EXTERNAL TOOTH RESORPTION IN CATS

Part 2: Therapeutic Approaches

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Tooth resorption in cats is prevalent, affecting 28% to 68% of mature cats, depending on the population researched. One study found histologic evidence of resorption in all teeth among cats with at least one resorptive lesion; this led to the hypothesis that given enough time, all teeth of affected cats will develop tooth resorption.

External tooth resorption, or root resorption, is the breakdown or destruction and subsequent loss of the root structure of a tooth, while internal root resorption occurs when the integrity of the outermost layer of pulp tissue is broached. In feline patients, external root resorption is far more common than internal root resorption.

Whether the clinician identifies tooth resorption clinically or by radiography (see Classifying Tooth Resorption by Anatomy & Radiographic Appearance), treatment options can be confusing. Fortunately, solid evidence-based concepts can guide the practitioner toward 2 treatment options:

• Crown amputation followed by gingival closure
• Extraction.

Other therapeutic options—the merits of which are discussed in this article—include monitoring, tooth restoration, and crown/root atomization.

TOOTH RESTORATION: An Outdated Remedy

Before tooth resorption in cats was differentiated from caries (cavities) in humans, restoration with glass ionomer cement was the treatment of choice. As first glance, it would appear that filling the defect with a substance that bonds to dentin and releases pain-relieving fluoride made sense. However, this therapy does not resolve disease because the lesion commonly begins just below the cementoenamel junction and undermines dentin, exposing crown enamel. Filling the lesion only cosmetically treats the surface defect.

WATCHFUL WAITING: A Conservative Approach

Conservative management of nonpainful external root resorption may be chosen when the lesion is confined to the root and has not extended into the pulp chamber, root canal, or exposed oral cavity. This approach requires semi-annual monitoring, at minimum, because resorptive lesions are considered progressive; monitoring includes intraoral radiography and clinical examination.

TR 5 features no clinically recognized inflammation of the gingiva, and only wisps of dental hard tissue are seen radiographically. This stage of resorption can be managed conservatively, with follow-up radiographs obtained at the time of future professional oral hygiene visits (Figure 1, page 52).

CROWN/ROOT ATOMIZATION: Not Recommended

Crown and/or root atomization is not recommended as a therapy option for tooth resorption. Root atomization is performed using a round bur on a water-cooled, high-speed handpiece that blindly eliminates root fragments. This procedure is fraught with potential iatrogenic negative outcomes, including nasal cavity, mandibular, or infraorbital canal perforation; sublingual soft tissue trauma; and subcutaneous emphysema.

EXTRACTION: Treatment of Choice for T1 & T3

Extraction is the treatment of choice for tooth resorption involving teeth with roots that have not been replaced by the surrounding bone (T1 and T3). Proper extraction removes painful dentin exposure and eliminates the route for bacteria to enter into the root canal.

It is important to understand the dental hard tissue anatomy above and below the gingiva. In cats:

• Canines, incisors, and often maxillary second premolars are single-rooted.
• Maxillary first molars, even though anatomically double- or triple-rooted, can be treated as single-rooted due to root fusion.
• The maxillary fourth premolar has 3 roots.
• All remaining premolars and mandibular first molars have 2 roots.
The American Veterinary Dental College (avdc.org) has adopted stage and type classifications for tooth resorption. These classifications help practitioners categorize lesions both anatomically for record keeping (Table 1 and Figure A) and radiographically for treatment decisions (Table 2).6

### Table 1. Tooth Resorption: Anatomic Classification

<table>
<thead>
<tr>
<th>Stage (TR 1)</th>
<th>Description</th>
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<tr>
<td>Stage 1 (TR 1)</td>
<td>Mild dental hard tissue loss (cementum or cementum and enamel); this stage is not observed clinically because the lesion is small and confined below the gingiva.</td>
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<tr>
<td>Stage 2 (TR 2)</td>
<td>Moderate dental hard tissue loss (cementum or cementum and enamel with loss of dentin that does not extend to the pulp cavity) (Figure B).</td>
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<tr>
<td>Stage 3 (TR 3)</td>
<td>Deep dental hard tissue loss (cementum or cementum and enamel with loss of dentin that extends to the pulp cavity); most of the tooth retains its integrity.</td>
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<tr>
<td>Stage 4 (TR 4)</td>
<td>Extensive dental hard tissue loss (cementum or cementum and enamel with loss of dentin that extends to the pulp cavity); most of the tooth has lost its integrity.</td>
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<tr>
<td>Stage 5 (TR 5)</td>
<td>Remnants of dental hard tissue are visible only as irregular radiopacities, and gingival covering is complete (Figures C).</td>
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#### Table 2. Tooth Resorption: Radiographic Appearance

<table>
<thead>
<tr>
<th>Type (T)</th>
<th>Description</th>
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<tbody>
<tr>
<td>Type 1 (T1)</td>
<td>Radiograph demonstrates a focal or multifocal radiolucency in the tooth, with otherwise normal radiopacity and normal periodontal ligament space.</td>
</tr>
<tr>
<td>Type 2 (T2)</td>
<td>Radiograph demonstrates narrowing or disappearance of the periodontal ligament space and decreased radiopacity in parts of the tooth.</td>
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<tr>
<td>Type 3 (T3)</td>
<td>Radiograph demonstrates features of both type 1 and type 2 in the same tooth. A tooth with this appearance has areas of normal as well as narrow or lost periodontal ligament space. There are focal or multifocal radiolucencies in the tooth and decreased radiopacity in other areas of the tooth.</td>
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**FIGURE A. AVDC classification of clinical stages of tooth resorption.**

*Courtesy AVDC*

**FIGURE B.** Radiograph of type 2 tooth resorption showing the roots of the left mandibular third premolar being replaced by bone.

**FIGURE C.** Radiograph of stage 5 tooth resorption (arrows) affecting the left mandibular third premolar.
External Tooth Resorption in Cats

**Initial Steps**

1. Intubate and stabilize the patient under anesthesia.
2. Prepare the oral cavity by rinsing with 0.12% chlorhexidine gluconate, scaling and polishing the visible teeth, and then rinsing again. Chlorhexidine gluconate helps reduce bacterial exposure to the patient and veterinary team.
3. Expose full intraoral survey radiographs and examine them to evaluate crown and root morphology.
4. Provide local nerve block anesthesia before making any incisions.

**Step-by-Step: Extraction**

1. Make the initial vertical incision rostrally 1 to 2 mm coronal to the mucogingival junction. One mesial releasing incision is preferred to prevent interruption of the distal blood supply. Place the incision in the attached gingiva to help preserve the blood supply during and after surgery.
2. Angle the blade tip toward the root, incising 360 degrees into the pocket or sulcus.
3. Use a freshly sharpened periosteal elevator (#2 Molt preferred) to expose the alveolar bone by freeing the attached gingiva and alveolar mucosa past the mucogingival junction.
4. Expose full intraoral survey radiographs and examine them to evaluate crown and root morphology.
5. Provide local nerve block anesthesia before making any incisions.

**Tooth Extraction and Crown Amputation**

With gingival closure require removal of several millimeters of the coronal buccal alveolar bone underlying the attached gingiva, which is accomplished through periodontal flap exposure.

**Periodontal Flaps:**
- Expose the alveolar bone and underlying root surface
- Preserve attached gingiva
- Allow suturing in a fashion that reduces the periodontal pocket and promotes reattachment of soft tissue to the root surface
- Include a pedicle, with a base that maintains attachment and circulation.

**Flap Design Should:**
- Allow maximum use and retention of keratinized gingival tissue
- Be long enough to permit full evaluation of the root surface not covered with bone
- Create a flap base 1.5 times as wide as the coronal aspect to allow adequate vascularity. Tissue tags should be removed to allow rapid healing and prevent formation of undesired granulation tissue

**Full Thickness Flaps:**
- Are used to gain visibility and access for osseous surgery, root planing, and pocket elimination; in both tooth extraction and crown amputation with gingival closure procedures, these flaps include the periosteum
- Can be elevated by blunt dissection using a periosteal elevator in a rocking motion until the periosteum is peeled away from the underlying bone
- Include flap closure sutures that are placed...
FIGURE 2. Intraoral radiograph revealing stage 3 tooth resorption of the left mandibular canine and third premolar (A); scalpel blade used to incise the gingiva covering the left mandibular canine affected by external root resorption (B); and gingival incision carried caudally (C).

Tension-free from moveable to nonmovable tissue when possible, with surgical knots not on the incision line.

**Triangular flap design for extraction (Figure):**
1. A pedicle flap is created with 2 vertical releasing incisions extending past the mucogingival line.
2. This flap should include the papilla, which is incorporated in the mesial or distal extent of the incision to make repositioning and suturing easier.

**Triangular flap design for crown amputation:**
1. A triangular flap is raised, extending apically to the point needed to allow gingival closure without tension.
2. A second vertical releasing incision can be made to allow greater exposure.

FIGURE 3. Molt elevator used to separate the attached gingiva from the underlying alveolar bone (A); exposed coronal alveolus (B).

FIGURE 4. Water-cooled, high-speed hand-piece used to remove coronal buccal alveolus.
the mandibular canal lies immediately beneath the cheek tooth apices. Marked hemorrhage and damage to the mandibular nerve may occur when the mandibular canal is entered. Digital pressure and closure of the gingival defect can usually control excessive hemorrhage.

6. If needed, use a winged elevator to stretch the periodontal ligament and gently elevate the tooth root from the alveolus. Introduce the blade between the root and alveolus, and maintain each movement of rotation for at least 10 seconds. The tooth or segments can usually be delivered from the alveolus with the operator’s fingers or through gentle torsion with extraction forceps. If the root fractures during the extraction procedure, create a trench around the root fragment with a 701L cross-cut taper fissure or round bur to provide a purchase area for a dental elevator or root-tip pick (Figure 5).

7. After extraction, contour the remaining rough edges of alveolar bone and smooth them with a round bur placed in a water-cooled, high-speed handpiece (Figure 6).

8. Expose and examine a radiograph to confirm extraction.

9. Use a bone curette to clean out alveolar socket debris.

10. Suture the gingiva without tension (Figure 7).

CROWN AMPUTATION: Treatment of Choice for T2

In T2 root replacement resorption, bone- and cementum-like tissue replaces the periodontal ligament, dentin, and pulp. In these cases, crown amputation with intentional partial root retention, followed by gingival closure, is the treatment of choice because the root is already resorbing and considered nonpainful to the cat.

This procedure should be done only after evaluation of intraoral radiographs to confirm that extraction of the entire root is not possible (Figure 8), as evidenced by a marked decrease in root opacity and absence of the periodontal ligament space. Contraindications for this procedure include:

- Periodontal disease, as shown by horizontal or vertical bone loss
- Endodontic disease
- Stomatitis
- Positive retroviral status.

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**FIGURE 5.** Tooth removed from the oral cavity (A); extracted tooth (B).

**FIGURE 6.** Alveoloplasty to smooth the sharp alveolar crest.

**FIGURE 7.** Prepared extraction site before suturing.

**FIGURE 8.** Intraoral radiograph confirming type 2 tooth resorption.
Step-by-Step: Crown Amputation with Intentional Partial Root Retention & Gingival Closure

1. Follow the preparation outlined under Initial Steps, page 52.
2. Create a triangular flap—see Periodontal (Gingival) Flap Creation, page 52—with 2 vertical releasing incisions labially or buccally by initially making a vertical incision several millimeters interproximally mesial and distal to the affected tooth (Figure 9).
3. Use a fine periosteal elevator to expose the cementoenamel junction and alveolar margin (Figure 10).
4. Incise vertically into the periodontal ligament space, through the sulcus, 360 degrees around the tooth.
5. Remove the exposed crown and 1 to 2 mm of the coronal root apical to the alveolar margin using a #2 sterile or cross-cut fissure bur on a high-speed, water-irrigated handpiece (Figure 11).
6. Remove sharp alveolar margin projections with a round bur (Figure 12).
7. Suture the surgical site with 4-0 or 5-0 absorbable sutures (Figure 13).
8. Perform radiography on operative area to document the postoperative result (Figure 14).
Root Fragments
When a tooth fractures during the extraction process, the root fragment can usually be retrieved after removal of more alveolar bone and elevation with a small root-tip pick elevator. Avoid displacement of root fragment(s) into the mandibular or infraorbital canal, nasal cavity, or maxillary sinus. In cases of oropharyngeal inflammation, it is essential that no root fragment remains. If a root fragment is left in place, inform the owner and arrange radiographic follow-up.

Postoperative Care
The patient’s diet should be softened for at least 1 week after surgery. This can be accomplished by instructing the client to wet the animal’s food for about 20 minutes before feeding, allowing it to soften. A 0.12% chlorhexidine solution can be sent home with the owner for twice daily application as an oral rinse for 1 week.

References

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