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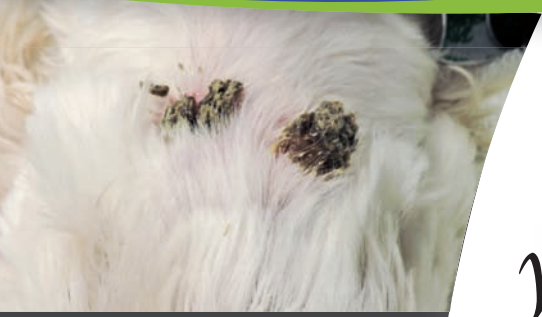

A diagnosis is at *your* **command**

How simply asking a dog to "sit"—among other diagnostic evaluations—can help you differentiate between bad hips and bad knees

p275

Image Quiz
What's the cause of a dog's bilateral submandibular draining tracts? 260

Journal Scan
- Investigating feline audiogenic reflex seizures 256
- Comparing two spay techniques in cats 258

At-home diabetic monitoring
Advice on helping clients achieve accurate results, charging appropriately 264

Toxic troubles for rabbits
A parasiticide with life-threatening effects 270

Idea Exchange
- Install cat doors to keep trash out of sight 282
- Use rubber bands to store BP cuffs 282

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High-frequency sounds can lead to seizures in some older cats

Why they did it

Researchers in the United Kingdom, aware of the occurrence of seizures induced in cats exposed to sounds at certain frequencies, sought to characterize feline audiogenic reflex seizures (FARS) to provide a description of this previously unreported syndrome.

What they did it

Cases of suspected FARS were solicited from primary veterinarians and owners through print media, the Internet and the radio. Cat pedigrees, medical histories and cheek swab DNA samples were collected. A detailed online questionnaire was made available to those owners whose cats met the inclusion criteria. A full medical history and, in many cases, video recordings of episodes were also reviewed.

The questionnaire asked about signalment, precipitating factors, the cat's overall health and any relevant therapies or medications as well as detailed descriptions of the episodes. It was designed to avoid leading owners to make conclusions or to provide "expected answers."

For inclusion in the study, the cats had to have suffered three or more generalized tonic-clonic seizures (GTCSs) precipitated by the same sound and lasting less than five minutes for a minimum one-year history. Other types of episodes such as myoclonic seizures or jerks and absence seizures were described separately on the questionnaire. A total of 96 cats met the criteria for the study.

What they found

The mean age for seizure onset was 15, with a fairly even distribution of males and females. Many breeds were represented, but Birman cats were most common (n=30). The noise stimulus for all cats was high-pitched, and audiogenic kindling—repeated sound stimulation resulting in progression from myoclonic seizures to GTCS—was observed in most of the subjects. The seizure episodes occurred an average of once every three to six months, and of the cats in which diagnostics were pursued, no cause for the seizures was found.

Some common sounds that induced FARS episodes in affected cats were

- Crinkling tin foil (n=82)
- Dropping a metal spoon into a ceramic bowl (n=79)
- Clinking or tapping a glass (n=72)
- Crinkling paper or plastic bags (n=71)
- Typing on a computer keyboard or clicking a mouse (n=61)

Many of the cats had concurrent disease, most commonly chronic renal disease and hyperthyroidism. None of the cats demonstrated progression of the seizure disorder. Interestingly, 50% of the cats were described as having hearing loss or deafness. Forty-four cats received antiseizure medication—phenobarbital or levetiracetam—to control their seizures, but only levetiracetam resulted in good control of both the myoclonic seizures and GTCSs.

Take-home message

FARS is newly defined nonprogressive clinical syndrome affecting geriatric cats characterized by myoclonic seizures and GTCSs triggered by high-pitched sounds, often with persistence of the sound serving to increase the severity of the seizure episode. Levetiracetam appears to be more effective than phenobarbital in controlling both the myoclonic seizures and GTCSs associated with FARS. Birman cats were overrepresented in this study, suggesting a breed predilection and genetic basis for the disorder. Hearing loss or deafness reported in many of these cats may not indicate damage to the area of the cochlea associated with higher frequency hearing, providing an explanation for how FARS occurs in cats with apparent hearing impairment or deafness. VM

Lowrie M, Bessant C, Harey RJ, et al. Audiogenic reflex seizures in cats. *J Feline Med Surg* 2015;epub ahead of print.

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Important Safety Information
OSURNIA® (florfenicol/terbinafine/betamethasone acetate) is for otic use only under veterinary supervision. Do not use in dogs with known tympanic perforation or a hypersensitivity to florfenicol, terbinafine or corticosteroids. Adverse reactions observed during clinical trials include vomiting, increased liver enzymes and transient loss of hearing. Please see brief summary on page 258 for additional information.

***Associated with susceptible strains of bacteria (*Staphylococcus pseudintermedius*) and yeast (*Malassezia pachydermatis*).**

Elanco

Ovarian pedicle tie technique put to the test

Why they did it

Since time is always of the essence, these researchers evaluated the rate of hemorrhage-related complications associated with pedicle tie procedures in cats undergoing ovariohysterectomy at the Oregon Humane Society (OHS) and compared the surgical time of pedicle tie to the pedicle double ligation technique.

What they did

The study involved two phases. In phase one, more than 2,000 intact female cats were spayed with the pedicle tie technique by one of three surgeons experienced with the procedure. The cats, which were either part of a low-cost spay-neuter program or owned by the OHS and adopted shortly after surgery, were categorized as kittens (< 4 months of age) or adults (> 4 months of age). Cats in estrus or that were pregnant were not excluded from the study as they were routinely spayed in this clinic setting.

The cats were evaluated for ovarian pedicle hemorrhage intraoperatively and monitored postoperatively. Any hemorrhagic complications were corrected either at the time of surgery or via exploratory surgery if hemorrhage was suspected after recovery.

In phase two, the surgical times were recorded for more than 200 similarly categorized female intact cats undergoing ovariohysterectomy with either the pedicle tie or pedicle double ligation technique.

What they found

Of the large number of pedicle tie procedures performed in phase one, only six ovarian pedicle hemorrhagic complications were recorded. Five of these were detected intraoperatively and corrected via pedicle ligation. None of these were cats in estrus or pregnant, and the surgical times for the pedicle tie procedure were two minutes faster than with pedicle double ligation technique.

Take-home message

For practices with limited resources performing a high volume of feline ovariohysterectomies, every minute counts. The results of this study suggest that the pedicle tie procedure is associated with a low risk of ovarian pedicle hemorrhage while reducing surgical time. The benefits of a two-minute per surgery time reduction in a high-volume spay and neuter clinic are significant considering employee (surgeon and anesthetist) pay and anesthetic and surgical material (suture) cost savings over time. Furthermore, the reduced surgical time may also decrease the risk for other types of surgery-related complications such as hypothermia or infection. VM

Miller K, Rekers W, Ellis K, et al. Pedicle ties provide a rapid and safe method for feline ovariohysterectomy. *J Feline Med Surg* 2015; Epub ahead of print.

These "Journal Scan" summaries were contributed by Avi Blake, DVM, a freelance technical editor and writer in Eudora, Kansas.

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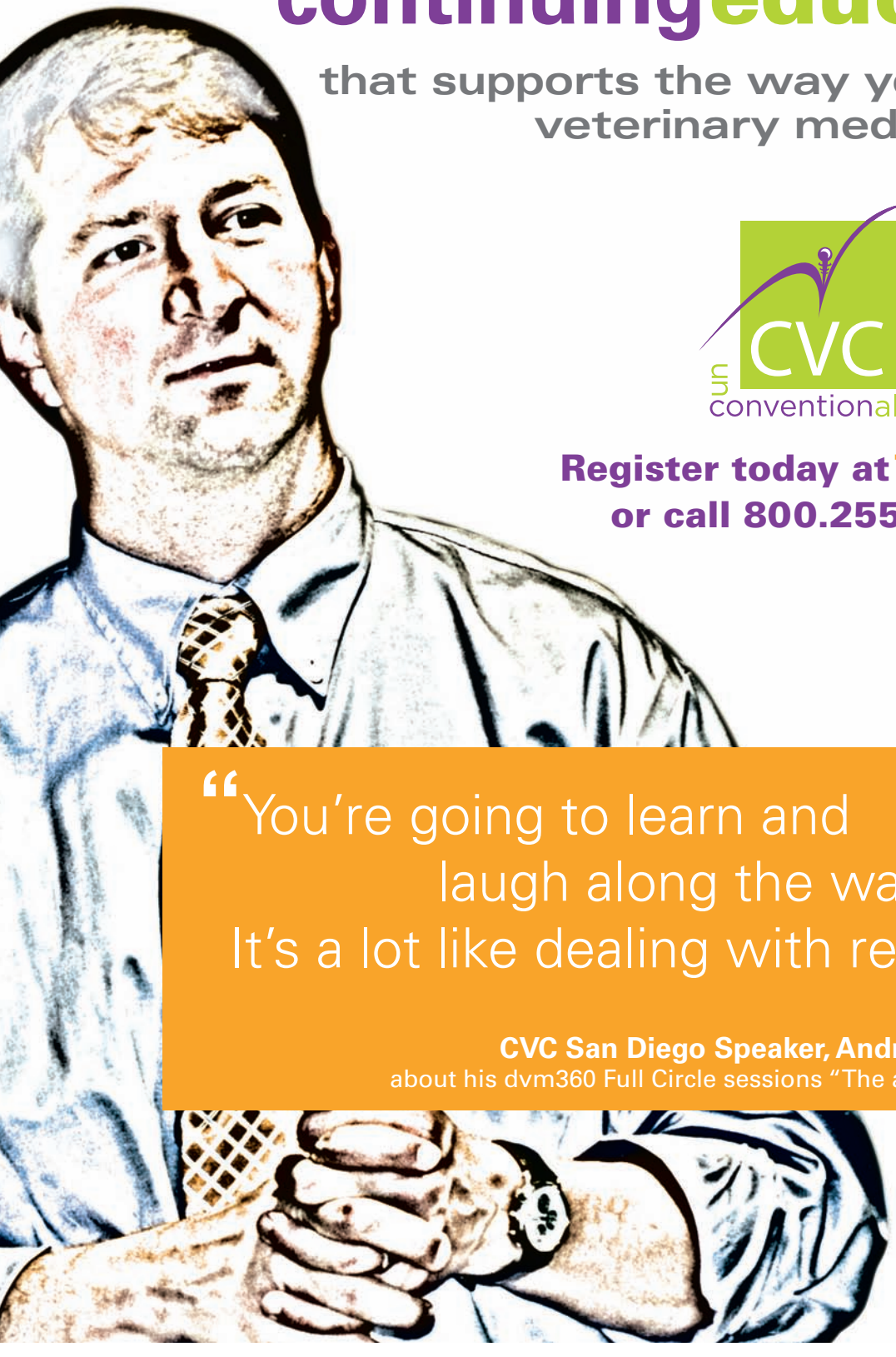

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Submandibular *draining tracts* in a Maltese mix

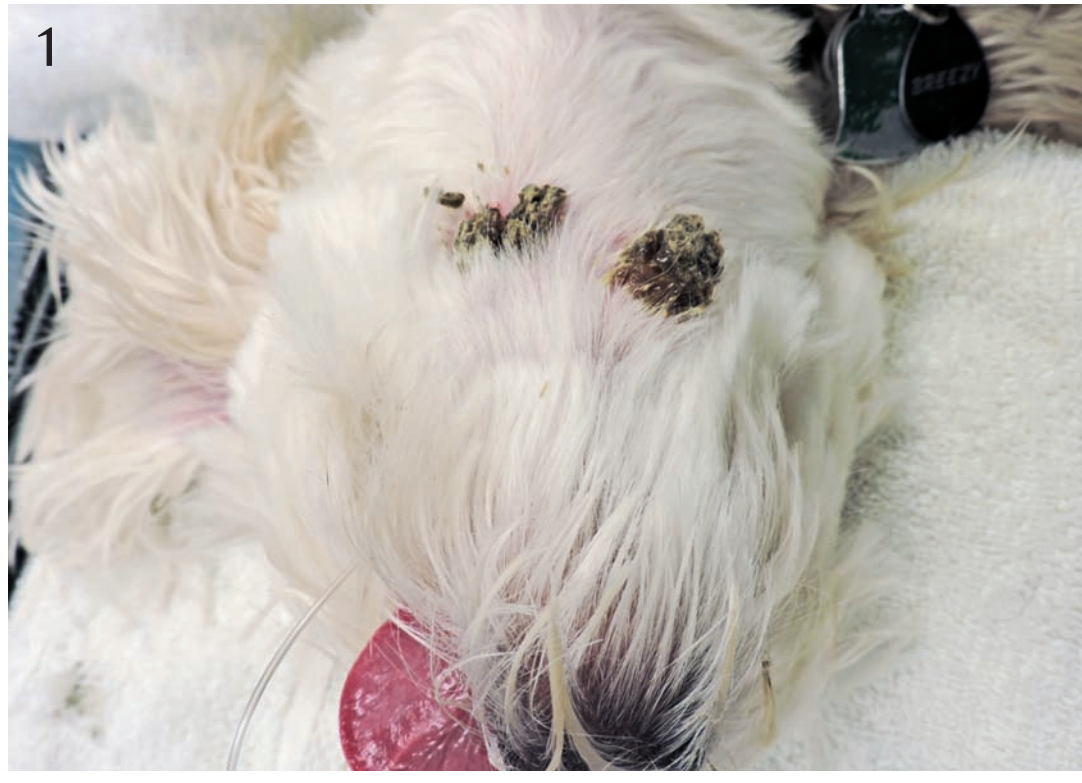
By Kendall Taney, DVM, DAVDC

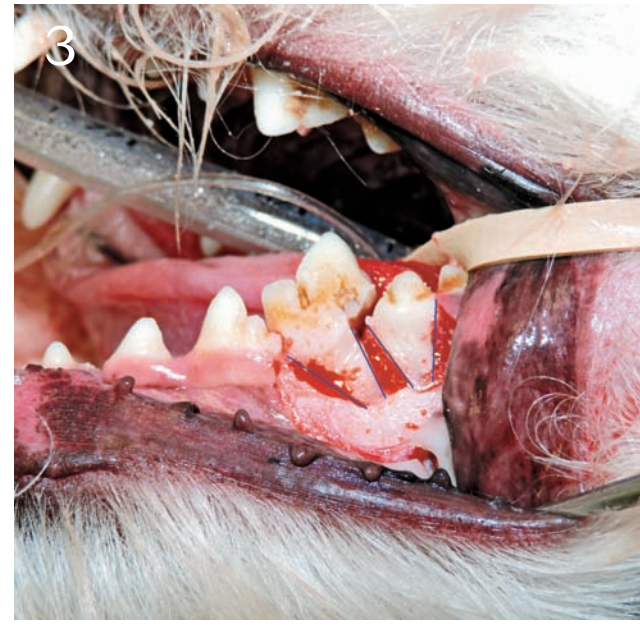
A 4-year-old spayed female Maltese mix was presented for chronic bilateral draining tracts and swelling below the mandibles. Treatment with multiple courses of antibiotics was not successful in resolving the lesions. An oral examination revealed some abnormalities with the shape and crowns of the mandibular first molars.

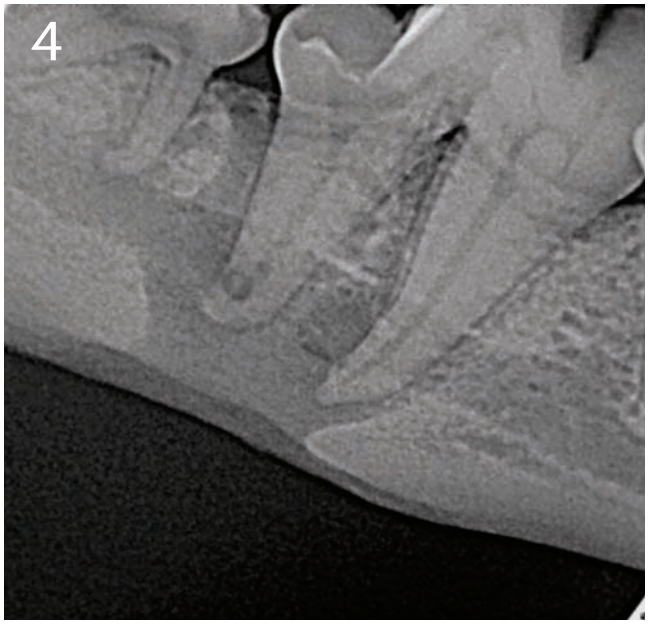
Which of the following is the most likely diagnosis?

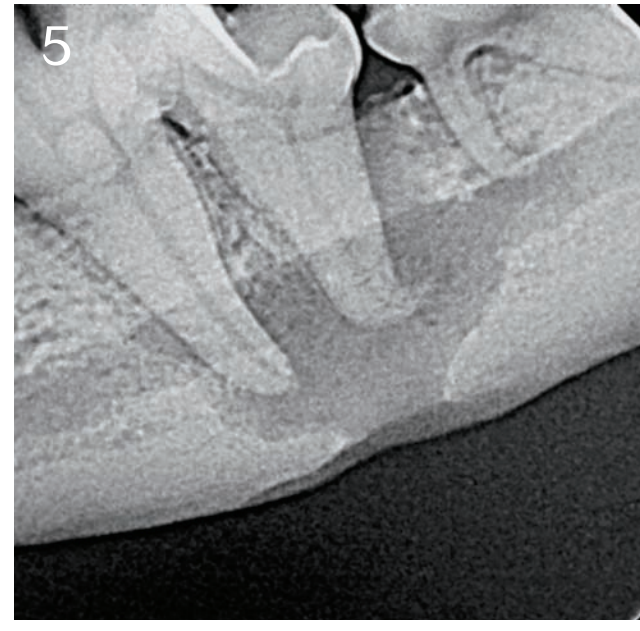
a) Rubber jaw
b) Carious lesions of the first mandibular molars
c) Dens invaginatus
d) Complicated crown fractures of 309 and 409
e) Neoplasia

(See the answer on page 262.)









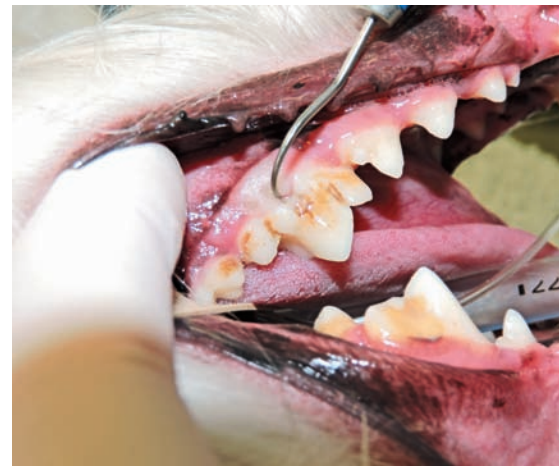
>>> 1. Bilateral chronic draining tracts on the ventral aspect of the lower jaw.

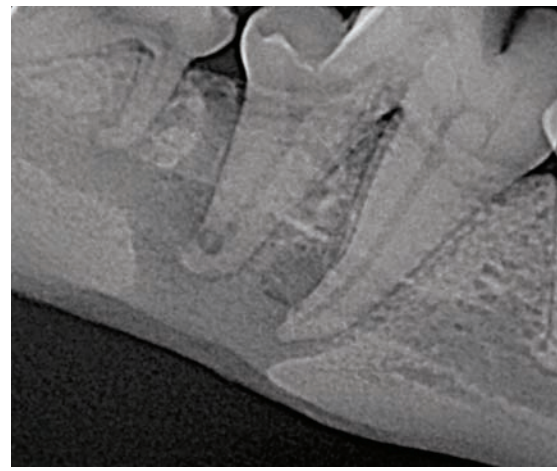
>>> 2. Crown shape and surface abnormalities of the left mandibular first molar. The same abnormalities were noted on the right.

>>> 3. The normal first mandibular molar roots are divergent. After elevation of a mucogingival flap and lateral alveolar bone removal, these tooth roots appear to be converging.

>>> 4. A dental radiograph of left mandibular first molar (309).

>>> 5. A dental radiograph of right mandibular first molar (409).





malities of the crown can be evident, and enamel may be rough or irregular in the area of the furcation.

Radiographs reveal that the roots are converging together instead of diverging as they normally would. The endodontic system may also be difficult to define or may be obstructed in areas.

Treatment options include endodontic treatment or extraction. Endodontic treatment can be challenging since often the root canal system is not normal and the canals can be difficult to navigate and treat effectively. If you suspect this condition in a patient, endodontic therapy can be initiated to prevent pulp death and subsequent infection.

Answer

c) Dens invaginatus

Dens invaginatus is a developmental abnormality in which the enamel organ infolds back into the tooth as the permanent tooth is forming. These teeth often have dentin exposure and do not have normal root canal systems, and pulp necrosis occurs soon after eruption.

A histopathologic examination is needed to definitively diagnose the condition, but the appearance of the crown, root and endodontic system can provide strong support for the diagnosis of dens invaginatus. Abnormalities of the crown can be evident, and enamel may be rough or irregular in the area of the furcation.

Radiographs reveal that the roots are converging together instead of diverging as they normally would. The endodontic system may also be difficult to define or may be obstructed in areas.

Treatment options include endodontic treatment or extraction. Endodontic treatment can be challenging since often the root canal system is not normal and the canals can be difficult to navigate and treat effectively. If you suspect this condition in a patient, endodontic therapy can be initiated to prevent pulp death and subsequent infection.

In this case, there is significant periapical bone loss due to the chronic infection. Careful extraction of these teeth is warranted to prevent pathologic mandibular fracture.

The prognosis is good for stability and strength of the mandible once bony healing occurs. Use of a bone graft in the alveolus may help facilitate the healing process. VM

Kendall Taney, DVM, DAVDC, is a partner at the Center for Veterinary Dentistry and Oral Surgery in Gaithersburg, Maryland.

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See brief summary on page 262

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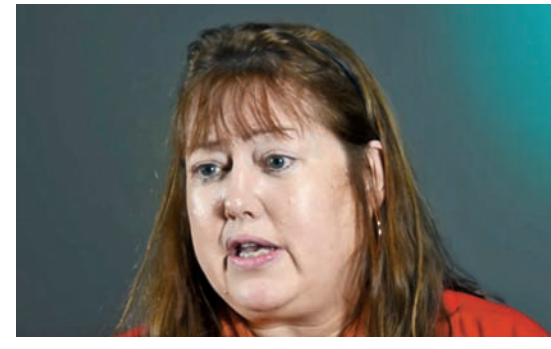
CAUTION: Federal law restricts this drug to use by or on the order of a licensed veterinarian. Federal law prohibits the extra label use of this drug in food-producing animals. WARNINGS: For use in cats only. PRECAUTIONS: The safety of pradofloxacin in cats younger than 12 weeks of age has not been evaluated.

V15413

At-home diabetic monitoring

How much should you *charge*?

At-home blood glucose monitoring has become a valuable tool clinically, often generating a more accurate picture of how a pet is doing than when curves are performed in the clinic. Inspired by their upcoming Learn Then Earn session at CVC San Diego, Dec. 3, veterinary endocrinologist Dr. David Bruyette and financial consultant Dr. Karen Felsted have a frank talk about the best way to charge—or not charge—clients for consultations while they're performing at-home monitoring for their diabetic pets. Watch the video by scanning the QR code on the left or by visiting **dvm360.com /diabetescharge**.



Then read fellow CVC San Diego veterinary endocrinology speaker Dr. Ellen Behrend's pointers on at-home glucose monitoring.

CVC

Love what you hear?
See Drs. Bruyette and Felsted live in CVC San Diego, Dec. 3-6. Visit **thecvc.com/sd** for more details and to register.

The particulars on at-home blood glucose monitoring

By Ellen N. Behrend, VMD, MS, PhD, DACVIM

To avoid some of the problems associated with in-hospital blood glucose curves, performance of glucose curves at home has taken on new importance. Home curves are likely the most accurate.

For home glucose curves, it is not necessary for venous blood to be collected. Capillary blood is suitable.[1] Choices of sites are the ear, gum, footpads or elbow callus (dogs). I do not recommend using the gum and footpads because of the associated pain. Keep in mind that glucose curves can vary from day to day when done at home as well.[2]

Two types of lancing devices are available. If using conventional automatic devices

Simbadol™ (buprenorphine injection)

1.8 mg/mL

For subcutaneous use in cats

BRIEF SUMMARY: Before using SIMBADOL, please consult the full prescribing information, a summary of which follows.

CAUTION: Federal law restricts this drug to use by or on the order of a licensed veterinarian.

HUMAN SAFETY WARNING

Abuse Potential
SIMBADOL contains buprenorphine (1.8 mg/mL), an opioid agonist and Schedule III controlled substance with an abuse potential similar to other Schedule III opioids. Buprenorphine has certain opioid properties that in humans may lead to dependence of the morphine type. Abuse of buprenorphine may lead to physical dependence or psychological dependence. The risk of abuse by humans should be considered when storing, administering and disposing of SIMBADOL. Persons at increased risk for opioid abuse include those with a personal or family history of substance abuse (including drug or alcohol abuse or addiction) or mental illness (suicidal depression).

Life-Threatening Respiratory Depression
Respiratory depression, including fatal cases, may occur with abuse of SIMBADOL.

Additive CNS Depressant Effects
SIMBADOL has additive CNS depressant effects when used with alcohol, other opioids, or illicit drugs that cause central nervous system depression.

Accidental Exposure
Because of the potential for adverse reactions associated with accidental injection, SIMBADOL should only be administered by veterinarians or veterinary technicians who are trained in the handling of potent opioids.

See Human Safety for detailed information.

INDICATION: SIMBADOL is indicated for the control of postoperative pain associated with surgical procedures in cats.

DOSAGE AND ADMINISTRATION: The dosage of SIMBADOL is 0.24 mg/kg (0.11 mg/lb) administered subcutaneously once daily, for up to 3 days. Administer the first dose approximately 1 hour prior to surgery. Do not dispense SIMBADOL for administration at home by the pet owner (see Human Safety).

CONTRAINDICATIONS: SIMBADOL is contraindicated in cats with known hypersensitivity to buprenorphine hydrochloride or any of the components of SIMBADOL, or known intolerance to opioids.

WARNINGS: For subcutaneous (SQ) injectable use in cats.

Human Safety: **Not for use in humans. Keep out of reach of children.** Because of the potential for adverse reactions, hospital staff should avoid accidental exposure and contact with skin, eyes, oral or other mucous membrane during administration. SIMBADOL contains buprenorphine, a mu opioid partial agonist and Schedule III controlled substance with an abuse potential similar to other Schedule III opioids. SIMBADOL can be abused and is subject to misuse, abuse, addiction and criminal diversion. SIMBADOL should be handled appropriately to minimize the risk of diversion, including restriction of access, the use of accounting procedures, and proper disposal methods, as appropriate to the clinical setting and as required by law. Abuse of SIMBADOL poses a hazard of overdose and death. This risk is increased with concurrent abuse of alcohol and other substances including other opioids and benzodiazepines. Buprenorphine has been diverted for non-medical use into illicit channels of distribution. All people handling opioids require careful monitoring for signs of abuse. Drug abuse is the intentional non-therapeutic use of a prescription drug for its rewarding psychological or physiological effects. Abuse of opioids can occur in the absence of true addiction. Naloxone may not be effective in reversing respiratory depression produced by buprenorphine. The onset of naloxone effect may be delayed by 30 minutes or more. Doxapram hydrochloride has also been used as a respiratory stimulant.

PRECAUTIONS: Hyperactivity (opioid excitation) has been observed up to 8 hours after anesthetic recovery (see ADVERSE REACTIONS). Safety has not been evaluated in moribund cats. Use in such cases should be based on the risk-benefit assessment of the veterinarian. Use with caution in cats with impaired hepatic function. The use of SIMBADOL has not been evaluated in breeding, pregnant, or lactating cats, or in cats younger than 4 months of age.

ADVERSE REACTIONS: In two controlled field studies, the following adverse reactions were reported.

Adverse Reactions in Two Field Studies

	SIMBADOL (N = 224)		Control (N = 226)	
Adverse Reaction[a]	**During Surgery[b]**	**After Surgery**	**During Surgery[b]**	**After Surgery**
Hypotension[c]	68 (30.4%)	51 (22.8%)	60 (26.5%)	40 (17.7%)
Tachycardia[d]	55 (24.6%)	73 (32.6%)	30 (13.3%)	44 (19.5%)
Hypothermia (≤98.0°F)	38 (17.0%)	1 (0.4%)	47 (20.8%)	0
Hyperthermia (≥103.0°F)	1 (0.4%)	91 (40.6%)	0	33 (14.6%)
Hypertension[e]	10 (4.5%)	40 (17.9%)	17 (7.5%)	18 (8.0%)
Anorexia	0	40 (17.9%)	0	35 (15.5%)
Hyperactivity	0	26 (11.6%)	0	11 (4.9%)
Reduced SpO_2 (≤90%)	8 (3.6%)	1 (0.4%)	11 (4.9%)	0
Bradycardia (≤90 beats/min)	5 (2.2%)	1 (0.4%)	4 (1.8%)	1 (0.4%)
Tachypnea (≥72 breaths/min)	0	5 (2.2%)	1 (0.4%)	6 (2.7%)
Arrhythmia	1 (0.4%)	1 (0.4%)	2 (0.9%)	0
Blindness	0	2 (0.9%)	0	1 (0.4%)
Apnea/Death	1 (0.4%)	1 (0.4%)	0	0
Ataxia	0	1 (0.4%)	0	0
Hyperesthesia	0	1 (0.4%)	0	0

a. Cats may have experienced more than one type or occurrence of an adverse reaction. Cats experiencing the same reaction both during and after surgery are presented in both time periods.
b. During surgery is the time from the administration of the anesthetic induction agent until discontinuation of the gas anesthetic.
c. Hypotension is defined as a mean blood pressure of ≤60 mmHg during surgery and ≤90 mmHg after surgery.
d. Tachycardia is defined as a heart rate of ≥180 beats per minute during surgery and ≥200 beats per minute after surgery.
e. Hypertension is defined as a mean blood pressure of ≥120 mmHg during surgery and ≥160 mmHg after surgery.

To report suspected adverse events, contact Abbott Animal Health at 1-888-299-7416, FDA at 1-888-FDA-VETS or FDA online at http://www.fda.gov/AnimalVeterinary/SafetyHealth.

EFFECTIVENESS: The effectiveness of SIMBADOL was demonstrated in two randomized, masked, placebo-controlled, multi-site field studies involving client-owned cats of various breeds. A descriptive, interactive pain assessment system was used by the trained assessor over the 72-hour post-operative period to determine pain control, and treatment success was defined as a cat that completed the 72-hour post-operative period without rescue analgesia. A statistically significant difference ($P \leq 0.005$) in the number of successes in the treatment group over the placebo control group was observed. The results of two field studies demonstrate that SIMBADOL is effective and has an acceptable safety margin for the control of postoperative pain in cats.

HOW SUPPLIED: SIMBADOL (buprenorphine injection) is supplied in a carton containing one 10 mL amber glass vial. Each multidose vial contains 1.8 mg/mL of buprenorphine.

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Q&A on New Pain Management Guidelines

In May 2015, the American Animal Hospital Association (AAHA) and the American Association of Feline Practitioners (AAFP) issued new pain management guidelines for dogs and cats. Zoetis, maker of SIMBADOL™ (buprenorphine injection), asked Dr. Michael Petty, DVM, of Arbor Pointe Veterinary Hospital in Canton, Michigan, and one of the authors of the new guidelines, about what's new in the updated guidelines and about surgical pain management for cats.

Q **Why was there a need to update the pain management guidelines for dogs and cats?**

A The last guidelines were published eight years ago, and since 2007 the profession has developed a much better understanding of pain medications and how they are used in veterinary medicine. The new guidelines also give much more specific information on uses, doses and indications for the pain medications available to veterinarians.

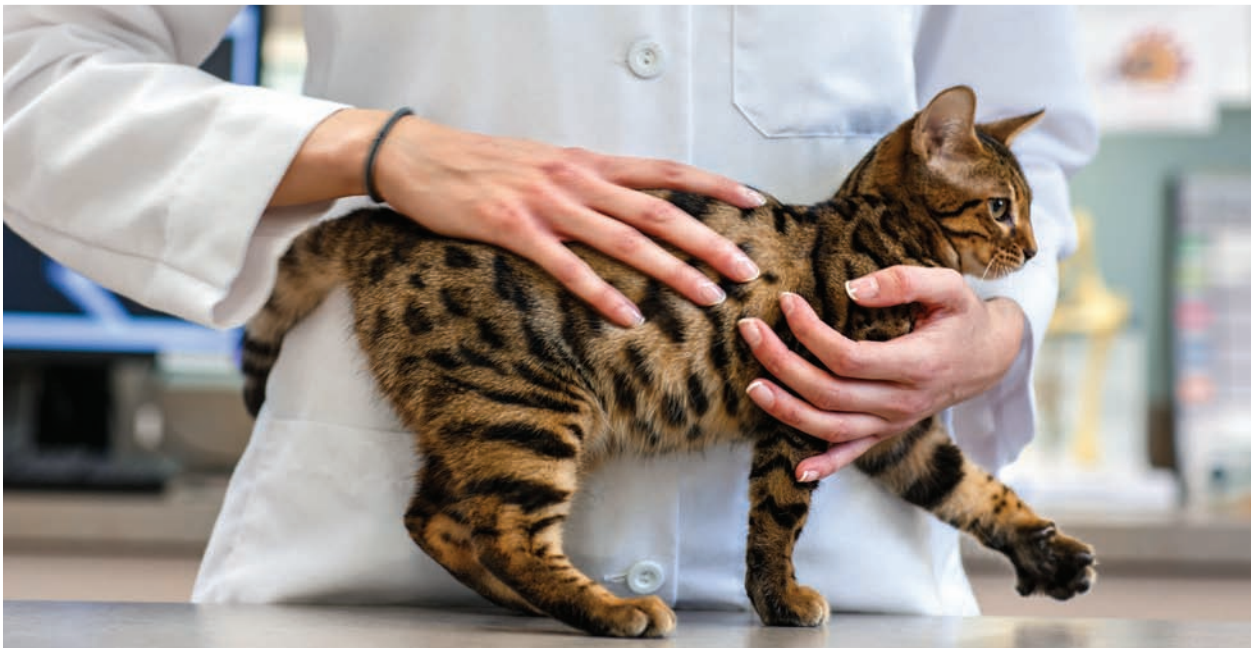
Q **How do the new guidelines address pain management for cats?**

A Dogs and cats can exhibit pain in different ways. For example, dogs limp, but cats rarely do. Pain in cats is often exhibited by a change in behavior, such as an unwillingness to jump, use the litter box or interact with people.

A lot of older cats are seen as cranky, but they wouldn't be cranky if they weren't in pain. We treat the pain, and suddenly the owners have a happy cat again.

Q **Looking specifically at surgery, what do you see as the most significant change in surgical pain management for cats over the past few years?**

A When I was in veterinary school, we were told never to use opioids in cats. Since then, there has been a lot of research presented in the literature and it has become an accepted practice. Also, the guidelines approach pain management with a multimodal view and provide information on what drugs are safe to use in combination.



& Feline Surgical Pain with Dr. Mike Petty

Q **Are there particular points that veterinarians should take into account when considering surgical pain management for cats?**

A Veterinarians can re-evaluate their anesthesia protocols, and if they are not addressing pain appropriately, then I suggest that they start out slowly with one analgesic, such as SIMBADOL. It's such a no-brainer of a drug; give it once, and it lasts for 24 hours with very good pain control. Once a doctor is comfortable, add in NSAIDs or local anesthetics.

Q **Are there any other important points regarding surgical pain management in cats that veterinarians should consider?**

A Practitioners should consider employing a pain management scale for each and every cat they see. Just looking at a cat isn't enough. You have to measure it. You can't know if the cat is running a fever without a thermometer, and you can't tell if a cat is in pain without using a pain scale.

Q **What medications would you recommend a veterinarian have in his or her "toolkit" for managing surgical pain in cats? Why are these medications important?**

A I recommend SIMBADOL because I know through personal use how effective and safe it is; plus, it is the only long-lasting opioid approved for cats.

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I also suggest meloxicam because of its strong anti-inflammatory effects as well as local anesthetics because they are so safe, easy to use and block 100 percent of the pain. If veterinarians are using those three things, they are doing a great job of managing feline pain.

Simbadol™ (buprenorphine injection) CIII

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WARNINGS, PRECAUTIONS and CONTRAINDICATIONS: Due to serious human safety and abuse concerns, including physical or psychological dependence, life-threatening respiratory depression and additive CNS depressant effects, read the full prescribing information before using this drug, including the complete Boxed Warning. Not for use in humans. Hospital staff should be trained in the handling of potent opioids and should avoid accidental exposure. For subcutaneous (SQ) injectable use in cats. Opioid excitation has been observed up to 8 hours after anesthetic recovery. Use with caution in cats with impaired hepatic function. SIMBADOL has not been evaluated in breeding, pregnant, or lactating cats, in cats younger than 4 months of age or moribund cats. Do not use in cats with known hypersensitivity to buprenorphine hydrochloride or any of the components of SIMBADOL, or known intolerance to opioids.

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See full Prescribing Information on page 265, including the complete Boxed Warning for human safety.

Dr. Petty is a consultant for Zoetis.

Side tip:

The purpose of a glucose curve is to determine how a particular dose of insulin is performing given a specific diet and schedule. Thus, routine must be adhered to. A normal routine is difficult to maintain even if the dog or cat is being "poked" every two hours at home. However, the standard procedures must be adhered to as much as possible.

designed for pricking human fingertips, choose a device with a variable needle depth. The appropriate depth for each patient can then be used.[3] A needle can be used, especially if the marginal ear vein is the site of blood collection. Glucometers that require minimal amounts of blood as well as those that sip the blood into the strip are desirable.

Training owners to perform home glucose curves takes time. Not all owners are suited to perform such a task. A small study of nine owners of diabetic dogs (n=7) and cats (n=2) indicated that, at least in that population, the most frequently encountered problems were the need for more than one puncture to obtain a blood drop, the creation of a sufficient blood drop, the need for assistance in restraining the pet, and the pet's resistance.[4] Two dogs became more resistant over time, and the owners abandoned the technique. The two cats became more compliant, especially because the technique was performed in a place chosen by the cat.[4] VM

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1. Casella M, Wess G, Hassig M, et al. Home monitoring of blood glucose concentration by owners of diabetic dogs. *J Small Anim Pract* 2003;44(7):298-305.

2. Alt N, Kley S, Haessig M, et al. Day-to-day variability of blood glucose concentration curves generated at home in cats with diabetes mellitus. *J Am Vet Med Assoc* 2007;230(7):1011-1017.

3. Reusch CE, Wess G, Casella M. Home monitoring of blood glucose concentration in the management of diabetes mellitus. *Compend Contin Educ Pract Vet* 2001;23:544-556.

4. Van de Maele I, Rogier N, Daminet S. Retrospective study of owners' perception on home monitoring of blood glucose in diabetic dogs and cats. *Can Vet J* 2005;46(8):718-723.

See more tips for diabetic cat owners from Dr. Behrend at dvm360.com/diabetestips.

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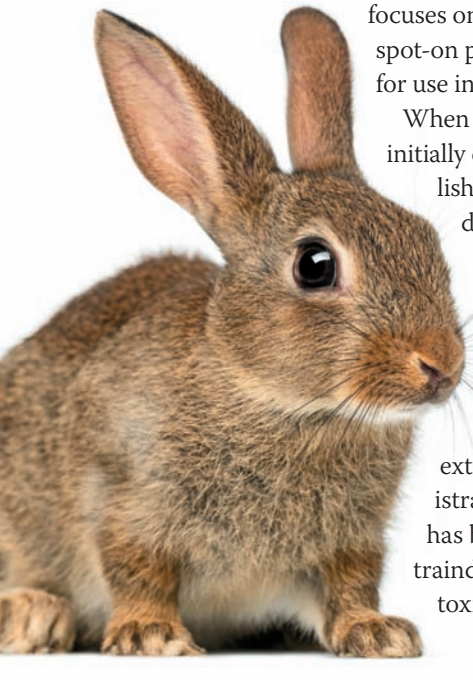
Fipronil toxicosis *in* rabbits

At one time, spot-on topical fipronil formulations for dogs and cats were recommended for extralabel use in rabbits, but no more. Exposure to these products can cause life-threatening signs in rabbits. *By Laura A. Stern, DVM*



Fipronil is a phenylpyrazole insecticide used to control a variety of insects such as ants, beetles, cockroaches, fleas, ticks and termites. It comes in a variety of formulations: topical, spray, dust and bait. This article focuses on the topical spot-on product labeled for use in dogs and cats.

When this product initially debuted, published, extralabel dosing recommendations for fipronil were used successfully in rabbits,[1,2] but subsequently, extralabel administration in rabbits has become contraindicated due to toxicity concerns.[2,3]

Pharmacokinetics and metabolism

Dermal absorption of topically applied fipronil in rabbits is low at 0.07%. Oral absorption is higher at 30% to 50% of the ingested dose and is possible if the rabbit licks the product off after topical application.[4] Fipronil is detected on the hair and superficial skin layers but not in the dermis or hypodermis.[5] It accumulates in the sebaceous gland and then is released by the follicular ducts.

Mechanism of action

Fipronil blocks GABA receptors in the central nervous system, which leads to the prevention of chloride ion uptake and results in excessive central nervous system stimulation and death. Fipronil exhibits a greater affinity for binding insect GABA receptors than for binding mammalian GABA receptors, resulting in a wide margin of safety for most mammals while still causing death to insects.[4]

Toxicity

The no observed adverse effect level (NOAEL) for rabbits is 5 mg/kg/day when applied topically.[4] Topically applied fipronil is classified as moderately toxic for rabbits.[6] The dermal LD_{50} for rabbits is 354 mg/kg.[6]

In one study, 10 mg/kg/day of fipronil applied topically to rabbits for 21 days caused decreases in mean body weight, weight gain and food consumption.[4] Other studies have shown that dermal dosing in rabbits causes hypersalivation, tremors, hyperactivity, diarrhea, emaciation and death.[6] Delays in the appearance of signs were noted in these studies. Seizures were not seen until three to nine days after exposure, and death often occurred 11 to 14 days after

GETTY IMAGES/ERIC ISSELÉE

exposure.[6] Young rabbits have been reported to be more sensitive to the effects of fipronil than older rabbits are.[3,7]

ASPCA Animal Poison Control Center data

A review of the ASPCA Animal Poison Control Center's toxicology database from 2003 to 2014 yielded 77 fipronil toxicosis cases involving rabbits.[8] These cases involved exposure to a single agent (fipronil-containing spot-on products used extralabel, inappropriately or erroneously) and were assessed as medium- or high-suspect cases based on the history of exposure and clinical signs. Of the 77 rabbits,

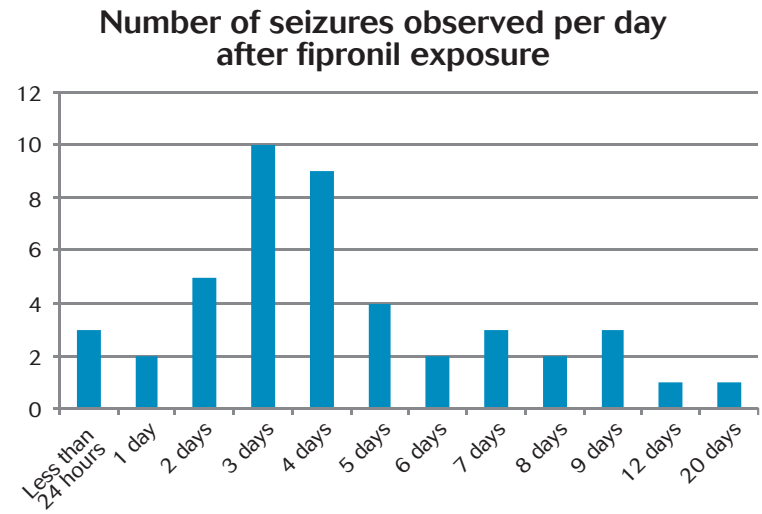
TABLE 1

Commonly reported clinical signs in rabbits exposed to fipronil*

Clinical sign	No. of rabbits exhibiting sign	Percentage of rabbits exhibiting sign
Seizures	45	58
Anorexia	44	57
Lethargy	36	47
Hypothermia	7	9
Tremors	5	6
Adipsia	5	6
Ileus	2	3
Agitation	2	3
Hypersalivation	2	3

*Source: AnTox Database. Urbana, Illinois: ASPCA Animal Poison Control Center, 2003-2014.

TABLE 2



follow-up was not available for 49 (64%), treatment was still continuing in four (5%), a full recovery was noted in three (4%), and death or euthanasia was observed in 21 (27%).[8]

The most commonly reported clinical signs observed in this review were seizures, anorexia, lethargy, hypothermia, tremors, adipsia, ileus, agitation and hypersalivation (*Table 1*). The gastrointestinal signs and depression often, but not always, preceded the tremors and seizures.[8]

The onset of seizures was often markedly delayed from the exposure, starting as soon as a couple hours after exposure to as long as 20 days later (*Table 2*). In one case, mild seizures lasted several weeks.[8]

Monitoring

Monitor the patient's food and water intake, as anorexia and adipsia are common. Also monitor the patient for changes in body temperature, tremors and seizure activity.

Treatment

Bathing the rabbit with liquid dishwashing detergent within 48 hours of the exposure will easily remove the fipronil.[9] After 48 hours, bathing is probably minimally effective. Special care should be taken to keep the rabbit warm during and after bathing until its fur is fully dry.

Benzodiazepines, such as diazepam (1 to 3 mg/kg intramuscularly or intravenously) or midazolam (1 to 2 mg/kg intramuscularly or intravenously), can be given to treat seizure-like activity.[10] For patients with seizures lasting longer than 48 hours, levetiracetam therapy can be initiated (20 mg/kg orally t.i.d., potentially for a few weeks).[11]

Maintenance fluids (100 to 120 ml/kg/day) should be administered to maintain the patient's hydration.[11] Nutritional support, such as Critical Care (Oxbow Animal Health; 10 to 15 ml/kg orally b.i.d. to t.i.d.), may be indicated in anorectic rabbits.[11] Often, inappetant rabbits may consume this

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See brief summary on page 272

The onset of seizures may be greatly delayed, so at-home monitoring for several weeks after exposure is warranted.

View the references for this article online at **dvm360.com/fipronilrabbit**.

voluntarily, but force feeding with a syringe may be indicated when continued feed refusal is present. If the rabbit is hypothermic, provide an external heat source, such as a heating pad or warming blanket.

Conclusion

Fipronil has a narrow margin of safety in rabbits. Its administration is contraindicated because of the potential for life-threatening signs and the availability of safer alternative spot-on products for external parasite control.

Seizures, anorexia, adipsia and lethargy are common clinical signs in rabbits exposed to topical fipronil products. The onset of seizures may be greatly delayed in these patients, and at-home monitoring for the development of seizures for several weeks after exposure is warranted. Mild seizures may last for several weeks. The prognosis is guarded for all rabbits exhibiting seizures.[9] VM

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Bad hips and knees: Is it hip dysplasia *or* a torn cruciate ligament?

It can be difficult to differentiate between these two orthopedic problems. Luckily, the sit test, among other diagnostic evaluations, can help.

By Jennifer Wardlaw, DVM, MS, DACVS

Differentiating between a torn cruciate ligament and hip dysplasia can be tricky, if not frustrating. In one study, 32% of dogs referred to a surgeon for hip dysplasia treatment actually had a torn cranial cruciate ligament.[1] Let's review the differences between the two conditions and how simply asking a dog to "sit" offers great clues.

CRANIAL CRUCIATE LIGAMENT TEAR

The severity of lameness depends on the severity of ligament disruption. For dogs with stable partial tears, lameness can be subtle and noted only after periods of strenuous activity. For dogs with complete tears, lameness will initially be severe and non-weight-bearing. Then, moderate to severe weight-bearing lameness will occur.

Rupture of the contralateral cruciate ligament occurs in 37% to 48% of dogs within six to 17 months of the initial diagnosis.[1] However, ruptures can be bilateral on presentation, giving affected dogs what appears to be a neurologic, crouched walk.

In obvious cases, the keys to diagnosing cranial cruciate rupture are a positive cranial drawer sign and tibial thrust. But what about less obvious cases?

Physical examination

Orthopedic examination reveals various degrees of stifle pain with flexion and extension, variable crepitus, and possibly clicking associated with a meniscal tear.

In patients with partial tears, a pain response is elicited when the joint is in full extension. In patients with chronic cases, muscle atrophy is notable, and periarticular fibrosis (medial buttress) is evident on the medial side of the stifle. Medial buttress is almost pathognomonic for a cranial cruciate rupture. The only other condition that may present with a medial buttress is a medial collateral ligament tear, which is usually seen with a deranged stifle, not with simple lameness.

Joint effusion is also a key finding. It can be palpated on the medial and lateral aspects of the patellar tendon.

In patients with a partial tear, the cranial drawer sign may or may not be present. An examination performed while the patient is sedated is needed to confirm the findings. Many patients that do not seem to have a cranial drawer sign while awake have one once they are sedated and relaxed.

Find out how "Sit. Good dog!" can aid you in your orthopedic evaluations.

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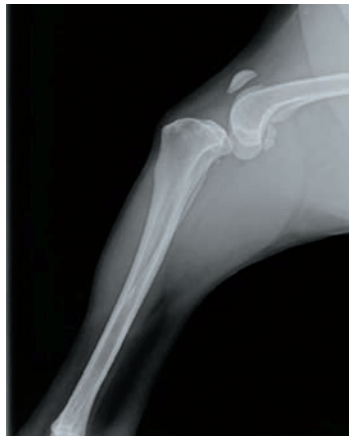
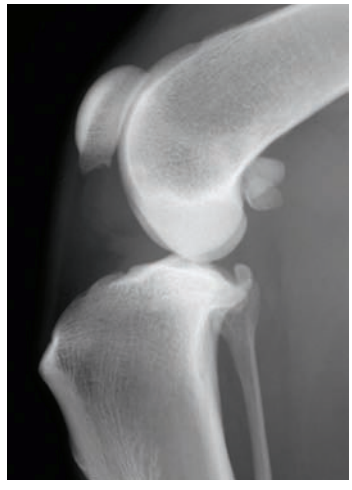
>>> 1. This dog's abnormal sitting position—extending its leg rather than flexing its knee—indicates that it has a cruciate ligament tear, not hip dysplasia.





>>> 2A. Cranial tibial thrust is evident on this radiograph. The knee is subluxated.

>>> 2B. Joint effusion is appreciated on this radiograph (loss of visualization of the infrapatellar fat pad shadow and caudal displacement of the gastrocnemius facial plane), but this tibia is positioned normally without subluxation.

Sit test

Dogs with a torn cruciate ligament sit abnormally. For example, notice how the patient in *Figure 1* does not want to flex its right knee. Affected dogs often sit with the affected leg extending out to the side rather than sitting squarely, which they will do even with hip dysplasia. So noting how the dog sits is a critical part of an evaluation.

Imaging

Radiography is warranted in all suspected cases to document stifle arthritis, confirm pathology in challenging cases of partial tears and rule out other disorders (e.g. tumors). The earliest, most consistent finding is the loss of an infrapatellar fat pad shadow by a soft tissue opacity in the lateral view, which is consistent with effusion. Caudal displacement of the gastrocnemius fascial plane, located caudal to the joint capsule by a soft tissue opacity, is also consistent with synovial distention.

In many cases, you can see the cranial tibial thrust on a radiograph (*Figure 2A*). Compare this with the position of the second radiograph, which also has effusion but the tibia is not displaced into a cranial position (*Figure 2B*). Another consistent finding is osteophyte or enthesiophyte formation in the region of femoral trochlear ridges and tibial plateau and at the base and apex of the patella.

HIP DYSPLASIA

Hip dysplasia causes joint inflammation and secondary osteoarthritis, which lead to variable degrees of pain. Clinical signs can vary from slight discomfort to severe acute or chronic pain. Although the disease onset has a linear progression over time, it can be divided into two forms.

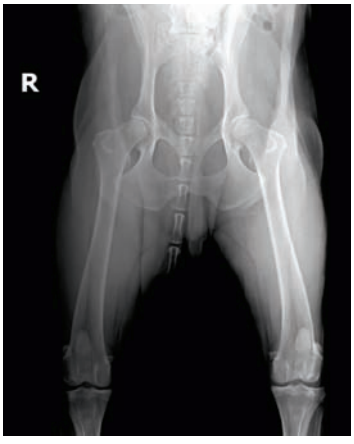
The juvenile form typically affects dogs between 5 and 12 months of age. Affected dogs may present with unilateral or bilateral hindlimb lameness or pain on hip extension. Affected dogs may be bunny hopping at presentation, have difficulty rising after rest, exhibit exercise intolerance, or seem reluctant to walk, run, jump or climb stairs. These clinical signs are the result of joint laxity and resultant instability and inflammation.

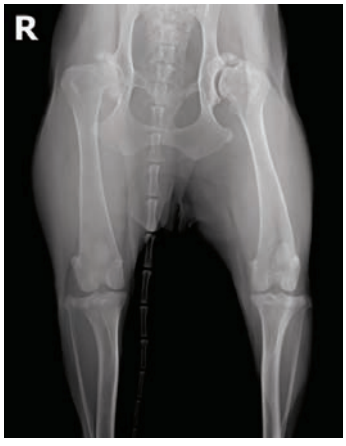
The chronic form of hip dysplasia has a highly variable onset of clinical signs in middle-aged to senior dogs. Pain is most often related to degenerative joint disease and has a more severe presentation. Clinical signs are similar to the juvenile form. Pain is elicited most notably during hip extension. Patients tend to off load their hip joints by shifting weight forward onto their thoracic limbs. Because of weight shifting over a long period of time, muscle atrophy of the hindlimbs is common. In large dogs, you can often see

muscular hypertrophy of the forelimbs as a result of the dogs' chronically hauling themselves up by their forelimbs.

Imaging

As the disease progresses, crepitus can be palpated with range of motion manipulation. An examination while the patient is sedated, followed by orthogonal radiography will further support the diagnosis of hip dysplasia. While the more chronic cases are much easier to diagnose on radiographs and physical examination (*Figures 3A & 3B*), younger dogs can often be challenging on radiographs. Since you may not have bony arthritic changes on these films, assessing for laxity in your physical examination and radiographs is vital for young dog diagnosis (*Figures 4A & 4B*).





>>> 3A. Mild hip dysplasia often has incongruence, acetabular sclerosis and a thickened Morgan's line where the joint capsule inserts along the femoral neck.

>>> 3B. Severe hip dysplasia is more easily seen and felt on physical examination. Radiographs confirm arthritic changes and help planning for surgery.

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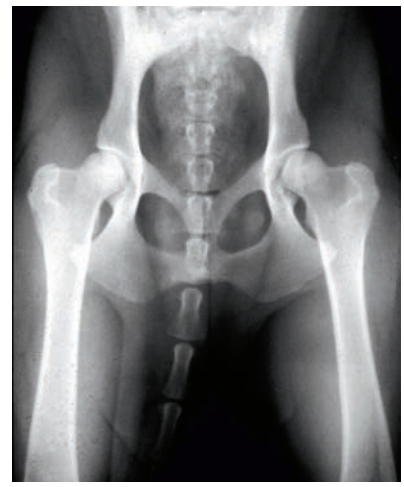
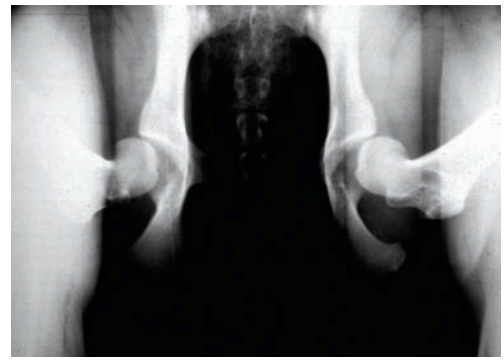


>>> 4A. This radiograph was scored as OFA Good with mild incongruence and slight acetabular sclerosis in a young dog.



>>> 4B. This distracted frog-leg view is of the same dog in *Figure 4A* but more clearly illustrates the laxity that is present in this patient that was missed with the standard OFA-style radiograph.

Sit test

Dogs with only hip dysplasia (no concurrent cruciate ligament injury) sit normally, with both legs flexed symmetrically.

DOUBLE TROUBLE

Of course, both conditions can be present in a dog at the same time. In the study mentioned above, 32% of dogs referred to a surgeon for hip dysplasia treatment had a torn cranial cruciate ligament.[1] Interestingly, 94% of the dogs with a cruciate tear had concurrent radiographic signs of hip dysplasia.[1]

Thus, I think it is a great practice to radiograph the hips in patients with torn cruciate ligaments as well since it affects the pain and rehabilitation protocols. In my experience, 80% never need hip surgery, but your knee patients won't do as well if you aren't aware you are fighting two battles.

CONCLUSION

When evaluating an affected dog, it is imperative to do a thorough orthopedic and neurologic examination to accurately localize the clinical signs and provide an appropriate diagnosis and treatment. My best advice: If you examine the patient and still have doubts about the diagnosis, sedate the dog and repeat your entire examination (*see "7 benefits of sedation" at* **dvm360.com/orthosedation**). VM

Acknowledgment
The author would like to thank Dr. Phil Zeltzman for his input in this article.

Reference

1. Powers MY, Martinez SA, Lincoln JD, et al. Prevalence of cranial cruciate ligament rupture in a population of dogs with lameness previously attributed to hip dysplasia: 369 cases (1994-2003). J *Am Vet Med Assoc* 2005;227(7):1109-1111.

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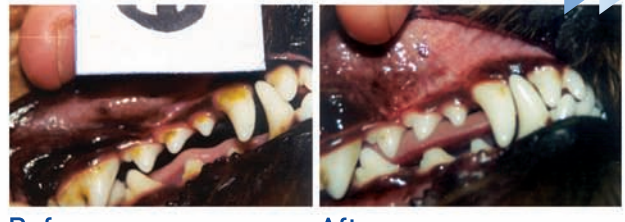

Before After

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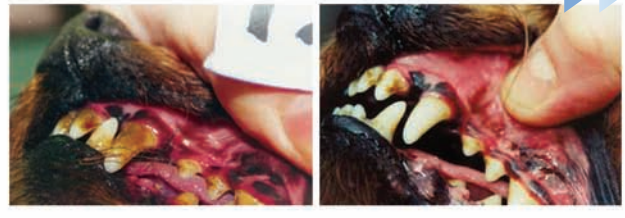

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Owner, Superior Veterinary Care, Lincoln NE

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Owner, Parkdale Animal Hospital Manistee, MI

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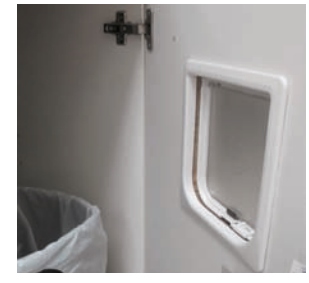

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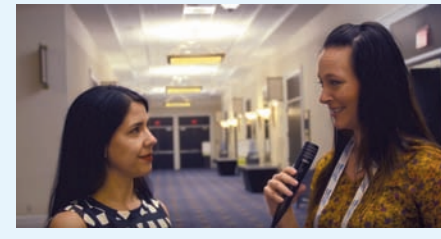

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See brief summary on page 274

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[1]Six R, Cherni J, Chesebrough R, et al. Efficacy and safety of cefovecin in treating bacterial folliculitis, abscesses, or infected wounds in dogs. *J Am Vet Med Assoc.* 2008;233(3):433-9.

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