

FACILITATING SAFE AND EFFECTIVE EQUINE ANESTHESIA

John A.E. Hubbell DVM, MS, ACVAA

Rood and Riddle Equine Hospital

Lexington, Kentucky

Morbidity and mortality for anesthetized horses is greater than other species with published estimates suggesting a mortality rate of 1%. A 2010 Survey of AAEP members revealed that approximately 50% of equine veterinarians anesthetize horses at least once a week, making anesthesia a relatively frequent occurrence in practice.¹ The survey further revealed that approximately 50% of equine veterinarians anesthetizing patients utilize an assistant to aid in induction and recovery and for monitoring, but only 22% complete an anesthetic record.

The author's view is that competent assistance is invaluable when veterinarians anesthetize any species of animals but especially the horse. The use of defensible anesthetic procedures and the documentation of the drugs used and their effects is the veterinarian's best defense if an untoward event occurs and there is litigation. The purpose of this presentation is to provide methods for those assisting veterinarians to help veterinarians in anesthetic situations to improve equine anesthesia and assist the veterinarian

The diplomates of the American College of Veterinary Anesthesia and Analgesia have developed guidelines for the use of anesthetics in the horse.² The guidelines are reasonable and form the basis for safe anesthetic practice. The guidelines emphasize the preanesthetic evaluation of the horse, the selection of appropriate drugs and doses, monitoring of the horse while anesthetized and documentation of each of the components. The maxim "If it wasn't written down, it didn't happen" is a phrase frequently applied in legal situations. Clearly, the veterinarian is the primary person responsible for the maintenance of the medical record but on a practical basis, his assistants make significant contributions to the thoroughness and accuracy of the record.

The guidelines suggest that prior to anesthesia the owner should be informed about the benefits and risks of the procedure to be performed and the risk of anesthesia. If the horse is insured, it is usually the responsibility of the owner to inform the insurance company that surgery and anesthesia are required but it is always prudent to ask the owner if the horse is insured. The guidelines suggest that written confirmation of informed consent from the owner or agent is obtained before beginning the procedure.

The author recommends that the anesthetic drugs to be used and emergency drugs be assembled in a pack or be placed so they are readily available before anesthesia induced. Emergency drugs that should be on hand include atropine or glycopyrrolate, epinephrine, and calcium chloride. It is also prudent to have 5 to 10 liters of isotonic fluids, such as lactated Ringers solution nearby. Syringes, needles, and a scalpel blade

with handle should also be easy accessible. Although few veterinarians carry an oxygen source with them in ambulatory situations, it is probably a good practice.

Preanesthetic Evaluation

Prior to any anesthetic procedure the horse should be identified and its age, sex, breed, and procedure to be performed and recorded. The preanesthetic evaluation should include a history of any recent medical problems, particularly if the patient is new to the practice. Questions that might be asked include: Can you catch the horse? Is the horse halter broke? Is the horse eating normally? Has the horse been anesthetized before? Has the horse ever colicked? Does the horse have persistent cough? Does the horse react well to sedation?

Record the findings.

The preanesthetic evaluation should continue with a physical examination. At a minimum the heart and lungs should be auscultated to determine the heart rate and rhythm and evaluate bronchovesicular sounds for the presence of pneumonia or other respiratory disease. The body temperature should be acquired and recorded. Determine an estimate of the body weight using a weight tape or other method. Lastly, it is useful to walk the horse a short distance to determine if the horse is sound and if there is any degree of ataxia that might affect recovery from anesthesia.

Record the findings.

The ACVAA guidelines suggest placing an intravenous catheter. Catheter placement has several advantages including assurance that drugs meant to be given IV are given IV and reduced irritation of the vessel (reduced number of punctures). Importantly, the presence of a catheter reduces stimulation of the patient in the induction phase because it reduces the required restraint and it avoids the pain of a needle stick that might cause patient arousal. Further the presence of the catheter facilitates the administration of additional anesthetic drugs, if required.

In field situations, it is important to select an appropriate site for the anesthesia and procedure. A top priority should be the footing. It is important that the surface be non-slick but not sticky with a grassy area and most riding arena surfaces working well. A minimum size of the space should be 12' by 12' for an adult horse. Bigger spaces tend to work better than confined spaces. Extensive padding is not required for short surgeries (less than 30 minutes). Depending on the amount of available assistants, ropes or straw bales can be used to maintain the horse's position, particularly when dorsal recumbency is chosen.

The Anesthetic Period

Ketamine is the primary drug used to anesthetize horses. Ketamine is an NMDA antagonist with activity at other receptors that produces what is termed dissociative anesthesia. Ketamine indirectly stimulates the cardiovascular system and respiration and respiratory reflexes tend to be maintained so that the airway remains patent. The larynx remains sensitive so horse may swallow frequently.

Ketamine should not be given to horses that have not been sedated. When given alone ketamine causes a waxing and waning rigidity that is known as catalepsy. Increases in muscle tone are frequently present and occasionally animals become excited. The use of xylazine and ketamine for equine anesthesia was first reported in 1977, some 41 years ago. Xylazine was given intravenously with ketamine to follow after 5 minutes when the animal was fully sedated.³ Induction is usually excitement free and muscle relaxation is adequate. Fifteen to 20 minutes of anesthesia is typically produced. Time has shown this technique to be safe but problems including "induction failure", inadequate muscle relaxation and too short a duration (less than 10 minutes) are reported.

The quality of anesthesia with xylazine and ketamine can be improved with the addition of a muscle relaxant. Guaifenesin was the first drug utilized and it produces good to great muscle relaxation but must be administered in large, relatively dilute volumes because it irritates the linings of vessels and causes hemolysis.⁴ Currently diazepam and midazolam, both benzodiazepine tranquilizers are coadministered with ketamine to improve muscle relaxation. The required volume is small (5 to 10 ml) and the degree of muscle relaxation is similar to that seen with guaifenesin.⁴ The addition of a muscle relaxant improves the quality of anesthesia, produces a smoother and more predictable induction and typically adds 5 to 10 minutes to the duration of anesthesia.⁴

Detomidine or romifidine can be used instead of xylazine. The use of detomidine tends to extend the anesthetic period and produce less coordinated recoveries than seen after xylazine sedation.⁵ Horses do not appear as sedated after romifidine administration and muscle relaxation is not pronounced thus the co-administration of muscle relaxants is necessary.⁶

The induction of lateral recumbency occurs within 60 to 90 seconds of ketamine administration. If muscle relaxants are used the induction usually occurs more quickly. Check for the presence of a pulse and respiration as soon as the horse is recumbent. Since horses are obligate nasal breathers and rarely regurgitate, the passage of an endotracheal tube, while a best practice is not required for short simple procedures.

Once the horse is recumbent and positioned for surgery, the halter should be removed to reduce the risk of facial nerve paralysis. The assistant should position themselves at the horse's head with additional anesthetic drugs within reach in case the depth of anesthesia is insufficient. Draw up 300 mg of ketamine (3 ml) in a syringe in preparation.

According to the ACVAA guidelines, the pulse rate and respiratory rate should be measured at least every 5 minutes and recorded at least every 10 minutes. The pulse rate should be determined over 10 to 15 seconds and the respiratory rate over 20 to 30 seconds (respirations tend to be more irregular). Initially, horses tend to breath hold (an apneustic breathing pattern).

Other means of assessing the horse include checking the color of mucous membranes and examining the eye. Horses anesthetized with ketamine have brisk palpebral reflexes and frequently tear and have nystagmus or side to side motion of the eye.

The presence of a strong regular pulse is sufficient cardiovascular monitoring for most short procedures. Pulse strength decreases as anesthetic depth increases.

If the horse does not move in response to surgical stimulation, it is sufficiently anesthetized for the procedure being performed. If the horse moves and the procedure is not completed, administer additional anesthetic drugs. The first “go to” drug is ketamine at a dose of 100 to 300 mg to a 1000 pound horse. This should be effective for 5 to 10 minutes. Check the heart rate and respiratory rate after ketamine administration and draw up additional ketamine in case it is needed.

Record what you did and when.

Recovery from anesthesia

Write down the time when the surgery is over and place the horse in lateral recumbency. It is important to position the horse so it has room to move forward as it gets up.⁷ Do not be in a hurry. More horses have trouble when they try to get up too soon than when they take too long to stand. If the horse tries to get up immediately, consider sedating it with some xylazine (100 – 200 mg, IV). Replace halter and attach a cotton lead rope. Cover the eye, particularly if you are outdoors. A tail rope is a useful aid if there are sufficient personnel present to allow its use. Once the horse stands, take hold of the halter so that it does not attempt to move around. Keep it standing in place for 5 to 10 minutes then return the horse to its stall. Remove the catheter and withhold food for 2 hours.

Record the times when the horse stood, any incidents, and when the horse returned to its stall.

Troubleshooting

What if the horse won't stand still for catheter placement or an IV injection?

Give xylazine (2 mg/kg) IM or detomidine (0.02 mg/kg) IM or detomidine gel

Then place a catheter administer IV drugs in increments until the nose is below the knees

What if the horse won't stay asleep?

Apply physical restraint.

Administer ketamine 100-300 mg/IV

Extends anesthesia 10 min or less

What if the horse still won't stay asleep?

Apply physical restraint

Administer xylazine (250 mg) and ketamine (500 mg)

Extends anesthesia time about 10 min.

What if the horse still won't stay asleep?

Administer GKX or Triple Drip

GKX is made by adding 1000 mg of ketamine (10 ml) and 500 mg of xylazine (5 ml) to 1 liter of guaifenesin (5%)

Administer to effect

Alternatively, replace guaifenesin with 25 mg of midazolam (5 ml) and administer to effect

What if the heart rate falls to less than 25 beats per minute?

If pulse is weak: administer atropine or glycopyrrolate

If pulse is strong: do not treat

What if respiration is absent or very slow? (2-3 breaths per minute)

Check pulse, Check color

Administer oxygen via demand valve or nasal tube

Administer doxapram?

Summary

Identify the patient: Write it down

Examine the patient: Write it down

Get written permission

Administer sedative drugs: Write it down

Administer induction drugs: Write it down

HR and RR every 5 min: Write it down

Watch until the horse stands: Write it down

Questions?

¹ Hubbell JAE, Saville WJA, Bednarski RM. The use of sedatives, analgesics, and anesthetics in the horse: an electronic survey of the members of the American Association of Equine Practitioners. *Equine Vet J* 42: 487-493, 2010.

² Martinez EA, Wagner AE, Driessen B, et al. American College of Veterinary Anesthesiologists guidelines for anesthesia in horses. Available online at <http://acvaa.org/docs/EquineGuidelines>. Accessed September 25, 2018.

³³ Muir WW, Skarda RT, Milne DW: Evaluation of xylazine and ketamine hydrochloride for anesthesia in horses. *Am J Vet Res* 1977; 38:195-201.

⁴ Brock N, Hildebrand SV: A comparison of xylazine-diazepam-ketamine and xylazine-guaifenesin-ketamine in equine anesthesia. *Vet Surg* 1990;19:468-474.

⁵ Clarke KW, Taylor PM, Watkins SB, Detomidine/ketamine anaesthesia in the horse. *Acta vet scand* 1986;82:167-179.

⁶ Kerr CL, McDonnell WN, Young SS. A comparison of romifidine and xylazine when used with diazepam/ketamine for short duration anesthesia in the horse. *Can Vet J* 1996;37:601-609.

⁷ Hubbell JAE. Recovery from anesthesia in horses. *Equine Vet Educ* 11:160-167,1999.