to desensitise the last three pairs of sacral nerves within the spinal column without compromising the motor function of the pelvic limbs. Needle placement is either at the sacrococcygeal (S5-Co1) interspace or, more commonly, at the first coccygeal (Co1-Co2) interspace ( ). The first coccygeal joint is easily identified by moving the tail up and down and palpating the movement between the Co1 and Co2 vertebrae. In contrast, it can be harder to identify the sacrococcygeal joint, as it is an immovable joint and may become calcified in cattle more than eight years of age.

The skin overlying the point of needle insertion should be clipped, scrubbed and disinfected. An 18-gauge, 1.5in needle is normally sufficient, although in large animals or those carrying excessive condition, a longer needle may be required.

The point of the needle is placed in the centre of the depression and advanced cranially and ventrally at an angle of 15° to the vertical. The needle is advanced until it contacts the ventral floor of the vertebral canal. The needle is then withdrawn approximately 0.5cm into the epidural space. Correct placement can be identified by placing a couple of drops of anaesthetic in the hub of the needle; sub-atmospheric pressure in the epidural space should lead to them being aspirated (hanging drop technique). Local anaesthetic can then be administered. No resistance should be encountered to the injection.

In cattle, anaesthesia extending cranially from the middle of the sacrum and ventrally over the perineum to the inner aspect of the thigh can be achieved with a dose of 1ml of two per cent lignocaine per 100kg bodyweight[1]. At an appropriate dose range, pelvic viscera and genitalia are

anaesthetised and abdominal contractions are abolished while leaving uterine motility and the locomotor function of the hindlimbs unaffected. Maximal effect is seen 10 to 15 minutes after administration and lasts for around one hour. Lack of anaesthetic effect within 10 minutes usually suggests that the injection was made outside of the epidural space.

Complications are rare but can include postural instability and/or recumbency and haemorrhage due to puncture of a venous sinus. In cases where asepsis is not observed, infection may lead to a discharging tract or a permanently paralysed tail.

Caudal epidural anaesthesia in sheep and goats can be performed in a similar manner to cattle – again ensuring asepsis is observed. The maximum recommended dose rate is 1ml of two per cent lignocaine per 50kg bodyweight.

The use of regional anaesthetic techniques in farm animal practice is often chosen above general anaesthesia due to its ease of administration, low cost and reduced incidence of complications. In addition to providing a means of anaesthesia, regional anaesthetic techniques should not be overlooked as a component of multimodal analgesia.

The use of local anaesthetics, either alone or in combination with other analgesics, can provide a useful tool for providing effective analgesia in ruminants.

Reference

- 1. Skarda R T (1996). Local and regional anesthesia in ruminants and swine, *Vet Clin North Am Food Anim Pract* **12**: 579-626.

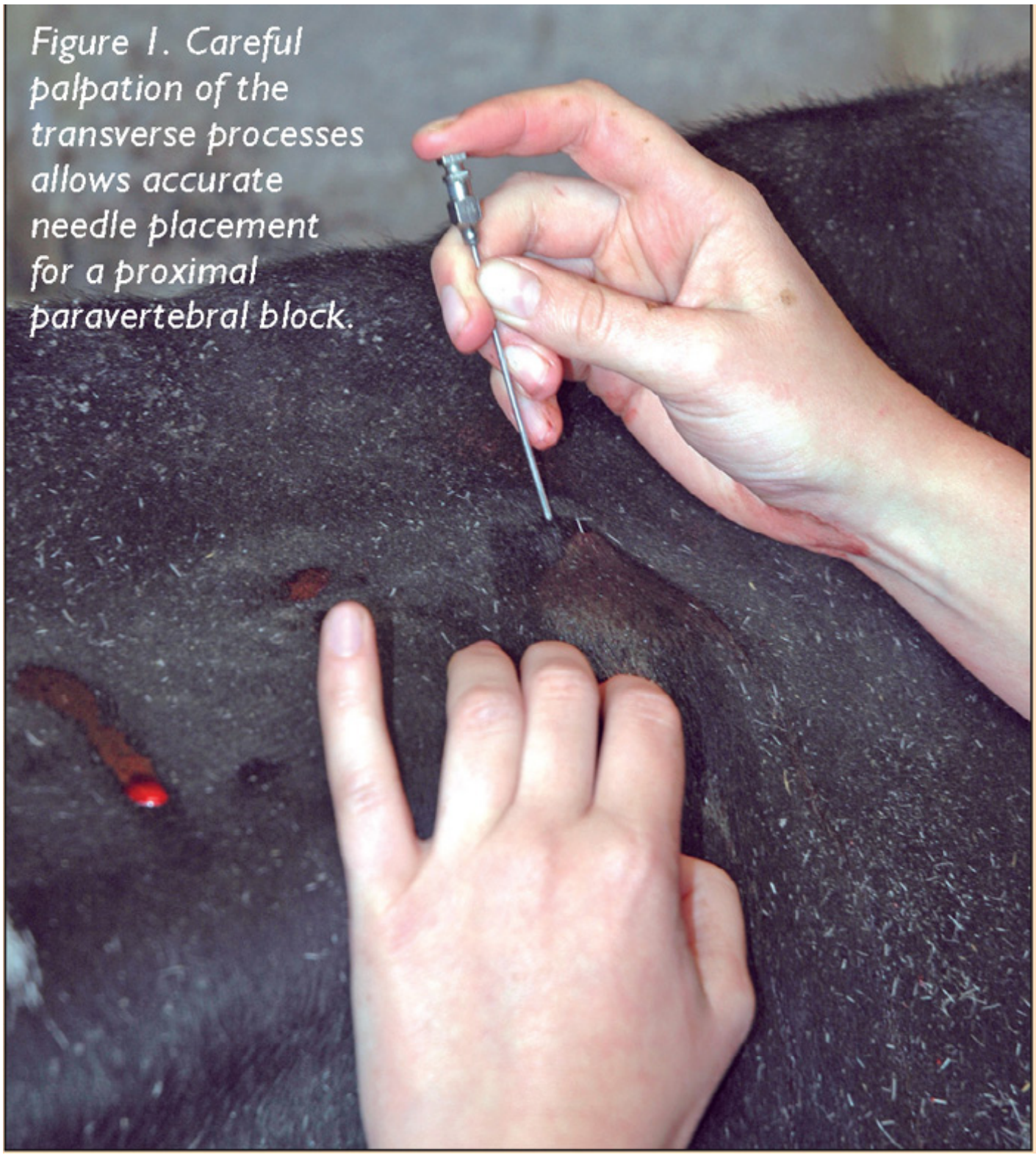

Figure 1. Careful palpation of the transverse processes allows accurate needle placement for a proximal paravertebral block.

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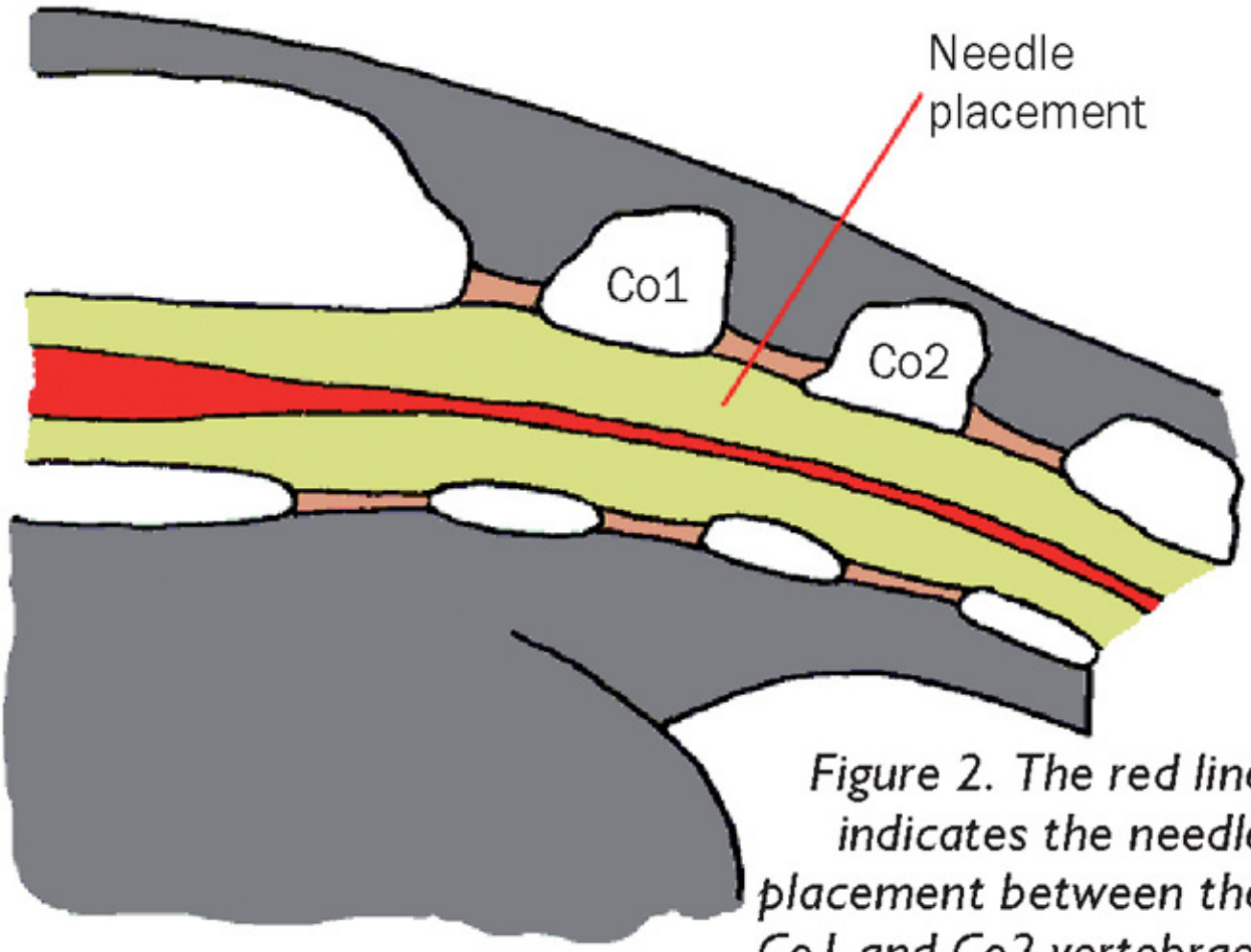

Figure 2. The red line indicates the needle placement between the Co l and Co2 vertebrae.

Figure 2. The red line indicates the needle placement between the Co1 and Co2 vertebrae.

Technique	Advantages	Disadvantages
Line block	Easy.	Oedema and haematoma along the incision site may interfere with healing. Incomplete analgesia and muscle relaxation of the deeper layers of the abdominal wall. Potential toxicity after injection of significant amounts of analgesia. Large volume.
Inverted L block	Easy. Deposition of anaesthetic away from the incision.	Incomplete analgesia and muscle relaxation of the deeper layers of the abdominal wall. Potential toxicity after injection of significant amounts of analgesia. Large volume.
Proximal para-vertebral block	Small volume. Wide and uniform area of analgesia and muscle relaxation. Increased intestinal tone and motility. Absence of local anaesthetic from the wound edges.	Technical difficulty. Arching up of the spine due to paralysis of the back muscles. Risk of penetrating vital structures.
Distal para-vertebral block	No risk of penetrating a major blood vessel. Lack of scoliosis. Minimal weakness in pelvic limbs and ataxia.	Technical difficulty. Larger dose than proximal paravertebral. Variable efficiency.
Thoraco-lumbar subarachnoid anaesthesia	Rapid onset. Small volume. Catheter used provides a port for repeated boluses of anaesthetic.	Requirement for specific equipment. Risk of trauma to conus medullaris. Ataxia or recumbency after overdose. Risk of meninigitis.
Segmental dorsolumbar epidural	One injection site. Small volume. Uniform anaesthesia and relaxation of skin musculature and peritoneum.	Technically difficult. Risk of trauma to spinal cord and venous sinuses. Potential loss of motor control of pelvic limbs. Potential physiological disturbances (such as bradycardia and hypotension).
Continuous lumbar segmental epidural	Small doses can be administered so the extent of anaesthesia can be readily controlled.	Technically difficult. Requires specialised equipment. Increased frequency of post-anaesthetic myositis

TABLE 1. Summary of local anaesthetic techniques employed for laparotomy in ruminants