

Surgical Extractions: Dealing with Complications and Tips for Achieving Predictable Healing

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“Visualizing the extraction”

A myriad of dental and oral conditions exist where tooth extraction is a possible treatment option. Frequently, when practitioners or students encounter difficulty with tooth extraction the solution tends to embody the need for better visualization. The various techniques and strategies we use to tackle this issue in practice likely involve some equipment you may already have. Proper visualization of the surgery site, which can be quite small, can be improved with the use of proper illumination and magnification. Illumination of the surgery site can occur both from directionally focused surgery lights as well as surgical lights that can be worn on the head or attached to surgical loupes. Surgical loupes provide magnification worn like glasses and can be fixed (through the lens) mounted magnifiers or 3rd generation surgical loupes that permit being flipped up as well as adjusted for various inter-pupillary distances. Most commonly used magnification in practice is 2-2.5x. Third generation loupes can be ideal in multi-doctor practices where the loupes can be shared and adjusted for each operator. Active suction can also be beneficial during surgical extractions since it permits visualization into an alveolus when looking for a tooth root as well as to evacuate blood from a surgery site. Dental radiography should also not be overlooked as a mechanism with which to visualize the structures being operated on.

Intraoral Radiography as a Means to Managing Complications

Intraoral radiography has become commonplace in many practices and has become ‘recommended’ in hospitals accredited by the American Animal Hospital Association. In practices where dental radiography has not been prevalent, the use of models or photos accompanied by photos of pathology can be helpful at demonstrating the importance of radiographs to completely appreciate the extent of disease.

Radiographic evaluation is especially important in 1) assessing the the health of periodontal structures associate with treatment success, and 2) as an important diagnostic and treatment planning tool. For the treatment of periodontal disease, ruling out periapical pathology and endodontic health status is important to assess the long term goal of preventing pain and infection. In situations of root resorption, identifying root fractures or establishing the presence of gross boney pathology, the aid of a dental radiograph helps the veterinarian anticipate complications such as fractured or missing roots as well as to determine if biopsy of an underlying condition is indicated.

At 6 months of age (conveniently coinciding with spay/neuter age), all permanent teeth in medium/large breed dogs have erupted. Small and toy breed dogs may demonstrate delayed eruption of mandibular second or third molars until closer to 9-10 months of age. Regardless of patient size, any unerupted teeth should be radiographed during the spay/neuter anesthetic episode. Occasionally, early identification of unusual lesions

radiographically can afford the patient treatment before lesion progression or the onset of symptoms. In the cases of compound odontomas, small tooth-looking structures are present and early identification and treatment reduces the impact that the expansile cystic lesion create on surrounding tissues. Not only complete removal of pathology is an important benefit of radiography, but also avoidance of complications such as iatrogenic mandibular fracture due to a dilacerated (curved) root is also valuable.

Correct treatment choice and efficient extraction or crown amputation is a major justification for the use of intraoral radiography. While the cause(s) of feline tooth resorption remains an enigma, treatment options have not changed. Fractured tooth roots is a common frustration when performing tooth extraction and being able to identify *Type 2* tooth resorption (loss of the periodontal ligament structure) which opens the opportunity for crown amputation in certain situations. Without radiography, overlooking affected teeth (stage 4c where resorption is predominately affecting just the root) would result in underdiagnoses of a painful condition. In cats, radiographic confirmation of complete removal of tooth structure can be particularly reassuring, especially while treating conditions reliant on complete extraction.

Oronasal Communications

The development of oronasal communications (typically oronasal fistulas,) occur iatrogenically during extraction (nasal alveolar plate is removed with the extracted tooth or inadvertent penetration into the nasal cavity while elevating along the nasal surface of the root) or due to periodontal disease. A very thin shelf of bone separates the maxillary canine teeth from the nasal cavity proper. Severe periodontal disease or endodontic infection can both result in apical bone loss and subsequent draining into the nasal cavity. While the treatment of oronasal fistulas in the area of the maxillary canine teeth can be straightforward, avoiding causing the fistula remains the goal. Avoid placing the dental elevator along the palatal aspect of the root as well as avoid applying a rotational force on the canine tooth such that the root tip rotates toward/into the nasal cavity.

Oronasal fistula repair should always utilize simple, straightforward repair techniques first. Wide-based buccal mucosal advancement flaps frequently can resolve the fistula and reestablish separation between the mouth and nasal cavity. Maintaining an airtight seal while avoiding the tendency to want to pack the alveolus with bone graft material should provide an environment for sufficient healing. The occlusion and relationship of the mandibular canine tooth with the maxillary buccal mucosal advancement flap should be carefully evaluated to ensure the occlusal tooth does not create tension on the maxillary flap. A primary cause for maxillary canine tooth extraction site dehiscence, in my experience, is tied to occlusal pressure from the mandibular canine tooth cusp.

Instrumentation

Appropriate instruments for extraction should be chosen and kept sharp. Holding periosteal and dental elevators in the palm of the hand and with a “short stop grip” provides the finger as a bumper and prevents inadvertent damage to neighboring tissues if the instrument slips. Accidental, iatrogenic slippage and penetration of the instrument into the

brain is likely to result in a fatal outcome while penetration into the globe will also likely result in enucleation (due to septic uveitis).

In the event that a root fractures, the fragment should be approached similar to buccal bone removal and moat creation to facilitate smaller, root tip removal instruments to be placed. Approaching root tip fragments are frequently obscured by difficulties visualizing the fragment and working in a hole. Extending the buccal bone osteotomy window is likely to help with exposure. Similar technique with a buccal bone window are useful for retrieving root tips from the mandibular canal or that are pushed into the nasal cavity. A similar strategy can be used when bulbous root structure is noted radiographically- being cognizant that in order to remove the root successfully, the surgical field must be made large enough to elevate the widest part of the root. Hopefully, using your dental elevators in a variety of ways will facilitate loosening the tooth before removal- remember the: fulcrum and lever, lever-and-wheel and luxator-wedge and rotation techniques!

Mandibular Fracture Related with Canine Tooth Extraction

Extraction of the mandibular canine, with such a large amount of the mandibular bone in that location being occupied by the canine tooth root, makes this area prone to iatrogenic fracture during elevation. Supporting the right and left mandibles in one hand will help to stabilize the rostral mandible while applying forces during elevation. If an inadvertent fracture does occur, depending on the instability of the fracture and availability of remaining teeth, conservative management may be enough to facilitate healing versus the need to apply fixation. In cases where severe periodontal disease predisposes the fracture and insufficient teeth exist for interdental wiring or composite splint placement, simply closing the soft tissue (+/- bone graft placement into the alveolus) and 8-10 weeks of softened food with appropriate pain management may be sufficient for healing. Other options for treatment may include interdental wiring and composite splint placement to facilitate bone healing. In fractures involving the alveolus of the mandibular canine tooth during extraction, communicating with the client about the fracture and offering referral for endodontic therapy of the tooth and jaw fracture stabilization is can be helpful.

Dealing with Deciduous Teeth

In itself, removal of deciduous teeth is not a complication however the close relationship between the deciduous tooth roots and permanent tooth buds makes injury to the developing permanent tooth easy to do. An overarching theme is that deciduous teeth are not designed to last an animal's entire life- if there is ever an issue with a deciduous tooth, the correct treatment is always extraction. When elevating deciduous teeth be mindful that the deciduous tooth roots rest buccal to the developing tooth bud- that being said, you should avoid placing the dental elevator, or elevating the deciduous tooth root tip toward, the lingual surface of the deciduous tooth root. I think of it this way- bodies have evolved with organ placement in locations that they are protected- permanent teeth develop closer to the middle of the body (palatal or lingual) relative to the deciduous counterparts in a sense the location is better protected. During the early stages of mineralization, damage to the developing permanent tooth can result in arrested development, enamel hypomineralization or hypocalcification. The maxillary canine teeth are the only exception to the location rule- the developing permanent tooth bud is oriented mesial (rostral) to the

deciduous tooth crown. In situations where retained deciduous teeth exist, radiographs should always be taken to discern permanent from deciduous however it is a safe bet that the deciduous teeth will be buccal to the permanents with the exception of deciduous maxillary canines sitting caudal to the developing permanent teeth.

Recommended Reading:

1. Gengler WR. Exodontics. *Vet Clin North Am Sm Anim Pract.* 2013;43(3):573–585.
2. Lobprise HB. *Blackwell's Five-Minute Veterinary Consult Clinical Companion Small Animal Dentistry*, Lobprise HB ed. Blackwell Publishing, Ames IA, 2007.