

Local and Regional Analgesia/Anesthesia:

There are many reasons for performing anesthesia nerve blocks. Mainly to provide analgesia which is the absence of sensibility to pain, particularly the relief of pain without loss of consciousness. It helps to alleviate intra-op and post-op pain, it also reduces the amount of anesthetic gas needed which not only decreases cost but also decreases vasodilation and in turn, hypotension. They are an inexpensive and versatile analgesic tool.

The use of local/regional anesthesia involves the prevention of transmission of nerve impulses either from the receptors or through the nerves supplying the area of the body which is subject to, or will be subject to, certain noxious stimuli.

We often add opioids to local/regional anesthetics to provide a multimodal form of analgesia. Opioids are a class of drugs such as morphine, its derivatives and synthetic agents, which are addictive, analgesic and generally produce hypnosis, but sometimes excitement. They occupy the same receptors as the endogenous opioids such as endorphins.

These multimodal techniques decrease the dose of each individual drug which, in turn, reduces the potential for adverse drug effects. Analgesics coupled with sedatives/tranquilizers, provide a more comfortable patient and staff experience and reduce induction and maintenance agent requirements and generally improve patient morbidity and mortality.

Intervening before the pain system becomes sensitized is necessary when your goal is optimal patient benefit (it is more difficult to eliminate pain once the patient feels it).

Local or regional anesthesia can be accomplished by several techniques; topical analgesia (emla cream), infiltration at the surgical site, blocking specific nerves (perineural) and epidural analgesia.

Rules of Performing Local Analgesia:

1. Clip hair and surgically prepare site. Use sterile needles, syringes and anesthetic solution.
2. Unless otherwise stated, always aspirate and check for blood before injection. Note the location of blood vessels that lie in close proximity to target nerves
3. Do not use epinephrine in areas that might be deprived of blood supply e.g. ring blocks.
4. Always work out the toxic dose for the patient and stay below. Base total dose calculations on lean bodyweight, not on actual bodyweight.
5. Identify key anatomical landmarks.

Mode of Action:

The drugs used are either amino esters or amino amides, and act by blocking sodium channels. These drugs, when applied in sufficient concentration at the injection site, prevent conduction of electrical impulses by the membranes of nerve and muscle. Vasoconstrictor substances, such as epinephrine, are added to many local anesthetic solutions in order to prolong duration of action by delaying absorption of the anesthetic from the site.

Systemic Effects:

Local anesthetics are absorbed into the circulation and excessive concentrations can cause toxic effects on the cardiovascular and central nervous systems (CNS). Initially, animals may become sedate or drowsy. As the blood and CNS concentrations increase, the animal may become restless, nauseous and may vomit. At even higher doses the animal will convulse, followed by coma. Death occurs due to respiratory and cardiac arrest.

Uses:

Local anesthetics are useful when performing many different surgeries; oral surgeries, amputations, orthopedic surgeries (epidurals, intra-articular injections), declawing cats (ring block), thoracotomies (intercostals), intrapleural infusions through a chest tube, exploratory laparotomies, neuters (intratesticular block), etc. The fast acting, shorter duration agents (lidocaine) can be combined with the slower acting, longer duration agents (bupivacaine, ropivacaine) for best effect.

Lidocaine can also be used to treat ventricular arrhythmias, principally ventricular tachycardia and ventricular premature contractions (VPCs). Cats are rather sensitive to lidocaine so some choose not to use it as an antiarrhythmic.

Drugs Used:

Lidocaine: Xylocaine, Duracaine. Available in many concentrations (5, 10, 20, 50 mg/mL injectable. Supplied both with and without epinephrine 1:200,000) and emulsions (2.0% jelly, 2.5% + 5.0% ointment, spray for intubation, delivers 10mg spray). Onset is 10-15 mins. Duration is 1-2 hours. Can be given IV. Toxic dose for dogs is 22mg/kg and for cats it is 12mg/kg. We tend to calculate half of the toxic dose for our blocks so we stay at a "safe" dose (10mg/kg for dogs and 6mg/kg for cats).

Mepivacaine: Carbocaine. Available in many concentrations (10, 15, 20 mg/mL solutions, no epi). Duration is 1.5-2 hours.

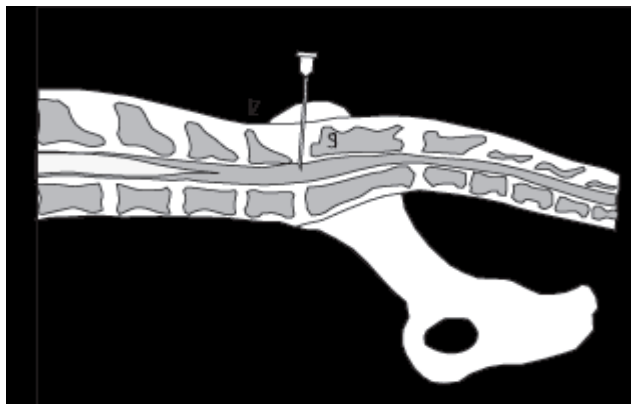
Bupivacaine: Marcaine. Available in many concentrations (2.5, 5.0, 7.5 mg/mL injectable, no epi). Onset is 15-30 mins. Duration is 4-6 hours. Cannot be given IV, cardiotoxic. Delayed onset but longer duration than lidocaine. You can use both lidocaine and bupivacaine together for a quick onset and long duration. Toxic dose for dogs and cats is 4mg/kg, "safe" dose is 2mg/kg.

Ropivacaine: Naropin. Available in many concentrations (2.0, 5.0, 10 mg/mL injectable, no epi). Duration is 2-6 hours. Less cardiotoxic than bupivacaine and more selective for sensory rather than motor nerves. Faster onset than bupivacaine and longer duration than lidocaine. More expensive than bupivacaine and lidocaine. Toxic dose for dogs and cats is 5mg/kg, "safe" dose is 2-3mg/kg.

Canine and Feline Epidurals:

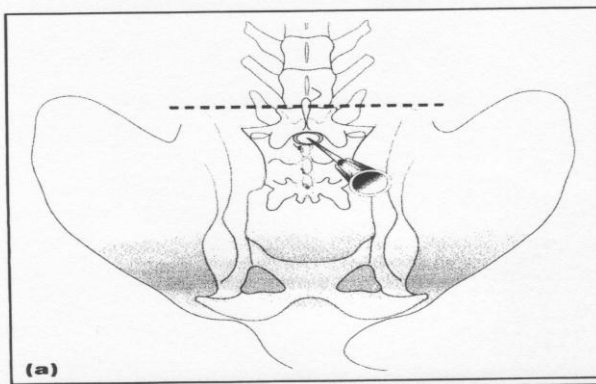
They are performed at the lumbosacral (L-S) space in sternal or lateral recumbency. It is best to use the smallest gauge spinal needle possible to reduce the chance of complications (damage to the spinal cord). We generally use 20-22g 1.5-3.5" spinal needles.

The site for epidural needle placement is on the midline, just caudal to a transverse line between the cranial prominences of the wings of the ilium. You will feel 3 "pops" as you insert the spinal needle; the skin, muscle and the interarcuate ligament. If you are in the correct location, there will be a lack of resistance to injection. With epidurals, you do NOT need to aspirate before injecting.



If the animal is in sternal recumbency, insert the needle perpendicular to the spine, remove the stylete, place a small amount of the drug or sterile saline onto the needle until you have a bleb on top. Slowly insert the needle and when the solution is drawn in, you are in the epidural space.

If the animal is in lateral recumbency, insert the needle slowly perpendicular to the spine until you feel the 3rd "pop", attempt to inject a small amount of sterile saline and if there is no resistance, you are in the correct location.



We use a bupivacaine concentration of 5mg/mL and a ropivacaine concentration of 10mg/mL. A dose of bupivacaine or ropivacaine of 1mL/5kg (max volume of 6-8mLs) will give analgesia to about T11-12. A dose of 1mL/10kg will give analgesia to the perineum and tail. A dose more than 1mL/5kg will extend the block into the

thoracic region where intercostal muscle function will be affected and also vasomotor tone through the sympathetic nervous system which exits in this area. The local will block every nerve fiber including motor and the autonomic nervous system.

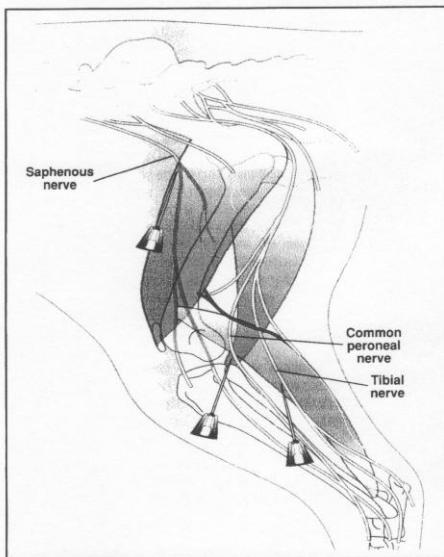
Combining opioids provides a superior level of intraoperative analgesia and prolongs postoperative analgesia. Opioids will have a direct effect on the opioid receptors within the spinal cord. Morphine is

frequently used as the opioid of choice for epidurals. When combined with bupivacaine or ropivacaine the usual dose is 0.1mg/kg. Use high concentrations of morphine (25mg/mL) so the opioid does not dilute out the local analgesic volume and brands that do not have a preservative (animal may react to the preservative). Morphine at this dose epidurally will provide analgesia for 24 hours, however it can cause urine retention so ensure the animal is passing urine over that period.

Morphine epidurals alone can also be used for surgeries more cranial, such as exploratory laparotomies (cystotomies) and thoracotomies. Morphine will provide analgesia without blocking any motor function. Doses of 0.1mg/kg diluted in 1mL/5kg of sterile saline are used.

3-Point Block:

This block effectively provides analgesia to the saphenous, common peroneal and tibial nerves of the hind limb (injuries distal to the stifle). Ensure you calculate your safe dose of bupivacaine before performing the block. You generally need enough volume for your block to effectively infiltrate the nerves (1-2mLs depending on the size of the animal). For dogs we would use a 22g x 1' needle and cats, a 25g x 5/8" needle.



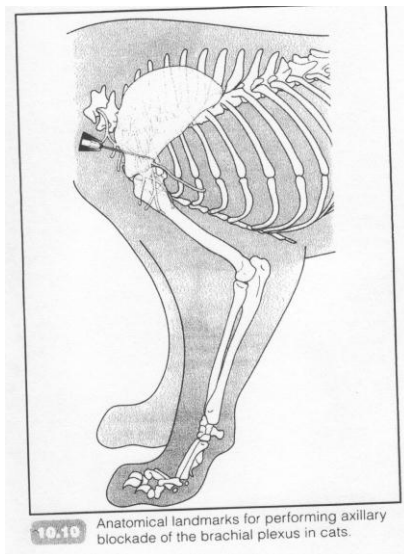
10.8 Anatomical landmarks for performing saphenous, common peroneal and tibial nerve blocks in dogs (medial view).

The saphenous nerve is a branch of the femoral nerve and runs through the femoral triangle on the medial surface of the thigh. The nerve lies cranial to the femoral artery and vein and pulsation of the artery can be used to facilitate correct placement of the needle. The saphenous nerve is blocked by placing the needle cranial to the femoral artery within the femoral triangle. Always aspirate to ensure you are not injecting into the vein or artery.

The common peroneal nerve is a branch of the sciatic nerve and runs laterally over the gastrocnemius and across the lateral surface of the fibular head. The nerve is easily palpated and blocked by inserting the needle distal to the fibular head and directing it towards the nerve.

The tibial nerve is also a branch of the sciatic nerve and runs deep to the medial and lateral heads of the gastrocnemius and then between the superficial digital flexor tendons and the long digital extensor tendon. The nerve is blocked by placing the needle deep to the medial and lateral heads of the gastrocnemius.

Brachial Plexus Block:



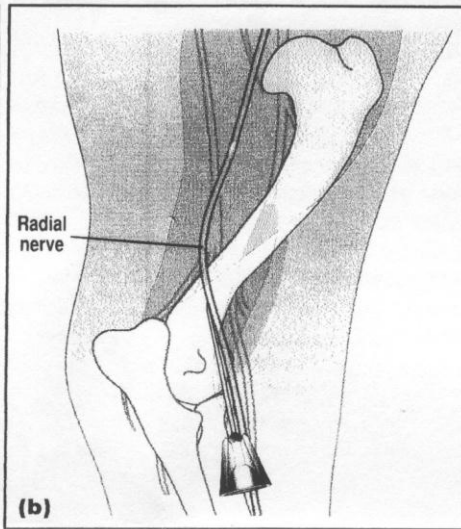
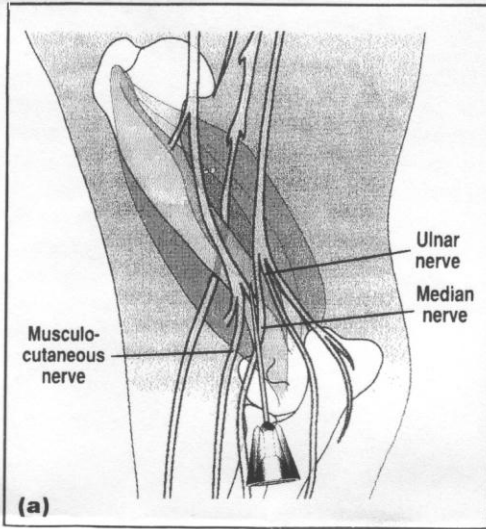
This block effectively provides analgesia to the forelimb distal to the elbow. The brachial plexus is located just cranial to the first rib within the axillary space. You need high volumes of bupivacaine for this block so ensure you calculate your safe dose of bupivacaine. Use a 22g x 2.5-3.5" needle. We use insulated needles which allows us to use a nerve stimulator to ensure we are in the correct location.

The needle is placed just dorsal to the point of the shoulder and is advanced horizontally toward the costochondral junction or the stifle, medial to the scapula until it is caudal to the scapular spine. Ensure you are "walking" your needle along the medial side of the scapula so you do not end up in the thoracic cavity. You can inject half of the volume of bupivacaine at the point of needle placement and half as the needle is withdrawn.

Radial, Ulnar, Medial and Musculocutaneous or RUMM Block:

This block also effectively provides analgesia to the forelimb, at and distal to the elbow. The radial nerve is blocked by inserting a needle proximal to the lateral epicondyle of the humerus and directing it between the brachialis and the lateral head of the triceps. The ulnar, median and musculocutaneous nerves are blocked by inserting a needle proximal to the medial epicondyle of the humerus and directing it between the biceps brachii and the medial head of the triceps. Pulsation of the brachial artery can be used to locate these nerves, and they can be palpated between these muscles over the distal third of the humerus. Insert the needle slightly off perpendicular along the back of the humerus and about half way in, aspirate and inject your drug

Use a 22g x 1" needle and, again, figure out your safe dose of bupivacaine. The higher up you inject your drug, the better the analgesia will be as this block does not always block the elbow itself (good for more distal injuries, the brachial plexus block is better for elbow injuries).



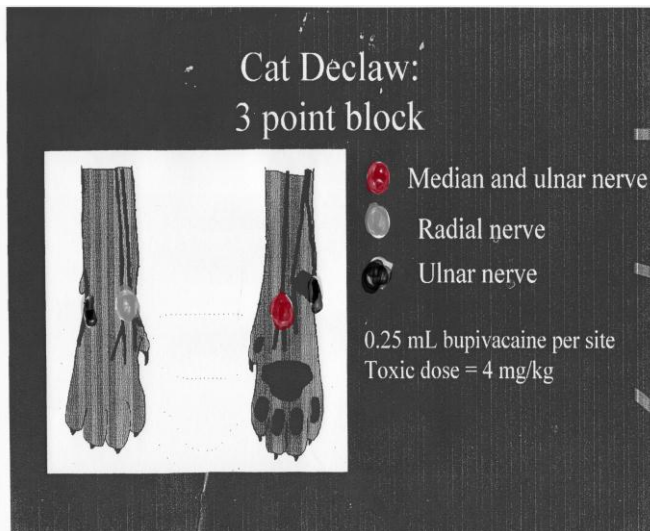
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Anatomical landmarks for performing radial, ulnar, median and musculocutaneous nerve blocks in dogs.

(a) Medial view.

(b) Lateral view.

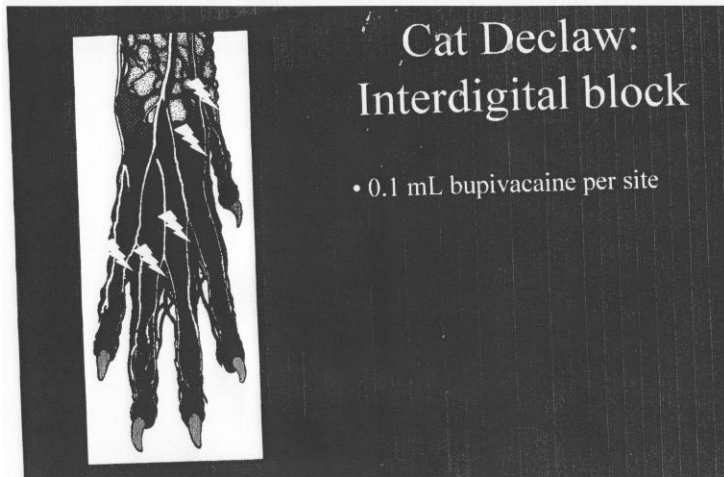
3-Point Cat Declaw Block:



Selective blockade of the distal branches of the radial, ulnar and median nerves can be used to manage perioperative pain associated with cat declaws. The radial nerve is blocked by placing a needle subcutaneously dosomedial to the carpus just proximal to the dewclaw. The ulnar nerve is blocked by placing a needle subcutaneously just medially and distal to the accessory pad. The median and ulnar nerves are blocked by placing a needle subcutaneously on the palmer surface at the midpoint of a diagonal line drawn between the dewclaw and accessory pad.

Use a 25g x 5/8" needle and inject about 0.25mLs per site of bupivacaine, making sure you have calculated your safe dose. And don't forget to take into consideration lidocaine spray used, if any (the toxic effects of local anesthetics are cumulative).

Interdigital or 6-Point Cat Declaw Block:



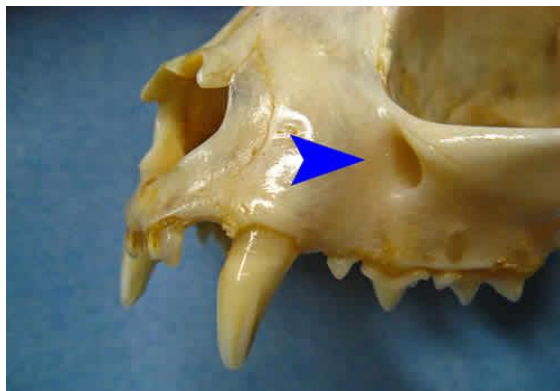
This block effectively provides analgesia to the paw by blocking the nerves as they enter the digits. The needle is placed down each lateral surface of each digit.

Use a 25g x 5/8" needle and inject about 0.1mLs per site of bupivacaine, calculate your safe dose, again taking into consideration, any lidocaine used as a laryngeal spray.

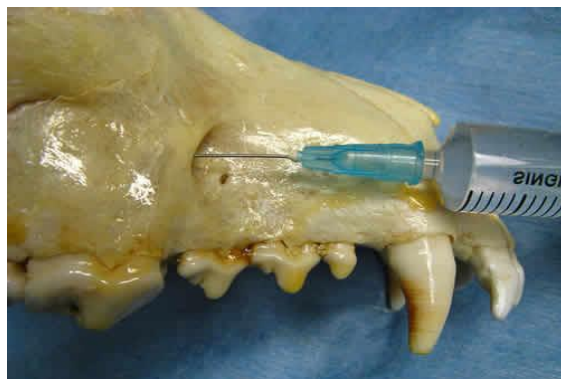
Infraorbital Dental Block:

This block effectively provides analgesia to the upper lip, nose, roof of nasal cavity, upper canines and incisors. I will also block the back teeth if the needle is carefully inserted into the canal itself. The foramen is located between the dorsal border of the zygomatic arch and the canine teeth. Lift the lips to gain intra-oral access where it is easier to palpate the foramen.

Use the smallest gauge needle possible to avoid damaging the nerve. Using a 25-27g needle, insert it just into the foramen, aspirate and inject a small amount of bupivacaine (0.25-0.75mLs). Place a finger over the foramen as you remove the needle to prevent the drug from oozing out.



Cat



Dog

Mandibular/Alveolar Dental Block:

This block effectively provides analgesia to the lower lip, chin and teeth of the lower jaw.

A 25g x 5/8" needle is advanced dorsally, just rostral to the angular process of the mandible (you will feel a small notch along the bottom of the mandible). The needle is advanced medial to the mandible until it reaches the lip of the mandibular foramen (about half way up).

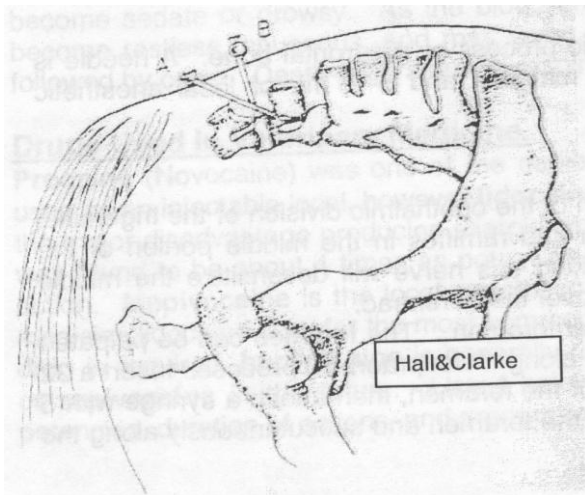


Cat



Dog

Equine Epidural:



This block provides analgesia of the tail, rectum, distal colon, bladder and reproductive organs in the standing horse. The site is the first coccygeal interspace (Co1-Co2). Moving the tail up and down helps locate the space. It is the first moveable joint caudal to the sacrum.

Approximately 5-7mLs of lidocaine with epinephrine is instilled through a 18g x 2.5" needle. The onset is approximately 10-30 minutes and the duration is 60-90 minutes. You can also use xylazine which will produce sedation with less ataxia and a longer duration. Dose at 0.17 mg/kg diluted to 10mL of

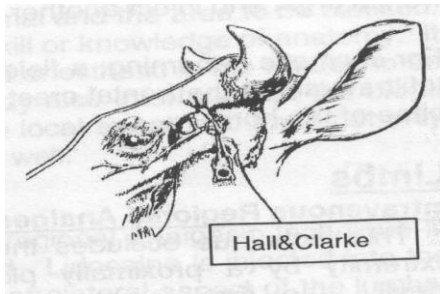
saline. You can also combine xylazine (0.17mg/kg) and lidocaine (0.22mg/kg) which produces analgesia in less than 15 minutes with a duration of 330 minutes.

Bovine Modified Peterson Eye Block:

This block will provide analgesia to the eye and orbit and immobilization of the globe (for eye enucleations). This procedure blocks the auriculopalpebral branch (motor) of the facial nerve (VII). The oculomotor (III), trochlear (IV) and abducens (VI) nerves; this blocks motor innervation to the ocular muscles. The maxillary branch of the trigeminal (V); sensory, innervates the lower eyelid, soft and hard palate, the nasal cavity, maxilla and adjoining bones, the maxillary sinus, and the region supplied by the infraorbital nerve. The ophthalmic branch of the trigeminal nerve; sensory, innervates the horn, upper eyelid, third eyelid, medial canthus, caudal part of nasal septum, cornea sclera and frontal sinus. The optic nerve. These nerves, except for the optic nerve pass through the orbital foramen.

Locate the notch formed by the supraorbital process, the zygomatic arch and the coronoid process of the mandible (the orbital foramen). Anesthetic is deposited anterior to the orbital foramen. Use a 4-6" x 18g needle and direct it horizontally for 2-4" until it strikes the pterygopalatine fossa, withdraw the needle slightly and deposit 15mL of lidocaine. An additional 15mL should be deposited slightly caudodorsally. You will still need to block the auriculopalpebral nerve to prevent blinking.

Bovine Auriculopalpebral Nerve Block:



This blocks motor but not sensory. Insert a 22g x 1" needle dorsal to the zygomatic arch and 1" cranial to the base of the ear. Instill 5-10mLs of lidocaine with epinephrine.

References:

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