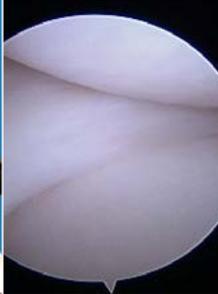


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ANESTHESIA



Pain vs. Dysphoria

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One of the most frustrating clinical postoperative decisions to make can be differentiating between pain and dysphoria and deciding how to properly treat each of these. In human medicine the physician has the ability to ask the patient, “How are you feeling?” or “What is your comfort level?” and then to treat appropriately based on the answer. In veterinary medicine, our patients cannot talk or express to us what they are feeling, so they rely upon us to make the proper clinical decisions and to implement the proper therapeutic technique. This article will attempt to differentiate between pain and dysphoria and briefly discuss the available treatment options for both.

Dysphoria is a profound state of unease or dissatisfaction accompanied by anxiety or agitation. Dysphoria can be very frustrating for the animal and the staff involved, and at times can be difficult to identify or treat. Clinical signs seen in a dysphoric animal include vocalization, panting or struggling.¹ Dysphoria is commonly caused by the very treatment we are giving in attempts to remedy the pain an animal is experiencing. Opioids are commonly known to induce dysphoria in some animals and some species (cats more often than dogs). Opioid-induced dysphoria is found in (or) occurs in an agitated animal that was recently treated for pain with opioids or an animal that does not respond to human contact.¹ Dysphoria caused by opioids can often be reversed with a low dose of a reversal drug such as butorphanol (a full mu antagonist and kappa agonist) or naloxone.

(CONTINUED ON NEXT PAGE)

EMERGENCY



The Use of Acupuncture in Critical Care Units

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You need to think about the whole patient when treating critical patients with a multitude of issues. Subsequently, an integrative approach is helpful and is becoming more common in veterinary medicine. Often our Critical Care Unit (CCU) patients can benefit from acupuncture, but it should not even be contemplated unless you have had training in Eastern medicine (acupuncture, herbal medicine, etc.). I have included some situations where acupuncture could be considered, but really they are too numerous to count.

If you have a patient that is bleeding postoperatively (post-op spay) or an unstable hemoabdomen that needs to go to the operating room, you can try dry needling Tian-ping. This point, commonly called the “scale point” due to its location on the dorsal midline between T₁₃ and L₁, can be helpful in stopping the hemorrhage. Of course, give blood/plasma as needed, but as an adjunct, it can be useful. Recently in our CCU, we have been using the herb Yunnan Baiyao orally as an adjunct to prevent bleeding in cases that have hemoabdomens, pericardial effusions and nasal epistaxis.

It is common to have anxious dogs in a CCU setting, and this can complicate an already difficult case. One indication for acupuncture could be in a post-op soft palate resection in a brachycephalic dog. Injecting B-12 at An Shen

(CONTINUED ON PAGE 3)

ANESTHESIA

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FIGURE 1

⚡ This dog has a hunched back posture, illustrating possible pain.



An animal that is dysphoric from opioids should not be restricted from pain medications but should instead be treated with a different class of analgesic or a different class of opioids. Often sedatives can be helpful in dysphoric animals. However, it is important when sedating an animal to first ensure that its pain is being managed appropriately.

Sedatives used to treat dysphoria include acepromazine, a phenothiazine, and dexmedetomidine, an alpha-2 agonist. These drugs each have different cardiovascular side effects and should be used carefully and in the correct patient. Acepromazine can be used in very small doses, such as 0.005-0.01 mg/kg IV, if given for sedation of a dysphoric patient post-operatively. Acepromazine causes various effects, including vasodilation and hypotension due to its antagonism of the alpha-1 receptors, so should be used judiciously.² Acepromazine has no analgesic properties. Dexmedetomidine in very small doses, 0.5 mcg/kg (0.0005 mg/kg), can also be used to treat dysphoria in postoperative or hospitalized patients. Again, dexmedetomidine should be used only in the appropriate patients, as it can cause initial vasoconstriction and bradycardia followed by hypotension.³ A newer drug on the market used to treat anxious or dysphoric animals is Trazodone, a serotonin antagonist and reuptake inhibitor. Trazodone is an oral drug used at a dose of 3-10 mg/kg twice daily. The onset of Trazodone is relatively short, around one to two hours in most dogs. When starting Trazodone it is recommended to start low and increase the dose as you see the patient's response. Trazodone should be used at low doses if giving other serotonin reuptake inhibitors such as Tramadol, or drugs that affect serotonin levels, such as acepromazine. Trazodone has been used with much success in dogs needing post-op confinement at home.⁴

Pain is defined as "an unpleasant sensory or emotional experience associated with actual or potential tissue damage."⁵ Pain is a complex,

multidimensional experience and a very individual experience. Pain can be chronic in nature (arthritic pain or neuropathic pain) or can be acute (postoperative/post-traumatic pain). The many different options for treating pain are beyond the scope of this article, and other resources should be used for a thorough discussion. Although pain is unpleasant, it is a necessary sensation in that it protects animals against potentially harmful stimuli. Pain receptors, also known as nociceptors, are the free endings of sensory neurons. The pain pathway starts at these nociceptors and extends up the sensory nerve fibers into the spinal cord, where signals are modulated and sent up to the brain. The brain then perceives these signals and sends signals back down to the spinal cord, where again signals are modulated. The different drugs used to treat pain all act on different parts of the pain pathway, and several of the drug classes act on multiple parts of the pathway. The fact that the drugs act on different parts of the pain pathway illustrates the importance of using multimodal analgesia.

FIGURE 2

⚡ This post-op thoracotomy patient is lying in a normal position, stretched out & eating.



Different types of pain exist (inflammatory, neuropathic, postsurgical, chronic), requiring different classes of drugs to be used as treatment. The different types of drugs used to treat pain include opioids, NSAIDs, local anesthetics, alpha-2 agonists, drugs that affect serotonin or norepinephrine, NMDA antagonists, and gabapentin. Other modalities besides pharmacologic therapy can also be effective in treating different types of pain, such as acupuncture, laser treatment, myofascial trigger point therapy and rehab/physical therapy. It is important to treat the patient as an individual and adjust the dosages and classes of drugs used according to how that specific patient responds. Not all patients will respond the same way to the same treatment. It is also important to know the drug's side effects prior to using it and to educate the clients on what to look for at home

and what sort of monitoring will be needed with each medication.

Recognizing the difference between pain and dysphoria can be difficult, but it is possible. Treating each patient as an individual and recognizing responses to therapy play an important role. The clinical signs of pain in cats and dogs can be difficult to recognize and sometimes difficult to distinguish from dysphoria or anxiety. Clinical signs of pain in dogs include panting, crying, increased aggression, decreased appetite, decreased activity, withdrawal from owner, and agitation. Clinical signs of pain in cats vary widely from patient to patient and range from vocalization, tachypnea, agitation and hyperthermia to withdrawal from owner and normal environment, hiding, lack of grooming, anorexia and inactivity. Remember, cats are not small dogs and will react differently to various medications and to pain. When evaluating a patient, start from afar and then approach to palpate around the area of concern. Use the procedure type, the patient's pain level and temperament, and the environmental setting to choose a treatment plan. Lastly, do not forget to use a multimodal approach, as all pain and dysphoria are not equal and should not be treated as such.

For more information about Angell's Anesthesia service, please call 617-541-5048 or e-mail anesthesia@angell.org.

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EMERGENCY

Continued from page 1

FIGURE 1

⚡ Acupuncture in a canine patient.



to help calm a patient instead of writing an order for acepromazine PRN may help prevent a chemically oversedated pet from aspirating and decrease oropharyngeal swelling by alleviating the constant panting.

Vomiting and nausea are very common in veterinary patients in the CCU. Knowing certain acupoints, such as ST-36 (master point for GI tract), Shan-gen (appetite stimulant), PC-6 (master point for chest and abdomen/helps prevent vomiting), can be especially useful after typical antiemetics have failed. The selection of points would be based on the pet's constitution and the pattern of the pet's disease. If an owner tells me that they will euthanize a pet if the pet does not eat since they would not pursue a feeding tube, dry needling these points for 15 minutes can only potentially help the pet.

We see many congestive heart failure cases, and there are six typical Traditional Chinese Veterinary Medicine (TCVM) patterns for heart failure. The cases that we have difficulty managing usually are the pets that have pulmonary fluid coming from their mouth despite CRIs of Lasix and nitroprusside. They essentially need mechanical ventilation (MV). If an owner is unwilling to do MV and the pet has collapse of Yang Qi, points for shock can be used as well. These same acupoints can be used in CPR cases. When doing resuscitation in patients that have arrested, the RECOVER guidelines should be followed. If a pet is not responding to conventional interventions, Dr. Huisheng Xie, founder of the Chi Institute, recommends needling GV-26 first in the philtrum at the level of the ventral limit of the nostrils. A hen-pecking technique at this site may be best for epinephrine release. If this

point does not help, KID-1, PC-6 through TH-5 can then be used.

If you have a feline patient with megacolon and the owner is unwilling — or it is too risky — to place a pet under anesthesia for a deobstipation, then enemas, lactulose, intravenous fluids and acupuncture can be used. There are two typical patterns for the Eastern diagnosis of megacolon: it is either Qi deficiency or Yin and Blood deficiency. The acupuncture points would be selected based on what pattern they were exhibiting.

We treat many cats that have IMHA, and when they respond quickly it is great, but often we have patients that do not respond to the typical immunosuppressives. The traditional Chinese medicine pattern would need to be identified, because there are different patterns. Typically, for an extravascular hemolysis case, the main issues tend to be spleen Qi deficiency/blood deficiency. So selecting acupuncture points that would tonify the Qi/blood and support the spleen and immunomodulating points, such as LI-4, LI-10, LI-14, ST-36 and GV-14, would be best. If the patient has evidence of intravascular hemolysis, clearing the heat and damp would be important and thus would direct your acupuncture approach. The use of herbal therapy is becoming more popular, and for a nonresponding primary ITP case Gui Pi Tang may be helpful.

FIGURE 2

⚡ Yunnan Baiyao can be given orally.



Though I have given some sweeping recommendations, every patient is different in its constitution and how it may respond. Dr. Xie impresses upon his students that Eastern medicine is best at treating the individual, especially during times of deficiency. I have given just a few examples, but many more come to mind, such as the cat that is having an acute asthma attack that is not responding to typical interventions such as oxygen, steroids and bronchodilators. Knowing LI-20, Bi Tong and lung/Hui acupuncture points can come in very handy. There are really

countless uses for dry needling, aqua and electrical acupuncture in the CCU, and it will likely become a more routine treatment in the critical care veterinary setting.

For more information about Angell's Emergency service, please call 617-522-7282 or e-mail emergency@angell.org.



When Clients Ask: “Why is my cat crying?”

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Why is my cat crying? This is a common question that comes in many forms. It may be a simple question during an annual exam, or it may be a distraught owner at the end of his or her rope due to lack of sleep. There are many answers, and to help our clients we need to try to understand what is going on with the cat.

Cats, like humans, have several types of meows or cries. Determining which type of vocalization the cat is making will help us interpret what the cat is trying to tell us. One recommendation is to have the client videotape the kitty crying and note when it occurs. This can take some of the guesswork out of interpreting the many descriptions for cat cries out there. The generic “meow” can mean almost anything. “Chirps or trills” may be a queen trying to get her kittens to follow or a cat trying to get its human to follow. “Chattering” is that cackling sound that cats make while watching birds or other animals at the window. Growling and hissing are warning sounds that tend to speak for themselves. But the sounds most owners are concerned with are the long, drawn-out cries that seem to get even louder and longer at night. These cries do indicate some form of distress (perceived or real). They can be due to either medical or behavioral causes. The yowls may progress to the point at which they are interfering with the human-animal bond. This should be evaluated the same way any other medical issue would be.

History is important (any detail from an owner is important):

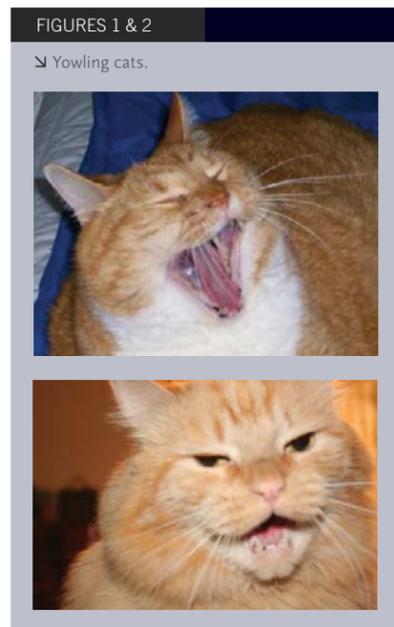
- Is the crying new, or has the cat always cried?
- What does the cry sound like?
- When is the crying occurring (at what time and during what activities)?
- Is there anything that helps stop the crying?
- Does the cat have any medical issues?
- A physical exam and possibly some basic laboratory testing will help with many of these. Common medical conditions to keep on our list of differentials:

- Deafness (seems to be one of the most common reasons; the cat is looking for reassurance)
- Hyperthyroidism
- Hypertension
- Blindness
- Brain tumor
- Cognitive dysfunction
- Pain: many conditions can cause discomfort or overt pain, which may cause cats to cry out
 - Trauma
 - Arthritis
 - Cystitis (or other causes of straining, such as bladder stones, masses, etc.)
 - Constipation (or other causes of straining, such as colon polyps, etc.)
 - Diarrhea

Medical conditions need to be treated appropriately and then the yowling can be reevaluated. If the yowling is still there, look for additional medical issues that need to be treated. Many times good home care helps in addition to medication.

Decreased hearing (or vision) can be helped by adding night lights and creating evening routines to keep the anxiety of these cats to a minimum. These cats can easily become disoriented, especially at night. Yowling is a way for the cat to seek reassurance.

Arthritis can cause a number of signs, including crying or even retreating from normal routines. In addition to using medications to treat this condition, you can help make sure the environment is as comfortable as possible. Use ramps or stairs up to furniture, and be sure access to the litter box and food bowls is easy. Central location of the litter box is just as important as the cat's ability to get into it (low walls).



Once we have treated or ruled out medical conditions, our focus moves to the environment and changes in the cat's routine. History is key. Has the cat moved into a new home, or has any new animal or human moved in or out? Are there animals coming up to a window or porch and causing anxiety? Has the owner changed job routines (e.g., now leaving the home but worked at home before)? Much of this yowling is seeking reassurance.

Much has been written about environmental enrichment, which is important for all cats to keep them occupied during the times the owner is not engaged with them. This is very important. Cats may also yowl due to boredom and desire for attention. Even though cats are not pack animals, they do not like being alone for long periods of time. Interactive environments are important for both the medical and emotional well-being of the cat. Using things like interactive toys, perching areas and rotating play routines can help. But one important factor is to teach the client that cats need exercise too. A tired cat is more likely to sleep than yowl.

Other cats will seek food with yowling. This is the cat that screams when its owner walks into the kitchen. It is important to be sure the cat is getting adequate nutrition and not crying because it is not getting enough calories. If calories are adequate, it is important to help clients avoid reinforcing this behavior. Distraction techniques during the yowling and then feeding when quiet are recommended.

A crying cat can bring even the most dedicated cat owner to the brink of insanity. Many conditions will not be cured overnight, and many medical issues become behavioral with time. It is important to take the time to work through each possible cause to maintain health as well as the human-animal bond.

For more information about Angell's Internal Medicine service, please call 617-541-5186 or e-mail internalmedicine@angell.org.

INTRODUCING ANGELL AT NASHOBA

ANGELL IS EXCITED TO ANNOUNCE THE OPENING OF ANGELL AT NASHOBA

Angell Animal Medical Center and Nashoba Valley Technical High School have partnered to create Angell at Nashoba, a one-doctor clinic dedicated to providing quality veterinary care to low income pet owners and training more technicians within northern Massachusetts. For the pets of owners that financially qualify, Angell at Nashoba provides discounted:

- 🐾 Spay/neuter services
- 🐾 Vaccinations
- 🐾 Basic veterinary care

Open weekdays from 7:45am-4:00pm throughout the year, the clinic does not provide overnight care, specialty service care, or 24/7 emergency service, as Angell's Boston and Waltham facilities do, but will refer cases as appropriate to surrounding specialty veterinary referral hospitals. Angell at Nashoba is proud to provide rigorous, valuable training to the bright, compassionate students of Nashoba Valley Technical School who work alongside staff at the clinic while preparing for careers in veterinary medicine.

As of press time, our plans are to open the clinic in mid-January of 2016.

THE STAFF AT ANGELL AT NASHOBA



LAURENCE SAWYER, DVM

Dr. Sawyer has been in small animal private practice since 2001. She has also volunteered regularly at Tufts at Tech Community Veterinary Clinic since its inception in 2012. She enjoys clinical medicine and surgery, teaching, and community service and is excited to be part of the Angell team that has established a community veterinary clinic in Nashoba Valley.



LISA QUINONES, CVT

Lisa has been working as a veterinary technician since 2007, starting her career in a fast-paced emergency and critical care practice. In 2010, she moved to Boston and joined MSPCA-Angell's surgery team, working as an anesthesia tech and becoming the department's supervisor in 2013. Lisa enjoys volunteer work, painting, yoga, gardening, reading and being outdoors with her two dogs.

Additionally, high school animal-science teachers licensed by the Department of Elementary and Secondary Education (DESE) will be part of the program. Their main focus will be the education of the high school students in the necessary theoretical and clinical elements for acquiring a veterinary assisting license. Students and staff will also work alongside the staff at Angell at Nashoba.

For more information, please visit angell.org/nashoba.



Weakness, the “Motor Unit” and Related Testing

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The motor unit is the effector function of those components of the central nervous system responsible for initiating and sustaining movement. This functional “unit” is made up of the lower motor neuron, the nerve rootlet and root, the nerve, the neuromuscular junction, and the muscle itself.

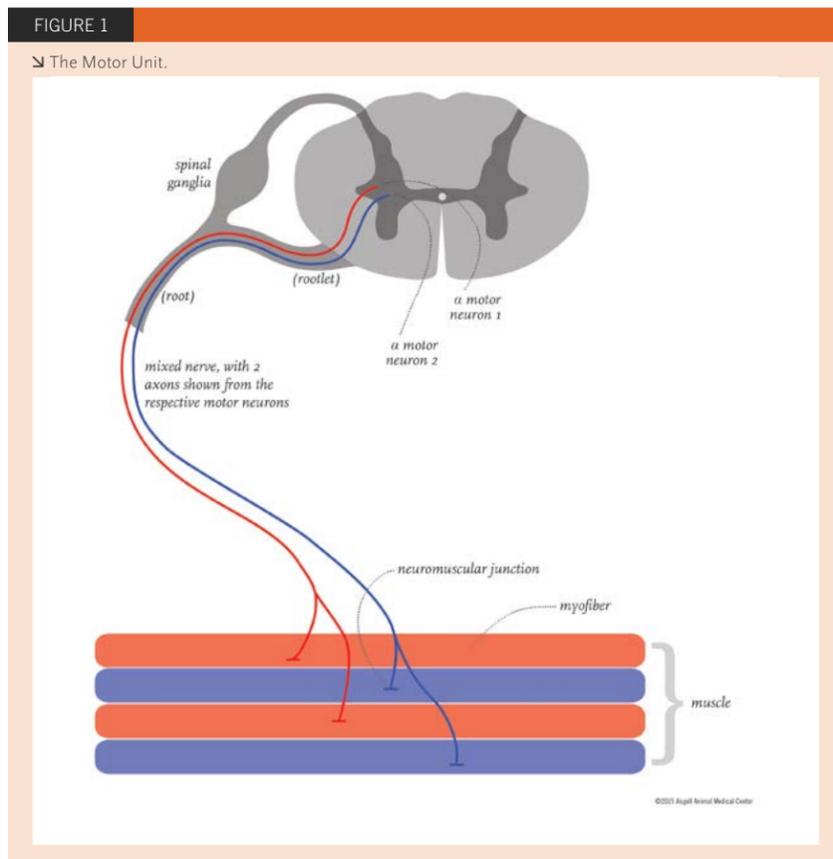
Dysfunction of the motor unit(s) in a particular limb often shows the hallmark “triad” of clinical signs, namely hyporeflexia, muscle atrophy and hypotonia. The acronym Neuro-“RAT,” which stands for Reflexes, Atrophy and Tone, has been coined (Thomson, Hahn) to help make recognition and recall of such dysfunction easier at the time of a general physical examination.

Once these clinical signs are recognized, the locations of possible disease processes are identical to those of the motor unit, beginning with motor neuron diseases, radiculopathies, peripheral neuropathies, junctionopathies and myopathies.

Once the lower motor neuron system, either in an isolated area or in a generalized area, is identified as dysfunctional, the history, signalment, general physical examination findings and neurologic findings are considered collectively to select appropriate testing in order to arrive at a diagnosis.

A minimum database (CBC, serum biochemistry and urinalysis) is always indicated in these patients to identify systemic diseases that could be the cause of neuromuscular weakness. Anemia, hypoglycemia, hypokalemia and hypercalcemia are good examples of diseases that can readily be diagnosed with this testing.

The importance of creatine kinase (CK) testing in these patients cannot be overstated. In consideration of the functional sub-unit of muscle, the sarcomere, CK is an enzyme that acts as a gatekeeper of muscle energy, capable of generating high concentrations of much-needed ATP, when needed. When energy demand is low, this energy is stored as creatine phosphate, and when demand increases, this enzyme allows for the rapid restoration of ATP, needed



for muscular contraction. This enzyme, a specific marker for myofiber damage, is increased in necrotizing, inflammatory and dystrophic myopathies. Anorexia in cats, along with venipuncture and prolonged recumbency, can also contribute toward elevations of this enzyme activity. Along the same lines, although aspartate aminotransferase (AST), alanine aminotransferase (ALT) and lactate dehydrogenase (LDH) may also be increased with myofiber damage, these enzymes lack the tissue specificity of CK.

Cardiac troponin I, myoglobinuria and lactate/pyruvate testing are often considered in the diagnostic test selection for patients with

lower motor neuron disease. For example, cardiac muscle can be involved in a generalized myopathy (e.g., mitochondrial myopathy, necrotizing myopathy), and brown urine (myoglobin in the urine >250 mcg/mL) often suggests myonecrosis.

Genetic testing has taken off over the past five to ten years. When faced with generalized weakness in a young purebred dog, possibly involving dysphagia and/or megaesophagus, a quick search of the OFA database and/or a Google search can be very helpful in cases where such a query will suggest a genetic test that can be performed on a DNA sample that can be submitted by mail to the respective lab.

Thyroid function is critical in both energy and lipid metabolism, and both hyperthyroidism (in cats) and hypothyroidism should be considered in cases of generalized weakness.

Specific testing, such as acetylcholine receptor antibody testing for myasthenia gravis, Type IIM fiber antibody testing in masticatory muscle myositis and muscle/nerve biopsies can be selected at the time of initial testing, considering pattern recognition for these specific diseases. A nerve and/or muscle biopsy can often be instrumental in not only reaching a definitive diagnosis but also in identifying key features of particular disease processes that may have been overlooked at the time of initial testing (consideration of mitochondrial and/or lipid storage myopathies).

Electrodiagnostic testing, a supplemental test to the physical and neurologic examination, can often be invaluable, as this is one of the few tests we have at our disposal (like an electroencephalogram, or EEG) that tests function rather than structure (radiographs, computed tomography and magnetic resonance imaging). Lower motor neuron dysfunction, in light of the signalment and history, can often be further explored using this diagnostic modality.

In summary, lower motor neuron disease can often be challenging but rewarding to treat, depending on where in the disease course the animal presents, the time at which the diagnosis is made and the time at which appropriate therapy is started. Our Neurology service is here at Angell to aid in these challenging cases and may be able to offer further input in regard to diagnostic testing at your hospital.

For more information about Angell's Neurology service, please call 617-541-5140 or e-mail neurology@angell.org.

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ANGELL WELCOMES TAYLOR KIRBY-MADDEN, DVM, TO THE BEHAVIOR SERVICE



TAYLOR KIRBY-MADDEN, DVM

Dr. Taylor Kirby-Madden is beginning the process of a non-conforming residency in Behavioral Medicine at the Angell Animal Medical Center, and joins Dr. Terri Bright in Angell's Behavior Service. Dr. Kirby-Madden earned her BA in English Literature from the University of Vermont, and spent several years working at animal shelters in Massachusetts

and Ohio. While in veterinary school, she was president of the Ohio State Behavior Club, and a founding student leader for an elective shelter enrichment course based at a large municipal shelter. Dr. Kirby-Madden was a participant in an Ohio State University summer research program, where she designed a study on the efficacy of the shelter enrichment program on the behavior of dogs. The results of this study were presented at the 2013 meeting of the American Veterinary Society of Animal Behavior, and then later published in the *Journal of the American Veterinary Medical Association*.

Dr. Kirby-Madden will see Behavior appointments at both our Boston and Waltham locations. She will provide behavior consultations for cats and dogs, and positive-based behavior modification treatment plans for issues such as aggression; separation anxiety; noise phobias; house soiling and marking; and compulsive behavior.

EDUCATION

- The Ohio State University, College of Veterinary Medicine, DVM, 2014

SPECIALTY TRAINING

- Angell Animal Medical Center, Non-Conforming Residency in Behavioral Medicine, 2015-2018





Canine Stifle Arthroscopy

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Arthroscopic surgery is the current standard of care for human knee surgery. Arthroscopy is becoming more widely accepted in the veterinary community for evaluation of the canine stifle joint. Arthroscopic examination provides a minimally invasive means of visualizing the intra-articular structures of the stifle, such as the cranial and caudal cruciate ligaments, medial and lateral meniscus, cartilage surface and synovium. The structures within the joint are highly illuminated and greatly magnified, which allows improved visualization over traditional arthrotomy and better sensitivity at diagnosis of meniscal injury.

Rupture of the cranial cruciate ligament (CCL) is one of the most common causes of pelvic limb lameness in dogs. Partial and complete CCL tears cause instability of the stifle joint. This instability results in inflammation, cartilage damage, meniscal injuries and subsequent osteoarthritis. In dogs, CCL rupture is most often a result of degeneration. Meniscal injury is often found as a result of the instability, which occurs with cranial cruciate disease. Shearing forces on the caudal horn of the medial meniscus caused by cranial subluxation and internal rotation of the tibia during loading may predispose to these tears. Most of the meniscal tears involving the caudal horn of the medial meniscus likely occur as a result of its firm attachment to the tibial plateau. The most common form of medial meniscal tear is a vertical longitudinal tear (otherwise known as a bucket handle tear), which can account for about 57% of medial meniscal tears.

During any surgery for cranial cruciate disease, the first step is evaluating the joint and diagnosing the severity of the cruciate tear and any meniscal injury. This joint exploration can either be performed with arthrotomy or arthroscopy. Arthrotomy involves a full-thickness incision through the joint capsule and reflecting the patella laterally so that instruments can be placed to open the joint space. Arthroscopy involves placing two small portals and an egress cannula (each a few millimeters wide) to allow fluid to enter and exit the joint. This technique allows for enhanced

visualization, and the camera allows for magnification of the joint structures. With arthroscopy, there is less disruption of the joint fibers, which subjectively may lead to less pain, swelling and bruising, and may help with a faster recovery postoperatively. During arthroscopy, we remove any torn ends of cruciate ligament with a shaver. If the CCL is partially torn, we leave the intact portion alone, as that may help with stability. Both the medial and lateral meniscus are thoroughly probed to see if there are any visible tears or fraying. If the meniscus looks healthy, it can be left intact to allow continued prevention of bone-on-bone contact. Though primary meniscal repair has been described in dogs, it is not commonly performed, and most tears are treated with partial meniscectomy. If there is a meniscal tear, that is removed with specialized meniscal instrumentation through the small arthroscopic portals. The most common type of meniscal tear is a bucket handle tear, which is removed via caudal pole partial meniscectomy.

The prevalence of meniscal tears found during CCL surgery is between 20 to 77% overall. Concurrent meniscal tears were diagnosed in 83% of stifles assessed by arthroscopy and 44% of stifles assessed by arthrotomy. Overall, concurrent tears were 1.9 times more likely to be diagnosed by arthroscopy than arthrotomy. Studies have found that the sensitivity and specificity for finding meniscal tears is best with probing of the meniscus during arthroscopy compared with arthrotomy. Probing during arthroscopy made the correct diagnosis of meniscal tear 8 times more likely during arthroscopy. Dogs with a complete CCL tear have been found to have a higher incidence of meniscal tear than dogs with a partial meniscal tear. One paper showed that meniscal tears were seen more often in stifles with a full CCL tear as compared with a partial CCL tear at a ratio of 11:1.

Subsequent medial meniscal injury has been noted to be a late complication of surgical management of dogs with cruciate rupture. The incidence of subsequent meniscal tears has been reported to be about 10.5% after tibial plateau leveling osteotomy (TPLO), 21.7% after

tibial tuberosity advancement (TTA) and 16.5% after extracapsular repair. Arthroscopy of the stifle for a subsequent meniscal tear is the perfect tool for a minimally invasive diagnosis and treatment of this process. Once the meniscal tear is identified with probing, the torn portion is removed via arthroscopy. This allows for a rapid recovery with the least amount of pain and incisional swelling compared with a full arthrotomy for a subsequent meniscal tear.

Meniscal release can also be performed during the stifle arthroscopy without having to convert to an open arthrotomy. This is a controversial procedure among surgeons, as there is some belief that performing meniscal release may change the biomechanics within the joint and therefore affect contact pressure on cartilage and potentially worsen osteoarthritis. However, performing a meniscal release has been shown to decrease the chances of a subsequent meniscal tear. Cases treated with meniscal release did not have subsequent meniscal tears, whereas dogs not treated with meniscal release had a subsequent meniscal tear rate of 11% in one study. Cases diagnosed and treated for concurrent meniscal tears were 1.3 times more likely to have a successful long-term outcome. In one study, medial meniscal tears after TPLO were 4 times more likely after arthrotomy with no medial meniscal release than after arthroscopy without medial meniscal release.

Once the stifle exploration is completed via arthroscopy, the stifle is stabilized with the surgeon's technique of choice. Both the TPLO and TTA are designed to stabilize the joint and carry an excellent outcome for returning to weight-bearing activities and improving lameness/pain. Arthroscopy, when combined with TPLO or TTA, is the most definitive and least invasive way to diagnose and treat canine cranial cruciate ligament and meniscal disease. Arthroscopy is the standard of care for human stifle disease and is now readily available for our canine patients as well.

For more information about Angell's Surgery service, please call 617-541-5048 or e-mail

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FIGURE 1

↘ Cranial cruciate rupture.



FIGURE 2

↘ Normal meniscus.



FIGURE 3

↘ Tear of the medial meniscus.



FIGURE 4

↘ Palpating meniscus.





Enterotoxemia in Pet Rabbits and Other Herbivores

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Any practitioner who treats herbivores regularly has encountered the dreaded “flat rabbit” emergency. The patient presents recumbent, weak and dull, possibly with pale mucous membranes, dyspnea, and usually with hypothermia. This presentation is usually caused by a severe imbalance (dysbiosis) in cecal bacterial flora, resulting in an overgrowth of anaerobic spore-formers that produce enterotoxins causing diarrhea and shock. Any delay in treatment may be rapidly fatal.

The patient’s signalment can vary widely. The condition can affect any small herbivore, of any age and either sex. The history is usually surprisingly uniform: a sudden onset of weakness and lethargy, occasionally preceded by diarrhea, and often by several days of decreased appetite and fecal output.

On physical examination, the patient’s lethargy and weakness may be temporarily masked by the patient’s adrenaline surge. (It is important to remember that animal hospitals are unusually stressful places for small herbivores, as the hospital environment often surrounds them with the sight, sound, and scents of their natural predators.) Rabbits and guinea pigs may present with a temperature of less than 100 degrees Fahrenheit (under 99 degrees in chinchillas). Abdominal palpation may reveal a full and doughy stomach, similar to that of gastrointestinal tract stasis, or a distended, fluid-filled, or gaseous cecum. Mucous membranes may be pale. Respiratory effort may be increased, especially when there is abdominal discomfort.

At this point I usually keep diagnostics to a minimum. A systolic blood pressure is taken, and if lower than 40mmHg, shock is diagnosed, with no further diagnostics performed until the patient is stabilized.

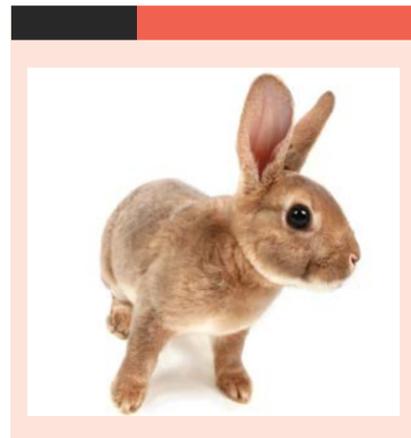
An intravenous catheter is invaluable here. If intravenous access cannot be obtained without undue stress to the patient, warmed subcutaneous fluids are given (LRS at 100-150 mL/kg), and the patient is placed on heat. In extremely hypothermic cases, a warmed

blanket may also be placed over the patient. As the fluid is absorbed and the patient is warmed, an intravenous catheter is reattempted; if impossible, an intraosseous catheter placed in the humerus or femur may also be used.

Once intravenous or intraosseous access is obtained, the following protocol is used, adapted from Marla Lichtenberger, DVM, DACVECC.

- 1) Crystalloids – 10-15 mL/kg IV
Hetastarch – 15 mL/kg IV over 15 minutes
Recheck blood pressure
 - If <40 mm Hg, repeat. If <40mm Hg after second bolus, go to step 2
 - If >40 mm Hg, go to step 3
- 2) Hypertonic Saline – 3 mL/kg over 10 minutes
Hetastarch – 3 mL/kg IV over 15 minutes
Crystalloids – 4 mL/kg/hr IV
Recheck blood pressure
 - If <40 mm Hg, rule-out hypoglycemia or heart disease
 - If >40 mm Hg, go to step 3
- 3) Warm aggressively including IV crystalloids until systolic blood pressure is greater than 90 mm Hg. If blood pressure drops below 40 mm Hg, return to step 1

Once the patient is stable, treatments are administered to reduce and correct enterotoxemia. This is similar to treatment in the early enterotoxemic small herbivore, which may present with hypothermia, diarrhea (with or without mucous), but is not weak and in shock. Treatments often need to be given slowly or in stages to avoid stressing the fragile patient. Therefore, our first treatment is usually toxin chelation: cholestyramine, available from human or equine pharmacies. One packet is mixed with 40mL tap water, and syringe-fed at 12cc every 12-24 hours (6cc in chinchillas and guinea pigs). This is followed by antibiotics to decrease the population of cecal spore-forming anaerobes: subcutaneous procaine penicillin G in rabbits (70,000 IU/kg every 48 hours), or oral or



injectable metronidazole or chloramphenicol in chinchillas and guinea pigs. Commercial rabbit probiotic is administered, or fecal pellet feeding from a healthy conspecific (preferably from the same household) in chinchillas and guinea pigs.

Once the patient is stable enough to tolerate further diagnostic testing, a complete blood count and chemistry panel as well as radiographs may be performed. Any additional diagnostics are generally deferred until the patient has been stable and normothermic for at least twenty-four hours.

Although some patients will respond quickly to the above treatments, for those that do not respond quickly, the prognosis is guarded to grave. Once the enterotoxemia has resolved, small herbivores very rarely progress directly to normal gastrointestinal motility, and treatment for ileus should be anticipated as the next step on the road to recovery.

For more information about Enterotoxemia or Angell’s Avian and Exotic service, please call **617-989-1561** or e-mail avianexotic@angell.org.

■ We encourage you to contact Angell’s specialists with questions.

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