Stage II periodontal disease (PD) is the beginning of an irreversible condition, periodontitis
Once periodontitis occurs radiographic evidence of up to 25% of tooth (root) supporting bone loss is present. The goal now is to arrest the progression of disease and initiate long-term therapeutic management. Stage II PD is incipient periodontitis. Stage III PD is identified by loss of tooth supporting bone of 25% to 50% as seen radiographically. Stage IV PD is advanced periodontal disease, with its attendant bone loss of greater than 50%. Stage IV PD usually requires surgical management. When the disease reaches this stage of development, so much of the alveolar bone has been lost that the periodontal pockets are too deep for the owner to adequately manage and maintain the affected teeth of his or her pet. Treatment of periodontitis is focused on thoroughly cleaning and smoothing the surface of the roots, removing periodontal necrotic tissue, infected bone, and granulation tissue, disrupting bacterial colonies, reducing the depth of the periodontal pockets, regaining periodontal attachment and, when possible, covering exposed root surfaces and encouraging a creeping reattachment of periodontal ligament. Diode laser treatment has been used to effectively reduce pocket depth after multiple treatments. In human dentistry, today, the newer YAG laser therapy removes infected bone and encourages new bone formation.

Following surgical or laser treatment of Stage IV periodontritis, the owner must be committed to providing daily home care and seeing that the pet receives professional care every four to six months to prevent the chronic condition from worsening. If the owner cannot make this commitment, it is reasonable to consider extracting the affected teeth to rid the mouth of its source of chronic infection. Even with today’s products that enable us to more effectively encourage reestablishment of cementum, periodontal ligament and alveolar bone, we have not yet effected a cure. Our patients are still periodontal patients, genetically and systemically predisposed, and should still be recalled as periodontal patients with appropriate frequency and attendant thorough examination and maintenance or remedial therapy.

Advanced periodontal disease is most easily recognized by Class I (0.2 – 0.5 mm mobility in any direction other than axial) to Class III (greater than 1.0 mm) tooth mobility, deep pocket formation, and halitosis. Radiographically, alveolar crestal bone is lost. Gingival edema and suppuration are often chronically or intermittently present. Multi-rooted teeth may not be mobile if vertical bone loss involves only one root. Treating established periodontal disease always begins with complete prophylaxis and closed curettage. Clinical examination and radiography will help determine if open curettage is indicated to provide better visualization and exposure to achieve thorough deep root planing therapy and adequate debridement of the periodontal tissues.

After prophylaxis and closed or open curettage are performed, the treatment plan may be amended if a second stage of treatment with general anesthesia is deemed necessary. In cases of advanced periodontal disease with a periodontal pocket greater than 4 mm and an adequate zone of attached gingiva, a gingivectomy may be indicated to reduce the pocket depth. If there is inadequate attached gingiva, an apically repositioned gingival flap may effectively reduce the depth of the pocket so that adequate home care can be administered. In cases of muco-gingival defects with severe gingival recession and only a narrow zone of attached gingiva remaining, a rotating pedicle flap or free gingival flap may be indicated to prevent farther recession. Maintenance will consist of daily tooth brushing and flushing as well as professional care consisting of smoothing the root surfaces and prophylaxis every four to six months.

Open curettage
Open curettage is indicated in cases where the gingival pockets are so deep that the gingiva must be surgically reflected to access the diseased area and adequately debride the tissue. Open curettage involves reflecting the gingival tissue by making parallel incisions on either side of the involved tooth and elevating a gingival flap by freeing the attached gingiva from the alveolar bone with a scalpel and periosteal elevator. Granulomatous tissue is curetted and necrotic cementum removed before treating the root surface medically and suturing the flap back in place inter-proximally.

Apically repositioned flaps
Creating an apically repositioned flap is another surgical technique used to treat Stage IV periodontitis. These flaps are employed when gingival tissue and bone have been lost, only 0.5 to 1 mm of attached gingiva remains, and a deep periodontal pocket is present, potentiating the progression of periodontal disease. The roots will remain exposed post-operatively but there will be little or no periodontal pocket, a condition that simplifies home management. We are performing this procedure less these days and treating these pockets with perioceutics. Maintenance therapy consists of daily brushing with an antimicrobial solution such as a 0.12% chlorhexidine or zinc ascorbate gel as mentioned earlier. Systemic antibiotics and pain medications should be administered during surgical healing, and a softened diet should be fed.
Animals with valvular heart disease or those predisposed to endocarditis should receive prophylactic antibiotics prior to surgery and for at least 24 hours afterward. Antibiotics such as amoxicillin, amoxitrhydrate and clavulanate potassium (Clavimox® - Zoetis), or clindomycin are excellent drugs for this purpose. Periodontal disease itself is a localized infection, but a bacteremia can result after periodontal treatment. The bacteremia is transient, usually lasting only 20 minutes, therefore a three-day pre-dental and one-day post-dental course of antibiotics will usually suffice to prevent systemic complications in cardiac patients.

Rotational gingival flaps
These types of flaps, also known as pedicle flaps, involve moving attached gingiva mesially or distally to cover a gingival defect on an adjacent tooth. A muco-gingival flap is particularly useful for upper canines and incisors or areas of gingival loss at the upper third and fourth premolars in dogs and lower first molars in cats. When scheduling permits, an initial preparation, which involves root scaling, root planing, and gingival debridement at the site of the defect, is ideally performed one week before surgery in order to convert the chronic infected lesion to an acute lesion in a healthier environment.

Free gingival flaps
These autogenous grafts of attached gingiva are used in places where no attached gingiva (or less than 0.5 mm) is present because the remaining alveolar mucosa is too weak to protect the periodontium from the constant abrasion of mastication. The surgery involves removing unhealthy tissue, harvesting the donor gingiva, and suturing the gingiva to the recipient site with preplaced simple interrupted sutures. The most common recipient sites are the upper canine and fourth premolar; the most common donor sites are the attached gingivae of the lower canine and first molar. Cyanoacrylate adhesive (Vetbond® - 3M Animal Care Products, St. Paul, MN) can be used to strengthen the sutured edge but should not extend beneath the graft. Saliva also should not be allowed beneath the graft. Paint-on-Dam® (DenMat, Santa Maria, CA) is a light-cured product that can be used to cover the graft and protect it from abrasion during healing.

More regarding post-surgical patient care
Treating periodontal disease is considered a day procedure, but the care necessary to prevent its progression continues for life. As the patient is released from the hospital, the client should be counseled again about home care. If the patient has had gingival surgery requiring sutures, it should be fed softened food until healing is re-evaluated two weeks later. The patient should not be allowed chew toys, hard treats or oral play until the tissues have healed. Daily tooth brushing and sub-gingival irrigation, excluding the sites, should begin the day after surgical treatment. Clients need to be reminded repeatedly that even with our newer and improved products and seemingly break-through surgical or medical treatment, their pet is still a periodontal patient for life. For animals with Stage IV PD, daily home care coupled with semi-annual or tri-annual professional care will be required from this time forward to avoid progression of the disease. Most pet owners will appreciate professional encouragement and a one-month checkup to evaluate the adequacy of their home care. During that evaluation, it can be determined whether a six-month interval between professional visits is adequate. As the intensity of periodontal disease waxes and wanes, so does home care. Professional recall intervals need periodic evaluation and adjustment to best complement the current level of supportive home care.

Bone grafts and implants
Some patients with advanced periodontitis may require a bone graft or implant to stabilize teeth that are threatened by a deep intra-bony pocket. A "graft" usually refers to the transfer of living tissue (or bone), while the term "implant" is applied to non-viable material placed in the body. Synthetic bioactive bone “graft” particulates or putty are also available and, because of convenience, more commonly used in veterinary dentistry. To fill the defect, grafts or implants are lightly packed, filling the osseous void, and stabilized by a soft tissue covering. Bone grafts or implants can be beneficially placed on the palatal side of maxillary teeth to help prevent the development of an oro-nasal fistula.

The classical graft of choice for strength, rapid incorporation, and the fewest complications is cancellous bone, harvested from the humerus at the time of surgery (an autogenous graft). Bone can also be used from another individual of the same species (allograft). Allografts work almost as well as autografts, but take longer to revascularize. An allograft consisting of demineralized bone powder is not as strong as fresh cancellous bone graft, but such grafting material can be preserved and stored in the hospital for convenient use on short notice. Irradiated frozen medullary bone from a bone bank can also be used. Human and bovine demineralized bone and frozen bone are additional sources of grafting material for dogs and cats.

More conveniently, a number of synthetic implant materials are available for use in veterinary practice. A product which works very well to promote more rapid bone formation and that has been used not only to fill extraction sites, but also to augment the alveolar crest, is a bioactive ceramic synthetic bone graft particulate, Consil™ (Nutramax Laboratories, Inc., Baltimore, MD). It comes to veterinary dentistry from the human field where the product is known as Bioglass® and Perioglass® and stimulates a response at the interface of the material that results in a bond between the tissues and the material strengthening the jaw more quickly following extractions or other treatments. You must have an infra-bony pocket within which to place the Consil. It cannot just be
packed around an exposed root alone and expect bone to develop. Consil should also not be placed in an infected site. In addition to the administration of pre-operative antibiotics, the patient should be released from the clinic with ten days of oral broad-spectrum antibiotics.

**Periodontal splints**

Periodontal splints are used in cases of Stage IV periodontitis to stabilize very mobile (Class III mobility) teeth that otherwise might exfoliate. Periodontal splints can be installed in combination with bone augmentation products and removed 6 weeks later, or can be designed to be permanent and incorporated into the tooth enamel. Periodontal splints should be constructed so that they do not touch the gingival tissue as it would promote trapped food and gingival inflammation. Splints also should not interfere with normal occlusion. Periodontal splinting techniques are described in numerous texts and articles.

Self-curing composites (Concise™ - 3M, St Paul, MN; Tenure™, Perfection™, and Infinite Cure Pastes™ - Den-Mat, Santa Maria, CA) are activated by mixing a base paste with a catalyst paste. They are inexpensive, but limit you to several minutes working time. Z250™ restorative (3M, St. Paul, MN) is supplied as a light-cured paste. Compounds such as this allow unlimited working time, and are available in many different shades of color. A hybrid combination of composite and glass ionomer, Protemp Garant (Espe America, Norristown, PA), a material provided in tandem syringe barrels and delivered to the site via a mixing gun, is also very effective. It is strong, rapidly self-curing and easily applied. Another effective material currently used in periodontal splints is a gas-plasma treated, woven, ultra high molecular weight polyethylene fabric (Ribbond Bondable Reinforcement Ribbon™-Ribbond, Inc., Seattle, WA).

Acrylics, also used for fabricating splints, are self-curing, inexpensive, and easy to apply. Unlike the composites which are rigid, they offer a small degree of flexibility and shock absorption. But acrylics do not come in many shades, and aesthetics are important when constructing splints for the rostral teeth. Non-exothermic products are best for areas where an exothermic reaction might cause pain or tissue damage.

For greatest success, the owner should be committed to brush and pick between the teeth and flush the dog's mouth daily with a medicated solution. In addition, for permanent splints, the pet should be scheduled to receive professional dental care every three months to maintain the status quo. The splint is fabricated before the surgical installation of any implant or graft so that blood from the surgical field will not discolor the splint or prevent the materials from successful hardening.

**Conclusion**

Periodontal treatment takes many forms, requiring varying degrees of clinical competence. Treating advanced periodontal disease, which includes mobile teeth, often with little supporting bone, requires four important ingredients. First, the animal's caretaker must be willing and able to deliver lifelong constant care in the form of tooth brushing and sub-gingival flushing. Second, the animal has to tolerate the treatment. Third, every three to four months, the owner must schedule professional care, which entails general anesthesia, deep root therapy, and general prophylaxis. And fourth, the veterinarian caring for this patient must be knowledgeable and skilled in the art and science of treating chronic, advanced periodontal conditions. Unless a pet receives good home care on a regular basis and appropriate periodic professional dental care, the pet will need periodontal therapy with increasing frequency, eventually losing its teeth. One therapeutic option, if the primary care veterinarian has limited dental experience, is for him/her to refer the case to a dental specialist for its initial care and then orchestrate the recall appointments back at his office and monitor the owner's home care program.

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