

Drugs and Anesthesia

BY NANCY S. LOVING, DVM, AND STACEY OKE, DVM, MSC

Treating Severe Forelimb Pain With a Continuous Nerve Blockade

Veterinarians can reduce a horse's severe forelimb pain by administering a continuous, low-dose infusion of the local anesthetic bupivacaine, but this method is not suitable for every case, according to researchers from Cornell University's College of Veterinary Medicine.

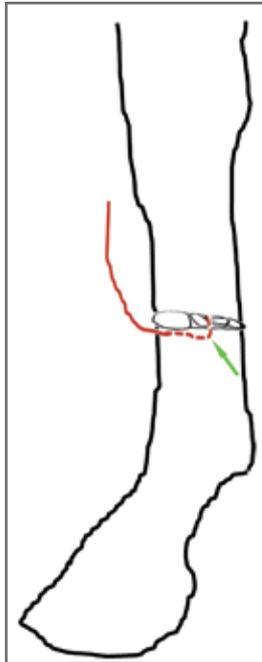
"Severe forelimb pain can occur with fractures, joint or tendon sheath infections, or traumatic injuries," explained Ashlee E. Watts, DVM, Dipl. ACVS, a graduate student pursuing a PhD and a part-time large animal surgeon, who presented a study on this subject. "In response to the reluctance to bear weight on a severely painful limb, increased weight bearing stresses are placed on the opposite forelimb, which can lead to support limb laminitis."

Veterinarians can administer epidural medications in the hind limb to drastically reduce pain. Since an epidural cannot be used for forelimb pain, Watts and colleagues assessed the use of a continuous peripheral nerve blockade (CPNB). This technique is performed by inserting a catheter in the mid-metacarpal (cannon bone) region between the suspensory ligament and the deep digital flexor tendon and continuously administering bupivacaine to the palmar nerves. These nerves are responsible for transmitting pain signals from the tissues of the distal cannon bone, fetlock, pastern, and foot to the spinal cord and brain.

Watts and colleagues compared the effect of administering bupivacaine via CPNB at a rate of 0.14 mL/hour to that of injecting bupivacaine only intermittently (0.85 mL every six hours). They studied 14 horses with experimentally induced forelimb pain over three days.

Key findings:

- CPNB can be performed using a single catheter and a low volume of bupivacaine that does not cause complete nerve block;



COURTESY DR. ASHLEE WATTS

The diagram on the left shows placement of a catheter for continuous administration of bupivacaine to the palmar nerves that transmit pain signals. The middle photo shows the catheter prior to removal, and the photo at right shows the catheter immediately after removal. The solid red line (in diagram) represents the catheter; the dotted red line on the diagram/white arrows on the photos shows subcutaneous (beneath the skin) catheter placement. The green arrows show where the catheter transitions from subcutaneous to between the suspensory ligament and check ligament.

- Catheters were easily placed and did not dislodge with normal limb movements; and

- CPNB effectively decreased severe, short-term lameness compared to intermittent low-dose injections. No adverse effects of the injections were noted.

"One catheter did culture positive for *Staphylococcus aureus*, suggesting that although this technique can reduce lameness from short-term, severe forelimb pain, clinicians need to consider the risk of microbial contamination to the tissues when selecting cases in which to use this technique," concluded Watts.

Side Effects of Sedative Reversal

The idea of being able to "unsedate" or "reverse" a sedated horse after minor procedures is a great one, but veterinarians must select their cases carefully and be

vigilant about using these drugs properly.

"The alpha-2 adrenergic agonists xylazine, detomidine, and romifidine are all commonly used sedatives in equine practice," relayed David B. Scofield, DVM, of Colorado State University's College of Veterinary Medicine & Biomedical Sciences. "Their effects can be reversed by such drugs as tolazoline and yohimbine."

Tolazoline is FDA-approved for horses and has been deemed a safe pharmacologic product: "Yohimbine is approved for use in dogs, so there is no label claim for the horse. Tolazoline is specifically labeled for the horse, therefore it's deemed safe for use in the horse."

To document the side effects associated with tolazoline or yohimbine in horses, Scofield and colleagues collected data from case reports on the AAEP e-mail distribution list and Equine Clinician's

distribution list in early 2010.

“Thousands of doses of tolazoline and yohimbine are used successfully each year without incident,” he said. “This survey found only 18 adverse reactions that occurred without a pattern or predisposing factors.”

Of these 18 reports from veterinarians, seven horses were treated with tolazoline and 11 with yohimbine. Four and nine deaths occurred respectively following administration of these drugs.

Veterinarians are well aware that no drug is risk-free; however, Scofield et al. warned that adverse reactions to alpha-2 antagonist agents like tolazoline and yohimbine can occur unpredictably and without a predisposing factor.

In horses that exhibit a reaction to an alpha-2 antagonist, the study authors suggested providing cardiovascular support via intravenous fluid therapy and administering a vasoactive drug such as phenylephrine.

“As outlined in our paper included in the AAEP conference proceedings, veterinarians are encouraged to follow the dosage time frame and routes of administration to limit the potential for an adverse reaction and to carefully weigh the benefits of the use of these drugs for nonemergency situations,” Scofield concluded.

Horse Sedation with an Oral Gel

We’ve all heard about or witnessed horses that simply refuse to be restrained long enough for the veterinarian to administer a much-needed intravenous sedative. Authors of a recent study suggest that a sedative-containing gel might be just what the doctor ordered in these cases.

Detomidine is an alpha-2 adrenergic agonist and one of the more common drugs used to sedate horses. Usually, veterinarians administer detomidine intravenously, but they can inject it intramuscularly as well.

For those “hard to reach” horses, an oral formulation that can be administered by either a veterinarian or horse owner/trainer would be a valuable product, said Gary W. White, DVM, of Sallisaw Equine Clinic, in Oklahoma. White and colleagues tested the gel in 129 horses.

“The horses in the treatment group were sedated with a single, sublingual (beneath the tongue) dose of the gel prior



Above, a demand valve is being used to ventilate an anesthetized horse.

to performing such procedures as cleaning the prepuce (sheath), clipping hair, trimming feet, shoeing, manual rasping of teeth, radiography, and passing a stomach tube or endoscope,” said White.

“Hypoventilation in anesthetized horses is undesirable because reductions in breathing cause changes in the amount of oxygen that is delivered to the body ...”

DR. JOHN A. E. HUBBELL

The researchers included an additional 42 horses in a placebo group.

Key findings:

- Handlers were able to complete 76% of the procedures successfully in the treatment group;
- They were successful in completing only 7% of the procedures were in the placebo-treated horses; and
- The researchers did not note any significant side effects following administration of the detomidine gel.

“This study demonstrated that the gel is safe and effective for horses requiring sedation for routine procedures,” concluded White.

This was one of the studies required for U.S. approval of detomidine oral gel in the United States. The product is now approved and is available from Pfizer Animal Health as Dormosedan Gel.

Avoiding Respiratory Problems in Anesthetized Horses

Letting ‘sleeping horses lie’ may not be the best thing when they’re anesthetized, according to John A. E. Hubbell, DVM, MS, Dipl. ACVA (anesthesiology), professor of veterinary anesthesiology in the Department of Veterinary Clinical Sciences at The Ohio State University’s College of Veterinary Medicine. In fact, the horse might not get enough oxygen, so some kind of ventilation is preferred, particularly when anesthesia extends for 60 minutes or longer. Hubbell reviewed support ventilation techniques for the anesthetized horse.

Hypoventilation occurs when a horse’s lung ventilation is reduced or deficient. Hubbell explained, “Hypoventilation in anesthetized horses is undesirable because reductions in breathing cause changes in the amount of oxygen that is delivered to the body and changes in metabolism by altering the cellular



COURTESY DR. LORI BIDWELL/AAEP PROCEEDINGS

The musculature in the donkey's neck can make accessing the jugular vein more difficult in donkeys, which complicated the process of inserting a catheter for general anesthesia.

environment of various organs, including the heart, liver, and muscles.

"Even healthy horses hypoventilate under general anesthesia," he continued. "This decrease in respiration and subsequent decrease in oxygenation of their tissues is caused by three main things: the drugs they are administered, being laid down on their sides or back, and the length of time they are anesthetized." Most anesthetic procedures in the field last less than an hour, and horses kept under for that amount of time usually tolerate the hypoventilation well in most instances. Regardless, all anesthetized horses benefit from the administration of oxygen while they are recumbent, Hubbell noted.

A number of veterinary researchers have looked at ways veterinarians can minimize the degree of this "respiratory embarrassment" (i.e., respiratory depression, hypoventilation, and decreased oxygen delivery). He summarized these as follows.

During short procedures veterinarians should monitor anesthetized horses' ventilation and oxygenation by looking at their respiratory rate and the "pinkness" of their gums. During longer procedures, the best way to assess the adequacy of ventilation is to take a sample of arterial blood to measure pH and the blood gases (carbon dioxide and oxygen). Portable, "stall-side"

units allow veterinarians to assess ventilation even in remote locations. Arterial blood-gas analysis is the "gold standard" method of monitoring ventilation and oxygenation.

Veterinarians should enhance oxygenation by delivering oxygen ("insufflating") via a compressed gas source through a delivery tube to the pharynx or trachea.

Veterinarians should support ventilation and oxygenation either manually (by compressing an air-filled bag that delivers air to the horse) or with a commercial ventilator. Larger breaths and lower respiratory rates are better. Excessively fast respiratory rates should be avoided because the distribution of ventilation is less optimal when they are used.

Any anesthetic procedure has the potential to significantly impair respiration and oxygenation in the horse, Hubbell added. Anesthesia of a short duration is relatively well tolerated, but horses anesthetized for longer procedures benefit from increased inspired oxygen levels and assisted ventilation.

Anesthesia for Donkeys vs. Horses

"Donkeys are becoming more common patients for equine veterinarians, and although it is tempting to treat a donkey like a horse, there are important differences regarding patient handling and

drug dosages," said Lori Bidwell, DVM, of Lexington Equine Surgery and Sports Medicine in Kentucky. She discussed the key differences between anesthetizing donkeys and horses, listing several behavioral and physiologic differences between the two equids:

- Donkeys behave differently than horses (their behavior is often closer to that of cattle rather than horses);
- The musculature in the donkey's neck can make accessing the jugular vein more difficult in donkeys, which complicates the process of inserting a catheter for general anesthesia. A local anesthetic and surgical incision can help veterinarians place an intravenous catheter more easily;
- The angle of the larynx at the back of the throat (top of the trachea) is different than in horses, and donkeys have a pharyngeal diverticulum (pocket) in their throat, excess tissue in their pharynx, and elongated laryngeal sacculles (part of the airway that aids in vocalization). Together, these differences make placing an endotracheal tube through the mouth to the trachea more difficult; and

- Nasal intubation also is more challenging because donkeys have narrower nasal passages than horses.

Also, higher doses (typically 1.5 times the horse dose) of a number of drugs are needed in donkeys. "One notable exception is guaifenesin (a centrally acting muscle relaxant). Horse doses of this drug in donkeys can cause respiratory arrest," she warned.

In general, all of the same types of drugs can be safely used in both horses and donkeys. This includes sedatives (e.g., xylazine and detomidine, used to sedate for standing surgeries), drugs used to induce or maintain general anesthesia (e.g., ketamine, diazepam), and drugs for pain management (e.g., butorphanol, morphine).

"Donkeys can be easy to work with if everyone appreciates that they are not horses," concluded Bidwell.

Bute vs. Firocoxib Safety

The non-steroidal anti-inflammatory drug (NSAID) firocoxib had fewer side effects than phenylbutazone in horses after 42 days of treatment, according to scientists from Merial Limited who presented



comparative research results.

Phenylbutazone, or "Bute" as it is commonly called, is useful for controlling pain and/or inflammation in many equine veterinary cases, but its use is not without risk. Side effects such as gastric ulcer formation and kidney damage can occur.

Like phenylbutazone, firocoxib is also a non-steroidal anti-inflammatory drug. It is approved to control pain and inflammation associated with equine osteoarthritis at a dose of 0.1 mg/kg once daily for up to 14 days.

Bute, considered a "pioneer" NSAID, inhibits the production of pro-inflammatory molecules (called prostaglandins, produced from fatty acids) by blocking the action of an enzyme called cyclooxygenase (COX, which makes the prostaglandins from the fatty acids). Unfortunately, Bute blocks some "good" prostaglandins, such as those that protect the lining of the stomach. Newer NSAIDs such as firocoxib are more selective and mostly block the production of "bad" prostaglandins;

therefore, these are thought to have fewer untoward side effects.

The research team treated 42 horses with various dose levels of firocoxib and phenylbutazone once daily by mouth (orally) for 42 days. They found:

The non-steroidal anti-inflammatory drug (NSAID) firocoxib had fewer side effects than phenylbutazone after 42 days of treatment.

- There was an 88% increase in gastric ulceration in the horses treated with therapeutic levels of phenylbutazone (4.4 mg/kg), compared to only an 11% increase in horses in the control group and those treated with elevated levels of firocoxib (0.5 mg/kg);

- Microscopic damage to the gastrointestinal tract occurred following phenylbutazone, but investigators did not note any damage even after administering five times the therapeutic level of firocoxib; and

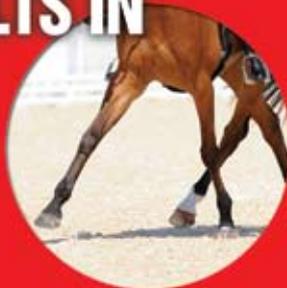
- The researchers noted microscopic damage to the kidneys following administration of therapeutic doses of phenylbutazone, but they noted similar damage only in the higher-dose firocoxib-treated horses.

The research team concluded that after 42 days of treatment at therapeutic levels, firocoxib was well-tolerated, whereas phenylbutazone was associated with gastrointestinal ulceration and tubulointerstitial nephropathy (a type of kidney damage that can lead to kidney failure). 🐾

MORE ONLINE See TheHorse.com/AAEP2010

- Watch the Drugs and Anesthesia in Horses video, TheHorse.com/Video.aspx?VID=470.

STRONGER BONE RESULTS IN



PAIN-FREE JOINTS

The *only* bone supplement containing proven joint supplement **CORTA-FLX**®

OCD™ Pellets provide the fundamental nutrients for **healthy bone development**

and aids in resolving skeletal injuries and joint pain.

What do you feed for bone?

Feed OCD™ Pellets for as little as 99¢ a day.



To order visit

www.OCDPELLETS.COM

or call **866-392-2363**



Dr. Douglas R. Beebe

Located in Lexington, KY

