

Diagnosis and Treatment of Osteoarthritis

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Osteoarthritis (OA) is a common disease in aging dogs and cats but frequently goes undiagnosed and untreated. Although OA cannot be cured, long-term management of the disease can be very rewarding for the veterinary medical team as well as pet owners. Managing pain with pain medications is an essential first step. There are a wealth of pain medications available, including nonsteroidal antiinflammatory drugs, gabapentin, amantadine, and tramadol. There are also physical modalities available for pain reduction. Weight management and nutritional joint support are also important in aspects of managing OA in dogs and cats. Finally, physical rehabilitation is a great way to improve mobility and keep pets active as they age.

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As pets age, they slow down. Osteoarthritis (OA) can contribute to or cause decreased activity level in aging pets. In some cases, pet owners see such a decrease in quality of life they elect euthanasia, and in other cases it may not be the sole reason for euthanasia but may contribute to a family's decision not to treat another concomitant disease. As veterinarians there is a lot we can do for aging pets' pain with simple interventions and owner education. These adjustments will allow pets to live longer and, more importantly, better quality lives.

OA can affect any joint, including hips, elbows, and stifles, but also vertebral facet joints, carpal joints, tarsal joints, and even metacarpophalangeal and metatarsophalangeal joints.¹ Large and giant breed dogs are the most commonly thought of when OA comes to mind, and, although they may develop more severe clinical signs of OA or begin the disease process earlier, all shapes, sizes, and breeds of dogs and cats can be affected by OA as they age. Because pets have become such an important part of the family in modern culture, it is becoming more important to pet owners to keep animals comfortable, mobile, and pain free throughout their lifetime.

Osteoarthritis Is Not Normal Aging

Annual or semiannual examinations are now standard care in veterinary medicine, both to keep up on pets' health status and for early disease detection and treatment. Unfortunately, osteoarthritis is a disease process that is frequently overlooked or chalked up to the normal aging process. In fact, it is a very specific problem, affecting precise anatomic locations and with identifiable predisposing causes.

Instability, incongruity, uneven load-bearing, and injury to a joint predispose to osteoarthritis by setting a patient up for a lifetime of abnormal stress on intraarticular cartilage and chronic inflammation.² Examples of predisposing causes include elbow and hip dysplasia, orthopedic surgery, rupture of the cranial cruciate ligament in the stifle, articular fractures, and incongruity resulting from trauma or angular limb deformity. With any of these disease processes, there is a continued state of inflammation in the joint, and the body attempts to stabilize the area with bony proliferation, or OA. Figures 1 and 2 show examples of dogs with a history of joint instability that led to severe arthritis later in life. Joints along the vertebral column are also prone to arthritis, so look for signs of pain and spondylosis along cervical, thoracic, and lumbar spinal segments, and at the thoracolumbar and lumbosacral junctions.

Pain Assessment and Osteoarthritis Diagnosis

Incorporation of a pain assessment in your annual or semi-annual examination is essential to proper diagnosis and early intervention in the development of pain and arthritis. Animals with OA will learn to compensate for their pain, so a thorough myofascial pain assessment is an essential tool in finding the source of discomfort for an animal patient. Just like a physical examination, a systematic approach to muscle palpation, including cervical muscles, paraspinal muscles, and major muscle groups associated with each limb is an excellent start. Some animals will also carry tension in their muscles of mastication, so do not forget to include the muscles of the head in your assessment. Areas of muscle tension or tenderness may be associated with a primary problem, or may be secondary to compensation for pain or neurological deficits in other areas, so use an orthopedic and neurologic assessment to sort out the source of pain.

It is important to know the underlying cause of pain in an aging animal and essential to rule out other disease processes, such as osteosarcoma, fungal disease, osteomyelitis, septic

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Figure 1. This dog, a 9-year-old male neutered Labrador Retriever, has a history of complete rupture of the left cranial cruciate ligament and partial rupture of the right cranial cruciate ligament. Bony proliferation can be seen throughout the stifles bilaterally, which led to clinical signs of hindlimb lameness, difficulty rising, and inability to participate in family walks.

synovitis, and soft tissue injury. Like all other veterinary diseases, a good history and physical examination parameters can help rule out certain diseases, but radiographs also play an important role in diagnosis of OA. Once the location of pain is pinpointed, radiographs can be used to identify bony changes in and around the joint while ruling out excessive bony lysis, proliferation, or other suspicious abnormalities that may be related to disease processes other than OA.

A Multimodal Approach to Managing Osteoarthritis

It is very important for pet owners to understand up front that OA is a lifelong disease. It cannot be cured, only managed. The approach to managing the disease will vary based on severity and location. Parameters that can help a clinician guide therapy include pain, mobility and normal activities, pet owners' goals and commitment to therapy, and resources accessible in your area. Helping pet owners understand that arthritis pain does not have to be part of the normal aging process is the most important first step, then building a pyramid of pain management, joint protection, nutritional support, and strengthening becomes a natural progression that pet owners will enjoy.

Pain Management

Getting pain under control is the most important first step of therapy and, in most cases, requires pharmacologic intervention. By getting pain under control, you will allow your patients the luxury of gaining strength and mobility, as well as allowing time for slower-acting therapies, such as nutraceuticals, to begin having an effect. The range of medications and modalities that can be used to manage pain is vast, each with slightly different benefits and precautions, so it is important to be well versed in the options available.

Pharmacologic Pain Relief

Nonsteroidal antiinflammatory drugs (NSAIDs) are often the first drugs used for treatment of OA in veterinary medicine. Like any medication, NSAIDs have risks and benefits, but with appropriate monitoring they can be safely used for long periods of time to manage the inflammatory component of arthritis pain. Blood work and urinalysis should always be performed before beginning an NSAID to rule out renal insufficiency and dehydration, both contraindications for administration. Gastrointestinal (GI) ulceration and even perforation are also potential side effects, so it is essential to obtain a thorough history to ensure pets are not getting aspirin or steroids of any kind before starting them on an



Figure 2. This 9-year-old female spayed Rottweiler mix had a history of hip dysplasia as a younger dog. She presented for slowing down. She had become less interactive with the family and was less able to participate in walks in the park. Notice the severe arthritic changes in bilateral coxofemoral joints, including significant remodeling of the femoral head and neck, and shallow acetabula surrounded by severe bony proliferation and sclerosis.

NSAID.³ With initial NSAID therapy, pet owners should be educated regarding home monitoring for potential renal, GI, or hepatic adverse reactions, and should be educated to discontinue the medication and call for help if any concerning clinical signs develop. Idiosyncratic nondose-related hepatotoxicity can be seen within the first days to weeks of NSAID administration, so close monitoring at home in addition to follow-up blood work is the best way to ensure pets are tolerating their medication. Mild elevations in liver parameters on blood work do not make a hepatic adverse event more likely and are not a contraindication for NSAID administration.⁴ There are numerous veterinary NSAIDs currently on the market, and their use is recommended instead of over-the-counter NSAIDs such as aspirin, which is more likely to cause GI side effects compared with veterinary-labeled medications and can also cause dose-related hepatotoxicity.

Animals affected by significant liver, renal, or GI disease, or those who do not tolerate NSAID administration have a wealth of other options available for pain management. Gabapentin can be used for dogs and cats with minimal side effects, though owners should be warned about possible sedation when beginning administration. This medication is a great option for long-term pain management in cats with significant OA because there is a lower risk of side effects than with drugs such as NSAIDs.^{5,6} To minimize sedation in dogs or cats, gabapentin can be started at low doses and slowly increased to an effective dose for each individual patient. Dosing gabapentin every 8 hours is best, but for long-term treatment or in animals with compromised liver or renal function, twice daily dosing may be more appropriate.^{7,8} Because gabapentin is very safe, doses can be increased over time until appropriate pain control is achieved.

Amantadine is another medication that is often well-tolerated and can be used for decreasing spinal cord wind-up in states of chronic pain, which most OA patients experience as a result of long-term, unmanaged pain. Amantadine turns off receptors within the nervous system, called N-methyl-D-aspartic acid receptors (NMDA receptors), which are responsible for amplifying pain signals sent to the brain for pain perception. Amantadine is synergistic with NSAIDs⁹ but can also be used alone for long-term pain management. Amantadine can cause some agitation or GI upset but is usually well tolerated even in geriatric, compromised veterinary patients.¹⁰

Tramadol is a synthetic opiate drug that also acts on serotonin and adrenergic receptors to reduce pain in dogs and cats and is commonly used in veterinary medicine. Bioavailability and half-life of this medication are variable across species as well as individuals, so it is important not to rely on tramadol alone for long-term management of OA pain. For acute flares of arthritis pain and breakthrough pain, tramadol is very useful. It is nice for owners to have tramadol available for bad days or after a bigger outing than the usual, as tramadol works well for more short-term or sudden pain. Because tramadol's bioavailability is variable in cats¹¹ and its half-life is short in dogs,¹² frequent dosing (every 4-8 hours in dogs) and follow-up pain assessments are essential to ensure

adequate pain control. Tramadol can cause interactions with selective serotonin reuptake inhibitors and monoamine oxidase inhibitors, so patients on these medications should use tramadol with caution.¹⁰ Also, in patients with opiate sensitivity; dysphoria, agitation, and sedation are possible sequelae to administration of tramadol.

Nonpharmacologic Pain Relief

Low-level laser is an excellent adjunctive modality for pain management in dogs and cats with chronic pain. Although the mechanism for low-level laser is not fully elucidated, it decreases pain in arthritis conditions, decreases muscle spasm, and improves circulation in affected areas.^{13,14} Low-level laser is an excellent, noninvasive way to decrease pain for animal patients and is generally very well tolerated in dogs and cats, even if their pain severity is high, as shown in Figure 3.

Acupuncture, when used with a scientific and methodical approach, can provide an excellent addition to the pain management pyramid. Needle placement is usually nonpainful, and most animals enjoy their acupuncture treatments so much they will relax or sleep through their treatment, as shown in Figure 4. Pet owners will often notice an immediate difference in their pet's mobility, attitude, and level of pain. Although acupuncture alone is not sufficient to alleviate most lameness secondary to OA,¹⁵ it keeps pets more comfortable and considerably improves their quality of life. Acupuncture



Figure 3. A 4-month-old male intact kitten receives low-level laser therapy for pain in the right stifle joint and surrounding the femur. This kitten had a Type I Salter-Harris fracture that was too painful for direct manipulation immediately postoperatively. Because low-level laser is so well tolerated in most small animal species, it is a great, noninvasive way to provide pain relief. (Color version of figure is available online.)



Figure 4. A 12-year-old female intact Rottweiler with hip osteoarthritis and lumbosacral disease receiving acupuncture treatment. Acupuncture is well tolerated and has no adverse effects, making it a very appealing treatment for many veterinarians and pet owners. (Color version of figure is available online.)

can be used to treat back pain that results from lameness and compensation, as well as tight, painful musculature that results from OA pain. Although all the mechanisms of medical acupuncture are unknown, release of endogenous endorphins, local release of muscle spasm, and decreasing pain transmission to the spinal cord are some of the ways acupuncture reduces pain.⁶ Because it is safe and well tolerated in cats, it is an excellent option for geriatric cats that will not tolerate oral medications.⁵

Moist heat is a great way to decrease pain, improve circulation, and reduce joint stiffness in pets affected by OA. Although heat should be avoided in acute injuries and swelling, it is a great way for owners to make animals more comfortable at home.¹⁶ Treatment with icing is better for acute injury by decreasing pain transmission and inflammation in an injured area. Ice is useful in acute exacerbation of chronic OA and can be used multiple times each day for several days after the injury.

Weight Loss

Weight loss is one of the most important management issues in dogs and cats with OA. Obesity is very common in small animals and is a significant contributing risk factor in the development of osteoarthritis. In addition, obesity in older dogs can predispose to soft tissue injuries such as damage to the cranial cruciate ligament. Additional weight puts undue stress on joints that are already sore, and obesity contributes to a state of chronic, systemic inflammation. Adipose tissue is proinflammatory and capable of synthesizing metabolically active cytokines. Animals with excessive adipose tissue are not only more likely to be inactive, but this state of chronic inflammation, will adversely influence

joint health.^{17,18} Studies have shown that decreasing caloric intake and weight reduction alone will decrease clinical signs of OA and improve mobility.¹⁹ Weight assessment and guiding clients through a weight loss program is an essential part of lifelong veterinary management, but is even more important in small animals affected by OA.

Joint Support and Nutraceuticals

Treatment with glucosamine plus chondroitin is the most common nutraceutical most practitioners recommend when treating OA. Although it is not incorrect to use glucosamine and chondroitin, it is important to realize that evidence for their use is varied and product dependent.^{20,21} Some studies have shown that then can help reduce pain associated with degenerative joint disease, whereas others show a chondroprotective effect,²² but the evidence is not overwhelmingly convincing. Product quality and bioavailability are highly variable, so it is important to provide clients with a trusted source if they are going to use glucosamine and low molecular-weight chondroitin products.²³

Avocado soybean unsaponifiable products are a proportioned combination of the unsaponifiable portion of avocado and soybean plants and are used for patients as part of a rounded approach to human OA management. One small equine study showed promising effects in horses, not in treating pain, but actually improving OA disease parameters.²⁴ There is promise for antiarthritis effects in canine and feline patients too,^{25,26} but the doses, ratios of avocado:soybean components, and clinical data for avocado soybean unsaponifiables are still lacking.

Beneficial effects of omega-3 fatty acids in states of chronic inflammation are well known in humans and animals. OA is the result of chronic inflammation within joints, so incorporation of omega-3 fatty acids into the plan for OA patients is always a good idea. The ratio of fatty acids in a pet's diet will translate to the makeup of their cellular membranes and fatty acid ratios systemically.²⁷ Omega-3 fatty acids are anti-inflammatory, so as they incorporate into cells that make up synovial membranes and other joint-related structures, they will decrease the magnitude of the inflammatory cascade at that site.^{19,28} Because omega-3 fatty acids have so many additional health benefits, including cardiac health, renal health, improvement of atopic disease, and even reduction of the rate and recurrence of neoplasia, they are an excellent addition to the diets of most geriatric dogs and cats.²⁸⁻³¹ Omega-3 fatty acids are safe and can be supplemented in a liquid or capsule form or can be fed as a prescription diet high in omega-3s. Look for a product that is reputable, uses quality and sustainable fish sources, and is high in eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).

Polysulfated glycosaminoglycans are an injectable formula that can be given intramuscularly or subcutaneously in dogs and cats for the treatment of OA. Although research is somewhat limited, the research available is promising, showing beneficial effects in lameness³² as well as chondroprotective effects.³³ Dedicated pet owners can easily be taught to give

injectable medications at home to reduce cartilage degradation and lameness in dogs and cats.

The use of autogenous mesenchymal stem and regenerative cells, collected from either bone marrow or fat deposits, is just gaining popularity for the treatment of osteoarthritis. Because it is more invasive and expensive than orally administered drugs or nutraceuticals, it has been slow to catch on but is an option for animals with chronic OA that is unresponsive to other therapies. Two separate studies have shown beneficial effects of adipose-derived mesenchymal stem and regenerative cells for the treatment of elbow and hip OA and pain.^{34,35}

Improving Mobility and Strength to Improve Quality of Life

Loss of strength and mobility is a vicious cycle for geriatric patients, so the use of physical rehabilitation is very important in management of OA in pets. The goals of physical rehabilitation are to reduce pain and improve function. It is essential to ensure animals are not asked to perform therapeutic exercises or activities that will exacerbate pain before appropriate pharmaceutical pain management has been implemented.

Initial therapies, while a patient's pain level is still high, include the use of transcutaneous electrical nerve stimulation, thermotherapy,³⁶ and low-level laser.¹³ Once a patient is comfortable enough to begin exercising, a therapeutic exer-



Figure 5. An 8-year-old male neutered German Wirehair Pointer navigates Cavaletti rails as part of a therapeutic exercise program for stifle OA. Cavaletti exercises encourage active range of motion and strengthening in arthritic patients and are one example of an exercise pet owners can modify for home use. (Color version of figure is available online.)

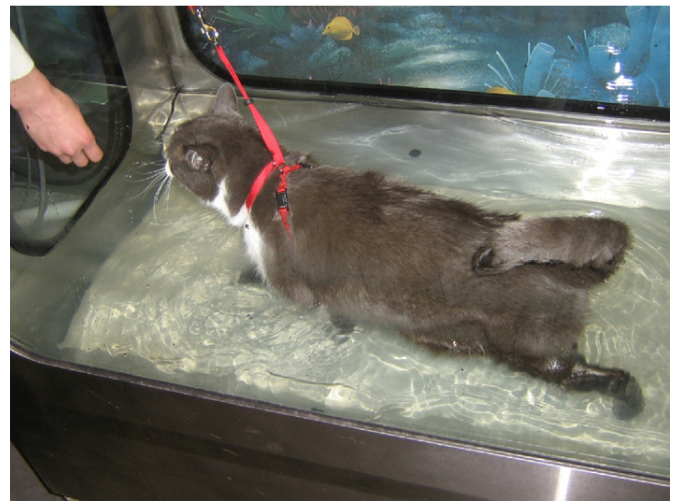


Figure 6. A 14-year-old male neutered domestic shorthair cat walks for 10 minutes in the underwater treadmill. With patience and gentle guidance, cats can be treated with physical rehabilitation, including therapeutic exercises. Underwater treadmill therapy is an excellent way for geriatric patients to gain strength, improve mobility, and reduce pain. (Color version of figure is available online.)

cise program can be developed for use during veterinary visits, and modified for owners to use at home. In people, both aerobic and strengthening exercises are beneficial in reducing pain caused by OA.³⁶ The same is true in pets, so it is important to encourage owners to participate with prescribed strengthening exercises and a regular walking program, even if walks are very short. Therapeutic exercise can help improve cardiovascular function and strength but will also improve balance and range of motion, as demonstrated in Figure 5. Cats are often neglected but tolerate therapeutic exercises well and will often participate in play at home as they begin to feel more comfortable.

Swimming and walking in an underwater treadmill, as shown in Figure 6, are among the best therapeutic exercises for the geriatric patient because they can rebuild strength, gain cardiovascular fitness and improve lameness without excessive stress to joints. While stress on the joints is minimized in the water, other forces improve the outcome, such as larger active range of motion, resistance provided by water to build strength, and improved posture resulting from lengthened stride and decreased pain.¹⁶ Rehabilitation facilities are becoming increasingly common in veterinary medicine, so visit the rehabilitation specialists in your area to learn more about referral if you are not comfortable or do not have the equipment to perform physical rehabilitation.

Conclusion

Managing OA in dogs and cats takes dedication from owners and veterinarians, but pet owners will be grateful for the improvement in their pet's quality of life and will be thankful

to the entire veterinary medical team for the support and care they provide their pets.

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