Episodic Shaking & Facial Twitching in a Terrier

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Max, a 2-year-old, 17.2-lb (7.8-kg), neutered male cairn terrier, was presented to an emergency clinic for neurologic evaluation following a recent onset of episodic shaking and facial twitching.

Initial Presentation

The owner reported that Max was twitching and convulsing while lying awake in his bed the day before presentation. He was shaky the rest of the day and tentative in gait, and he had a similar but more severe episode of shaking the same night ≈2 to 3 minutes in duration. There was no reported salivation, vocalization, or elimination during the episode. Max had no known history of head trauma, toxin exposure, or travel and was up to date on vaccinations. Lead exposure was considered unlikely.

Max was evaluated ≈4 hours after the second episode by an emergency clinician, who suspected that Max was experiencing seizures. Physical and neurologic examinations were normal. CBC, serum chemistry profile, and urinalysis were unremarkable. Bile acid testing revealed normal preprandial bile acids (3.27 µg/mL; range, 0-4.9 µg/mL) and mildly elevated postprandial bile acids (15.89 µg/mL; range, 0-10.21 µg/mL), which were attributed to possible microvascular dysplasia, but other disorders (eg, portosystemic shunt) could not be excluded.

Max was prescribed phenobarbital (2 mg/kg PO every 12 hours) as a maintenance anticonvulsant and 2 doses of rectal diazepam (1 mg/kg per dose) for emergency seizure control and was discharged and referred to a neurologist. He was presented to the neurology service 2 days later with generalized tremors that had not responded to diazepam.

Neurologic Examination

On presentation to the neurology service, Max was alert and responsive. Neurologic examination revealed whole-body, small-amplitude, high-frequency tremors that were most apparent when Max was moving or being examined (see ***Video***). The tremors were substantially reduced when Max was sitting or lying down and stopped when he was completely at rest or asleep. The tremors resumed when he awoke and/or became active. Gait analysis revealed dysmetria (ie, hypermetric thoracic limbs) and vestibular ataxia (eg, veering, drifting, occasional stumbling). No resting nystagmus was observed, but opsoclonus (ie, pendular nystagmus with no fast phase) was observed when he was placed on his back.

VIDEO

To watch a video of this patient's presentation, visit **cliniciansbrief.com/article/episodic-shaking-facial-twitching-terrier** or scan the QR code below. Portions of the neurologic examination that were normal are not shown in the video.

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RELATED ARTICLE

For a list of differential diagnoses for patients presented with tremors, see **Tremors** on page 69.

SRTS = steroid-responsive tremor syndrome

Postural reactions, patellar reflexes, and withdrawal reflexes were normal.

Clinical signs were localized to the cerebellum, and vestibular signs were thought to be due to involvement of vestibular components of the cerebellum (ie, flocculonodular lobe, fastigial nucleus, caudal cerebellar peduncle). The initial convulsions reported by the owner may have been a milder version of the tremors the dog later displayed.

Diagnosis

The primary differential diagnoses were steroid-responsive tremor syndrome (SRTS) and toxicosis (eg, mycotoxicosis). Other differential diagnoses included encephalitis, brain malformation, and neurodegenerative disorders (see ***Related Article***). Toxicity was considered less likely, as there was no known exposure to mold in the house and the patient was confined to a fenced-in yard when outside.

Routine MRI of the brain was within normal limits. CSF analysis showed normal protein content (15.7 mg/dL; range, <25 mg/dL) and a mildly elevated nucleated cell count (6 cells/µL; range, <3-5 cells/µL). Cytologic examination of a concentrated CSF sample revealed mononuclear pleocytosis composed of mostly small, mature lymphocytes (66%), with fewer reactive macrophages (26%) and non-degenerate neutrophils (8%). CSF bacterial culture was negative. Serologic testing for *Borrelia burgdorferi*, *Anaplasma phagocytophilum*, *Ehrlichia canis*, and *Rickettsia rickettsii* was negative. PCR testing of CSF for *Anaplasma* spp, *Bartonella* spp, *Blastomyces dermatitidis*, *B burgdorferi*, canine distemper virus, *Coccidiodes* spp, *Cryptococcus* spp, *Ehrlichia* spp, *Histoplasma capsulatum*, *Neospora caninum*, *R rickettsii*, *Toxoplasma gondii*, and West Nile virus was also negative.

Based on the lack of toxin exposure combined with the results of diagnostic testing, SRTS was strongly suspected.

DIAGNOSIS:

PRESUMPTIVE STEROID-RESPONSIVE TREMOR SYNDROME

Treatment & Outcome

Max received immunosuppressive doses of prednisone (7.5 mg [1 mg/kg] PO every 12 hours) and diazepam (0.5 mg/kg PO every 12 hours for 1 week; see ***Treatment at a Glance***).

At the 2-week follow-up visit, Max's owner reported that the tremors had stopped within 2 to 3 days of discharge and gait had returned to normal during the first week of treatment. Neurologic examination was within normal limits. The prednisone dose was reduced to 5 mg PO every 12 hours for 1 month, then to 5 mg PO every 24 hours for 2 months, and finally to 5 mg PO every 48 hours for 2 months.

Max was presented for a recheck examination 6 months after the 2-week follow-up. The owner had discontinued prednisone 2 weeks prior. Because there was no sign of relapse during the treatment period or after the owner discontinued treatment, prednisone was not restarted. Max was still normal ≈3 months after the 6-month recheck.

Common Causes of Tremors

Tremors are involuntary, somewhat rhythmic, oscillating muscle contractions and relaxations of ≥1 body part.[1-3] Tremors are common but incompletely characterized in veterinary medicine.

The terminology used to define tremor syndromes is under debate, and classification schemes are continually evolving. Veterinary classification schemes typically divide tremors into the following broad categories: physiologic or pathologic, congenital or acquired, and resting or action related.[2-4] Tremor syndromes can fall into multiple categories; for example, tremors caused by hypomyelination/dysmyelination in young springer spaniels, Samoyeds, chow chows, and other breeds are both congenital and action related.[2]

The most common causes of acquired, small-amplitude, high-frequency, action-related tremors are SRTS and toxicity, particularly mycotoxicosis.[1]

Steroid-Responsive Tremor Syndrome

SRTS is reported most commonly in small-breed dogs typically younger than 5 years.[1-3] SRTS was originally described—and appeared to be more common in—small white dogs (eg, bichon frises, Maltese terriers, West Highland white terriers), leading to the term little white shaker syndrome.[2,5,6] This term is no longer recommended, as more than half of affected dogs are not white and any breed can be affected.[1,7,8] Other terms for this condition include shaker dog syndrome, corticosteroid-responsive tremors, and acquired action-related repetitive myoclonus.[2]

Although its cause is unknown, SRTS is suspected to be an autoimmune disorder due to its response to corticosteroid administration. Gross histologic examination of brain tissue is often normal,[5] but histologic findings in some dogs have shown mild, diffuse meningoencephalitis characterized by mild perivascular cuffing with lymphocytic infiltrates.[2]

Continues ▶

TREATMENT AT A GLANCE

- Corticosteroids (eg, prednisone [1-2 mg/kg PO every 12 hours for 2 weeks, followed by gradual tapering to the lowest effective dose]) are most commonly prescribed. Many patients can be weaned off steroids in 6 to 8 months. Recurrence/relapse is more likely if tapering occurs too quickly.
- Some patients may benefit from 1 week of benzodiazepine treatment (eg, diazepam [0.5 mg/kg PO every 12 hours]) for mild sedation and skeletal muscle relaxation.
- Other immunosuppressants (eg, azathioprine, cyclosporine) may be needed if prednisone is contraindicated or severe adverse effects are observed.

Most patients with SRTS are presented for evaluation of tremors and incoordination. Owners may misconstrue the tremors as fear, anxiety, or shivering. As seen in Max, patients with SRTS exhibit small-amplitude, high-frequency, whole-body tremors when moving[1-3,9]; these tremors typically resolve when resting or asleep. Affected dogs also frequently display signs of ocular tremors (ie, opsoclonus), cerebellar or vestibular ataxia, head tilt, absent menace, weakness, and, potentially, seizures.[2,3] Clinical signs of SRTS are indistinguishable from those of tremors due to mycotoxicosis.[2,3]

A presumptive diagnosis of SRTS can be made based on signalment, clinical signs, neurologic examination findings, and exclusion of other potential causes. MRI results are usually normal in SRTS patients, but evidence of mild meningoencephalitis may be apparent.[1,7,9] CSF in SRTS patients typically contains normal to mildly elevated protein content and has a nucleated WBC count.[1,5,7-9] CSF differential cytology most often reveals lymphocytic pleocytosis.

SRTS is generally responsive to corticosteroids. Immunosuppressive doses of corticosteroids (eg, prednisone [1-2 mg/kg PO every 12 hours for 2 weeks]) often resolve tremors within a few days.[1,5-9]

TAKE-HOME MESSAGES

- Whole-body, small-amplitude, high-frequency tremors are most commonly associated with SRTS and toxicosis, particularly mycotoxicosis.
- Patients with SRTS frequently exhibit cerebellovestibular signs.
- MRI results are often normal in these patients, and CSF analysis may be normal or mildly abnormal (eg, mild lymphocytic pleocytosis).
- Patients with tremors should be screened for possible exposure to mycotoxins via moldy food, trash, or compost, as well as other potential toxins (see ***Related Article***, page 64).

Once the tremors resolve, the dose should be slowly tapered to the lowest effective dose over several months as for other autoimmune disorders. Anecdotally, clinical signs are more likely to recur if treatment is tapered and discontinued before 6 months. Some patients may need to remain on low-dose treatment (eg, prednisone [0.25-0.5 mg/kg PO every 48 hours]) long-term to prevent recurrence. In rare cases, other immunosuppressive medications may be required, typically to reduce the adverse effects of corticosteroids. Affected dogs may also benefit from a short course of diazepam (0.5 mg/kg PO every 8 hours for 1 week).[1,5,9] Prognosis is excellent if disease is treated early and aggressively. Many patients can be successfully weaned off corticosteroids entirely.

Toxicosis

Toxicosis is the second most common cause of small-amplitude, high-frequency tremors in dogs. Although many toxins have been reported to cause tremors in dogs, mycotoxins are the most commonly reported toxic cause of generalized tremors (see ***Related Article***, page 64).[10-15] Mycotoxins are produced by *Penicillium* spp, *Aspergillus* spp, and *Claviceps* spp.[10] The most commonly implicated mycotoxins, penitrem A and roquefortine, are produced by *P crustosum* and *P roqueforti*, respectively, although *P crustosum* can produce both toxins concurrently.[10] Common sources of mycotoxins include garbage, compost, contaminated feed/grain, and moldy foods, particularly dairy products, bread, and nuts.[10-15]

Clinical signs include generalized tremors, seizures, and muscle tremors.[10-15] As with SRTS, tremors caused by mycotoxins tend to be of low amplitude and high frequency (ie, small, fast tremors) and occur when the patient is moving but tend to resolve at rest.[10-15] Diagnosis is typically based on compatible clinical signs and exposure risk. Measurement of penitrem A or roquefortine in biologic samples (eg, GI contents) can be performed to confirm diagnosis, but testing is generally not necessary, as tremors tend to resolve within a few days.[10-15] Treatment is largely sup-

portive with GI decontamination, IV fluids, oxygen and ventilatory support, methocarbamol, and, if indicated, anticonvulsants.[12-15] Prognosis for full recovery is excellent, particularly when treated early and aggressively. Clinical signs often resolve within 1 to 4 days of treatment, although long-term signs (eg, lasting 2-3 months) have been reported.[12-15]

Conclusion

Generalized tremors are a relatively common neurologic disorder. Affected patients may have severe clinical signs. Fortunately, the most common causes in dogs, SRTS and mycotoxicosis, have a very good prognosis if treated early and effectively.

SRTS = steroid-responsive tremor syndrome

References

1. Wagner SO, Podell M, Fenner WR. Generalized tremors in dogs: 24 cases (1984-1995). *J Am Vet Med Assoc*. 1997;211(6):731-735.
2. de Lahunta A, Glass E, Kent M. Uncontrolled involuntary skeletal muscle contractions. In: de Lahunta A, Glass E, Kent M, eds. *Veterinary Neuroanatomy and Clinical Neurology*. 4th ed. St. Louis, MO: Elsevier; 2015:509-524.
3. Sanders SG. Cerebellar diseases and tremor syndromes. In: Dewey CW, da Costa RC, eds. *Practical Guide to Canine and Feline Neurology*. 3rd ed. Ames, IA: Wiley-Blackwell; 2016:299-327.
4. Podell M. Tremor, fasciculations, and movement disorders. *Vet Clin North Am Small Anim Pract*. 2004;34(6):1435-1452.
5. Bagley RS, Kornegay JN, Wheeler SJ, et al. Generalized tremors in Maltese: clinical findings in seven cases. *J Am Anim Hosp Assoc*. 1993;29(2):141-145.
6. Ross JA. Tremor and ataxia in a West Highland white terrier. *Vet Rec*. 1985;117(3):71.
7. Yamaya Y, Iwakami E, Goto M, et al. A case of shaker dog disease in a miniature dachshund. *J Vet Med Sci*. 2004;66(9):1159-1160.
8. Vanvooren N. A suspected case of idiopathic generalised tremor (shaker disease) in a shih tzu. *Vet Rec*. 1995;136(22):568.
9. Hazell KLA, Child G, Chin G. Clinical characteristics and outcome after treatment of shaker dog syndrome in 90 dogs. *Aust Vet Pract*. 2011;41(4):167-171.
10. Puschner B. Mycotoxins. *Vet Clin North Am Small Anim Pract*. 2002;32(2):409-419.
11. Eriksen GS, Jäderlund KH, Moldes-Anaya A, et al. Poisoning of dogs with tremorgenic *Penicillium* toxins. *Med Mycol*. 2010;48(1):188-196.
12. Young KL, Villar D, Carson TL, et al. Tremorgenic mycotoxin intoxication with penitrem A and roquefortine in two dogs. *J Am Vet Med Assoc*. 2003;222(1):52-53.
13. Boysen SR, Rozanski EA, Chan DL, et al. Tremorgenic mycotoxicosis in four dogs from a single household. *J Am Vet Med Assoc*. 2002;221(10):1441-1444.
14. Barker AK, Stahl C, Ensley SM, et al. Tremorgenic mycotoxicosis in dogs. *Compend Contin Educ Vet*. 2013;35(2):E1-6.
15. Walter SL. Acute penitrem A and roquefortine poisoning in a dog. *Can Vet J*. 2002;43(5):372-374.