Vermont Veterinary Medical Association

2017
WINTER MEETING

Sunday, February 19, 2017
Burlington Hilton Hotel

Donnell Hansen, DVM, DAVDC
Blue Pearl Veterinary Partners

NAVIGATING A DAY IN THE LIFE OF VETERINARY DENTISTRY

HOLD THE DATE!

VVMA SUMMER MEETING
Friday, June 23, 2017
Burlington Hilton Hotel
6 CE Credit Hours

Small Animal Topic TBD by your survey responses!
Please complete and return the survey in your registration packet

Bovine Topic: Food Armor – Phase II

Thanks for being a VVMA member!
We are pleased to welcome the following members who joined since our 2016 Summer Meeting

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Emma Basham – Chelsea Animal Hospital
Brendan Bergquist – Franklin Cty Animal Rescue
Noel Berman – Peak Veterinary Referral Center
Tim Bolton – Peak Veterinary Referral Center
*Meagan Coneeny – Walpole Veterinary Hospital
*Amy Cook – Newbury Veterinary Clinic
J. Nicholas Drolet – Stowe Veterinary Clinic
*Amber Goodwin – Vermont Large Animal Clinic
*Andrew Hagner – Hill's Pet Nutrition
Thomas Linden – Northwest Veterinary Assoc.
Paul Kotas – Green Mtn. Veterinary Hospital
*Aaron Lothrop - Essex Veterinary Center
*Alice McCormick – Petit Brook Vet. Clinic
*Meghan Morrell – Vermont Large Animal Clinic
Kimberly O'Connor – Derby Pond Animal Hosp.
Carrie Olson – Vergennes Animal Hospital
Joanna Schmidt – BEVS
Nell Snider – Veremedy Pet Hospital
Christopher Spooner – Oxbow Veterinary Clinic
*Emily Sullivan-Riverside Vet. Care & Dental Ser.
Bradley Temple – Springfield Animal Hospital

* Attending this 2017 Winter Meeting!

Vermont Veterinary Medical Association

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VVMA Mission:
Promoting excellence in veterinary medicine, animal well-being and public health through education, advocacy and outreach.

VVMA Vision:
To be the preeminent authority on veterinary medicine and animal well-being in Vermont.

VVMA Values:
Integrity, Service, Dedication, Compassion, Inclusivity, Visionary Thinking, Life-Long Learning

For questions or more information on the VVMA, contact Executive Director Kathy Finnie.

2017 Winter Meeting Vendors
Thank you for your support of our Meeting!

4 Legs & A Tail	Tim Hoen	TimH.4LT@gmail.com
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Burlington Emergency & Vet. Specialists	Whitney Durivage	whitbier@bevsvt.com
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Jenny Garber, DVM

Internal Medicine
Marielle Goossens, DVM, Diplomate ACVIM
Tim Bolton, DVM, Diplomate ACVIM

Oncology
Kendra Knapik, DVM, Diplomate ACVIM - Oncology
Noelle Bergman, DVM, Diplomate ACVIM - Oncology

Physical Rehabilitation
Nancy Zimny PT, CCRT

Vermont Veterinary Eye Care
Sarah Hoy, DVM, MS, Diplomate ACVO

Neurology
Phil March, DVM Diplomate ACVIM - Neurology

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Kurt Schulz, DVM, MS, Diplomate ACVS
Kristian Ash, DVM

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Pam Perry DVM, *Practice Limited to Behavior*

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CRACKED CANINES; REVIEWING FRACTURED, DISCOLORED, AND "ODD" TEETH.

Donnell Hansen, DVM, DAVDC
BluePearl Veterinary Partners

This lecture will investigate identification, diagnosis and treatment options associated with specific tooth abnormalities. We will address indications for extraction, vital pulp therapy, root canal therapy, and even some situations in where restoration may be an option. If you have ever wondered what to do with the fractured maxillary fourth premolar that "doesn't seem to be bothering him, doc…" this lecture is for you. Although most of the lecture notes hold true for dogs and cats, our focus today will be on the canine patient.

Introduction

"The days of observing and neglecting fractured teeth are over." These are the words of Dr. Jan Bellows, a board certified veterinary dentist who is active on the lecture circuit and a vocal "VIN"ner for those of you who are internet savvy. Did you know 1 in 10 dogs have a pulp exposed tooth? Unfortunately, too often, these teeth are either not noticed or not addressed. As our patients rarely show signs of oral pain (which does NOT mean they do not have oral pain), owners do not have the motivation to pursue therapy. Likewise, the veterinarian is left wondering if the risk of anesthesia and financial investment on the owner's behalf is worthwhile in an asymptomatic patient. Fear of anesthesia is sadly an excuse used by both owners and veterinarians alike to avoid performing a potentially costly and frustrating procedure. However, with a little knowledge, some inexpensive equipment, and client education, you can feel confident that not only is treating a diseased tooth personally rewarding, it is necessary for our patient welfare.

Marketing

There are many creative and easy ways to market your dental care that are obviously beyond the scope of this lecture. However, I often get asked the question, how do you get your clients to consent? Most of my clients are referred by general practitioners, and I always tell the students that there is very little that I do in the "ivory tower" that they cannot do themselves in general practice. Aside from the patients who see us due to real (but rare) high risk anesthesia concerns, the only difference that I can identify is the fact that I take the time to show the owners what is happening. I explain confidently and unequivocally that this patient is experiencing pain. I do not use words like "I think" or "we should consider." Rather, pull out your dry erase board and draw them a picture of what is happening or what is likely to occur in the future. I recognize that it is hard to set aside that kind of time during their routine annual visits when the fractured tooth is identified and on top of the heartworm meds, the vaccines,

the fecal exam… now you want to "sell" them an extraction under anesthesia. You start to feel a bit like an overwhelming car salesman. However, although my estimates are likely significantly higher than many of yours, rarely do I ever have a client decline treatment. You could argue that by the time our clients arrive at the hospital, they are prepared to spend money. Yet, weekends spent in private practice yield similar results.

Tooth anatomy

Endodontic disease is defined as the pathology of the dental pulp and periapical tissues. Most of the conditions included below involve disease of the pulp. However, before we can talk in depth about endodontic disease we need a brief review of tooth anatomy.

The enamel is the hardest substance in the body (96% inorganic). It provides the protective coating to the crown of the tooth. Enamel cannot regenerate so if enamel is lost, it will not be replaced. Dentin makes up the bulk of the tooth and is made up of a series of tubules. I like to imagine boxes of the Styrofoam pool noodles you see at the large warehouse stores laid on their sides. If the dentin is exposed, bacteria can sneak down those "pool noodles" and result in endodontic disease. However, dentin does have some reparative capacities. Odontoblasts (the cells that make dentin) line the pulp chamber and have "arms" or processes that extend out into the tubules. These are what give you that sensation of sensitivity when you drink hot tea or eat a Starburst candy. The osmotic changes stretch or shrink those nerve endings resulting in a "zing." If these nerve endings are irritated, they stimulate dentin deposition called tertiary or reparative dentin in an effort to create a thicker buffer between the contaminated oral cavity and the sensitive pulp. Tertiary dentin is slightly more porous and therefore tends to pick up pigment easier. The chocolate milk colored dots you see on those worn lower incisors of a tennis ball chewer is likely tertiary dentin. Occasionally, however, this reparative process cannot work fast enough and bacteria have already reached the pulp tissue through either the dentinal tubules or directly through exposed pulp tissue (in the case of excessive wearing) and resulted in endodontic disease and/or a periapical abscess. Therefore, it is always important to carefully investigate any worn and chipped teeth for pulp exposure (in case the reparative process could not keep up) and also use radiographs to assess if there is evidence of endodontic disease! Be wary, debris can become lodged within an open pulp canal and appear similar to tertiary dentin. Careful investigation of the tooth with the explorer end of your probe usually reveals the answer; the tooth surface should be smooth without any "sticking" when probed. Lastly, the pulp tissue is at the center of the tooth with the pulp chamber (with the horizontal portion of the canal on multi-rooted teeth) and pulp canals (portion within the roots). The pulp tissue is made up of nerve fibers, blood vessels, and to a lesser extent, lymphatics. The components of the

pulp enter at the apex of the tooth at the apical foramen. People have what is termed as an apical delta where the fibers enter and exit the canal in a fan like (or river delta) appearance, whereas dogs and cats tend to have a more defined foramen. Once the pulp is exposed it WILL chronically be exposed resulting in pain and infection. It is a myth that a pulp exposed tooth will eventually 'seal over." The pulp canal can be filled with debris leading to the impression of a closed tooth; however this is simply a plug of calculus, debris, minerals, and bacteria that do nothing to protect the tooth or prevent abscessation.

Diagnoses based on clinical appearance

In order to make appropriate therapeutic decisions, we must first diagnose what we are seeing. Intra-oral radiology is a critical modality when diagnosing and treating diseased teeth, however much can be determined based on a thorough oral exam.

Fractures

There are several types of fractures affecting teeth resulting in numerous classification schemes. Although seemingly academic, the classification scheme helps direct our therapeutic intervention. The simplest and most practical classification, in my opinion, is used by the American Veterinary Dental College and is as follows:

* Enamel infraction (EI): An incomplete fracture (crack) of the enamel without loss of tooth substance.
* Enamel fracture (EF): A fracture with loss of crown substance confined to the enamel.
* Uncomplicated crown fracture (UCF): A fracture of the crown that does not expose the pulp.
* Complicated crown fracture (CCF): A fracture of the crown that exposes the pulp.
* Uncomplicated crown-root fracture (UCRF): A fracture of the crown and root that does not expose the pulp.
* Complicated crown-root fracture (CCRF): A fracture of the crown and root that exposes the pulp.
* Root fracture (RF): A fracture involving the root.

Furthermore, we must determine the duration of pulp exposure or fracture. An acutely pulp exposed tooth is a fracture that has occurred within the last 48 hours. Anything beyond that critical time period or of an unknown duration is considered chronic regardless of the clinical appearance of the tooth. This is important when discussion therapeutic options.

Discolored teeth
In general, a discolored tooth is a diseased tooth. As we age, we may experience staining or thinning of enamel which can result in an off-white to yellowish appearance, however if any single tooth is different in color from the general pattern it warrants investigation.

* Pulpal hemorrhage (or pulpitis): This is a condition that results from blunt trauma and is accompanied by a pink, purple, or chronically grey/brown color. The tooth receives an injury that does not result in fracture but does result in inflammation of the pulp. Often Frisbees, oral play, or even a clumsy fall can be the culprit. Consequently, the pulp swells and bleeds, however unlike a thump to the arm, there is no place for the swelling to go. Red blood cells escape into the dentinal tubules and unlike a bruise to the arm, there are no lymphatics in the tubules to clean up the trapped red blood cells. Overtime, the hemeparticles in the red blood cells break down and an originally pink tooth will start to appear purple, then ultimately grey. Unfortunately, when the pulp swells it strangulates at the apical foramen and no fresh blood can enter the tooth and no hypoxic blood can exit. THIS IS A DEAD TOOTH AT RISK FOR (IF NOT ALREADY) ABCESSATION. Originally, this is a painful tooth, however the pain likely subsides as the associated nerves die UNTIL periapical abscessation occurs and the pain is inevitable. A common question is, "where did the bacteria come from to create the abscess?" Although in fractured teeth, it is obvious the bacteria come from the contaminated oral cavity, the teeth affected by pulpal hemorrhage become infected much like a sequestrum. Bacteria are constantly circulating in our vascular system and are usually cleared by the immune components, however, when they encounter an area of necrosis before our reticuloendothelium, abscessation can occur. Although the literature explains that there is reversible and irreversible pulpitits, 94% of these teeth have necrotic pulp tissue and the remaining 6% likely are undergoing some degree of pulpal death. These teeth deserve to be treated like any diseased tooth.

* Internal root resorption: Another consideration for a pink tooth is internal root resorption. This is less commonly identified than pulpal hemorrhage and needs radiographic interpretation to diagnose. Like pulpal hemorrhage, internal root resorption occurs as a result of pulp inflammation, although the etiology is often unknown. In this case, as opposed to cats with external root resorption (tooth resorption/resorptive lesions), this is a case where the dentin is being resorbed from within the tooth.

Malformed teeth
* Enamel defects: This condition is caused by damage to the enamel that occurred during development. Often, if you inquire about these patients you will learn of an illness in puppyhood. Certainly trauma (including trauma from an aggressive deciduous tooth extraction) can also be a culprit resulting in enamel defects. Although

distemper virus is traditionally blamed for enamel hypoplasia, any significant illness resulting in fever and/or attack of rapidly dividing cells can be responsible including parvo, giardia, etc. Enamel hypoplasia is a quantitative defect resulting in less enamel. What you see is what you get, meaning it should not change throughout the lifetime of a patient. Enamel hypocalcification on the other hand is a qualitative defect meaning there is not enough mineral within the enamel and it flakes off overtime. Both conditions results in defects on the enamel, although what we tend to term enamel hypoplasia is often in fact, hypocalcification. Depending on the degree of defect, the underlying dentinal tubules may be exposed. As dentin is rougher than enamel, it accumulates plaque, calculus, and stain quicker than the surrounding enamel. This discrepancy accounts for the discoloration associated with enamel defects. Care must be taken so as to not aggravate the condition during daily activities as well as while undergoing dental care (i.e. prophylaxis).

* Root dilaceration: Although this topic is not one of our typical “buzz words” this condition is common in small breed patients. Technically, root dilaceration is defined as a sharp bend or angle in the root of any tooth. However, in the small breed dog, a common form of root dilacerations affects the mandibular first molars resulting in converging rather than diverging roots. Although not always obvious, these teeth often have an opening to the pulp chamber at the level of the crown margin or furcation that results in endodontic disease and abscessation. In these micro-dogs, it does not take long for a periapical abscess in the mandible to result in pathologic fracture. Recently, as we identify the concern so frequently, I have gotten into the habit of taking survey intra-oral radiographs of all mandibular first molars regardless of oral exam findings in our small/toy breeds.

* Dens en Dente: This term is Latin for "tooth in tooth" where essentially there is a developmental abnormality that results in an enfolding on the tooth resembling a tooth within a tooth. Again, like root dilaceration in the microdog, there is often a direct communication from the oral cavity to the pulp chamber resulting in an infected pulp chamber or the invagination creates a periodontically compromised tooth.

* Dentinogenesis imperfecta: This is essentially improper tooth development often secondary to trauma while the immature tooth was developing. Based on the type of trauma, the clinical picture can vary significantly. Again, often these teeth are endodontically and/or periodontically compromised.

* Odontoma: An odontoma is a hamartoma of dental origin usually diagnosed in young patients. There are two types of odontomas, 1) Compound and 2) Complex. A compound odontoma has tooth-like structures called denticles versus a complex odontoma where the “mass” of dental tissues bears no resemblance to a tooth. If you see a “tooth” that looks like dozens of little teeth squished together, this is likely an

odontoma. These tumors are considered benign, however due to the associated periodontal or endodontic disease, they still require removal.

Caries

Caries, otherwise known as cavities, occurs in our canine patients, as well as, in our own mouth. These are erosions into the surface of the tooth as a result of the acid produced when certain bacteria interact with the sugars in our mouth. What originally begins as a softening of enamel eventually extends into the dentin and/or pulp.

Treatment

Now that we have identified all of this oral pathology, what are our treatment options? When discussing tooth related disease, the treatment options in the veterinary world generally encompass three branches; endodontics, exodontics, and restorative dentistry. Here is a brief review of the appropriate treatment options for the conditions listed above. Remember, variables and exceptions exist and the ultimate diagnosis and best treatment option depend on the oral exam findings, radiographic findings, along with patient and client compliance. Excellent laboratory sessions are offered by veterinary dentists throughout the United States and a great resource is the veterinary dental forum (www.veterinarydentalforum.com) for further education and hands-on skills.

Briefly, I want to explain the rationale behind the different treatment options so that you all can keep a straight face when offering the rancher referral for a root canal on his cattle dog.

* Root canal therapy: In a nut shell, a root canal is a procedure that removes the infected/diseased pulp, shapes and cleans the pulp canal, fills the canal with a sealant and core material (usually gutta percha) and places a composite restoration over the access sites or fracture site so as not to allow percolation from the oral cavity. A root canal is considered the treatment of choice in periodontically sound but endodontically compromised teeth. Root canal therapy is strongly recommended for the strategic teeth; the canines, maxillary fourth premolars, and mandibular first molars. A root canal avoids a potentially complicated surgery (every created an oronasal fistula extracting the maxillary canine or fractured the jaw extracting the mandibular canine?), is more comfortable for the dog, and leaves the patient with an intact and functional tooth. I do not even offer extraction of fractured mandibular canines as it will be much more frustrating, time consuming, and ultimately costly for the client when it takes me three hours to extract the 6 cm long canine tooth when I could have performed a nearly painless root canal in under an hour. I receive emails once a month asking how to repair a fractured mandible after attempted extraction of this strategic tooth! Depending on the career and behavior of the dog, a crown may be recommended as a dead or treated tooth may be more likely to fracture than a healthy

tooth. Police dogs, for example, automatically receive crown therapy. The cons of root canals may include potential for lost/leaking fillings, risk of ongoing fracture, and the requirement of annual monitoring. Having said that, if appropriate candidates are chosen wisely, root canals in our canine patients have about a 95% success rate. And yes, a root canal CAN be performed on an abscessed tooth!

* Extraction is a good option especially in areas where there simply isn't access to someone performing endodontic therapy. With radiographs, a high speed hand piece, sharp elevators, and patience every veterinarian can perform successful extractions. Although the patient has to experience a potentially painful procedure, the diseased tooth is removed and the problem is solved!

* Vital pulp therapy is essentially placing protective materials and a composite restoration over an acutely fractured tooth (<48 hours of exposure). The goal in vital pulp therapy is to eliminate any source of oral pain and infection while maintaining a living (hence the term vital) and functional tooth. The hope with vital pulp therapy is that the materials placed within the canal will irritate the odontoblasts to create a dentinal bridge therefore adding an additional layer of protection from infection should the filling ever fall out or leak. Again, annual monitoring is recommended.

* Restoration is essentially placing a bonding agent and filled or unfilled resin over a defect to minimize sensitivity and provide an added layer of protection.

Fractures

* Enamel infraction (EI): There is likely no treatment necessary, annual oral exam and radiographic monitoring are warranted.

* Enamel fracture (EF): After the tooth is confirmed to be radiographically normal, there is likely no treatment necessary, annual oral exam and radiographic monitoring are warranted.

* Uncomplicated crown fracture (UCF): This one can be a little tricky and up for some debate among the veterinary dental community. Again, pending radiographic findings, there may be no need for treatment. If the fracture was relatively new (i.e. within the last several weeks to months), an unfilled resin bonding agent may be placed over the exposed dentin to "seal" those open dentinal tubules. If the fracture is chronic, one

would imagine the dentinal tubules have already produced tertiary dentin and "sealed" themselves, however the only way to know would be serial intraoral radiographs over time. If endodontic disease is present, then root canal therapy or extraction is warranted.

* Complicated crown fracture (CCF): If less than 24-48 hours of pulp is exposure can be documented; vital pulp therapy can be performed. If longer than 48 hours, then either root canal therapy or extraction is indicated.

* Uncomplicated crown-root fracture (UCRF): Depending on the degree of root fracture, extraction may be necessary. Potentially, a crown lengthening procedure may be performed to expose the fracture plane and minimize the risk of periodontal disease. The remainder of the treatment options are exactly like uncomplicated crown fracture.

* Complicated crown-root fracture (CCRF): Again, depending on the degree of root fracture, extraction may be necessary. Potentially, a crown lengthening procedure may be performed to expose the fracture plane and minimize the risk of periodontal disease. The remainder of the treatment options are exactly like a complicated crown fracture.

* Root fracture (RF): Aside from heroics, extraction is necessary.

Discolored teeth
* Pulpal hemorrhage (or pulpitis): Treatment options include root canal therapy or extraction.

* Internal root resorption: Depending on the degree of resorption, root canal therapy or extraction (if too much, root canal therapy may not be an option).

Malformed teeth
* Enamel defects: This is also a tricky one subject to many variables. The concern here is that the tooth is likely sensitive, weakened, and due to exposed dentinal tubules, subject to infection of the pulp therefore intervention is recommended. If the tooth is not structurally or endodontically compromised, restoration may be an option with composites and bonding agents in the case of enamel hypoplasia. In my opinion, however, composite restoration may be impractical in the case of enamel hypocalcification as the remaining enamel is of poor quality and the likelihood that the restoration will be successful is low. Bonding with an unfilled resin may be an option, however you must start with a clean surface and it can be difficult to achieve that without removing excessive amounts of enamel. Regular oral exams, intraoral radiographs, good client education/diligence, avoidance of hard/abrasive chew toys are necessary at a minimum.

* Root dilaceration: In the case of the microbreed, abscessed mandibular first molar, extraction is really the only option as it can be difficult to address the site of pulp exposure. CAREFUL extraction with pre- and post- extraction rads are necessary here

as risks include pathologic and/or iatrogenic jaw fracture. Significant hemorrhage can also occur as the apices of this tooth are often sitting in mandibular canal. Have bone wax handy!

* Dens en Dente: This is not likely to be a functional tooth and usually poses a significant periodontal risk. Extraction is the treatment of choice.

* Dentinogenesis imperfecta: Like dens en dente, this is not likely to be a functional tooth and usually poses a significant periodontal risk. Extraction is usually the treatment of choice unless mild enough that the tooth remains functional with normal periodontal anatomy.

* Odontoma: These tumors are considered benign, however due to the associated periodontal or endodontic disease, surgical "extraction" and/or oral surgery is necessary to remove these masses. Radiographs are going to be critical to ensure all appropriate tooth-like material is removed.

Caries
Depending on the degree of involvement, debridement with composite restoration and annual monitoring may be adequate. However, as many of these cases are not identified until significant destruction has occurred, debridement with root canal therapy or extraction is recommended.

The bottom line is, in most of these conditions, to do nothing is not an option. To do nothing is often a failure of adequate patient care. However, it is understandable that not every client will be willing to pursue advanced therapies like a root canal. The vast majority of these conditions can be quite appropriately addressed in your hospital… providing the appropriate diagnosis is made; extraction is almost always a valid and acceptable option. Although in many cases it is ideal to "save" teeth, the ultimate goal is provide a pain free and functional mouth and we do not need an "ivory tower" to accomplish it!

Imagine for a moment that you have fractured a tooth and the pulp has become exposed? Would that be painful? No doubt! Because our canine companions are more stoic than ourselves, we find it hard to interpret signs of oral pain. Unlike a broken leg, often dental pain starts out dull and amplifies overtime which is very subtle and difficult to detect. Patients rarely will stop eating due to oral pain as they have a choice; eat and live, or don't and starve. You will notice many of these patients do not chew or chew on the opposite side of the fracture. Watch for the discrepancy in calculus accumulation between the right and left side of dog with a unilateral maxillary carnassial fracture! So the next time a client exclaims wild dogs "do fine" or "I had a 10 year old Schnauzer that never had any issues," remind them that most wild

canids have pulp exposed teeth and do not have the life expectancy of our canine companions and although the Schnauzer may have gotten along okay, we never will know how much better he could have done with appropriate oral care. Get into the habit of asking clients if they have noticed a difference in their pets before and after the dental procedure at the recheck exam… you will gain ample motivation to continue addressing the “cracked canine!”

MALOCCLUSIONS; WHAT DO I NEED TO KNOW IN GENERAL PRACTICE?

Donnell L. Hansen, DVM, Dipl. DAVDC

Malocclusions (or an abnormal alignment of teeth and/or the bones that house the teeth) are everywhere in our veterinary world. Truth be told, if you really pay attention to our human counterparts, there are a lot of abnormal "bites" among our own smiles. Of course, contrary to the situation in people, in most cases, we are not as concerned about the aesthetics of a Boxer dog's occlusion (in fact, they are bred purposely to have a malocclusion, as right or wrong, we find it oddly adorable) rather we tend to focus more on the comfort and function of their bite. In the world of referral medicine, there are many options for treatment of malocclusions, however, what does this mean to you as a general practitioner? Why do we really care about a malocclusion? What kind of malocclusions are there and what common pathology would you expect with each? And what treatment options should you be aware of and how practical are they? We will spend the hour delving into each of these topics and showcasing the common treatments for each so you are familiar with the rationale and motivation behind malocclusion care. While I work in a specialty hospital, my heart is there with you in general practice and my goal is to help you understand what role you have in malocclusions (and it's a big one). Once a bite evaluation becomes part of your standard physical exam, you just may resent ever looking in the first place as there is so much to find!

Malocclusions, or "bad bites", matter on an individual basis simply due to patient comfort. As a veterinarian and/or an owner of a gaggle of rescued dogs, I honestly do not particularly care if my own pet does not have a scissors bite, what I worry about is if there are teeth hitting the wrong place and causing either soft tissue or dental trauma. These conditions are uncomfortable. Period. Have you ever had a filling placed and the composite or amalgam was "just a bit high?" Even a millimeter of abnormal contact and you can feel it with every bite or chew. Imagine an adult canine tooth (or worse, those sharp little baby teeth), stabbing your palate every time you closed your mouth. It is important to remember that pets affected by a malocclusion rarely complain, especially when you consider many of them have had the abnormal bite since their first baby teeth erupted. The families who accompany my patients referred for malocclusions rarely mention obvious complaints from their pets. Rather, you may notice that many of these patients are head shy or reluctant to allow a good oral exam. I had one family who was fostering their 72nd and 73rd puppies, a pair of pit bull puppies with trauma to their palates from their deciduous baby teeth. The foster family explained that this was the calmest set of puppies they have ever known… until I performed interceptive orthodontics and extracted the maloccluding teeth… and then, they had two very mischievous bullies in their home. Bottomline:

malocclusions, specifically traumatic malocclusions, matter. Whether it be the short term immediate discomfort, palatal trauma or defects, long term attrition from constantly abnormally occluding teeth, exacerbation of periodontal disease, or non-vital teeth secondary to chronic concussion, these abnormal bites deserve care (preferably sooner rather than later although malocclusions can, and should, be treated at any age).

Throughout the years, the classification systems for malocclusions has shifted in an effort to better describe the occlusion when talking among colleagues. We used to say, "that patient is 'brachygnathic.'". However, to what are we referring? The maxilla? The mandible? While

most assumed one was referencing the mandible (as the maxilla TENDS to be more fixed since it is connected with the rest of the calvarium) even this does not seem to be true in some cases. Consequently, confusion inevitably snuck in. So here are a list of terms to reference:

Class 0 (mal)occlusion; neutroclusion, scissors bite, normal; aka this is your expected Labrador or wolf-like occlusion. This is considered the intended occlusion with optimum function and comfort. If you ever notice, these patients tend to be at less risk for periodontal disease as well (unless you are a microbreed). It may just be my opinion/personal theory but I bet that a normal occlusion not only helps a patient use their mouth as intended but also helps provide the appropriate shape and motion to divert debris and plaque away from the gingival margin and thereby minimize periodontal disease.

Class I malocclusion (MAL/1); also neutroclusion (meaning the maxilla to mandible ratio/lengths are appropriate) but one or more teeth are out of place. Examples include: "lance" canines or maxillary canines in mesio/facioversion, base narrow mandibular canines, and some examples of rostral or caudal crossbite. The pathology depends on the unique situation. "Lance" canines are prone to periodontal disease and creating and mandibular canine that are tilted buccally. Base narrow canines are prone to horrible palatal trauma. Caudal crossbites can create an incredibly awkward open bite, etc. Base narrow canines are very common in the standard poodle. Maxillary canines that are deviated facially (lance) are often attached to a Sheltie or even Italian Greyhound.

Class II malocclusion (MAL/2); mandibular brachygnathism, mandibular distoclusion, overbite, parrot mouth. There are even cases of maxillary prognathism that I think would fit here. Here, the mandible is short in relation to the maxilla typically resulting in mandibular canines that contact the gingiva or palate. Be careful to pay attention to the lower incisors as well as they can cause significant palatal

trauma. Although any breed can be affected, we see this most commonly in the longer nosed breeds and breeds like the Labrador or German Shepherd.

Class III malocclusion (MAL/3); mandibular prognathism, mandibular mesioversion, underbite. Again, while we often reference the mandible, in many cases it strikes me as maxillary brachygnathism is more to blame here. The lower jaw is long compared to the upper jaw in these dogs (or cats). The most common pathology we see with this malocclusion is trauma to the mucosa lingual to the mandibular incisors (+/- secondary periodontal disease/attachment loss). Also watch (via oral exam and intraoral radiographs) the lower canines very carefully as the maxillary second or third incisors can wear (cause attrition) into those lower canines enthusiastically. While the focus for most malocclusions tends to be the canines and incisors, we see so many non-vital Pug premolars that I cannot help but wonder if their malocclusion leads to abnormal concussion among the premolar series causing "dead teeth." Another great reason for full mouth radiographs. Again, while a class III malocclusion is expected in a boxer dog (or other brachycephalic breed), there are supposed to be atrauamatic occlusions according to the AKC. Teeth are not supposed to contact eachother or soft tissue abnormally. However, in my experience, this occlusion is nearly always traumatic and intervention recommended (start looking very carefully at your squishy faced patients—you will have a lot of work to catch up on!).

Class IV malocclusion (MAL/4); wry bite. This one is only included in some veterinary dental references and is not commonly used. It is intended to refer to a discrepancy between the left and right sides of the maxilla/mandible. This is often considered to be a result of trauma to one of more centers of growth in the maxilla or mandible resulting in one side (or one quadrant) being discrepant compared to the other. Again, pathology here is simply related to the physics associated with the maloccluding teeth.

Treatment options for the different malocclusions depend on the pathology encountered and the goals of the pet/family. We will cover the specifics a bit more with photos in the session to help clarify. It is always important to remember/consider the patient's lifestyle, willingness to tolerate manipulation, overall health, spay/neuter status, and long term goals/career. Concurrently, you have to consider the family's motivation, willingness to recheck/monitor/anesthetize, and plans for this patient. What I would recommend on a working police dog with a class II malocclusion may be different than a nutzo Labrador (none of us have met those dogs, right?!). Here are some things we consider depending on the pathology and the patient/family goals:

* Buttons, elastics, wires to actively orthodontically move teeth

* Expansion devices

* Coronal extenders

* Inclined planes/PetAlign

* Crown reduction with vital pulp therapy (some go straight to root canal therapy)

* Wedge gingivectomy

* Ball therapy/digital manipulation

* Selective extraction

* Creative others (every patient requires a creative approach and many unique concepts have been devised)

* **Conceivably, facial bone distraction (as sometimes performed in people) could be an option for veterinary patients but I cannot help to say that the trauma and morbidity associated with that kind of care is not necessary in our patients especially when selective extraction of offending teeth can be a 100% solution and pets do so well despite missing teeth.

Please know, while all of these orthodontic and/or endodontic options exist, in my opinion, it is always ok to consider extraction of the maloccluding teeth. These other options can be putsy, time consuming, and in many cases, offer no guarantees. On the flip side, they can be less traumatic in the long term, can avoid complications like iatrogenic mandibular fracture, and in some situations, result in a pain free bite that may not need ongoing monitoring (which is the ideal situation). So, while on one hand I encourage clients and veterinarians alike not to discount the value of "doggie braces" I always acknowledge that the goal is to get a pain free and comfortable pet… and in many cases, I do not care how we get there. My uncle thinks my job as a veterinary dentist is completely "asinine" (that is his word) and many laugh at the notion of orthodontics in pets, BUT, if you can shift the lower canine of a mobility-assist working dog to its expected location, that is a great accomplishment with such satisfaction.

The genetics of these occlusions are a bit of a touchy subject. Class II/III malocclusions are collectively considered heritable in most cases (but conceivably could be traumatic in origin). Class I malocclusions are treated a bit as a genetic grey zone. For example, lance canine teeth tend to run in family lines of shelties (but can also be exacerbated by retained baby teeth). I have one client who swears she can tell the difference between a genetic "lance canine" and a non-genetic version… and her breeding Shelties have the non-genetic type. I was asked to give a lecture about

malocclusions to a Golden Retriever club and when I went to officially cite a reference about the genetics of malocclusions, I could not find great resources to support our claims. So, when talking with clients and breeders alike, I explain it just like that. “Yes, Ms. Client, we cannot help but think that these short lower jaws noted in German Shepherds have a genetic component, but I cannot prove it.” There is a lot of debate about whether orthodontics should be performed on intact patients or pets intended for breeding programs. With orthodontics, you may have the opportunity to make a patient phenotypically normal but genotypically affected. Is that fair to help portray a normal occlusion? Is it ethical to alter the way a patient appears when its’ genes may be prone to passing on the abnormal trait? I do not have the answers to these questions. I have long discussions with breeders or potential pet owners looking to buy a pet with a malocclusion explaining how it is an awkward discussion as we all have an opinion about the genetics of a malocclusion but I cannot cite great studies to prove it. I used to theoretically refuse performing any kind of care on an intact patient that would make the patient appear normal. AKA: If I had an intact male standard poodle with a base narrow mandibular canine with secondary palatal trauma, I would happily shorten the tooth via crown reduction and vital pulp therapy to alleviate the trauma but I would be very hesitant to orthodontically move the tooth as the now normal occlusion may misrepresent the pet’s genetics. I have since softened slightly since medically, moving the tooth may actually be in the best interest of the dog… but I will have documented all of the discussions about the potential heritability of such traits and be sure that the information shows up in the patient’s records, the client’s handouts, and my own notes (perhaps ad nauseum). What the family/breeders choose to do with that information is up to them, I suppose, and I am not accountable for their actions… I am here to help this patient here in front of me. Admittedly, I still struggle with that decision in many cases. l do not alter atraumatic malocclusions for aesthetic reasons, however. Some veterinary dentists have developed waivers to help clarify and document these discussions… and others stick to their guns and refuse care.

To be truthful, if you poll the veterinary dentists, there is only a handful of us who really embrace orthodontics. Some veterinary dentists are incredibly creative with their cases and others suggest it is not even advised. Many of us tend to sit right in the middle of that spectrum… given the right client, the right patient, and lots of client education, any of these options have a role in veterinary dentistry. What we all can agree on (as I am sure you do too) is that addressing a traumatic malocclusion is always the right thing to do.

ITS NOT "JUST A DENTAL"; PROVIDING QUALITY ORAL HEALTH CARE STARTING WITH THE ORAL EXAM.

Donnell Hansen, DVM, DAVDC

This lecture will address providing a quality oral exam with a focus on achieving high quality oral health care (and not coincidentally, a fiscally healthy dental program) by identifying and diagnosing oral disease. We will review the necessary steps for a thorough oral exam and review the common (and not so common) pathology encountered.

Oral Examination

The first step in diagnosing oral disease is to recognize what is normal and what is abnormal. A complete oral exam is essential to properly identify and consequently treat the problem properly. Many painful and/or compromising oral conditions are missed simply due to our failure to look. However, a thorough history of the pet precedes any hands on examination. Age, breed, sex, affected litter mates, environmental conditions, duration of onset or duration of the problem, progressive nature of the disease, weight loss, presence of salivation, head tilting, dropping of food out of the mouth or difficulty in chewing, inappetence, pawing at the mouth, rubbing the head against the ground, crying in pain when eating are some important factors evaluated in the history. A complete oral examination includes: the general health status of the pet, nutritional status, presence of calculus build up with associated periodontal disease, loose or infected teeth, halitosis, salivation, stomatitis, nasal-ocular discharge, swelling in the jaw (indicating abscessed teeth or oral tumors), facial asymmetry, malocclusions, retained deciduous teeth, discoloration of the gums or teeth, fractured teeth and oral tumors are some of the common dental problems seen. All the hard and soft tissues in the oral cavity need to be examined, and may require sedation or general anesthesia to perform a thorough oral exam.

As with any condition, treatment of dental disease requires a basic knowledge and understanding of dental disease. Treatment may include; dental prophylaxis, periodontal surgery, extractions, endodontics, orthodontics, oro-nasal fistula repair, fracture repair and oral surgery (ie. complicated exodontia, retained root tips, oral neoplasia).

Dental Charting: THIS IS THE KEY!!! JUST REMEMBER THIS ONE THING!

(If you want to perform quality oral care you must start with the oral exam… this is how you find disease! If you do not look, you do not find, and you cannot treat. Consequently, the owner will not appreciate a difference in their patient and they will

not return for further care. This is a missed opportunity for good patient, increased client perception of value, and important income for your practice!)

Dental records are part of the legal medical record for each patient. It should provide enough information to justify the treatment performed. Some information that should be part of the dental record would be; patient identification and information, chief complaint, dental chart to record previous dental work, missing teeth, abnormal teeth, fractured teeth, periodontal pockets, gingival recession, furcation exposure, attachment loss, treatment plan, treatment performed, radiographic interpretation, follow-up appointments and home care instructions.

There are many types of charts available and that are used in practice. The most important point to remember is that there needs to be some charting and documentation of dental disease. In the veterinary hospital consistency among the staff is important to ensure continuity of care.

Once the patient is under general anesthesia, a systematic approach to charting should be followed:

* Examine the extra-oral tissues for any facial swellings or asymmetry

* Examine the intra-oral tissues such as the buccal mucosa, hard and soft palate, tonsils, the tongue and the lymph nodes

* Check the occlusion

* Note the amount of generalized plaque and calculus present

* Identify any missing or supernumerary teeth

* Document any tooth abnormalities, retained deciduous teeth, fractured teeth, malformed teeth, carious lesions, tooth resorption (formerly resorptive lesions) or rotated teeth

* Use a periodontal probe to determine the periodontal status of each tooth, such as periodontal pockets, gingival inflammation, gingival recession, furcation exposure and tooth mobility.

While performing your oral exam, make it as easy as possible. Use four handed charting if possible (ie one person does the exam and relays it to someone with clean hands writes it in the chart). The first few times you chart it will take several minutes, but once you get the hang of things and use convenient/consistent nomenclature and terms, you can feel confident you have identified any oral areas of concern in under 5

minutes. Just a helpful hint, we lay our patients in lateral recumbency, chart the available buccal and lingual/palatal sides then perform any necessary radiographs, nerve blocks, prophylaxis, and treatments pertaining to that side, then flip and start the whole process over. This seems to cut down on time spent moving/positioning patients, as well as, time spent adjusting the monitoring equipment, etc.

Directional nomenclature

Understanding the nomenclature of teeth surfaces and direction is important when discussing dental disease and anatomy. The buccal surface is the surface of the premolars and molars facing the cheek. The lingual surface is the surface facing the tongue. In the maxilla it is sometimes described as the palatal surface.

The mesial direction is towards the midline or in a proximal direction, while the distal direction is away from the median line or in a caudal direction. Why so confusing? Ask yourself, which tooth is more rostral in a pug; the right maxillary first incisor (101) or the second incisor (102)? It can be impossible to say. Mesial and distal eliminates the confusion.

Apical is towards the apex of the tooth while the coronal surface is directed towards the occlusal surface.

Triadan Numbering System

The Triadan numbering system is a way to avoid having to write or say long explanations for a single tooth (ie. the left maxillary fourth premolar is simply #208). Although a bit awkward at first, it quickly becomes second nature. Simply put:

The upper right quadrant is the 100 series and moves clockwise (looking at the patient) from there. The upper left is the 200s, lower left 300s, lower right 400s. Can't remember which is which? Just think you are always number one when you have the upper right hand! The canines are always number X04 (ie the upper right canine is 104) and the fourth premolars are always # X08 (ie upper left fourth premolar = 208). Note that while the upper carnassials are always a #08, the lower carnassials are actually the first molar therefore are #X09 (mandibular left first molar =309). Dogs are counted sequentially mesial to distal #X01-X10 on the maxilla, while the mandible has an extra molar and is counted to the #11 (right mandibular third molar = 411). The same holds true for cats, however they do not have a complete dentition and are missing the maxillary first premolars (106, 206) and mandibular first and second premolars (305, 306, 405, 406) and cats only have one molar regardless of maxilla or mandible (109, 209, 309, 409). Simply include the Triadan system in your chart and you will be spouting numbers in no time.

It is important to realize what is normal and what is abnormal. It is not exceptional for the incisive papilla to be biopsied or receive referrals for an oral mass in a cat that

turns out to be the normal lingual molar gland. If you have made this mistake, do not feel badly, we all have done similar thing. As a general practitioner you have the hardest job… it is impossible to know "everything." Some familiarity may help…

Oral cavity

The oral cavity is considered the area extending from the lips to the oral pharynx at the level of the palatine tonsils. It is bound by the lips, laterally by the cheeks and above by the hard and soft palates, and below by the floor of the mouth. The oral pharynx is where the digestive and respiratory tracts share a common pathway. The facial or skin part of the upper lip at the midline has an indentation known as the philtrum. The point at which the oral mucosa and the top or bottom of the vestibule turn toward the alveolar ridge is known as the mucobuccal or mucolabial fold.

The attachment of the mucosa to the alveolar bone is loose and movable and the point at which it becomes tightly attached is the beginning of the attached gingiva. The line formed by the junction of the mucosa and the alveolar mucosa is known as the mucogingival junction.

The frenula are areas where the folds of the alveolar mucosa form a ridge of attachment between the lips and the gums. The dog has three primary frenula: One that extends from the upper midline of the lip to the gingiva at the level of the two central incisors and two others that extend from the lip to the level of the lower canine teeth

The hard palate is the soft tissue covered bony area on the dorsum of the oral cavity. The median raphe divides the left and right sides, while the rugae are the epithelial ridges that radiate from the median raphe. Asymmetry of these ridges may indicate a tendency towards cleft palate formation. The incisive papilla is the tissue just behind the two central incisor teeth and has incisive ducts that open on either lateral side of the papilla and often times are misdiagnosed as a tumor or mass.

The soft palate is the unsupported soft tissue that extends back from the hard palate free of the palantine bone and is relatively thick at its attachment to the hard palate and thins at the caudal margins. The hard and soft palates serve to separate the oral cavity from the nasal cavity.

The tongue is a mobile prehensile structure used for grooming and intake of food and fluids. It is formed primarily by skeletal muscle covered by a mucosal membrane. The dorsal surface of the tongue is covered by various types of papilla that have mechanical and taste functions while the ventral part of the tongue is covered by a smooth mucous membrane, and has a fold of tissue that extends from the floor of the mouth to the anterior ventral base known as the lingual frenulum. On either side of the

base of the frenulum are the duct openings for the sublingual and mandibular salivary glands.

Be aware that different shapes, head types, and breeds may be prone to certain conditions. For example, a Boxer's brachycephalic shape is prone to share a class III malocclusion (mandibular prognathism). Although this malocclusion is accepted in breeding and show circuits, it does not necessarily preclude trauma. Many boxers, shih tzus, and bulldogs suffer from trauma caused by their maxillary incisors contacting the mucosa lingual to the mandibular incisors. If you look carefully, you often find divots in the mucosa where the upper incisors are improperly occluding. The dolicocephalic breeds are often seen for class II malocclusions (ie palatal trauma).

Head types

Brachycephalic indicates a short, wide head that commonly results in rotation of premolar teeth. Some common breed examples include Boxers, Boston terriers, Pugs, Bulldogs, and Pekingnese.

Mesaticephalic indicates a head shape of medium proportions seen in Beagles, German shepherds, Labrador retrievers, Poodles to name a few of the many examples.

Dolichocephalic indicates a long, narrow head shape that is seen in Collies, Borzois, and Wolfhounds as some examples.

Now that you are satisfied that the extra-oral examination is complete, you can finally focus on the teeth themselves. How many teeth are there? Are there any missing teeth? Are they the expected size, shape, color? Is the dentition appropriate for this age dog?

General terms

Deciduous teeth are considered the first set of teeth that exfoliate and are replaced by permanent teeth.

Permanent teeth are considered the final or lasting teeth are typically very durable in nature.

Dental formulae

Dog

Deciduous 2 x (I 3/3, C 1/1, PM 3/3) = 28

Permanent 2 x (I 3/3, C 1/1, PM 4/4, M2/3) = 42

Cat

Deciduous 2 x (I 3/3, C 1/1, PM 3/2) = 26

Permanent 2 x (I 3/3, C 1/1, PM 3/2, M 1/1) = 30

Finally, once you have examined the entire oral cavity, you can now develop a diagnostic and treatment plan to implement with confidence that you have identified any areas of concern and are providing the best oral care possible. Now, the challenge is how to schedule your cases once you start identifying all of this pathology!!??!

When you send a patient home after a dental procedure, what is the first thing the client is going to do? First, they will look in the mouth to see if there is a "pepsodent smile," right? The next thing you can expect them to do is smell the breath. If the breath still smells, or if halitosis returns in 2,3, or 4 weeks, you can bet the client will feel cheated and will be reluctant to invest the energy and finances into future oral care. One of the most frequent questions I get asked when given continuing education to other veterinarians and technicians is, "How do I know that I did it right? How can we be certain that we are providing the care with think we are?" In other words, they are asking, if the client returns in 3-4 weeks with an oral complaint about their pet (ie. calculus returning, etc) how do we know it is the normal course of events or something we missed? The answer is the oral exam. By following these simple steps, you eliminate the question marks and replace them with confidence. You identified the pockets and treated them accordingly, you found the slab fracture and addressed the tooth, you noticed the erosion on the hard palate that was diagnosed as cancer. Combine this knowledge with client education and you have a winning approach. If clients do not realize that calculus (and consequently, bad breath!) will recur within weeks in the absence of brushing, you have lost next year's opportunity to provide quality oral care as well as an important source of revenue. The oral exam is the gateway to quality oral health and its corollaries (additional diagnostics and treatments) and will provide your hospital with added personal satisfaction and financial security! As you start performing more careful oral exams and recording your findings, you will identify more pathology, be able to treat more conditions, and discharge healthier, happier patients.

FOR CLIENT HANDOUTS YOU CAN PRINT AND GIVE TO YOUR FAMILES PLEASE GO TO www.bluepearlvet.com

I have the most common diseases listed with an explanation of treatments and things to consider to help with client education. I sincerely believe the key to success and compliance in veterinary dentistry is client education!