Epidural Analgesia and Drug Choices
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Often epidural anesthesia and analgesia is underutilized in the veterinary world as part of a multi-modal approach to pain management. Providing epidural anesthesia and analgesia are one of many tools in the arsenal of the well trained veterinary technician. Epidurals are technically fairly simple to master, have relatively few side effects, and can be used on any number of cases, both routine and critical. Several drug combinations can be given safely through an epidural injection or a long-term epidural catheter allowing for analgesic plans that are specifically created for each case and patient.

Epidurals are given as either single injections using one time spinal needles or continual boluses/constant rate infusions using an epidural catheter. The equipment required for a one time epidural injection is minimal. The technician will need to have ready the supplies for a sterile preparation of the skin, an appropriate length and gauge spinal needle, a syringe containing sterile saline, and the drug to be delivered. Epidural catheters are more complicated and require several items. The technician should have supplies for a sterile prep, including a sterile drape, an appropriately sized Tuohy needle, radio-opaque catheter with stylet, catheter connector, epidural filter, injection cap, syringe with sterile saline, and drug to be administered. Epidural catheter trays containing all necessary parts are readily available in a variety of sizes and lengths.

Positioning is the same for both single injection and epidural catheter placement. The patient is placed in sternal, with support given to prevent rolling away from midline. The pelvic limbs are brought forward in order to fully open the lumbar vertebrae. It is possible to place the patient in lateral recumbency, still bringing the hind limbs cranially, but only for single injection epidurals. It is extremely difficult to place an epidural catheter in while in lateral recumbency. Lateral positioning can be a useful technique when dealing with trauma patients that have fractures preventing sternal positioning.

The area is clipped and aseptically prepped; if placing a catheter, use a sterile drape. The technician, wearing sterile gloves, uses the non-dominant hand to palpate the wings of the ilium and using the pointer finger to locate the lumbosacral space between L7 and S1. Using the dominant hand, the spinal needle—with the bevel facing cranially—is inserted directly on midline and about an inch into the skin. The stylet is then removed. An assistant fills the hub of needle with sterile saline and the spinal needle is advanced until a “pop” is felt as the needle passes through the ligamentum flavum and the fluid in the hub is drawn into the needle. Many times the tail will twitch in response to the placement of the needle. Injection of sterile saline into the space should meet with absolutely no resistance.

If blood is found in the hub of the needle, a venous sinus may have been entered. The needle should be immediately withdrawn and the either the procedure attempted again or an alternate analgesic plan created. It is vitally important to inject local anesthetics into any area of venous access as there is a high risk of toxicity.

It is possible to pass into the subarachnoid space which is confirmed by cerebrospinal fluid flowing from the spinal needle. Either the epidural can be aborted, or half the calculated drug dose administered. It is not overly common to find CSF in canine epidurals, but it does happen. It is, however, extremely common to encounter in cats as their anatomy differs slightly and instead of the subarachnoid space ending cranial to L7 as in dogs, it often extends well past S1.

If placing an epidural catheter, the previous steps are followed (using a Touhy needle instead of a standard spinal needle) and once confirmation has been made that the Touhy needle is in the epidural space, the catheter is pre-measure so it ends at the appropriate space and is fed through the needle. Commonly the catheter meets some resistance as it comes through the curved end of the needle, however, do not force the catheter. NEVER pull the catheter back through the needle, if the procedure is to be aborted, remove the needle and catheter as one unit. Pulling the catheter back through the needle can shear off the end leaving a piece in the epidural space.

Once the catheter is in place, the stylet is removed and the needle withdrawn. Attach the adapter, pre-flushed filter, and injection cap. Coil any excess length of catheter and staple carefully to the skin. Cover with a waterproof material like tegaderm and label with the date.

An epidural should not be performed on any patient suffering neurologic impairment or hypovolemia which cannot be resolved. Any patient that has a bleeding disorder or coagulopathy is at increased risk of an epidural hematoma and should not be considered a candidate for an epidural. Other contraindications include sepsis, infection or pyoderma on or near the epidural site, and physical or anatomic defects or traumatic injury that could make an epidural difficult.

When using any drug in the epidural space, local anesthetic or opioid, make absolutely certain the drug is preservative free. Many of the common preservatives used—sodium bisulfate, metabisulfite, edatate disodium, formaldehyde or phenol—have been shown to have neurotoxic effects when placed directly on the spinal cord.

Local anesthetics are commonly used in epidurals, either singly or in combination with an opioid analgesic. They are effective within 5 to 30 minutes, depending on the local anesthetic chosen and can have a duration of up to 6 hours. Local anesthetics work by causing sensory and motor blockade and will desensitize the hind limbs, abdomen, tail, and anal region. Lidocaine and bupivicaine are
the most commonly used local anesthetics. Lidocaine has a short onset—10-15 minutes—as well as a limited duration of only 1-2 hours. Bupivacaine has a longer onset—20-30 minutes, but also has a duration of 2-6 hours. It is common to mix lidocaine and bupivacaine to provide the best of both anesthetic worlds—short onset and long duration. Lidocaine is typically given at 2mg/kg and bupivacaine at 1mg/kg—keeping in mind the volume limit of 0.2ml/kg that is allowed by the epidural space. Local anesthetics are often combined with opioid analgesics to provide a quick onset of sensory and motor blockade and allow for multimodal analgesia.

Adverse reactions to local anesthetics include hypoventilation, primarily occurring if the local anesthetic has migrated cranially and caused paralysis of the respiratory muscles. This may require the patient to be mechanically or hand ventilated (only until the effect of the local anesthetic has worn off). Ataxia, hypotension, Horner’s syndrome, and Shiff-Sherrington-like activity are other rare but acknowledged reactions. In the event of a toxic level of local anesthetic, muscle twitches, convulsion, coma, and death may occur.

Opioid analgesics work by binding to specific receptors in the dorsal horn of the spinal cord. Use of opioids in the epidural space has been proven to give profound, long-lasting analgesia without many of the side effects often associated with opiate administration. Morphine has been the “old standby” for some time, but recent bodies of research have shown that fentanyl is also an excellent choice.

Morphine is typically given at 0.1mg/kg. It has a long time of on-set, 30-60 minutes, but also an extremely long duration of effect, anywhere from 10-24 hours. When given intramuscularly, morphine often causes bradycardia, hypotension, and hypoventilation, but when delivered epidurally the side effects are minimal. It also does not typically cause negative locomotor effects. Depending on the volume used in the epidural, it can spread far enough cranially to be effective for thoracic surgeries.

Fentanyl is a highly lipid soluble opioid that is historically used as an intravenous constant rate infusion. It has exciting applications in terms of epidural analgesia that are not always fully utilized. When given intravenously, fentanyl has an onset of just a few minutes, but only lasts about 20 minutes, which is why the CRI is essential for maintenance of analgesia. It can be given at 2-25mcg/kg/hr. When fentanyl is delivered into the epidural space the onset is about 15-20 minutes and the duration is 3-5 hours. The best application for fentanyl epidurally is a combination of epidural catheter and constant rate infusion through the catheter. It allows for excellent titration of analgesia and can be used for the most painful surgeries, including limb amputations and thoracotomies. The CRI can be maintained post-operatively and the level of analgesia adjusted as needed.

Side effects universal to opioids include respiratory depression and dysphoria, though incidence of this is less than with intramuscular or intravenous administration. Constipation and decreased gastrointestinal motility are commonly seen. Urinary retention is a commonly reported occurrence and the patient should be monitored for appropriate urination. It may be necessary to place a urinary catheter or manually express the bladder as needed.

Local anesthetics and opioid analgesics, whether used alone or in various combinations, provided a wonderful tool to help keep veterinary patients comfortable and pain free. Several other drugs are readily available for analgesia via parenteral routes that are not fully understood in terms of epidural use. There are a number of on-going studies looking at the effectiveness and potential of such opioids as oxymorphone, buprenorphine, and butorphanol, as well as non-opiates like alpha-2 agonists, NMDA agonists, and benzodiazepines. While there is no definitive answer yet as to dose and effectiveness, it is exciting to know that soon there could be even more choices available to technicians when incorporating epidural analgesia into their pain management plans.

Technician involvement is vital in the entire process of providing epidural analgesia, from proper placement of the epidural or epidural catheter to choosing the best analgesics for each case. There are various situations in which epidurals are useful and different drug combinations that can be used. Remember, there is never just one right answer when creating an analgesic plan. There are always other combinations and other reasons to justify those choices.

References