Proper Diagnosis of

PERIODONTAL DISEASE

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Periodontal disease is the number one problem in small animal medicine.[1,2] In fact, the classic university study reported that, by 2 years of age, 80% of dogs and 70% of cats have some form of periodontal disease.[3]

In contrast, a recent large clinical study from general practices reported that by 10 years of age, only 24% of patients were clinically diagnosed with periodontal disease.[4] Therefore, it appears this disease is significantly under diagnosed, likely due to lack of dental education.
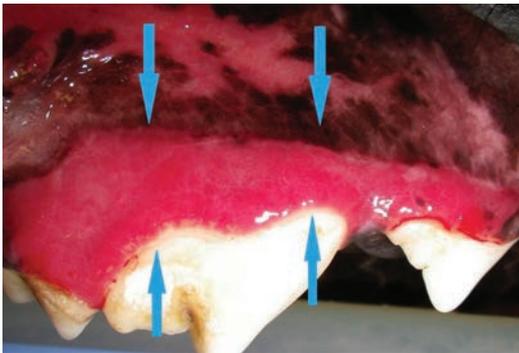

FIGURE 1. Intraoral picture of the right maxillary fourth premolar (in a dog) with significant gingival inflammation (affecting the entire attached gingiva, **blue arrows**) despite minimal calculus.

FIGURE 2. Intraoral picture of the left maxillary fourth premolar (in a cat); note lack of inflammation but significant calculus on the tooth, which even overrides the gingiva.

The significant adverse consequences of periodontal disease (**Table**) show why diagnosis is so important.[5,6]

Veterinarians have many misconceptions about periodontal disease. This article outlines some common pitfalls encountered by veterinarians and provides some practical tips that can be implemented in general practice. (See **Dental Definitions** on page 67.)

FALLACY #1. The amount of calculus on teeth is an accurate measurement of periodontal disease.

While it is true that periodontal disease is typically associated with calculus, it is primarily elicited by plaque and, thus, can be seen in the absence of calculus (**Figure 1**).[7-9] Conversely, widespread supragingival calculus may be present with little to no periodontal disease (**Figure 2**).

Use the degree of gingival inflammation to judge the need for professional therapy—not the amount of calculus.[10] While this is a radical change in thought, it is a much more accurate measure of disease. However, evaluation of degree of visible gingival inflammation may still lead to underestimation of the severity of periodontal disease (see **Fallacy #2**, page 66).[9]

TABLE.
Adverse Consequences of Periodontal Disease

LOCAL/REGIONAL CONSEQUENCES[5]	POSSIBLE SYSTEMIC CONSEQUENCES[6]
Abscess	Adverse pregnancy effects
Jaw fracture	Diabetes mellitus
Ocular problems/ vision loss	Early mortality
Oronasal fistulas	Heart, liver, renal disease
Osteomyelitis	Valvular endocarditis

Key Point

It is critical to remember that, while calculus acts as an irritant, it is in and of itself essentially nonpathogenic.[3,8,9]
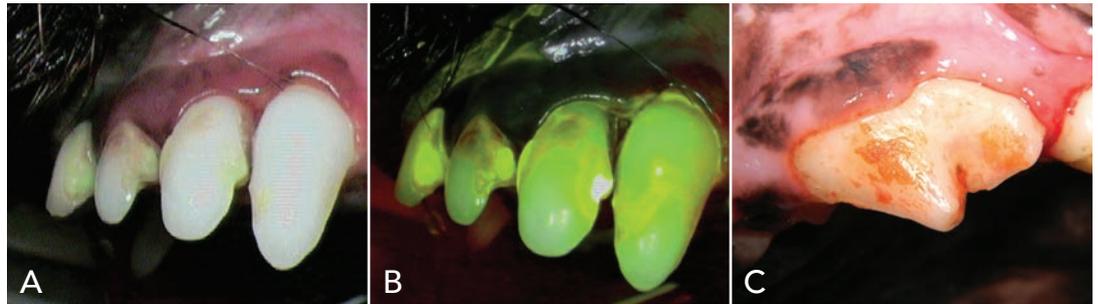
FIGURE 3. Plaque-disclosing light used on maxillary incisors (dog): The teeth appear to be fairly clean (**A**), but the light reveals extensive plaque accumulation (**B**). Plaque-disclosing solution applied to a maxillary fourth premolar (**C**).

PRACTICAL TIP: Lights/solutions that identify plaque/calculus can be used in conscious patients in the examination room to demonstrate the level of calculus (**Figure 3**). Plaque and early calculus can be invisible to the naked eye in natural light. Therefore, they can easily be missed, especially on wet teeth. Plaque-disclosing solutions and lights allow veterinarians to visually identify plaque/calculus.

FALLACY #2. Color change of the gingiva is the first sign of periodontal disease.

The first clinical sign of gingivitis was believed to be color change of the gingiva, termed *marginal gingivitis*.[11,12] While this is a reliable sign of disease, it is now known that increased gingival bleeding on probing or brushing occurs first.[11,13] In fact, bleeding is a more objective measure of inflammation than subtle color change. In addition, gingival color change is not a reliable indicator in dark pigmented patients (**Figure 4**).

PRACTICAL TIP: Consider carefully probing or brushing tractable patients' teeth on conscious examination to demonstrate level of inflammation. In addition, ask clients about a history of bleeding during brushing or after chewing hard/rough toys.[8,12,14] If either of these are positive, a diagnosis of early gingivitis can be made despite a lack of gingival color change.[10]

FALLACY #3. A visual oral examination is sufficient for diagnosis of periodontal disease.

This is completely untrue for both conscious and anesthetized examinations. Significant gingivitis can exist without periodontal pockets and, conversely, deep periodontal pockets can be present without significant gingival inflammation (**Figure 5**).[9]

FIGURE 4. Intraoral picture of patient with dark gingiva and minimal to no calculus; however, significant bleeding is apparent upon probing, indicating that gingivitis is present.

FIGURE 5. Deep (15-mm) periodontal pocket on right mandibular first molar (in a dog) despite relatively normal appearance of gingiva; **only** periodontal probing under general anesthesia allowed identification of this pocket.

Periodontal Probe

Normal sulcal depths in:[12,15-17]

- Dogs are **0 mm to 3 mm**
- Cats are **0 mm to 0.5 mm**.

This is not common knowledge in most veterinary hospitals, and emphasizes the point that periodontal disease *cannot* be accurately diagnosed without a periodontal probe, which determines sulcal depth and identifies pockets.[12,18,19] Various periodontal probes are available; one such probe

FIGURE 6. Color-coded periodontal probe. Once inserted in the sulcus, the colors represent the following: Green (first mm)—normal sulcal depth in cats. If the green line cannot be seen in a cat, periodontal loss is present, and closed root planing (at least) is necessary. Blue (third mm)—in dogs, pathologic periodontal pocket that requires closed root planing. Red (sixth mm)—in dogs and cats, periodontal pocket that requires periodontal flap surgery or extraction.
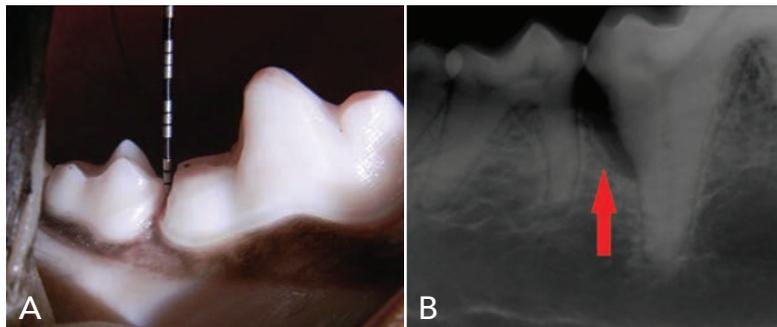

FIGURE 7. Periodontal probing in areas of tight contact is challenging. Intraoral picture of right mandibular first and second molars (409–410, dog); note that the probe cannot pass between the teeth (**A**). However, the dental radiograph (**B**) reveals severe alveolar bone loss (**red arrow**).
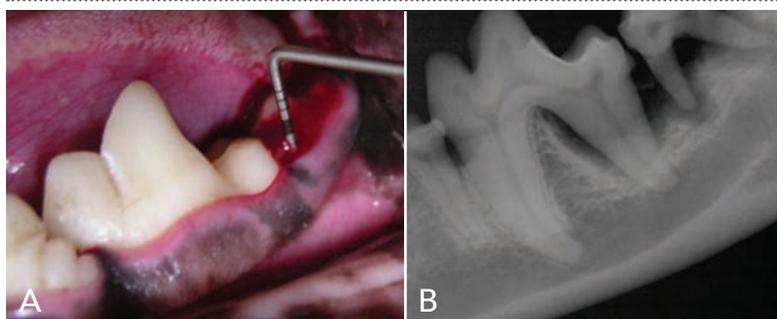

FIGURE 8. Deep (14-mm) periodontal pocket on distal aspect of the left mandibular first molar (in a dog); the rest of the mouth appears normal (**A**). The dental radiograph (**B**) confirms severe alveolar bone loss. A routine conscious examination would not have identified this condition, but a periodontal diagnostic strip likely would have recognized its presence.

(Niemiec EXPRO, dentalaireproducts.com) is color coded to indicate the various depths (and severity) of periodontal pockets (**Figure 6**).

Even in anesthetized patients, periodontal probing may be challenging and inaccurate in some cases. Ledges of calculus or tight interproximal spaces (**Figure 7**) may preclude the standard insertion path and result in a missed pocket.[20] Therefore, *careful probing and dental radiographs* are critical to accurate assessment of periodontal health.

Periodontal Diagnostic Strip

An additional diagnostic tool that can be used in the examination room is a periodontal diagnostic strip (eg, OraStrip, perio-dx.com). This product measures the production of thiols, which are produced by periodontal pathogens. A quick swipe along the maxillary gingival margins reveals visual evidence of severity of periodontal infection and may, therefore, be used to improve client compliance with dental recommendations.[21]

While this product may be a valuable tool for any patient, there are several presentations in

which it may be particularly valuable:

- **Patients without significant gingival inflammation or calculus**, especially patients with dark pigmented gingiva
- **Small and toy breed dogs**, which often have severe disease of the molar teeth in an otherwise

Dental Definitions

Calculus: Hardened dental plaque (also called tartar); its rough surface provides an ideal medium for further plaque formation. Dental plaque becomes hardened as a result of continued accumulation of minerals from saliva

Closed Root Planing: Nonsurgical periodontal therapy that removes plaque, calculus, and granulation tissue from the root surface and smooths the diseased/roughened root (also called *scaling/root planing*)

Plaque: Biofilm—formed by colonizing bacteria—that develops naturally on teeth and attaches to their smooth surfaces; hardened plaque becomes calculus

Probing: Process that identifies periodontal pockets and evaluates their depth; helps determine extent of periodontal disease during oral examination

Scaling: Dental cleaning technique that removes supragingival and subgingival plaque and calculus; typically performed along with polishing of the teeth

FIGURE 9. Intraoral picture of dog that received regular anesthesia-free dental cleanings (as recently as 2 weeks prior to presentation); there is significant inflammation—indicated by significant hemorrhage and attachment loss (6 mm).

fairly healthy mouth; this disease is typically difficult or impossible to completely evaluate on conscious oral examination, but infection is demonstrated on the test strip (**Figure 8**, page 67).

• **Patients receiving nonanesthesia dentistry**; these patients typically have significant disease despite clean crowns, and test strips elucidate hidden disease and facilitate proper therapy (**Figures 9 and 10**).

PRACTICAL TIP: Visual examination is not accurate, and a complete oral examination and probing is not possible, without general anesthesia. Therefore, consider:

1. Performing a complete oral examination (including periodontal probing) on every anesthetized patient
2. Taking digital pictures of the pathology found; then sharing a completed dental chart and printout of the pictures with the client. Dental work can be scheduled for a later date.

FALLACY #4. Periodontal probing is not necessary if dental radiography is performed.
Numerous studies support full-mouth radiographs on all dental patients to further eliminate missed pathology.[22-24] At a minimum, radiograph every area of pathology noted on dental examination, including any periodontal pocket *> 3 mm in dogs and > 0.5 mm in cats*.[12,15-17]

Dental radiographs are critical when evaluating periodontal disease; however, they are NOT a substitute for clinical examination for several reasons.[15,19,25-29]

1. Periodontal bone loss does not become radiographically evident until 30% to 50% of mineralization is lost;[25,30] therefore, radiographic findings will always underestimate bone loss.[15,31]
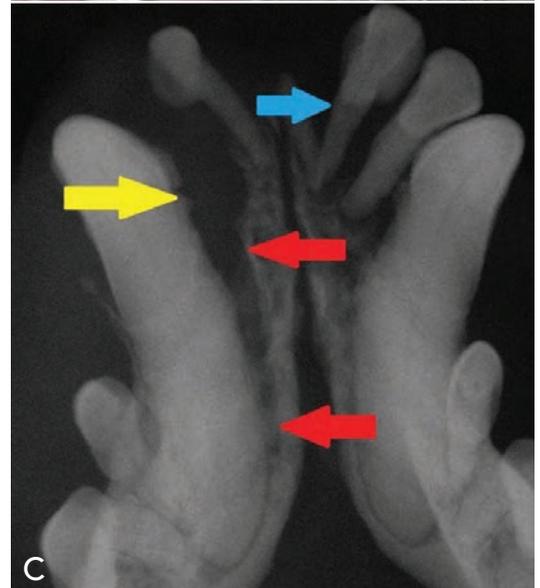

Figure 10. Intraoral pictures (**A and B**) of a dog that received regular anesthesia-free cleanings; the buccal surface of the crowns is clean, but significant calculus is present on the lingual aspect of the canine (**A, yellow arrow**). Upon probing, a deep (16-mm) periodontal pocket was discovered on the mesial aspect of the tooth (**B**). The dental radiograph (**C**) confirms the deep vertical periodontal pocket (approximately 75% alveolar bone loss, **red arrows**); note the ledge of calculus (**yellow arrow**) and concurrent significant alveolar bone loss present on the incisor teeth (**blue arrow**).
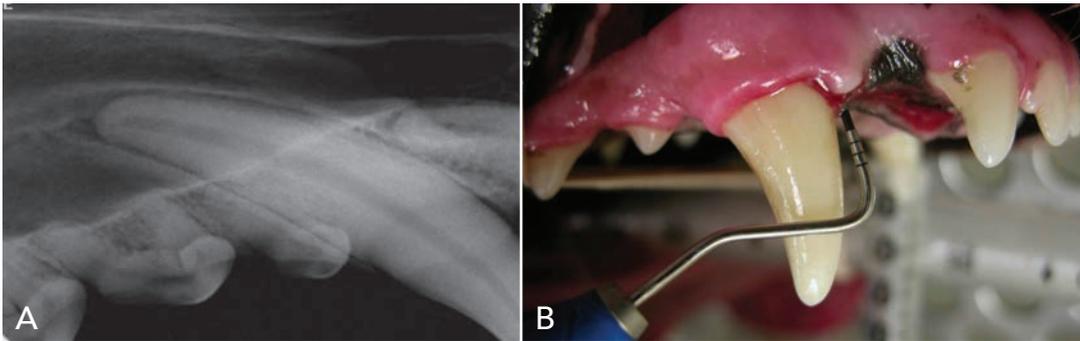
FIGURE 11. Dental radiograph of right maxillary canine (104, dog); the tooth appears normal (**A**); however, periodontal probing reveals a deep periodontal pocket on the palatal surface (**B**), which was not seen radiographically due to overlying structures.

2. Dental radiographs are a 2-dimensional image of a 3-dimensional space; any overlying structures can easily obscure periodontal pockets (**Figure 11**).
3. The first stage of furcation exposure (F1) is *not* evident radiographically.
4. Errors of angulation can greatly affect the radiographic appearance of alveolar bone loss.

PRACTICAL TIP: Expose full-mouth radiographs on all small breed (< 15 lb) dogs because:
1. Periodontal disease is more prevalent in these dogs
2. They are more likely to have heavy calculus and tight contacts that may complicate probing.

FALLACY #5. Only mobile (loose) teeth need to be extracted.
This is wholly inaccurate. Well before mobility occurs, teeth can:
• **Commonly demonstrate extensive disease** beyond a level that can be cleaned with standard scaling/root planing (especially true for larger, multirooted teeth, such as the carnassials, maxillary fourth premolars/first molars, and mandibular first molars)[3,32-35]
• **Develop deep periodontal pockets**; pockets > 5 mm to 6 mm cannot be effectively cleaned with closed root planing (**Figure 12**).
   Teeth with furcation Stage 2 or 3 cannot be effectively cleaned with closed root planing (**Figure 13**). Therefore, *teeth with pockets > 6 mm or furcation Stage 2 or 3* require extraction or referral for periodontal flap surgery. These procedures are taught through several hands-on continuing education resources.
   For a complete description of furcation and its stages, read **Dental Diagnosis: Periodontal Disease of the Mandible** (July/August 2013 issue), available at **tvpjournal.com**.

FIGURE 12. Intraoral picture of deep (9-mm) periodontal pocket on mesial surface of right mandibular canine (404, dog); this tooth requires periodontal flap surgery or extraction.
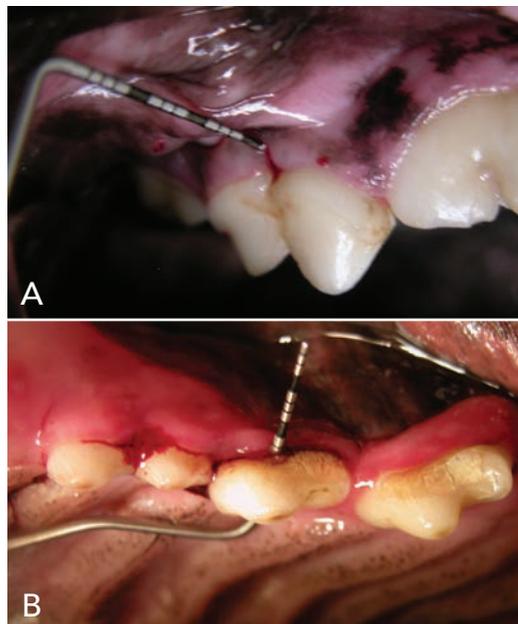

FIGURE 13. Intraoral pictures of canine patients with furcation exposure Stages 2 (**A**) and 3 (**B**); these teeth require periodontal flap surgery or extraction.

PRACTICAL TIP: Educate your clients about the various treatments required, or available, for periodontal disease **prior** to the surgical appointment, and discuss cost. This avoids miscommunication and frustration related to clients' decisions about dental procedures.

IN SUMMARY

Periodontal disease is a very common, but misunderstood disease process that has numerous deleterious consequences both regionally within the oral cavity and systemically.[5,6] Utilization of the tools and information provided in this article will aid clinicians in diagnosing and treating this common but significant disease process.

Read **Proper Treatment of Periodontal Disease** in an upcoming issue of *Today's Veterinary Practice*.

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