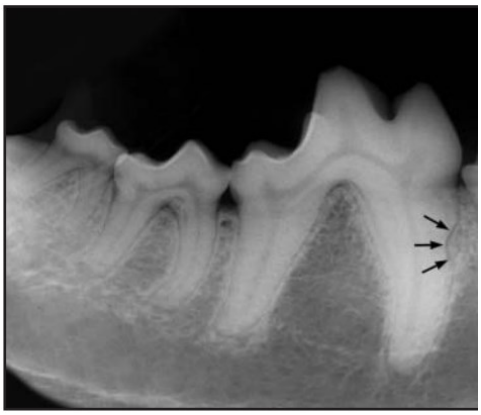
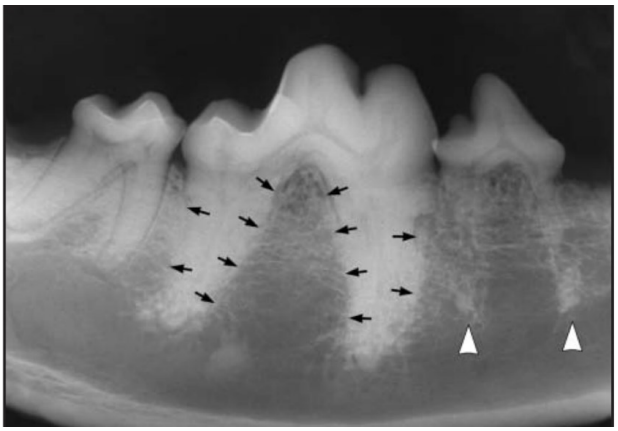
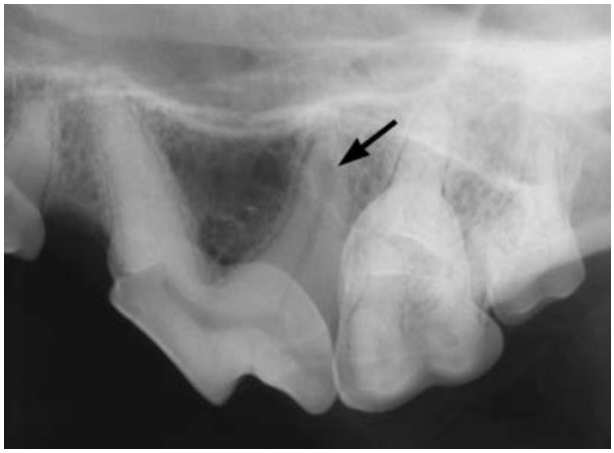
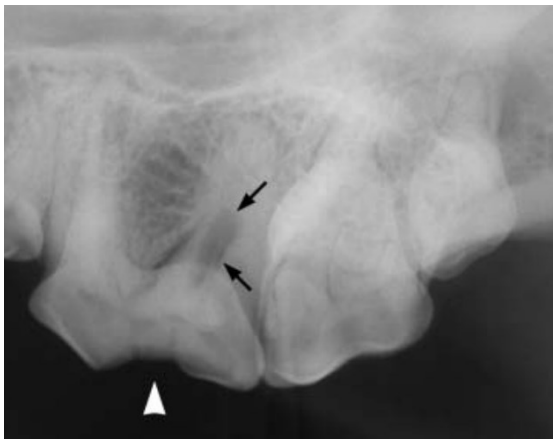
Tooth Resorption in Dogs

By Alice Ekerdt, DVM
Practice Limited to Dentistry and Oral Surgery
Angell Dentistry Service
angell.org/dentistry
dentistry@angell.org
617-522-7282

Tooth resorption (TR) is defined as resorption (or loss) of dental hard tissue mediated by odontoclasts, cells involved in normal tooth movement and loss of deciduous teeth. Tooth resorption differs from dental caries that result from demineralization of tooth structures by acidic bacterial byproducts. Internal resorption originates from within the pulp cavity while external resorption originates from the outside surface of the tooth. Tooth resorption is found in multiple species including humans, horses, cats, and dogs. It can be classified based on severity, location, and radiographic appearance. Classifying the type and stage of tooth resorption allows us to treat properly and relieve discomfort in our patients.

There are seven types of tooth resorption in dogs, as determined by radiographic appearance: external surface resorption, external replacement resorption, external inflammatory resorption, external cervical root surface resorption, internal surface resorption, internal replacement resorption, and internal inflammatory resorption (see the following images and descriptions).

Types of Canine Tooth Resorption

External surface resorption (below):	External replacement resorption (below):
	
External inflammatory resorption (below):	**External cervical root surface resorption (below):**
	
Internal surface resorption (below):	**Internal inflammatory resorption (below):**
	

(Radiographs from reference #1)

Internal replacement resorption: ***No picture ***

Characteristics and Suspected Causes of Canine TR

Type of TR	Characteristics	Causes
External surface resorption	Shallow resorption lacunae affect the cementum and dentin, usually along lateral margins of the root. The PDL space and lamina dura are unaffected. Not always visible on radiographs. Usually asymptomatic.	Mild trauma
External replacement resorption	Gradual disappearance of PDL space with progressive replacement of root tissues by alveolar bone. This can result in dentoalveolar ankylosis (fusion of the tooth to the bone). Asymptomatic if it remains below the gingival attachment. AKA Type 2 TR in cats	Injuries that cause necrosis of PDL
External inflammatory resorption	Loss of dental tissues adjacent to areas of loss of alveolar bone secondary to inflammatory conditions. AKA Type 1 in cats.	Inflammatory conditions- endodontic disease, periodontal disease, or both
External cervical root surface resorption	Invasive resorption process that starts at the cervical area of the tooth and invades coronally and apically. The crown may appear pink.	Unknown
Internal surface resorption	Oval-shaped enlargement in the apical 1/3 of the root canal.	Mild traumatic injury.
Internal inflammatory resorption	Oval-shaped enlargement in the cervical 1/3 of the root canal	Inflammatory disease (endodontic)
Internal replacement resorption	Irregular enlargement with tunnel-like appearance adjacent to the root canal. Usually located in the coronal fragment of root fractures	Root fractures, luxation injuries

Peralta, et al. found the prevalence of tooth resorption in dogs to be 53% with external replacement resorption being the most common type at 34%. The incidence of TR in canines increases with age and body weight. In addition, premolar and canine teeth are affected more often than incisors and molars. External inflammatory resorption was found most commonly in the maxillary 4th premolars. The exact causes of tooth resorption are not fully understood, but mastication forces, orthodontic forces, and even the presence of oral tumors at distant sites have been proposed. According to Reiter, tooth resorption is aymptomatic if it does not involve inflammatory cells, remains below the gingival attachment (protected from oral bacteria), and does not affect the pulp. On the other hand, inflammatory resorption may cause oral pain.

Peralta, et al. also investigated the prevalence of different stages of TR in dogs. They found that the AVDC classification method (originally developed for cats) was applicable in identifying the extent, but not the radiographic patterns or location of TR lesions. The AVDC classification method was relevant in only some teeth and was best used for lesions with radiographic patterns of external replacement resorption and external cervical root surface resorption. (See Stages of TR below, descriptions and images)

AVDC Description of Tooth Resorption Stages

Stage 1: Mild loss of dental hard tissue (cementum or cementum and enamel)

Stage 2: Moderate loss of dental hard tissue (cementum or cementum and enamel with loss of dentin that does not extend to the pulp cavity).

Stage 3: Deep loss of dental hard tissue (cementum or cementum and enamel with loss of dentin that extends to the pulp cavity); most of the tooth retains its integrity.

Stage 4: Extensive loss of dental hard tissue (cementum or cementum and enamel with loss of dentin that extends to the pulp cavity); most of the tooth has lost its integrity.

- **Stage 4a**: Crown and root are equally affected
- **Stage 4b**: Crown is more severely affected than the root
- **Stage 4c**: Root is more severely affected than the crown

Stage 5: Remnants of dental hard tissue are visible only as irregular opacities on radiographs, and gingiva completely covers the remanant of the resorbing root.

(Descriptions from reference #5)

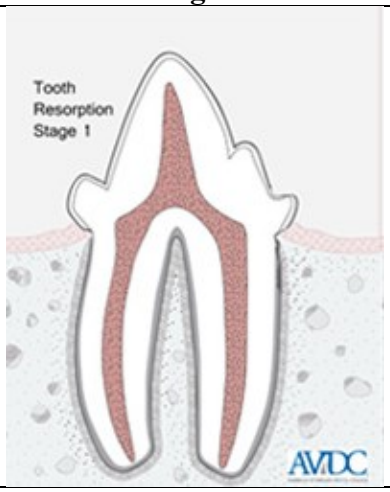
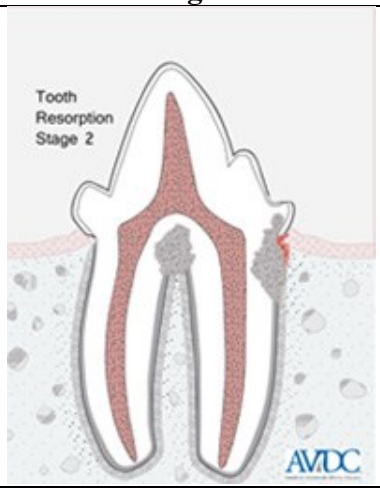
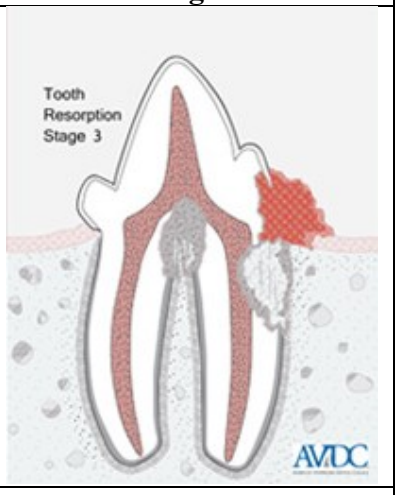
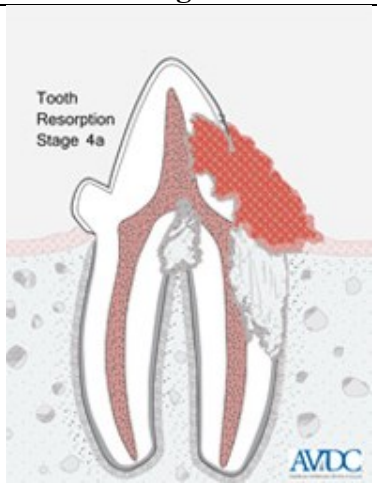
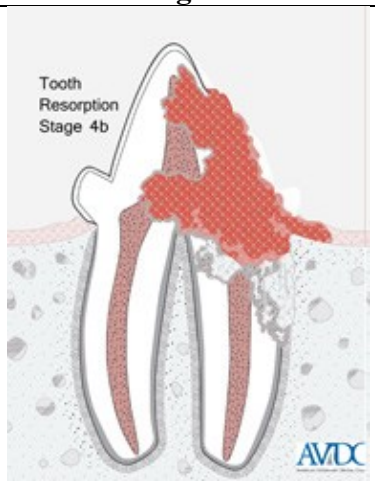
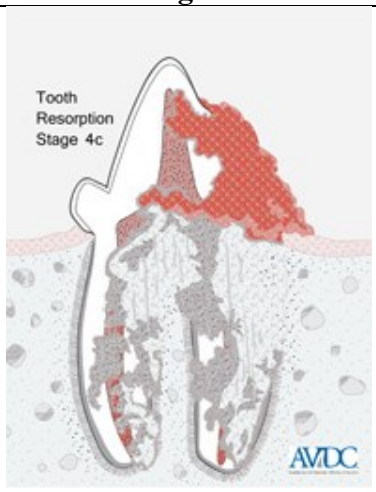
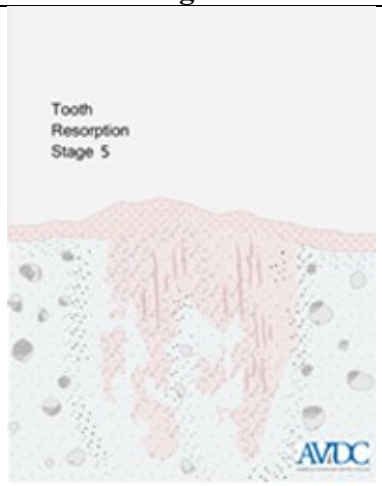
Treatment in dogs, similar to that in cats, depends on the type, location, and stage of tooth resorption in addition to the entire clinical picture. Each tooth should be considered individually and multiple types of tooth resorption can affect a single tooth. Sometimes no treatment may be required, as in external and internal surface resorption. These types are both self-limiting processes and do not require treatment. Internal replacement resorption is not progressive and can often be monitored as well.

Treatment for external replacement resorption is variable; some of these teeth can simply be monitored while others will require extraction. Replacement resorption is often associated with tooth root ankylosis and hypercementosis. Crown amputation can be performed if the resorption is extensive and there are no signs of periodontitis, endodontic disease, or periapical disease. When replacement resorption progresses coronally toward the gingival attachment, an inflammatory element may join the originally non-inflammatory lesion, and both replacement and inflammatory resorption will be present on the same tooth. When this occurs, the teeth cannot simply be monitored and will require either extraction or root canal therapy.

Extraction or root canal therapy are the treatments of choice for a few other types of resorption. Internal inflammatory resorption can be treated by resolving the underlying disease, often leading to extraction or root canal therapy in select cases. External inflammatory resorption usually requires extraction, but root canal therapy is occasionally an option. External cervical root surface resorption is only treated by extraction of the tooth.

Histopathology is the gold standard for differentiating types of tooth resorption, but it is impractical in a clinical setting. Using the guidelines in this article, tooth resorption can be diagnosed based on intraoral radiographs and a thorough examination. Becoming familiar with the different types and stages of tooth resorption will allow the clinician to properly diagnose and treat TR in our canine patients.

AVDC Stages of Tooth Resorption

Stage 1	Stage 2	Stage 3
		
Stage 4a	**Stage 4b**	**Stage 4c**
		
Stage 5		
		

(Images from reference #5)

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