



# The Importance of Dental Radiology

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*This is the second article in our Practical Dentistry series, which is presenting different aspects of veterinary dental care and how it can provide best medicine for patients and an improved bottom line for the practice. Read the first article in the series, **Dental Services: Good***

***Medicine for Patients & Practices** (September/October 2011), at [todaysveterinarypractice.com](http://todaysveterinarypractice.com).*



Dental radiology is fast becoming the standard of care in veterinary dentistry. This is primarily because it is crucial for proper patient care. Utilizing the knowledge gained from dental radiographs improves patient care as well as client acceptance of treatment recommendations. Consequently, increasing the number of dental procedures performed also significantly increases income for a veterinary practice. Following are several dental conditions in which dental radiography plays an important role in patient care and treatment.

## PERIODONTAL DISEASE

Periodontal disease is by far the most common problem encountered in small animal veterinary medicine. It has been estimated that by the age of 2, 70% of cats and 80% of dogs have some form of periodontal disease.<sup>1</sup>

Periodontal probing is an important first step in

the evaluation of periodontal disease. However, there are several reasons that dental radiographs should be obtained when evaluating periodontal disease:

- Periodontal pockets may be missed during probing due to narrow pocket width, a ledge of calculus, or a tight interproximal space.<sup>2</sup>
- Dental radiographs can serve as a visual baseline and ongoing documentation to evaluate the effectiveness of professional therapy and home care.<sup>2</sup>
- Radiographs are absolutely critical in cases of periodontal disease of the mandible of cats and small or toy breed dogs. In these patients, periodontal disease can cause marked weakening of the mandible and significantly increase the possibility of iatrogenic fracture during the extraction attempt (**Figure 1**, page 76).<sup>3</sup> A pre-operative dental radiograph can help the practitioner avoid this result. Alternatively, if a mandibular fracture does occur, the radiograph will provide conclusive evidence regarding the cause.
- When several areas of the mouth are afflicted with periodontal disease, whole-mouth radiographs are indicated.<sup>4</sup>

## EDUCATING CLIENTS—SEEING IS BELIEVING

Go to [todaysveterinarypractice.com](http://todaysveterinarypractice.com) to view an in-clinic poster—**The Importance of Dental Radiographs**—that helps educate clients about the importance of dental radiography. It can be located on our website by selecting the Resources tab in the top navigation bar. The poster is available for purchase at [VETDENTALRAD.COM](http://VETDENTALRAD.COM).

## FELINE TOOTH RESORPTION

Dental radiographs are critical for diagnosis and treatment of feline tooth resorption (TR). Since these lesions typically initiate at or below the gingival margin, clinical evidence does not appear until late in the disease course. Therefore, severe root and painful

cervical crown resorption often occur undetected for long periods of time. For this reason, many veterinary dentists recommend taking full-mouth dental radiographs during each dental prophylaxis, beginning at 2 to 3 years of age.

Once a TR lesion is diagnosed, radiographs are crucial for appropriate therapeutic decisions. There are 2 recognized types of TRs (Types 1 and 2).<sup>5,6</sup>

### Type 2 Lesions

Type 2 lesions demonstrate significant replacement resorption of the roots, which makes extraction extremely challenging. Resorption in these cases typically continues until no recognizable tooth structure remains (**Figure 2**). In these cases, endodontic infection does not occur.

This finding has resulted in the accepted therapy of crown amputation for treating these teeth.<sup>7</sup> Remember, **ONLY** if there is significant ankylosis and root resorption (no evidence of periodontal ligaments or endodontic system), is crown amputation and intentional root retention an acceptable method of therapy.

### Type 1 Lesions

In contrast, type 1 TRs do not undergo replacement resorption. These teeth generally retain sufficient normal root and pulp structure that result in pain and infection if not fully extracted. If the dental radiograph reveals intact root structure (**Figure 3**) or worse yet an active infection (endodontic or periodontal), complete extraction is required. Extraction of these teeth often requires a surgical approach due to the resorption.

### Treatment

Armed with a diagnostic dental radiograph, the surgeon can save time by directing his or her efforts appropriately rather than delving after severely ankylosed roots. Radiographs will also allow the practitioner to more accurately estimate the surgical time and cost of the procedure.

There are no clinical signs that accurately differentiate between type 1 and

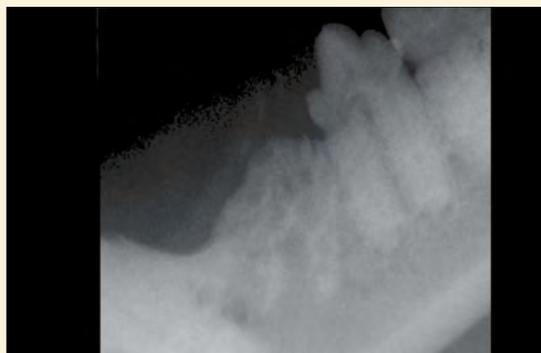
type 2 lesions. In addition, the degree of replacement resorption cannot be determined without dental radiographs. Therefore, without the knowledge provided by dental radiographs crown amputation therapy should **NOT** be performed.<sup>7</sup>

### ENDODONTIC (ROOT CANAL) DISEASE

Endodontic disease is also very common in veterinary dentistry. It has been shown in 1 published report that 10% of all dogs have at least 1 tooth with direct pulp



**Figure 1.** Advanced periodontal disease of the mandible; note the thin bone in the area of the first molar (arrows)



**Figure 2.** Intraoral dental radiograph of the mandibular left third premolar (307) in a cat with advanced type 2 tooth resorption. This is a crown amputation candidate.



**Figure 3.** Type 1 tooth resorption; note the significant coronal resorption (white arrows) but normal root structure (red arrows)



exposure.<sup>8</sup> Veterinary patients rarely show any obvious signs of oral pain or infection.<sup>10</sup> Therefore, because animal patients with endodontic disease may not show clinical signs of pain, they may suffer for a long time prior to diagnosis and definitive treatment.

### Identifying Disease

In cases of obvious endodontic compromise, such as a complicated crown fracture or intrinsic staining (discoloration of the tooth as a result of changes in the root canal system), radiographs may sway the reluctant client into pursuing therapy. However, dental radiographs are even more critical in cases where endodontic disease has either subtle or no clinical signs.

The most common instance of hidden endodontic disease is an uncomplicated crown fracture, where dentin but not the pulp is exposed (**Figure 4**). In the majority of cases, these teeth are vital; however, there is a possibility that the endodontic system has been infected through the dentinal tubules. This can result in tooth nonvitality and infection just like a tooth with direct pulp exposure. This painful infection **cannot** be diagnosed without dental radiographs.<sup>2</sup> Therefore, every tooth with direct dentin exposure should be radiographed to rule out endodontic disease.

### Radiographic Indications for Therapy

Further therapy is always indicated, depending on the results of the dental radiograph. If the dental radiographs reveal no signs of endodontic disease (**Figure 5A**), a bonded sealant should be applied to seal off the tooth from infection and to decrease sensitivity<sup>10</sup> (see **Bonded Sealant Application for Crown Fractures**, July/August 2011, available at [todaysveterinarypractice.com](http://todaysveterinarypractice.com)). The patient should have dental radiographs repeated in 9 months to ensure the tooth is/was not subclinically infected.<sup>10</sup>

If there is evidence of tooth death, such as wide root canals or periapical rarefaction (**Figure 5B**), root canal therapy or extraction is mandated.<sup>5</sup>

### PERSISTENT DECIDUOUS TEETH

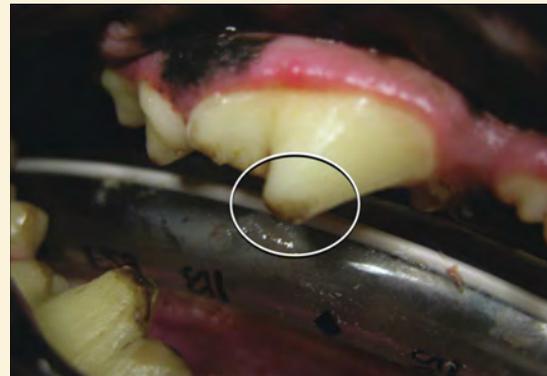
Extraction of persistent deciduous teeth is a very common procedure performed in veterinary dentistry. However, without dental radiographs it can be a very difficult and frustrating endeavor.

In some cases, the root of the deciduous tooth is normal and held in naturally by the periodontal ligament. In these cases, extraction is straightforward and root fracture should not occur if the extraction is performed correctly.

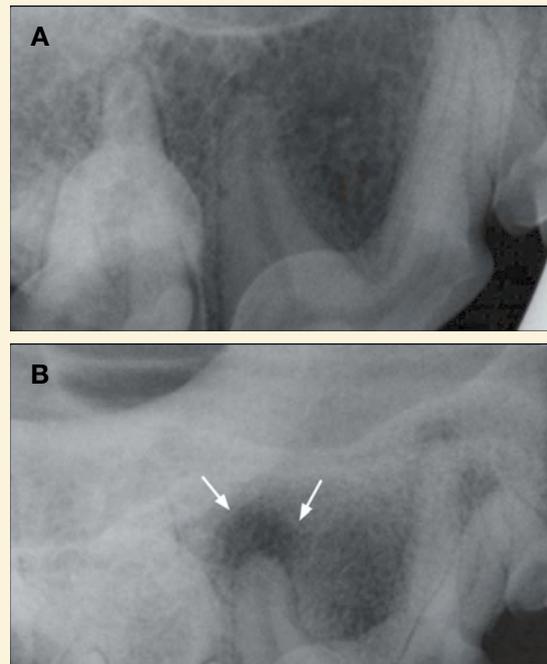
In many cases, however, the deciduous teeth will have undergone some to significant resorption due to the pressure placed on the deciduous tooth by the erupting permanent tooth (**Figure 6**, page 78).<sup>2</sup> This makes extraction very difficult and commonly results in a fractured root. In these cases (as in therapy for resorptive lesions), a surgical approach from the begin-

ning may be prudent. Regardless, if there is an identifiable root canal, complete extraction is required to avoid inflammation and infection.<sup>11,12</sup>

Finally, there are cases where the root structure of the deciduous tooth has been completely resorbed and the crown is only being held in by ankylosis at the alveolar crest (**Figure 7**, page 78).<sup>12</sup> Proper therapy for this situation requires that only the crown and very small retaining root segment be removed. With the help of dental radiographs to identify the condition, the practitioner knows exactly what therapy to pursue and does not cause unnecessary trauma to the patient.



**Figure 4.** Apparently healthy tooth with a small cusp fracture (circle); radiographs revealed endodontic infection (see **Figure 5B**).



**Figure 5.** (A) Dental radiograph of a normal maxillary fourth premolar for comparison; (B) same tooth as in **Figure 4** showing endodontic infection as noted by the dark areas around the root tip (arrows).

### MISSING TEETH

It is exceedingly common for teeth to be absent in the dental arcades of veterinary patients. In many cases the tooth is truly missing; however, in others, the tooth/root is present and may be pathologic. If radiographs have not been taken of the area, do not assume that the tooth is not present.

It is critical to note that 2 of the causes for missing teeth require no therapy while the other 2 can lead to significant pathology. Therefore, all apparently missing teeth should be radiographed to ensure that they are truly missing.

### Nonsurgical Conditions

Two possible etiologies for missing teeth include:

- *Congenital missing teeth*: Common in small, toy, and brachycephalic breeds<sup>13</sup>
- *Previously exfoliated (lost)*: Rare in young patients, but quite common in mature animals.

No therapy is necessary for the above conditions.

### Surgical Conditions

The following conditions require surgical extraction:

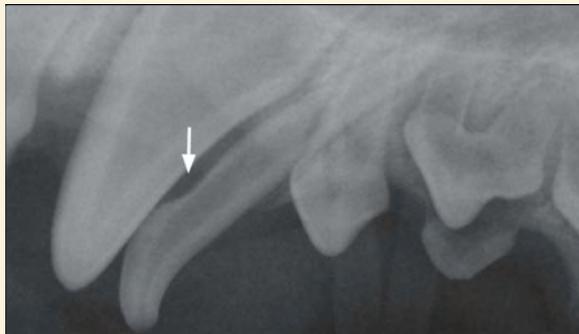
- *Fractured teeth under the gum line (Figure 8)*: This is rare in juvenile patients, but common in adults and may be the result from an incomplete extraction attempt. Dental radiographs will confirm a retained root and quite possibly infec-

tion. If the root appears relatively normal (ie, no resorption), surgical extraction is generally recommended to alleviate pain and endodontic infection. *Note: If there is no evidence of infection in the tooth and if extraction will be difficult due to resorption/ankylosis, it can be left in place. But ONLY if the FACTORS above are present.*

- *Impacted or embedded teeth*: These teeth can be malformed or normal, but they do not erupt into the dentition, usually because they are blocked by an area of thick and firm gingiva called an *operculum*. This condition is most common in the first and second premolars of brachycephalic breeds.

### Embedded Teeth

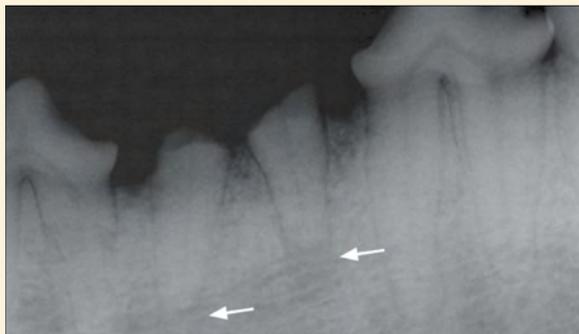
The biggest concern with embedded teeth is the development of dentigerous cysts, which arise from the enamel forming organ of the unerupted tooth. The incidence of this condition is unknown in veterinary medicine; however, anecdotally incidence is estimated at 50%. In 1 human study, pathologic changes were noted in 32.9% of cases.<sup>14</sup> As the cyst grows it will cause bone loss by pressure. These cysts can grow quite large in a short period of time, resulting in weakened bone (Figure 9). If surgery is not performed, a pathologic fracture may result.



**Figure 6.** Significant resorption just under the gum line (arrow) may cause the root to fracture, requiring surgical extraction.



**Figure 7.** A completely resorbed root (arrows) facilitates simple extraction



**Figure 8.** Intraoral dental radiograph of a mandibular left third premolar (307) in a dog that reveals retained roots. These roots are infected as evidenced by the dark areas at the tips of the roots (arrows).



**Figure 9.** Dental radiograph of the mandibular left premolar of a dog with a large dentigerous cyst; note the minimal amount of bone on the ventral cortex. This cyst formed as a result of the impacted mandibular first premolar (arrow).

### Impacted Teeth

Therapy for impacted teeth is surgical extraction. If cystic formation has occurred, en bloc removal or extraction of the tooth and meticulous curettage of the lining will prove curative.

### MANDIBULAR FRACTURES

Mandibular fractures are fairly common in veterinary medicine. They are generally traumatic in nature; however, in aging patients there is an emerging problem known as a *pathologic fracture*.<sup>15</sup>

Chronic periodontal loss loosens the tooth support and may eventually result in exfoliation. In the majority of teeth, this will occur prior to severe bone weakening. However, in some situations, significant bone thinning will occur prior to tooth exfoliation.

#### Pathologic Fractures

Pathologic fractures are most common in small and toy breed dogs because they:<sup>15</sup>

- Have a propensity for periodontal disease
- Tend to live longer
- Have proportionally larger teeth than do larger breeds, which results in the root apex of the mandibular first molar being very close to the ventral cortex of the mandible (**Figure 10**).

Pathologic fractures typically occur due to mild trauma or during extraction procedures. A pathologic fracture should be suspected in any case of mandibular fracture, especially in the area of the mandibular first molar or canine tooth of older, small- or toy-breed dogs.

#### Diagnosis & Treatment

Diagnosis of a pathologic fracture is only possible with dental radiographs because skull films typically provide insufficient detail. The classic appearance of a pathologic fracture is bone loss around the tooth and/or periapical lucency in the area of the fracture or other root of a multirooted tooth (**Figure 11**).<sup>2</sup>

The fracture will not heal no matter how perfect the fixation is if the diseased tooth root is not extracted (**Figure 12**)<sup>16</sup> due to the fact that the tooth will act as a nidus of infection; therefore, not allowing healing to occur.

### EXTRACTIONS

Dental radiographs should be a part of all pre- and postoperative extraction procedures.<sup>2</sup>

Pre-extraction radiographs allow the practitioner to determine the amount of disease present, any abnormalities, such as curved (**Figure 8**), supernumerary (**Figure 13**, page 80), and ankylotic roots (**Figure 2**). In addition, the level of remaining bone will be elucidated (see **Periodontal Disease**).

Postextraction dental radiographs are equally important. Regardless of the appearance of complete extraction, there is still a possibility of retained roots or other pathology, making postoperative radiographs critical in all cases (**Figure 14**, page 80).

### REVENUE RESOURCE

From a financial standpoint, there is no piece of veterinary equipment that has the potential to provide the return on investment that dental radiology does. If a moderately busy practice exposed radiographs whenever necessary, the equipment should be paid for in less than 3 months.



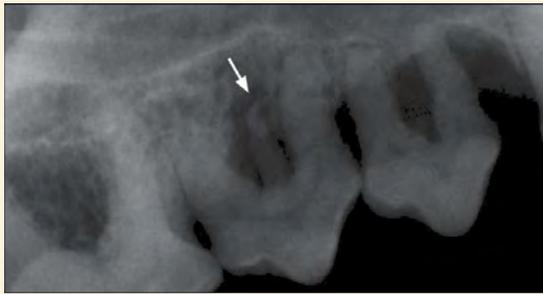
**Figure 10.** A mandibular left first molar with severe root curvature (arrow) and thin apical bone around the apex of the mesial root



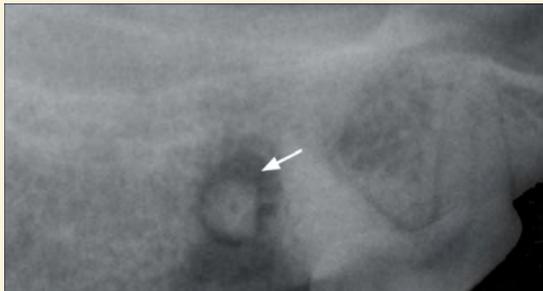
**Figure 11.** Intraoral dental radiograph of a patient with a pathologic mandibular fracture. There is significant bone destruction (black arrows) and weakened bone fractured at the distal root (dashed white arrow). Infection of this tooth is confirmed by the periapical rarefaction on the mesial root (white arrow).



**Figure 12.** Intraoral dental radiograph of the mandibular left premolar of a dog. The radiograph reveals severely infected teeth, bony sequestra, and a failed external fixator. This fracture did not heal despite 3 surgeries performed by a surgeon (but without the benefit of dental radiographs). Extraction of the infected teeth would allow healing to occur.



**Figure 13.** A maxillary right third premolar that has an extra root (arrow)



**Figure 14.** Intraoral dental radiograph of the maxillary right premolar of a dog with a large facial swelling (carnassial abscess). The maxillary fourth premolar had been “extracted” elsewhere several years ago and the patient had waxing and waning infection since then. Dental radiographs revealed the cause of the chronic infection, which was a retained mesiobuccal root (arrow). The significant local infection is shown by the rarefaction surrounding it. Extraction of the root was curative.

This does not include the income from the additional procedures that can now be performed with confidence, such as bonded sealant application, root planing and scaling, extractions, and periodontal surgery. Nor does it factor in the significant time savings during oral surgery. The information provided by radiographs regarding root and bone pathology as well as documenting complete extraction is crucial.

### CONCLUSION

Since virtually all veterinary patients have some form of oral disease and dental radiographs are indicated for any oral disease, almost all patients will benefit from the information provided by dental radiographs. In addition, dental radiographs provide critical information for the veterinarian when treating oral disease.

Therefore, dental radiography equipment should be used on a daily basis in every general practice. All patients undergoing general anesthesia for dental prophylaxis/cleaning should have radiographs taken. In my experience, dogs < 20 lb should have dental cleaning performed once a year; cats and larger dogs, every 2 to 3 years. Dental radiography provides peace of mind, which is priceless. ■

**FIGURE CREDITS:** Figures for this article provided courtesy of VETDENTALRAD.COM

TR = tooth resorption

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