

Epidural anaesthesia and analgesia

EPIDURAL drug administration offers the potential for excellent pain control in patients during the surgical and postoperative periods. With practice, the technique is easy to perform, cost effective and takes less than 10 minutes.

Epidural anaesthesia refers to the use of local anaesthetics, whereas epidural analgesia refers to the use of opioids.

Anatomy

The epidural space is a potential – not an actual – space, which contains blood vessels, connective tissue and fat. The relevant anatomy for performing injection is highlighted in **Figure 1**. A pair of venous plexuses lie on the floor of the spinal canal. The spinal cord in the cat ends further back than the dog, at around S1-S2.

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discusses the importance of injection location and needle placement for this pathway of pain relief and prevention in cats and dogs

Indications

Indications for epidural anaesthesia and analgesia are:

- analgesia/anaesthesia to the hindlimbs and perineum;
- abdominal surgery; and
- thoracic surgery.

Epidural injection's role in multimodal analgesia

When considering how best to provide analgesia to a patient, the concepts of multimodal analgesia and pre-emptive analgesia are key to successful provision of pain prevention and relief.

Multimodal analgesia is the practice of using several different classes of analgesic, which act at different locations in the pain pathway by various appropriate routes of administration to provide analgesia.

Pre-emptive analgesia refers to the administration of analgesic medication within a suitable time frame prior to the onset of a painful stimulus and for the duration of that stimulus. This practice has been shown to reduce the doses of subsequent analgesics required to achieve effective pain relief, compared to administering analgesics post-operatively (Kissin, 2000).

An example of an analgesia plan for a dog undergoing repair of a femoral fracture might include the use of an NSAID and opioid as part of pre-anaesthetic medication, then an opioid and local anaesthetic administered by the epidural route prior to surgery. By using a combination of drugs – rather than a high

dose of one agent alone – side effects of that one agent are minimised. An epidural injection of morphine can provide 18-24 hours of analgesia and avoid the peaks and troughs associated with parenteral administration, which may provide a variation in levels of analgesia. It also avoids the need for repeated injections, which may prove painful for the patient and difficult to administer in less compliant patients.

Injection technique

● Location

The anatomical location is the junction of L7-S1.

● Patient positioning

The anaesthetised animal can either be placed in sternal or lateral recumbency. The hanging drop technique is less obvious in the lateral positions; therefore, sternal recumbency is the author's preferred technique.

In sternal recumbency the pelvic limbs are drawn forwards underneath the animal. In this position it is easier to appreciate the popping sensation as the ligamentum flavum is penetrated.

● Landmarks

The landmarks for needle placement are illustrated in **Figure 2**. Palpate the highest point of the ilial wings. Palpate the dorsal spinous process of L7 and, caudal to that, identify a depression between L7 and S1 in the midline (**Figure 3**).

● Technique

The site should be surgically prepared and the operator should wear sterile gloves. Using an appropriate length spinal needle (less than 5kg = 25swg; more than 5kg = 22swg), advance the needle perpendicular to the skin. Once the skin is penetrated, remove the stylet from the needle and add one drop of sterile saline. As the needle is advanced and the epidural space is penetrated, this drop will be sucked into the needle when the negative pressure of the epidural space is encountered. This is reliable in 80 per cent of dogs in sternal recumbency.

As the needle penetrates the ligamentum flavum, a popping sensation can sometimes



Figure 1. Anatomy of the lumbosacral region.

be appreciated. Further confirmation of needle placement is obtained by using a test injectate of 1-2ml sterile saline with a cushion of air above the solution in the needle.

This should inject easily and the air should not become compressed. Aspirate before injection to check the needle tip is not within a blood vessel. The solution for injection can then be administered over a period of one to two minutes. There should be no resistance to injection and no compression of an air cushion placed in the syringe.

If cerebrospinal fluid is evident at the needle hub, either abandon the technique or reduce the injectate volume by one-third. If blood is present, the technique should be abandoned as there is a risk of intravascular injection.

Methods to confirm correct placement

The three methods described so far to confirm needle placement are the hanging drop technique, the loss of resistance technique and the air compression test. These techniques are the most practically applicable and easiest

to perform. They rely on the fact that there is negative pressure within the epidural space.

Other practical techniques are described in the literature, and some are limited to academic study where the confirmation of placement is critical to the study protocol.

● The whoosh test is performed by injecting air into the epidural space while listening over the lumbar spine with a stethoscope for an audible "whoosh".

● Needle placement can be confirmed fluoroscopically.

● If a current is applied to the spinal needle using a nerve stimulator, the pelvic limbs will be seen to twitch when the needle is correctly placed.

The profile of pressure waves in the epidural space has also been investigated in dogs to guide needle placement.

Drugs

Table 1 illustrates common drugs and combinations used for epidural injections. If local anaesthetic is incorporated into the solution, then a total blockade of transmission should occur, result-

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Drug	Dose	Onset (min)	Duration (hr)
Lidocaine	4mg/kg	10-15	1-2
Bupivacaine	1mg/kg	20-30	2.5 to six
Ropivacaine	3mg/kg	Five to 15	2.5 to four
Morphine	0.1mg/kg	20-60	16-24
Methadone	0.1mg/kg	20-30	Four to six
Morphine + bupivacaine	0.1mg/kg + 1.0mg/kg	15	16-24
Morphine + methadone	0.1mg/kg + 0.1mg/kg	20-30	16-24



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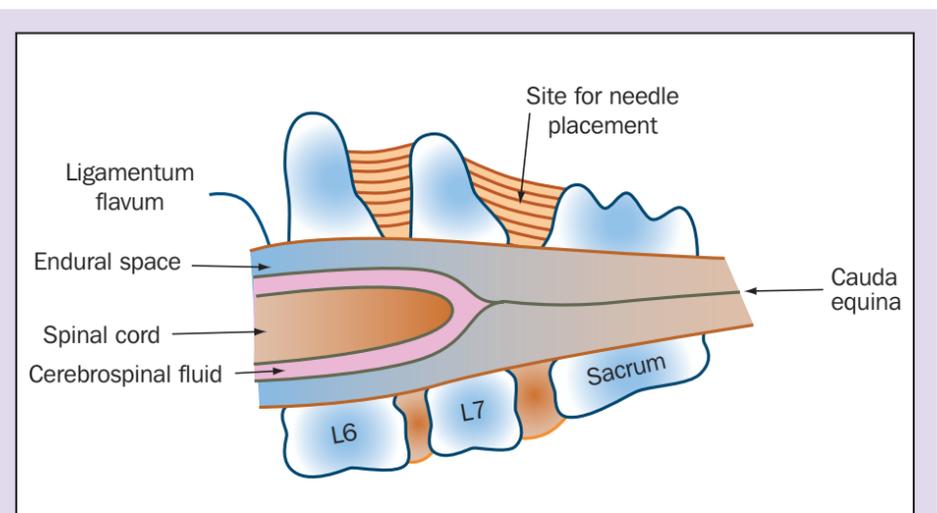


Figure 2. Illustration of the epidural space anatomy in a dog.

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ing in true anaesthesia. Where an opioid-only solution is used, this will provide analgesia, rather than total anaesthesia. However, the animal should retain motor control of the pelvic limbs.

There are no drugs licensed for use by the epidural route. All the drugs listed are available in preparations without preservative; solutions with preservative carry a risk of tissue damage. Where morphine or methadone is used, the volume for injection may be small if 10mg/ml solutions are used. This can be diluted in 0.2ml/kg sterile saline for injection.

In older patients, there can be narrowing of the spinal canal; in obese patients, there is more fat in the epidural space; and in pregnant patients, the

space is smaller, due to venous plexus engorgement. These three patient groups, therefore, require a lower volume of drug. As a guide, the volume can be reduced by one-third.

How can efficacy be evaluated?

Following correct injection, the main sign noticed intra-operatively should be a decreased maintenance agent requirement. So, be prepared to turn the vaporiser or infusion rate down and be guided by the depth of anaesthesia. Following recovery from anaesthesia – provided an agent with an appropriate duration of action has been used – the animal should be comfortable in the postoperative period and should require less ongoing

analgesia. The expected duration of action for each drug is given in Table 1.

It is advisable to use a system of pain scoring at appropriate intervals, so you can be sure analgesia is sufficient for the individual patient. If at any stage analgesia is deemed to be inadequate, further pain relief can be provided in the form of an opioid, even if an opioid was used in the epidural.

Complications

● Hypotension

Hypotension can occur as a result of sympathetic blockade if local anaesthetics are used. It is also possible that the hypotension arises as a result of inadvertent IV injection. Therefore, monitoring the patient's blood pressure is recommended. Hypotension should be treated with an intravenous crystalloid

solution and reduction of the inspired volatile agent.

● Hair regrowth

Failure of complete hair regrowth at the site has been reported, with a retrospective study finding that in eight of 72 patients delayed hair regrowth was apparent following epidural morphine with or without bupivacaine (Troncy et al, 2002).

● Pruritis

Pruritis has been reported, associated with epidural morphine.

Contra-indications

Coagulopathy is an absolute contraindication, because there is risk of puncturing the venous plexuses within the canal, leading to either undetected or prolonged bleeding. Infection at the site is also an absolute contraindication, as with all local anaesthetic techniques, due to the risk of spreading infection. Similarly,



Figure 3. A depression between L7 and S1 is palpable.

systemic sepsis is a contraindication. In a patient that is hypotensive or haemodynamically stable, the use of epidural anaesthesia should be avoided.

Pelvic trauma and obesity are both relative, not absolute, contraindications because, in both cases, it can be difficult to palpate landmarks and ensure the correct needle placement. If you are unsuccessful after three attempts, further attempts should be abandoned.

Postoperative care

Where motor blockade is present, animals will be unable to walk and care should be taken to ensure that urinary or faecal soiling does not occur. Motor blockade should not last longer than 24 hours. Urinary retention can occur in the postoperative period following opioid use in epidurals. Therefore, if the animal has not urinated the bladder should be palpated every four hours and expressed if full.

As suggested, pain scoring should be carried out at frequent intervals to determine the animal's analgesia requirements. Two scales that are easy to use in a busy practice are the visual analogue scale (VAS) and the numerical rating scale (NRS). Both are used widely in human pain management.

With VAS, the assessor marks on the line where he or she considers the animal's pain to be. The line is a scale from zero to 100mm. Zero indicates no pain at all and 100 represents the worst pain imaginable. The distance from the no pain end to the patient mark is their pain score. An NRS is numbered from zero to 10 and the assessor marks the number that correlates to the level of pain. Both scales are very easy to use and can be applied to everyday practice with little extra work. Ideally, the same person should score the pain each time to give

the best representation of how the patient changes over time.

Recent studies

Bradyarrhythmias and hypotension have been reported in two dogs undergoing epidural injection of lidocaine/bupivacaine and lidocaine/bupivacaine/morphine. In each case, epidural pressures were studied and both cases demonstrated a large increase in pressure. One dog was treated with atropine, but no treatment was administered in the second case.

In both cases, blood pressure and heart rate returned to acceptable values. The authors recommend stopping injection if negative pressure is encountered, or avoiding large volumes. Both dogs were reported to be obese and this provides further evidence that the volume of injectate should be reduced in such patients.

A study examining cortisol levels in dogs undergoing cranial cruciate ligament repair after epidural bupivacaine/morphine showed lower levels post-surgery in the epidural group. These dogs also required less morphine in the postoperative period.

References

- Iff I and Moens Y (2008). Two cases of bradyarrhythmia and hypotension after extradural injections in dogs, *Veterinary Anaesthesia and Analgesia* **35**: 265-269.
- Kissin I (2000). Preemptive analgesia, *Anesthesiology*, **93**: 1,135-1,143.
- Sibanda S, Hughes J M, Pawson P E, Kelly G and Bellenger C R (2006). The effects of preoperative extradural bupivacaine and morphine on the stress response in dogs undergoing femoro-tibial joint surgery, *Veterinary Anaesthesia and Analgesia* **33**: 246-257.
- Troncy E, Junot S, Keroack S, Sammut V, Pibarot P, Genevois J P and Cuveliez S (2002). Results of preemptive epidural administration of morphine with or without bupivacaine in dogs and cats undergoing surgery: 265 cases (1997-1999), *J Am Vet Med Assoc* **221**(5): 666-672. ■

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MATTHEW GURNEY graduated in 2003 from the University of Liverpool and spent the next two-and-a-half years enjoying everything mixed practice had to throw at him. During his anaesthesia residency at Liverpool he was successful in gaining the RCVS Certificate in Veterinary Anaesthesia. Upon completion of his residency Matthew moved to Northwest Surgeons in Cheshire and is currently studying for the European Diploma in Anaesthesia and Analgesia.

