Ruminant Field Anesthesia: Local Anesthesia and Injection Protocols

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Overview of the Issue
Not happy with your current protocols? This lecture will present a thorough review of local anesthetic techniques from ring blocks to epidurals as well as injectable anesthetic protocols for both cattle and small ruminants.

Objectives of the Presentation
- Review common standing and recumbent sedation protocols
- Describe common local anesthetic techniques for common procedures in ruminants

Standing Sedation
- Alpha-2 Agonists
  - Xylazine
    - 0.02-0.03mg/kg IV
    - 10-20 min mild/moderate sedation
    - 0.04-0.06mg/kg IM
    - 15-30 min mild/moderate sedation
  - Detomidine
    - 10-40 μg/kg
    - 40-50 min mild/moderate sedation
  - Phenothiazine (Acepromazine)
    - Most effective when combined w/ alpha-2 or opioid
    - 10mg acepromazine/10mg xylazine
    - Approx 0.02mg/kg of each drug in 500kg animal
    - 10mg acepromazine/10mg butorphanol
- 5-10-20 (based on ~500 kg body weight)
  - Intravenous administration
    - 10-15 minutes mild-moderate sedation
  - 5 mg Butorphanol (0.01 mg/kg)
  - 10mg Xylazine (0.02 mg/kg)
  - 20 mg Ketamine (0.04–0.1 mg/kg)
- 10-20-40
  - Intramuscular or SQ administration
    - Peak effect in 15-20 minutes
  - Prolonged duration of effect
    - 20-40 minutes
  - 10 mg butorphanol (0.015–0.02 mg/kg)
- 20 mg **xyazine** (0.03–0.04 mg/kg)
- 40 mg **ketamine** (0.06–0.08 mg/kg)
- 20-40-80 for large bulls or spirited animals
- Re-dose with 25-50% of original dose

- Epidurals for Standing Surgery
  - Alpha-2 agonists +/- opioid
    - Will result in systemic sedation
      - Ataxia mild to moderate
  - Volume
    - 25-30cc/cow for flank analgesia
      - q.s. drug with sterile saline to get this volume
  - Dose?
    - Systemic doses
      - Xylazine .05-0.1 mg/kg
      - Morphine 0.05-0.1 mg/kg
      - Romifidine 30-50 μg/kg

**Recumbent Sedation**

- **Tips**
  - Fast the animal if elective
    - 24-48 hours (feed)
    - 12-18 hours (H2O)
  - Casting Ropes
  - Local Anesthesia
    - Reduce amount of injectable anesthetic needed

- **Inducing Recumbency**
  - Calves/Small Ruminants
    - Diazepam/midazolam with ketamine
      - 0.2-0.4mg/kg diazepam/midazolam
      - 1-2 mg/kg ketamine
    - Excellent for short, minimally invasive procedures
      - Minimal cardiovascular/respiratory effects
      - Calves recover quickly
  - Alpha-2 Agonists
    - Xylazine
      - 0.1-0.2mg/kg IM
        - 10-20 min duration
      - 0.5-0.1 mg/kg IV
        - 10-15 min duration
        - higher doses may be required for aggressive animals
Combinations

- Xylazine-ketamine
  - 0.1 mg/kg xylazine
  - 2 mg/kg ketamine
  - Administer intravenously
    - 10-15 min duration
  - Double dose for IM administration
  - 0.2 mg/kg xylazine
  - 4 mg/kg ketamine
  - 15-30 min duration

Maintaining Recumbency

- Ketamine-Xylazine Infusion
  - For maintenance of anesthesia in the field
  - Surgical anesthesia for approximately 60 min for an adult bovine (500-700kg)
  - 1L electrolyte solution add
  - 50-100mg xylazine
  - 1.0-1.5g ketamine
  - Administer to effect

- Triple-Drip (Ketamine-Xylazine-Guaifenesin)
  - 1L 5% guaifenesin solution
    - Add 50mg xylazine
    - Add 1-1.5g ketamine
  - Induction of Anesthesia with Triple Drip:
    - Administer IV to effect
  - Maintenance of Anesthesia with Triple Drip
    - Can be used after induction with triple-drip or another induction method
      - Decrease or eliminate xylazine in triple-drip if large dose of xylazine was given for induction

Sedation for Unbroke Animals

- Telazol-Ketamine-Xylazine
  - Telazol: Tiletamine-Zolazepam (NMDA antagonist/benzodiazepine)
  - Reconstitution
    - 1 vial Telazol/100mg xylazine/400mg ketamine
    - 1 vial Telazol/250mg xylazine/250 mg ketamine
  - Advantages
    - Small volume
    - Profound sedation
    - 30-45 min duration
Local Anesthesia

- Caudal Epidural
  - Adult Cattle
    - Lidocaine/Other Local Anesthetic Agents
    - Alpha-2
    - Opioids
- Lumbosacral Epidural
  - Sheep/Goats/Calves
- High volume caudal epidural
  - Lidocaine 2%
    - 0.15 mL/kg
    - Usually recumbent for 4-6 hours
    - Can add morphine @ 0.1 mg/kg for increased duration of activity

- Proximal Paravertebral Nerve Block
  - Blocks T13, L1, L2
    - Landmarks: L1, L2, L3
  - Technique
    - 1-2 cm off midline
    - Start in line with cranial edge of transverse process of L1
    - Use 14g 1 inch needle as trocar
    - Insert 5inch 18g spinal needle until transverse process encountered, then walk needle off cranial edge
    - Advance until transverse ligament and faschia are penetrated (a “pop” will be felt)
    - Inject 10-15 ml 2% lidocaine
    - Withdraw 1-2 cm and inject another 10-15ml lidocaine
    - Inject 2-3 ml lidocaine as you are removing needle
    - Repeat walking off the cranial edge of L2 and L3
  - Advantages
    - Relatively small amount of lidocaine required
    - Large area anesthetized
    - No edema in surgical field
  - Disadvantages
    - Scoliosis
    - Moderate Ataxia
    - Potential to penetrate large blood vessels or spinal canal

- Distal Paravertebral Nerve Block
  - Blocks T13, L1, L2
  - Landmarks: L1, L2, L4
  - Technique
- Use 18g 1.5 inch needle (Dairy)
  - Longer needle may be necessary in fat beef heifers/cows
- Inject parallel to transverse process
- 10-20 ml injected dorsal to process
- Withdraw needle to redirect ventral to process

- Advantages
  - Use of common sized needles
  - Lack of scoliosis and ataxia
  - No risk of penetrating large vessels or nerves

- Disadvantages
  - Difficult to impossible in fat cattle
  - Dairy cows easier than beef cows
  - Variable position of nerves leading to incomplete or inadequate anesthesia

- Bier block
  - For procedures involving the foot
    - Tourniquet on distal limb
      - 19-25g butterfly catheter in digital vein
        - 20cc/cow
        - 2-3cc/sheep or goat

- Intravenous Regional Anesthesia
  - Cast the animal or place on tilt table.
  - Place a rubber tourniquet above the elbow/carpus or hock; above the carpus or hock.
    - Take care not to pinch the skin of the axilla with the tourniquet when placing above the elbow.
    - When placing on the hind limb, place sufficiently high to allow injection into the saphenous vein distal to the tourniquet.
  - Using a 19-25g butterfly catheter, inject 2-5 ml 2% lidocaine (adult sheep/goat) or 20-30 ml in adult large ruminant) into any superficial vein.
    - Cephalic in the forelimb
    - recurrent tarsal vein or the saphenous vein in the hind limb
  - Apply pressure over the injection site to minimize the risk of leakage and hematoma formation.
  - Anesthesia of the limb distal to the tourniquet is achieved within 10 minutes.
  - Keep the tourniquet in place while the procedure is in progress.
  - Do not release the tourniquet for at least 10 minutes.
    - Small Ruminants: Gradual release of the tourniquet, over a period of 10-15 minutes, is required in order to avoid toxicity from a sudden systemic bolus of the local anesthetic agent.
- 4 point block
Selected References