

Diagnostic Imaging in Veterinary Dental Practice

In cooperation with
AVDC
AMERICAN VETERINARY DENTAL COLLEGE

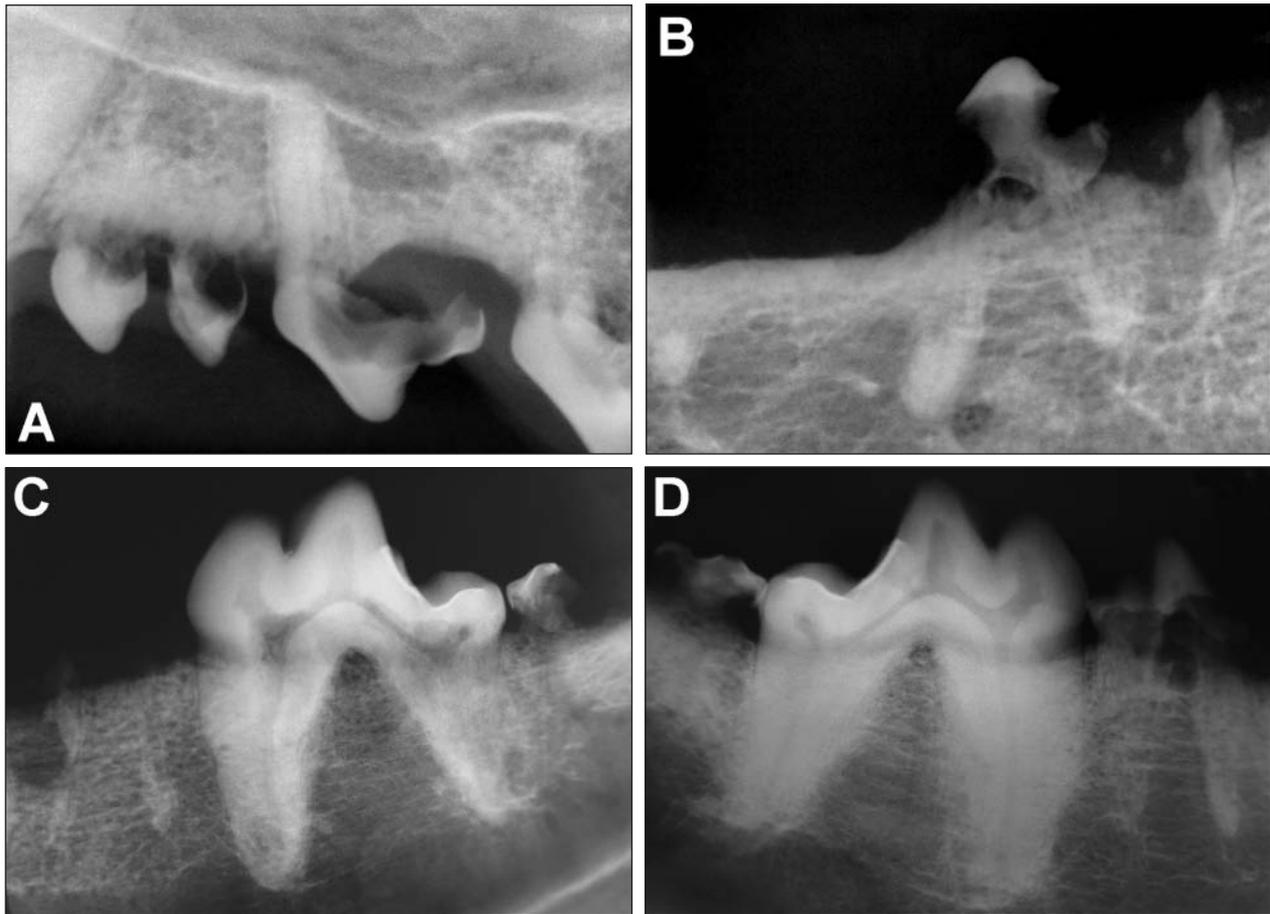


Figure 1—Intraoral radiographic projections of the teeth in a dog examined for dental radiography and, possibly, multiple extractions. A—Bisecting-angle radiographic projection of the left maxillary first premolar, supernumerary first premolar, and second premolar. B—Radiographic projection of the left mandibular second and third premolars obtained with a parallel technique. C—Radiographic projection of the left mandibular fourth premolar, first molar, and second molar obtained with a parallel technique. D—Radiographic projection of the right mandibular fourth premolar and first molar obtained with a parallel technique.

History and Physical Examination Findings

A 6.5-year-old 36.4-kg (80.1-lb) castrated male Airedale Terrier was referred for dental radiography and, possibly, multiple extractions. Four weeks previously, dental scaling and polishing had been performed by the referring veterinarian. At the time of initial examination, the dog showed signs of pain when the mouth and muzzle were touched and a thorough oral examination was not possible without chemical restraint. No other abnormalities were identified on physical examination.

Results of a CBC and serum biochemical profile were within reference limits. The dog was anesthetized, and a complete oral examination and full-mouth dental radiography were performed. Four radiographs are presented here (Figure 1).

Determine whether additional images are required, or make your diagnosis from Figure 1—then turn the page →

This report was submitted by Eva Sarkjala-Kessel, DVM, PhD, DAVDC; from VCA All Pets Animal Hospital, 5290 Manhattan Cir, Boulder, CO 80303.

Diagnostic Imaging Findings and Interpretation

All teeth have evidence of tooth resorption ranging in severity from stage 2 to stage 5 (Appendix). In particular, the roots of the left maxillary first premolar and supernumerary first premolar are resorbed and replaced with alveolar bone (Figure 2). Although the crowns are less affected, the teeth have lost their integrity (stage 4c). The distal root of the left maxillary second premolar is fully resorbed (stage 4a), with substantial resorption of adjacent alveolar bone, and the mesial root is partially resorbed. There is extensive resorption of the cervical portion of all 3 teeth.

Only a small apical portion of the mesial root of the left mandibular second premolar remains (stage 5). Apical portions of the mesial and distal roots of the left

mandibular third premolar remain (stage 4a), although > 50% of the crown is missing.

The roots of the left mandibular fourth premolar are almost completely resorbed (stage 4a), although a small piece of the mesial crown and root remain. The left mandibular first molar has severe resorption of the distal root and mild resorption of the mesial root (stage 4c). The lamina dura and periodontal ligament are unidentifiable in both roots (ankylosis). There are areas of resorption at the cervical portion of the tooth. Greater than 50% of the crown of the left mandibular second molar is missing (stage 4c), and the roots are resorbed and replaced by alveolar bone.

The roots of the right mandibular fourth premolar are almost fully resorbed (stage 4c), and only small parts of the mesial root apex and crown remain. Alveolar bone has been resorbed between the mesial and distal roots. The lamina dura and periodontal ligament of the right mandibular first molar are visible in the disto-

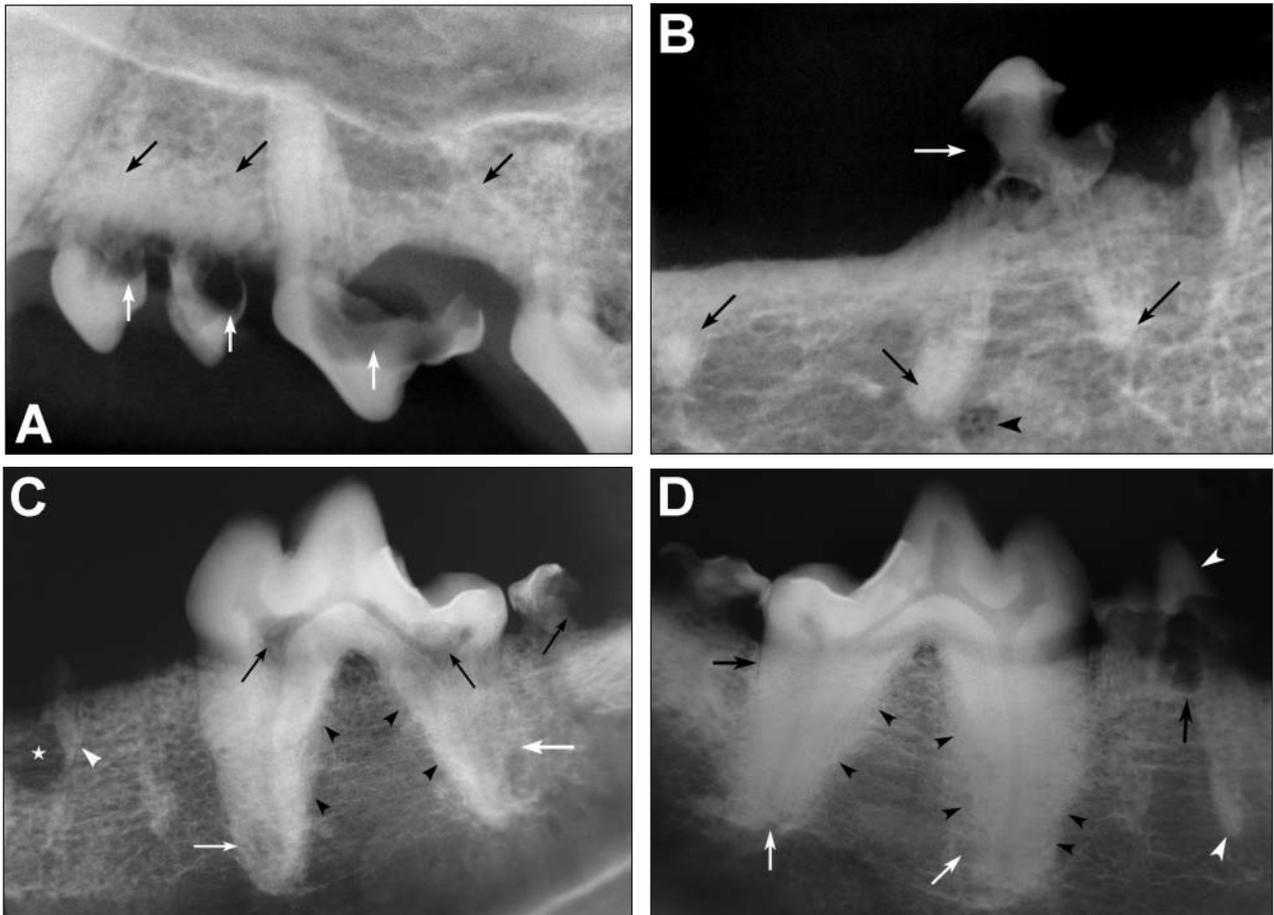


Figure 2—Same radiographic views as in Figure 1. A—Notice that the roots of the left maxillary first premolar and supernumerary first premolar are resorbed and replaced with alveolar bone (black arrows). Although the crowns are less severely affected, the teeth have lost their integrity. The distal root of the left maxillary second premolar is fully resorbed (black arrow), with substantial resorption of adjacent alveolar bone, and the mesial root is partially resorbed. There is extensive resorption of the cervical portion of all 3 teeth (white arrows). B—Only a small apical part of the mesial root of the left mandibular second premolar remains (black arrow). Apical portions of the mesial and distal roots of the left mandibular third premolar remain (black arrows), although > 50% of the crown is missing (white arrow). The caudal mental foramen (black arrow head) is distal to the mesial root apex. C—The roots of the left mandibular fourth premolar are almost completely resorbed, although a small piece of the mesial crown and root is left (white arrow head). The radiolucent area next to the mesial root (star) may represent inflammatory resorption of alveolar bone or may be the result of an earlier extraction attempt. The left mandibular first molar has severe resorption of the distal root and mild resorption of the mesial root (white arrows). The lamina dura and periodontal ligament (black arrow heads) are unidentifiable in both roots (ankylosis). There are areas of resorption at the cervical portion of the tooth (black arrows). Greater than 50% of the crown of the left mandibular second molar is missing (black arrow), and the roots are resorbed and replaced by alveolar bone. D—The roots of the right mandibular fourth premolar are almost fully resorbed, and only small parts of the mesial root apex and crown remain (white arrow heads). Alveolar bone has been resorbed between the mesial and distal roots (black arrow). The lamina dura and periodontal ligament of the right mandibular first molar are visible in the distocoronal portion of the distal root (black arrow) but unidentifiable elsewhere (black arrow heads), indicating ankylosis. Moderate resorption is seen involving both roots of the first molar (white arrows).

coronal portion of the distal root (stage 2) but unidentifiable elsewhere, indicating ankylosis. Moderate resorption is seen involving both roots of the first molar.

Treatment and Outcome

On the basis of clinical and radiographic findings, the following 20 teeth with resorption were extracted: right maxillary canine; right maxillary first, second, third, and fourth premolars; right maxillary second molar; left maxillary canine; left maxillary first, second, third, and fourth premolars; left maxillary supernumerary first premolar; left mandibular canine; left mandibular third and fourth premolars; left mandibular first and second molars; right mandibular third and fourth premolars; and right mandibular second molar.

Subgingival coronectomy, also referred to as crown amputation, was performed on teeth for which the roots appeared fully resorbed or for which only a small portion of resorbing root was visible radiographically (ie, left maxillary first premolar and supernumerary first premolar; left mandibular third premolar and second molar; and right mandibular fourth premolar and second molar). The small piece of mesial crown and root of the left mandibular fourth premolar was nonsurgically extracted. The remaining teeth were extracted after raising a mucoperiosteal flap and removing a portion of the alveolar bone. Alveoplasty was performed, and all extraction sites were closed with simple interrupted sutures of 4-0 poliglecaprone 25.^a

A fentanyl patch^b was applied following tooth extraction. At the time of discharge, the owner was advised to continue to administer carprofen and amoxicillin-clavulanic acid, which had been prescribed previously. At the 2-week recheck visit, the extraction sites had healed well and the dog was comfortable and eating well.

Comments

Tooth resorption is reportedly common in dogs and cats, with 29% to 61% of cats affected in previous reports^{2,3} and 18% of dogs > 10 years of age that were euthanatized for reasons other than oral cavity disease having evidence of root replacement resorption in another study.⁴ The etiology of tooth resorption in dogs is not well studied, but studies^{3,6} in cats suggest that bacterial products and inflammatory elements in periodontal pockets can attract and activate odontoclasts that can resorb tooth structures.⁶ However, bacterial invasion of the pulp has not been demonstrated in cats with tooth resorption.² In humans with endodontic disease, bacterial toxins can pass through dentinal tubules and stimulate an inflammatory response in the periodontal ligament, resulting in resorption of the root and bone.⁷ Noninflammatory root replacement resorption usually occurs anywhere along the root surface apical to the gingival attachment and may be triggered by excess dietary vitamin D in cats.⁵

It has been suggested that resorptive lesions in cats can be classified into 2 types,⁸ with type 1 lesions characterized by inflammatory resorption and type 2 lesions characterized by replacement resorption. Tooth roots may not be completely resorbed in cats with type 1 lesions,⁹ although alveolar bone adjacent to type 1 lesions is commonly resorbed.⁵ Teeth with evidence of type 1 lesions need to be completely extracted.⁹

In cats with type 2 lesions, the tooth roots become ankylosed and replaced by alveolar bone.^{8,9} Teeth with radiographic evidence of root replacement resorption that have

lost most of the root can be treated by means of coronectomy at the level of root replacement.^{8,9} However, all roots should be completely extracted in cats that have periodontitis, endodontic disease, or chronic gingivostomatitis and in cats that are positive for FIV or FeLV infection.⁹

Teeth with mild or moderate root replacement resorption do not always require extraction but should be monitored radiographically. Thus, the right mandibular first molar in the dog described in the present report was not extracted at this time. In contrast, the left mandibular first molar had cervical resorption with pulp exposure and substantial portions of the roots remaining. Therefore, it was completely extracted.

Intraoral dental radiography is essential in the diagnosis, treatment, and follow-up of tooth resorption. If oral examination reveals 1 or more teeth with resorption, full-mouth dental radiographs should be obtained. Without dental radiographs, it is impossible to determine whether complete extraction or coronectomy is indicated for teeth with tooth resorption.

- a. Monocryl, Ethicon Inc, Somerville, NJ.
- b. Fentanyl transdermal system (75 µg/h), Sandoz, Broomfield, Colo.

References

1. American Veterinary Dental College Web site. Veterinary dental nomenclature. Available at: www.avdc.org/Nomenclature.pdf. Accessed Jan 18, 2008.
2. Lommer MJ, Verstraete FJ. Prevalence of odontoclastic resorption lesions and periapical radiographic lucencies in cats: 265 cases (1995–1998). *J Am Vet Med Assoc* 2000;217:1866–1869.
3. Van Wessum R, Harvey CE, Hennet P. Feline dental resorptive lesions. Prevalence patterns. *Vet Clin North Am Small Anim Pract* 1992;22:1405–1416.
4. Arnbjerg J. Idiopathic dental root replacement resorption in old dogs. *J Vet Dent* 1996;13:97–100.
5. Reiter AM, Lewis JR, Okuda A. Update on the etiology of tooth resorption in domestic cats. *Vet Clin North Am Small Anim Pract* 2005;35:913–942.
6. Okuda A, Harvey CE. Etiopathology of feline dental resorptive lesions. *Vet Clin North Am Small Anim Pract* 1992;22:1385–1402.
7. Trope M, Blanco L, Chivian N, et al. The role of endodontics after dental traumatic injuries. In: Cohen S, Hargreaves KM, eds. *Pathways of the pulp*. 9th ed. St Louis: Mosby, 2006;610–649.
8. DuPont GA, DeBowes LJ. Comparison of periodontitis and root replacement in cat teeth with resorptive lesions. *J Vet Dent* 2002;19:71–75.
9. DuPont GA. Radiographic evaluation and treatment of feline dental resorptive lesions. *Vet Clin North Am Small Anim Pract* 2005;35:943–962.

Appendix

Classification of tooth resorption.¹

- Stage 1: Mild dental hard tissue loss (cementum or cementum and enamel).
- Stage 2: Moderate dental hard tissue loss (cementum or cementum and enamel with loss of dentin that does not extend to the pulp cavity).
- Stage 3: Severe 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.
- Stage 4: 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.
- 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 radiopacities, and gingival covering is complete.

The classification system was developed on the basis of the assumption that tooth resorption is a progressive condition.