# **Plaque and Pockets: Treating Periodontal Disease**

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Pathophysiology, recognition, and diagnosis of periodontal disease were discussed in the previous lecture (Recognizing and Diagnosing Periodontal Disease).

To fully understand professional treatment options and home care products understanding periodontal disease reduces to two topics

- 1. Plaque biofilm
- 2. Periodontal pockets

Treatment of periodontal disease is not a once in a lifetime event for the patient but rather an ongoing treatment program throughout continued life stages of the patient. Gingivitis is reversible. However, once periodontium attachment destruction occurs, the process is not reversible. The goal with periodontitis is to stop the disease, minimize further attachment loss, and treat compromised teeth (e.g. periodontal surgery, guided tissue regeneration, and extraction as indicated). Therefore, education and prevention of disease (daily brushing, dentifrices, and frequent professional dental care) are the best defenses.

# **Plaque biofilm**

It begins with the accumulation of the dental pellicle (e.g., salivary glycoproteins and enzymes) that occurs within seconds of a tooth being cleaned. As first colonizing oral bacterial colonize the pellicle, within hours, the plaque biofilm is formed. The plaque biofilm matures within days and mineralization resulting in calculus occurs. Periodontal disease is caused by a bacterial biofilm (plaque) and the associated inflammatory response. Significant periodontal disease can be present without calculus. Likewise, some patients can have significant calculus with minimal periodontal disease. Calculus (tarter) is NOT the cause of periodontal disease.

Therefore, professional cleaning to return the tooth to a clean surface followed by daily home care to remove the plaque biofilm is the gold standard to prevent and control periodontal disease. If pockets are eliminated and the plaque biofilm removed on a daily basis, then the maturation of plaque and further pocket formation can be controlled and minimized.

As the plaque biofilm matures early bacterial colonizers, gram positive aerobic cocci, become less predominant as the biofilm switches to gram negative anaerobes and spirochetes found deeper in the periodontal pockets. Bacterial products such as ammonia, volatile sulfur compounds, and proteolytic enzymes contribute to the destruction of the periodontium. The host inflammatory response, matrix metalloproteinases that degrade collagen of the periodontal ligament, elastase (break down collagen and elastin), and prostaglandins (PGE<sub>2</sub>) are directly responsible for tissue damage and/or stimulate osteoclastic bone resorption (PGE<sub>2</sub>, IL-1 $\beta$ , TNF- $\alpha$ ). The calcium carbonate in the saliva of cats and dogs combines with the plaque to form calculus. Calculus increases surface area for bacterial attachment and can mechanically disrupt and damage the gingiva.

# **Periodontal pockets**

Periodontal pockets, the plaque biofilm, and the host inflammatory response to the plaque biofilm are the targets of periodontal treatment. The normal gingival sulcus depth of the dog is 0-3 mm with slightly accepted larger measurements for giant breeds and slightly less measurements for toy breeds. The normal gingival sulcus in a cat is less than 0.5 to 1.0 mm.

Periodontal pockets can be simplified into 3 types. However, there are often combinations of periodontal pocket types as they are not mutually exclusive.

# Simplified, there are 3 types of periodontal pockets

- 1. Pseudopockets are created when the gingiva enlarges (often gingival hyperplasia) and the marginal bone remains at the appropriate level. Breeds such as Boxers and Collies have a genetic predilection for gingival hyperplasia. Common veterinary medications such as cyclosporine and amlodipine may cause gingival enlargement.
- 2. Suprabony pockets occur when marginal bone loss exceeds gingival recession (the marginal bone is lost horizontally below the tissue).
- 3. Intra(Infra)bony pockets occur when bone is lost vertically around a tooth. Infrabony pockets can be classified as onewall, two-wall, three-wall, and four-walled (cup or crater) defects. Clearly, they can be a combination of each of these types of pockets in each oral cavity and with each tooth. Regardless, pockets are a haven for gram negative anaerobic bacteria and spirochetes in the subgingival plaque biofilm and planktonic bacteria in the pocket fluid.

Common locations for intrabony pockets in dog patients include the distal aspect of the mandibular 1<sup>st</sup> molars, the furcation of the mesial roots of the maxillary 4<sup>th</sup> premolars, the mesial aspects of the mandibular canine teeth, particularly after the 3<sup>rd</sup> incisors are lost or are extracted without proper technique, and the palatal aspect of the maxillary canine teeth. Without osseous surgery to treat these bone defects, they will simply continue to cause periodontium destruction and chronic inflammation and infection in the patient.

## Treatment of periodontal disease

Veterinary patients should be scheduled for a periodontal cleaning when there is gingivitis and before irreversible periodontal disease and attachment loss has occurred. Supragingival scaling and subgingival scaling is performed. Subgingival scaling separates a professional dental cleaning from a purely cosmetic procedure. Correct subgingival cleaning is impossible in the non-anesthetized patient.

A professional dental (periodontal) cleaning takes time to assess the oral cavity, obtain intraoral radiographs, and professionally clean the oral cavity. Additional periodontal treatments, periodontal surgery and extractions as indicated can easily double the treatment time. Therefore, appropriate time must be scheduled in the surgical schedule to allow unrushed assessment and execution of treatment plans. Appropriate fee structures should be established to allow appropriate compensation for the veterinarians and veterinary staff time and capital resources to perform a professional periodontal assessment and cleaning.

### Periodontal cleaning equipment and instruments

Equipment necessary for a complete, professional periodontal cleaning includes, but is not limited to, ultrasonic scalers [piezoelectric and magnetostrictive (ferromagnetic stacks and ferrite rods)], hand scalers, universal curettes, gracey curettes (only one working surface offset 70°), slow speed handpiece for polishing, irrigation, dental probes and explorers, and dental charts.

### Periodontal cleaning steps

Client consent is required prior to the initiation of treatment (be prepared to find more disease then you would expect and prepare the client).

Masks, caps, gloves and protective eyewear are worn. General anesthesia is required. The oral cavity is rinsed with a 0.12% chlorhexidine gluconate oral rinse to decrease aerosolization of bacteria.

Supragingival scaling involves removing the calculus and plaque from above the gumline (hand scalers and water cooled ultrasonic scalers – no more than 5-7 seconds per tooth to prevent thermal and concussive injury).

Subgingival scaling (root planing and subgingival curettage) is crucial for the treatment and prevention of periodontal disease. Hand curettes and some water cooled ultrasonic scalers, with approved periodontal or universal tips, are used to clean subgingivally.

Polishing involves using a pumice (fine) to smooth out roughness created in the enamel during the periodontal cleaning. Polishing should be minimized to less than 3 seconds per tooth. The polishing cup should flare 1 to 2 mm subgingivally to polish the subgingival tooth surface cleaned during the subgingival scaling.

The air-water syringe is used to irrigate the sulcus and remove debris, plaque, and polishing paste.

Intraoral radiographs are obtained.

The periodontal cleaning is not complete until client education is presented. If the procedure was a periodontal cleaning without surgery, then the client should be educated on home care at discharge. If surgery was performed, education may be delayed until the recheck appointment to verify the surgical sites are healed (10-14 days) prior to instituting a plaque control home care program. A recall for the next periodontal cleaning and oral exam is set for 6-12 months depending on the stage of periodontal disease, client commitment to home care, and signalment of the patient.

## **Periodontal surgery**

Periodontal surgery occurs with, and after, the oral cavity has had a thorough assessment, intraoral radiographs, and professional periodontal cleaning. Often, it is best to stage the procedures so that the periodontal surgery is performed several weeks after a periodontal cleaning if periodontal flaps or guided tissue regeneration are being utilized. Soft tissue resection and some osseous subtractive surgeries may be performed during the periodontal cleaning.

When patients have teeth in stage 3 periodontal disease and/or periodontal pockets, periodontal surgery may be necessary to return periodontal anatomy to a manageable level. Once returned to a manageable status, frequent periodontal cleanings and home care programs can maintain and stabilize the periodontium. Stage 4 periodontal disease is best treated by exodontics depending on the tooth and signalment of the patient.

Periodontal pockets greater than 5 mm, periodontal probing depths beyond the mucogingival junction (whether 5 mm or not), stage 2 and 3 furcation exposures, intrabony pockets, gingival clefts, mobile incisors, loss of gingiva, and periodontal trauma require periodontal surgery.

Pseudopockets are often treated with gingivectomy and gingivoplasty. Suprabony pockets can be treated with open or closed root planing. Additionally, periceutical treatment can be considered when treating suprabony pockets. Intrabony pockets require osseous additive surgery (guided tissue regeneration) or osseous subtractive surgery to eliminate intrabony pockets.

## Periodontal pocket healing

Following periodontal treatment gingival connective tissue, gingival epithelium, periodontal ligament, and alveolar bone compete to create reattachment to the tooth surface. Following subgingival scaling for suprabony pockets the gingiva can re-attach the tooth surface via long junctional epithelium.

Following more advanced periodontal surgery (guided tissue regeneration) four (4) tissues compete for the root surface; gingival epithelium, gingival connective tissue, periodontal ligament, and alveolar bone. The preferred attachments are the periodontal ligament and alveolar bone for long term periodontal support. The gingival connective tissue and epithelium colonize the root surface at the fastest rate and exclude, the other more desirable periodontal tissues, periodontal ligament and bone from the root surface.

Advanced periodontal surgery should not be performed if the client is not compliant with home care, the pet is not compliant with home care, or the pet is not medically stable for future anesthetic episodes to recheck and augment periodontal treatments. If there is any doubt, then extraction of an offending tooth or teeth should be executed to alleviate pain and inflammation in the patient.

Prior to some advanced periodontal surgeries, having the client demonstrate and commit to home care is recommended. Appropriate training is necessary in order to achieve predictable results when utilizing guided tissue regeneration.

#### Home care products

No home care product is a monotherapy for periodontal disease caused by the plaque biofilm. Home care products are not a substitution for a professional periodontal cleaning. The plaque biofilm and the host inflammatory response are the cause of periodontal disease. Even with meticulous home care, anesthesia for complete oral examinations (detect tumors, periodontal pockets, fractured teeth, etc. early), and subgingival scaling is necessary throughout the life of the patient.

The list of home care products and over the counter products is extensive. Label claims may or may not be supported by science. Some products simply control halitosis and do not address the cause of periodontal disease – the subgingival plaque biofilm.

A good way to determine if a product or diet meets its label claims is to look for the veterinary oral health council (VOHC) seal. The VOHC does not conduct testing. The VOHC reviews results and data voluntarily submitted by the manufacturer.

#### Home care

Home care should be started prior to the establishment of periodontal disease. Home care is best started in the puppy and kitten in order to train them to accept oral care. However, many animals can be trained to accept home care after oral infection and pain has been treated

The gold standard of home care is daily brushing with a soft-bristled nylon tooth brush. The soft bristles mechanically remove the plaque biofilm

Additional categories of home care products include, but may not be limited to, mechanical cleansing (e.g. diets, chews), chemical antiplaque products (e.g., 0.12% chlorhexidine rinses, fluoride, zinc ascorbate and zinc gluconate), enzyme Systems (e.g., glucose oxidase and lactoperoxidase), dental surface barrier sealants/treatments, and water additives (e.g., natural, chemical).

#### References available upon request