How to Use Local and Regional Anesthesia for Procedures of the Head and Perineum in the Horse

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1. Introduction
Combining local or regional anesthetic techniques with sedation will allow many diagnostic and surgical procedures to be safely performed in the horse. Drugs used for local anesthesia are designed to penetrate peripheral nerves and interrupt nerve conduction resulting in reversible anesthesia for a predictable period of time.1 It is important for the clinician to have a thorough understanding of the pertinent anatomy in order to be successful with these techniques.

2. Local Anesthetics
The mechanism of action of local anesthetic drugs is to prevent transfer of nociceptive information by blocking sodium channels in excitable membranes.1,2 Local anesthetics can be used topically, injected over nerves (perineural anesthesia), intra-synovial, regional infiltration, and injected into the epidural space. Common local anesthetics used in equine practice are lidocaine hydrochloride, mepivacaine hydrochloride, and bupivacaine hydrochloride.

Lidocaine is probably the commonly used because of its potency, rapid onset of action, moderate duration of action, topical anesthetic properties, and cost.1 Peripheral nerve blocks and epidural anesthesia are typically performed with the use of a 2% lidocaine solution. The onset of action for peripheral nerve blocks is typically 5 to 10 minutes. The duration of action has been reported to be 1.5 to 3 hours, but clinical experience would suggest that the duration of action is shorter.1,2 Repeated dosing or excessive amount of lidocaine can lead to toxicity. Total dosage should be kept less than 250 mL of 2% lidocaine in a 500-kg horse.

Mepivacaine is very similar to lidocaine. It has a similar onset of action, but the duration of action is longer.1 Mepivacaine has less vasodilatory activity compared with lidocaine, and mepivacaine is less effective as a topical anesthetic compared with lidocaine.

Bupivacaine is two to four times as potent as lidocaine and mepivacaine. It has a much slower onset of action and a prolonged duration of action. The duration of action is reported to be greater than 3 hours.1

3. Anesthesia of the Head
Dental procedures are one of the most common reasons to use regional anesthesia of the head. Other indications include ophthalmic procedures, lacera-
tion repair, and repair of incisive bone fractures. The maxillary, mandibular, alveolar, and mental nerve blocks are the regional nerve blocks of the head. The horse should be sedated and properly restrained before the nerve block is given. The area over the injection site should be cleaned and prepped. Clipping of the hair is not necessary.

Maxillary Nerve Block

The maxillary nerve enters the infraorbital canal at the pterygopalatine fossa and becomes the infraorbital nerve. Anesthetizing the maxillary nerve at the level of the pterygopalatine fossa will desensitize the ipsilateral dental structures of the maxilla and premaxilla, the paranasal sinuses, and the nasal cavity. There are two techniques to perform this block. The first method uses a 3.5-inch, 20- or 22-gauge spinal needle inserted perpendicular of the long axis of the head at the level of the caudal third of the orbit. The needle should be just ventral to the zygomatic process and dorsal to the transverse facial vessels. The needle is advanced until bone is contacted. The volume of local anesthetic to be injected is 15 to 20 mL.

The second technique uses a 6-inch spinal needle inserted just ventral to the most dorsal aspect of the zygomatic process. The needle is directed rostrally and ventrally, aiming toward the rostral aspect of the contralateral facial crest. The needle should be advanced until bone is contacted. The volume of anesthetic to be injected is 15 to 20 mL. Within 15 minutes, structures innervated by the maxillary nerve should be desensitized.

Infraorbital Nerve Block

The infraorbital nerve can be desensitized as it emerges from the infraorbital canal or within the infraorbital canal. The effect is the same as achieved with the maxillary nerve block if local anesthetic completely fills the infraorbital canal. The skin of the ipsilateral lip, nostril, and face up to the lateral surface of the mandible and premaxilla provides innervation to the ipsilateral dental structures. The mental nerve is located on the lateral aspect of the mandible and all of its dental structures are desensitized when the mandibular nerve is blocked at the level of the mandibular foramen. The mandibular foramen is located by drawing an imaginary line from the lateral canthus of the eye ventrally and a second imaginary line that extends along and caudal to the occlusal surface of the mandibular cheek teeth. The point at which these two lines intersect is the mandibular foramen. A 6- to 8-inch, 20- to 22-gauge spinal needle is used for the injection. The needle is inserted at the ventral border of the ramus of the mandible and advanced dorsally toward the mandibular foramen. A second spinal needle of the same length can be held against the lateral surface of the mandible and used as a “depth guide” for the needle that was inserted on the medial surface of the mandible. Fifteen to 20 mL of local anesthetic should be infused. Within 15 to 30 minutes, structures innervated by the mandibular nerve should be desensitized.

Mental Nerve Block

The mandibular nerve travels through the mandibular canal and emerges at the mental foramen as the mental nerve. The mental nerve provides innervation to the skin of the ipsilateral lip and chin. Branches of the mandibular nerve that lie within the mandibular canal provide innervation to the mandibular canine, incisor, and cheek teeth. The mental foramen is located on the lateral aspect of the horizontal ramus of the mandible in the interdental space. The foramen is beneath the tendon of the depressor labii inferioris muscle. This tendon must be elevated to palpate the foramen. To perform this block, a 1.5-inch, 22-gauge needle is inserted through the skin, and the tendon of the depressor labii inferioris muscle is then elevated. The needle is advanced into the foramen and 5 to 10 mL of local anesthetic is infused. Within 15 minutes, structures innervated by the mental nerve should be desensitized. Infusing large volumes (>10 mL) of local anesthetic into the mandibular canal is likely to desensitize the same structures as in performing a mandibular nerve block.

4. Anesthesia of the Perineum

Caudal epidural anesthesia is a common technique used to desensitize the perineum and associated anatomic structures. This technique has been used to facilitate many procedures, both medical and surgical. Examples include the following: to prevent or stop rectal tenesmus, assist with obstetric manipulations, and assist with surgical procedures of the caudal reproductive tract.

Epidural Anesthesia

Epidural anesthesia is achieved when the local anesthetic solution is deposited between the dura mater and the periosteum of the spinal canal, which blocks conduction in the caudal nerve roots. Caudal epidural anesthesia implies that sensory inner-
nervation is lost but motor control of the hind limbs is not affected. However, the tail should be tied overhead to support the horse if ataxia develops. The sacrococcygeal or first intercaudal vertebral space is selected as the site for injection for epidural anesthesia.\(^5\) This location is found by grasping the tail and moving it up and down. The first articulation caudal to the sacrum is the first intercoccygeal space. The site should be clipped and aseptically prepared. The epidural should be administered with the use of aseptic technique. There are various injection techniques and drug combinations that can be used. The horse should be sedated and restrained in stocks (if available) during administration of epidural anesthesia. A small skin bleb of local anesthetic can be deposited at the proposed injection site to facilitate placement of the spinal needle. A 20-gauge, 7.5-cm spinal needle should be positioned just cranial to the dorsal spinous process of the second coccygeal vertebra. The needle is inserted through the skin at an angle 30 degrees relative to the tail and inserted cranially. If bone is encountered, the needle should be redirected. Once the needle is placed, the stylet should be withdrawn and the hub of the needle is filled with the local anesthetic to be injected. If the needle is positioned in the epidural space, the fluid will be aspirated (hanging drop technique). Minimal resistance is encountered during epidural injection. Horses that have had previous epidural injections may develop fibrous scar tissue over the intercoccygeal space, making needle placement difficult.\(^5\) After injection, the needle should be removed. Caution should be exercised during placement of the spinal needle because some horses will kick during the procedure. An epidural catheter can be placed to facilitate readministration of anesthetic agents if needed during the surgery. Loss of anal sphincter tone is common when epidural anesthesia is achieved.

The type of blockade (motor and/or sensory) and the duration of effect is dependent on the type of drug(s) and the volume that is administered. Local anesthetics should produce motor and sensory blockade, whereas only sensory innervation is lost with other drug treatments. The use of 5 to 7 mL of 2% lidocaine hydrochloride per 500 kg body weight should produce analgesia within 5 to 15 minutes, and the duration of analgesia should be 60 to 90 minutes.\(^5\) Two percent mepivacaine hydrochloride given at the same dose will produce analgesia in 10 to 30 minutes and provide analgesia for 90 to 120 minutes.\(^4\) Ataxia is a complication when local anesthetics are used.

Epidural administration of \(\alpha_2\)-adrenergic agonists such as xylazine will provide profound analgesia without the complication of ataxia.\(^5\) The recommended dose of xylazine is 0.17 mg/kg. The onset of action is 10 to 30 minutes, and the duration of analgesia is 2.5 to 4 hours.\(^5\) The xylazine should be diluted in saline to a total volume of 6 to 10 mL. Epidural administration of detomidine (30–60 \(\mu\)g/kg) provides analgesia lasting for 2 to 3 hours but produces sedation and ataxia.\(^5\)\(^,\)\(^6\) The combination of lidocaine (0.22 mg/kg) and xylazine (0.17 mg/kg) produces significantly longer analgesia (approximately 5 hours) with only mild ataxia when compared with either agent used alone.\(^7\)

Ataxia and the potential for recumbency must be considered when determining which drug or combination of drugs and the dosage that is to be administered.

5. Conclusions

The successful outcome of the use of local anesthetic drugs depends on the clinician to accurately deposit an appropriate volume and type of drug at the correct anatomic site. This can be achieved by a thorough understanding of the pharmacology of local anesthetics and equine anatomy.

References