Tips and Tricks for Common Medical and Surgical Procedures in Small Ruminants

David C. Van Metre, *DVM, DACVIM*
Animal Population Health Institute, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO 80523

Abstract

Every practitioner develops his or her own unique and efficient ways of doing things, and the author has collected a few of these tricks from personal experience, the veterinary literature, and veterinary technicians and practitioners. This presentation will include a variety of useful tips for a variety of commonly used procedures for South American camelids, sheep, and goats in a field setting.

Résumé

Tout vétérinaire développe ses propres façons de faire, uniques et efficaces. L'auteur de cette communication a recueilli quelques-uns de ces trucs à partir de son expérience personnelle et de celle d'autres professionnels vétérinaires (techniciens et médecins), ainsi que de la documentation en médecine vétérinaire. Dans ce séminaire, nous vous présenterons une variété de trucs pratiques utilisés sur le terrain concernant divers soins couramment apportés aux camélidés d'Amérique du Sud, aux ovins et aux caprins.

Procedures Involving the Jugular Vein

Finding the jugular vein in heavily-wooled sheep and South American Camelids (SACs) can be challenging, particularly in males with heavily-muscled necks. The following set of landmarks has been used by the author for instruction of lay persons and veterinary students. The upper one-third of the right side of the neck is visualized for injection / catheterization of the right jugular vein. The trachea in the upper third of the neck is first located with the left hand, and the left index finger is placed on the ventral midline of the neck, directly over the midline of the trachea. With the right hand, and at the same level of the neck that the left hand is located, the lateral aspect of the neck is palpated until the bony protruberances that mark the transverse process of the 3rd or 4th cervical vertebra are felt. The right index finger is placed on one of the palpable transverse processes. An imaginary line is then drawn between the two fingers. At the halfway point along this line, the jugular furrow is found.

If an intravenous catheter is to be placed in the jugular vein of a SAC, it is generally recommended that a skin incision be placed over the vein to minimize the drag created by the thick neck skin.[1] The overlying skin is clipped and swabbed with an antiseptic, and 1-2 mL of 2% lidocaine is injected subcutaneously over the catheter placement site. The neck skin of young SACs is sufficiently pliant to enable the clinician to pinch the skin into a "tent," so that a #15 scalpel blade can be used to safely incise the skin over the jugular vein. For older SACs, however, the tautness of the neck skin can limit the clinician's ability to tent the skin away from the underlying vein. What often results is an incision that does not penetrate the full thickness of skin, leading to a difficult catheter placement. To ensure a complete stab incision is made, a pair of penetrating towel forceps can be used to tent the skin; alternatively, the author has used an 18-gauge, 1.5-inch needle, bent at the mid-shaft into a 90° angle, to lift the skin from the underlying vein. The tip of the bent needle is inserted into the skin 2-3 mm ventral to the intended point of insertion of the #15 blade. The hub of the needle is then lifted with a prying motion to elevate the skin from the underlying vein, and the #15 blade is then used to make an incision through the full thickness of the neck skin.

Maintaining hands-free venous distension is occasionally desirable when inserting a catheter. To fashion a device to keep a jugular vein distended, a 2 inch diameter hoof block cement[a] "doughnut" can be hand-fashioned, and 2-3 foot length of surgical tubing can be inserted through its hole. Knots can be placed in the tubing on either side of the doughnut to keep it in place on the tubing (Figure 1). The tubing is then placed around the animal's neck near the thoracic inlet, with the doughnut placed in the jugular groove. The tubing is then pulled tight on the animal's neck, and a pair of forceps or small vice-grip pliers is used to hold the tension on the free ends of the tubing. The pressure exerted by the doughnut on the jugular vein will cause it to distend. The tube may need to be clamped to the skin to limit its incursion cranially into the center of the sterile field. This device works best for llamas and cattle; for sheep and goats, a small length of cut bicycle inner tube can simply be applied at this site as a tourniquet.

In the author's experience, this is tolerated very well, with no evidence of compromise of carotid flow after hundreds of applications. In lambs and kids, one can simply use a cut length of heavy rubber band or rubber drain for this purpose (Figure 2).

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.[4] 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 most distal 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 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 the same site on the medial aspect of the digits. The technique for injection on the medial aspect of the digits is the same as for the lateral side. Deposition of lidocaine at these two 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 1 cm distal to the fetlock joint. A 20- or 22-gauge, 1-inch needle is poised perpendicular to the skin and parallel with the coronary band. The needle

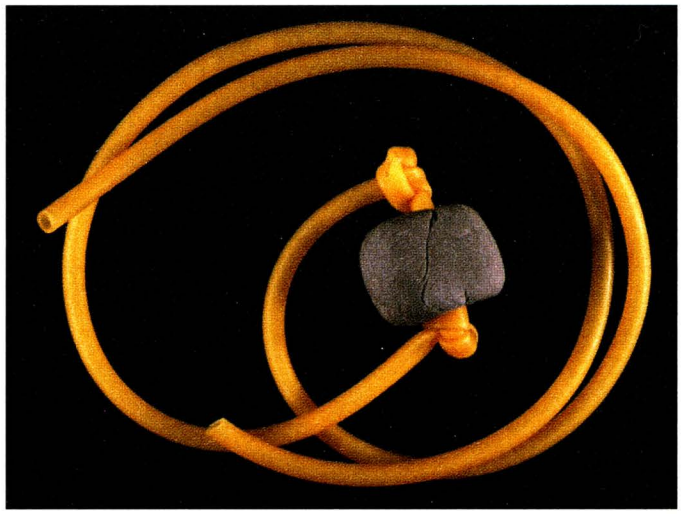

Figure 1. Cement "doughtnut" secured to rubber surgical tubing.

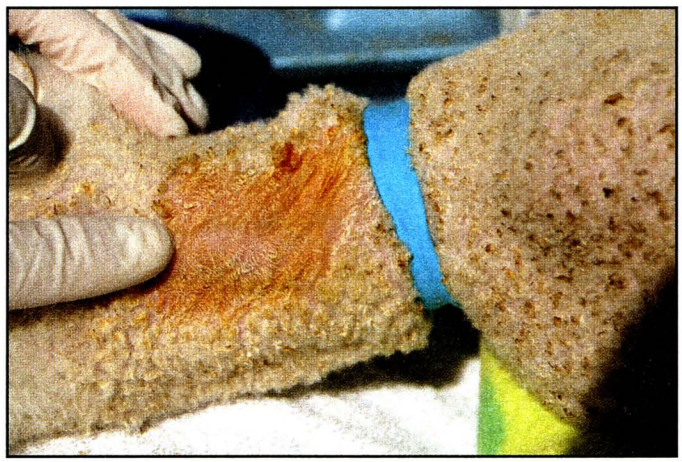

Figure 2. Heavy rubber tourniquet applied to aid in jugular venous distension in a dehydrated lamb. The lamb's head is to the left.

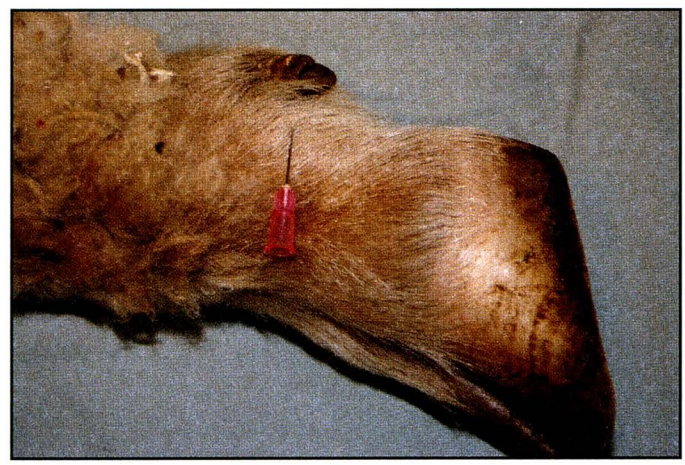

Figure 3. Path of subcutaneous needle insertion for the medial and lateral blocks.

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 two proximal phalangeal bones (Figure 4). For an adult ewe, 2-3 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, leaving a subcutaneous depot. 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, 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 two proximal phalangeal bones (Figure 5). For an adult ewe, 2-3 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. Deposition of lidocaine at this site is intended to anesthetize the axial palmar or plantar digital nerve.[2]

Onset of digital anesthesia occurs within 5-10 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. If diffuse cellulitis exists in the affected digit(s), an alternative technique for anesthesia (ring block, intravenous regional anesthesia) is recommended because insertion of the needle for the 4-point block may drive infected tissue fluid deeper into the digital tissues. The author has used this block in pigs and SACs, with the injection points being located roughly 1 cm distal to the fetlock joint in these species. In sheep and goats, the total dose of lidocaine should not exceed 10 mg per kg of bodyweight in order to avoid lidocaine intoxication.[4] In cattle, the volume injected per site should be increased 3-4 fold, and the needle size increased to 1-inch for the medial and lateral blocks and 1.5-inches for the dorsal and palmar / plantar blocks.

Lumbosacral Spinal Anesthesia

Lumbosacral anesthesia can be utilized for anesthesia for surgical procedures involving structures caudal to the level of the umbilicus, such as hindlimb 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, nearly all 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. Therefore, the following description applies to such instances, wherein true spinal anesthesia is induced by administration of lidocaine directly into the subarachnoid space, while CSF is flowing from the needle.

In adult ewes and does weighing more than 200 lb (90 kg), a 3.5-inch, 18- or 20-gauge needle is needed; for smaller sheep and goats, the procedure can be successfully performed with a 1.5-inch, 18- or 20-gauge needle. Owing to a greater depth from skin to spinal column, SACs that weigh more than 165 lb (75 kg) typi-

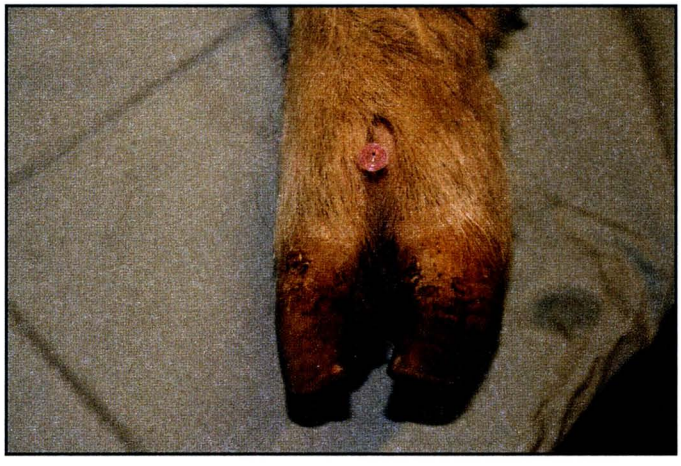

Figure 4. Needle insertion point for the deep injection component of the dorsal block.

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

cally require a 3.5-inch, 18- or 20-gauge spinal needle, whereas a 20-gauge, 1.5-inch needle is usually adequate for smaller SACs. 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 and the first sacral vertebra. The needle is aligned perpendicular to the vertebral column and inserted ventrally. The animal typically responds with a flinch or a movement of the tail when the subarachnoid space is entered. If the needle is advanced onto bone 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 off to one side. 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. Ewes and does with neonates in the same pen should be monitored carefully during recovery, as they may be weak and ataxic for 1-2 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.

Short-term, Injectable General Anesthesia for SACs 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 three 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 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. Anesthetic depth is typically sufficient for achieving recumbency and performing minor surgery; however, animals are typically not sufficiently anesthetized to enable endotracheal intubation. Local anesthesia is needed for most painful surgical procedures, such as castration.

In the author's experience, for reasons unknown, administration of this drug combination into the pelvic limb musculature has resulted in less consistent immobilization of the animal. Lateral recumbency is typically achieved in 4-7 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. The halter should be removed to limit the chance of pressure from the straps or buckles on the facial nerves.

In a study of this protocol in seven llamas and seven alpacas, five animals of each species were successfully anesthetized to the point of lateral recumbency.[3] Heart rates during recumbency ranged from 29-37 bpm in llamas and 37-49 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.[3] 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.

Endnote

[a]J-61PA Technovit Powder, Jorgensen Laboratories, Loveland, CO.

References

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