Abstract

The purpose of an oral examination is to determine whether all teeth are erupted (visible) and in proper alignment, specifically whether the patient has primary dentition, permanent dentition, malocclusion, persistent deciduous teeth, or missing teeth within an arcade. If a tooth is missing, it should be noted in the patient’s record and a history should be taken. An unerupted tooth is associated with potential development of a follicular dentigerous cyst. The sooner a dentigerous cyst is detected and treated, the less invasive the surgical treatment and the better the prognosis.
Dentigerous Cysts: An Overview

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Some clients bring their pet to the veterinary hospital because they notice a swelling on the face, sometimes large enough to cause facial asymmetry (FIGURE 1). Others may bring their pet in with no clinical signs other than a “missing tooth,” which may be truly missing or may be unerupted and thus not visible. Even for patients presented for wellness examinations, with no client complaints, an oral examination should be performed to determine whether all teeth are visible and in proper alignment. An unerupted tooth may lead to formation of a follicular dentigerous cyst (DTC); unerupted teeth and formation of DTCs are closely associated. The incidence of unerupted teeth developing into DTCs is low, but 1 study noted pathologic changes in 32.9% of cases secondary to unerupted teeth in humans.¹

Take-Home Points

- Dentigerous cysts (DTCs) are more common in dogs than in cats, especially brachycephalic breeds (e.g., pugs, Shih Tzus, Boston terriers, boxers).
- Any missing tooth should be noted in the patient’s record and investigated to ensure that it is truly absent versus unerupted.
- Although any tooth can be affected, the tooth most likely to be affected by a DTC is the mandibular first premolar.
- Oral radiography is the preferred tool for identifying an unerupted tooth and/or DTC.
- Histopathologic examination of cyst lining is needed for a definitive diagnosis of DTC.
- Complete en bloc removal of the affected tooth and cystic membrane is curative.
- Annual oral examination and radiographs are needed to ensure that a DTC has not recurred.
Oral examinations are valuable for patients of all ages as early detection of DTCs leads to less invasive treatment and improved oral health and quality of life for the patient.

ODONTOGENESIS

Odontogenesis, or tooth development, is a process that includes the formation and eruption of primary and permanent teeth. Each individual tooth bud size, shape, and location is genetically predetermined. Dogs and cats have diphyodont dentition, which means they have 2 sets of teeth within their lifetime; a primary set (deciduous) and a secondary set (permanent). Puppies should have a total of 28 primary teeth and kittens a total of 26 primary teeth within their oral cavity (TABLE 1). Molars are not preceded by primary teeth and thus are not visible in the mouth until adulthood. After the eruption of their permanent teeth, adult dogs should have 42 teeth and adult cats should have 30 teeth (TABLE 2).

During Embryonic Development

Odontogenesis begins while an animal is an embryo and continues for a short while after birth. By day 30 of gestation, the dental papilla, enamel (dental) organ (an aggregate of cells around a developing tooth, responsible for enamel production), and dental follicle have formed. Enamel is then formed and deposited by ameloblasts (cells within the epithelial lining of the enamel organ that secrete proteins that will later mineralize to form enamel) onto the developing tooth via the enamel organ and follicle. Osteoclasts expedite eruption by resorbing alveolar bone and creating a pathway for the tooth to exit its bony crypt. After a tooth has completely erupted, the enamel-forming organ is worn away.

At 3 to 6 Weeks

When a dog or cat is 3 to 6 weeks of age, the primary teeth usually begin erupting into the oral cavity, and the primary incisors, canines, and premolars should be visible.

At 3 Months

In dogs and cats around 3 months of age, the primary teeth will begin to exfoliate and make way for permanent dentition.

At 6 Months

At 6 months of age, all permanent teeth should have erupted into the oral cavity and be in proper alignment.

DENTIGEROUS CYST FORMATION

Many factors affect tooth eruption (e.g., genetics, sex, environment, infection, skeletal deformities, persistent deciduous teeth, trauma). Although DTCs have been strongly linked to unerupted permanent teeth, they reportedly affect primary teeth as well.

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### TABLE 1 Deciduous Teeth Eruption Times

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>TOOTH EROSION TIME, WEEKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puppy</td>
<td>INCISORS: 4-6</td>
</tr>
<tr>
<td>Kitten</td>
<td>INCISORS: 3-4</td>
</tr>
</tbody>
</table>

* Dental formula for puppies: 3/3 I, 1/1 C, 3/3 P × 2 = 28 teeth.  
* Dental formula for kittens: 3/3 I, 1/1 C, 3/2 P × 2 = 26 teeth.  
   I = incisors; C = canines; P = premolars.

### TABLE 2 Permanent Teeth Eruption Times

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>TOOTH EROSION TIME, MONTHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dog</td>
<td>INCISORS: 3-5</td>
</tr>
<tr>
<td>Cat</td>
<td>INCISORS: 3-4</td>
</tr>
</tbody>
</table>

* Dental formula for adult dogs: 3/3 I, 1/1 C, 4/4 P, 2/3 M × 2 = 42 teeth.  
* Dental formula for adult cats: 3/3 I, 1/1 C, 3/2 P, 1/1 M × 2 = 30 teeth.  
   I = incisors; C = canines; P = premolars.
The most common cause of unerupted teeth is lack of space. Deciduous and permanent teeth need space to erupt properly. The eruptive force of a tooth emerging through the gumline enables the enamel organ around the tooth to tear and begin to dissolve. DTCs often result from disturbance to the normal eruption process (e.g., when there is not enough eruptive force to push a tooth past the buccal frenulum, when eruption is impeded by another tooth/structure). DTCs arise from the remnants of enamel organ that remain whole under the gumline. Ameloblasts have the potential to produce fluid, which can result in cyst formation (FIGURE 2).

**DIAGNOSIS**

DTCs are rarely noted in cats and are far more common among dogs, especially brachycephalic breeds (e.g., pugs, boxers, Shih Tzus, Boston terriers). Unerupted teeth with secondary DTC formation can be diagnosed at any age and can affect any tooth. Depending on its size and location, a DTC can encompass a single tooth (FIGURE 3) or several teeth (FIGURE 4). The tooth that most commonly becomes impacted or embedded in the dog, leading to a DTC, is the mandibular first premolar.

Patients with a small DTC (FIGURE 5) are generally asymptomatic (no discomfort/swelling) and the DTC may remain undiagnosed unless incidentally noticed on oral radiography performed during a routine dental procedure. Patients with a large DTC may exhibit facial swelling and/or distortion. Despite the size of a DTC, clients should be asked if the patient has shown signs of oral pain (e.g., drooling, chattering, pawing at the mouth, dropping food, chewing on 1 side of the

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**FIGURE 2.** Illustration of a dentigerous cyst.

**FIGURE 3.** Small dentigerous cyst (arrowheads); the asterisk indicates an impacted tooth.

**FIGURE 4.** Large dentigerous cyst (arrowheads) encompassing 404, impacted 405 (asterisk), and the mesial root of 406.

**FIGURE 5.** Gross presentation of small dentigerous cyst (arrowheads).
mouth, reluctance to play with hard toys, avoiding hard treats, avoiding letting anyone touch their mouth).

For patients with a “missing” tooth, oral radiography is used to indicate if the tooth is actually absent or if it is impacted, embedded, or surrounded by a cyst-like structure. If a cyst is present, radiographs will show the affected tooth as well as the extent of the alveolar bone or cortical bone resorption caused by the cyst. Radiographically, a cyst appears as a circular radiolucent lesion with a well-defined cortex. However, although radiographs can be used to determine if a cyst is present, they cannot definitively diagnose it as a DTC. To determine if a cyst is truly a DTC, a sample of the cyst lining should be submitted for histopathology (FIGURE 6). Among humans, rare cases of ameloblastoma and carcinoma cells have been found in the lining of cysts submitted for histology. Similarly, among dogs, a few cases of carcinomas and ameloblastic fibro-odontoma associated with a DTC have been reported.

**TREATMENT**

Early treatment of a DTC is key to a successful outcome. Several surgical options are available for patients with unerupted teeth and a DTC; the choice depends on the extent of pathology.

**En Bloc Excision**

A typically curative treatment is surgical removal of the offending tooth (FIGURE 7) and debridement of the cystic lining via complete en bloc surgical excision of the cyst (FIGURE 8). Incomplete excision of cystic material can result in a residual (recurrent) cyst, requiring another surgical procedure. After curettage and removal of the cyst, bone graft material is typically not needed to fill the cavity.

**Two-Stage Excision**

For patients with large DTCs, it is best to proceed with caution as surgical procedures can injure adjacent...
structures (e.g., maxillary/mandibular artery, nerves, surrounding teeth).\(^7\)

Treatment of large cysts can be approached in 2 stages. In the first stage, a large cystic wall is marsupialized to provide continuous drainage and reduce the cavity size. In the second stage, the cyst is removed en bloc.\(^7\) Teeth that are adjacent to the cyst may also require treatment, depending on whether they are affected by tooth resorption or significant loss of alveolar bone or vascular supply.\(^7\) It is strongly recommended that patients with a large DTC involving multiple teeth and structures be referred to a veterinary dentist.

**Medication**
Depending on the extent of the work performed, nonsteroidal anti-inflammatory medications and opiates may be appropriate for postoperative pain management. Postoperative antibiotics are not needed unless an infection is present before or at the time of surgery. Because of the possibility of recurrence, 6- and 12-month recheck examinations with oral radiography are recommended to be sure that the treatment was curative (FIGURE 9).

**CLIENT COMMUNICATION**
Clients with brachycephalic dogs should be informed of the possibility that an unerupted tooth may lead to a future DTC. Client education and dental disease prophylaxis will not only prevent a patient from suffering in silence but also promote oral health care for the rest of the patient’s life.

After a patient has undergone an oral exam, the client should be informed of the findings, such as the extent of dental disease, missing teeth, or misaligned teeth. If an unerupted tooth or DTC is discovered, the clients should be informed of the condition and the value of early removal. For advanced cases, clients should be given the option of referral to a veterinary dentist.

For patients younger than 6 months, a missing tooth or other anomaly can be addressed at the time of the patient’s sterilization procedure. For patients older than 1 year, a missing tooth or other anomaly can be addressed during any other surgical procedure, but additional examination and testing (e.g., blood analysis) may first be needed. The recovery process for patients with a DTC is similar to that of any routine extraction (i.e., 14 days of postoperative recovery, a soft food–only diet, and avoidance of hard toys and treats).

The potential for DTC recurrence should also be discussed. Clients should be advised to bring the patient back within 6 months to up to a year for recheck oral radiographs to be sure that the treatment was curative.

**SUMMARY**
A complete history obtained during a patient’s physical examination, whether the patient is young or old, may indicate whether a tooth is missing because it was removed during a previous dental procedure or whether the cause is unknown (e.g., animal was recently rescued/adopted).

A comprehensive oral examination should be performed for every patient, if amenable. For patients that are not amenable, chemical restraint can be used or the oral examination can be performed while the patient is anesthetized for another procedure. Also, while the patient is sedated or under general anesthesia, oral radiographs can be taken to confirm whether the patient has a missing tooth, unerupted tooth, and/or a DTC.

When a tooth appears to be missing without indication of being extracted, full-mouth oral radiographs are always indicated. Definitive diagnosis of DTCs requires submission of a cystic lining sample and histopathologic confirmation (which can also rule out the possibility of underlying conditions such as ameloblastoma and carcinoma).

When a DTC is diagnosed early, treatment by en bloc surgical removal is curative, and the prognosis is
excellent. General practitioners can usually perform en bloc removal of small/focal cysts and accompanying affected teeth; complicated large cysts may require referral to a veterinary dentist.

References