How to Place an Epidural Catheter and Indications for Its Use

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The veterinary literature describes many uses for epidurally placed drugs in the horse. This paper offers an actual description of epidural placement, as well as a brief review of the drugs that are used. Authors' address: Depts. of Pharmacology (Ball), Large Animal Surgery (Cable), and Pharmacy (Kirker), College of Veterinary Medicine, Cornell University, Ithaca, NY 14850. © 1998 AAEP.

1. How to Do It

The placement of an epidural catheter is a relatively easy and convenient way to reparatively administer a variety of drugs into the epidural space for the provision of analgesia or anesthesia. There have been numerous articles in the veterinary literature describing various uses for epidurally placed drugs in the horse.1–20 The catheter used comes in a commercially available kit prepared for use in people and includes everything necessary for the successful placement of the catheter. The catheter actually comes with incredibly detailed instructions and many extra items that are not needed for placement of the catheter in a horse.

The anatomical location for placement is the first movable space at the tail head, which usually corresponds to the junction of the first and second caudal vertebral bodies or the sacrococcygeal union. Palpate the site carefully and become very comfortable with the anatomy. The hair is clipped from the area in approximately a 6 in. x 6 in. (~15 cm x 15 cm) square and a standard aseptic surgical preparation is made. After the area has been prepared, the horse is sedated with 5–6 mg of detomidine. The needle placement appears to be relatively painful in some horses, and the sedative dose may have to be adjusted accordingly. The first time you do this you may want to wait to sedate the horse until you have had a chance to check out the parts of the catheter.

After putting on your surgical gloves, open and explore the catheter kit and become familiar with its contents. What you will use is the catheter insertion needle, the catheter itself, and the catheter endpiece. The needle has a slight curve in it at the insertion end that aids in directing the catheter forward; the needle also has a plastic stylet inside. The catheter is fairly long, and care must be taken so that it does not uncoil and become contaminated. The catheter has black graduation marks on it at the end to be inserted that act as a depth guide; the insertion end has several holes in it on the side of the tubing. The end plate will be attached to the catheter after the placement needle has been removed, and it unscrews such that when it is placed over the end of the catheter and rescrewed, it will tighten onto the catheter. Play with this endpiece to ensure knowledge of how it works before you use it.

Now that the horse is sedated and you are comfortable with the kit, repalpate the disk space and make a stab incision with a #15 scalpel blade. Then...
insert the needle with the stylect in place, making sure that the curve in the end is facing forward (toward the head of the horse). You will be going through the dorsal spinal ligament of the caudal vertebrae, and there may be some resistance, depending on just how much in the center of the space you are. When the procedure is done correctly the needle will insert 2–3 in. (5–8 cm), depending on the size and body condition of the horse. If the needle advances well to this depth, you can remove the stylect and check to see if you are in the space.

The epidural space appears to be under a slight vacuum, and you will often hear a mild aspiration of air (if you are in the space) when the stylect is removed. You can further check the needle placement by dropping a few drops of the drug or sterile saline into the hub of the needle; if it is in the proper location, these drops will usually be sucked out of the hub and down the needle. Remember that if you plunge the needle in too deeply, it may be buried in caudal nerve roots and may have to be backed out slightly.

Now that you are convinced that you are in the right place, the catheter can be threaded. Double check to ensure that the proper end is being inserted and pass the catheter down the needle. Sometimes there is slight resistance, but generally the catheter can be passed without too much difficulty. The catheter can be placed up to the sacral–lumbosacral area. When the catheter is in place, remove the needle but leave the catheter behind. At this point the endpiece can be attached to the free end of the catheter and an injection cap can be threaded onto the end.

The best way I have found to protect and keep these catheters in place is to make a butterfly with cloth tape next to where the catheter enters the skin, and suture it in place. The catheter can be further secured by cutting pieces of Elastikonb (4 in. × 4 in.) and placing them over the coiled remains of the catheter with the injection cap emerging between them; the four corners of the adhesive tape can be stapled to the skin of the horse. Most catheters I have secured in this manner stay in well and have few complications. The longest time for which I have left one of these catheters in place without complication has been 3 weeks.

2. What to Do with It

Now that the catheter is in place you are ready to administer some medication. It may be unnecessary to place an epidural catheter for many of the single-dose requirements of epidural anesthesia or analgesia. For procedures such as rectal, vaginal, rectovaginal, or any perineal area surgery, the replacement of a rectal or vaginal prolapse, or the manipulation of a dystocia, a single epidural injection may be all that is necessary. For some of these cases, longer-term epidural anesthesia or analgesia may be desirable to prevent straining in the horse and to provide pain control; the placement of an epidural catheter may be useful in such cases.

For true longer-term epidural anesthesia or analgesia applications, horses with chronic pelvic end pain may benefit. The use of epidural anesthesia or analgesia can provide pain relief in hindleg abnormalities such as arthrodesis, fractures, severe wounds, infected joints, and so on. In addition, the use of epidural anesthetics or analgesics can reduce the concentrations of anesthetic agents required for pelvic end surgery and the dosages of nonsteroidal anti-inflammatory drugs required for pain control, thereby reducing the potential toxicity of these agents. A brief review of what drugs have been used epidurally in the horse is given here (also see Table 1).

3. Lidocaine or Mepivacaine

Lidocaine, a sodium channel blocker, has been used to provide both single-dose and continuous caudal epidural anesthesia in the horse.2–5,7–11 It is frequently administered at the 2% concentration with a dose ranging 4–8 ml for an adult horse. The 8-ml dose has been used to provide continuous caudal epidural anesthesia by repeating a 4-ml dose of the 2% when the original 8-ml dose was noted to be wearing off.6 In one study in which a dosage of 0.22 mg/kg of 2% lidocaine was used,7 the average duration of action of the lidocaine epidural was 87.2 min. In another study in which a dosage of 0.35 mg/kg of 20 mg/ml lidocaine was administered, the average duration of action was 135 min.5

Mepivacaine, another sodium channel blocker, has been used epidurally in the horse.14 The average dose of mepivacaine to produce caudal epidural anesthesia is reported to be 91.4 mg and has an average duration of action of 80 min.14

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dosage</th>
<th>Reference</th>
<th>How Administered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lidocaine</td>
<td>160 mg/adult</td>
<td>6</td>
<td>8 ml of 2% solution</td>
</tr>
<tr>
<td>Lidocaine</td>
<td>0.35 mg/kg</td>
<td>5</td>
<td>no dilution</td>
</tr>
<tr>
<td>Lidocaine</td>
<td>0.22 mg/kg</td>
<td>7</td>
<td>no dilution</td>
</tr>
<tr>
<td>Mepivacaine</td>
<td>0.22 mg/kg</td>
<td>14</td>
<td>no dilution</td>
</tr>
<tr>
<td>Xylazine</td>
<td>0.17 mg/kg</td>
<td>8</td>
<td>diluted to 10 ml (saline)</td>
</tr>
<tr>
<td>Xylazine</td>
<td>0.35 mg/kg</td>
<td>5</td>
<td>no dilution</td>
</tr>
<tr>
<td>Detomidine</td>
<td>60 µg/kg</td>
<td>16</td>
<td>diluted to 10 ml (saline)</td>
</tr>
<tr>
<td>Lidocaine and Xylazine</td>
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<td>7</td>
<td>added together</td>
</tr>
<tr>
<td>Morphine</td>
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</tr>
<tr>
<td>Morphine and Detomidine</td>
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<td>19</td>
<td>no dilution</td>
</tr>
<tr>
<td>Morphine and Detomidine</td>
<td>30 µg/kg</td>
<td></td>
<td></td>
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</table>
4. Xylazine or Detomidine
The use of xylazine6,7,10,16,17 and detomidine16,19,20 to produce caudal epidural anesthesia in the horse is reported in the veterinary literature.

The caudal epidural administration of 0.17 mg/kg of xylazine, diluted to a total volume of 10 ml with saline, has been reported to produce sensory blockade for an average of 2.5 h without complication.8 In addition, the caudal epidural administration of 0.35 mg/kg of 20 mg/ml xylazine has been reported to produce sensory blockade for an average of 4 h with mild but clinically insignificant ataxia.9

Detomidine has been evaluated both alone and in combination with morphine for the production of epidural anesthesia–analgesia.15,16,19,20 The dose of detomidine typically administered epidurally is 30–60 µg/kg15,16,19,20 and has been shown to actually have a shorter duration of action and more systemic side effects than xylazine.16

5. Alpha Blocker and a Sodium Blocker
It has been shown that a combination of xylazine and lidocaine, administered as 1 ml of 10% xylazine and 5 ml of 2% lidocaine per 454 kg (0.22 mg/kg and 0.17 mg/kg, respectively), can provide a longer duration of caudal epidural anesthesia than either drug alone.7

6. Morphine
The use of epidural or intrathecal opiates for the treatment of postoperative or chronic pain is becoming more popular in veterinary medicine. In people the epidural administration of morphine can provide analgesia for up to 16 h or longer. The benefits of the opiates are that they will provide sensory blockade without affecting motor stability, have few if any systemic side effects (at the commonly used doses), and have a long duration of action. Morphine can provide substantial pain control and allow for the reduction of potentially toxic nonsteroidal anti-inflammatory drugs. In addition, the drug is very inexpensive and has a dosing frequency of once every 24–72 h. The use of epidural morphine, at the dose of 0.1 mg/kg, has been shown to significantly decrease the mean alveolar concentrations of halothane necessary for surgical pelvic limb manipulation.4 In addition, epidural morphine has been shown to alleviate experimentally induced hindlimb lameness.19

Because of the presence of potentially tissue-destructive preservatives (e.g., formaldehyde) in morphine for intravenous use, preservative-free morphine should be used. There are several sources of commercially available preservative-free morphine. As a way to reduce the expense even further, morphine powder can be purchased (again, from multiple sources), and a preservative-free solution can be compounded with saline. The compounded morphine will be sterilized when it is passed through a 0.22-µm filter during injection.

7. Morphine and Detomidine
Because of its relatively slow onset of action, it is desirable (if you want immediate analgesia) to combine epidural morphine with another epidural analgesic that has a quicker onset of action. The combination of morphine and detomidine has been evaluated in the veterinary literature.19,20 The combination of morphine 0.2 mg/kg with detomidine 30 µg/kg has been shown to be effective in alleviating experimentally induced hindlimb lameness.19 In addition, the long-term use of morphine 0.2 mg/kg with detomidine 30 µg/kg epidurally has been shown to produce no systemic or local side effects of clinical significance.20

We have used 0.1–0.2 mg/kg of epidural morphine alone and in combination with xylazine, detomidine, and lidocaine with good clinical responses to a variety of pelvic end lameness problems. We have also used epidural morphine in combination with the aforementioned drugs for epidural analgesia during a variety of perineal area surgeries. We have observed no local or systemic adverse effects of epidural catheter placement or the epidural administration of morphine sulfate in over 20 horses.

References and Footnotes


aContinuous Epidural Tray (#4948-18), Smiths Industries Medical Systems, Keene, NH 03431.

bElastikon, Johnson & Johnson Medical, Inc., Arlington, TX 76017.