

Chapter 16: Pediatric Dentistry

Certainly, the incidence and severity of periodontal disease and other oral problems increases with age, but young animals may also suffer from a number of dental and oral maladies. Often, early recognition and treatment of these problems can prevent more serious complications in later life. This chapter will cover some of the more common dental concerns in dogs and cats during their first year of life. It is not my intent to teach you techniques for treating these conditions, but rather to teach you to recognize them, their significance and to understand that treatment is both indicated and available.

Juvenile Dental Problems Recognized in the First Weeks of Life

Microglossia (Bird Tongue):

Microglossia is a lethal hereditary abnormality that results in, among other things, an abnormally small tongue. The puppies are usually presented for evaluation of difficulty nursing, as they are unable to latch on to the nipple properly. As well, these puppies seem mentally dull, disinterested in nursing and lack the swallowing reflex. It had been suggested that puppies that die of Fading Puppy Syndrome are in fact afflicted with microglossia and fade due to an inability to nurse with resultant malnutrition, dehydration and aspiration pneumonia.

Wiggs and Lobprise reported on a litter of five Miniature Schnauzer puppies, in which there were three affected individuals. With intensive nursing care, the affected pups survived to seven weeks of age at which point their condition deteriorated dramatically and they were euthanized. During their short lives, it was observed that the puppies developed slowly compared to litter mates; they were smaller in stature, slower to open their eyes, were unable to stand or walk and had intermittent digestive upsets. Post-mortem findings indicated that the condition is a complex multi-system birth defect with abnormalities noted in the tongue, pharynx, musculoskeletal system and the brain.

The characteristic abnormality for which the condition is named was described as follows:

“...the affected animals’ tongues had grossly normal deep base muscular layers, but the lateral and rostral thin portions were missing or underdeveloped. Light fimbriation was present on the lateral surfaces. Their tongues initially moved only in a dorso-ventral direction action [sic], with the tongue commonly placed against the roof of the mouth.”

The experience with this litter suggests that the prognosis is hopeless, even with heroic efforts to support the puppies. Immediate euthanasia seems the only reasonable recommendation. As this is a hereditary condition, the parents should be removed from the breeding pool.

Cleft Palates:

Clefts may be in the primary palate (rostral to the incisive foramen and including the lips) or the secondary palate (hard palate caudal to the incisive foramen and the soft palate).

Defects of the primary palate (harelip) usually cause no problems with nursing or respiration and are largely of cosmetic significance only. In most cases, surgical treatment can be delayed until the patient is mature, at which time the structures are larger and easier to work with and the anesthetic risks are lower. Primary palatal clefts may be unilateral or bilateral and when unilateral, are almost always on the left side in dogs. Standard surgical texts contain outlines of various surgical techniques for closing these defects.

Clefts of the secondary palate (hard palate caudal to the incisive foramen and the soft palate) are of much greater concern in the neonate. Congenital hard palate clefts are almost always midline and usually associated with midline clefts in the soft palate. These clefts result in a direct communication between the oral and nasal cavities. During nursing, milk will flow into the nasal passages leading to sneezing, gagging, coughing and nasal discharge. Affected animals are at great risk of developing aspiration pneumonia. Other signs include poor growth and weight gain and a general unthriftiness. The prognosis is guarded without surgical correction of the cleft to re-establish a functional separation between oral and nasal cavities. With successful closure of the defects, the prognosis is excellent.

The first challenge is keeping the patient healthy until anesthesia and surgery are acceptable risks. If the patient can be supported until six to eight weeks of age, there will be more tissue to work with and the anesthetic risk will be more manageable than in a newborn. Delaying surgery longer is contra-indicated as the defect often gets proportionally larger as the animal grows. Standard surgical and dental texts outline a variety of procedures for closure of midline hard and soft palate defects.

Clefts of the soft palate may be midline, unilateral or bilateral with a thin strip of palatal tissue down the midline. If sufficient tissue exists, some of these clefts are amenable to surgical repair.



Figure #16.1. Photos of clefts of the primary palate (top) and secondary palate (bottom).

Congenital bilateral absence of the soft palate has also been reported. In this case, the pharyngeal sphincter is incomplete and so the animal cannot swallow. It is not possible to surgically create a soft palate with the necessary neuromuscular anatomy for a functional sphincter and so the prognosis is hopeless.

The reader should be aware that repair of palatal defects can be frustrating. Complete healing does not often happen after the first surgery. The constant motion of the tongue, changes in air pressure during respiration and the difficulty in getting a tension-free closure with connective tissue support under the suture line all conspire to cause dehiscence. Plan at the outset on more than one surgery to effect complete closure of the defect.

On the other hand, the reader should also be aware that the first surgery has the best chance of success. If the first surgery fails, subsequent procedures are compromised by the disruption of the vasculature, loss of tissue and scarring from the first surgery. Therefore, plan the first surgery as if it will be your only chance at treating the condition and do everything possible to enhance its chances of success.

First Visits: (eight-week and twelve-week check ups)

Malocclusion:

When a puppy or kitten is presented for a check-up at eight weeks of age, it should undergo a thorough oral examination. By this age, the



Figure #16.2. This eight-week-old pup has a severe Class II malocclusion. The mandibular deciduous canine teeth are contacting and traumatizing the hard palate on the palatal side of the maxillary canine teeth and the mandibular incisors are trapped behind the incisive papilla and palatal rugae. This not only causes painful trauma to the hard palatal mucosa, it also mechanically prevents the mandible from catching up to the maxilla.

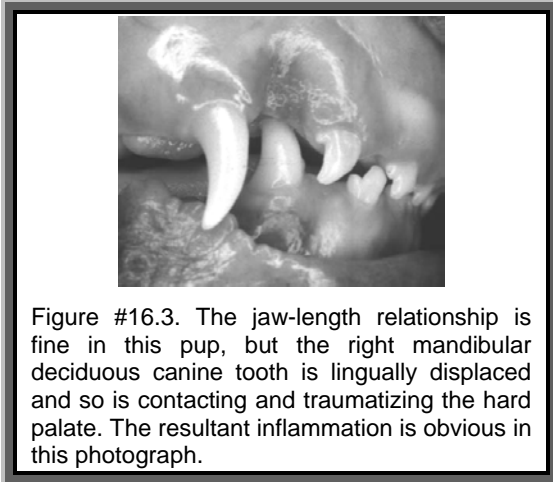


Figure #16.3. The jaw-length relationship is fine in this pup, but the right mandibular deciduous canine tooth is lingually displaced and so is contacting and traumatizing the hard palate. The resultant inflammation is obvious in this photograph.

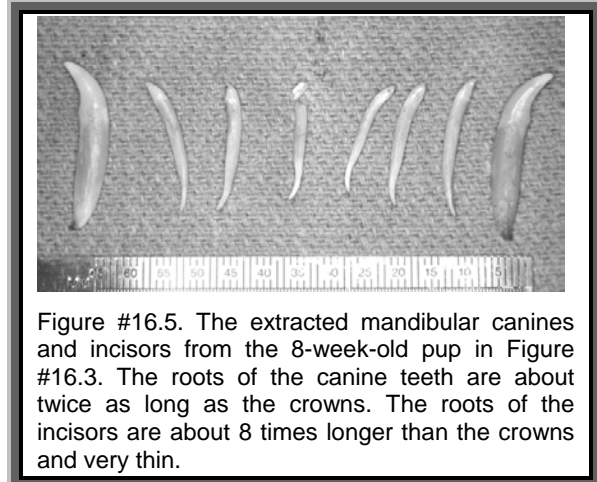


Figure #16.5. The extracted mandibular canines and incisors from the 8-week-old pup in Figure #16.3. The roots of the canine teeth are about twice as long as the crowns. The roots of the incisors are about 8 times longer than the crowns and very thin.

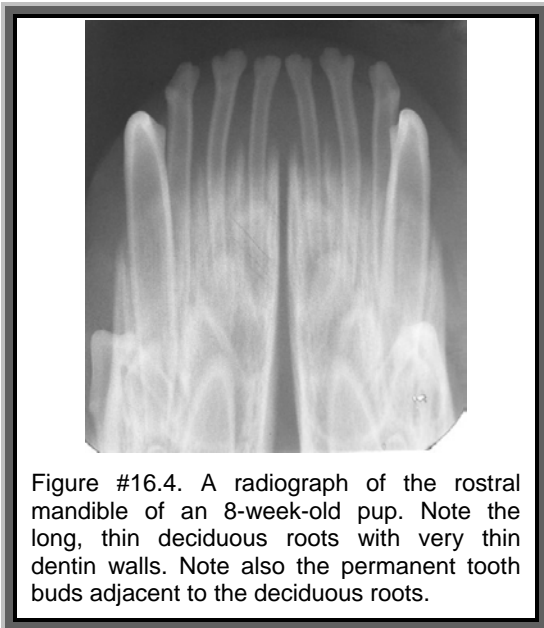


Figure #16.4. A radiograph of the rostral mandible of an 8-week-old pup. Note the long, thin deciduous roots with very thin dentin walls. Note also the permanent tooth buds adjacent to the deciduous roots.

deciduous teeth should be well erupted and in place. The upper incisors of the puppy should just slightly overlap the lower incisors and the lower canine tooth should be placed between the upper lateral incisor and the upper canine tooth. In kittens, the lower canine should be positioned as in the puppy, but the incisors may meet tip-to-tip in a level bite.

As the growth of the mandible and maxilla are under separate genetic control, the growth of one only influences the growth of the other in so far as they are “locked” together by the interdigitation of the teeth. If the teeth are properly positioned, as the maxilla grows, its upper canine can push on the back of the lower canine and “drag” the mandible along. As the

mandible grows forward, its incisors hit the back of the maxillary incisors and “push” the maxilla ahead. In this way, the proper mandible-maxilla relationship should be maintained throughout the growth period and into adulthood.

If the young puppy or kitten has a significant jaw length discrepancy so that there is an abnormal dental interlock (lower canines digging holes in the hard palate or upper incisors trapped behind lower incisors) then the potential for the short jaw to catch up is mechanically impeded.

In the example of an eight-week-old puppy with a short mandible (*Class II malocclusion*), the lower canines will often dig into the hard palate and the incisors will be trapped behind the incisive papilla of the hard palate. If the lower jaw attempts to go through a growth spurt to catch up to the maxilla, the interlock holds it back. The result can be that the mandible remains abnormally short or it may bend in the middle and bow ventrally.

A puppy or kitten with an obvious malocclusion is a candidate for *interceptive orthodontics*. Interceptive orthodontics involves the selective extraction of any deciduous teeth that would impede the development of a proper bite. The general rule is to extract the teeth from the short jaw. However, each case must be planned on its own merits. Extract those teeth that would impede desired growth but retain those that would encourage desired growth or impede abnormal growth. For a Class II malocclusion, extraction of the deciduous mandibular canines and incisors will alleviate the dental interlock. These procedures do not alter the animal’s genetic make-up nor do they *make* anything

happen. Rather, they *allow* the animal to express its full genetic potential by removing any mechanical impediment to growth. Owners and breeders should be cautioned that, even if the animal turns out normal, it required intervention and so should be bred very carefully if at all. A safer recommendation would be to neuter these animals at an appropriate age.

To maximize the benefit of interceptive orthodontics, it should be performed as soon as possible. The hope is that the jaw length relationship will normalize before the permanent teeth erupt and recreate dental interlock. The more time between deciduous tooth extraction and permanent tooth eruption, the better the chances of success. The owners should be made aware that most animals with jaw length discrepancies at eight weeks of age will not 'go normal', regardless of treatment, and there will very likely be orthodontic problems when the permanent teeth erupt.

A second benefit of interceptive orthodontics is that it immediately relieves the oral trauma and pain associated with abnormal tooth-to-tooth or tooth-to-soft tissue contacts. This on its own is sufficient cause to recommend the surgery. I have seen twelve-week old dogs with oronasal fistulas caused by misplaced mandibular deciduous canines perforating the hard palate.

Another common malocclusion is *base-narrow*, or *lingually displaced mandibular canine teeth*. In these cases, the jaw length relationships are normal, but the mandibular deciduous canine tooth crowns are parallel to each other. Since the maxilla is wider than the mandible, if the mandibular canines are standing up straight, they will contact and traumatize the maxillary gingiva or palatal mucosa. This causes pain and can lead to perforation into the nasal passage. It also creates an abnormal dental interlock that can impede the lateral growth of the mandible. Finally, the permanent mandibular canine tooth will erupt on the lingual side of its deciduous ancestor. Therefore, if the deciduous tooth is lingually displaced, there is a strong likelihood that the permanent canine tooth will also be lingually displaced.

The recommended treatment for lingually displaced deciduous mandibular canines is extraction of the offending deciduous mandibular canine teeth. Benefits of this surgery include immediate relief of the traumatic occlusion and removal of the abnormal dental interlock, allowing unimpeded lateral mandibular growth.

It also clears a pathway by which the permanent tooth can erupt in a more labial direction, tipped away from contact with the maxilla.

Fractured Deciduous Teeth:

Deciduous canine teeth are long and thin and are found in the mouths of puppies. These three factors make them very subject to wear and fracture which will expose the *pulp* of the tooth. The pulp is the soft tissue that is found inside a tooth and consists of blood vessels, nerves, lymphatics and connective tissue. Once exposed to oral bacteria, the pulp quickly becomes infected and dies. During this time, there is significant pain, but once the pulp is dead, the pain subsides. Next, infection oozes out through the root tip into the periodontal space around the root. This can cause a draining fistula, osteomyelitis and damage to the developing permanent teeth. The treatment for all deciduous teeth with exposed pulps is immediate and careful extraction of the entire crown and root. If the fracture is very fresh (less than 24 hours) vital pulpotomy and direct pulp capping is also an option.

It is beyond the scope of this chapter to outline the procedure for deciduous tooth extraction in detail, but some general comments are appropriate.

- Always take a pre-operative, intra-oral, dental radiograph to document the presence and location of developing permanent teeth.
- Elevate very carefully and avoid the area of the developing permanent tooth to avoid

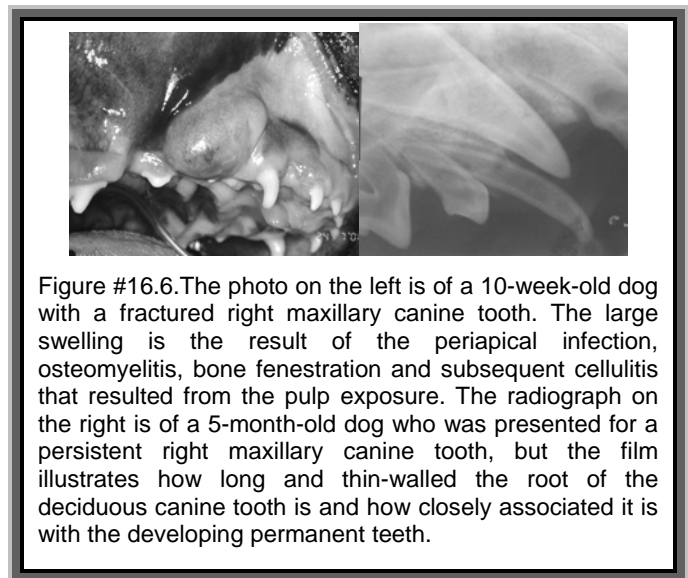


Figure #16.6. The photo on the left is of a 10-week-old dog with a fractured right maxillary canine tooth. The large swelling is the result of the periapical infection, osteomyelitis, bone fenestration and subsequent cellulitis that resulted from the pulp exposure. The radiograph on the right is of a 5-month-old dog who was presented for a persistent right maxillary canine tooth, but the film illustrates how long and thin-walled the root of the deciduous canine tooth is and how closely associated it is with the developing permanent teeth.

damage to it. Permanent teeth can be seriously damaged by careless extraction of deciduous teeth.

- Use appropriately sized (small and delicate) elevators and forceps.

Delayed Eruption of Deciduous Teeth:

By eight weeks of age, the deciduous teeth should all have erupted. Refer to page 31 for dental formulas and approximate eruption times for puppies and kittens.

Occasionally, the deciduous teeth will fail to erupt. In most cases they are impacted below dense, fibrous gingival tissue. Small breed dogs seem particularly prone to this condition. If the deciduous teeth fail to erupt, there may be insufficient room within the mandible and maxilla for normal development of the permanent teeth.



Figure #16.7. In the top photo, there is an obvious bulging of the gingiva where the deciduous third and fourth premolars are attempting to erupt but are impacted below dense, fibrous gingival tissue. In the bottom photo, operculectomies have been performed to expose the crowns of these deciduous teeth and to allow them to erupt properly.

Treatment is preceded by dental radiographs (as are virtually all dental treatments) to document the shape, size and location of the deciduous and permanent dentition. Then windows of gingiva are resected from around the crowns of the impacted deciduous teeth to reduce the resistance to eruption. If this is done between eight and twelve weeks of age, the deciduous teeth will usually erupt and lead the way for the eruption of their permanent counterparts.

Bear in mind that the molars and first premolars have no deciduous precursors. Therefore, animals that have had soft-tissue impaction of deciduous teeth should be monitored carefully, as they may also suffer from soft tissue impaction of the permanent molars.

For the permanent teeth that have deciduous precursors, the permanent begins as a bud forming from tip of the root of the deciduous. Therefore, if a deciduous tooth is congenitally absent, then the permanent tooth that should follow it will also be absent.

Third visit (four-month check-up)

By the time a pet is presented for rabies vaccine around 4 months of age, some of the permanent incisors should be erupting. The permanent canines and some of the premolars may also be erupting by this time. It is at this stage that you should start looking for *persistent deciduous teeth*. This is a problem commonly associated with small breed dogs, but can happen in cats and large breed dogs as well. The rule is that if the permanent tooth crown is visible above the gum line, then the deciduous tooth should be gone. If the deciduous tooth is still in place, it should be removed as soon as possible. Leaving a persistent deciduous tooth in place until six months (spay/neuter time) is inappropriate as it forces the permanent tooth to erupt into an abnormal location. The interactions are complex, but very simply, if the deciduous tooth is in place while the permanent is erupting, you have two teeth occupying the space meant for one and this will cause problems.

Typically, the animal has been presented monthly for check-up and immunization. After this visit, it is often two months before the animal is presented for spay/neuter. A lot will be happening in the mouth during those two months. It would be prudent to spend some time with the owners to explain what should happen and what problems they should be watching for.



Figure #16.8. This radiograph is from a five-month-old cat. Careless elevation to remove the persistent deciduous tooth could crack the very thin-walled developing permanent tooth root. There is resorption of the mesial wall of the deciduous tooth in the middle third of the tooth. The crown is intact as is the apical third of the root. The resorption makes it very likely that this tooth will fracture during extraction unless a delicate touch is used. The resorption has also resulted in pulp exposure and so the pulp and root must be considered contaminated. Therefore, if the tooth fractured during extraction, leaving the root tip in place would not be an option.



Figure #16.9. The persistence of the deciduous maxillary canine tooth is forcing the permanent canine tooth to erupt too far mesially, thus the space between the maxillary permanent lateral incisor and canine tooth is too narrow to accommodate the erupting crown of the mandibular permanent canine tooth. Timely removal of the deciduous tooth allowed the maxillary permanent canine to drop back so that the mandibular canine could erupt into the widened space.

It would be worth making a five-month check-up part of your puppy/kitten protocol so developmental abnormalities (persistent deciduous teeth and malocclusions of erupting permanent teeth) can be diagnosed early and dealt with in a timely fashion.

Six-month spay/neuter visit:

An animal presented for spay/neuter at about six months of age represents a golden opportunity. The animal will be under general anesthesia and so you can do an unhurried, thorough oral examination. In most breeds, all permanent teeth should be partially or fully erupted by this age. During your examination, you should note any missing or extra teeth, deformed or malpositioned teeth or any other situations that might predispose to problems. (See chapter 20).

Dentigerous Cysts:

“Missing” teeth should always be documented with an intra-oral radiograph. If the radiograph shows that the tooth is missing then it can be recorded as such on the animal’s permanent dental record for future reference. Though this may be of no functional significance to the animal (depending on which tooth is missing) some breed standards have specific requirements for the number of teeth and so the breeder should be informed of this developmental abnormality.

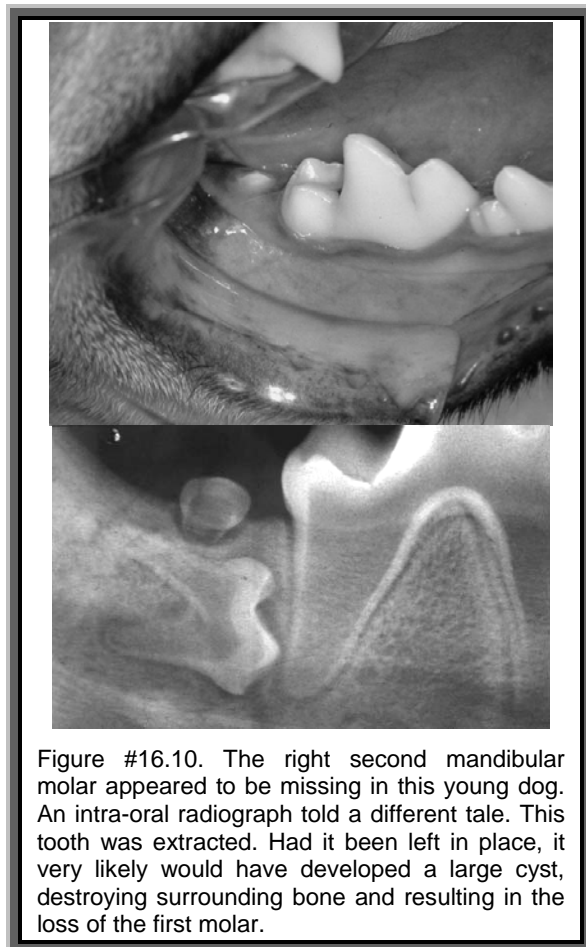


Figure #16.10. The right second mandibular molar appeared to be missing in this young dog. An intra-oral radiograph told a different tale. This tooth was extracted. Had it been left in place, it very likely would have developed a large cyst, destroying surrounding bone and resulting in the loss of the first molar.

If the radiograph shows a tooth that is unerupted for any reason then its extraction should be recommended. In theory, this extraction should not be done at the same time as a sterile

procedure due to the increased risk of infection at the sterile site. The finding of an unerupted tooth should be recorded on the animal's chart and the extraction scheduled as soon as possible.

In practice, if it is going to be a quick and simple procedure to extract an impacted tooth in a clean, young mouth, maybe it makes good sense to get it out while the animal is on the table, rather than leaving it for another anesthetic another day. Some owners may not return for that second anesthetic in a timely manner and so you might be further ahead to strike while the iron is hot. This is always a judgment call.

Failure to detect and extract an unerupted tooth will often lead to the development of a dentigerous cyst. These cysts, while benign, are destructive of bone as they expand, which can lead to loss of adjacent teeth. They have also been reported to undergo malignant transformation.



Figure #16.11. This series is from a 1.5-year-old chow with a left mandibular swelling. The mucosa over the lesion had a blue tinge to it. It is obvious that some teeth are "missing" from the area. In the pre-operative radiograph (centre), the cause of the swelling is found. The first mandibular premolar failed to erupt and a large dentigerous cyst had formed. The second premolar is actually missing. The intra-operative film (below) shows the size of the cyst and the extent of the bone destruction. The canine root had lost over 50% of its periodontal attachment and required extraction. If this small, impacted premolar had been removed when the dog was six months old, this massive cyst and the associated bone loss would have been prevented.



Figure 16.12. Top photo shows soft-tissue impactions of the mandibular and maxillary first molars. The bottom photo was taken after operculectomy surgery to expose the crowns of these teeth and encourage unimpeded eruption.

Soft Tissue Impaction

As with the deciduous teeth, the permanent teeth may become impacted below a layer of dense fibrous gingival tissue. Typically, if there has been a deciduous tooth to lead the way, the permanent tooth does not have trouble breaking through the gingiva. However, there are no deciduous first premolars or molars and so these are the permanent teeth most likely to have soft-tissue impaction. Following intra-oral radiography, treatment involved operculectomy to surgically remove enough gingiva over the crown of the tooth to alleviate the physical barrier to eruption while leaving enough gingiva for proper periodontal health.

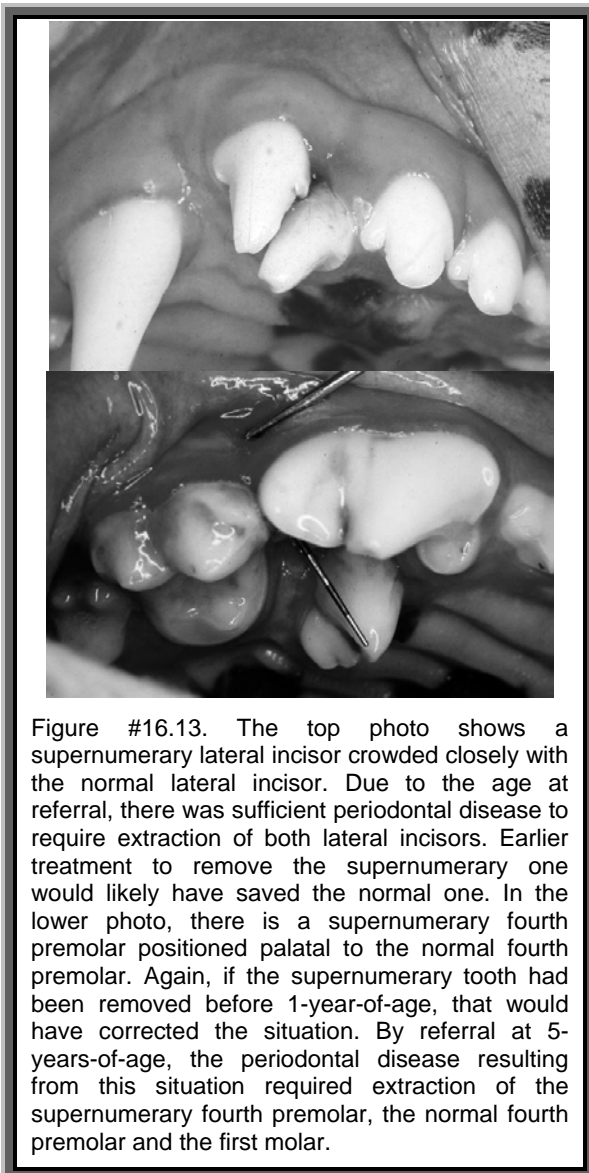


Figure #16.13. The top photo shows a supernumerary lateral incisor crowded closely with the normal lateral incisor. Due to the age at referral, there was sufficient periodontal disease to require extraction of both lateral incisors. Earlier treatment to remove the supernumerary one would likely have saved the normal one. In the lower photo, there is a supernumerary fourth premolar positioned palatal to the normal fourth premolar. Again, if the supernumerary tooth had been removed before 1-year-of-age, that would have corrected the situation. By referral at 5-years-of-age, the periodontal disease resulting from this situation required extraction of the supernumerary fourth premolar, the normal fourth premolar and the first molar.

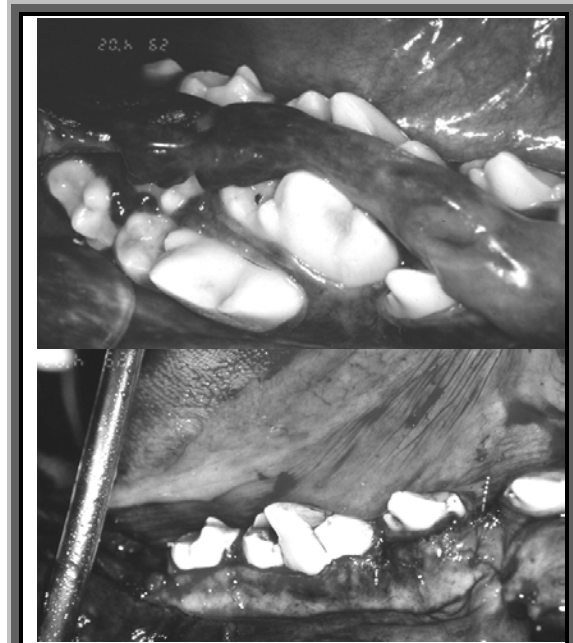


Figure #16.14. This dog had three rows of premolars and molars in the right mandible. Anatomically, the lingual and buccal rows were right mandibular teeth and the row in the middle was composed of left mandibular teeth. Treatment involved removal of the buccal and middle rows, soft tissue resection, osteotomy and closure of the defect by suturing the buccal gingiva from the buccal row to the lingual gingiva from the lingual row.

Supernumerary Teeth:

Extra teeth also call for an intra-oral radiograph to determine if there are two completely separate teeth or two crowns sharing a common root and pulp system. If you find that they are two completely separate teeth and the extra tooth is causing a crowding situation, it should be extracted in the near future.

Though incisors and first premolars are the most common teeth to have supernumerary copies, the condition can be found with any tooth.

Dental Crowding:

Many brachycephalic and small breed dogs will have severe crowding and rotation of teeth. This can lead to food impaction and early onset of periodontal disease. The suggested treatment is selective extraction of less significant teeth to relieve the crowding and improve the periodontal prognosis for the remaining teeth. If there are three teeth crowded together, then removal of the middle one may improve the outlook for the

other two. Failure to do this can lead to loss of all three within a few years.



Figure #16.15. The crowding of the maxillary premolars in this brachycephalic dog led to end-stage periodontal disease affecting all four premolars. Selective extraction of some at an early age would likely have saved the others.

Malocclusions:

Most orthodontic problems lead to abnormal tooth-to-tooth or tooth-to-soft tissue contacts. The resulting trauma can cause a variety of problems including periodontal disease, root resorption, oro-nasal fistulas and endodontic (pulp) disease. The treatment varies depending on the specifics of the condition but may involve selective extraction, crown reduction (with partial vital pulpotomy and direct pulp capping) or orthodontic movement of teeth to alleviate the abnormal contact.

One of the most common orthodontic problems is Class II malocclusion as discussed earlier in this chapter. If the lower jaw remains short relative to the upper jaw into maturity, then the



Figure #16.16. The lower jaw is too short compared upper jaw so the lower canine tooth is trapped to the palatal side of the upper canine and will cause considerable destructive trauma to the palate and the periodontal support of the upper canine.

permanent mandibular canine teeth will frequently be trapped on the palatal side of the maxillary canine teeth and will contact and traumatize the palatal mucosa. The trauma can result in oronasal fistulation, periodontal damage to the maxillary canine tooth, traumatic pulpitis in the mandibular canine tooth and other problems.

One option for malocclusion is extraction of the mandibular canine teeth. However, in these cases, the lower jaw is already too short and removing the canines will tend to cause further regression of the chin.

Another option might be to extract the upper canine teeth, remove the buccal cortical bone and suture the defect so that the lower canines can slip into the groove where the upper canines used to be. The risk with this is the that lower canines will contact the healing extraction site and may traumatize the flaps leading to dehiscence.

Crown Reduction:

A less painful and less disfiguring option is crown height reduction, partial vital pulpotomy and direct pulp capping.

In this procedure, the crown of the offending canine is amputated with a sterile carbide or diamond bur at a level that will allow the animal to close its mouth without the remaining crown stump hitting anything. I usually take the canine down to the level of the adjacent incisor and premolar. Of course, doing this exposes the pulp of the tooth. To prevent pain, pulp death and endodontic infection, the pulp must be protected. First, the remaining pulp is carefully excised to



Figure #16.17. A dog with Class II malocclusion following crown reduction of the mandibular canine teeth. This dog can now close his mouth without traumatizing his palate.

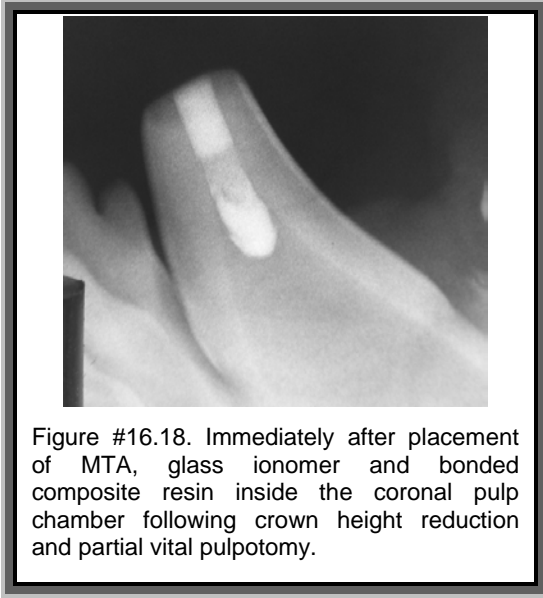


Figure #16.18. Immediately after placement of MTA, glass ionomer and bonded composite resin inside the coronal pulp chamber following crown height reduction and partial vital pulpotomy.

the level of the gum line with a sterile carbide bur in a high-speed hand piece (a low-speed hand piece will cause too much trauma for this purpose). Hemostasis is achieved by various means including flushing with cold saline, gentle pressure with sterile paper points and patience. A thin layer of calcium hydroxide powder or mineral trioxide aggregate is placed directly on the pulp stump followed by a layer of glass ionomer liner as a thermal barrier and then a final restoration of bonded composite.

The calcium hydroxide or mineral trioxide aggregate in contact with the pulp stump stimulates the production of reparative, tertiary dentin to further isolate the pulp from the outside world.

Though the use of calcium hydroxide has been the standard for a century or so, the new product may supplant it shortly. Mineral tri-oxide aggregate, which is a purified and fiendishly expensive form of Portland cement has been showing some promise as the material-of-choice to go in direct contact with the pulp. Research is on-going. A recent paper out of Brazil actually indicates that sterilized Portland cement itself worked just as well as the professional MTA product and at a considerably lower price.

As time goes on in a vital tooth, the dentinal walls get thicker as the pulp chamber becomes narrower. Six to twelve months after doing a pulp-capping, the tooth should be radiographed. This allows you to compare the pulp chamber size after time with the radiograph you took pre-operatively.

If the pulp survives the procedure, the chamber will continue to get smaller as the pulp continues to produce dentin. There should also be a layer of reparative dentin directly under the calcium hydroxide, the so-called dentin bridge. (See Figure #15.1, page 112 and Figure #15.14, page 120).

The advantages of crown amputation are that it is less traumatic and painful than extraction and it preserves the entire root and a significant portion of the crown. The tooth should be monitored radiographically throughout the animal's life, as there have been instances of the pulp becoming necrotic years after treatment. Should this happen, the tooth can still be saved by having complete root canal treatment.

Incline Planes:

In some cases of Class II malocclusion, and in cases of lingually displaced canines in dogs with normal jaw-length relationships, orthodontic movement of the mandibular canines might be considered. This treatment has the advantage of being the least invasive and giving a final result that is closest to normal.

There are several conditions which must be met before we can consider orthodontic procedures. There must be a vacant space to which the misplaced tooth can be moved. There must be a clear path for the tooth to take on its way to its new home. We must have a very co-operative patient who will allow daily examinations and cleaning of the appliance. We must have a very compliant and motivated owner who can be trusted to check and clean the appliance daily, keep regular recheck appointments and keep the animal from chewing things that might damage the appliance. The owner must understand that it will take one anesthetic to install the appliance, one to remove the appliance and possibly others for adjustments and repairs and that there can be no guarantees. Finally, it must be firmly established that the patient will not be used for showing or breeding and should be neutered prior to the start of orthodontic treatment. To orthodontically alter a show or breeding animal should be considered fraud. If all these conditions cannot be met, then do not even consider orthodontic repositioning as an option.

With the recent advent of early spay/neuter protocols, more and more animals are being spayed/neutered before six months of age. For these animals and for those that are not being neutered, plan on doing a thorough oral



Figure #16.19. Top photo shows the left mandibular canine tooth displaced distolingually to traumatize the palate mesiopalatal to the upper canine tooth. To create space for the lower canine to move forward, the lateral incisor was sacrificed. In the middle photo, acrylic incline planes have been attached to the maxillary canines and incisors (bilaterally) to guide the erupting mandibular canines to a desirable position. The bottom photo was taken one month after appliance removal. Appliances were in place for 28 days.

examination at six months of age with the patient awake. If there are *any* abnormalities or concerns anesthetize the patient for a more detailed visual inspection and appropriate radiographs.

Six months to one year:

If the patient has developed a normal occlusal relationship with the proper number of teeth all

in their proper place, then the rest of the first year should go smoothly, from a dental standpoint.

Once all the permanent teeth have erupted and the pain of 'teething' is over, it is time to start training the owner and animal in the art of dental home-care. Daily brushing of the teeth is the most effective means of controlling dental plaque and maintaining gingival health.

It is often suggested that owners should start introducing home-care at a very young age, when puppies and kittens are most easily trained. There is merit to this approach, but owners should suspend these efforts during the time of deciduous tooth exfoliation and permanent tooth eruption. Brushing during this mixed dentition period is very likely to cause pain; thereby teaching the animal that home-care is unpleasant. By waiting until the deciduous teeth are all gone and the permanents have all erupted, the owner can avoid this confounding factor. Home-care programs should be introduced gradually and with plenty of positive reinforcement, as with any behaviour modification program. Trying to proceed too quickly can result in a non-compliant pet and eventual failure of the program. Once a client had decided that they do not want to bother brushing their pet's teeth (because they tried and it did not go well), it will be very difficult to convince them otherwise.

Young animals may suffer fractures of permanent teeth as a result of inappropriate chewing habits or accidental trauma. As with mature patients, crown fractures that cause pulp exposure, or near exposure (thin layer of dentin remaining over the pulp), require treatment. Treatment options are limited to extraction of the fractured tooth or endodontic treatment to save it. In a mature patient, endodontic treatment usually means full root canal treatment (removal of all of the pulp and filling of the pulp chamber with dental materials). In a young dog or cat, full root canal treatment is often not an option.

When a permanent tooth erupts, the outside dimensions of the crown are established, but the wall of the crown, and especially of the root, are very thin and the pulp chamber is very large. Until the tooth has fully erupted, the apex of the root is wide open. Once the tooth has erupted to its full length, the pulp produces dentin inside the tooth to create an apical delta and thicker root and crown walls (this post-eruptive dentin production continues as long as the pulp remains alive and healthy).

If an immature tooth is fractured, it is very desirable to keep the pulp alive so that the tooth can continue in its normal internal development. This is accomplished by partial vital pulpotomy and direct pulp capping as is done following crown reduction (see chapter 15). The procedure removes only a small amount of pulp from the crown of the tooth and then seals the tooth to protect the remaining pulp and keep it vital. The prognosis for this procedure is greatly affected by the amount of time between injury and treatment. It is best if the tooth can be treated immediately, before the pulp becomes contaminated and inflamed. The younger the animal, the larger the pulp and the more forgiving it is, so in animals under a year of age, a delay of 48, or even 72 hours is often acceptable. Beyond that, the prognosis decays exponentially with the passage of time. The literature contains reports of vital pulpotomies being successful in immature teeth that were treated as much as two weeks after the fracture, but these are likely the exception to the rule. Therefore, crown fractures in dogs and cats under a year of age (even up to eighteen months) should be considered emergencies and treatment sought without delay.

Other conditions that might be detected in young animals such as areas predisposed to caries and deformed teeth are described in chapter 20.