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KEY POINTS

- Owners should be educated that cats experience pain from OA, which impacts health, QOL, and behavior. Behavioral and QOL scores and mobility animations such as those available through Zoetis can be useful tools on educating owners how to recognize OA-associated pain (see **Education & Diagnostic Tools**, next page).
- Using pain-specific questionnaires and performing feline-friendly, OA pain-specific examinations can help expedite a diagnosis of pain (see **Education & Diagnostic Tools**, next page).
- Feline OA patients should be treated with the drugs and techniques currently available, but clinicians should stay abreast of future data and new treatment options as they emerge.

ZOETIS PETCARE

Feline Osteoarthritis Pain: Tools for Clinicians & Pet Owners

Osteoarthritis (OA), a form of degenerative joint disease (DJD), is the most common cause of chronic pain in mammals, including cats. More than 90% of adult cats may have radiographic evidence of OA, with the presence/severity of disease expected to increase by >10% each year.¹

Pain can be classified as either adaptive (physiologic) or maladaptive (pathologic). Adaptive pain facilitates tissue protection and healing, whereas maladaptive pain negatively impacts health, quality of life (QOL), and behavior, which can impact the human–animal bond, potentially leading to surrender or euthanasia of the pet.² OA is a nonhealing disease, with OA-associated pain having no protective benefit; thus, OA causes maladaptive pain that, without treatment, progressively worsens as peripheral and central sensitization and neuropathic pain develop.¹

Although OA is not curable, if identified and treated early, the progression of the intensity of OA pain can be slowed, providing a prolonged period of controllable pain and good QOL (likely a normal lifespan). Because OA is more common in geriatric cats,^{1,3} OA screening should begin when cats reach 7 to 10 years of age.

Recognizing OA-Associated Pain

OA-associated pain may not be obvious—to owners and to veterinary teams.⁴ Because cats are evolutionarily both predators and prey, their natural instinct is to hide any vulnerability that could increase predation, including pain. Tools such as checklists, animations, and videos can help owners and veterinary teams accurately recognize and assess pain associated with OA in cats.

Tools for Owners

Although the expected prevalence of OA is similar between dogs and cats, cat owners may be less likely than dog owners to identify pain in their pet.⁴ However, educating owners on the prevalence of OA-associated pain and available treatment options may make owners more likely to bring their cat to the clinic.⁵

Owner education starts with an understanding of feline behavior and mobility. Owners should understand that the clinical signs of OA-associated pain are rarely what is expected but the impact of pain (ie, pain-mediated changes in behavior, activity, and mobility) can still be identified. Behavior and activity changes related to urination/defecation, grooming, and social interactions (with humans and/or other pets) are often indicators of pain and, if not due to pain, could be due to other conditions that may require medical attention. Cats are largely sedentary, making

pain-related mobility changes challenging to observe. Cats are also often semi-nocturnal, so owners may be sleeping when cats exhibit mobility changes. Feline OA is often idiopathic and bilateral as compared with canine OA, which is primarily secondary and unilateral.⁶⁻⁸ Thus, classic limping as exhibited by dogs is unlikely to be exhibited by cats. In addition, cats also spend more time moving vertically (eg, jumping, climbing) as compared with dogs. Vertical mobility changes, which most owners do not know how to identify, are important indicators of OA-associated pain.

Checklists can be useful in a variety of settings, including medical diagnostics. Using checklists with specific pain-related behavior/activity questions can educate the owner on the potential presence of pain and expedite diagnosis by alerting the clinician to pain-related concerns (see **Education & Diagnostic Tools**). Questions on a checklist should focus on the cat's behavior and activity. Mobility discussions should center on the cat's ability to jump and climb.

Videos and animations may help owners understand mobility in patients with OA, as the owner may more readily identify with observing the cat in motion. Detailed animations are available and can be effective diagnostic tools, comparing the movement of a cat with healthy, nonpainful joints with a cat with painful osteoarthritic joints as the cats climb up and down stairs, jump up and down, and jump to/from elevated surfaces, among others (see **Education & Diagnostic**

Tools). Providing mobility animations on the clinic website and/or social media can also be beneficial; they can also be displayed on TV or computer screens in the lobby or examination rooms.

Infographics describing changes in behavior-related pain are also available (see **Education & Diagnostic Tools**). Clinicians should strive to be a pre-eminent resource for animal health information. Thus, infographics and questionnaires should be shared on the clinic website and/or social media and hard-copies made available in the clinic. Information regarding this material can also be included by audio in the clinic's on-hold phone recording.

Tools for Clinicians

In a study of 90 geriatric cats with radiographic changes of DJD, only 4 had DJD or arthritis mentioned in their medical records.³ Although radiographic changes do not consistently predict the presence of pain, there is some correlation,⁹ and it could therefore be assumed that >4 of these 90 cats were painful.

Identifying feline pain can be difficult for the clinician if not specifically investigated. Clinicians rarely observe a cat walking at the clinic as commonly occurs with dogs; thus, gait analysis is not typically a normal part of a non-pain-related examination. Having the owner explore checklists and mobility animations prior to the visit can increase the likelihood of pain being identified, as the owner's input will provide a template for pointed pain-related, cat-specific questions.

A feline-friendly musculoskeletal examination focused on joint-specific pain and mobility using gentle palpation and range of motion should be a part of any examination for patients in which pain is a potential problem and for every examination for cats >7 to 10 years of age. Detailed videos on feline-friendly, pain-focused musculoskeletal examinations in cats are available (see **Education & Diagnostic Tools**) and include thorough evaluative descriptions of the patient and several joints, including the hip, stifle, tarsus, and elbow—common locations for feline OA. Asking the owner to video their cat at home can also help facilitate diagnosis, as mobility and behavior can be more accurately assessed when the cat is in an environment it is familiar with. Radiography can provide valuable information and is recommended; however, some patients will have radiographic lesions with no pain, and some patients may have pain that is worse than the radiographic evidence.^{7,10} Regardless, pain should be the focus of treatment, not the radiographic changes.

Treatment of Feline OA

There are no research-backed, FDA-approved, easy-to-administer, long-lasting analgesic treatments for chronic pain in cats. NSAIDs are currently the most effective treatment option but are not approved in the United States for chronic use in cats and can cause adverse effects, including renal dysfunction, which is a common concern in cats.¹¹ NSAIDs are typically a first-line treatment option in all species but often do not control pain—especially moderate to severe pain—when used alone. Other pharmaceuticals can be used to treat OA pain in cats, but most have little to no demonstrated efficacy in cats and typically require oral administration.

EDUCATION & DIAGNOSTIC TOOLS

- ▶ Feline Examination Videos: felineOAexam.com
- ▶ Feline OA Owner Checklist: catOAchecklist.com
- ▶ The International Veterinary Academy of Pain Management: Animal Pain Awareness Month: ivapm.org/animal-pain-awareness-month
- ▶ Role of Nerve Growth Factor in OA Pain: thenewscienceofOApain.com
- ▶ Zoetis Technical Bulletin: Current & Future State of Disease: felineOApain.com

For advantages and disadvantages of drugs commonly used to treat chronic pain in cats, see Table, page 4.

Nonpharmacologic treatment (eg, acupuncture, laser and physical therapy) should be considered, although these techniques are largely unproven by research and require frequent treatment visits. Nutraceuticals and specific joint diets may be effective and could be added to the protocol as multimodal therapy but also have little to no demonstrated efficacy in cats. Most of these compounds are likely most effective at slowing disease progression, which may potentially delay the onset of worsening pain, than they are at providing analgesia directly.

The Future of Treating OA-Associated Pain

Nerve growth factor (NGF) is a cytokine that has recently been recognized as a major factor in the generation, propagation, and sensation of pain.¹²⁻¹⁴ Once released from damaged tissue, including tissue in an osteoarthritic joint, NGF rapidly escalates pain due to its impact on multiple pain pathway components, resulting in maladaptive pain.¹²⁻¹⁴ NGF binds to tropomyosin receptor kinase A (trkA receptors) and causes nociceptor

sensitization, which can lead to hyperalgesia and/or allodynia; this is augmented by the release of other inflammatory mediators (eg, histamine, bradykinin) and additional NGF following NGF binding to trkA receptors on proinflammatory cells (eg, mast cells). In addition, the NGF/trkA receptor complex is internalized and transported to the neuronal cell body in the dorsal root ganglion, where it promotes the expression and/or upregulation of a variety of other pronociception ion channels and receptors, including transient receptor potential vanilloid receptor 1, which is integral for development of central sensitization.¹²⁻¹⁴ Because of profound pronociceptive involvement and the ability to rapidly produce both peripheral and central sensitization, NGF is an obvious target for the control of OA pain. Monoclonal antibodies could potentially be an option for anti-NGF therapeutics; they can bind to specific target molecules, including cytokines, and block the activity of the target. Specified (felinized and caninized) anti-NGF monoclonal antibodies for dogs and cats are in development but not yet

available.^{15,16} In proof-of-concept studies, anti-NGF monoclonal antibodies have shown promise for relief of OA-associated pain for ≈1 month following SC injection.

Conclusion

OA can cause maladaptive, potentially excruciating, pain in cats. Although owners may struggle to identify pain in their cat, educating owners on the prevalence of OA-associated pain and available treatment options may make owners more likely to bring their cat to the clinic. Education can be provided through numerous resources, such as posters, questionnaires, and mobility animations. Providing education to owners through these means can also help expedite a diagnosis of OA, as pointed questions regarding changes in behavior and vertical movement can help more quickly identify pain. Incorporating these tools for both the owner and the clinician can help to more readily identify and treat feline OA-associated pain, improving patient quality of life. ■

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TABLE

COMMON MEDICATIONS USED TO TREAT CHRONIC PAIN IN CATS: ADVANTAGES, DISADVANTAGES, & DOSAGES

Drug & Class	Dose, Frequency, & Route	Advantages	Disadvantages	Notes
Robenacoxib (NSAID)	1-2.4 mg/kg PO every 24 hours*	Class is effective against OA-associated pain	Oral administration, which may be difficult for owners Adverse effects are possible with NSAIDs, which can frequently be an owner concern	Approved outside the United States for treatment of chronic pain in cats No limit on duration of therapy
Meloxicam (NSAID)	0.1 mg/kg PO first day, then 0.05 mg/kg every 24 hours thereafter*	Class is effective against OA-associated pain	Oral administration, which may be difficult for owners Adverse effects are possible with NSAIDs, which can frequently be an owner concern	Approved outside the United States for treatment of chronic pain in cats No limit on duration of therapy Doses as low as 0.01-0.03 mg/kg every 24 hours may be effective ¹⁷
Gabapentin	3-20 mg/kg PO every 8-12 hours	Minimal adverse effects One study has indicated efficacy for treatment of OA-associated pain in cats ¹⁸	Oral twice- to three-times-daily administration Can cause sedation Often a controlled drug	Proven effective for calming prior to transport to the clinic, which may decrease pain, as pain causes anxiety and anxiety exacerbates pain
Amantadine (NMDA-receptor antagonist)	3-5 mg/kg PO every 12 hours	Minimal adverse effects Potential for significant pain relief due to monoamine oxidase inhibition	Oral twice-daily administration Efficacy can be difficult to determine	Dosing is based on one canine study and may be inadequate Neither pharmacokinetics nor pharmacodynamics have been studied in cats
Ketamine (NMDA-receptor antagonist)	4-10 µg/kg/min IV following a loading dose of 0.5 mg/kg	Minimal adverse effects Potential for significant pain relief due to monoamine oxidase inhibition	Patient must be hospitalized for infusion Repeat infusions may be necessary	Proven effective in other species, particularly in patients with pain of central sensitization Most effective dose and infusion duration are unknown and are likely highly individual
Amitriptyline (tricyclic antidepressant)	3-4 mg/kg PO every 12 hours	Minimal adverse effects	Oral twice-daily administration Cats typically do not like the taste	Serotonin-reuptake inhibition may provide analgesia through the descending inhibitory limb of the pain pathway
Tramadol (opioid)	1-2 mg/kg PO every 12 hours	Two studies indicate efficacy for treatment of OA-associated pain in cats ^{19,20}	Cats typically do not like the taste Oral twice- to three-times-daily administration Can cause sedation or dysphoria Controlled drug	Adverse effects like dysphoria, sedation, and diarrhea are common at the effective dose ¹⁹
Buprenorphine (opioid)	0.02-0.05 mg/kg oral transmucosal every 8-12 hours	Opioid-level pain relief	Potential adverse effects Oral twice- to three-times-daily administration Controlled drug Opioids are not ideal for treatment of chronic pain	Oral transmucosal absorption is fairly low, potentially leading to the need for higher doses

*Dosage used outside the United States to treat chronic pain