AABP & AASRP Joint Session

Moderator: *Patty Scharko*

Small ruminant tips for the practitioner: field anesthesia techniques[a]

David C. Van Metre, DVM, DACVIM
Department of Clinical Sciences, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO 80523

Abstract

Restraint, local or spinal anesthesia, and short-acting general anesthesia are commonly employed procedures in small ruminant field practice. Correct application of these procedures can greatly facilitate the completion of other common procedures such as debridement of infected wounds of the foot, paring out of hoof lesions, obstetrical procedures, and placement of casts or splints for orthopedic problems. Presented here are different methods for restraint, sedation, and local, spinal, and general anesthesia that the author has used successfully in a field setting.

Key words: sheep, goats, anesthesia

Résumé

La contention, l'anesthésie locale ou rachidienne et l'anesthésie générale de courte durée sont des procédures souvent utilisées dans les pratiques de petits ruminants. La bonne utilisation de ces procédures peut grandement faciliter l'achèvement d'autres procédures courantes telles le débridement de plaies infectées au niveau du pied, l'ablation des lésions du sabot, les procédures obstétriques et la pose de plâtres ou d'attelles pour des problèmes orthopédiques. Nous présentons ici les différentes méthodes de contention, de sédation et d'anesthésie locale, rachidienne et générale que l'auteur a utilisées avec succès sur le terrain.

Use of a Sheep Mask and Gambrel Restrainer

In many instances, placement of a Gambrel restrainer on the forelimbs, combined with placement of a mask[b] (blindfold) over the eyes, is sufficient to provide restraint and variable degrees of calming to the ovine patient. Gambrel restrainers are available from multiple vendors; an internet search for "Gambrel restrainer" can be used to identify a source (Figure 1).

Blindfolding of sheep, either with a commercial sheep mask or a blindfold made from a towel and bandage tape, greatly reduces the animal's instinct to flee. In the author's experience, blindfolding achieves greater calming in sheep than in goats; particularly fractious goats may require medical sedation in addition to blindfolding. The sheep should be cast into sternal or lateral recumbency before the forelimbs are placed into the Gambrel restrainer. Sheep restrained in a Gambrel restrainer tend to remain calm if the sheep mask is applied concurrently (Figure 2). Gambrel restrainers are not recommended for restraint of goats or South American Camelids (SACs).

The 4-Point Block for Digital Anesthesia

Intravenous regional anesthesia (Bier block) is a commonly used, safe, and effective method of providing anesthesia to the ruminant digits.[3] However, restraint of the affected limb is necessary for success, and adequate facilities, personnel, and preparation time to accomplish good restraint are not always available to the practitioner. If the practitioner wishes to anesthetize a digit by another means, a 4-point method for injection has proven useful to the author. This technique was adapted from a nearly identical method described to the author by Dr. Tom Kasari, formerly of Texas A&M University. The instructions below pertain to using this technique in small ruminants.

All injections are performed at the level on the digits that is even with the distal – most point of attachment of the digital skin and dewclaws. The entire circumference of digital skin at this level should be scrubbed with disinfectant soap and alcohol. If blood enters the needle during any of these blocks, the needle should be redirected to prevent inadvertent intravenous injection of lidocaine. For the lateral injection site of the 4-point block, a 25-gauge, 5/8 inch (16 mm) needle is introduced subcutaneously over the lateral aspect of the digit, with the needle directed parallel with the coronary band and aimed for the dewclaw (Figure 3).

The needle should be burrowed under the skin until the needle tip is adjacent to the junction of the dewclaw with the digital skin. For an adult ewe, 2 mL of 2% lidocaine solution is injected subcutaneously at this site; the needle should be withdrawn as the injection is made in order to disperse the anesthetic along a line. The medial injection site is located at

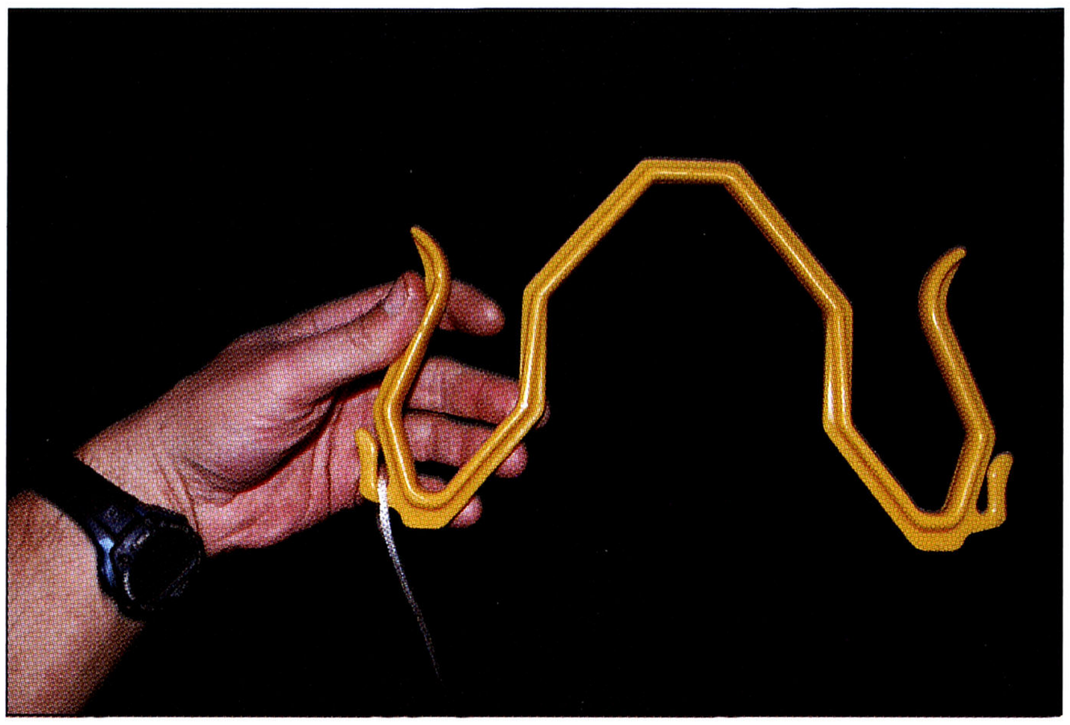

Figure 1. Gambrel restrainer for sheep.

Figure 2. A non-sedated sheep restrained with a Gambrel restrainer and a commercial sheep mask (blindfold).

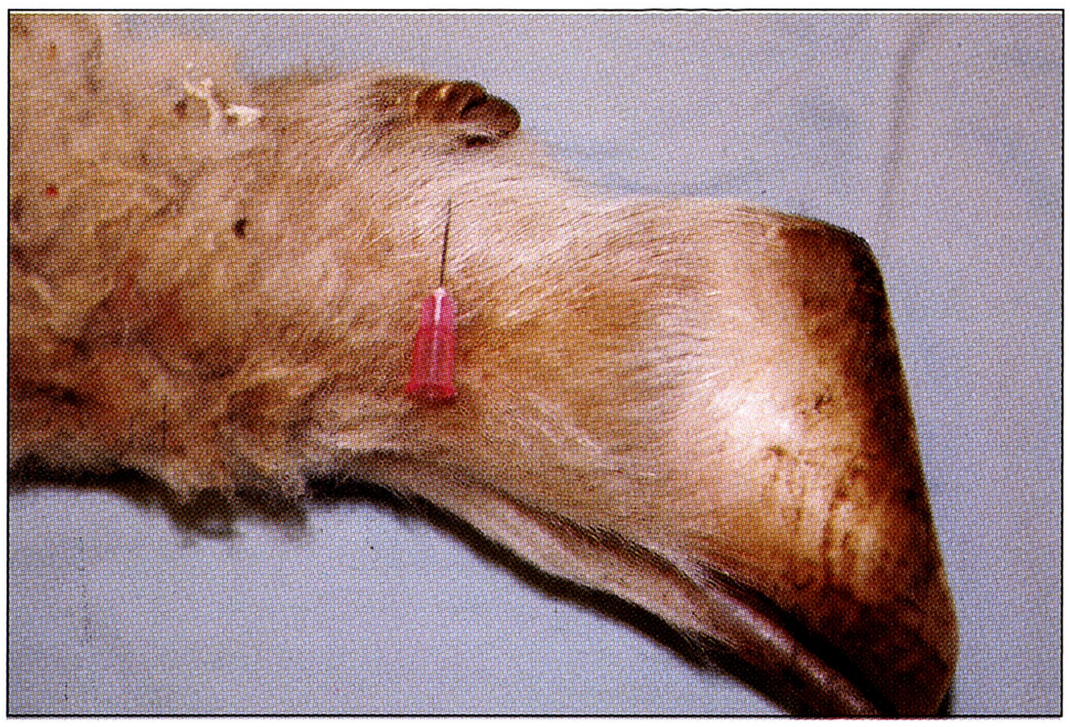

Figure 3. Path of subcutaneous needle insertion for the medial and lateral blocks.

Figure 4. Needle insertion point for the deep injection component of the dorsal block.

the same site on the medial aspect of the digits. The technique for injection on the medial aspect of the foot is the same as for the lateral side. Deposition of lidocaine at these 2 sites is intended to anesthetize the abaxial dorsal nerves of the third and fourth digits.

The dorsal injection point for this block is made on the dorsal midline of the foot, again at the level of the distal aspect of the point of attachment of the digital skin and the dewclaws. In an adult ewe, this point lies roughly 0.4 in (1 cm) distal to the fetlock joint. A 20- or 22-gauge, 1 inch (2.5 cm) needle is poised perpendicular to the skin and parallel with the coronary band. The needle is then inserted completely to the hub (or nearly that distance in a small-breed ewe), such that the tip of the needle lies in the soft tissue between the 2 proximal phalangeal bones (Figure 4). For an adult ewe, 3 to 4 mL of lidocaine is injected at this site, with roughly half administered with the needle fully inserted and half injected as the needle is slowly withdrawn, leaving a subcutaneous depot of the remainder of the lidocaine (~1 mL). Deposition of lidocaine at this site is intended to anesthetize the dorsal common digital nerve as well as communicating nerves from the axial palmar or plantar digital nerve.[2]

The fourth point of this block is located on the opposite side of the foot, on the axial midline of the palmar or plantar aspect of the digit. The needle is aimed perpendicular to the skin and kept parallel with the coronary band. The insertion point is at the level of the distal aspect of the attachment of the digital skin and the dewclaws. The needle is then inserted completely to the hub (or nearly that distance in a small-breed ewe), such that the tip of the needle lies in the soft tissue between the 2 proximal phalangeal bones (Figure 5). For an adult ewe, 3 to 4 mL of lidocaine is injected at this site, with half administered with the needle fully inserted and half injected as the needle is slowly withdrawn so as to leave a subcutaneous depot of ~ 1 mL of lidocaine. Deposition

of lidocaine at this site is intended to anesthetize the axial palmar or plantar digital nerve.[2] Other than the needle being introduced on the palmar or plantar aspect, the technique for this block is identical to that used for the dorsal block.

Onset of digital anesthesia occurs within 5 to 10 minutes and typically lasts for 45 minutes to an hour. This nerve block will anesthetize the digits immediately distal to the dewclaws; it has been used successfully for drainage of extensive or complicated sole abscesses, debridement of footrot lesions, coffin joint drainage and curettage, and digital amputation, as well as a diagnostic nerve block for localizing lameness. The author has used this block with success in pigs and

South American camelids (SAC)s. In sheep and goats, the total dose of lidocaine for subcutaneous injection should not exceed 4.5 mg/lb (10 mg/kg) of body weight in order to avoid lidocaine intoxication; although different upper limits to lidocaine dosage have been published; the author has used this recommendation by Skarda[4] successfully. In cattle, the volume injected per site should be increased 3 to 4 fold, and the needle size increased to 1 inch (2.54 cm) for the medial and lateral blocks and 1.5 inches (3.8 cm) for the dorsal and palmar/plantar blocks.

Lumbosacral Spinal Anesthesia

Lumbosacral anesthesia can be utilized for surgical procedures involving structures caudal to the level of the umbilicus, such as hind-limb fracture repair, cesarean section, manual correction of severe dystocia, and rectal, vaginal, or uterine prolapse replacement. Techniques for lumbosacral epidural anesthesia have been described;[4] however, in the author's experience, many attempts to place a needle in the epidural space have resulted in needle entry into the subarachnoid space, which is evidenced by cerebrospinal fluid (CSF) welling from the needle hub. The following description applies to both true spinal anesthesia (induced by administration of lidocaine directly into the subarachnoid space) as well as epidural injection.

Figure 5. Needle insertion point for the deep injection component of the palmar / plantar block.

In adult ewes and does weighing more than ~ 200 lb (90 kg), a 3.5 inch (8.9 cm), 18- or 20-gauge needle is needed; for smaller sheep and goats, the procedure can be successfully performed with a 1.5 inch (3.8 cm), 18- or 20-gauge needle. Owing to a greater depth from skin to spinal column, SACs that weigh more than ~165 lb (~75 kg) typically require a 3.5 inch (8.9 cm), 18- or 20-gauge spinal needle, whereas a 20-gauge, 1.5 inch (3.8 cm) needle is usually adequate for smaller SACs. The author recommends that the lidocaine (with or without morphine, as described below) be placed into 3- or 6 mL syringes for injection. The amount of friction encountered when using larger-volume syringes for injection can make it difficult to judge if there is resistance to injection; no resistance to injection is expected if the needle is placed in the epidural or subarachnoid spaces.

The lumbosacral space can be located by simultaneously palpating each of the tubera coxae of the sheep, goat, or SAC. The caudal-most aspect of each tuber coxae is then found. A line is extended from the caudal-most aspect of each tuber coxae to the dorsal midline. Deep digital pressure at this point on midline will reveal the space between the last lumbar vertebra (L6 or L7 in small ruminants) and the first sacral vertebra (S1 in small ruminants). The supraspinous ligament that spans the space between L6 (or 7) and S1 can be palpated if deep pressure is applied with the finger, particularly if the finger is moved side to side to "strum" the ligament. This ligament spans the midline of that space and serves as a convenient landmark for identifying the midline. The area is clipped and aseptically prepared. A subcutaneous "bleb" of 2% lidocaine can be used to minimize the discomfort associated with needle puncture.

The needle is aligned perpendicular to the vertebral column and inserted on the midline. The needle should be inserted to pass directly through the supraspinous ligament from dorsal to ventral. The animal typically responds with a flinch or a movement of the tail when the subarachnoid space is entered. Typically, in a sheep or goat weighing approximately 165 lb (75 kg), the 1.5 inch (3.8 cm) needle is advanced almost completely to the needle hub for entry into the subarachnoid space. If the needle is advanced to this depth without such a response, the needle should be very slowly withdrawn while checked for visible evidence of CSF, as the needle occasionally passes through the conus medullaris without inciting any response from the animal. If no CSF is obtained, the needle should be visually checked to ensure that it is not angled lateral to the vertebral column. Redirection with an appropriate adjustment to the needle alignment should then be attempted. Once CSF flow occurs, 1 mL of 2% lidocaine per 33 lb (15 kg) of bodyweight should be slowly injected into the subarachnoid space.[4] The onset of posterior paralysis typically occurs within 3 to 5 minutes;

anesthesia typically lasts 45 minutes to an hour. Anesthesia typically spans to the mid-lumbar region. The author has added morphine sulfate to the lidocaine at a dosage of 0.05 mg/lb (0.1 mg/kg) to confer additional analgesia without apparent effect on resolution of motor control of the hind limbs.

If, upon insertion of the needle as described above, the veterinarian believes that the needle is situated in the epidural space, the injection may be administered there; the onset of anesthesia requires 3 to 5 more minutes but produces identical clinical effects as spinal anesthesia. Unlike what occurs in cattle, the "hanging drop" method used for confirmation of needle placement in the epidural space is rarely successful in small ruminants. Instead, the veterinarian should aspirate ~1 mL of air into the syringe. When the needle is believed to be placed in the epidural space, the syringe should be carefully attached to the needle hub. While initiating injection, the veterinarian should watch the column of air within the syringe. If the needle is placed properly, the column of air should maintain its volume within the syringe; in other words, there should be no compression of the air within the barrel of the syringe (Figure 6). This confirms that there is no resistance to injection and that the needle is either in the epidural or subarachnoid space. On the other hand, if the needle is not placed properly, the volume of air within the syringe will decrease as the air is compressed between the plunger of the syringe and the medication. If the latter circumstance is encountered, the syringe should be removed and the needle repositioned.

Ewes and does with neonates in the same pen should be monitored carefully during recovery, as they may be weak and ataxic for 1 to 2 hours after the procedure. Depending on the dam's condition, colostrum may be milked from the dam and tube- or bottle-fed to the neonates. This procedure does carry potential risks in volume-depleted animals, as the resultant loss of vasomotor tone in the caudal lumbar and pelvic trunk and pelvic limbs may contribute to systemic hypotension.

Figure 6. Lumbosacral spinal or epidural injection. Note the presence of air in the syringe to allow confirmation of the lack of resistance to injection.

Short-Term, Injectable, General Anesthesia for South American Camelids and Small Ruminants

A combination of xylazine, butorphanol, and ketamine has been used successfully to induce short-term general anesthesia in SACs for such procedures as castration, laceration repair, and cast placement. This combination protocol was developed by Dr. LaRue Johnson during his years on the faculty at Colorado State University. The following dosages are provided for llamas and alpacas, respectively: xylazine, 0.03 and 0.04 mg/kg; butorphanol, 0.3 and 0.4 mg/kg; and ketamine, 3.0 and 4.0 mg/kg.[3] These 3 drugs can be combined in a single syringe and administered intramuscularly in the triceps muscle. To prepare a stock solution of this drug combination, begin by adding 1 mL of 100 mg/mL xylazine to 10 mL of 100 mg/mL ketamine solution. To this combination add 1 mL of 10 mg/mL butorphanol. Administer intramuscularly in the triceps at a dosage of 1 mL/50 lb (22.7 kg) bodyweight to llamas and 1 mL/40 lb (18.2 kg) bodyweight to alpacas. For sheep and goats, the dosage is 0.1 mL/20 lb (9.1 kg) bodyweight, intramuscularly.

Lateral recumbency is typically achieved in 4 to 7 minutes, with the animal showing ataxia and behavioral signs of sedation prior to becoming recumbent. Ocular lubrication and ocular protection with a soft towel should be provided once the animal becomes recumbent. Anesthetic depth is typically sufficient for achieving recumbency and performing minor surgery; however, animals are typically *not* sufficiently anesthetized to enable endotracheal intubation. The addition of local anesthesia is needed for painful surgical procedures, such as castration.

In a study of this protocol in 7 llamas and 7 alpacas, 5 animals of each species were successfully anesthetized to the point of lateral recumbency.[3] Heart rates during recumbency ranged from 29 to 37 bpm in llamas and 37 to 49 bpm in alpacas. In that study, the animals were able to assume sternal recumbency on their own on an average of 43 minutes +/- a standard deviation of +/- 14.6 minutes post-induction in llamas, and 18.4 +/- 7.7 minutes in alpacas. Time to standing was 62.9 +/- 12.6 minutes in llamas, and 21.9 +/- 10.4 minutes in alpacas. Quality of recovery was good. Hypoxemia was noted during recumbency, however, and the authors of that study recommended that oxygen supplementation be provided to avoid this problem.[4] In addition, whenever possible, a 24-hour fast from food and water prior to anesthesia is considered by the author to be a prudent measure to limit the risk of regurgitation during recumbency.

Endnotes

[a]Previously published in *Proceedings*, 42nd Annual Conference, American Association of Bovine Practitioners, 2009;116-119. Additions to the original text are included in the current paper.

[b]https://www.wyomingclassics.com/cgi-bin/commerce.cgi?search=action&category=9999

References

1. Davis IA, McGaffin JR, Kuchina GD. Intravenous catheterization of the external jugular vein in llamas. *Comp Cont Ed Pract Vet* 1996; 18:330-335.
2. DeLahunta A, Habel RE. *Applied Veterinary Anatomy*. Philadelphia: WB Saunders Co., 1986; 110-117.
3. Mama KR, Aubin ML, Johnson LW. Experiences with xylazine, butorphanol, and ketamine for short-term anesthesia in llamas and alpacas. *Proceedings.* 7th World Congr Vet Anaesth 2000; 104.
4. Skarda RT. Local and regional anesthesia in ruminants and swine. *Vet Clin North Am Food Anim Pract* 1996; 12:579-626.