1. **Oral blocks (Figure 1):** Blocks listed below will cause unilateral desensitization from the site of injection rostrally to midline.
   
   a. **Maxillary or infraorbital nerve block**
      
      i. **cranial approach**
      
      1. The infraorbital nerve exits the infraorbital foramen, which can be palpated as a depression in the buccal mucosa dorsal to the distal root of the maxillary 3rd premolar (just cranial to the root of the 4th premolar or carnassial tooth in the area where the gingiva on the maxillary bone and the gingiva on the lip join together).
      
      2. Block the nerve by injecting local anesthetic under the gingiva just rostral to the foramen or insert the tip of the needle into the infraorbital canal and inject. Injecting into the foramen insures more caudal spread of the block but is not necessary if the oral surgery site is rostral to the foramen. Also, the foramen can be difficult to locate or to enter in small dogs and cats & infusion rostral to the canal is still useful as there will be some caudal migration of the local anesthetic into the canal.
      
      3. A vessel runs with this nerve so aspirate, then slowly infuse drug (0.1 to 1.0 ml).

      ii. **caudal approach** – will also block molars and caudal carnassial
      
      1. Insert the needle percutaneously along the ventral border of the zygomatic process approximately 0.5 cm caudal to the lateral canthus of the eye. The needle is directed medially and slightly cranially (in an angle that would draw an imaginary line with the premolars on the opposite side of the head) until it hits bone. At this site, the maxillary nerve enters the pterygopalatine fossa. Aspirate and slowly inject 0.1-1.0 mls local anesthetic.
      
      2. An alternate technique is to approach the pterygopalatine fossa from the ventral margin of the orbit.

   b. **Mandibular nerve block**
i. The mandibular foramen or the mandibular nerve can often be palpated on the lingual side of the mandible just rostral to the angle of the mandible and just caudal to the last molar in approximately the middle 1/3rd of the mandible (as measured from top to bottom).

ii. Regardless of whether or not the nerve or foramen can be palpated (often difficult to palpate in very small patients), the landmarks described above will be utilized for deposition of local anesthetic drug.

iii. The nerve ENTERS the mandible at the mandibular foramen and cannot be blocked between the mandibular foramen and the mental foramen.

1. Intraoral technique:
   a. With the patient’s mouth supported in the open position (i.e., use a mouth gag, roll of tape or some other contraption to insure that the patient doesn’t close its mouth while your hand is in the oral cavity), direct a needle to the site described above.
   b. Aspirate, then slowly infiltrate (0.2 -2.0 mls). The foramen cannot be entered so the drug is merely infused under the gingiva at the site of the nerve.

2. Extraoral technique:
   a. Landmarks are the same as those described above but the approach is from the outside, through the skin at the angle of the mandible. This technique is easier than the intraoral technique in cats and in some small dogs.
   b. Pass the needle through the skin along the medial aspect of the mandible with the needle perpendicular to the mandibular cortical bone, to the level of the foramen (again, aiming for a site just caudal to the last molar on the lingual side of the mandible).
   c. With a finger in the oral cavity the needle can be felt under the gingiva.
   d. When the site near the mandibular foramen is reached, aspirate and inject the local anesthetic drug (0.2-2.0 mls).

C. Mental nerve block
i. The mandibular nerve EXITS the mandible at the middle mental foramen which can be palpated just ventral to the root of the 2nd premolar, immediately caudal to labial frenulum.

ii. Krug 2012 found the area of desensitization to be smaller than expected and variable in study dogs

iii. Insert needle tip just cranial to the foramen, aspirate and slowly infuse Apply digital pressure over injection site for 60 seconds in order to ensure maximum caudal/distal diffusion of agent into mandibular canal.

2. Testicular block
   a. has been shown to be anesthetic-sparing in dogs,¹ along with an abundance data revealing utility in large animals.
   b. Isolate body of testicles
   c. Inject lidocaine or bupivacaine into the body of the testicle until you feel ‘pressure’.
      i. Drug will migrate up spermatic cord.
   d. Generally ½-2 ml per testicle in dogs and cats
   e. For incision directly over testicle, continue infiltrating as the needle exits the testicular body to block the skin and subcutaneous tissue.
   f. For incision in other location, inject local anesthetic in skin and subcutaneous tissue at site of incision.

3. Ovarian block
   a. The mesovarium can be infiltrated with lidocaine.
   b. 0.5 mls per side in small dog up to 1-2 mls/side in large dog (up to 5 mg/kg total).
   c. Elevate ovary, infiltrate mesovarium, elevate opposite ovary, infiltrate mesovarium, remove first ovary, remove the second ovary and proceed with the ovariohysterectomy.

Fig 1 - Diagram of a dog’s skull showing the locations of a variety of local anesthetic blocks. Cranial and caudal infraorbital block (A), inferior alveolar nerve or mandibular block (B), and mental nerve block (C). Landmarks for cats are the same as for dogs. Diagram used with permission from Pfizer Animal Health.
d. One study in cats concluded the technique to be analgesic based on lowered supplemental anesthetic requirements in the study group (the total dose was 5 mg/kg of lidocaine and also included a splash block on the linea alba); a similar study in dogs appeared to give minimal benefit based on a lack of differences in autonomic changes and anesthetic MAC.

4. Digit or paw block (Figure 2)
   a. Four different ways to block
      i. Three point (or four point)
         1. Locate the carpus and the accessory carpal pad
         2. Inject 0.1-0.3 mls subcutaneously at three sites:
            a. medial to the accessory carpal pad (blocks median nerve and palmar branch of the ulnar nerve);
            b. lateral and proximal to the accessory carpal pad (blocks dorsal branch of the ulnar nerve); and
            c. on the dorsal-medial portion of the carpus (blocks superficial branches of the radial nerve).
      ii. Ring block
         1. Similar to three point block but use a subcutaneous ‘line’ of local anesthetic all the way across the dorsum of the paw and another ‘line’ all the way across the ventrum of the paw to provide a ‘ring’ of local anesthesia that desensitizes the nerves described above.
      iii. Digital block
         1. Block between each toe
      iv. ‘Splash block’
         1. ‘Splash’ local anesthetic into incision
         2. Not as effective as other methods

Fig 2 - Diagram of a cat’s distal forelimb showing the locations for placement of local anesthesia for desensitization of the digits. Diagram used with permission from Tranquilli WJ, Grimm, KA, Lamont LA. Pain Management for the Small Animal Practitioner. Teton New Media Jackson, WY, 2000.
5. **Intercostal block**
   a. Inject local anesthetic in the tissues caudal to the proximal portion of the ribs. Inject local anesthetic in 2-3 rib spaces in front of and 2-3 rib spaces behind the area that needs to be desensitized.

6. **Brachial plexus block**
   i. Locate the point of the shoulder, the first rib and the transverse processes of the cervical vertebrae.
   ii. Insert a 2-3 inch needle (an epidural needle will work) at the point of the shoulder to the point where the tip of the needle is even with the first rib. Keep the needle horizontal during placement so that the tip does not enter the thoracic cavity.
   iii. Aspirate, then inject 1/3 of the local anesthetic (2 mg/kg bupivacaine diluted with saline to a total 1 ml solution per 4.5 kg body weight) at this site, slowly withdraw the needle to the middle of the area to be blocked, aspirate and inject 1/3 of the local anesthetic. Withdraw the needle to a site just before it exits the skin, aspirate and inject the remaining 1/3 of the local anesthetic.

7. **Epidural block (Figure 3)**
   a. **Opioids** are most commonly used but local anesthetic drugs can be used in conjunction with opioids.
      i. 0.1 mg/kg morphine (preservative-free is gold standard but morphine with preservative is commonly used in veterinary medicine)
      ii. Dilute to 1 ml/4.5 kg with bupivacaine, sterile saline or sterile water
   b. Provides up to 24 hours of analgesia with little to no systemic effects. The opioids will cause sensory blockade but will not cause motor blockade. The local anesthetics can cause motor blockade, however, the motor effects are generally minimal or absent by the time the patient recovers from anesthesia to the point that it is ambulatory.
   c. Consider for any pain in caudal half of patient. Examples include, rear limb soft tissue or orthopedic surgery, abdominal exploratory and bladder surgeries, surgeries on the tail or perineal region, etc…
   d. Technique:
      i. Place the anesthetized patient in dorsal or ventral recumbency
1. Legs can be placed forward or to the back. I prefer forward in cats and small dogs.

ii. Locate the wings of the ileum and palpate the lumbo-sacral (LS) space (almost directly in line with the wings of the ileum on the mid-line).

iii. Clip and scrub this region. Wear gloves and use a small drape or glove wrapper.

iv. Insert an epidural needle into the caudal portion of the LS site with the needle angled at approximately 45° from vertical.

v. Slowly advance the needle until the epidural space is entered.

1. ‘Hanging’ drop often works (aspiration of fluid in the hub of the needle as the epidural space is entered).
2. Several ‘pops’ will be felt.
3. ‘Walking off’ the bone is the most definitive determination of proper placement of the needle.

vi. STOP as soon as the space is entered and slowly inject the drug.

1. The drug should inject easily if the needle is in a space.
2. If the drug does not inject easily, back up a VERY tiny amount and try again.

vii. Once drug has been injected, remove needle and proceed with surgery.

1. If local anesthetic drugs have been used, may want to lay patient with surgical side down for about 5 minutes.

viii. Opioid epidurals do NOT affect motor function of the rear limb or diaphragm. Local anesthetic drugs can affect motor function but rarely do (volumes that are described here do not migrate far enough cranially to affect the diaphragm so ventilation is not impaired).

e. Complications include ineffective block (by far most common complication), epidural hematoma or abscess, hyperalgesia (VERY rare). Contraindications include bleeding disorders (to prevent hematomas) and skin disease over the LS space (to prevent abscesses). Abnormal pelvic anatomy (either from congenital lesions or trauma) may make epidurals difficult.

f. Epidural catheters are fairly easily placed in larger dogs and can be maintained for several days to allow continuous or intermittent delivery of analgesic drugs.
8. Sacro-coccygeal block

Sacro-coccygeal
- Anal sacculectomy
- Perineal mass removal
- Other tail, perineal S'x
- Blocked cats
- PU

Indicated for perineal, tail procedures including: relief of urinary obstruction, perineal urethrostomy, anal sacculectomy, peri-anal mass removal, tail amputation

a. Patient is placed in sternal recumbency, palpate the space between the sacrum and the 1st coccygeal vertebra while dorsoflexing tail (between Cx 1-2 also acceptable)
b. Clip & prep, Use a 25ga 1” needle to penetrate the skin at midline
c. Direct the needle at a 30 to 45 degree angle and continue through the interarcuate ligament
d. There may be a palpable “pop” when the ligament is penetrated; as the needle is advanced, there is no resistance upon entering the epidural space
e. If bone is encountered, keep the needle in the skin and slightly angle the needle cranially or caudally off the bone until the space is entered
f. The needle feels more firmly seated once the ligament is penetrated than it does in the subcutaneous tissues
g. Inject 0.5 ml of 2% lidocaine or 0.5% bupivacaine; there should be no resistance
9. **Intra-articular block**
   
i. This block is used for analgesia following intraarticular anesthesia. Inject 1-5 ml local anesthetic into the joint prior to surgery and repeat the injection after the joint has been sutured closed.

   ii. In vitro studies have demonstrated chondrotoxicity of 0.5% bupivacaine and 2% lidocaine; the clinical significance of single application is uncertain.

   iii. If local anesthetics are concerning, use opioids! There are opioid receptors in the synovium and they are upregulated in inflammation. This seems like the joint's way of screaming, 'give me opioids!'

10. **Retrobulbar block**
    
    a. 22 g 1 1/2” needle is inserted through the skin on the dorsal surface of the lateral aspect of the zygomatic arch, pointing under the globe and medially. Some clinicians prefer to place a 10° bend in the needle to facilitate proper advancement.

    b. The needle is advanced under the globe in a caudo-medial fashion, coming up into the retrobulbar space behind the globe. After aspirating to ensure not in a blood vessel, the local anesthetic is injection.

11. **Peripheral nerve blocks (perineural):** These are widely used for perioperative analgesia in humans. The duration of “single shot” blocks with bupivacaine is approximately 4 - 8 hours. In humans, a meta-analysis of evidence for superiority of local anesthetic block over traditional opioid –only methods includes improved pain scores, patient satisfaction and reduced side effects. Furthermore, bupivacaine blocks applied in humans can have hypoalgesic effects long surpassing the expected duration of action of the drug, through uncertain mechanisms. Use of nerve locator devices is becoming
more common in veterinary patients; this enhances precision of delivery and reduces the doses needed to block specific nerves. Descriptions of the techniques are available.10,11

References for technique descriptions:


11 Wenger, S; Moens, Y; et al. Evaluation of the analgesic effect of lidocaine and bupivacaine used to provide a brachial plexus block for forelimb surgery in 10 dogs. Veterinary Record 2005; 156(20): 639-642.