ORAL INFLAMMATION

Oral inflammation is described by location (www.avdc.org for images) and severity. Diagnosis and treatment of oral inflammatory diseases is based on oral exam, intraoral radiography, and when indicated, biopsy. Oral pathology presenting with inflammation includes: periodontal disease, tooth resorption, feline chronic gingivostomatitis (FCGS), eosinophilic granulomas, gingivitis, autoimmune disease, neoplasia, etc. Antibiotics or steroids may be adjunctive therapies in certain oral inflammatory diseases but are NOT indicated as monotherapies. The exception is the cat with eosinophilic granuloma lip ulcers. Amoxicillin clavulanate is an effective monotherapy for the treatment of eosinophilic granuloma lip ulcers.1

PERIODONTAL DISEASE

Periodontal disease (PD) is very common in cats. Just as in any species, periodontal disease occurs after colonization of subgingival bacteria and biofilm. A recent study evaluated the presence and proportions of putative pathogens implicated in feline PD and the correlation with PD status. The study confirmed that *Porphyromonas gulae* is the most relevant pathogen in feline PD. It was detected in high proportions of anaerobic flora cultured in cats having PD. Moreover, those cats having >10% of the flora being *P. gulae* had more severe PD. The mere presence of *P. gulae* was not an indicator per se of PD since *P. gulae* was identified in 90% of healthy cats and 100% of cats with PD.2 In this study of 50 cats, younger cats had deeper probing depths (pockets) and greater attachment loss. There is a hypothesis in human PD that suggests that genetics of the individual’s immune system effectiveness influences susceptibility of a patient to periodontal destruction. Antibiotics will neither restore the bacterial flora to a normal balance, nor prevent periodontal disease. Periodontal therapy is indicated for cats having PD. Periodontal disease requires ongoing professional therapy to slow the progression of disease. It will never be cured. Periodontal disease contributes to systemic inflammation.

TOOTH RESORPTION

Tooth resorption (TR) often presents with focal gingivitis and oral pain. Tooth resorption can be external inflammatory (associated with periodontal disease) or noninflammatory replacement resorption resulting in ankylosis.\textsuperscript{3,4} It cannot be treated with steroids or other anti-inflammatory medications. Intraoral radiographs are indicated to evaluate stage and type of resorption (www.avdc.org for nomenclature, stages and types of tooth resorption) prior to oral surgery. Surgical treatment of teeth having Type 1 TR (external inflammatory resorption) varies from treatment of teeth having Type 2 TR (noninflammatory replacement resorption).

ORAL FISTULAS

Oral fistulas are always an indication for intraoral radiography. Pending radiograph results, biopsy, surgery, or periodontal treatment may be indicated. The following oral pathologies may present with fistulas: periodontal disease, endodontic disease, retained tooth roots, tooth resorption, neoplasia, dentigerous cysts, and Actinomycosis. Squamous cell carcinoma often presents as an ulcerated lesion without a mass-like effect.

ORAL MASSES

Oral masses are always an indication for intraoral radiography and occasionally CT or CBCT. Biopsy and cytology may also be indicated. The following oral pathologies may present as masses: alveolar bone expansion, neoplasia, buccal granulomas, unerupted teeth, dentigerous cysts, peripheral odontogenic fibromas, osteomyelitis, etc.

FELINE OROFACIAL PAIN SYNDROME (FOPS)

FOPS is a recently recognized condition affecting mainly Burmese cats. It is a pain disorder with behavioral signs of oral discomfort and tongue mutilation. The most common triggers appear to be oral lesions and/or dental disease. There are similarities to trigeminal neuralgia and other orofacial pain disorders in humans.

Cats present with exaggerated licking and chewing movements, pawing at the mouth, and unilateral discomfort. Clinical signs can be episodic or continuous. In the episodic version, the distress usually begins after eating and lasts 5 minutes to 2 hours. Some cats have continuous

discomfort that increases in intensity when excited or stressed. These cats are often anorexic, in great distress, and may require an E-collar to prevent severe mutilation.5

Painful oral disease must be ruled out as an etiology: calicivirus ulcers, erupting permanent teeth, tooth resorption, periodontal disease, recent history of difficult extraction or tooth root atomization, etc.

Medical management of the FOPS cat is dependent on the underlying cause. Tooth resorption is one of the more common associated diseases and the questionable practice of dental atomization of fractured or retained roots aggravate the problem. Psychological factors must also be considered, such as stress from multi-cat household. Spontaneous remission, such as in the case of erupting permanent teeth, and recurrence are common.

As a general guideline, NSAID’s are the most appropriate first line therapy for mild cases and phenobarbitone (2-3 mg/kg initial dose, with reduction over time to lowest effective dose) for more severe acute or chronic cases. Gabapentin (10-20 mg/kg Q8-12 h) and Selegiline (1 mg/kg p.o. SID) have also been used to treat FOPS in which a primary etiology could not be identified.

MALOCCLUSION

Malocclusion may be genetic, pathologic, or traumatic (as in the case of jaw fractures).6 Open mouth jaw locking is an intermittent malocclusion without a history of trauma and is often misdiagnosed as TMJ luxation. Both present with the cat being unable to close its mouth. The locking is released by opening the mouth wider and shifting the unlocked mandible toward the midline and into normal occlusion. Surgery is required to prevent recurrence. If surgery is not performed, the locking often recurs when the cat yawns or the mouth is opened wide for oral medication. It is most often diagnosed in brachycephalic cats. A cat with TMJ luxation or fracture presents with an open mouth and a history of trauma. History, head shape, and radiographs and/or CT should be used to differentiate open mouth jaw locking from TMJ luxation/fracture. Malocclusion of any etiology may cause dental and/or soft tissue trauma and requires surgical treatment to restore or correct the problem to a non-painful, functional occlusion.

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Facial and jaw fractures in cats are usually the result of trauma. The cat with these injuries may present with blood in the nose or an inability to close the mouth completely. The most important principle of facial and jaw fracture treatment is restoring the occlusion. It is best to refer the patient as soon as it is stable for evaluation and fracture stabilization to a Boarded dentist (www.avdc.org for a Dental Specialist nearest you). An esophagostomy feeding tube may be placed to deliver nutrition prior to transfer. A CT or CBCT scan may be needed to assess the extent of trauma. Waiting and watching several days allows the jaws to heal out of occlusion thus creating complications. In the common presentation of a mandibular symphyseal separation, with no other jaw, dental or facial fractures, 26 gauge wire may be used in a cerclage pattern to stabilize the symphysis. It is important to take intraoral radiographs prior to placing the wire. If there are any tooth roots in the symphysis, healing will not occur. For less traumatic removal of the wire upon healing, do not bury the knot.

FRACTURED TEETH

Unlike dogs, fractured teeth in cats are most often the result of trauma that is not self-induced. Complicated fractures (visit www.avdc.org for classification of dental fractures) require surgical treatment – either root canal therapy (fractured canine teeth) or extraction.

UPDATE ON FELINE GINGIVOSTOMATITIS

Gingivostomatitis (GS) in cats has various patterns of disease and may require multimodal therapy. According to currently available knowledge, there is no agent with a cause and effect relationship to this chronic inflammatory syndrome. Plaque biofilm must be managed in order to achieve good control of the symptoms. Daily plaque removal by the pet owner is impractical due to the pain the cat is experiencing. Removal of plaque retentive surfaces (oral surgery: caudal teeth or full-mouth extractions) is currently the most effective treatment for chronic GS. In a retrospective study\(^7\) of sixty Calicivirus positive cats treated with premolar and molar extractions, 50% were cured, 37% improved but required less medication (NSAIDs +/- antimicrobials) than before surgery, and 13% did not improve after surgery. In another study with long-term follow-up of 30 cats with chronic GS\(^8\) that were treated by extraction of most or all premolars and molars, 80% were significantly improved or clinically cured 11-24 months postoperative. In a more recent study of 95 cats, extraction of teeth in areas of oral inflammation provided substantial improvement or complete

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resolution of stomatitis in more than 2/3 of affected cats. Full mouth extraction did not appear to provide additional benefit over partial mouth extractions. Extracting teeth only in areas where inflammatory lesions are present was supported by the results of the study. It was also concluded that most cats with GS may require extended medical management to achieve substantial clinical improvement. Six percent of GS cats did not respond to surgery or medical therapy.\(^9\) The cause of GS continues to be an enigma and is probably multifactorial. In a study of the feline microbiome (collective genetic material of microorganisms in or on an environment), the authors concluded that there is a decreased microbial diversity in cats having FCGS and that *Pasturella multocida* dominated the bacteria flora. Disturbance or imbalance in the oral microbiome can shift immune tolerance to a proinflammatory response that results in clinical disease. The current shortcoming in all microbiota research is that a link between cause and effect and changes in microbiota is lacking.\(^{10}\) All we can say with confidence is that FCGS is probably an atypical immune response of unknown etiology.

**Role of Bartonella, FHV-1, FCV, FIV, FeLV**

In a study\(^{11}\) of nine cats with (GS) and 36 unaffected cats, no correlation was found between Bartonella, FHV-1, FCV, FIV, and FeLV and GS. In an unpublished study by KL Dowers and MR Lappin at Colorado State University evaluating the association of *Bartonella* sp infection with chronic stomatitis in cats, the only survey factor with significant correlation with stomatitis was a history of upper respiratory infection. There was no statistical difference between PCR tissue samples in Bartonella positive, Bartonella negative and stomatitis cats. In a study of sixty cats\(^{12}\) with chronic GS with palatoglossitis (caudal stomatitis) and 30 cats with chronic GS without caudal stomatitis, the prevalence of FCV carriage and FHV carriage was 97% and 15% in the cats with caudal stomatitis versus 30% and 14% in cats without caudal stomatitis. In 2010, Dowers et al. reported that FCV is the only correlated factor of significance in caudal mucositis/stomatitis so far.\(^{13}\)

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\(^{11}\) Quimby JM, Elston T, Hawley J, et al. Evaluation of the association of *Bartonella* species, feline herpesvirus 1, feline calicivirus, feline leukemia virus and feline immunodeficiency virus with chronic feline gingivostomatitis. *J Fel Med and Surg* 2007, doi:10.1016/j.jfms.2007.05.007


**Cyclosporine**

Cyclosporine A (CsA) has been used an immunomodulatory therapy in cases of feline atopy, eosinophilic granulomas, and more recently chronic GS. There has not been any strong evidence that cyclosporine is a successful treatment for chronic GS. In a study of 16 cats with chronic GS, whole-blood cyclosporine levels > 300ng/ml were associated with significant improvement in oral inflammation in cats that had already undergone partial or full-mouth extractions. One cat receiving placebo (fish oil) also had improvement. Chronic use of cyclosporine has been associated with fatal systemic toxoplasmosis in a cat with feline atopy.

**Virbagen Omega**

The Virbac product, Virbagen Omega (feline interferon) has been used in some refractory feline gingivostomatitis cases, which were unresponsive to caudal teeth or full mouth extractions. It has “shown promise” in many of these cases. Improvement in visible inflammation may take up to three months. Unfortunately, Virbagen Omega is seen by some as the new “magic bullet” and has been used unwisely. Virbagen Omega is not available in the United States. In a study of calicivirus positive cats (n=39) with refractory caudal stomatitis, feline interferon and glucocorticoids treated cats were compared. Progression of behavioral, clinical and lesional scores were assessed over 90 days. There was no significant difference between the two groups for most parameters, except pain.

**Class IV Laser**

The analgesic effects of Class IV laser therapy (maximum power = 8-12 Watts) are due to decreased nocioceptor sensitivity, and increased endorphin and opioid release. There are anecdotal reports of Class IV laser being used to manage oral pain in cats having stomatitis that have not had oral surgery. Pain management with this method requires lifelong therapy. Stomatitis is not cured with Class IV laser therapy. Postoperative healing, in cats having had oral surgery (extractions), may possibly be enhanced with Class IV laser.

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**CO2 Laser**

The goals of CO2 laser therapy in stomatitis patients are: 1) removal of proliferative tissue, 2) stimulation of fibrosis, and 3) reduction of opportunistic bacteria in abnormal tissue. This mode of laser therapy may be used as an adjunctive therapy for refractory caudal stomatitis in cats after extractions have been performed. Studies are needed to determine if laser treatment provides a true benefit for the stomatitis patient.17

**Polyunsaturated fatty acids (PUFAs)**

PUFAs are known to decrease the inflammatory response in people and pets and have been used to treat several inflammatory conditions. In a study of 16 chronic GS cats in which fish oil was used as a placebo, one placebo cat had significant decrease in oral inflammation after six weeks. 34 Anecdotally, this author has seen partial remission of oral pain after 3 months of fish oil given daily, and complete remission after six months in a stomatitis patient that had premolar, molar, and incisor extractions. A study in which diets supplemented with PUFAs were fed to chronic GS cats for four weeks after having premolar and molar extractions did not alter the degree of inflammation or wound healing over the placebo group.18

**Famciclovir**

The systemic anti-herpes drug, famciclovir appears to be a promising drug for treating diseases associated with FHV-1 infection including ophthalmic disease, rhinosinusitis, and some dermatitis cases. Most viral isolation studies from cats having stomatitis have shown an association with Calicivirus. Famciclovir specifically inhibits RNA synthesis of herpes virus. Calicivirus is an unenveloped RNA virus. Some cats with chronic FCGS shed both Calicivirus and herpesvirus.19 There are only anecdotal reports of FCGS cats that have been responsive to famciclovir. Dosages vary widely, from 31.25 mg BID (Plumb’s 7th ed) up to 125 mg TID for a month.20,21

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**Stem Cell Therapy**
In a study using adipose derived stem cell therapy in seven cats with FCGS, 2 were non-responders, 2 had some improvement, and 3 were controlled. Two injections of autologous stem cells were given one month apart in addition to opioids. Feline foamy virus killed some of the stem cells prior to injection. In this study, cats with \(<15\%\) CD8 T cells with low expression (CD8$^{lo}$) were responders to stem cell therapy. They had systemic immunomodulation of several inflammatory mediators. Cats with \(>15\%\) CD8$^{lo}$ cells were non-responders.22

**Pentoxifylline**

Pentoxifylline (Trental®) has been used anecdotally in dogs and cats with chronic stomatitis. It is postulated to reduce endotoxic effects of cytokine mediators. It is not approved for use in cats. In cats, the anecdotal dose is 5 mg/kg BID. Allow two weeks to evaluate response to the treatment. Pentoxifylline may be given with Atopica as they have different mechanisms of action. Veterinary experience with pentoxifylline is limited and animal adverse effects may differ.23

**Pain Management**

Approximately 6\% of stomatitis patients are refractory to surgical and medical therapies. Chronic pain management may be needed in the non-responders to maintain a quality of life. Transdermal prednisolone at doses recommended for treating IBD (10 mg Qd until remission, then every other day and gradually diminishing the dose) or gabapentin applied to food as a flavorful suspension may provide comfort for some of these patients. Some refractory stomatitis patients have chronic inflammation, but no clinical signs of pain: they eat without difficulty, groom, are active, social and maintain body weight. These patients may not need any medical therapy to maintain quality of life, in spite of ongoing inflammation.

**BRUXISM**

Evaluate the cat that presents for bruxism for gastrointestinal disease. Bruxism in cats has been associated with esophagitis, IBD, lymphoma, and reflux. A complete oral exam should also be included in the diagnostic plan of the cat with bruxism.

SUGGESTED READING

Feline Dentistry: Oral Assessment, Treatment & Preventative Care, by Jan Bellows, available from Wiley-Blackwell. Also available on Amazon.com