

# Diagnostic Imaging in Veterinary Dental Practice

In cooperation with  
**AVDC**  
AMERICAN VETERINARY DENTAL COLLEGE

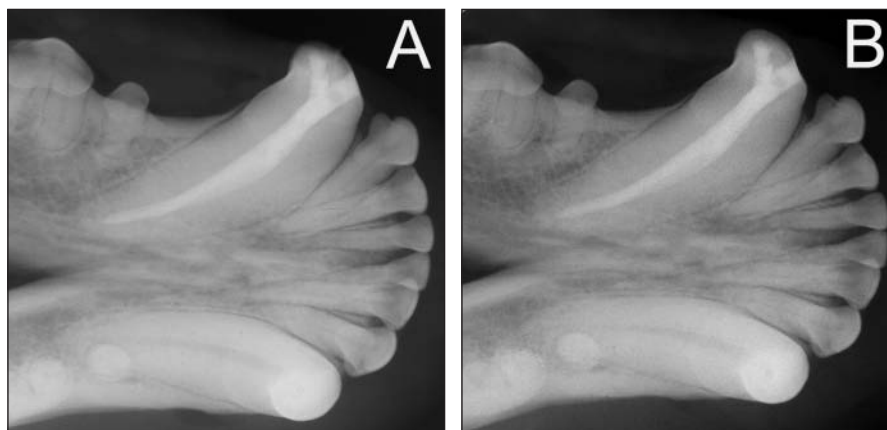


Figure 1—Lateral radiographic views of the right mandibular canine tooth in a dog; radiographs were obtained immediately after (A) and 4 months after (B) root canal treatment.

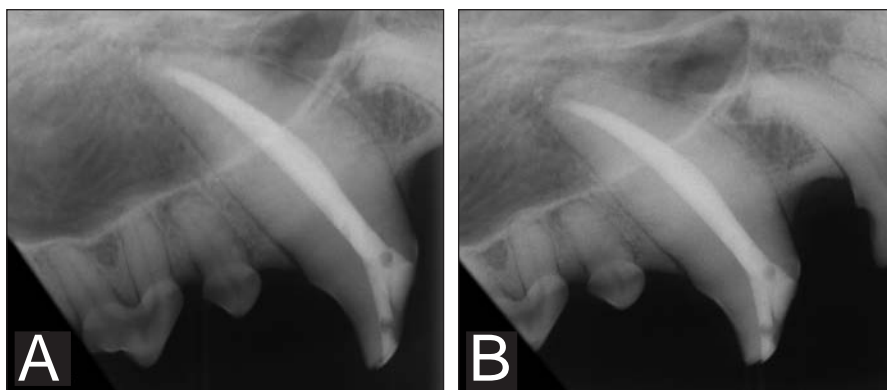


Figure 2—Lateral radiographic views of the right maxillary canine tooth in a dog; radiographs were obtained immediately after (A) and 4 months after (B) root canal treatment.

## History and Physical Examination Findings

A 4-year-old spayed female Labrador Retriever was brought to the Veterinary Medical Teaching Hospital for follow-up radiography following root canal treatment of the right maxillary and right mandibular canine teeth 4 months previously. The dog had had a complicated crown-root fracture of the right maxillary canine tooth and a complicated crown fracture of the right mandibular canine tooth of unknown duration; in both teeth, the pulp was not vital. Root canal treatment was performed by means of a hand-filing, crown-down technique<sup>1</sup>; the canals were obturated with a combination of a solid gutta-percha core and polydimethylsiloxane-based<sup>2</sup> root canal sealer. A type 1 crown-lengthening procedure (gingivectomy and gingivoplasty)<sup>3</sup> was performed on the right maxillary canine tooth. Given the extent of dentinal exposure and periodontal compromise of the right maxillary canine tooth, it was recommended that a prosthetic metal crown be applied to the tooth, primarily to improve the gingival contour.

Results of a physical examination and clinicopathologic testing were unremarkable. An oral examination performed with the patient awake revealed mild generalized gingivitis and mild plaque and calculus. Restorations of the right maxillary and right mandibular canine teeth appeared intact, and no tooth discoloration, intraoral or extraoral draining tracts, or soft tissue inflammation were detected. Results of an oral examination performed after the dog was anesthetized were similar. Intraoral radiographic views of the right maxillary and right mandibular canine teeth were obtained and compared with views obtained immediately after root canal treatment to determine the periapical status of both teeth and assess outcome. Lateral radiographic views are presented here (Figures 1 and 2).

Determine whether additional studies are required, or make your diagnosis, then turn the page →

This report was submitted by Santiago Peralta, DVM; from the Dentistry and Oral Surgery Service, Veterinary Medical Teaching Hospital, School of Veterinary Medicine, University of California, Davis, CA 95616.

## Diagnostic Imaging Findings and Interpretation

On lateral radiographic views of the right mandibular canine tooth obtained immediately after root canal treatment and at the time of the 4-month recheck examination, there is suboptimal shaping of the canal, with the middle third of the canal being more curved and wider than optimal (Figure 3). However, there are no obvious signs of root canal treatment failure on the view obtained 4 months after treatment.

On the lateral radiographic view of the right maxillary canine tooth obtained immediately after root canal treatment, 2 voids approximately 2 mm in diameter can be seen immediately below the restoration, and there is suboptimal shaping of the canal, with the middle third of the canal being more curved and wider than optimal; suboptimal obturation of the apical third of the canal, as evidenced by an area of reduced radiodensity in the apical 2 mm of the canal; and minimal overfill, as evidenced by traces of obturation material in the periapical region (Figure 4). On the lateral

radiographic view obtained 4 months after treatment, there is a well-defined lucency approximately 6 mm in diameter surrounding the apex of the tooth and blunting of the apex. Findings were considered indicative of periapical inflammation and inflammatory root resorption. Because neither of these abnormalities was evident on radiographic views obtained immediately after root canal treatment, a diagnosis of root canal treatment failure was established.

## Treatment and Outcome

Options that were considered for treatment of the right maxillary canine tooth included extraction of the tooth, repeated root canal treatment, and apicoectomy. The owner chose to have apicoectomy performed. The procedure was completed without complications, and the dog was discharged with a recommendation that follow-up radiography be performed in 3 months and that depending on status of the periapical region, placement of a prosthetic crown be considered at that time.

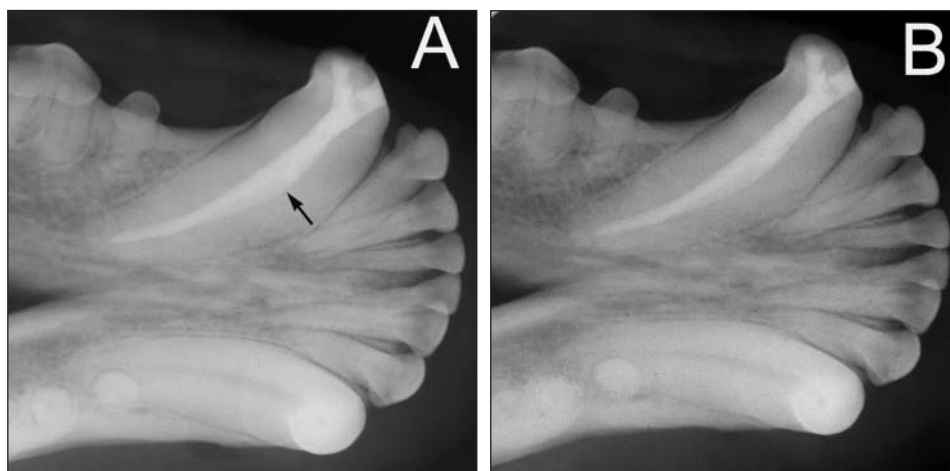


Figure 3—Same radiographic views as in Figure 1. Notice the suboptimal shaping of the canal immediately after root canal treatment (A; arrow). Despite the suboptimal shaping of the canal, there is no evidence of root canal treatment failure 4 months after treatment (B).

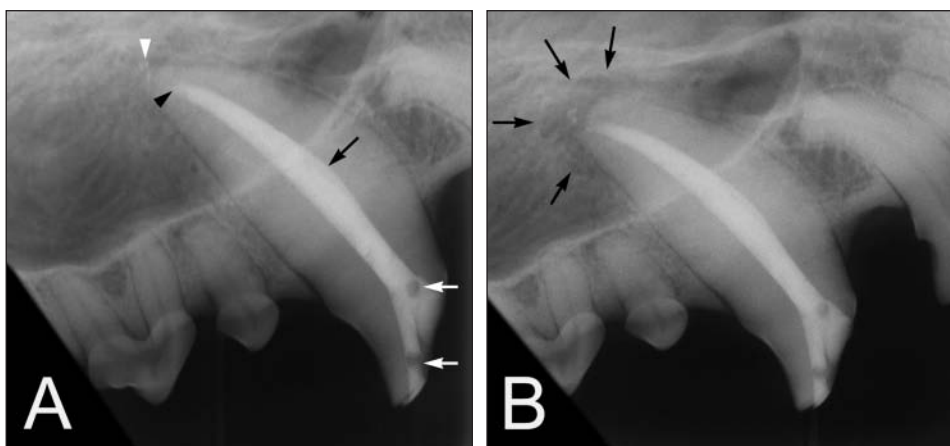


Figure 4—Same radiographic views as in Figure 2. On the view obtained immediately after treatment (A), notice the 2 voids below the restoration (white arrows), suboptimal shaping in the middle third of the canal (black arrow), suboptimal obturation of the apical third of the canal (black arrowhead), and traces of extruded obturation material (white arrowhead). On the view obtained 4 months after treatment (B), notice the 6-mm-diameter well-defined periapical lucency (arrows) and the blunting of the apex.



Figure 5—Occlusal radiographic views of the right maxillary canine tooth in the same dog as in the previous figures; radiographs were obtained immediately after (A) and 4 months after (B) root canal treatment. Notice that technical problems and signs of root canal treatment failure visible on the lateral radiographic views are not apparent on these views.

## Comments

The success rate for root canal treatment in dogs has been reported to be as high as 95%.<sup>4</sup> Outcome is highly dependent on the use of proper techniques, and the success rate may be lower if periapical lesions are present at the time of root canal treatment. Thus, radiography is essential for preoperative assessment of the periapical region and for intra- and postoperative assessment of the technique.<sup>1,4</sup> In addition, although clinical signs may be evident in some dogs with root canal treatment failure,<sup>5</sup> radiography is required to obtain a definitive evaluation of the outcome of root canal treatment.

In some instances, root canal treatment failure can be detected radiographically as soon as a few weeks after the procedure is performed. Thus, it has been recommended that radiographic follow-up be performed 3 months after root canal treatment and every year thereafter.<sup>4</sup> Common radiographic signs of root canal treatment failure include development of a periapical lucency after treatment and, in dogs with a periapical lucency at the time of treatment, failure of the lucency to resolve or an increase in size of the lucency. Another indicator of root canal treatment failure is inflammatory root resorption,<sup>1,6</sup> often evidenced by blunting of the apex with or without shortening of the root, when compared with length of the root on previous radiographic views or length of the contralateral tooth root.

A commonly used radiographic projection for assessment of the periapical regions of the canine teeth in dogs is the intraoral occlusal view, and use of this projection has been recommended for intraoperative and postoperative assessment of root canal treatment.<sup>7</sup> However, other projections have been described, including the intraoral lateral view.<sup>8,9</sup> In the dog described in the present report, technical problems that were visible on the lateral radiographic views of both teeth immediately after treatment (ie, suboptimal shaping and obturation of the canal and voids below the restoration) and signs

of root canal treatment failure visible on the lateral radiographic view of the right maxillary canine tooth 4 months after treatment (ie, periapical lucency and root resorption) were not evident on the comparable occlusal radiographic views (Figure 5). Thus, if lateral radiographic views had not been obtained, examination of the occlusal radiographic views alone could have led to erroneous clinical impressions and, potentially, placement of a prosthetic crown on a tooth with periapical disease. It is therefore recommended that both views be obtained intra- and postoperatively and during follow-up examinations whenever root canal treatment is performed on canine teeth in dogs.

a. GuttaFlow, Coltene/Whaledent Inc, Cuyahoga Falls, Ohio.

## References

1. Niemiec BA. Fundamentals of endodontics. *Vet Clin North Am Small Anim Pract* 2005;35:837–868.
2. Brackett MG, Martin R, Sword J, et al. Comparison of seal after obturation techniques using a polydimethylsiloxane-based root canal sealer. *J Endod* 2006;32:1188–1190.
3. Hale FA. Crown lengthening for mandibular and maxillary canine teeth in the dog. *J Vet Dent* 2001;18:219–221.
4. Kuntsi-Vaattovaara H, Verstraete FJ, Kass PH. Results of root canal treatment in dogs: 127 cases (1995–2000). *J Am Vet Med Assoc* 2002;220:775–780.
5. Lobprise HB, Bloom BC. Endodontic decisions based on clinical appearance. *Clin Tech Small Anim Pract* 2001;16:133–138.
6. Kovacevic M, Tamarut T, Jonjic N, et al. The transition from pulpitis to periapical periodontitis in dogs' teeth. *Aust Endod J* 2008;34:12–18.
7. Eisner ER. Oral-dental radiographic examination technique. *Vet Clin North Am Small Anim Pract* 1998;28:1063–1087.
8. Tsugawa AJ, Verstraete FJ, Kass PH, et al. Diagnostic value of the use of lateral and occlusal radiographic views in comparison with periodontal probing for the assessment of periodontal attachment of the canine teeth in dogs. *Am J Vet Res* 2003;64:255–261.
9. Tsugawa AJ, Verstraete FJM. How to obtain and interpret periodontal radiographs in dogs. *Clin Tech Small Anim Pract* 2000;15:204–210.