EXTRACTION DISSATISFACTION

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Dr. Mathis's "Cliff Notes" for Dental Extractions

As noted in the Extraction in Action notes, a suggested order for extractions is:

1) Place regional nerve blocks prior to tissue incisions (https://bit.ly/blockvideo)
2) Flap margin incision(s) resecting diseased tissue at the same time
3) Elevate the flap with the periosteal elevator
4) Retract the flap with the zombie on bone (4 handed dentistry can be helpful)
5) Remove as much buccal bone as is necessary to see the furcation or widest part of the tooth with an appropriate sized round bur (generally ½ or 2) Goal is to 'paint' away the marginal buccal bone until you can visualize PDL spaces while leaving the tooth root fully intact without bur marks
6) Create grooves on the sides of each root as if you are taking away the periodontal ligament (PDL) that looks like a grey line with an appropriate sized round bur (generally ¼ or ½) (Round burs are usually placed perpendicular to the bone)
    - The above two steps can be thought of as sanding away three 'PDL' sides of a square peg. Each tooth root is a round peg, but it's easier to visualize with the square peg thought. This means that the fourth side of the peg needs to have the PDL stretched the most.
7) Extend these PDL grooves towards the crown of the tooth and its natural tapers. This resects a diamond shaped part of the upper PM4. Thin the cusps for 'straight access' to the periodontal ligament space with a cross cut taper bur (699 cats or 701 surgical length dogs) (Side of taper bur, *not* the tip, against bone)
    - Note the suggested round burs are to remove bone and PDL and the tip is the part that is being used. The suggested taper burs are to cut teeth and the sides are used. Alternatively, 329 pear for cats and 1557 round end taper for dogs can be used as BOTH which can limit the different sizes of burs and types that are needed in one office.
8) Use an appropriately sized luxator to *cut* the periodontal ligament in a vertical fashion holding your finger near the tip to provide a stop in case of 'slippage' (Clear view models and intraoral radiographs can help ensure your luxator direction is *parallel to the long axis of the tooth* root). Do not twist luxators, as the thin metal will fail damaging the instrument and/or the patient.
9) Sing 20 to 30 second elevator music to yourself for each of the 4 root 'sides' as you hold even pressure with a finger stop. Some think of this as isotonic exercise. We are not moving much but are working to fatigue the PDL fibers. Do not expect to advance the luxator at this point of the extraction.
10) Use an appropriately sized elevator to stretch and advance vertically while singing 10 to 20 second elevator music all the while holding pressure with a finger 'stop' in place. (Controlled even pressure to fatigue the PDL, not forcing through)
    - One advantage of a live patient when using elevators and luxators is that as the ligament stretches, blood fills the space helping to facilitate the extraction. Lab

specimens do not do this, thus are harder. If you can take it out in a lab, you can take it out often easier on a live patient.

- Though blood is helpful, it also can obscure your ability to see the PDL for initial elevator/luxator placement. Suction is helpful to resolve this. Recommend MAI's DV-350 suction unit as it's extremely quiet.

11) Scoop (NOT twist) with elevators (no scooping nor twisting with luxators) to reposition to the other sides of the root. Scooping is going around the tooth root. Twisting forces the side of the elevator into the tooth root. This is where elevator shape and size matters.
12) Use of rongeur style extraction forceps to grasp the root even with the long axis of the tooth with *gentle* twisting can help fatigue the PDL fibers. It can also help determine which side of the root may need more attention with elevators/luxators. If the twist is in the wrong plane, or if this is done too soon, or with too much force, this action will only serve to break roots and make extractions more difficult. If you haven't taken out at least 10 teeth in your career, this is not something you should be learning yet.
13) Practice can remove each tooth root in 2 minutes (Do not rush, as this will only create problems adding even more time) (30 seconds x 4 'sides' is 2 minutes!)
Though this is attainable, you are welcome to laugh, as not every situation is ideal even for board certified veterinary dentists.
14) Curette the alveolus scraping against healthy bone as mentioned above.
15) Smooth the rough edge of the remaining jaw bone with a medium to coarse grit (blue or black stripe) diamond of your choice of shape (ball, football commonly). This called alveoloplasty.
16) Release the flap (cutting periosteal fibers) to ensure tension free closure if it was not released during flap creation. **It is not appropriate to close an extraction site unless you can lay the flap against the opposing side and release all forceps and the tissue still stays in apposition. If the tissue retracts as you let go, it is NOT released enough.
17) Be sure to release the tissue off of the palatal and/or lingual side as well. Not having 1-2 mm of free tissue here is a common cause of inadequate suture throws and your suture pulling through as you tie it. This release also allows for improved alveoloplasty of the palatal/lingual side.
18) Trim to healthy/fresh tissue margins prior to tension free surgical closure.

"Luxating All the Way" An alternative method of extraction
authored by Loïc Legendre, DVM, Dipl. AVDC, Dipl. EVDC, AVDC-ZWD

Technique

An envelope flap is created and the buccal attached gingiva is lifted off. If necessary, one or more vertical releasing incisions are made in order to expose the root/s. Multi rooted teeth are sectioned so one can work on one root at a time.

The correct size luxator is introduced in the periodontal ligament space. It is moved in a back and forth motion (wrist rock) while being pushed apically. The blade thus cuts the ligament fibers. Once the instrument is wedged, pressure is applied by pushing the luxator towards the root being removed. This motion is the safest on the surrounding tissues and provides the largest force that can be applied to the tooth. The pressure is constant and is applied for a minimum of 30 seconds. This time interval is necessary for the fibers to unravel.

Most of the luxation is done on the mesial and the distal surfaces of roots. If one started on the distal surface then repeat the procedure (introduction, cutting of fibers, constant pressure 30 sec) on the mesial surface. By that time the tooth often moves 1 mm or 2 mm with simple digital pressure. This

tells you that roughly the coronal half of the ligament is destroyed. The remaining apical portion of the ligament fibers can be broken by rotating the root in its axis, in the alveolus. This is done in a similar manner than one would do to rotate a cork halfway out of a wine bottle.

Explanation

The luxating is done almost exclusively on mesial and distal surfaces because those are safe areas. No work is done on the buccal surface as the buccal bone is too thin and would break. No work is done on the lingual/palatal surface as the bone is thin and to avoid damaging important anatomical landmarks. No buccal bone is removed, thus, following extraction, the blood clot fills the alveolus and with time bone deposits. Removing buccal bone is similar to taking one wall out of a swimming pool; one can never refill the pool. Therefore, one ends up with a marked bone defect at the site of the extraction. This can be serious enough to cause iatrogenic fractures.

If one has difficulty introducing a luxator in the ligament space, one can open the space by destroying the ligament fibers using a fine bur such as a #329 or a ½ round and running it along the curvature of the root. One ends up removing some bone in the process, but not removing the entire wall. The swimming pool at the end of the extraction, is longer but the 4 walls are still present.

This technique is not longer than the technique that recommends removing buccal bone. The time spent removing the buccal bone is spent luxating instead. The result though is much different: with this technique the patient is not damaged in the process.

Most practitioners benefit from a hybrid technique, and each person will develop their methods for extractions that work for them.

Note that there are two methods of rotating the root with extraction forceps above in the "Luxating All the Way." One is almost the same as #12 above. The other uses the forceps to grasp the widest portion of the root (usually just below the neck) once there is 2mm of movement on a canine or mini canine (the third incisor) and another instrument is utilized as a fulcrum to rotate the tooth out of the socket in an occlusal direction.

Both types of extraction use luxators to get you started. A 329, 1557, or ¼ surgical length bur can be utilized to begin to get you to find and release the periodontal ligament. The main difference is the lack of buccal bone removal. Winged elevators are helpful to scoop around to find additional PDL sites without compromising the thin bone of the buccal and palatal/lingual aspects.

Key points for all of these methods:

Constant pressure for 30 seconds

No wiggling or twisting

Using rotational force slowly over 30 seconds to release further down the root after the coronal aspect has been loosened

Extractions require patience. Rushing will only make things take even longer.

Ergonomics (sitting up, wearing loupes) using instruments that fit your hands and act as an extension of your hand will help. If you are reaching too far to place a finger stop you will result in fatigue and wrist strain.

Complications

- Sharp instruments are less likely to slip. Always use a finger stop grip.
- If you cannot find a 'sticky' spot in the PDL, remove more buccal or interdental bone (best to preserve buccal and lingual mandibular/maxillary walls). A ¼ round surgical length bur is best to begin to moat about 25% of the circumference. When using a bur to begin to

'moat', your bur width may be wider than the PDL you are removing. As a result, the placement of an instrument into the moat may contact a shelf of bone instead of PDL. The best place to find the 'sticky spot' is at the ends of the moat. This is why it is suggested to moat 25-50% and not more, leaving natural anatomy in which your luxator more easily finds the 'sticky' PDL space.

- Tooth fracture =retained tooth root (RTR): Remove surrounding bone with a round bur and irrigation (not air to avoid air embolism possibility); once the grey PDL margin is revealed, create a crescent groove site to place your instrument. (25-50% moat described above is a crescent groove.)
    - If downward pressure is likely to result in the RTR entering the nose or mandibular canal, select a smaller elevator and/or root tip pick to 'scoop' the sides of the RTR until it is loosened or luxate towards the pulp waiting for the PDL to fatigue. The use of a root tip pick can also wedge the RTR side to side and allow an outward motion with the wider pointed tip.
    - A luxator is best then followed by an elevator if vertical pressure is not a risk
    - Interradicular (between the roots) bone removal can also be done if needed
- Retained tooth root (RTR) enters the mandibular canal: the best opportunity for removal is NOW as later will result in granulation tissue making removal more difficult and sometimes impossible/impractical. Do NOT expect the fragment to resorb even with the most zealous wishful thinking.
    - As the fragment is lying on the pillow that is the neurovascular bundle, the path of least resistance is the hole from which it came…
    - Never take anything larger from a smaller hole unless you have had an epidural and can name it afterwards (Heidi-ism) – thus make the hole larger by removing interradicular bone
    - Water irrigate. (No air) You are looking for the pearl in the red sea. Irrigation often results in it floating right up if you've provided the space to do so while preventing your bur from damaging the neurovascular bundle during interradicular bone removal. (Easier said than done.)
- Retained tooth root (RTR) enters the nose:
    - Take a radiograph
    - Remove with suction out the alveolus should it align with an alveolus. (unlikely)
    - Otherwise, pack the pharynx with clean dry gauze to prepare to catch it
    - Irrigate with water stream
    - REPEAT above 3 until you've caught it and confirmed it has moved out of the sinuses (many radiographs needed)
    - Waiting to do this later results in granulation tissue, root retention, and a nidus of infection.
- Tooth resorption (TR):
    - Determine the TR type with radiographic imaging:
    - Inflammatory (black spot) or replacement (become part of jaw bone) resorption
    - Expect the tooth to break, though we are sometimes surprised
    - If you can see PDL, get it out.
    - Drilling away the RTR pieces is NOT acceptable as it causes many problems. (This is called root pulverization and it results in SQ emphysema, trauma/pain, or more.)
    - If there is only replacement resorption, you can do a crown amputation to the level of alveolar bone or lower. This modified extraction technique (MET) begins with

nerve blocks and flaps just as in any other extraction. It ends with intentional root retention (IRR), alveoloplasty, and gingival closure without tension. We must continue to monitor (CTM): follow up intraoral radiographs at least annually as the success rate of IRR is high but not 100%

- For marginal root resorption (RR) (dogs) NOT affecting the neck/alveolar rim – If no other types of resorption or periodontal disease are present, only CTM; ie leave the tooth intact. (This is typical older and large breed dogs.)

Preventing Complications

- Take pre extraction radiographs (dilacerated roots?) (resorption?) (bone quality?)
- Use sharp instruments as they are less likely to slip
- Use a finger 'stop'
- Use patience
- Sing elevator music (pressure for the full 30 seconds per side to stretch the PDL)
- Do not rush or it will always take longer

Other suggestions to aid in difficult extractions:

- Use the SLOB (Same Lingual, Opposite Buccal) technique to split the mesial roots of the upper 4th premolar. A distal tube shift will move the palatal root distally so you will know which root you are looking for.
- CBCT imaging can allow cross sectional views of teeth and tooth roots as well as alveolar bone walls. It's 4.7 times more diagnostic than standard radiographs for cases of trauma.
- Avoid laterally luxating a maxillary canine tooth

Recall that ONF and OAF sites are missing bone between the oral cavity and the nose, thus there is nothing supporting the sutures as the patient breathes. A wide based tension free flap with fresh margins is helpful. Dr. Loic Legendre also prefers inverted cross mattress suture patterns, which have been shown to work well. Dr. Heidi Lobprise also suggests a subcuticular cruciate pattern that has many similarities.

- Be aware that removal of the maxillary canine in a cat often leads to lip entrapment. Removal of the same side mandibular canine or referral for crown shortening and root canal therapy may be necessary if the maxillary canine tooth is elected to be extracted.
- Removal of 309/409 in a cat is also likely to result in a pyogranulomatous lesion from contact of 108/208 with the missing opposing carnassial tooth site. Thus, it is common to need to evaluate and potentially extract both carnassial teeth on the same side if one of them requires removal.
- Mandibular symphysis separations should be evaluated to determine the difference between physiologic movement and separation. A separation should be repaired with a wire that is not over tightened as that can result in base narrow canines.
- If you are not sure of what you are seeing, take more radiographs. Don't feel you need to make a decision based off one radiograph alone. Changing the angle and comparing to other teeth as well as combining your oral examination features will help you make treatment decisions.

Resources for more information:
https://tooth.vet/wvc-lectures New kits with lifetime sharpening, small sizes for broken root tips, and sized to aid in ergonomics will also be linked in the additional resources.