Diagnostic Imaging in Veterinary Dental Practice

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Figure 1—Photograph of the right maxillary canine tooth in a dog examined because of signs of oral pain. Notice the intact tertiary dentin in the center of the abraded occlusal surface of the tooth.

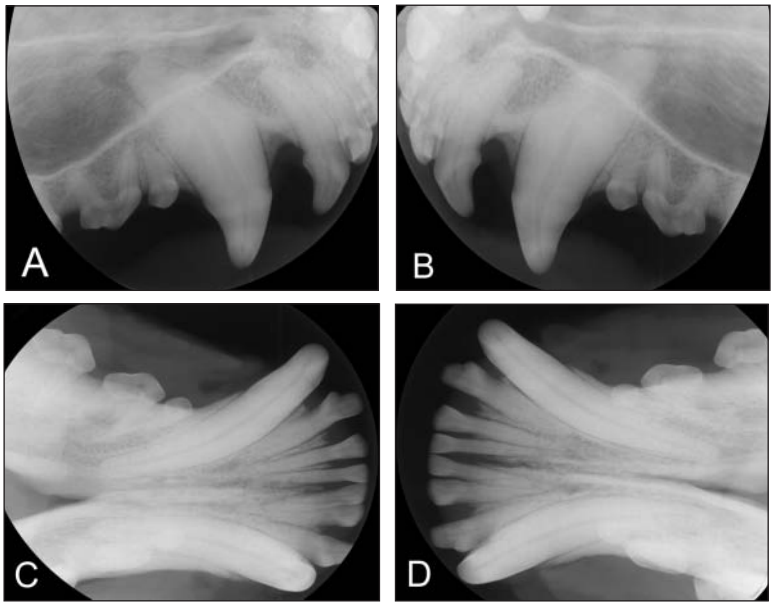

Figure 2—Radiographic views of the right (A) and left (B) maxillary canine teeth and right (C) and left (D) mandibular canine teeth in the dog in Figure 1.

History and Physical Examination Findings

A 6-year-old 29.3-kg (64.46-lb) sexually intact male mixed-breed dog was evaluated for signs of oral pain. According to the owner, the dog was first noted to have signs of oral pain approximately 1 year prior to examination. The owner reported that the dog was reluctant to play tug of war with rope toys and would routinely, after picking a ball up with the rostral portion of its mouth, chatter its jaw and drop the ball. The owner also reported that the dog avoided dry food and preferred a softer diet. The dog had a long history of chewing tennis balls and wood and was reported to be otherwise healthy.

Results of a general physical examination were unremarkable. Oral examination revealed mild dental plaque and calculus and mild gingivitis. There was moderate abrasion of all teeth that was especially notable on the maxillary canine teeth. Intact tertiary dentin was evident in the center of the abraded surface of the maxillary and mandibular canine teeth (**Figure 1**).

Results of a CBC, serum biochemical profile, and urinalysis were within reference limits. The dog was anesthetized, and intraoral radiography and periodontal charting were performed. Select radiographic views are provided (**Figure 2**).

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

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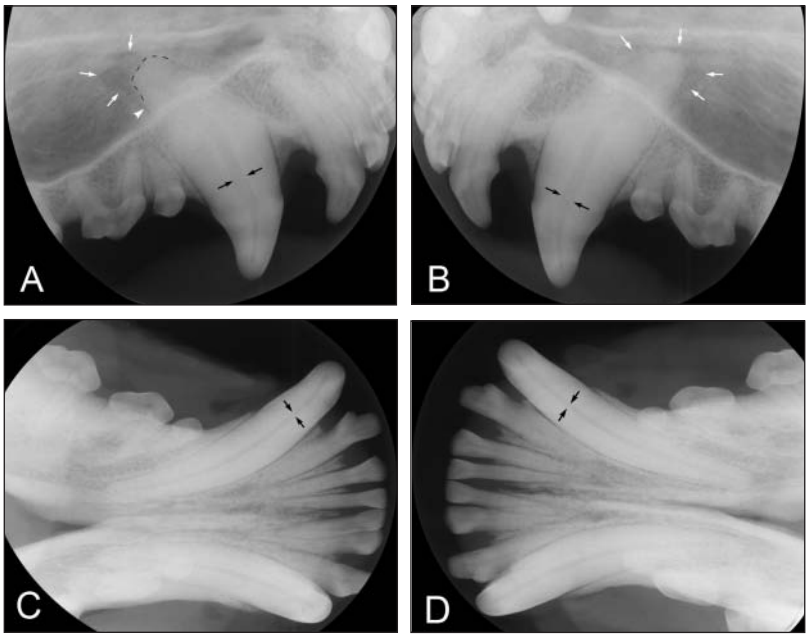

Figure 3—Same radiographic views as in Figure 2. On the radiographic view of the right maxillary canine tooth (A), notice the abnormally wide pulp cavity (black arrows), widening of the apical periodontal ligament space (white arrowhead), moderately well-defined periapical lucency (white arrows), and blunted appearance of the apex secondary to inflammatory root resorption (broken line). On the radiographic view of the left maxillary canine tooth (B), notice the abnormally wide pulp cavity (black arrows) and moderately well-defined periapical lucency (white arrows). Widths of the pulp cavities in the right (C) and left (D) mandibular canine teeth (black arrows) were consistent with expected widths given the age of the dog.

Diagnostic Imaging Findings and Interpretation

Oral radiography revealed generalized moderate abrasion of the occlusal aspect of most of the teeth, consistent with the dog's reported habit of chewing tennis balls. Both the left and right maxillary canine teeth had signs of endodontic disease. In particular, the pulp cavities of both teeth had failed to narrow as expected with age, compared with pulp cavities of the mandibular canine teeth (**Figure 3**). The pulp cavities of the maxillary canine teeth both measured 2.5 mm in width at the widest point, whereas the pulp cavities of the mandibular canine teeth measured 1 mm in width at the same reference points. Uniform relative widening of the pulp cavity of a tooth indicates that secondary dentin formation has ceased owing to a lack of odontoblastic activity, which may be associated with pulpitis, fibrosis of the pulp, or, more commonly, pulp necrosis. Moderately well-defined periapical lucencies measuring 9 mm in diameter were associated with both maxillary canine teeth. There was evidence of inflammatory resorption of the apex of the right maxillary canine tooth, resulting in a blunted appearance. There was no radiographic evidence of marginal periodontitis.

Treatment and Outcome

The maxillary canine teeth were ultrasonically scaled above and below the gingival margin and pumice-polished. Complete root canal treatments were performed on both maxillary canine teeth with self-curing filling material[a] and a gutta-percha point technique. In both teeth, the pulp appeared nonvital (necrotic) during root canal treatment. The owner was contacted 2 weeks following the procedure and again 3 months later and reported that there were no longer signs of pain or discomfort and that the dog had gone back to playing and eating normally. The root canal treatments were rechecked radiographically 6 months following the procedure. There was no evidence of failure, the periapical lucencies appeared smaller, and there was no further evidence of inflammatory root resorption.[1,2]

Comments

It is uncommon for dogs with endodontic disease to have overt signs of oral pain or discomfort.[3,4] However, if they do, clinical signs can range from a reluctance to chew or pick up food or toys to ptyalism, vocalization, and even aggression.[5] In patients with severe inflammation and infection, there often is facial swelling with or without draining tracts.[4,6]

The most common finding on oral examination in dogs with endodontic disease is a fractured tooth with pulp exposure.[3,7] In contrast, the dog described in the present report only had evidence of abrasion of the teeth during the initial oral examination. Abrasion is defined as the abnormal wear of tooth substance due to a mechanical process.[8] This often results in exposure of the dentinal tubules. The exposure and mechanical trauma stimulate odontoblasts at the periphery of the pulp and in direct contact with the dentinal tubules to form tertiary dentin, the main pulpal repair response to injury.[9,10] Possible portals for entry for bacteria other than direct pulp exposure have been suggested,[3,4,7] and microleakage through the dentinal tubules with subsequent pulpal infection has been reported in patients with exposed dentin.[7] Alternatively, pulpal infection may be a result of anachoresis, whereby previously traumatized pulp is infected via the systemic blood circulation.[7,11] It was impossible to ascertain the pathogenesis of the pulp disease in the dog described in the present report.

Identifying endodontic disease in animals relies on a complete patient history, thorough physical and oral examinations, and dental radiography. The radiographic signs of endodontic disease vary with chronicity.[6,12] Early signs may range from an anatomically normal appearance to increased width of the periapical periodontal ligament space and a loss of the periapical lamina dura. As the disease progresses, signs that may be seen include periapical lucencies (well or poorly defined), arrested tooth maturation (relatively wide pulp cavity), and external inflammatory root resorption.[12] It is important to note that interpreting the radiographic appearance of the tooth apex can sometimes be challenging because normal anatomy may mimic a disease process.[6,12] An example of this is the chevron lucency, a

normal radiographic appearance of the alveolus at the apex of the canine teeth that is often noted on dental radiographs.[12,13] Thus, knowledge of the normal radiographic anatomy is essential.

Even with a thorough oral examination and appropriate intraoral radiography, identifying a nonvital tooth may be challenging. Human dentists rely on thermal or electric pulp testing in awake patients as well as the use of more advanced diagnostic tests such as laser Doppler flowmetry and pulse oximetry.[6,14] Unfortunately, testing tooth vitality in awake animals is not realistic and reports[15] on advanced vitality testing in the veterinary literature are limited.

The present case illustrates that in dogs with obvious signs of oral pain that do not have overt evidence of dental disease, full-mouth radiography to assess the endodontic system is indicated.

a. GuttaFlow, Coltène/Whalendent Inc, Cuyahoga Falls, Ohio.

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