Diagnostic Imaging in Veterinary Dental Practice

Figure 1—Gross appearance of the right (A) and left (B) maxillary fourth premolars in a dog examined because of a possible fractured tooth. Notice the moderate plaque and calculus accumulation, moderate gingivitis on the distal aspects of the teeth (black arrowheads), and parulides (black arrows) at the mucogingival junctions (white arrowheads).

Figure 2—Intraoral radiographic views of the right (A) and left (B) caudal maxillary teeth and an occlusal radiographic view of the rostral maxillary teeth (C) in the dog in Figure 1.

History and Physical Examination Findings

A 10-year-old castrated male Cocker Spaniel–Maltese mix was brought to the William B. Pritchard Veterinary Medical Teaching Hospital for evaluation of a possible fractured tooth. The dog had injured the left maxillary first incisor 1 month before while chewing on a rawhide but had not had any signs of oral discomfort since then. Pertinent medical history included well-controlled epilepsy treated with phenobarbital (1.5 mg/kg [0.68 mg/lb], PO, q 24 h). Pertinent dental history included extraction of the right maxillary third incisor because of a root fracture 3 years previously.

Results of a physical examination and clinicopathologic testing were unremarkable except for a slightly high serum creatinine concentration (1.6 mg/dL; reference range, 0.3 to 1.2 mg/dL), which was attributed to prerenal azotemia. During an oral examination, mild to moderate generalized plaque and calculus were evident; the right maxillary third and left maxillary first incisors were missing, and gingiva in these areas was intact. Elevated, erythematous, round nodules consistent with parulides were evident at the mucogingival junctions of both maxillary fourth premolars. The crowns of these teeth appeared intact, but there was moderate gingivitis and minimal gingival recession on the distal aspect of both teeth (**Figure 1**). The dog was anesthetized, and dental charting and full-mouth radiography were performed. Dental charting revealed probing depths of 8 mm at the distal aspects of the maxillary fourth premolars with furcation exposure (stage 3) and probing depths of 6 mm at the mesial aspects of the maxillary first molars. Maxillary occlusal and left and right caudal maxillary radiographic views are presented (**Figure 2**).

Determine whether additional studies are required, or make your diagnosis, then turn the page →
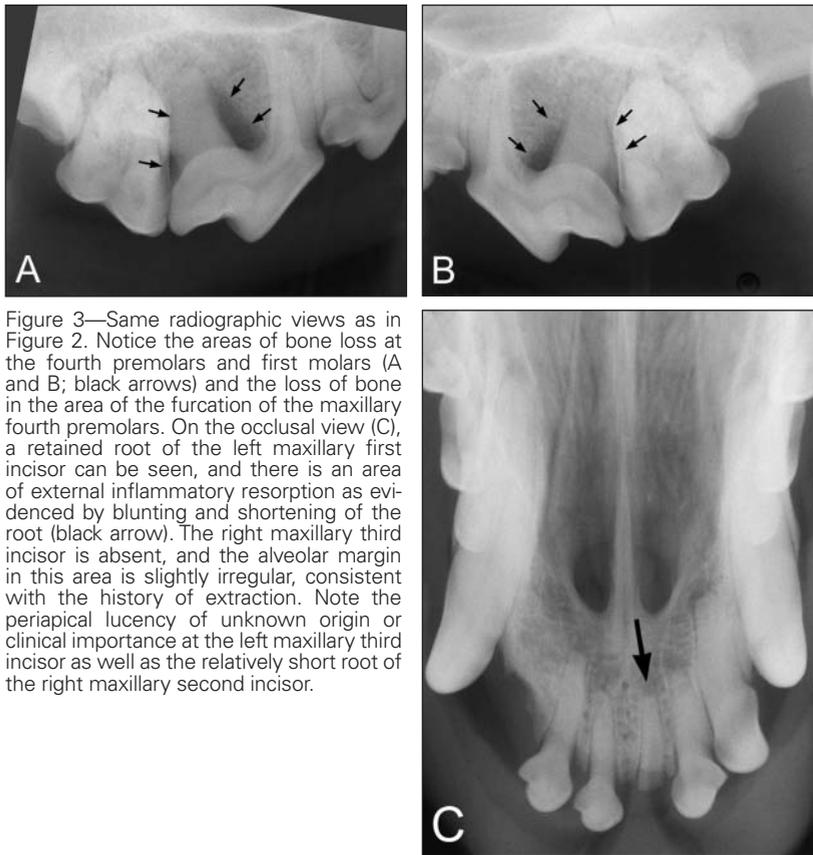
Figure 3—Same radiographic views as in Figure 2. Notice the areas of bone loss at the fourth premolars and first molars (A and B; black arrows) and the loss of bone in the area of the furcation of the maxillary fourth premolars. On the occlusal view (C), a retained root of the left maxillary first incisor can be seen, and there is an area of external inflammatory resorption as evidenced by blunting and shortening of the root (black arrow). The right maxillary third incisor is absent, and the alveolar margin in this area is slightly irregular, consistent with the history of extraction. Note the periapical lucency of unknown origin or clinical importance at the left maxillary third incisor as well as the relatively short root of the right maxillary second incisor.

Diagnostic Imaging Findings and Interpretations

Examination of the caudal maxillary radiographic views revealed periodontitis characterized by 8 mm of alveolar bone loss in a combined horizontal (alveolar margin parallel to the cementoenamel junction) and vertical (alveolar margin perpendicular to the cementoenamel junction) pattern at the distal roots of the maxillary fourth premolars with furcation exposure (through-and-through osseous defect between the roots) and 6 mm of horizontal alveolar bone loss at the mesial aspects of the maxillary first molars (**Figure 3**). Examination of the occlusal maxillary radiographic view revealed a root fracture of the left maxillary first incisor with a missing coronal fragment and external inflammatory resorption evidenced by a blunt and shortened root. The root of the left maxillary second incisor was shorter than the root of the contralateral tooth, and the left maxillary third incisor had a periapical lucency. The cause and clinical importance of these latter findings were not known.

Treatment and Outcome

Clinical and radiologic findings were discussed with the owner, and extraction of the maxillary fourth premolars and maxillary first molars as well as removal of the retained root of the left maxillary first incisor was recommended. All teeth were ultrasonically scaled and air-polished before extractions, and bilateral infraorbital regional nerve blocks were performed. Surgical extraction of the affected teeth was performed without

complications, and the patient was discharged the same day. The owner was advised to rinse the dog's oral cavity with a chlorhexidine solution daily[a] and to feed soft food for 1 week. Tramadol was prescribed for treatment of pain as needed (2.5 mg/kg [1.14 mg/lb], PO, q 12 h for 5 days). A recheck examination 2 weeks later revealed healed extraction sites and resolution of the parulides. The client was provided instructions on oral home care, and routine periodontal treatment and recheck radiography of the left maxillary second and third incisors 1 year later were recommended.

Comments

The diagnosis of dental conditions in animals can be challenging because clinical signs are often subtle and dissimulated. The dental history and oral examination are crucial as diagnostic tools. However, even when there is obvious historical and clinical evidence of dental disease, a definitive diagnosis will not be possible without dental charting and intraoral radiography. Moreover, the current standard of care requires documenting dental disease via these 2 modalities.[1,2]

The dental history in this patient was important because it explained the missing right maxillary third incisor and suggested that there might be a root fracture of the left maxillary first incisor. A comprehensive oral examination with the patient awake allowed detection of parulides and moderate gingivitis with minimal gingival recession of the maxillary fourth premolars. A parulis is an elevated nodule on the gingiva or alveolar mucosa through which a sinus tract of dental origin drains into the oral cavity.[3] Because the gingiva proper is lined by keratinized epithelium, parulides often occur at the area where the gingiva meets the nonkeratinized alveolar mucosa (mucogingival junction). Parulides may be the result of endodontal[3,4] or periodontal[3,5] disease.

In the dog described in the present report, dental charting revealed probing depths of 8 mm at the distal aspects of the maxillary fourth premolars and furcation exposure (stage 3) and probing depths of 6 mm at the mesial aspects of the maxillary first molars. Probing depths > 3 mm are suggestive of alveolar bone loss in dogs,[6] and loss of alveolar bone is indicative of periodontitis.[6,7] Alveolar bone loss may occur in the area between the roots of multirooted teeth, and when a through-and-through defect in this area is found during probing, it is referred to as stage 3 furcation exposure.[8]

Also, in this dog, radiography was crucial in confirming periodontitis, revealing the extent and pattern of alveolar bone loss at the maxillary fourth premolars and maxillary first molars, and ruling out endodontal disease as the cause of the parulides. Given the advanced stage of periodontal disease, the prognosis for the maxillary fourth premolars and first molars was

considered guarded to poor, and all of these teeth were therefore extracted. Despite the lack of clinical signs, radiography revealed external inflammatory resorption of the fractured left maxillary first incisor. Because periapical inflammation may be associated with pain,[9] the retained root was extracted.

Given the absence of any historical, clinical, or other radiologic indicators of dental disease and the fact that the periodontium appeared sound, the crowns appeared intact, and the pulp cavities appeared normal, the cause of the periapical lucency at the left maxillary third incisor and the relatively shorter root of the left maxillary second incisor could not be determined. Periapical lucencies similar to those seen at the left maxillary third incisor have been described previously in dogs and are believed to be the result of vascular channels in the trabecular bone around the apices of the maxillary incisors.[10] Considering the patient's dental history, it is possible that previous trauma led to external inflammatory resorption of the second incisor tooth root. Follow-up radiography will help determine whether treatment of these teeth is indicated. Immediate endodontic treatment or extraction would have been valid alternatives, but given the clinical uncertainty and the subtlety of the radiologic findings, follow-up radiography 1 year later was considered prudent.

The present case illustrates the importance of using a comprehensive approach in the diagnosis of dental disease in animals, including dental charting and full-mouth radiography, even when the initial complaint involves a single tooth. No single diagnostic tool allows the detection of all dental problems. Instead, each step is complementary to the others. A systematic diagnostic routine ensures optimal dental care.

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