Animal Behavior Case of the Month

Statement of the Problem
A dog was examined because it was frequently chasing lights and shadows and spinning in circles.

Signalment
The patient was a 2-year-old 17-kg (37.4-lb) spayed female Border Collie.

History
The dog lived with 2 other dogs in a single-family house with a large yard. The owners (2 adults) had adopted the dog from a shelter at 4 months of age; the history prior to that time was unknown. The owners indicated that the dog knew a variety of commands but did not respond to them well.

Since adoption, the dog would spin in both directions equally and appeared to chase light and shadows. The behavior was more pronounced when there were loud noises present, if there was a heightened amount of activity surrounding the dog, and when it was outdoors in bright sunlight or indoors when rooms were brightly lit. This behavior would last between 15 and 20 minutes, after which the dog appeared normal. The episodes occurred once or twice daily for a total of approximately 15 to 40 min/d. During the episodes, the dog did not respond to commands or other interruptions from the owners. The behavior had not been observed on regular outdoor walks in the early morning hours before sunrise.

Within 1 week after adoption, the dog was evaluated by the primary care veterinarian because of the described behaviors. At that time, the referring veterinarian suspected hyperactivity or obsessive-compulsive disorder, and amitriptyline hydrochloride (1 mg/kg [0.45 mg/lb], PO, q 12 h) was prescribed. Treatment with the medication was continued for approximately 3 months with no improvement in the behavioral signs. Shortly after this visit, the dog was anesthetized for a full dental examination. Numerous retained deciduous teeth (which appeared to be functional and firmly attached) were identified, and the right and left maxillary premolar teeth were noted as missing. Results of a CBC and serum biochemical analysis at that time were within the respective reference ranges.

Eight months prior to evaluation by the authors, the dog was examined because it was frequently chasing lights and shadows and spinning in circles. The primary care veterinarian referred the owners to a veterinary neurologist because the dog’s light- and shadow-chasing and spinning behaviors had persisted. There were no clinically important findings on full physical and neurologic examination except for light chasing and spinning in both directions in the examination room. The neurologist recommended further diagnostic evaluation by means of MRI, examination of a CSF sample, and EEG, all of which the owners declined. Differential diagnoses made by the neurologist at that time included partial complex seizures or obsessive-compulsive disorder. Amitriptyline hydrochloride treatment was discontinued, and administration of phenobarbital (5 mg/kg [2.3 mg/lb], q 24 h) was started on a trial basis.

One month later, after consultation with the primary care veterinarian, the dose of phenobarbital was increased to 8.1 mg/kg (3.7 mg/lb) every 24 hours. Two weeks after this change in treatment, potassium bromide solution (2 mL [concentration not reported], q 24 h) was added to the regimen. During this period, the dog had also received zonisamide (information on dosage and duration of treatment was not available) with no noted improvement. At the time of evaluation at the University of California-Davis Veterinary Medical Teaching Hospital, the patient was receiving phenobarbital (2.8 mg/kg [1.3 mg/lb], q 12 h) and 1 mL of the potassium bromide solution every 24 hours. During this time, the owners had not attempted behavior modification, but would calmly hold the dog in place when episodes were observed.

Physical Examination Findings and Laboratory Results
During the consultation, the dog was observed to periodically spin equally in both directions in response to noises from outside the room or if the owners talked loudly. During these episodes, the patient bit at the air while continually appearing to scan the ceiling area.

On physical examination, it was noted that all maxillary and mandibular premolar teeth were missing, and the teeth that were present were much smaller than expected. All other general physical and neurologic examination findings were unremarkable.

To assess the patient’s vision, consultation with a veterinary ophthalmologist was requested. On ophthalmic examination, both eyes were open and appeared comfortable with no overt photophobia appreciated. Direct and consensual pupillary light reflexes were present and considered normal in both eyes. There was no anisocoria. The patient had an appropriate menace response, and dazzle and palpebral reflexes were present in both eyes. Globe position and movements of both eyes were normal, and no facial asymmetry was evident. Tropicamide solution was administered topically to each eye for pupil dilation. There were no clinically important findings on examination of a CSF sample, and EEG, all of which the owners declined. Differential diagnoses made by the neurologist at that time included partial complex seizures or obsessive-compulsive disorder. Amitriptyline hydrochloride treatment was discontinued, and administration of phenobarbital (5 mg/kg [2.3 mg/lb], q 24 h) was started on a trial basis.

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was no conjunctival or episcleral hyperemia. Both corneas were clear, and the anterior chambers were of normal depth with no aqueous flare or cells detected. A vitreous strand was seen extending through the pupillary aperture and into the anterior chamber in each eye. The irises appeared normal with no iridodonesis appreciated in either eye. Both lenses were also considered normal with no phacodonesis detected. Intraocular pressures measured with applanation tonometry after dilation were unremarkable (17 and 15 mm Hg in the right and left eye, respectively). Evaluation of the vitreous body in both eyes revealed a marked degree of vitreous syneresis, several large clumps of vitreous that were mobile with patient head movement, and some vitreous plication. All changes were more severe in the left eye. Results of fundus evaluation were normal in both eyes.

Evaluation of the dog's vision in an obstacle course under photopic and scotopic conditions confirmed the previously noted behavior of biting at the air while visually scanning the ceiling and intermittently spinning. This behavior was seen under photopic conditions only. The dog did not bump into any objects placed in its path in either lighting condition.

A veterinary neurologist examined the video of the dog’s behavior. On the basis of this behavior evaluation and unremarkable results of the neurologic examination, the neurologist did not believe the behaviors were the result of neurologic dysfunction. Full neurologic examination and appropriate workup of the dog by a veterinary neurologist were recommended but were declined by the owners.

The results of a CBC performed at the time of this examination were within respective reference ranges. Results of serum biochemical analysis were also unremarkable, except for high activities of aspartate aminotransferase (51 U/mL; reference range, 20 to 49 U/mL), creatine kinase (271 U/mL; reference range, 55 to 257 U/mL), and alkaline phosphatase (98 U/mL; reference range, 14 to 91 U/mL).

Diagnosis

The cause for the dog’s light- and shadow-chasing behavior was determined to be multifactorial. There was a strong likelihood that the stimulus for the behavior was related to the marked vitreous changes in both eyes. The degree of vitreous syneresis and clumping was severe, especially for the patient’s young age. Syneresis, or degeneration of the normally gel-like vitreous body, is seen more commonly in older dogs.1 It is a degenerative breakdown of the gel separating its liquid (water) from its solid (network of collagen and hyaluronic acid) components. Syneresis can also be seen secondary to past vitreous inflammation,2 although there was no evidence of this in the patient of this report. Vitreous degeneration predisposes the patient to the development of vitreous floaters, which are mobile condensations in the vitreous and can be of various sizes, shapes, and consistencies such as the multiple clumps of vitreous observed in this patient. The free-floating vitreal opacities drift slowly within the vitreous body, particularly during rapid eye movement, and are likely visible to the patient because of the shadows they cast on the retina. They often appear dark against a light background, such as the sky or a light-colored, monochromatic ceiling.3 The perception of these floating opacities is referred to as myodesopsia and is a very common phenomenon in humans;4 patients describe seeing spots, shadows, and cobwebs moving about in their field of vision. For some people, myodesopsia can be physically and psychologically debilitating because of its interference with important activities of daily living such as reading, driving, and near-vision work.5,6 Our patient’s light-chasing and air-biting behaviors were most pronounced when in brightly lit environments, where mobile vitreal opacities would be expected to be visually apparent.

There was a displacement component to the behaviors, as evidenced by the fact that the behavior increased in the presence of loud noises or when activity around the dog was heightened or potentially stressful. The dog’s behavior was considered fairly normal in dark and quiet environments but worsened when the dog was exposed to loud discussions between the owners, loud barking by another household dog when in the house, or other loud sounds. There was a compulsive component to the behavior as well because once it started, the behavior could only be stopped by physical control of the dog. There could also have been an original component of attention-seeking behavior in the responses to light, where the owners could have inadvertently given the dog extra attention during these episodes early on.

It was considered unlikely that the behavior was caused by seizures, given the lack of response to multiple medications and the fact that the behavior would start with identifiable triggers.7 However, it has been hypothesized that some repetitive behaviors are due to underlying seizure activity.8

Treatment

The ophthalmic component of the problem was discussed with the owners. The only way to determine the extent of the effects of vitreous degeneration and vitreal opacities in the dog’s behavior problems would have been to perform a vitrectomy. The primary risks associated with the procedure include retinal separation and subsequent blindness;9,10 if the procedure was to be performed, a concurrent laser barrier retinopexy would also be recommended to decrease the chances of retinal separation. Vitreolysis by means of neodymium-doped yttrium aluminum garnet laser has been used in people for treatment of vitreous floaters with controversial results.5,10 The applied laser energy evaporates the floating opacities and severs vitreous strands. Bilateral enucleation could also have been performed, but it seemed to be a drastic measure and unnecessary at this point, given that all medical options and behavioral modification techniques had not been attempted. All surgical options were declined by the owners.

The owners were counseled to avoid the situations that appeared to trigger the dog’s problematic behaviors. Because the behavior was observed during daytime or when a room was well lit, it was suggested that the owners keep light levels low in the house, attempt to cover shiny objects in the house, and con-
disorder. Also used to alleviate a potential underlying compulsive behavior might have so that the component of the behaviors related to displacement activity would be reduced. It was also used to alleviate a potential underlying compulsive disorder.

To help increase the owners' ability to redirect the dog's behavior as well as to help control potential attention-seeking behaviors, it was recommended that the owners follow a command-response-reward program that would create structure and predictability for the dog and teach her to respond to an owner when unwanted behaviors occurred. This program requires a dog to perform in response to commands to receive rewards. To help the dog to focus on the owners when redirection was needed, they were given instructions for teaching the dog to make eye contact and to touch its nose to an owner's palm (ie, hand targeting) when specific commands were given.

The owners were encouraged to enrich the household environment and provide more activities for the dog indoors. This could be accomplished by feeding a large portion of the dog's food out of food-dispensing apparatuses. If the dog had unwanted behaviors, the owners were counseled to attempt distraction with a command. They were told that these steps were not likely to be very successful until the dog responded more consistently to the owners.

The dog was to be very gradually weaned from the antiseizure medications to avoid a possible rebound seizure because it had been receiving a high dose of phenobarbital and potentially a high dose of potassium bromide for a long time. The owners were instructed to decrease the amount of potassium bromide first, beginning with 0.75 mL every 24 hours for 4 weeks, followed by 0.5 mL every 24 hours for 4 weeks, then 0.25 mL every 24 hours for 4 weeks before discontinuing the treatment. When this was accomplished, the oral phenobarbital treatment would be reduced in a similar manner (1.9 mg/kg [0.9 mg/lb], q 12 h, for 4 weeks; then 0.9 mg/kg [0.4 mg/lb], q 12 h, for 4 weeks; and finally 0.5 mg/kg [0.2 mg/lb], q 12 h, for 4 weeks).

Follow-up

The dog was seen for a follow-up appointment 4 weeks after the initial evaluation. The owners followed the prescribed schedule for gradual discontinuation of the antiseizure medications, with no seizures observed. Fluoxetine hydrochloride treatment was started at this time, while the dog continued to be weaned off the other medications. The owners had also instituted the behavior modification program initially prescribed, including redirecting the dog's attention if it began spinning in circles or chasing lights and shadows, instituting the command-response-reward system, and providing much of the patient's dietary intake by use of food-dispensing toys. They did not purchase the hearing-protection device.

At the same follow-up appointment, the owners were counseled on systematic desensitization and counterconditioning to flashing lights and loud noises. To have the dog become accustomed to lights and shadows, the owners were asked to sit in a (mostly) dark room that allowed for some shadows. They were to make small motions to create shadow movement, such as a slight movement of the owner's foot, while the dog received a high-value reward that was not often provided, such as a game of tug or a long-lasting food treat. When the stimulus stopped (eg, foot movement ceased), the reward was to be put away. Over time, they were to increase the intensity of the exposure by increasing the amount of movement, the intensity of ambient light, or both. They were also to use the same process for other stimuli that induced the problem behaviors, such as sounds and excited movements, including hand clapping. For example, an owner was to clap very softly while the dog received the reward. When the clapping was to stop, the reward was to be removed; over time, they were to increase the intensity of clapping.

After the patient had received the prescribed dosage of fluoxetine hydrochloride (1.2 mg/kg, PO, q 24 h) for 6 weeks with no observed change in the spinning and air-biting behaviors, the dose was increased to 1.8 mg/kg (0.81 mg/lb) every 24 hours. After another 4 weeks with no change, the fluoxetine administration was gradually stopped with a decreasing dosage regimen. Clomipramine hydrochloride (1.5 mg/kg [0.68 mg/lb], PO, q 12 h) treatment was initiated after confirming that the dog was no longer receiving antiseizure medications and had not had any observable seizures. Clomipramine hydrochloride is a tricyclic antidepressant with antianxiety and anticonvulsant actions, but has been implicated in potentiating seizures. With 1 day, the owner noticed a substantial decrease in the dog's light-chasing behavior. Because of cost considerations, the owner asked that the dosage be changed to 3 mg/kg (1.36 mg/lb) every 24 hours (a single 50-mg capsule instead of two 25-mg capsules), which continued to be effective in controlling the dog's behavior, with no adverse effects identified. Although considerably less expensive, the decision was made not to attempt treatment with amitriptyline hydrochloride again because of its relative lack of efficacy, compared with clomipramine hydrochloride.
During a follow-up conversation 3 months later, the owners reported a decrease in frequency of the dog's spinning and light-chasing behaviors to approximately once every few days; the episodes were reported to last for only 1 or 2 minutes. These behaviors continued to occur only when it was light outside or in the room. During these episodes, they were able to call the dog to them and distract it away from the behavior, after which it would behave normally. They had instituted desensitization and counterconditioning to the sudden sounds of clapping and raised voices in the house, to which the dog responded with decreased reactions. They had also worked on desensitization and counterconditioning to lights for approximately 3 weeks by use of a flashlight with gradually increasing intensity and had achieved similar results.

Views differ with regard to the cause of light chasing in dogs, which is often referred to as an obsessive-compulsive or, more accurately, a compulsive behavior.16 Displacement behavior should be considered as a possible cause of repetitive behaviors in companion animals, especially when a stress-inducing trigger can be identified. In humans, an essential feature of obsessive-compulsive disorders is a recurrent obsession leading to compulsions that are severe enough to be time-consuming or to cause marked distress or substantial impairment.17 Various veterinary disorders are collected under the term compulsive behavior. These include tail chasing, flank sucking, and light or shadow chasing. However, displacement behavior should not be ignored as a diagnosis.18–20 In the dog of this report, there was a medical component that likely contributed to the behavior problems. A report on organic diseases underlying behavior problems in dogs notes that episodes of behaviors such as tail chasing, flank sucking, and light or shadow chasing are collectible under the term compulsive behavior. These behaviors can be considered as a possible cause of repetitive behaviors in companion animals, especially when a stress-inducing trigger can be identified. In humans, an essential feature of obsessive-compulsive disorders is a recurrent obsession leading to compulsions that are severe enough to be time-consuming or to cause marked distress or substantial impairment.17 Various veterinary disorders are collected under the term compulsive behavior. These include tail chasing, flank sucking, and light or shadow chasing. However, displacement behavior should not be ignored as a diagnosis.18–20 In the dog of this report, there was a medical component that likely contributed to the behavior problems. A report on organic diseases underlying another disorder, acral lick dermatitis,21 highlights the importance of considering possible medical conditions in the diagnosis of behavior-related problems.22 It is always advisable to treat any underlying cause of a problem behavior, as it would have been of little worth to attempt to treat this patient's behavior problem without understanding and treating the underlying ophthalmic disorder. It was necessary to treat the dog with psychotropic medications, along with behavior modification, to ameliorate repetitive light- and shadow-chasing and spinning behaviors.

References