

Anesthesia and Analgesia for the Dentistry Patient

Every patient needs dental care every year, so let's make it a great experience for patients and clients!

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Practice Limited to Veterinary Dentistry

Learning Objectives:

- Understand perioperative management of the patient and anesthetic protocol development
- Understand common complications associated with anesthesia for dental procedures and how to manage them
- Understand analgesia for the dental patient through multi-modal pain control and local anesthesia



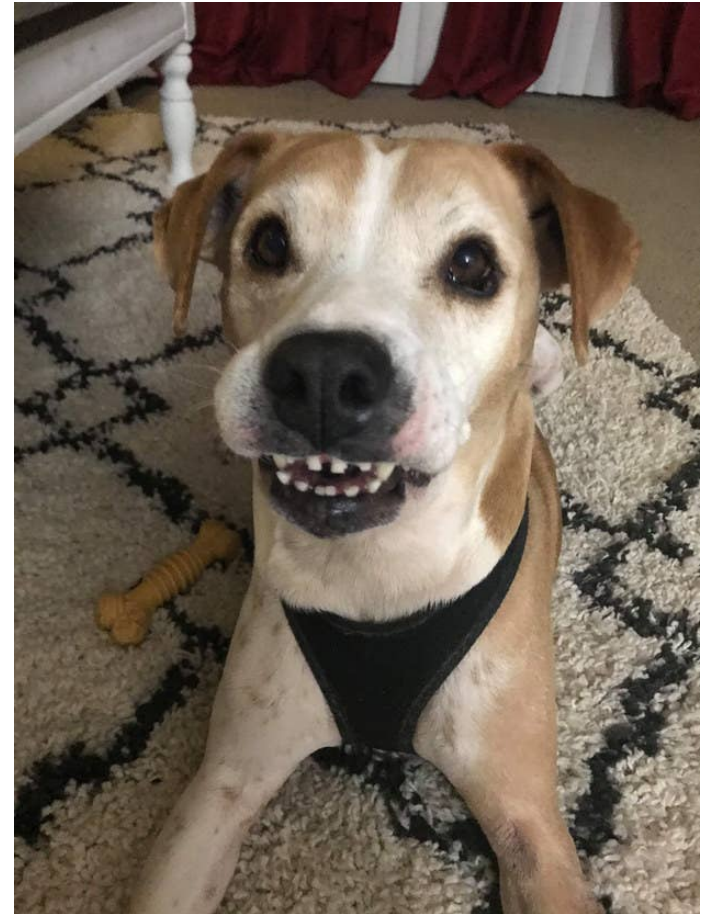
Why do we anesthetize dental patients?



- Safety for the patients
- Safety for the humans
- The only way to treat periodontal disease
- The only way to get diagnostic dental radiographs
- The only way to perform any dental surgery – extraction, endodontics, orthodontics, biopsy, etc.

What's unique about dental anesthesia?

- Procedures can be quite long (multiple hours)
- Patients can get quite cold due to water spray
- Patients are often older and smaller pets are over-represented
- Dental surgery can be very painful



Essential Items for Every Dental Anesthesia

- Pain control (before, during, and after)
- Properly inflated endotracheal tube cuff to protect the airway (high volume, low pressure is ideal)
- Appropriate heat support (water blankets and Bair Huggers)
- Monitoring equipment (blood pressure via doppler or oscillometric in particular)
- IV access (because hypotension WILL happen!)



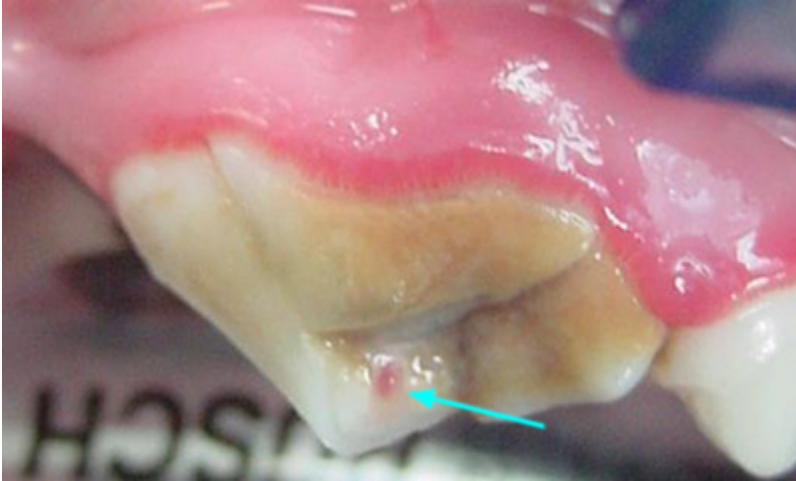
Routine Periodontal Maintenance



- “COHAT” – comprehensive oral health assessment and treatment
- “Dental Prophy”
- Supra and subgingival scaling
- Polishing
- Root Planing (open/surgical or closed)

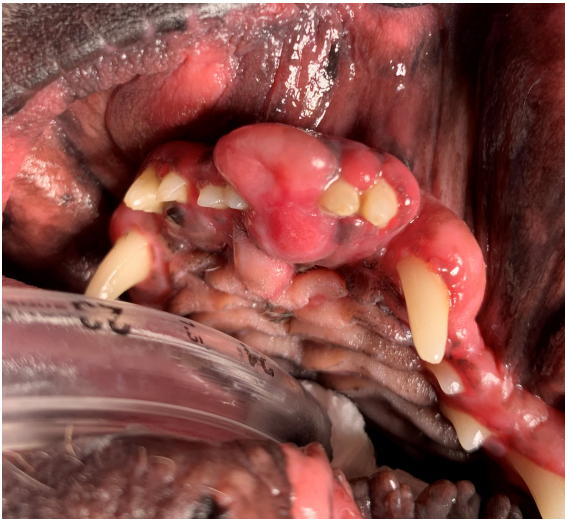


Extractions and/or Severe Periodontal Disease



- Pain and inflammation
REQUIRES analgesia
- Before, during, and after anesthesia!
- Utilize CRIs – Fentanyl, Ketamine, MLK, FLK, etc
- Utilize local blocks
- Opioid premedications (NOT butorphanol!)
- These patients get COLD and HYPOTENSIVE

Oral masses and biopsies



- Mandibulectomies, maxillectomies – VERY painful and bleeding is a major complication
- May not be able to effectively use local blocks due to disruption of neurovascular tissues
- Post operative pain may be greater than pre-operative pain for biopsies due to “angering” the tumor and increasing inflammation



Common anesthetic complications

- Hypothermia
- Hypotension
- Inadequate anesthetic depth
- Breakthrough pain

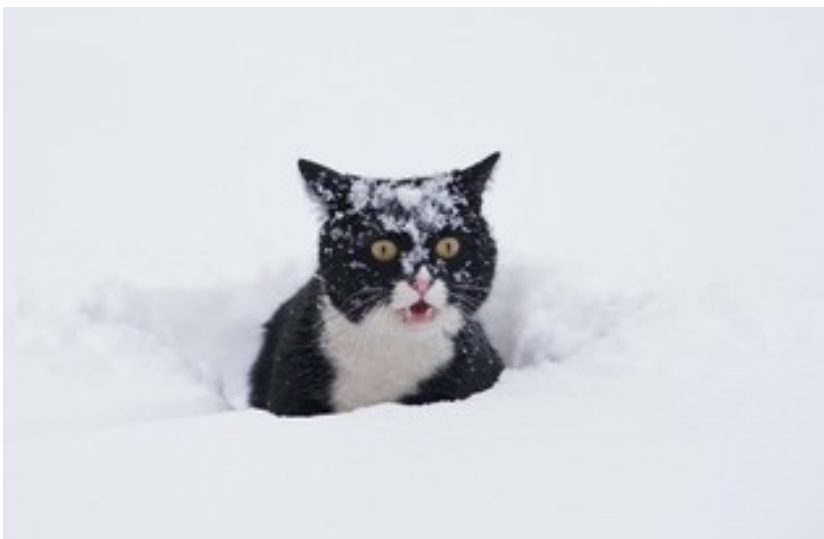


Hypothermia – What, why, how?

- Body temperature less than 99F
- Major heat loss occurs at anesthetic induction due to blood shifting away from the core to the periphery of the body
- Continued heat loss over 1-3 hours due to greater loss of heat to environment compared to heat generated through metabolism
- Body temperature plateaus around 3 hours (if no intervention is made)



Hypothermia – Effect on the Patient



- **Metabolic activity is slowed** and the action of injectable anesthetics may be prolonged.
- **Inhalational agent needs are reduced** by hypothermia and can result in a relative overdose.
- **Coagulation factor activity** and platelet function are **decreased**.
- **Oxygen distribution to the tissues is disturbed** and hypoxia can occur.
- **Impaired immunologic function** occurs and increased wound infections are documented
- Severe hypothermia **decreases cardiac output** and increases myocardial irritability. Ventricular fibrillation can result.
- Upon recovery, shivering can **increase metabolic oxygen requirements** by 300% at a time when the patient may be hypoventilating and not oxygenating well.
- Hypothermia, and resultant shivering, is a **very unpleasant experience** and is a common complaint from human patients.

Hypothermia – Prevention is key!

- Passive warming
 - Cover patient with a towel and blanket (reduces heat loss by 30%)
 - Baby socks and bubble wrap on the limbs/feet (may work better than warming the trunk)
- Active surface warming
 - Bair Hugger (forced warm air blanket)
 - Water blanket
 - Hot Dog (resistive electric blanket)
- Active core warming
 - IV fluid warmers (get as close to the catheter as possible!)
 - IV lines under the Bair Hugger
 - Lower O₂ flows with circle rebreathing circuits

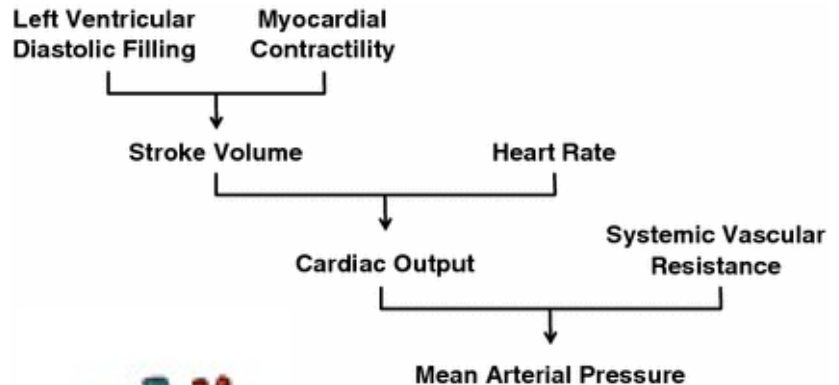


Hypothermia – Things to never do



Hypotension – What, why, how?

- Systolic blood pressure less than 80mmHg
- Mean Arterial Pressure less than 60mmHg
- MAP is the driver of organ perfusion
- Hypotension is caused by vasodilation (decreased systemic vascular resistance) or decreased cardiac output



HEART

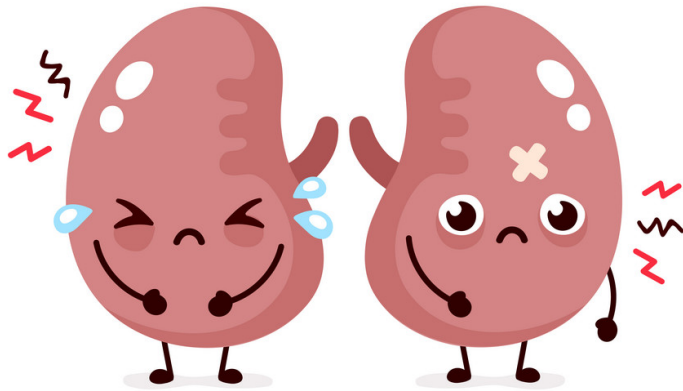


KIDNEYS



BRAIN

Hypotension – Effect on the Patient



- Decreased perfusion and hypoxia of the end organs
- If the patient recovers, they may have complications days later, such as acute kidney injury (AKI) which decreases glomerular filtration rate and can result in death of cells in the glomerulus
- Hypoxia and decreased perfusion in the brain can cause death of neurons in the cerebrum and cerebellum - patients can't be extubated, never regain consciousness, remain apneic, etc.

Hypotension – be ready to treat it!

- Can you decrease isoflurane or sevoflurane?
 - Give a dose of an analgesic to help reduce the need for gas
 - Assess patient depth
- Is the heart rate appropriate?
 - If patient is bradycardic, give a dose of glycopyrrolate or atropine
 - In puppies and kittens, blood pressure is heart rate dependent
 - Reverse any alpha-2 medications given before giving anticholinergics (dexmedetomidine)
- Does the patient need more volume?
 - Consider a fluid bolus (if not contraindicated) of 3-10ml/kg
- Still hypotensive?
 - Inotropes and/or vasopressors are your friend
 - Dopamine, dobutamine, norepinephrine most commonly used
 - Syringe pumps are a really, really good investment for this exact purpose!



Hypotension algorithm

Hypotension

- 1 Communicate** with surgeon & team
Surgical hemorrhage? Vascular compression?
Consider requesting addl help
- 2 Check the patient:**
Heart rate/rhythm, pulse quality, capillary refill time,
oxygenation, ventilation, & anesthetic depth
If bradycardia, go to *bradycardia flow sheet*
If no pulse/hr, go to *cardiac arrest flow sheet*
- 3 Decrease inhalant** delivery
Consider partial injectable technique
- 4 Consider equipment error**
Assess integrity of anesthetic circuit
Check BP cuff placement
Obtain BP reading with another machine
- 5 Administer IV fluid bolus**
Balanced crystalloids
Hypertonic saline
+/- artificial colloids
- 6 Administer pressors and/or inotropes**
Ephedrine bolus to temporize
Dopamine or dobutamine infusion
Norepinephrine infusion
Severe refractory hypotension: epinephrine bolus or infusion

Hypotension:

Systolic Arterial Pressure <80 mmHg
Mean Arterial Pressure <60 mmHg
Diastolic Arterial Pressure <40 mmHg
<30% reduction from awake baseline

Drug doses:

Balanced crystalloids
5-10 mL/kg over 5-10 minutes
(Consider total volume administered)

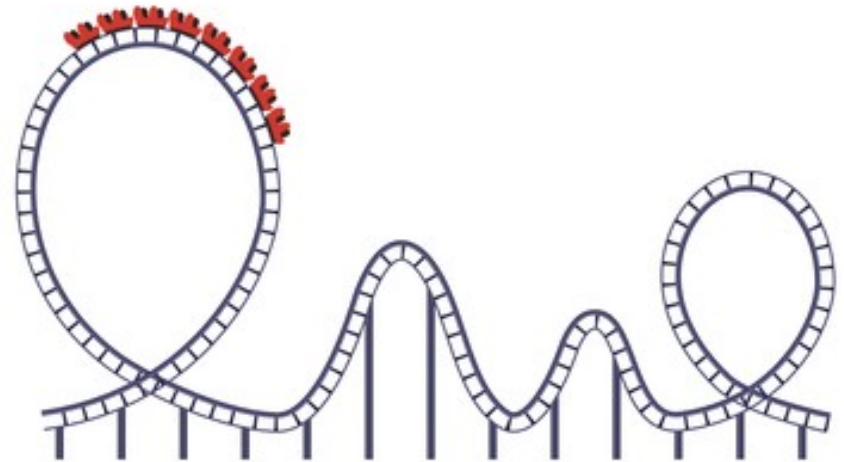
Hypertonic saline
4 mL/kg over 15 minutes

Artificial colloids
3-5 mL/kg over 10 minutes

Ephedrine bolus 0.03 - 0.1 mg/kg IV
Dopamine infusion 2-20 mcg/kg/min
Dobutamine infusion 2-20 mcg/kg/min
Norepinephrine infusion 0.1-2 mcg/kg/min
Epinephrine bolus 0.001 - 0.005 mg/kg
Epinephrine infusion 0.01-0.2 mcg/kg/min
Vasopressin 0.5 - 5 mU/kg/min

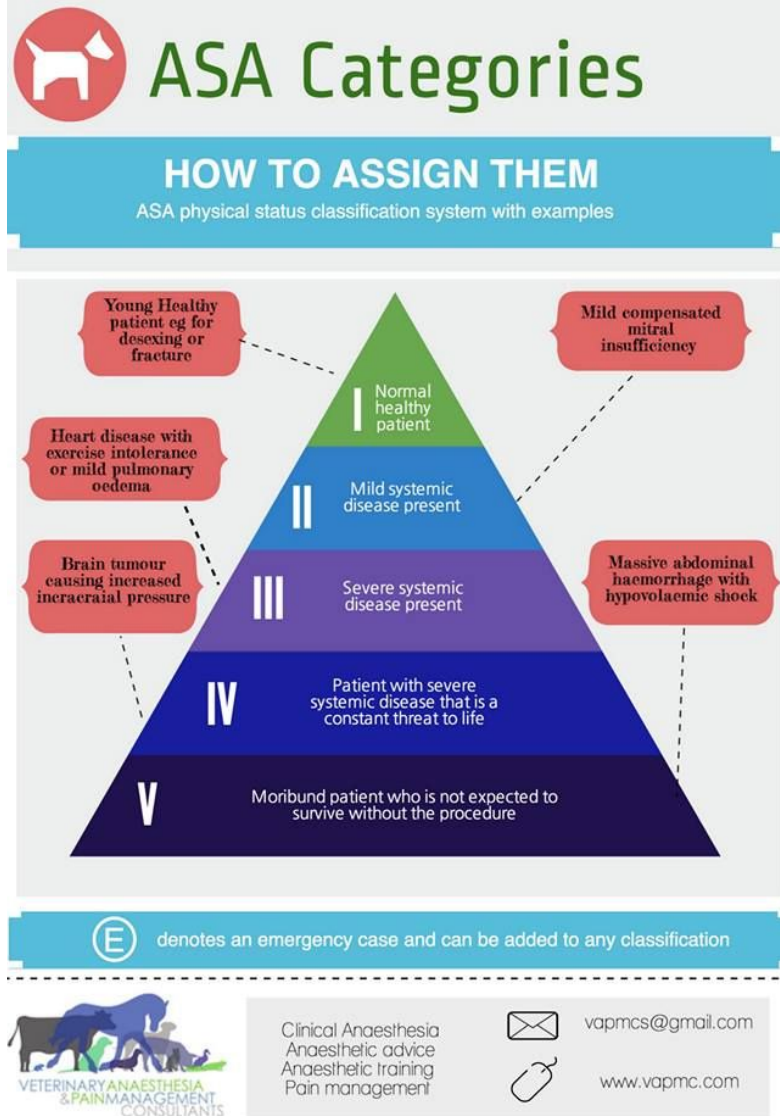
Inadequate Depth and Pain

- “Anesthesia Rollercoaster” (also known as “being a cat”)
- Patients can become light with painful stimulus, which starts the cycle of increasing depth → hypotension and/or bradycardia → decrease depth → getting too light...
- For those procedures you know will be painful (anything that involves bone!) CRIs are your best friend
 - Fentanyl (especially for kitties)
 - Ketamine (also great for kitties)
 - Morphine/Lidocaine/Ketamine (old school but you can make it in a fluid bag and don’t need a syringe pump)
- Local Blocks (better safe than sorry!)

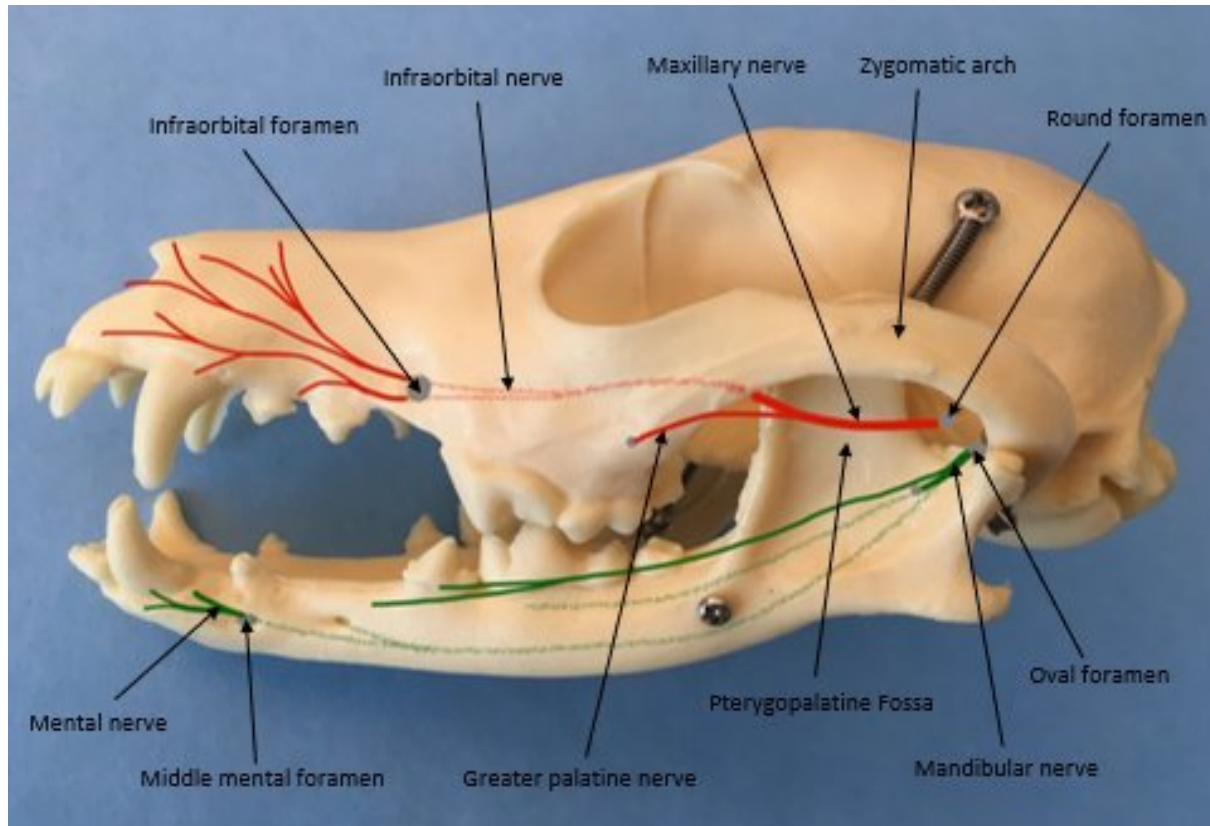


Anesthetic Plan Development

- ASA status
- Comorbidities
 - Kidney disease (fluids are good!)
 - Mature cats
 - Cardiac disease (fluids can be bad!)
 - Older, small breed dogs
 - Boxers
 - Cats of all ages
 - Liver disease (drugs may have prolonged effect!)
 - Brain disease (monitor very carefully on recovery, avoid ketamine and acepromazine)
 - Seizure disorders
 - Endocrine disease (so many things can go wrong!)
 - Cushing's, Addison's (cortisol is awesome except when it's not!)
 - Diabetes (insulin is great except when it's not!)



Local Anesthesia



Brett Beckman, DVM, DAVDC, FAVD, DAAPM has a great video:
<https://www.youtube.com/watch?v=UtWUzkHnLTk>

Infraorbital Nerve Block – Canine



- Palpate the opening of the foramen midway between the dorsal aspect of the maxillary bone and the teeth
- You can feel the thick nerve bundle fairly easily in all patients except brachycephalics
- Keep the thumb of your other hand on the zygomatic arch so you know you're not poking the eye

Blocks the teeth, bones, and soft tissues from the fourth premolar to the first incisor of that side of the face

Infraorbital Nerve Block - Celine



Blocks the teeth, bones, and soft tissues from the fourth premolar to the first incisor of that side of the face

- Foramen opening is very close to where the zygomatic arch meets the maxillary bone
- Keep your thumb of your other hand on the zygomatic arch to assure yourself you're not poking the eye
- Keep the needle parallel to the maxillary bone and insert into the area without tipping the needle up, down, or medially

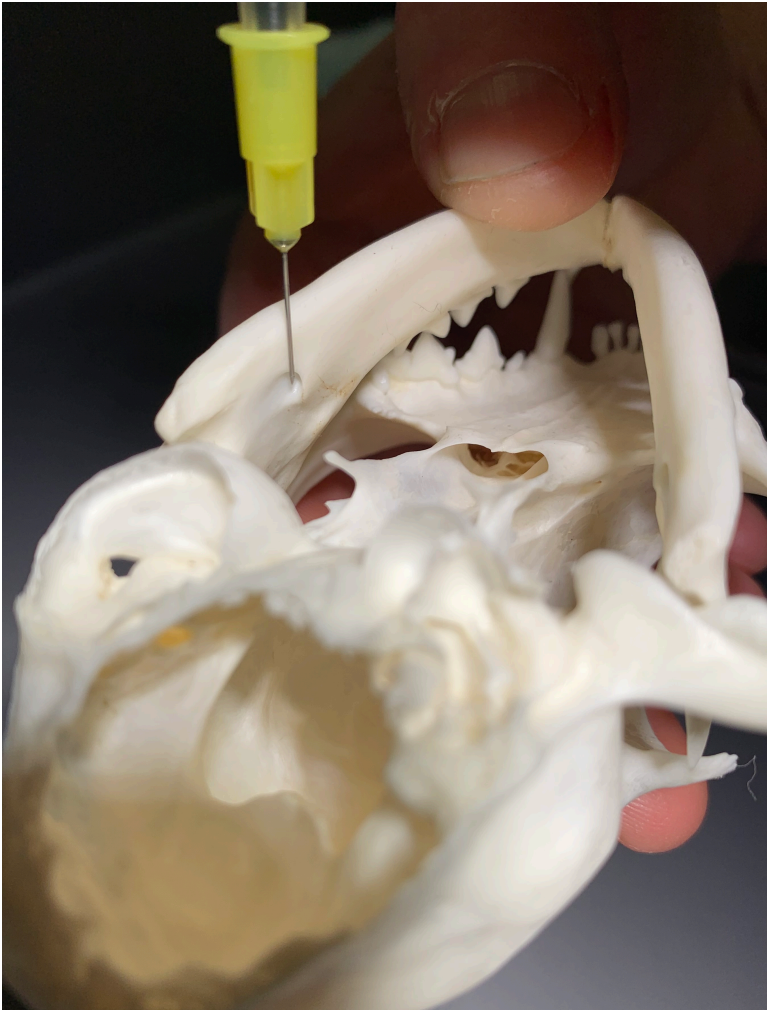
Mandibular Nerve Block - Canine



Blocks the entire mandibular nerve –
desensitizes the teeth, bone, and soft tissue all
the way to the symphysis
Use caution as you can also desensitize the
lingual nerve – keep needle against the
mandible to help avoid this

- Feel for the “notch” in the caudal mandible distal to the third molar
- Push soft tissues away from the mandibular bone with thumb
- Place needle perpendicular to mandibular bone and insert until you hit the mandible
- “Walk” the needle off the bone toward the INSIDE of the mandible, then insert needle slightly further
- This block can also be done intraorally

Mandibular Nerve Block - Feline



Blocks the entire mandibular nerve
– desensitizes the teeth, bone, and
soft tissue all the way to the
symphysis

Use caution as you can also
desensitize the lingual nerve – keep
needle against the mandible to help
avoid this

Mental Nerve Block – Canine



- Middle mental foramen is located between the first and second premolar or between the roots of the second premolar
- Easier to feel in larger patients – palpate just behind the labial frenulum as the distal aspect of the canine tooth
- Needle is inserted at a 20-45 degree angle to the mandibular bone

Considered the least effective of the mandibular blocks, especially in smaller patients when insertion of the needle into the foramen is challenging

If effective, provides desensitization of the mandible from the third premolar to the symphysis

Mental Nerve Block - Feline



- Can be very difficult to palpate in cats
- Needle needs to be inserted through the thick labial frenulum
- Middle mental foramen is located just in front of the third premolar tooth, where the labial frenulum attaches to the mandibular mucosa

Considered the least effective of the mandibular blocks, especially in smaller patients when insertion of the needle into the foramen is challenging

If effective, provides desensitization of the mandible from the third premolar to the symphysis

Maxillary block



- Provides desensitization to the entire maxilla
- Can be difficult and risk of complications is higher than with other blocks
- Depth of needle insertion is very important as the floor of the orbit can be penetrated and the globe may be traumatized

Local Anesthetic Agents



- Bupivacaine 0.5%
- Max dose = 2mg/kg
- Typically 0.1mL per 10 pounds, up to 0.4-0.5mL at each block site
- Onset of action ~20 minutes
- Duration of 8-10 hours



- Lidocaine 2%
- Max dose = 5mg/kg (even less for cats!)
- Same volume of infusion as bupivacaine
- Onset of action is rapid
- Duration less than 30 minutes



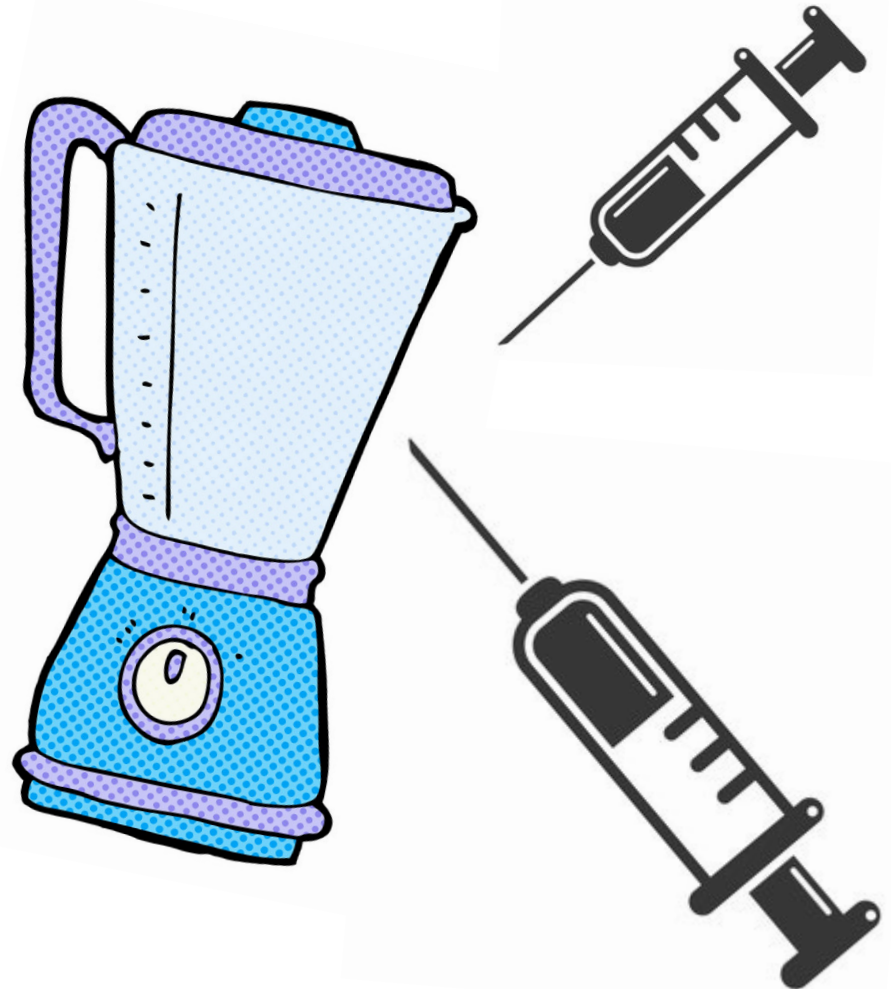
- Carbocaine/Mepivacaine 0.5%
- Similar to lidocaine but longer duration (still not as long as bupivacaine)
- Acceptable alternative when the “good stuff” is on backorder



- Liposomal bupivacaine that lasts ~72 hours
- Limited information for use in dentistry
- Use may be limited due to volume needed
- May be appropriate for major maxillofacial surgery

Local Anesthetic Mixers

- Buprenorphine – may extend the duration of bupivacaine blocks, but it's not statistically significant based on studies
- Dexmedetomidine – may extend the duration of the blocks, but volume needed may make challenging in dental applications
- Lidocaine + Bupivacaine – no evidence to suggest that this improves pain control early on and decreases the duration of the bupivacaine



When to Refer

- Any time the patient has significant anesthetic risk factors and could benefit from the supervision of an anesthesiologist!
- Almost always the benefit of dental care outweighs the risk of anesthesia – and we are here for those patients that can't be well managed in non-hospital settings





Questions?

Thanks for listening!

You can always e-mail me at
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