STRESS FREE MANDIBULAR CANINE EXTRACTIONS
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The primary complication associated with mandibular canine tooth extraction is fracture of the rostral mandible. The smaller the patient and the older the patient, the more likely this complication may occur, especially if enough time is not allowed for the extraction and equipment is not available. Two techniques have been described for mandibular canine extraction: labial approach and lingual approach.

**Anatomy**
In cats and dogs, the canine tooth root has a lingual orientation in relation to the crown.\(^1\)

Labial approach (dogs): The mental artery, nerve, and vein must be avoided or ligated. The roots of the first and second premolar must not be damaged. Approach of choice for extraction of persistent primary canines.
Labial approach (cats): The mental artery, nerve, and vein must be avoided or ligated. There are no first and second premolars.

Lingual approach (dogs): Avoids the mental artery, nerve, vein and premolar roots. There is slightly less bone to remove over the root than via the labial approach.
Lingual approach (cats): Avoids the mental artery, nerve and vein

**Pathology**
Dentoalveolar ankylosis adds complexity to the extraction process. Roots that have ankylosis lack the periodontal ligament and cementum. The dentin is in direct contact with the alveolar bone. This is often evident on radiographs. However, a radiograph is a two dimensional image of a three dimensional root. Foci of ankylosis may not be evident on radiographs. Areas of ankylosis must be “severed” with a surgical bur before elevation of the root can be accomplished. Failure to do this can result in mandibular fractures.

**Equipment:** Dental radiography
15 or 15C scalpel blade, scalpel handle

Periosteal elevator or molt
Round burs: sz 4, 2, 1, surgical length round: sz 1, ½
Diamond burs: cylinder (sz 016, 018), bullet
High speed (HS) handpiece
Cross cut tapered fissure bur (#558, #701)
Wing tipped elevators (sizes 1-8)
Extraction forceps
Osteoconductive or Osteoinductive bone implant (optional)
La Grange surgical scissor or sharp iris scissor
Small needle holder (4.5-5”)
Absorbable suture size 4-0 (FS2 needle for dogs) or 5-0 (P3 needle for cats)

Procedure: Steps for lingual approach to mandibular canine extraction:

1. Anesthesia
   a. General
   b. Local – inferior alveolar nerve block (2 mg/kg bupivacaine maximum dose)

2. Radiograph the tooth to be extracted. Identify any root pathology or anomalies.

3. Mucoperiosteal flap
   a. Intrasulcular incision around canine tooth
   b. Gingival incision from distal canine to mesial first or second premolar on the lingual side
   c. Gingival incision from mesial canine to lingual of 1st, 2nd, 3rd incisors
   d. Elevation of full thickness mucoperiosteal flap with periosteal elevator or molt

   *The flap base should always be wider than the apex.*

4. Lingual alveolectomy
   a. HS handpiece and #2 (small dogs) or #4 (large dogs) round bur to remove alveolar bone over lingual side of root. Use a “coloring” motion to remove bone until the root is visible. Use a round #1 or #2 bur to outline the mesial and distal root surface and create a place for purchase of the elevator.
   b. Length of alveolectomy will depend on the size of the tooth root

5. Elevate
   a. Using an appropriate size wing tipped elevator, advance gently, twist for 10-20 seconds on the mesial, lingual and labial surfaces. Each surface may require a
different size elevator. Bleeding between the tooth root and alveolar bone indicates that the PDL is being torn. This is the beginning of elevation.

b. DO NOT wiggle the elevator. Wiggling the elevator does not release the PDL. Instead, insert the elevator in the PDL space, gently rotate and hold for 10-20 seconds. This method fatigues the PDL and allows the root to be released. Wiggling an elevator only fatigues the doctor.

c. If the PDL does not release, there may be ankylosis. Identify the area of ankylosis and remove it using a surgical length round bur (#1 or #1/2). The older the patient the more likely there will be ankylosis.

d. *Take your time.* It is during this step that iatrogenic fracture of the mandible can occur. Root fracture could also occur and necessitate retrieval of the root tip. *Elevation is not about force – it is about technique.*

6. Curettage of the alveolus

   a. Using a spoon excavator or bone curette (depending on the size of the alveolus), gently remove any debris or granulation tissue from the alveolus. Follow with a sterile saline flush of the alveolus. DO NOT flush the alveolus with the air/water syringe.

7. Alveoloplasty

   a. Remove sharp alveolar margin edges with a round carbide or diamond bullet shaped bur

8. Radiograph

   a. Make sure all of the root has been removed

   b. Examine for iatrogenic fracture

9. Optional step: Apply osteoconductive or osteoinductive bone implant to alveolus to the level of the alveolar margin. Always radiograph before the bone implant is applied.

10. Close the wound

    a. Juxtapose the flap margins. Trim any acute angles. Assess for tension. If there is any tension during this step, elevate the flap enough to relieve it.

    b. Close the flap using simple interrupted absorbable sutures.

11. Postoperative instructions

    a. Dispense appropriate medication for pain management for a few days.

    b. Feed soft food for two weeks

    c. Remove all chews and toys for two weeks, an E-collar may be needed

    d. Schedule a postoperative follow-up in two weeks
Labial approach to mandibular canine extraction:
All of the steps listed above are the same for the labial approach for canine tooth extraction except Steps 3 and 4. This approach is typically used in cats.

Step 3: Design of the mucoperiosteal flap will be different than Step 2. The incision will extend from the mandibular canine distally to the first premolar (in dogs) and just distal to mandibular frenulum in cats. The mesial incision will extend from the canine to the distal line angle of the third incisor and the gingival margin and apically along the distal line angle of the third incisor. When elevating the flap, locate the mental foramen, artery, vein, and nerve. They may require ligation.

Step 4: Labial alveolectomy must avoid the premolar roots in dogs.

Steps 5-11 as described for lingual approach.

Complications
1. Symphyseal separation – poor elevation technique
2. Mandibular fracture – poor elevation technique, not scheduling enough time
3. Dehiscence – due to poor flap design (tension on flap or base narrower than apex), sharp alveolar margins, poor tissue handling, or postoperative trauma caused by inappropriate chewing behaviors.
4. Bleeding – laceration of the mental artery
5. Fractured root tip – secondary to root pathology (ankylosis, resorption) or technique. Retrieval of a root tip has been described. 2,3

Surgical root tip extraction
Tooth root fractures are a common complication during extraction, especially if ankylosis or root resorption is present or excessive force is applied with an elevator. Where ankylosis has replaced the normal periodontal ligament (PDL) with hard tissue, it is hard to discern tooth root anatomy or place an elevator. “Burring” out roots with a high speed handpiece causes

substantial bony damage and may leave root tissue behind. Removal of apical alveolar bone is less traumatic and more predictable for extraction of root tips and is the preferred method.

**Anatomy**

Tooth root: pulp canal, dentin, cementum  
Periodontium: PDL, alveolar bone

**Equipment**

Dental radiography  
Magnification (surgical loupes) and light source  
High speed handpiece  
Burs: Round #1/2, 1, surgical length #1/2, 1, cylinder diamond (shape 837, sizes 018 and 016)  
Elevators: sizes 1, 2, 3 root tip elevators, larger for canine tooth root tips  
Spoon excavator

**Procedure**

1. Radiographs  
   Begin with post-extraction radiographs to locate any fractured or retained root tips. The occlusal view is best for maxillary premolar and molar root tips. Parallel technique is best for mandibular premolars and molars. Bisecting angle technique should be used for canine and incisor root tips.

2. Identify root anatomy  
   Use the cylinder diamond bur to flatten the coronal portion of the fractured root tip. The pulp canal, and dentin will become visible. The dentin is often darker, more yellow and harder than the surrounding alveolar bone.

3. Create space for the elevator  
   If the PDL is not visible, release the ankylosis with a #1/2 or #1 bur or surgical length bur (1/2 or 1) to create a “moat” or “gutter” adjacent to the dentinal walls of the root tip, where the PDL should be. Removal of 2-3 mm of bone will allow purchase of a small elevator.

4. Elevate  
   Gently advance the elevator and twist for 10-20 seconds on each side. Oval root tips will require two different sizes of elevators for proper fit. If there is no mobility, release more ankylosis with a round bur creating a deeper gutter. In some cases, the tooth root will be
removed in sections. This has been described in the mandibular canine tooth of cats.\textsuperscript{4} Use a spoon excavator to curette the alveolus of any granulation tissue or necrotic tissue.

5. Radiograph

Confirm complete tooth root extraction with radiographs prior to removing sharp alveolar bone edges and closing the extraction site.

**Extraction of Persistent Primary Mandibular Canines**

As a rule, there should never be two teeth in the same place at the same time. If the permanent canines are erupting and the primary canines have not exfoliated, the primary canines should be extracted. This may help prevent lingually displaced permanent canines in some patients (those with normal jaw length and width). If the primary tooth has a complicated fracture (pulp exposure), it should be extracted even if the permanent teeth are not yet erupting (prior to 5 months of age). Pulp exposure of any tooth, causes pulp necrosis and exposes the root to infection untreatable with antibiotics. Infection or necrosis of the primary tooth root can affect the health of the unerupted permanent tooth. Any tooth with pulp exposure is also a source of pain whether or not the puppy is still playing and eating.

It is important to prevent damage to the permanent tooth root when extracting a persistent primary canine tooth. Instrumentation is the same as that used for extraction of a permanent tooth. A vertical releasing incision is made over the tooth root of the primary mandibular canine. (This is different than extraction of a permanent tooth in which line angle incisions are used.) After using a periosteal elevator to elevate the gingiva mesially and distal from the incision, carefully remove alveolar bone from the labial aspect of the root with a size 1 or 2 round bur. Elevate the tooth on the mesial and distal aspects. Avoid using any metal instruments between the primary and permanent canine teeth as this may damage the permanent tooth. The primary tooth roots are long, thin, and often soft. It is not uncommon to break the root during elevation. The tooth root will need to be removed in pieces if a root fracture occurs. Close the vertical releasing incision with absorbable sutures.

\textsuperscript{4} Krakowski Volker M, Luskin IR. Surgical Extraction of the Mandibular Canine Tooth in the Cat. *J Vet Dent* 29(2); 2012:134-137.