A puppy or kitten’s first veterinary visit can seem like a blur to even the most experienced technicians. Vital signs are checked, the abdomen is palpated for hernias, joints are extended and flexed, vaccinations are given, and dewormers are administered. It might be easy for the veterinary team to overlook something that is just as important: the patient’s rapidly developing mouth. Puppies and kittens are born toothless, but by 8 weeks of age, many of their deciduous teeth have erupted, so an initial veterinary visit is an excellent time to check for abnormalities that could cause problems later (TABLE 1).

This article is designed to familiarize veterinary technicians and assistants with some of the most common dental problems in puppies and kittens.

**Normal Occlusion**

Normal adult dogs have 42 teeth, with the following dental formula for each side of the mouth:

- I3/3, C1/1, P4/4, M2/3

Normal puppies have 28 teeth, with the following dental formula for each side of the mouth:

- i3/3, c1/1, p3/3

Normal adult cats have 30 teeth, with the following dental formula for each side of the mouth:

- I3/3, C1/1, P3/2, M1/1

Normal kittens have 26 teeth, with the following dental formula for each side of the mouth:

- i3/3, c1/1, p3/2

To identify an abnormal occlusion, a veterinary technician must first understand how the teeth normally occlude. There are several criteria for determining whether a canine or feline patient has a normal occlusion (FIGURE 1), which is called a scissors bite. Start by examining the front of the mouth and work toward the back of the mouth. First check the incisors; the maxillary incisors should rest just slightly in front of the mandibular incisors. The mandibular canine teeth should be rostral to the maxillary canine teeth, half-way between the maxillary lateral incisor and the maxillary canine tooth. The maxillary and mandibular premolars should interdigitate so that a zigzag line could be drawn from front to back in the spaces between. The maxillary fourth premolars should rest outside the mandibular first molars.

**Pediatric Dental Abnormalities**

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<table>
<thead>
<tr>
<th>Age at Visit</th>
<th>Dental Abnormalities to Look For</th>
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<tbody>
<tr>
<td>8–16 wk</td>
<td>Missing deciduous teeth, malocclusion, fractured deciduous teeth</td>
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<tr>
<td>16–20 wk</td>
<td>Malocclusion, fractured deciduous teeth, persistent deciduous teeth</td>
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<tr>
<td>6–7 mo (spay/neuter visit)</td>
<td>Persistent deciduous teeth, missing permanent teeth, dentigerous cysts, impacted teeth, supernumerary teeth, crowding of permanent teeth, enamel abnormalities, fractured permanent teeth</td>
</tr>
<tr>
<td>6 mo–1 yr</td>
<td>All of the above, especially if the pet’s first visit occurs at this age (e.g., an older, already spayed or neutered puppy or kitten adopted from a shelter)</td>
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Courtesy of Westside Animal Hospital, Durham, North Carolina.
Malocclusions

There are many types of malocclusions with various degrees of severity. In some pets, malocclusion results in soft tissue damage, pain, increased risk of periodontal disease, and abnormal tooth-to-tooth contact and attrition. Malocclusion can have a dental and/or skeletal origin. A single tooth (dental origin) or an entire side of the jaw (skeletal origin) can be out of place. Common malocclusions that technicians might see include neutroclusion (class I malocclusion), mandibular distoclusion (class II malocclusion), and mandibular mesiocclusion (class III malocclusion).

In neutroclusion, one or more teeth may be out of place, but the maxilla and mandible meet up as they should. An example is a mesioverted canine tooth, which is also called a lance canine. Shetland sheepdogs are more likely than other breeds to develop mesioverted (lance) maxillary canine teeth that point forward instead of interdigitating properly with the mandibular canine teeth (FIGURE 2). Other examples of a class I malocclusion are anterior crossbite (FIGURE 3), posterior crossbite, and base-narrow (linguoverted) canine teeth. Treatment of a class I malocclusion may involve extraction, orthodontic movement (FIGURE 4), and/or crown reduction as well as vital pulp therapy of the affected teeth.

Dental radiographs should always be obtained when treating pediatric dental problems; without radiographs, a patient’s deciduous or developing permanent teeth could be irreversibly damaged during treatment.

In mandibular distoclusion, the mandible occludes behind (distal to) where it should (FIGURE 5). Because this causes the mandibular incisors and canine teeth to rest...
behind, rather than occlude with, their maxillary counterparts, they can traumatize the hard palate, causing pain and even a fistulous tract between the mouth and the nasal cavity (FIGURE 6). Treatment of a class II malocclusion does not correct the skeletal abnormality but does correct the individual teeth involved. Selective extractions, crown reduction, vital pulpotomy of the mandibular canine teeth (FIGURE 7), and/or orthodontics may be needed.1,5

In mandibular mesioclusion, the mandible occludes in front of (rostral to) where it should (FIGURE 8). In some cases, this allows the maxillary incisors and canine teeth to greatly damage the mandible. The maxillary incisors can dig into the soft tissue of the lower jaw because they do not interdigitate properly with the mandibular incisors. In addition, the maxillary canine teeth may occlude against the lingual surface of the mandibular canine teeth, causing an enormous amount of attrition and even wear into, and exposure of, the pulp chamber. Treatment of this malocclusion, as with mandibular distoclusion, does not correct the skeletal abnormality but addresses the teeth that are damaging either each other or the soft tissues of the mouth.

In brachycephalic dogs, such as pugs and boxers, mandibular mesioclusion is considered breed normal.1–5 However, these dogs’ mouths must be thoroughly examined throughout their lives to ensure that their “normal” occlusion does not result in soft tissue damage or excessive attrition and pulp exposure.

In all patients with malocclusion, it is important to ensure that their bite is not traumatizing the oral and dental tissues and causing, or likely to cause, pain. Dogs and
cats do not need beautiful occlusions, but they do deserve healthy, comfortable occlusions. Proper, prompt treatment of malocclusion or referral to a veterinary dentist can give patients a good start toward oral health.

**Basic Tooth Anatomy and Development**

The three main layers of every tooth are the enamel, dentin, and pulp. Enamel is the outermost layer and overlays the dentin, which surrounds the pulp chamber. Enamel is the hardest substance in the body, is nonporous, and cannot be regenerated if lost. Dentin is a hard but porous tissue, communicates with the pulp via microscopic dentinal tubules, and may be regenerated throughout a patient’s life. The pulp contains the nerve and blood supply to the tooth. The pulp chamber shrinks as the dentinal wall thickens throughout a patient’s life. On radiographs, this is immediately obvious, as the enamel and dentin of a young tooth appear to be a thin shell surrounding the large pulp chamber (FIGURE 9). As the patient ages, the pulp chamber appears smaller on radiographs because it is being filled in by secondary dentin.2–5

**Enamel Abnormalities**

Enamel abnormalities are more likely to be noticed during older puppy or kitten visits. Because amelogenesis stops at or before eruption,7 the enamel on adult teeth when they erupt is the only enamel that a patient will ever have. If the enamel has developed abnormally, even normal wear will eventually result in permanent loss of protective enamel. Affected teeth may look pristine at eruption only to become mottled as food, calculus, and other debris accumulate quickly on abnormally roughened, diseased enamel.4

According to the American Veterinary Dental College, a distinction must be made between two types of enamel abnormalities—enamel hypoplasia and enamel hypomineralization. In *enamel hypoplasia*, the enamel has a normal structure but is not thick enough and, therefore, wears down more quickly than normal enamel. This type of enamel defect can be extremely localized, even affecting only one small spot on a tooth covered by otherwise normal enamel, or it can affect multiple locations on multiple teeth. In *enamel hypomineralization*, the enamel is structurally abnormal because it did not mineralize properly during amelogenesis. Teeth affected by this type of defect do not have normal enamel on their crowns8 (FIGURE 10). As with any dental abnormality, radiographs are an important part of the diagnostic process when affected patients are evaluated.

Enamel abnormalities can appear as a single spot on a single tooth, or they can affect every tooth in a patient’s mouth. Enamel abnormalities have many different causes. Trauma or infection that affects a tooth during enamel development can result in focal areas of abnormal enamel on individual teeth. High fever, nutritional deficiencies, or administration of certain drugs during amelogenesis can result in abnormal enamel on every tooth.3,5,7 Some patients seem to have a genetic propensity for enamel hypoplasia or

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**FIGURE 9**
Radiographs demonstrating the shrinking pulp chamber in a dog’s canine tooth. (A) The patient’s maxillary canine pulp chamber as a puppy. (B) The same tooth’s pulp chamber 2 years later.

**FIGURE 10**
Enamel hypomineralization in a young Samoyed. (Courtesy of Westside Animal Hospital, Durham, North Carolina)
hypomineralization. The possible consequences of enamel defects include discomfort associated with exposed dentin, pulp infection, tooth death if bacteria migrate down the dentinal tubules to the pulp, and increased risk of periodontal disease. Abnormal enamel is often rough and porous, allowing more rapid accumulation of plaque and calculus than normal (smooth) enamel does.

To treat enamel defects, first remove plaque and calculus from all affected surfaces and gently remove unsupported or flaky enamel with a hand scaler. Then restore these teeth with a dentinal bonding agent and dental composites to decrease the chance of infection and to seal the dentinal tubules to reduce sensitivity. It is very important to obtain follow-up dental radiographs every 6 to 12 months to ensure that the teeth remain vital. To slow the accumulation of plaque and calculus in these patients, home care and regular professional dental cleanings are very important. Daily toothbrushing, weekly plaque-prevention sealants, dental diets and chews, and antiplaque water additives can all be used at home.

“Missing” Teeth

Teeth that are not present above the gumline can be either truly missing (and, therefore, not a problem) or unerupted. An ideal time to check for missing teeth, especially in a wiggly puppy or kitten, is when the patient is under anesthesia for spaying or neutering. Unerupted teeth found at this time can be documented, radiographed, and, if necessary, extracted.

Teeth may not erupt properly for several reasons (e.g., improper orientation in the jaw due to malocclusion or crowding; trapping of teeth under a tough, fibrous gingiva).

If an unerupted tooth is found early enough and is merely trapped under unusually dense gingival tissue, operculectomy to remove a flap of this tissue should allow the tooth to erupt normally. Dental radiographs are important for determining whether the tooth is oriented properly and trapped beneath the gingiva or impacted in the jawbone. An impacted tooth must be extracted if operculectomy is not an option. If an impacted tooth is untreated, a dentigerous cyst may form. Although these cysts are usually not painful, they grow rapidly and can be incredibly invasive, destroying bone and teeth as they grow (FIGURES 11 and 12). These cysts can even weaken the jawbone to the point of fracture. If a dentigerous cyst forms, the veterinarian must remove the affected tooth and any teeth with extensive bone loss and then curette the cyst lining. Most dentigerous cysts can be prevented if dental radiographs are obtained early for patients with “missing” teeth.

Boxers are extremely predisposed to having supernumerary incisors and first premolars. These teeth can become impacted and form dentigerous cysts, so even if the tooth count is correct (42), an unerupted extra tooth may exist. Full-mouth radiographs are essential for detecting this problem.

Persistent Deciduous Teeth

Persistent deciduous teeth are deciduous teeth that are still in the mouth after their permanent counterparts have erupted. These teeth can be found in any dog or cat but are more common in small-breed dogs. According to the “rule of dental succession,” if any part of the permanent crown has erupted, the deciduous tooth should have fallen out. If an adult tooth has not partially or fully erupted by 6 to 7 months, consult a veterinarian.
months of age, a radiograph should be obtained to determine whether the tooth is missing or is impacted beneath the gingiva. If a deciduous tooth is still present and there is no adult tooth to replace it, the deciduous tooth does not need to be extracted if it stays healthy.3

In cases in which adult teeth have developed, two possible sequelae of persistent deciduous teeth are malocclusion and crowding. Because two teeth are vying for a space meant for one, the permanent tooth cannot erupt into proper occlusion with the rest of the teeth.1 Permanent teeth, except for the maxillary canine teeth and the maxillary fourth premolars, erupt lingually to the deciduous teeth that they are meant to replace. The permanent maxillary canine teeth (FIGURE 13) and permanent maxillary fourth premolars erupt rostrally and buccally, respectively, to their deciduous counterparts.3 Persistent deciduous teeth prevent permanent teeth from moving into their proper place. Persistent deciduous teeth are simply in the way and must be extracted so that the permanent teeth will not cause a traumatic occlusion. For example, if the mandibular permanent canine teeth are erupting but the deciduous teeth are still in place and are not extracted, the permanent teeth will be lingual to where they should be, meaning that they will not occlude properly in the space between the maxillary canine tooth and the maxillary lateral incisor. If this happens, the mandibular canine teeth may occlude with the roof of the mouth instead, resulting in discomfort and, possibly, infection.1

Persistent deciduous teeth also cause crowding in the mouth. Small-breed dogs, which are predisposed to persistent deciduous teeth, have tiny, crowded mouths, so the addition of even one more tooth can lead to food impaction between teeth and faster plaque and calculus deposition, eventually leading to periodontal disease.1,5

Persistent deciduous teeth must be extracted carefully. The long, thin roots of these teeth require the use of delicate extraction instruments to avoid damaging adjacent permanent teeth.4

Fractured Deciduous Teeth

Puppies and kittens explore the world with their mouths, stressing their fragile and rapidly developing dentition. The enamel and dentin of a deciduous tooth are thin, and the pulp chamber is comparatively large, so any fracture is likely to expose the pulp.1,3 Once the pulp is exposed, the tooth can become infected and die. This is painful and could result in a draining tract and infection of the bone surrounding the tooth (FIGURE 14). In addition, this could seriously damage the unerupted permanent tooth.1

The affected tooth must be radiographed (FIGURE 15) and very carefully extracted, along with the root, using deli-
cate instruments designed for tiny, fragile deciduous teeth. Using improper technique or instruments that are too large may damage the permanent tooth bud.\textsuperscript{1,3,4}

**Conclusion**

Puppy and kitten visits are a valuable time for examining the ever-changing dentition of young pets. These visits are also important for discussing dental home care with owners and demonstrating proper techniques to them. Owners can help ensure a lifetime of dental health for their pets by making a habit of brushing their pets’ teeth daily.

While the whole veterinary staff is essential to educating clients about home care and finding and discussing pediatric dental abnormalities, these issues can be challenging, requiring an experienced veterinarian. Referral to a dental specialist should always be presented as an option to clients. Dental problems that are found during puppy and kitten visits should be addressed promptly, before they cause weeks, months, or a lifetime of discomfort.
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1. When in proper occlusion, the mandibular canine teeth should be ______ to the maxillary canine teeth.
   a. rostral
   b. distal
   c. palatal
   d. none of the above

2. Which of the following breeds is most prone to lance (mesioverted) maxillary canine teeth?
   a. boxers
   b. Shetland sheepdogs
   c. shih tzus
   d. German shepherds

3. How many deciduous teeth are puppies supposed to have?
   a. 14
   b. 20
   c. 26
   d. 28

4. The _____ contains a tooth’s nerve and blood supply.
   a. dentin
   b. pulp
   c. enamel
   d. none of the above

5. Which of the following is not a potential cause of enamel defects?
   a. high fever
   b. trauma due to inappropriate extraction of an adjacent tooth
   c. vaccination
   d. nutritional deficiencies

6. Which of the following is/are appropriate home care for a pet with enamel hypomineralization?
   a. water additives
   b. daily toothbrushing
   c. weekly plaque-prevention gel
   d. all of the above

7. Which statement about dentigerous cysts is false?
   a. They may form after a tooth becomes impacted in the jawbone.
   b. They are treated by lancing and draining the cyst.
   c. They can cause massive destruction of teeth and bone.
   d. They can be detected using dental radiography.

8. Which of the following defines operculectomy?
   a. the extraction of a deciduous tooth
   b. Use of a dentinal bonding agent to restore an enamel defect
   c. removal of a flap of tough gingival tissue to allow an unerupted tooth to erupt
   d. treatment of the exposed pulp of a fractured tooth to prevent it from becoming infected

9. The permanent mandibular canine teeth erupt ______ to the deciduous mandibular canine teeth.
   a. lingually
   b. rostrally
   c. palatally
   d. buccally

10. Why are deciduous teeth prone to fracture?
    a. They have thin enamel and dentin overlying a large pulp chamber.
    b. They do not have roots.
    c. They do not have a pulp chamber.
    d. Their enamel has not been produced.