



## **VESTIBULAR DISEASE**

### **WHAT IS THE VESTIBULAR APPARATUS?**

In a nutshell, the vestibular apparatus is the neurological equipment responsible for perceiving one's body's orientation relative to the earth (determining if you are upside-down, standing up straight, falling etc.) and informing ones eyes and extremities how they should move accordingly.

The vestibular apparatus allows us to walk, even run, on very uneven ground without falling, helps us know when we need to right ourselves, and allows our eyes to follow moving objects without becoming dizzy.

There are two sets of receptors involved: one to detect rotational acceleration (tumbling or turning) and one to detect linear acceleration and gravity (falling and letting us know which direction is up and which is down). Both receptors are located in the middle ear. Tiny neurological hair cells project into special canals of fluid so that when one's head moves, the fluid moves, and the hair cells wave within the fluid. The hair cells are part of sensory nerve cells which carry the appropriate message to the cerebellum (part of the brain that coordinates locomotion) and to 4 vestibular nuclei in the brain stem.

From these centers, instructions are carried by nerve cells to the legs and neck muscles, and eye muscles so that we may orient ourselves immediately. The information about being upside down (or in some other abnormal orientation) is also sent to the hypothalamus (an area of the brain) so that we can become consciously aware of our position. The information is also sent to the "reticular formation" (another area of the brain - a sort of a volume control on our state of wakefulness. In this way, if we are asleep and start to fall, the vestibular stimulations would wake us up. This is also why rolling an anesthetized animal from side to side is used to hasten anesthetic recovery).

### **THE SIGNS OF VESTIBULAR DISEASE**

If there is trouble in the vestibular apparatus, then one may not properly perceive one's orientation. To put it more simply, one won't know which way is up, whether or not one is standing up straight or slanted, and one will feel very dizzy.

The following are signs of vestibular disease:

- ataxia (lack of coordination without weakness or involuntary spasms - in other words, stumbling and staggering around)
- motion sickness
- nystagmus (back and forth or rotational eye movements. The movements will be slower in one direction. This is the side where the neurologic lesion is likely to be; however, nystagmus is named according to the direction of the fast component i.e. there may be left nystagmus but the lesion is probably on the right side of the vestibular apparatus.)
- Circling
- Head tilt (usually toward the side of the lesion)
- Falling to one side (usually toward the side of the lesion)
- Trouble with other nerves controlling the head and face

## **CAUSES OF VESTIBULAR DISEASE**

In order to determine prognosis and choose treatment, one needs to figure out what has happened to the vestibular system. The first step is to determine whether the lesion is central (in the brain) or peripheral (in the inner ear).

There will be some hints in the clinical presentation. For example, if other cranial nerves are involved and they are on the side opposite from the head tilt, then the lesion is likely to be in the cerebellum (central). If the nystagmus is vertical (the eyes are moving up and down rather than back and forth) or only exists when the animal is placed in certain positions, then the lesion is more likely to be central.

Canine idiopathic vestibular disease (also called "Old dog vestibular disease") and, its feline counterpart, feline idiopathic vestibular disease both begin acutely and resolve acutely. Usually improvement is evident in 72 hours and the animal is normal in 7-14 days, possibly with an occasional head tilt persisting. When a case of vestibular disease presents, it may be a good idea to wait a few days to see if improvement occurs before doing diagnostics beyond a routine blood/urine database. These two conditions are idiopathic, meaning we do not know why they occur. We do know that they represent problems in the periphery (nerves of the middle ear rather than in the actual brain.)

## **IDIOPATHIC VESTIBULAR DISEASE IS THE MOST COMMON FORM OF VESTIBULAR DISEASE IN DOGS AND CATS.**

Middle ear infection is a likely possibility for vestibular disease especially if the patient has a history of ear infections. When an otoscope is used to visualize the external ear of an animal with vestibular disease and debris is seen, this would be a good hint that there is infection in the middle ear as well. However, just because debris is not seen in the external ear does not mean that a middle ear infection is unlikely. Special imaging of the middle ear bones may be in order.

The most accessible way to evaluate the middle ear is with a special set of radiographs called a "bulla series" (so named because it focuses on an ear bone called the "tympanic bulla"). If the bulla appears abnormal, the ear may require surgical drainage. The problem is that radiography is often not sensitive enough to pick up damage in the middle ear and a normal

set of films does not rule out disease. In these cases, special imaging such as CAT Scan or MRI is better (though rather expensive). These imaging techniques, however, allow imaging of the brain tissue itself (which radiology does not) thus allowing brain abnormalities to be evaluated as well.

If a middle ear infection is present but is not known to be present, a routine cleaning of the external ear can lead to a flare up of vestibular symptoms. This is often unavoidable in long standing ear infections.

Brain tumors can be a cause of vestibular disease if the signs fit with a central lesion. In these cases, special imaging as mentioned above is needed to make the diagnosis. Such tumors may be treatable depending on their location.