# Surgical Extraction Techniques Kevin S. Stepaniuk, DVM, AVD, DAVDC University of Minnesota Saint Paul, MN

*"Extractions"* are surgical procedures requiring significant training and skill. Surgery is defined as the treatment of disease, injury, or deformity by manual or instrumental operations, as the removal of diseased parts or tissue by cutting. Extraction is defined as the process or act of pulling or drawing out. In order to correctly "extract" teeth in veterinary patients, surgery must be performed.

The majority of extractions in veterinary dentistry are surgical extractions (creation of a mucoperiosteal flap, sectioning of teeth, and/or removal of bone). Extractions involve the creation of mucoperiosteal flaps, removal of cortical and alveolar bone, sectioning of multi-rooted teeth, curetting the alveolus to remove infected tissue, smoothing the bone (alveoloplasty and/or osteoplasty), suturing the extraction site closed, and post-operative care. The American Veterinary Dental College position statement is that treatment planning and exodontics should be performed only by a veterinarian (www.avdc.org). All extraction treatment planning requires intraoral dental radiography.

### **Indications for exodontics**

Indications for extraction of teeth include, but is not limited to, persistent deciduous teeth, fractured teeth with pulp exposure (when endodontic treatment is declined), periodontally compromised teeth, maloccluded teeth (when orthodontic and endodontic treatment is declined), unerupted teeth, tooth resorption, etc. Comprehensive preventive and treatment plans can save many teeth. However, the ultimate goal should be for a pain and infection free oral cavity in our patients. Exodontics is often necessary for fractured or periodontally infected teeth where case history and/or clients do not wish to pursue endodontic or periodontal surgery to treat the infected tooth.

## **Extraction equipment and supplies**

In order to be successful and to be professionally satisfied performing extractions the following equipment, but not limited to, is recommended:

- 1. Protective masks, glasses, and gloves
- 2. Good lighting
- 3. An ergonomic work environment
- 4. Magnification (if possible)
- 5. Scalpel Blades (#15, #15c, #11)
- 6. Scalpel Handle (I prefer a round scalpel handle)
- 7. Water Cooled High Speed Hand Piece to prevent thermal necrosis of bone
- 8. Dental Burs (Such as #330, #331, #1/2, #1, #2, #4, #669, #701, medium or fine diamond bur)
- 9. Dental Periosteal Elevators
- 10. Dental Luxators
- 11. Dental Elevators
- 12. Extraction Forceps
- 13. Root Tip Picks
- 14. Excavators/Curettes (to clean out the alveolus)
- 15. Tissue Forceps
- 16. Needle Holders
- 17. Absorbable Suture (4-0 or 5-0 poliglecaprone 25, 4-0 or 5-0 chromic gut, 4-0 or 5-0 polyglactin 910 on a P-3 needle)
- 18. Tongue depressor
- 19. Minnesota retractor
- 20. All instrumentation used delicately and with control A finger stop should be near the tip of the working instrument to stop the instrument if it slips and
- 21. PATIENCE!

## General extraction technique (single rooted teeth and individual roots after sectioning)

Client consent is obtained for the extraction. The goal is to remove the entire tooth from the alveolus with minimal trauma to the surrounding bone and tissue. The periodontal ligament attaches to the tooth and the alveolar bone in order to hold the tooth in the mouth. The ligament is designed to withstand short bursts of pressures/forces. The ligament must be fatigued in order to remove the tooth. Extracting the tooth is about patience and finesse not brute force.

The oral cavity is rinsed with an oral 0.12% chlorhexidine gluconate solution. Intraoral radiographs are always obtained for treatment planning. An intrasulcular or parasulcular incision is made to release the gingiva by cutting the junctional epithelium and

connective tissue. A mucoperiosteal flap is created, if indicated. An appropriate sized dental elevator (fits the curvature of the tooth root) is used with axial pressure to cut the periodontal ligament fibers. A major pitfall is not placing the instrument in the periodontal ligament space which results in crushing of alveolar bone. This delays extraction and results in unnecessary surgical trauma. Once the elevator is in position, rotation will cause the periodontal ligaments to stretch. Hold the position and wait (15-30 seconds). Bleeding (periodontal ligament is being damaged) should be noted. Repeat the procedure and use a smaller dental elevator that fits the curvature of the root as you work apically. Repeat again as needed. Take time to fatigue the ligament and damage the periodontal ligament fibers.

Once the root is sufficiently mobile, and only when it is mobile, do you reach for the extraction forceps. The tooth then can be grasped with extraction forceps and rotated on the long axis. The whole tooth should be present. If not, take an intraoral dental radiograph and remove the retained root fragment. The retained root fragments can be retrieved with the use of root tip picks. "Burring out" or "atomizing" retained roots is contraindicated. Serious damage and trauma to surrounding bone and neurovascular structures can occur.

The alveolus is cleaned with a curette, to remove granulation tissue, purulent debris, and bone fragments, and then lavaged with an oral 0.12% chlorhexidine gluconate solution. The margins of the alveolus and cortical bone are carefully smoothed with a medium diamond football shaped bur in order to remove rough spicules of bone.

An intraoral dental radiograph is obtained to document extraction of the tooth. Most extraction sites do not require osteoconductive material. A healthy blood clot is a phenomenal osteogenic, osteoinductive and osteoconductive material.

Surgical margins are freshened so healthy, non-epithelialized margins are opposed. Extraction sites are sutured closed (except for interceptive extractions of deciduous teeth). The use of 4-0 or 5-0 poliglecaprone-25, chromic gut, or polyglactin 910 on a P-3 needle is used to suture the extraction site closed with a simple interrupted pattern.

### Key points in surgical site closure include

- 1. No tension of the mucoperiosteal flap
- 2. Suture lines over bone
- 3. Sutures 2 mm apart with 2 mm bites of tissue and
- 4. No bony spicules or irregular rough bone margins beneath the mucoperiosteal flap.

Appropriate multimodal post-operative pain management is prescribed for 5-7 days. The patient should be fed soft food for 7-10 days. An oral 0.12% chlorhexidine gluconate rinse PO BID for 7-10 days should be prescribed. Appropriate antibiotics (amoxicillinclavulanic acid or clindamycin) are prescribed for 7-10 days as indicated. A recheck of the surgical site in 10-14 days is recommended.

## Extraction of the maxillary 4<sup>th</sup> premolars (teeth 108 and 208)

Intraoral dental radiographs are obtained for treatment planning. These teeth are closely associated with the infraorbital canal and major palatine foramen containing large neurovascular bundles. The location of the parotid and zygomatic salivary papillae are identified and avoided. A mesial releasing line angle incision is created. The mucoperiosteal flap is created by directing the instrument towards the bone in order to lift both periosteum and oral mucosa. It will also prevent damage to the flap if the instrument slips.

Once the flap is created, the tooth is ready to be sectioned. Cortical bone is removed. The amount of cortical bone removed is dependent on the extent of current disease, operator skill, and training. Remove the required amount of cortical bone to expose the furcation and roots as needed for the clinical situation. For example, I remove enough cortical bone with the high speed bur in order to expose the furcation (25-40% of the alveolar bone from CEJ to the apex). More alveolar bone can always be removed if necessary. The water-cooled bur is used in a light touch and with a continuous feather-brush-stroke movement. Sectioning begins at the furcation and extends to the crown. The mesial roots are sectioned from the distal root. The mesial-buccal and mesio-palatal roots are sectioned apart by directing the bur from palatal to buccal in at a 45 degree angle.

Once the teeth are sectioned, proceed as outlined above. A small trough can be created with a #1/2 or #1 round bur in the periodontal ligament space on the distal-buccal aspect of the mesio-palatal root if needed. However, with experience this is rarely needed. Also, if there is insufficient space between the maxillary 4<sup>th</sup> premolar and 1<sup>st</sup> molar for the dental elevator, the distal cusp of the maxillary 4<sup>th</sup> premolar can be removed. The mucoperiosteal flap is released by making a transverse incision at the base of the flap. The flap must be sutured without tension, the suture should be placed over bone, and the sutures should be no more than 2 mm apart.

#### Extraction of mandibular canine teeth (teeth 304 and 404)

The mandibular canine tooth is a one of the most difficult teeth to extract and iatrogenic jaw fracture is possible. The tooth is a strategic tooth so, if possible, endodontic therapy is recommended for a fractured canine tooth with pulp exposure or discolored tooth. Clients should be advised extraction of tooth 304 or 404 may result in the tongue to deviating from the mouth.

Buccal or lingual approaches are possible. The approach is based on the surgeon's preference and underlying disease process. If the tooth is being extracted for periodontal disease, the buccal approach is often utilized. If the tooth is being extracted for endodontic disease (clients declined endodontic treatment, a lingual approach may be used to preserve buccal cortical bone.

## **Buccal approach**

Intraoral dental radiographs are obtained. The mesial line angle incision is made at the distal aspect of the third incisor. An intrasulcular incision around the canine tooth is made and extended distally along the coronal aspect of the interproximal space to the 1<sup>st</sup> premolar. The incision may be extended intrasulcularly on the buccal aspect of the 1<sup>st</sup> premolar if necessary. However, the elevated gingiva will need to be returned to the 1<sup>st</sup> premolar. The mucoperiosteal flap is elevated to expose the jugum. Caution is exercised to avoid the neurovascular bundles exiting the middle and caudal mental foramens so that these vital structures are preserved. The water-cooled high speed bur is used to remove buccal bone of the canine tooth. The tooth is extracted as previously discussed. The rostral mandible is held between the thumb and index finger of the non-dominant hand to palpate for pressure and torque on the mandible. Torque on the mandible indicates a fracture may occur and elevation pressure from the dominant hand must be stopped.

### Lingual approach

Intraoral radiographs are obtained. The releasing incisions are made. An incision on the lingual mesial edge of the canine tooth, 2-3 mm lingual to the incisors, is extended to the midline. The incision is extended caudally using light pressure to avoid cutting into and separating the mandibular symphysis. The incision extends towards, but stops prior to the sublingual salivary papillae. An incision is extended from the distal aspect of the mandibular canine to the 1<sup>st</sup> premolar. The periosteal flap is elevated. The lingual alveolar bone is removed. The tooth is extracted as outlined above. Make sure the mandible is held firmly in your hand while luxating/elevating the tooth. The tooth is tipped lingually towards the removed lingual cortical bone. The rostral mandible is held between the thumb and index finger of the non-dominant hand to palpate for pressure and torque on the mandible. Torque on the mandible indicates a fracture may occur and elevation pressure from the dominant hand must be stopped.

## Extraction of the maxillary canine teeth (teeth 104 and 204)

Intraoral dental radiographs are obtained. The distal line angle incision is made distal to the maxillary first premolars. This allows for a wider mucoperiosteal flap with increased blood supply. It also allows placement of sutures over bone and not over the empty alveolus. The mucoperiosteal releasing incisions are created. An intrasulcular incision is continued mesially to the distal aspect of the  $3^{rd}$  incisor and distally to the distal aspect of the maxillary  $1^{st}$  premolar. The mucoperiosteal flap is elevated to expose the jugum. The water-cooled high speed bur is used to cut into the periodontal ligament space on the mesial and distal aspects of the maxillary canine tooth. The bone incisions are then connected across the buccal bone to the level of the tooth approximately  $1/3^{rd}$  to  $\frac{1}{2}$  the length of the root. The tooth is extracted as previously discussed.

### **Complications of extractions**

- 1. A fractured root or root tip is common and must be removed to complete the extraction.
- 2. Intrusion of root tips into the mandibular canal, infraorbital canal, or nasal cavity should be avoided. If intrusion occurs and the root tip cannot be safely retrieved, referral to a veterinary dentist is recommended for removal of the root tips.
- 3. Major neurovascular structures are in immediate proximity to, adjacent to, and/or encircling the roots of many teeth. Extensive hemorrhage and neuropathy are possible if the maxillary, infraorbital, palatine, or mandibular arteries are damaged during extraction.
- 4. Mandibular fracture is possible but is completely avoided with pre-operative intraoral dental radiographs and proper surgical technique.
- 5. Slipping of surgical instruments and orbital penetration should not occur with proper surgical technique but has been reported.
- 6. Maxillary lip entrapment by the mandibular canine teeth following mandibular canine tooth extraction can occur in cats. Excessive buccal bone removal, tension on the flap, and conformation can potentiate the problem. If non-healing maxillary dermal abrasions occur, crown reduction and vital pulpotomy or extraction of the offending mandibular canine tooth/teeth is necessary to resolve the complication.

#### References available upon request