Tooth Extraction Techniques

Christopher Snyder, DVM, DAVDC
University of Wisconsin
Madison, WI

As you have seen, there are a variety of conditions of tooth-related disease that necessitate treatment. Extraction of teeth, although not necessarily always the best option, will frequently provide a predictable result to resolving a painful condition. Performing extractions utilizes a skill set not otherwise used in traditional veterinary orthopedic or soft tissue surgery. While your confidence and efficiency in performing extractions will continue with practice, be cognizant of always offering the client *all* the treatment options, even if referral may be necessary. Many states are instituting informed consent regulations requiring veterinarians to offer all the treatment options. As advanced tooth-salvaging dental procedures become increasingly available, protect yourself and counsel clients that other treatment alternatives to extraction do exist.

Extraction armamentarium

Just like any other surgical exercise, having the right tools (and sharp tools!) can make the difference between an extraction going smoothly and the same procedure taking all day. Knowing how dental elevators and dental luxators work differently is important in meeting your expectations. Luxators are made of softer metal, should be kept very sharp and are designed to be placed into the sulcus and periodontal ligament space of a tooth and function as a "wedge." By occupying this space and holding for 15-20 seconds, periodontal ligament fibers will stretch and sever; bleeding will occur to continue to create a force perpetuating the periodontal attachment breakdown. The instrument is repositioned and the same action is performed at other locations around the tooth. Dental elevators, being made of a stronger alloy, allow for placement between teeth to apply leveraging forces while anchoring off of adjacent healthy teeth or bone. They can be used with rotation in a manner where leverage is placed against the target tooth in effort to apply "lifting" forces out of the alveolus. Keep in mind that whichever tooth has the smaller healthy root mass will be the root that moves (ie don't use a dental elevator between a 3rd incisor and canine tooth hoping that the canine tooth will be the root that loosens.)

Any instruments used in oral surgery to create a force along the long axis of the instrument (luxators, elevators, periosteal elevators) should all be held using the *short stop grip*. By placing the instrument in the palm of your hand and strategically extending your finger along the shaft towards the working end- this creates a bumper (your finger) to minimize trauma should the instrument slip. This is particularly important when working on maxillary extractions since penetration into the nasal cavity, periorbital space or through the calvarium could all be significant complications.

After extraction, the extraction site should be closed with absorbable suture. There should be absolutely no tension on the suture line before closure. Techniques for releasing tension are discussed below. Quickly absorbed sutures like chromic gut are appropriate for patients who will heal quickly (juvenile patients) but may not be the best choice in patients where delayed healing is expected. Prolonged or delayed absorbable sutures are better to withstand the constant activity of the tongue, the salivary sections and the interaction with manipulations of the food bolus. Whichever suture is used, 5 to 6 suture throws are recommended because of the aforementioned variables that may interfere with knot security. Sutures should be spaced 2-3mm apart.

Radiography- "If I'm taking it out, why do i need to radiograph it?"

It is the author's understandign that AAHA certification is moving toward requiring certified hospitals to have the capacity to expose dental radiographs. Radiography serves to 1) better anticipate the severity of complications which may be encountered with dental extraction (is the tooth ankylosed?) 2) identify underlying pathology that may indicate further investigation (is biopsy necessary?) 3) elucidate whether there is supernumery or oddly shaped roots (root dilacerations) which may hamper extraction. By properly anticipating potential complications and correctly estimating for the time and cost required for a safe extraction, the procedure can be performed more safely and without extensive complications.

Appropriate pain management

Consider dental extractions as oral surgery. Surgical flaps, removal of bone and sectioning teeth would all be considered extremely painful in human dentistry without supplemental analgesia and anesthesia. Consider preoperative medications and local block placement to reduce the amount of required inhalant and to improve chances of a smooth recovery. Aggressive postoperative pain management will also improve client perception about the success of the procedure as well as reduce the amount of general anesthesia and the associated side effects seen during recovery.

Informed consent

Veterinary clients are becoming increasingly internet savvy and their expectations for veterinary treatment has exponentially increased over the past 15 years. Many clients expect similar treatment options as what their physicians and dentists offer people. The worst scenario would be to not offer referral treatment options and a client to discover them after the fact. States are beginning to pass informed consent regulations subjecting veterinarians to medical licensing board disciplinary action if they do not offer referral

treatment options as an alternative. That being said, veterinarians who have received advanced dental training can salvage most teeth. Protect yourself- counsel clients on all dental treatment options and document it in the medical record and NEVER extract teeth without a client's permission.

Extraction techniques: Closed (nonsurgical)

A closed extraction technique involves an absence of needing to excise epithelium or section teeth into individual roots. This technique is typically only applicable to incisors or extremely diseased multi-rooted teeth. The divergent nature of the dog's multi-rooted teeth precludes them from being removed through simple elevation. Elevation frequently can be achieved with luxators to fatigue and break down the periodontal ligament as well as dental elevators placed in the periodontal ligament space and rotated or tipped to fatigue the periodontal ligament fibers. Any forces applied and designed to break down the periodontal ligament fibers should be applied for 15-20 seconds to allow for fiber rupture and hemorrhage which will further break down fibrous attachment. After the tooth or tooth roots are removed, the alveolus should be inspected for residual signs of granuloma, infection, root remnants or bone spicules. All these residual tissues should be cleared away. Placement of materials such as autogenous bone graft, decalcified freeze-dried bone graft or Consil are typically not necessary. Proteins and circulating pleuripotent mesenchymal cells offer all the ingredients necessary to begin the clotting cascade, and cellular differentiation required for healing. Sharp bony edges should be blunted with a diamond bur on a water-cooled high-speed hand piece before closing the extraction site. Edges of the gingival collar should be scarified with a surgical blade or with a high-speed diamond bur. If wound edges are unable to be closed, use a periosteal elevator to create a mucoperiosteal release extending beyond the mucogingival line of the soft tissues. This will take advantage of the elasticity of mucosa.

Extraction techniques: Open (surgical)

Most states define surgery as an act in which epithelium is incised. Enamel is of epithelial origin so the simple act of sectioning the tooth constitutes surgery in most places. Typically, the idea of surgical extraction conjures thoughts of releasing incisions into the gingiva and mucosa and the creation of a flap. Principles of flap creation include:

- Flaps should have divergent vertical releasing incisions. A wide based flap allows for better maintenance of blood supply as well as flexibility of the flap becoming wider as the tissue is advanced. This is important to minimize the creation of tension.
- Incision lines should be made over line angles. Line angles are where "faces" or surfaces of the tooth come together. These intersections of the faces of teeth are surfaces where food would naturally be deflected away from the incision line.
- Incisions should be made, and closed over, areas supported by bone. Don't create mucogingival incisions over the buccal bone overlying tooth roots. Err on the side of making incisions wider than necessary to ensure that suture lines are supported. Tension is the number one reason for incision dehiscence!
- Vertical releasing incisions should be made with a scalpel blade and should extend past the mucogingival line. Gaining stretch of the flap will occur from the high elastin content found in mucosa. The flap is then elevated with a periosteal elevator. Attached gingival fibers are oriented in a way to resist forces in a coronal-to-apical direction. Elevating the flap in an apical-to-coronal direction may serve to make flap elevation easier.
- Sectioning of teeth should occur after buccal cortical bone is removed and the furcation can be visualized. Being able to see the furcation and section the tooth from the furcation towards the oral cavity prevents sectioning the tooth and inadvertent cutting into root structure.
- When removing buccal cortical bone or inspecting for tooth roots, remember that cementum and dentin don't bleed-bone does. Much of the difficulty with isolating fractured roots or inspecting the alveolus for debris results from problems with visualization. Suction, a good light source and magnification if possible all permit the surgeon to visualize for bleeding structures while identifying and elevating structures that don't bleed.
- Rarely should crown amputation be necessary in canine patients. While indications exist for this to occur in felines, dogs rarely exhibit ankylosis and the replacement root resorption necessary to consider crown amputation. This should only be considered IF there is no evidence of periapical pathology, if extensive amounts of root is not resorbed and if periodontal ligament cannot be visualized. Instances where extractions need to be cut short due to anesthetic complications or if surgically exploring for a fractured root tip is beginning to cause more harm than good, closing the extraction site and moving on is recommended. The client should be made aware of the situation and the patient should be radiographically evaluated in 6 and 12 months to evaluate the residual fragment. Leaving root fragments or performing crown amputation should be extremely rare in dogs.
- After removing the buccal cortical bone and sectioning teeth, the use of very small cutting bur may be helpful to outline and create a trough in the periodontal ligament space. This enables easier placement of dental elevators and may be particularly necessary in patients who have evidence of ankylosis.

- Dental crowding or the close association between adjacent teeth may make placement of luxators or elevators difficult. Selective removal of parts of the crown of the tooth being extracted may be helpful in creating space for the instruments to generate leverage during extraction. These kerfs may be a big time saver when maxillary PM4 distal roots are closely associated with the M1 or when the mandibular PM4 is in close association with the M1.

Extraction site packing

Various products exist for the purpose of packing extraction sites. Manufacturers suggest packing all extraction sites with their product. Available products fall into two basic categories- natural and synthetic. Bone grafts can be autogenous (donor and host are same individual) and or an allograft (donor and host are same species, different individual). Autogenous and decalcified freeze-dried bone graft both contain an important ingredient for bone healing- bone morphogenic protein (BMP). BMP is classified as having an osteoinductive potential which means that it induces pleuripotent cells to differentiate into osteoblasts. This will increase the speed with which osteoblasts and osteclasts will incorporate the inorganic minerals of the graft into the extraction site to fill with bone. Disadvantages of bone grafts are that they are species specific and typically can be used only for the patient once opened. The inductive qualities of bone grafts make them a poor choice for placement in areas where neoplasia is suspected. Synthetic graft materials known as alloplasts are comprised of the inorganic building blocks necessary for bony healing. These materials are not species specific and can be sterilely divided into multiple sterile containers to be used on multiple patients. Extraction site infection or possible neoplasia are contraindications for placement of either of these products. Keeping in mind that BMPs exist in normal circulation, it is the opinion of most veterinary dentists that having a blood clot rich with BMPs and infection fighting cellular mediators occupy the alveolus will serve to be the best material to occupy the alveolus.

Complications

These seem to occur most often when someone is rushed, is using dull equipment or using incorrect equipment. Taking your time, estimating and charging appropriately should result in an uneventful treatment. In instances of maxillary canine tooth extraction, an oronasal fistula may be discovered or inadvertently caused during extraction. The nasal bone plate is very thin and can be easily removed during extraction despite great care during elevation. These patients are more likely to demonstrate postoperative blood-tinged nasal discharge and the importance of an airtight, watertight closure is extremely important. Clients should be particularly observant for signs of sneezing after eating/drinking and stressing client compliance with no hard food or water for 10-14 days are paramount. If dehiscence occurs, wound edges should be allowed to heal completely before attempting a revision.

Periorbital, orbital penetration, or penetration into the braincase are all situations that require great attention. Periorbital penetration usually will carry a favorable prognosis with secure closure and appropriate antibiotic therapy. Orbital penetration is usually accompanied by a deflated globe, hyphema or air bubbles seen behind the cornea. A poor to grave prognosis is given and these clients should be contacted immediately to coordinate referral to an ophthalmologist. A dental elevator that enters the brain is very unusual but can be a complication of extraction of the caudal maxillary molars. In the event that this occurs, these patients should be woken up immediately and referred for advanced imaging and management.

Mandibular fractures are encountered during extraction of severely diseased teeth and usually involve the canine teeth or first molars. Intraoral radiography is the single best preventative measure to provide the practitioner with information that can be expressed to the client. NEVER recommend leaving a diseased tooth because of the poor health of supporting bone. Severe periodontal disease that predisposes jaw fracture will continue and pathologic fracture is likely. Pathologic fractures are more difficult to repair than iatrogenic fractures because of the quality of the fractured bone that will be expected to heal.

Conclusion

There are many indications for dental extractions. Practitioners should do everything possible to thoroughly identify disease, offer appropriate treatment options and perform extractions safely. Taking your time, estimating and charging appropriately are obstacles frequently encountered in practice. Not all extractions are the same and fee schedules within practices should be created as to not undercharge clients or rush practitioners.

References

Blackwell's Five-Minute Veterinary Consult Clinical Companion Small Animal Dentistry. 2007 Author: Heidi Lobprise.
Veterinary dental techniques for the small animal practitioner, 3rd edition. 2004 Author: Holmstrom SE, Fitch PF, Eisner ER.
Cislak website for instrument ordering: www.cislak.com/
Smith MM, Smith EM, La Croix N, Mould J. Orbital penetration associated with tooth extraction. J Vet Dent. 2003 Mar;20(1):8-17.
Carmichael DT. Surgical extraction of the maxillary fourth premolar tooth in the dog. J Vet Dent. 2002 Dec;19(4):231-3.
Fitch PF. Surgical extraction of the maxillary canine tooth. J Vet Dent. 2003 Mar;20(1):55-8.
Marretta SM. Surgical extraction of the mandibular first molar tooth in the dog. J Vet Dent. 2002 Mar;19(1):46-50.