Literature Review – Feline Tooth Resorption

By Amy Hille, DVM, MPH; Ashlee Addleman, MPH | Contributing Authors

INTRODUCTION

Tooth resorption (TR) is a common and important dental condition affecting cats. Although it is acknowledged to be a common disease, reported prevalence estimates vary greatly and the exact impact of the disease on an otherwise healthy cat population is unknown. Various factors, such as difficulty in diagnosing this disease, under-reporting, patient population characteristics, or other unknown variables may account for the wide range of prevalence noted in the literature. In recent years, a great deal of interest has been devoted to understanding the disease process more fully and identifying potential causes of tooth resorption. Changes in the nomenclature of TR tend to reflect changes in theories of etiology. Tooth resorption has been referred to as caries, erosions, neck lesions, feline odontoclastic resorptive lesions (FORLs), and resorptive lesions. However, since the term “tooth resorption” currently best reflects the disease process, this term is now more commonly used and is the nomenclature recognized by the American Veterinary Dental College (AVDC).
Despite an incomplete understanding of the underlying causes, TR can be a serious manifestation of periodontal disease and therefore needs to be diagnosed early by careful oral examination and followed with appropriate and timely treatment.

**PATHOGENESIS**

In veterinary medicine, the underlying causes of TR are an enigma. Despite the gaps in knowledge, studies have identified aspects of the local microenvironment around the teeth, systemic factors and structural characteristics of teeth that are unique to feline tooth resorption. "Table 1 is a summary of these factors that may be associated with feline tooth resorption. The major limitation to these studies, however, is the temporality of associations, i.e., it is not..."
known whether these changes precipitate tooth resorption or are initiated by disease process.

**CLASSIFICATION**

Tooth resorption in domestic cats can be classified into stages based on amount of tooth destruction caused by TR, and into types based on the appearance of the root in dental radiographs. Staging and typing of lesions is important since the treatment and prognosis can be more accurately determined for patients by using these classifications. Different staging systems are used in clinical practice to classify tooth destruction resulting from TR, but most systems use five stages. To further describe the lesion pathology of the crown and root, the AVDC endorses a similar classification system but further subdivides stage 4 (into 4a, b, c) to capture this detail. Table 2, pages 4-5, presents the AVDC-endorsed classification system.

A root typing system can also be used to describe the appearance of the root upon radiographic presentation. To classify a lesion as type 1, the root should have a normal radiographic appearance with evidence of a normal periodontal ligament. Conversely, type 2 lesions present with an abnormal tooth root replaced by alveolar bone, and narrowed or missing periodontal ligament space. Lesions are also discovered underneath plaque or calculus, while others manifest subgingivally. Diagnosis of TR is performed by tactile probing and/or dental radiography as part of an oral exam. Lesions can be identified at the cementoenamel junction (CEJ) by visual inspection, or by feeling for a rough area that has a sharp margin, using a dental explorer.

Focusing the dental examination on the teeth and the areas of the teeth most likely to be affected can make classification and diagnosis of TR easier. In a study examining all teeth from 182 cats, the mandibular third premolars and mandibular first molars were reported to comprise 14.6 and 11.3 percent of all affected
<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Mild dental hard tissue loss (cementum or cementum and enamel).</td>
</tr>
<tr>
<td>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).</td>
</tr>
<tr>
<td>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>
</tr>
<tr>
<td>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>4a</td>
<td>Crown and root are equally affected.</td>
</tr>
<tr>
<td>4b</td>
<td>Crown is more severely affected than the root.</td>
</tr>
</tbody>
</table>

*Table 2: AVDC’s Classification System (Staging) of Tooth Resorption*
A different study also provides evidence suggesting that TR lesions mostly occur with mandibular third premolars. After evaluating 228 clinically healthy cats, authors reported that the mandibular third premolar was affected most.

Although tooth resorption can be found anywhere on the tooth surface, the CEJ tends to be the area most affected. In one study examining 138 teeth from 13 healthy cats and another examining 22 teeth from 12 cats, between 38 and 95 percent of lesions, respectively, were found at or near the CEJ. Another area of the tooth susceptible to TR is the furcation of multi-rooted teeth. According to DeLaurier et al. (2008), 95 percent of multi-rooted teeth with tooth resorption showed evidence in this area of the tooth. Although the majority of the literature reports TR at the CEJ, studies have found TR lesions on all areas of the tooth. This reinforces recommendations to take intraoral radiographs of the entire dentition when a patient presents for dental evaluation, because tooth resorption is not entirely exclusive to the CEJ and the furcation of multi-rooted teeth.

In addition to the dental examination, intraoral dental radiographs under general anesthesia are highly recommended for accurate diagnosis of TR. Dental radiographs can provide superior diagnostic information regarding the severity of the lesions when compared to the clinical examination alone, and thus enable the most accurate prognosis and effective treatment. It is essential to radiograph the entire dentition when a TR is found on a single tooth, as cats rarely have lesions on a single tooth.
dental radiographs to diagnose TRs, Heaton and colleagues advocate using dental radiographs as a screening method to determine overall TR disease status. The authors suggest using the tooth resorption status of the radiographic views for the left and right mandibular third premolars (two intraoral films and parallel technique) to predict the overall status of TR in a patient.\textsuperscript{18} Using this technique, the authors reported a sensitivity of 78.5 percent and a negative predictive value of 91.3 percent. A screening technique such as that described by Heaton and colleagues may decrease the amount of time a patient spends under anesthesia as well as radiation exposure.\textsuperscript{18}

**TREATMENT**

Treatment options for cats with TR are limited, but choosing an appropriate treatment is critical for eliminating the pain associated with TR and preventing further complications. In the majority of cases, lesions are treated with either extraction or crown amputation. Complete surgical extraction of teeth is necessary for patients with type 1 lesions.\textsuperscript{19} With type 1 lesions, extraction is important regardless of the status of the crown, because leaving the root can provide a nidus for infection after crown amputation.\textsuperscript{19} For type 2 lesions, crown amputation may be a viable treatment option in a select group of patients; for these patients, signs of the alveolar bone replacing the root should be observed.\textsuperscript{14,19} It is also important that no underlying pathologic changes in the mouth are present, such as periodontitis, stomatitis, tooth mobility or radiographic evidence of disease.\textsuperscript{19}

Additionally, it is worth noting that restoration of teeth, such as glass ionomer and/or composite filling, has been shown to have poor long-term success rates and is not advisable as a treatment option.\textsuperscript{1,15} An alternative option currently being investigated is a human osteoporosis drug, called alendronate. This biphosphonate compound was explored in a proof of concept study and works by inhibiting the activity of osteoclasts. When given orally at a dose of 9 mg/kg biweekly to feline subjects, it was found to accumulate on the alveolar bone and subgingival tooth surfaces. Results from this study suggested that alendronate slowed the process of resorption in cats already diagnosed with TR and that it might someday be a viable treatment option.\textsuperscript{20} No matter which treatment option is selected, it is imperative that lesions be classified and diagnosed accurately, as the consequences of selecting an unsuitable treatment for a patient may result in severe infection, endodontic disease, gingivitis and/or periodontitis.\textsuperscript{1,15,19}
DISCUSSION

Tooth resorption remains a serious dental condition that affects cats significantly, but the pathogenesis remains undefined. Tooth resorption is diagnosed by visualization and probing during physical examinations, and with dental radiographs, an essential tool in complete diagnosis and staging. It is strongly recommended that radiographs be taken of every tooth when TR is suspected. TR is classified using both staging and typing systems, and accurate classification of TR helps to support the clinical decision-making in treating this disease. Treatment options are currently limited to surgical extraction or crown amputation. Features of the local microenvironment around the tooth as well as systemic and structural factors have been identified in association with abnormal tooth resorption in cats. Additional research into these associations may provide further insight into this disease.

Until definitive causes are confirmed, accurate diagnosis by means of staging and typing systems and subsequent selection of an appropriate treatment are proven to reduce oral pain in affected cats. Currently, this approach offers the best strategy for management of the disease. Since etiology and pathogenesis are yet to be fully determined and are still widely debated, veterinarians are only able to provide limited advice to clients on prevention of feline tooth resorption. Recommended strategies should focus on prevention of dental disease in general; this usually consists of semiannual oral examinations and professional dental prophylaxis beginning early in adulthood.

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REFERENCES


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