PERIODONTAL DISEASE: SYSTEMIC CONSEQUENCES IN WIDER FOCUS

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DENTAL disease in cats and dogs has long been considered a major source of both local and systemic disease.

For most purposes, the disease of greatest concern – with regards to systemic consequences – is periodontal disease (PD). PD is an infection that, over time, progressively attacks the attachments of individual teeth.

While being important locally in the mouth, it also causes distant organ disease. The seminal paper in this regard for veterinarians was published by Delboyves et al. in 1996. This paper described the link, in dogs, between PD and pathology of the kidneys, liver, spleen, heart muscle and lung.

Over the past decade or so, the importance of untreated oral disease in elderly people has become of interest, not only to the dentist, but also the surgeon (Ake, 2011). Implant surgery in the elderly is increasingly common, with patients in their 70s, 80s and older routinely undergoing surgery. Prosthetic hips, knees and heart valves are now commonplace.

The importance of having the patient dentally fit before surgery is now well recognised to prevent failure of the implant, in addition to those patients undergoing elective cardiothoracic surgery.

Recent organ transplant surgeries lead to an increase in adverse outcomes, morbidity and even mortality (Tanny, 2010a; Tanny, 2010b). Although organ transplants are the most common example of such procedures, oral or dental pain also impacts adversely on cats and dogs. Neoplasia is also common, with six per cent of all tumours found in the mouth. Although oral infections are frequently the source of problems elsewhere in the body, the oral cavity can also be affected by conditions from other organs, such as renal failure and autoimmune diseases.

Key words: periodontal disease, systemic effects, oral infection, oral pain, periodontal management

ABSTRACT

The systemic effects of small animal dental disease is mainly associated with untreated and progressive periodontal disease. Organs affected include liver, kidneys, cardiovascular system and lungs. The effects of oral infection in ageing humans and well documented, and similar effects may have lessons for the veterinary profession. Timely and effective management of periodontal disease is a critical part of the practice approach to the health and well-being of patients. Although periodontal disease is the most common consideration, oral or dental pain also impacts adversely on cats and dogs. Neoplasia is also common, with six per cent of all tumours found in the mouth. Although oral infections are frequently the source of problems elsewhere in the body, the oral cavity can also be affected by conditions from other organs, such as renal failure and autoimmune diseases.

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The application of a disclosing solution to demonstrate the location and quantity of dental plaque.

Systemic consequences

Delboyves et al (1996) studied 45 dogs, ranging in age from five to 14 years, for PD scores and pathological changes after euthanasia. Statistically significant relationships were found between myocardial degeneration, kidney disease (both glomerular and interstitial), and liver parenchymal disease. In addition, a relationship between PD and flocculated molar heart valves is supported by a cause-and-effect relationship, with the same bacteria being found in both the gingival sulcus and the diseased heart valves. How does this occur? White blood cells and other inflammatory mediators migrate from the periodontal tissues into the blood and lymph streams due to increased vascular permeability. This combination of bacteria (mostly gram-negative aner-

Left lower quadrant before surgery, showing mild gingival inflammation associated with premaxillae and molars.

The major problem for veterinarians is that most animal patients are highly stocalic in the face of pain that would be considered highly significant in humans. This fact is present and real is not in doubt.

Often, the only way to prove the patient is to treat the problem and note the immediate effect on the patient’s demeanour having removed the noxious stimulus.

The fact many clients are sceptical of the need for treatment in such circumtances requires a high degree of confidence by the attending veterinarian in evaluating oral pathology and understanding its consequences. In these circumstances, the use of dental radiographs is very important.

It has often been said that the inability to communicate does not mean an absence of pain. The interplay of both animal and human, especially infants.

Periodontal disease studies and case reports have widely quoted incidence levels of PD in dogs of between 70 per cent and 92 per cent for more than 45 years since one of the earliest references on the subject in 1965.

Two of the best studies (Hampe et al, 1984; Kortegard et al, 2008) place the level at more than 80 per cent. Different diagnostic criteria are common in many of the seminal papers, mainly due to the lack of a generally accepted definition of periodontitis or PD.

It is also clear that breeds with certain risk factors will have higher levels of disease. These risk factors include:

- small size – less than 10kg
- aged more than four years
- crowded teeth, making good dental hygiene more difficult
- dental malocclusions – particularly when teeth make abnormal contact with other teeth or contribute to crowding
- brachycephalic head shapes, which contribute to both crowded teeth and dental malocclusions; and
- increasing age for all breeds, but it is worse for all of the above criteria.

Periodontal means “around the teeth”. The definition of PD is clinical attachment loss. Gum disease is often used by the public to mean periodontal disease.

Clinical attachment loss is loss of the tooth’s attachment to the supporting structures, and involves loss of attachment to both the soft tissues (gингiva) and bone.

It can be measured by probing and seen on a radiograph. Periodontal problems provide a guide to the existence of a pocket and, in addition, a measurement of depth. This is only half the equation required for accurate prognosis, diagnosis and treatment. A radiograph provides vital information as to how much attachment remains. This second half of the equation provides a clear course of action.

As a rough guide, attachment loss of 50 per cent or more is an indication to remove the affected tooth. Advanced periodontal surgery and grafting may be possible, but for most animal patients, the scirruous post-operative hygiene necessary is difficult to achieve.

One of the best studies uses 96 dogs (Kortegard et al, 2008), and summarises the author’s findings as follows: “The prevalence of clinical attachment loss (CAL) greater than 1.0mm was 20 per cent in one-year-old dogs, increasing to 84 per cent in dogs aged more than three years. It increased in both age and with age, but is already high at the age of two years.”
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1996). Changes in the atherosclerotic valvular substances have subsequently been proven in two more studies (Pavlakis et al, 2008; Gluckman et al, 2009). The latter study showed the risk of endocarditis was six times higher for dogs with stage three PD (25 per cent to 50 per cent clinical attachment loss) compared to those with no PD. Numerous studies in humans have linked ischemic heart disease and myocardial infarction to oral bacteraemia. A recent human study of 12,000 people also showed a direct relationship between the frequency of toothbrushing and increased incidence of cardiovascular events (De Oliveira et al, 2010). Those who brushed their teeth less than twice daily had a 70 per cent increase in their risk of heart disease.

While exact parallels between humans and dogs cannot be proven, recent history does show that the effects of PD in dogs appear to be similar to those in humans.

Finally, endocarditis and myocardial infarction shows greater frequency in old dogs, and it has been suggested that aged dogs with PD have a higher incidence and greater severity of cardiac problems compared to those with healthy teeth (Hamlin, 1990). Brain and nervous system strokes (ischaemic cerebral infarction) in humans are often preceded by a systemic infection. In addition, those individuals with such an infection suffer more significant neurological defects during an attack.

Poor dental health is considered to contribute to strokes in the same way it contributes to myocardial infarction, with an increase in thrombotic events, blood viscosity and C-reactive proteins (Mealey, 1999). Although the incidence of strokes in animals is not accurately known, it certainly does occur. Since dental disease is mostly preventable, steps to initiate management in a dental hygiene programme appropriate to the patient’s size, age and breed are simple to undertake and will improve the general health of the patient immeasurably.

Other adverse health effects Human literature abounds with PD’s other systemic effects. These include diabetes mellitus, malignancies, problems in pregnancy and conception, low birth weight and neonate viability, chronic inflammatory conditions (such as arthritis and chronic obstructive pulmonary disease) and early mortality. Dental plaque takes only hours, even minutes, to form on the teeth’s surface. Thus, if plaque is not removed, it will remain and will leach bacteria and toxins into the blood and lymph.

Frequent professional examinations – at least annually – are an important step to ensuring dental disease is treated early and often. Since the development of dental plaque takes only hours, it is not advisable to introduce clients to methods of plaque disclosing they can use at home. If they can see where the plaque is, and how much is present, they are more likely to brush effectively. For the same reason, disclosing plaque should take place in the consulting room at each dental check or routine examination. Plaque disclosing is cheap and easy to do. Since the primary enemy in PD is plaque, it makes sense to know your enemy before you start the good fight.

Domestic dogs generally have no access to the materials that would naturally clean teeth of the biofilm of dental plaque that initiates gingivitis and, ultimately, causes PD. For this reason, providing professional scaling and polishing as frequently as is necessary to prevent irreversible changes is important. If this level of frequency is annual or biannual, then this must be impressed on the owner.

Toothbrushing is an effective method of home maintenance when used with the correct frequency – preferably daily. It is very difficult to motivate many owners to provide daily toothbrushing for their pets beyond the short term (Miller et al, 1994; Gorrel et al, 1996). Most cease to brush three to six months after a professional scale and polish, with around 53 per cent of owners still brushing effectively at six months. As brushing less than every other day does not maintain clinically healthy gingival, the addition of a dental hygiene chew or proven effective dental diet can provide an added health benefit when not toothbrushing is possible. It can provide owners with a useful adjunct to home care (Gorrel et al, 1996).

PD management PD’s systemic effects in dogs and cats are serious and mostly preventable by a properly constructed and implemented practice oral health policy. Understanding the correct time to intervene is important and often left too late. The clear message is that gingivitis without attachment loss (stage one PD) is reversible. PD with any attachment loss (stage two and above) is not reversible in most cases, and the progressive nature of PD ultimately leads to tooth loss.

The nature of most dog and cat teeth, with long and/or multiple roots, means that without timely veterinary intervention, an infected tooth may long outstay its welcome in the mouth, thus teaching bacteria and toxins into the blood and lymph.

Summary PD is an inflammatory response by the teeth’s support structures, known as the periodontium. These structures are the gingiva, cementum, periodontal ligament and the alveolar bone. It is the number one cause of dental disease and early tooth loss in dogs and cats, with a minimum incidence level in adults of 70 per cent. PD consists of stages of progressive attachment loss, seen in cyclic periods of active destruction (periodontitis) and dormancy. PD is an infection that can be caused by a wide range of bacteria. PD has serious consequences for the health of internal organs, such as the heart, liver and kidneys. Only the half clients of owners dogs continue to provide the minimum effective frequency of tooth brushing beyond six months from professional scaling and polishing.

References
Hamlin R L (1990). Identifying the cardiovascular and pulmonary diseases that affect old dogs. Symposium on Veterinary Conservation Medicine, Veterinary Medicine 85, 483-497.

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