

How to Maximize Standing Chemical Restraint

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1. Introduction

Sedation and analgesia are commonly required to help facilitate diagnostic and treatment procedures in standing horses. α_2 -Adrenergic receptor (AR) agonists alone or in combination with opioids are used most commonly for this purpose.¹ Although such drug combinations in standing sedation are useful and mitigate some of the risks associated with general anesthesia,² they are not free of adverse effects. Dose-dependent respiratory depression, hypertension, bradyarrhythmias, decreases in cardiac output, hyperglycemia, polyuria, and decreased gastrointestinal motility are commonly caused by α_2 -AR agonists.³⁻⁸ Also, the presence of fear, stress, excitement, and pain can lead to failure to achieve satisfactory sedation with α_2 -AR agonists.^{3,5} The goal of this report is to present a practical technique that can help equine veterinarians in maximizing standing chemical restraint in patients undergoing diagnostic and/or surgical procedures.

2. Drugs and Drug Administration Techniques

Xylazine, detomidine, and romifidine are the most common α_2 -AR agonists used to produce standing chemical restraint in equines, and the intravenous (IV) route of administration is preferred in most cases. An intravenous catheter is very useful for drug and fluid administration, especially for longer procedures. A single bolus administration can be

used for short procedures (<30 minutes), whereas multiple boluses (ie, as needed) or a constant rate infusion (CRI) may be necessary for longer procedures. For longer procedures, a loading dose followed by a CRI is probably best because it produces more constant plasma levels and hence more stable sedation levels, and the overall dose used may be lower than with multiple doses. Administering small additional boluses can be used to intensify the level of sedation if required. Whereas α_2 -AR agonists are generally considered potent and useful sedatives, some horses sedated with α_2 -AR agonists may suddenly react to stimulation (even to touch), may become excited, or may develop aggression (especially with xylazine). Opioids can be used to modify some of these responses and improve the quality of the chemical restraint.

Combining opioids (morphine, butorphanol) with α_2 -AR agonists will produce a state referred to as neuroleptanalgesia, in which the level of sedation and analgesia is more profound and greatly improves the chemical restraint. The opioids can be used as a single bolus for short procedures or, for longer procedures, as multiple intermittent boluses or as a loading dose followed by a CRI. Combinations of detomidine and morphine are very useful for procedures expected to be associated with strong noxious stimulation such as (but not limited to) ovarioectomy and tooth extraction. For this tech-

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nique, the horse is first sedated with detomidine (0.005–0.01 mg/kg IV) and then given a slow (~5-minute) bolus of morphine (0.03–0.05 mg/kg IV). Morphine should be administered slowly to reduce possible risks of histamine release and to allow for early detection of an excitatory reaction. A CRI of both drugs can then be instituted (detomidine at 0.005–0.01 mg/kg per hour and morphine at 0.03–0.05 mg/kg per hour). Alternatively, morphine can be administered as intermittent IV boluses (slowly) as needed throughout the procedure. During the CRI, sedation level can be deepened with additional IV boluses of detomidine (0.002–0.005 mg/kg) or xylazine (0.1–0.2 mg/kg) as needed. Butorphanol can be used instead of morphine to improve sedation and analgesia produced by detomidine. It is administered as an initial IV bolus (loading dose) of 0.01–0.02 mg/kg that can be followed by a CRI (0.01–0.02 mg/kg per hour) or intermittent IV boluses (0.01–0.02 mg/kg IV) as needed. For the CRI, the drugs are best delivered with the use of syringe pumps as it allows for the most accurate dosing. However, drugs can also be added to a bag of crystalloid fluids and delivered through gravity flow with a drip set. For maximal control of infusion rates, drugs should be given through separate syringe pumps or fluid bags. For example, 10 mg of detomidine can be added to a 250-mL bag of saline (0.04 mg/mL) and dripped to effect through a 60-drop/mL drip set. With this setup, 1 drop per second will deliver 60 mL of fluid per hour or 2.4 mg of detomidine per hour. This is the equivalent to a dose of 0.005 mg/kg per hour of detomidine. It can be easily adjusted up or down from here as needed.

In patients undergoing urogenital procedures (ie, ovariectomy, removal of kidney stones), caudal epidural (S5-Cox1 or Cox1-Cox2) administration of morphine (0.1 mg/kg diluted into 15–20 mL of saline) produces useful analgesia during and after surgery.⁹ Although not typically used for sedation of adult horses, very low doses of midazolam or diazepam (0.005–0.01 mg/kg) appear to relax the tongue and jaw and facilitate dental procedures.³ Patients undergoing dental procedures may benefit from attenuation of visual (apply blindfold), auditory (apply cotton in ears), and oral tactile sensation (apply lidocaine gel on the surface of the tongue and oral mucosa). Patients with severe dental disease and suspected pathologic pain (ie, hyperalgesia, allodynia) may react severely to needle placement through the skin during the performance of nerve blocks. Application of a thick layer of eutectic mixture of local anesthetics (EMLA) cream on the skin over the site of the nerve block 20 to 30 minutes before the procedure greatly facilitates the performance of the nerve block. Patients undergoing prolonged sedation or expected to require deep sedation levels are in greater danger of development of significant ataxia and recumbency and therefore will

benefit from a sling. Drugs and materials should be available to induce and maintain general anesthesia in the case that a patient undergoing standing chemical restraint becomes recumbent. For long procedures, a urinary catheter should be placed in equine patients sedated with α_2 -AR agonists because these drugs increase urine production.

3. Discussion

Horses sedated with detomidine and morphine are typically less responsive to noxious as well as non-noxious stimulation. However, local blocks are still required to facilitate most surgical procedures. When given as a CRI, this combination produces stable sedation that can be relatively easily adjusted as needed. In our institution, this is the preferred method of sedation of horses undergoing urogenital as well as head procedures.

We have observed that significantly more detomidine and morphine is required to produce satisfactory chemical restraint in horses undergoing extensive dental procedures (ie, root canals, multiple dental extractions, etc). Some of these horses may have significant bradycardia and require treatment with an anticholinergic such as butylscopolamine.^a It can be given as small doses (0.05–0.1 mg/kg IV) as needed to maintain heart rate within an acceptable range for the patient.

Horses sedated with detomidine and morphine, especially those undergoing prolonged procedures, will also receive a crystalloid solution such as lactated Ringer's solution (2–5 mL/kg per hour) to maintain fluid balance and replace losses caused by polyuria. These horses also typically receive mineral oil through a nasogastric tube at the end of the procedure and are kept on colic watch for the following 24 hours. Morphine is avoided, used at the lowest possible doses, or replaced with butorphanol in horses with a recent history of colic. Antagonism of detomidine or morphine is typically not needed but could be performed with the appropriate antagonists.

References and Footnote

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- ^aBuscopan®, Boehringer Ingelheim Vetmedica, St. Joseph, MO 64506.