Local anesthetics are the only analgesic on the market that can completely block noxious stimulus transmission from a peripheral area to the central nervous system. Local anesthetics have been used for a very long time in Germany and other European countries, and in the last few years numerous papers from English-speaking countries have been published on the discovery of local anesthesia as a new method for the relief of pain. Epidural analgesia was first administered to experimental dogs in 1885 and a lot of papers very published since 1970.

Local anesthetics can be used in a variety of ways in all types of surgery. They can be used as a topical application, local infiltration (nonspecific) using single or multiple doses, soft tissue infiltration, bone infiltration, continuous infiltration blocks with fenestrated catheters, regional nerve blocks, epidural (single injection, catheter), intrathecal (single injection, catheter), as a brachial plexus block, or intra-articular.

ANATOMY OF THE EPIDURAL SPACE

The meninges surround the spinal cord and the brain and protect them, and are composed of three membranes: the dura mater, the arachnoid, and the pia mater. The spinal dura mater consists of only one layer, the meningeal layer. It is separated from the periosteum of the vertebrae by the epidural space which is filled by a semi-fluid fat and by the vertebral venous sinuses. The spinal arachnoid is a thin tube which envelopes the spinal cord. The subarachnoid cavity is the space between the spinal pia mater and the arachnoid membrane. It is filled with the cerebrospinal fluid. Normally the puncture of the epidural space is done in the lumbar vertebra and the sacrum is maximal. If the animal is anesthetized to perform epidural puncture without any risk to the patient. Local anesthesia could be a very useful combination of local anesthetic and analgesic in dogs and cats is the combination of mepivacaine and morphine. This combination results in a very good muscle relaxation for approximately 2 hours during surgery and a post-analgesic period without any disturbances of muscle function for at least 24 hours. If morphine is used for epidural analgesia it should be a formulation licensed for this purpose because some preservatives can cause neurotoxicity, and it should be diluted with sterile isotonic NaCl.

TECHNIQUE OF EPIDURAL PUNCTURE

Dogs and cats should be at least sedated but anesthetized to perform epidural puncture without any risk to the patient. In dogs and cats the lumbosacral region is the space where the epidural puncture is performed. This side is prepared as it would be for a surgical procedure. The patient should be positioned on their sterna and the hind limbs should be placed under the animal. This ensures that the space between the last lumbar vertebra and the sacrum is maximal. If the animal has a complicated fracture of the femur right or left lateral recumbency is also possible, but then the hind limbs should be pulled forward (see Figure 1).

### Table 1. Commonly Used Local Anesthetics in Dogs and Cats

<table>
<thead>
<tr>
<th>Local Anesthetic</th>
<th>Maximal Dose (mg/kg)</th>
<th>Onset of Analgesia (minutes)</th>
<th>Duration of Analgesic Action (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lidocaine</td>
<td>5</td>
<td>10–5</td>
<td>30–120</td>
</tr>
<tr>
<td>Mepivacaine</td>
<td>5</td>
<td>5–10</td>
<td>90–180</td>
</tr>
<tr>
<td>Bupivacaine</td>
<td>2</td>
<td>20–30</td>
<td>180–480</td>
</tr>
<tr>
<td>Ropivacaine</td>
<td>4.88</td>
<td>10–20</td>
<td>50–480</td>
</tr>
</tbody>
</table>
Figure 1. Finding the correct location for epidural puncture in the dog.

It is very important to find the midline which could be sometimes difficult, eg, if a fracture of the pelvis exists. The spinal needle is inserted slowly at an angle of 90° to the animal’s skin. The size of the spinal needle varies with the size of the animal. A 2.5-cm 22-gauge spinal needle is recommended for cats and small dogs, and a 20-gauge needle for medium-sized and large dogs. If the interarcuate ligament is pierced a special “popping sensation” can be felt.

The presence of cerebrospinal fluid (CSF) or blood should be tested before injection. If blood is aspirated a new needle should be taken and a new attempt of puncture is done. If blood is aspirated again then no new attempt should be started. If CSF is aspirated some authors describe that instead of a new puncture the dose of the local anesthetic may be reduced by 50%, but this cannot be recommended. It is better to start another attempt. To control whether the needle is placed correctly in the epidural space the “loss of resistance test” can be done. Up to 2 mL of saline may be injected and if the absence of resistance is confirmed, the needle is placed in the epidural space. In clinical routine this test is often done with a very small amount of the local anesthetic or analgesic, and resistance should be felt during the injection. The injection should be carried out over a period of 30 to 60 seconds and solutions should be at body temperature.

The dosage for the cat is 0.8 mL/cat independent of the local anesthetic, and in dogs 0.30 to 0.50 mL local anesthetic per 10 cm distance from the occiput to the coccyx with a maximum of 6 mL. If the injection is done correctly an immediate dilatation of the external anal sphincter can be seen; after 3 to 5 minutes this is followed by relaxation of the pelvic limbs.

If a continuous epidural anesthesia is necessary a catheter could be placed at the same location, but the disadvantage is that the risk of infection.

CONTRAINDICATIONS AND SIDE EFFECTS

There are a number of contraindications for epidural anesthesia/analgesia in dogs and cats. Infectious skin disease or tumor in the region of the lumbosacral area, are absolute contraindications. Hypovolemia, shock, or any other cause of hemorrhage is also absolute contraindication as well as bleeding disorders. Anatomic abnormalities, which may be congenital or which arise as a result of trauma and make access to the lumbosacral space either extremely difficult or impossible, could be contraindications. An absolute contraindication is the age of the dog; if the epiphysis of the vertebra is still open, because the puncture of the epidural space could lead to a trauma of the epiphysis.

Side effects and complications are very seldom seen if cerebrospinal fluid or blood is obtained when the needle is inserted into the spinal canal, then the needle should be withdrawn and the procedure should be repeated. Local infections after epidural puncture, discospondylitis, hypotension, neurologic complications (Horner’s syndrome, Shiff-Sherrington-like reflexes), and signs associated with local anesthetic toxicity, such as muscle twitch, coma, and convulsions, are not often seen. Hypotension is an important aspect of epidural block produced by the sympathetic blockade which occurs as a result of the epidural injection of local anesthetic agents but not if morphine is injected alone. Urinary retention may be a problem as long as the inhibition of nerve function exists. After epidural anesthesia there could be a problem with the hair growth over the site of lumbo-sacral injection.

REFERENCES


Additional references are available from the author upon request.