PRESENTATION NUMBER

**Golden Years, Hidden Tears: Senior Pet Dental Health (Canine)**

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Overview of the Issue

It has been shown that periodontal disease increases in prevalence as age increases, and as body weight decreases (small dogs vs large dogs). With any chronic process, particularly one with loss of tissues (gingival and bone), the disease is likely to get worse without intervention until the final phase of periodontal disease, which is actually tooth loss. The co-influence relationship of dental disease with diabetes and even renal disease underscores the importance of addressing issues in senior pets before they cause more problems.

Objectives of the Presentation

1. To understand the systemic impact of oral and dental disease on the patient – chronic inflammaging
2. To know the Incidence of dental disease in older patients
3. To appreciate the client’s concern with anesthesia in older dental patients and how to minimize risks
4. To be able to identify and properly manage common Oral and Dental problems in older patients

**Aging and Dentistry**

Most practices deal with dental issues on older, smaller (and larger) dogs on a regular basis. They may still be eating but have slowed down and are getting ‘older’. Understanding the aging process and the impact chronic oral and dental inflammation can have on a pet can help us provide optimal care for our patients.

Aging on a cellular level, cumulative DNA damage leading to genomic instability, oxidative damage and telomere shortening have all been discussed**.**1Specific organ systems are often evaluated extensively, both on an individual basis (tracking renal function), and on a population basis (looking at the prevalence and risk of chronic renal disease within an age group). Overall senescence with a declining ability to respond to stress, increased homeostasis imbalance and an increased risk of diseases that lead to death can be compounded by increased oxidative damage and low-level chronic pro-inflammatory states.

**Inflammaging**

While acute inflammation helps to respond to various stimuli, when it becomes chronic, it can impact most age-related diseases and be a risk factor for morbidity and mortality. Its impact is felt across multiple systems, from metabolic homeostasis and immune senescence to neuronal health. Reactive leukocytes and cytokines are amplified, interfering with anabolic signaling and contributing to decreased protein and erythropoietin synthesis, as well as insulin resistance. Identifying inflammaging in general can be done through various biomarkers, some of which aren’t as readily available in veterinary medicine. Once ‘identified’, then uncovering a potential source of chronic inflammation that can be ‘treated’ can be more challenging.

Oral and dental disease may provide one area where we can impact this inflammation. Periodontal disease increases with age, especially in smaller dogs, and with comorbidities present and decreased healing, can impact their quality of life. Many of our discussions may include discussing the bacteria present in the oral cavity, but it is more complicated than that. More research has shown that the presence of a chronic inflammatory condition plays a more important role.

**Clinical Impact**

In clinical practice, we can use information on life expectancy and aging information to help work with owners to optimize their awareness for early detection of clinical aspects we can help manage, to keep our senior pets as healthy as possible. When changes are not identified and no intervention is provided, the pets’ decreased quality of life can affect the companion animal bond and lead to euthanasia or abandonment at times.

For an owner, and the veterinary staff, the first step is to determine the relative age of the pet, as compared to human years. The old adage of one dog year equaling 7 human years can provide an estimate, but dogs and cats age at different rates, primarily based on their size. Smaller pets have longer expected life spans and giant breeds are often considered senior at 5-6 years of age. Several resources have tables that allow you to determine your pets’ relative age – but each animal is an individual, so these are starting guidelines to assess their senior status. Keep in mind, if the pet was adopted as an adult, there is a chance that the age on record might be an estimate, sometimes on the low side, when trying to determine their relative age.

**Body Condition and Senior Nutrition**

Many practices now enjoy assessment of the Body Condition Score (BCS) to determine if a patient is in its correct weight range. Certainly, excess body weight can be accompanied by higher risks of osteoarthritis, diabetes and other metabolic diseases. On the other hand, with aging pets, weight loss can be a significant issue as well. The basal metabolism rate of dogs continues to slowly decline with age, though they tend to maintain the ability to digest and utilize most nutrients. Geriatric pets require the same or more protein than younger animals, especially active seniors. In fact, maintaining activity and environmental enrichment in a senior pet can improve their quality of life.

**Cognitive Dysfunction**

As many pets age, there can be a noticeable change in activity and attitude and in some pets, certain signs may not be attributable to a medical cause, and “he’s just getting old” isn’t enough of an explanation. Just as in humans, dogs and cats can experience diminished cognitive function, beyond what can be expected in the normal aging process. The **DISHAA** acronym found in many publications can help alert you and the client to potential issues:

* **D** – Disorientation – may appear lost. confused
* **I** – Interaction – may not respond to familiar faces, or be clingy
* **S** – Sleep-wake cycles – sleep more during day, less during night
* **H** – Housetraining – eliminates inappropriately
* **A** – Activity levels – aimlessly wanders or decreased focus
* **A** – anxiety

The recent adding of the second “A” to separate and highlight anxiety in older patients can be a factor when bringing them in for periodontal treatment and also for assessing their cognitive issues post-procedure.

**Treatment Concerns**

Yet, as the increase in periodontal disease would warrant professional care, it is the presence of the co-morbidities that can make the necessary anesthetic procedure potentially riskier. In very few instances is the level of disease so severe, or unresponsive to management, that the dental care should be avoided completely. Most cases can be evaluated pre-operatively to identify underlying issues, and those identified disease processes can be treated to return the patient to a more stable level, to decrease the risk an anesthetic procedure would entail. In each patient, the risk of retaining the dental disease its potential effects on the rest of the body typically is outweighed by the benefits of treatment.

Individualized treatment plans are essential for senior and geriatric patients: from the pre-operative evaluation and stabilization therapy (if needed) to the immediate pre-operative period and peri-operative time frames. Many comparisons can be made to guidelines for human patients for dental procedures, including the benefit of pre-operative laboratory screening, but we have to realize that our patients cannot give us details on how they are feeling. While not always common, it is possible to pick up on underlying, inapparent disease of a patient when doing the pre-op screening.

For those patients in the mature-senior-geriatric categories, utilizing the patient anesthetic risk classification is a good starting point for evaluation and for determination of what level of assessment should be done. ASA levels of I and II might require basic blood work, UA and ECG, while adding additional chemistries to the levels III-V. Monitoring urine output (1-2 mg/kg/hr) is seldom done but can provide beneficial information.

Pre-operative medications often play a role in these patients, including evaluating what medications could have an impact on anesthetic and analgesic drugs utilized. Decisions may have to made about what medications need to be given on the day of the procedure (most can be given, except antihypertensive medications), and how fasting may influence diabetic patients. For most patients, a small amount of food can be given up to 4 hours prior to the procedure, and small amounts of water can be given until they are admitted to the hospital.

Antibiotic use and selection will always generate plenty of discussion, and again, while human dental recommendations are to be considered, adding in the complications of anesthesia, with possible hypovolemia, hypotension and hypothermia, it should be considered in each patient. If it is determined that the individual has some systemic risk (cardiac disease, borderline renal disease, etc), it may be appropriate to use a broad spectrum antibiotic (such as amoxicillin-clavulanic acid) just prior to the procedure, or to consider interoperative administration of an IV ampicillin/amoxicillin. In some patients with extreme dental infection, prior use of an antibiotic such as clindamycin has greatly improved the health of the dental tissues, and also the patient, in this author’s opinion, though this is an uncommon finding.

**Pain Management**

Another very important aspect of dental care is pain management. By customizing the analgesia and anesthesia protocols for each patient, appropriate use of pre-operative agents can reduce the anxiety and stress on the patient in the pre-operative stage, which could have a positive effect on stress-induced immunosuppression. With good pre-operative, multi-modal analgesia, combined with local and regional blocks, the level of general anesthetic needed for the patient can be reduced significantly. If NSAIDs are chosen (renal-healthy), perfusion with fluids is important.

For local and regional blocks, the total dose should be calculated, particularly in small dogs and cats. Bupivacaine (0.5%) premixed with epinephrine (1:200,000) provides a longer time for analgesia, with some hemorrhage control, but should not be used in cases with contraindications (cardiac arrhythmias, hyperthyroidism). It also needs to be placed 10-20 minutes before the extraction or periodontal procedure for maximum effectiveness. Lidocaine doesn’t last as long, but does provide quicker analgesic effects.

**Patient Care**

Perfusion before and throughout the procedure is critical in dental anesthetic cases, to maintain adequate blood volume, particularly for renal function. An initial bolus (5-10ml/kg) of intravenous fluids may be provided preoperatively, with 5ml/kg/hr for a maintenance dose for dogs and 3ml/kg/hr for cats. Cardiac patients might have a decreased fluid capacity, so decrease their flow and monitor patients closely for any signs of overhydration, including increased pulmonary sounds or even monitoring HCT. This interoperative replacement of fluids will offset loss of water by evaporation, third space losses into traumatized tissues, and even volume replacement for hemorrhage loss in some cases.

Maintaining body temperature in dental cases can be quite challenging at times: most are older, smaller, and the oral cavity is constantly wet, or being rinsed. Geriatric patients in particular can have exaggerated hypothermia with a decreased basic metabolism rate. Body temperatures less than 98 degrees can alter mentation, the immune competency of the patient, and can affect wound healing. Decreased body temperature can also impact recovery time. Keep the patient as dry as possible and provide patient warming devices where appropriate. Passive and active surface rewarming with warm water blankets, air warming devices or conductive fabric blankets can be helpful, as can active core rewarming with warmed isotonic fluids.

**Patient Monitoring**

The reason we have more confidence in safer anesthesia events is the combination of individualized analgesia/anesthesia protocols and the level of patient monitoring that can be provided. General anesthesia depresses many systems of the patient that may already be compromised: respiratory, cardiovascular, CNS, thermoregulatory, hepatic and renal, to name a few. Monitoring should be constant throughout the procedure, and into the post-operative period as well, where most unexpected deaths occur.

With all the advances in monitoring equipment available, the best monitor is still a good technician. Observation of general parameters, in addition to readings from monitoring equipment can provide the best assessment of the depth of anesthesia, or when changes indicate a need for intervention. Heart rate and respiration recorded every 5 minutes can be combined with pulse oximetry, blood pressure, CO2 levels, body temperature and continuous ECG readout. CNS evaluation of the muscle tone of the jaw and eye position/palpebral reflex are more subtle indicators of anesthetic depth.

A dental procedure can sometimes be lengthy, and in particular with older patients, this can lead to concerns about decreasing body functions as the time goes on. Maintaining perfusion and blood pressure with fluids can decrease body temperature, as can moisture associated with the procedure. Anesthetic levels should be kept to as low of a level as possible to help maintain blood pressure, without waking the patient. There are situations, either due to the patient’s body systems, the length of time needed, or the extent of treatment needed that could necessitate ‘staging’ the procedure and completing a portion of the surgery at a later date.

Emergency situations should be anticipated ahead of time with printed protocols for the common drugs that may be needed in such events. Regular monitoring should consider any trends in parameter changes that could precede an emergent event, and if patient response is inadequate, immediate recovery should be instigated.

**Recovery**

Patient management and monitoring should not end when the anesthesia is turned off, or when the endotracheal tube is removed. In fact, since the patient is not observed as closely as during the peri-operative period, the recovery time is when many adverse events happen, sometimes leading to patient death. Brachycephalic patients in particular should be closely monitored, as the challenges to their air passages return once the tube is removed, so the tube should remain in place for as long as possible. Any swelling, hemorrhage or pain flare-up can add to the morbidity of the case. In patients with emergent delirium, a very low dose of dexmedetomidine may be administered (if not contraindicated) to help relieve the anxiety, stress and pain for a smoother, slower recovery. If a patient shows significant pain beyond that, additional opioids may be required.

If a patient had issues with hypotension, fluid administration and even inotropes may be considered in the post-operative period, with close monitoring. Bracycardia may be present due to the effects of anesthesia, as well as any prolongation of hypothermia. If any medication (alpha 2) was used, a reversal agent would be recommended, and an anticholinergic may be used, with caution. Providing a safe means of keeping the patient warm – and dry - is also recommended.

Monitoring urine output, either with a specific measurement, or by encouraging conscious voiding, can assess if additional fluids are needed. With smaller patients, and certainly those with diabetes mellitus, monitoring blood glucose during and after anesthesia can point out those that might need supplementation.

**Post-Operative**

Returning the patient to normal function as quickly as possible helps in the recovery process. Post-operative medications from analgesics to antibiotics should be discussed with the owner for proper administration. Eating and drinking small amounts should be encouraged that evening, though the food may need to be softened for a period of time after the procedure. Supplemental feeding may be necessary, to include anything from syringe feeding to a peg tube, depending on the case. Phone recheck the next day and a physical exam in two weeks allows for continued monitoring of the patient with plans for ongoing management.

**Senior Dental Issues**

Periodontal disease has an increased incidence in older pets, as does any of the conditions that can increase over time. Advanced periodontal disease that is not regularly managed can progress to unsalvageable levels. That is why it is critical to provide regular care to all patients, particularly as they get older.

Chronic inflammation may also be a part of the changes seen in root structures of some older dogs. Replacement or odontoclastic resorption is not uncommon in the premolars of senior dogs. This is often found on routine radiographic examination during a dental procedure. If the resorption is contained to the mid-root region and not affecting the pulp cavity, there is likely any discomfort for the patient, and the tooth can be monitored. If the resorption has extended into the crown, then the tooth should be extracted. By removing alveolar bone around the root in the resorbing section, eventually the apex could be elevated. If there is extensive root resorption (not into pulp), no crown involvement and no peri-apical lesions (indicative of a tooth root abscess), then a modified extraction may be possible with some resorbing root retention that will be closely monitored.

Extensive periodontal disease that has destroyed mandibular bone at the level of the first molar can lead to pathological fractures, sometimes bilaterally, that have insufficient osseous structure for stabilization. Compromise of mandibular symphyseal bone can lead to separation of the mandibles at that site. This can be exacerbated by external trauma or even extraction attempts. Pathologic fractures in theory could be stabilized with rib bone grafts and plated, but if the healing is delayed on an older patient, a palliative option may be considered. With insufficient bone for stabilization at the fracture site, and possible even symphyseal compromise, removal of the portion of the mandible rostral to the fracture site (and to the symphysis) may be performed with reasonable results for the patient.

Key Therapeutic Points

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| Key Drug | Drug Class | Dose Range | Frequency | Route | Indications |
| Bupivacaine | Local anesthetic | 1 mg/kg – cat  2 mg/kg – dog | Once | Local blocks |  |
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Summary including 5 KEY “TAKE HOME” POINTS

1. Aging and dentistry are co-related, with many senior dogs requiring optimal oral and dental care.
2. Inflammaging is a key factor in aging, morbidity and mortality in pets.
3. There are many treatment concerns with proving oral and dental care for pets, and the benefits typically outweigh the risks.
4. Periodontal disease should be prevented whenever possible to avoid the consequences of severe bone loss in older dogs.

Summary

While senior pets may present with particular circumstances that make anesthesia planning more complicated, in most instances appropriate patient evaluation and care will provide the opportunity for good dental care. If dental health can be improved in a senior patient, their overall health is likely to improve as well.