

# Bovine Field Restraint: Physical and Chemical Techniques for Balanced Restraint

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## Abstract

Restraint of cattle is a vital portion of practice. Knowing and applying methods of basic physical restraint is a necessity. By combining physical restraint methods with multimodal chemical restraint, better patient cooperation and analgesia enhance results.

## Résumé

La contention fait partie intégrante des opérations vétérinaires appliquées aux bovins. Il est donc vital de connaître et d'appliquer les méthodes de contention physique de base. En combinant les méthodes de contention physique à la contention chimique multimodale, l'animal immobilisé, sous l'effet du traitement analgésique, coopère davantage, ce qui améliore les résultats.

## Introduction

Of many physical and mental challenges in bovine practice, chief among them is safely and effectively restraining cattle for procedures. We first have to figure out how to keep them still, and keeping a bovine patient “still” is a relative term. It can be quite amusing, even bump us up a hat size when a colleague in another discipline, student, or client marvels at our ability to perform surgery “on the move” so to speak. We accept it as part of the job, but relish the thought of not having to hit a moving target with the suture needle, dodge the flying hoof like an inside fastball, or be forced to practice our box waltz steps. But mostly we want to provide the most safe, secure, and pleasant care we can while we're doing what we need to do. We have tried and true, very effective methods for physical restraint which can keep our patients “still”, including chutes, tables, and rope restraint methods. Lidocaine and local anesthesia prevent the “ouch” at the focal location, but many of us have been smashed or kicked working on that totally numb flank. Sedatives, dissociatives, and systemic analgesics provide the mental distraction needed to reduce reflex reactions and override learned behavior, but ideally want to be used at the minimally effective doses to avoid adverse side effects. To achieve this goal, consider “multimodal” anesthetic and analgesic protocols.

Restraint through low-stress handling, secure physical restraint, local/regional anesthesia, and

“chemical reasoning” share the role of addressing pain and stress management, reducing risk, and increasing safety in both patients and handlers. We can look at this as multimodal restraint. Environment, situation, or breed may necessitate adjustments. This discussion will describe situations encountered by the author requiring restraint and how they are addressed. Drug dosages discussed in this paper by the author are not intended to be a formulary replacement for published drug recommendations.

## Physical Restraint

Learn how to make a halter. Watch the movie “The Man from Snowy River” to make it look flashy or read about it in a bovine veterinarian practice tip by Dr. Dee Griffin.<sup>2</sup> Knowing how to fashion your own head restraint allows you to tailor the length of lead you may need in the field or incorporate the lead in various rope casting methods. Even in squeeze chutes with various head catches, the head has enough movement to cause harm to handlers and the patient, not to mention making it really challenging to accurately incise skin during cosmetic dehorning, for example. The halter should be easy to remove and not constrict the airway.

Rope casting methods are a very helpful safety net even in field anesthetized patients. The two most commonly performed are 1) the double half hitch, also referred to as the “reefing” method, and 2) the “running W”, also known as the “criss-cross” or “over and under” (Figures 1 and 2). Both methods have their pros and cons, but both are safe and effective for inducing and restraining cattle in recumbency. The author prefers the running W for midline cesarean sections as it allows access to the surgical field, and provides hindlimb stabilization all in one. The running W is not ideal for a recumbent flank approach.

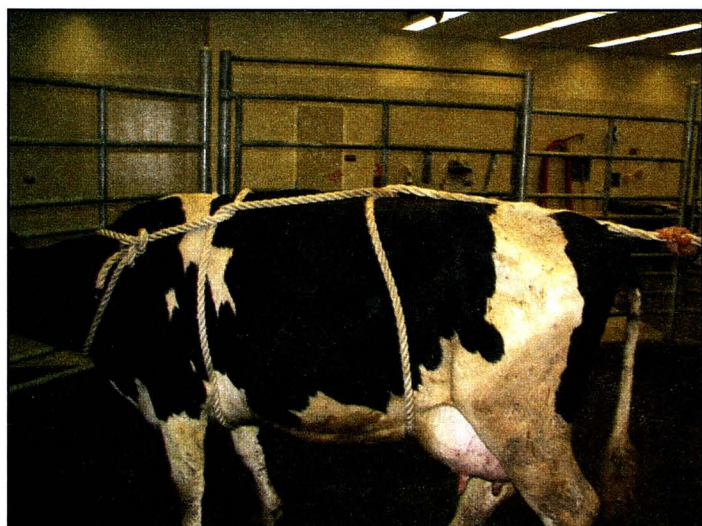
Invest in chutes and tables that allow safe access to the ventrum and feet. Portable units are very helpful, and endless possibilities exist with modifications made to adapt pulley systems and support straps for various situations.

## Local/Regional/Epidural Anesthesia

Block regions when possible, rather than locations. Local and regional anesthetics are commonly used in



**Figure 1.** The “running W” method of casting and restraining a patient in recumbency. The rope is draped over the dorsal neck, through the axilla bilaterally, then crossing dorsal over the topline and finally passing through the inguinal regions bilateral.



**Figure 2.** The “reefing” or double half-hitch method for casting and restraining a patient in recumbency. A non-tightening knot (bowline) is secured around the neck, followed by two half-hitch applications at the cranial and caudal barrel of the patient.

bovine practice for various procedures for both diagnostic and treatment regimes. Local infiltration of lidocaine into infected tissue or inflamed tissue can be ineffective, not to mention potentially scattering the infection with multiple injections. Therefore, when possible utilize local anesthetics at distal locations to the point of interest. Paravertebral blocks for the flank, intravenous regional limb blocks, ring blocks, and point blocks for

distal limbs and feet, and epidural blocks for perineal surgery are all well described and effective.

The distal limb can be anesthetized for localizing lameness and surgery by way of intravenous administration of lidocaine after applying a tourniquet proximal to the region, thereby allowing for diffusion of anesthetic throughout the distal limb. I have performed this procedure on standing cattle multiple times to address problems distal to the carpus/tarsus. After applying the tourniquet, allow several minutes to pass before attempting to insert the needle in the desired vein, usually blindly into the dorsal common digital vein. Delay after tourniquet application allows for the distal limb to desensitize to the insertion of the needle. A short extension line from the needle to the syringe is helpful to prevent perivascular injection during inevitable movement by the patient. Alternatively, a “four point” block of the abaxial pastern and interdigital region can be performed for coffin joint lesions or sole abscesses.

Epidural anesthesia with 2% lidocaine at high volumes (~20 to 50 mL [adult cow] in the tail head epidural space) will cause recumbency due to paralysis of the hind quarters. It is recommended that the animal be hobbled for recovery due to the extended time for the anesthetic effects to wear off. When combined with casting rope restraint, a pinch of opioid and a sprinkle of ketamine parenterally can make midline cesarean sections a lot more palatable.

### Field Anesthesia and Sedation

Chemical restraint can make procedures more pleasant for practitioners and patients, whether it be light or heavy sedation, or general anesthesia. The enhanced level of cooperation of the patient often improves efficiency to help counterbalance the cost of the drugs used. Of course, individual considerations with drug class use have to be made as to regulatory cost vs benefits. Finally, food animals require food safety guidelines and drug residue avoidance decisions to be considered with use of sedatives as well as antibiotics. Little is published in this area, and frequently changes. Call FARAD and consider the T<sub>1/2</sub> of the drug used. I am comfortable using short-acting drugs where elimination is nearly always less than healing times or antibiotic withdrawals for meat. Sedation for examination only requires an educated estimate. Milk withdrawals “should be” even shorter, but test when possible.

A few things should be taken into consideration when sedating or anesthetizing ruminants to aid in prevention of undue complications. First, ruminants produce a significant amount of saliva while under sedation or anesthesia. Thus, it is important that the patient’s head be positioned so that the saliva runs out of

the mouth, which is particularly important when the animal is in lateral or dorsal recumbency. As important as salivary pooling in the larynx are rumen contents from a drug-induced rumen atony and positional disruption of the rumen contents. This can be achieved simply by placing a pad under the neck just behind the ramus of the mandible or mid cervical region. The protocols that I will present should allow for some degree of protective laryngeal reflexes to remain intact to help prevent aspiration of saliva or rumen contents. Atropine does not necessarily reduce the amount of saliva produced in ruminants, but does make it more viscous which may be detrimental in itself. Atropine also causes reduced intestinal motility and risk of rumen atony. Try to perform as many procedures with the animal standing or in at least semi-sternal recumbency to help prevent or more readily recognize rumen tympany and decrease adverse cardiorespiratory effects. Also, consider other concurrent effects of the drug used, such as xylazine's increase in uterine tone, in addition to sedation of the fetus. Is there a dose-dependent effect of the drug used? For the most part there is, therefore using low-dose combinations of different drugs may provide desirable restraint without overwhelming individual mechanisms and saturating receptors.

### **Xylazine**

A suggested dose: Standing sedation (0.01-0.015 mg/lb (0.02-0.03 mg/kg) IV). Recumbency (0.05 mg/lb (0.1 mg/kg) IV).<sup>1</sup>

This is the most common drug used in chemical restraint of ruminants, either by itself or in combination with other pharmaceuticals. I rarely use the intramuscular route of administration as I am unsure of the ultimate effects that will be achieved and under what time frame they will occur. Intravenous administration provides me with a more predictable and faster onset of anesthesia and analgesia, and I can give multiple smaller doses to titrate the effect to the desired level of anesthesia or sedation. All levels of sedation from standing to recumbency can be achieved with xylazine alone. The initial demeanor of the patient does mediate the effect obtained to some extent. There are some dose-dependent side effects of decreased GI motility and cardiorespiratory function, and increases in uterine tone in late gestation. Use cautiously in compromised patients and/or reverse upon completion of the procedure. I will commonly reverse the effects of xylazine with tolazoline after the procedure, particularly if large amounts of xylazine were given to produce recumbency. Yohimbine has not proven to be as effective a reversal agent as tolazoline in my hands with ruminants. I use tolazoline at a much lower dose than the label dose, and have had good success and smooth reversals. The dose

I use for tolazoline is about 3X to 5X the milligrams of xylazine given, intramuscularly, dependent on the duration of the procedure and the time the last dose of xylazine was given. The recommended emergency reversal dose of tolazoline is 1.8 mg/lb (4 mg/kg) IV, but in the author's opinion, that is a whopping dose to reverse routine sedation, and mortal complications have been reported.

Combination anesthetic protocols are handy for standing and recumbent procedures, and can provide the multimodal goal of anesthetic-enhanced restraint. The author feels comfortable using an opiate, alpha-2, and dissociative combination for most procedures.

### **Intramuscular Butorphanol + Xylazine + Ketamine (BXK)**

Butorphanol (0.005-0.013 mg/lb (0.01-0.025 mg/kg)) + xylazine (0.01-0.025 mg/lb (0.02-0.05 mg/kg)) + ketamine (0.02-0.05 mg/lb (0.04-0.1 mg/kg)).<sup>1</sup> From this combination we get the benefit of a fairly potent ruminant sedative from xylazine, but at low dose. Butorphanol, a mild sedative, modulates some of xylazine's potency as well as providing analgesia and euphoria. Ketamine provides our dissociative limb of the combination with its affects of amnesia and catalepsy as well as analgesia.

At first glance, this dosage recommendation seems a little busy. But if you calculate this dose out for a 1000 lb (450 kg) animal, you come up with a dose of about 5 mg butorphanol, 10 mg xylazine, and 20 mg ketamine at the low range, and 10 mg butorphanol, 20 mg xylazine, and 40 mg ketamine at the high range.

Notice that we are administering about 2X the amount of xylazine as butorphanol, and 2X the amount of ketamine as xylazine. The 5-10-20 is good starting point for tame cattle and Brahman cattle. From this starting point, we estimate changes in doses administered. We don't give more than 10 mg of butorphanol, or 20 mg of xylazine in the initial dose. I personally have given up to 80 mg of ketamine and still maintained a standing patient. If we are going to re-dose during a procedure (try to give 30-40 minutes for the initial dose to fully take effect), then you can re-dose with one-half of your initial ketamine dose and one-fourth of the initial xylazine dose.

In general we have noted up to an hour of cooperation from patients using this protocol. As with anything, however, the attitude of the patient prevents blanket success, and we have had some go down, but restraint was maintained.

### **Other Drug Combinations**

Other drug combinations for achieving recumbency or subduing wild patients may need to be used

in certain situations. The following combinations are some suggestions that the author has used and feels comfortable with.<sup>1</sup>

- Intramuscular xylazine – ketamine: xylazine (0.05 mg/lb (0.11 mg/kg)) – ketamine (2 mg/lb (4.4 mg/kg)) administered together in one syringe. Extremely unruly patients may not go down in a timely fashion with this combination without some assistance. The level of anesthesia and analgesia seems to vary remarkably from patient to patient. Additional IV ketamine or “triple drip” (see below) can be administered to enhance the level of anesthesia and analgesia, if needed. Note that when using ketamine in combination with xylazine, it is important to allow sufficient time for the ketamine anesthesia to resolve (30-45 minutes post IM and 15-20 minutes post IV) before reversing the xylazine.
- Intravenous drips can be used to produce and/or sustain anesthesia. Sometimes severely cold ambient temperatures may necessitate the use of a warm water bath to run the IV line through if used.
- Triple drip – ruminant (GKX-Ru): Triple drip is 5% guaifenesin to which ketamine (1 mg/mL) and xylazine (0.1 mg/mL) have been added. The resulting mixture is administered as a slow IV infusion of 0.5-0.75 mL per pound (1.1-1.5 mL/kg) for induction of anesthesia, and can be continued at an infusion rate of ~ 1.2 mL/lb/hr (2.6 mL/kg/hr). Recovery time will be prolonged

with prolonged duration of infusion during the procedure.

- Double drip: Double drip is 5% guaifenesin to which only ketamine (1 mg/mL) has been added. Dose at 0.75-1.0 mL/lb (1.5-2.2 mL/kg) of BW. The benefit of double drip is less risk of cardiovascular compromise, but a downfall is a decreased level of analgesia. We commonly use this method for induction prior to starting the patient on inhalant anesthetics. If used in the field for a compromised patient, an analgesic such as morphine (0.025-0.1 mg/lb (0.05-0.2 mg/kg) IM) or butorphanol (0.025-0.1 mg/lb (0.05-0.2 mg/kg) IM) could be administered.

### Conclusion

Multimodal overall restraint is enhanced through multimodal chemical restraint techniques.

### References

1. Abrahamsen EJ: Chemical restraint in ruminants. *Vet Clin North Am Food Anim Pract* 24:227-243, 2008.
2. Griffin D: Easy halter or foot-restraint rope. *Bov Vet suppl* Jan 2009, p19.

### Recommended Reading

Fowler ME: *Restraint and Handling of Wild and Domestic Animals*, ed 2, Wiley-Blackwell, 1995.