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EPIDURAL ANAESTHESIA AND ANALGESIA. CLINICAL TECHNIQUE AND SURGICAL APPLICATIONS

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Introduction:
In the last years the interest for the regional anesthetic techniques has increased in small animal practice. Several studies in people suggest that the use of regional anesthesia avoids the central sensitization, reduces the amount of systemic analgesic requirement during and after the surgery and finally decreases the hospitalization time. Drugs are administered by epidural route as part of a balanced anesthetic protocol, for postoperative pain relief in surgical cases and to treat pain unrelated to surgery. They provide safe, effective and reliable analgesia with minimal physiological changes (Skarda et al., 2007), but, although it is a safe procedure, it is not without risk (Iff et al., 2008).

Lumbosacral epidural anesthesia is noted for its simplicity, safety and effectiveness, and is one of the most frequently used anesthetic techniques described for surgical procedures caudal to the umbilicus in small animals. However, the lumbosacral approach as the only possibility to access the epidural space limits the potential use of the technique by affecting an unnecessarily number of nervous routes. Moreover, the anesthesia/analgesia time in the cranial metamera is reduced. Even when it is a more difficult and dangerous technique, the puncture through the intervertebral spaces along all the lumbar spine, allows to focalize the pharmacological effect at the locus dolente, prolonging the action and the quality of the blockade.

To perform the technique correctly is mandatory to get a good knowledge of landmarks and to correctly employ the method, utilizing appropriate procedure and materials.

Epidural approach, “Loss of resistance” technique:
After checking the availability of resuscitation drugs and equipment, appropriate monitors are placed and the animal is positioned.

Landmarks for needle placement are easily identified in most animals, but can be difficult especially in obese patients. Patients can be positioned in sternal or lateral recumbency. The neck and head should be positioned to ensure normal blood flow through the jugular veins. The epidural puncture can be performed at the lumbosacral space (L7-S1) or between any other lumbar vertebra (L1-L7). Midline approach is recommended for lumbosacral epidural anesthesia, while paramedian approach is better for access cranial to L6 (Otero, 2004).

The midline is identified and the point of needle insertion is marked with a skin marker. The skin is widely prepared and the field draped. In conscious patients a skin wheal of 1% lidocaine is made with a short 32-gauge needle. A 25-G 1.5-inch standard bevel needle is used to infiltrate 1% lidocaine in the supraspinous and interspinous ligaments. An 18-G Tuohy needle with a stylet is inserted perpendicular to the skin with the bevel facing cephalad. Depth of the needle in the supraspinous ligament is limited to 1-2 cm before the stylet is removed. A 5 ml saline-filled loss of resistance syringe is then attached to the needle hub.

Bromage (1967) describes the technique in humans as follows:

"The needle is gripped with the thumb on top and the proximal and distal phalanges of the crooked forefinger below. The hand is supinated and the wrist partially flexed and the back of the carpus braced against the patient's back. Forward motion is imparted on the needle by a gradual extension of the wrist, and the carpus and metacarpus roll in toward the back like an eccentric cam driving a piston".

The nondominant hand rests against the patient's back and stabilizes the needle to prevent any sudden forward motion. Constant unremitting pressure is placed on the plunger of the saline-filled syringe with the thumb. A sudden loss of resistance is felt when the bevel pierces the ligamentum flavum. Injection, which was previously obstructed, should suddenly become "as easy as discharging the syringe into an empty space". The forward motion of the needle should be stopped
immediately. When the access is made up to L6, the jet of saline pushes the dura away from the advancing needle. The average depth of the epidural space varies with the animal size with a range between 1.5–6.0 cm. No CSF or blood should flow from the needle after the syringe is detached from the hub. Rotation of the needle during needle advancement and after entering the epidural space may increase the likelihood of lacerating epidural veins as well as the dura and subarachnoid placement of the needle bevel and epidural catheter may result. Some anesthesiologists recommend injection of a volume of saline or part of the initial dose of local anesthetic through the needle prior to threading the catheter. This may open up the epidural space, facilitate passage of the catheter, decrease the incidence of nerve damage and intravenous cannulation, and shorten the onset of the initial dose. In humane medicine, the incidence of intravenous cannulation is decreased significantly (1% vs 14%) when 10 ml of saline are injected through the needle, but is no different when volumes of less than 10 ml are injected prior to catheter insertion.

A 20 gauge epidural catheter is threaded through the needle with attention paid to the depth markings on the catheter. Moderate pressure might be required to pass the catheter tip beyond the orifice of the needle, but only light and delicate pressure should be needed to advance it further. The potential for shearing the catheter with the needle exists once the tip of the catheter has passed the bevel of the needle. The catheter should not be removed with the needle left in place. The catheter is grasped at its entry into the skin between the thumb and index finger as the needle is removed. The depth of the catheter at the skin is noted. Spontaneous flow of CSF or blood from the catheter should be absent when the end of the catheter is held in a dependent position. An aspiration test for CSF or blood is attempted with a 3 ml syringe. Following a negative aspiration, an appropriate test dose is administered.

The catheter should be secured to the skin. The author recommends subcutaneous tunneling of the catheter to prevent catheter dislodgement when prolonged catheterization is anticipated. Following a negative test dose, local anesthetic is administered in incremental doses. Catheterization of the epidural space provides the opportunity for repeated or constant delivery of analgesics to the spinal cord, and can be an effective method of providing relief to animals in pain from surgery, trauma, or inflammation (Hansen, 2001). Epidural catheter sets and complete placement kits are available from several manufacturers. Considerations for selection of these catheters include cost, desired positioning, and duration of use. If the catheter is to remain in place for >24 hours, models with imbedded coiled spring wire (which prevents kinking) are preferred. Polyurethane and polyamide catheters are more kink-resistant than nylon and may be expected to function for a longer time. Catheters intended for use >24 hours should be soft and flexible to avoid damage to the dura and spinal cord.

**Monitoring the epidural injection**

The most common techniques used to confirm that the tip of the needle is in the epidural space are the "hanging drop" technique and the "lost of resistance" to the injection of air or saline. The hanging drop method is a technique used to identify the accurate position of the spinal needle tip within the extradural space, and is characterized by the movement of fluid from the hub into the shaft of the needle as a result of the needle tip entering the extradural space, where the pressure is sub-ambient. One disadvantage of the technique is that it yields false negative results. Naganogi et al. (2007), reported that the hanging drop method, when performed with spinal needle, appears to be a useful technique for identifying the location of extradural space in dogs positioned in sternal, but not in lateral recumbency (0% of positive response). However, the technique may yields false negative results when performed in dogs positioned in sternal recumbency. It was reported that a positive "hanging drop" response was elicited in only 88% of cases (Naganogi et al. 2007).

When an experienced anesthetist performs the "lost of resistance" technique the false positives are unusual. However, false positive results may be obtained by the inexperienced, for whom the lack of resistance is difficult to appreciate, and this have been reported in veterinary and humane medicine. It has been attributed to loose connective tissue around the epidural space or the degeneration of interspinous ligament with cavity formation (Brook, 1935).
**Dosage:**
When the dose is calculated according to the spine length, the measurement begins from the occipital bone to the first coccigea vertebra.
A volume of 0.5-0.8 mL per 10 cm, blocks up to the L1.
A volume of 1.0 mL per 10 cm, blocks up to the T9-T10.
A volume of 1.5 mL per 10 cm, blocks up to the T4.
The quality of the blockade depends on the concentration of the local anesthetic and the adjuvant drugs.
For further information please go to:

**References:**