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Topical Review

Proposed Treatment for Geriatric Vestibular Disease in Dogs

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Sudden-onset vestibular dysfunction in the canine is a commonly seen condition in veterinary practice, with some veterinarians reporting several cases each month. However, traditional veterinary medicine has little to offer these patients other than symptomatic relief for the severe nausea that accompanies the vertigo and supportive advice for the owners. Owners of affected dogs are informed that these symptoms usually resolve within a few days. As physical therapists, we often see cases of benign paroxysmal positional vertigo in our human practice clinics, and effective protocols for diagnosis and treatment of the condition have been developed for this condition. A modified testing and repositioning postural maneuver used successfully on 12 canine patients in our canine rehabilitation clinic (The Canine Fitness Centre, Calgary, Alberta, Canada) is hereby described.

Geriatric vestibular dysfunction can be a most disturbing condition for dogs and their owners, as well as somewhat confounding for the veterinarian and physiotherapist. The sudden onset of extremely debilitating symptoms in their dogs causes owners great anxiety, and there is currently little in the way of viable solutions to help their pet. A very informal survey of veterinary clinics in the Calgary area revealed that the average neighborhood clinic will see 1-3 cases of geriatric vestibular disease per month, and the 24-hour emergency centers are seeing 20-30 cases each month.

The vestibular system in the inner ear is responsible for maintaining the orientation of the animal or person with respect to its environment and detecting the static position of the head as well as acceleration, deceleration, and rotational motion.[1,2,17,18] The anatomy of the vestibular apparatus in the dog is very similar to that in the human. The inner ear is located in the petrous portion of the temporal bone. The boney labyrinth of the inner ear consists of 3 semicircular canals, as well as the cochlea, and a central chamber called the vestibule. The membranous labyrinth is suspended within the boney labyrinth, and it contains 5 sensory organs: the membranous portion of each of the 3 semicircular canals and 2 otolith organs, the saccule and the utricle. One end of each semicircular canal is widened to form an ampulla. Separating the ampulla from the vestibule is a flexible diaphragmatic membrane called the cupula. The orientation of the canals in dogs and in humans is also very similar. Each of the 3 semicircular canals (the anterior, posterior, and horizontal canals) is positioned at approximately 90° in relation to the other 2. The horizontal canal occupies a nearly horizontal plane, whereas the anterior and posterior canals are vertical. The anterior canals are positioned at 90° to each other and 41° from the sagittal plane. The posterior canals are also positioned 90° to each other. The anterior canal of one ear is roughly parallel to the posterior canal of the opposite ear[1,3,17] (Fig 1). The 3 semicircular canals cover 360° of head movement. The otolith organs, the utricle and the saccule, are peripheral vestibular receptors, which provide sensations of gravity and linear acceleration. Receptors in the semicircular canals are stimulated by rotation or angular head movements. A dysfunction of the vestibular system in both dogs and people results in loss of equilibrium, ataxia, incoordination, circling, falling, head tilt (usually in the direction of the lesion), nystagmus, and nausea or vomiting.[4,19]

In the veterinary literature, this condition is also frequently described as idiopathic or geriatric peripheral vestibular disease, and it occurs more frequently in older dogs. Although clinical signs can be severe, patients often improve within 1-2 weeks. However, a head tilt may persist. Typical veterinary treatment is often limited to administration of antihistamines (such as diphenhydramine) to decrease the nausea, anxiety, and anorexia and to alleviate the severity of the head tilt and nystagmus.[5,20] Affected animals that are laterally recumbent often prefer to lie on the side of the vestibular lesion or may circle toward the side of the lesion. Dogs with bilateral peripheral vestibular dysfunction may stand with a wide base, with their head held close to the ground, and swing their head from side to side in wide excursions. Nystagmus of a horizontal nature is a frequently occurring sign, and it manifests itself as a reflex eye movement with a slow phase and a fast resetting phase, driven by vestibular stimulation. Nystagmus is commonly described according to the direction of the fast phase, which is often described as “running away” from the side of the lesion.[4,19] If nystagmus is purely vertical in direction in a case of canine vestibular disease, this is often indicative of a central nervous system pathology.

In humans, distorted vestibular function has been termed benign paroxysmal positional vertigo (BPPV). The first documentation of crystals (also called otoliths) or debris in the ear canals was identified on autopsy in humans in 1992.[6] Even though the same finding has not been described or identified in dogs, we can speculate that a similar pathology occurs in the canine species, considering that the anatomy is so similar to that of the human.[7] In humans, 2 types of BPPV have been identified: primary (or

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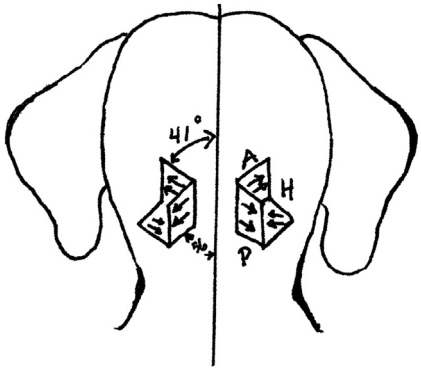

Fig. 1. Orientation of semicircular canals.

idiopathic) and secondary (or symptomatic). Spontaneous remission and frequent recurrence is the most common characteristic in primary or idiopathic BPPV, whereas secondary or symptomatic BPPV can be caused by a viral infection or head trauma (such as sports or motor vehicle related trauma) and therefore would not follow the same characteristics and would require a different approach to treatment. In the human population, a lifetime prevalence of this condition has been reported as 2.4%.[8] Of all human cases seen for moderate to severe dizziness, 8% are diagnosed with BPPV. The average duration of dizzy episodes in BPPV is 2 weeks.[16] Although spontaneous remission does occur, appropriate intervention shortens the duration of these episodes.[9]

The pathogenesis of primary BPPV in humans has been attributed to free-floating otoliths, causing abnormal stimulation of the cupula and resulting in distorted function of the vestibular apparatus. Symptoms of BPPV are severe ataxia, dizziness, nystagmus, and nausea, similar to symptoms described in dogs. It is reported that 60%-90% of all human BPPV cases are caused by debris traveling into the posterior canal. Some cases of debris moving in the horizontal canal have been identified, and very rarely has debris moving into the anterior semicircular canal been reported.[7,10]

The following testing and treatment techniques for BPPV are commonly used in humans and have been modified and applied to 12 cases of canine geriatric vestibular disease in our clinic. To treat vestibular conditions, it is important to identify the side of the inner ear involved and the semicircular canal affected. For the repositioning therapeutic maneuver to be successful, the positions in which the patient is placed have to specifically target the involved semicircular canal. As the otolith(s) moves by gravity, signs and symptoms of vertigo appear after a brief latency of 2-30 seconds. Vertigo elicited during testing maneuvers tends to be self-limiting, lasting approximately 30-60 seconds in duration. During the testing maneuvers, it is important to note the characteristics and direction of nystagmus.[7,8,11]

Testing Maneuvers

There are 3 typical postural maneuvers in humans to test for otoliths present in either the anterior or the posterior canals. These tests identify the side of the affected canal. In the *Dix-Hallpike maneuver*, the patient is positioned in the long sitting position (legs straight out in front) with the head turned 45° *toward* the canal being tested. The patient is then rapidly lowered into a supine position (lying on the back), with the head maintained in 45° of rotation and 30° of extension, lying with the head over the edge of the bed. The nystagmus elicited during this testing maneuver is up-beating and torsional, with the upper pole of the eye beating toward the lower most ear or the involved canal. The patient is then returned to the long sitting position, with the head still in 45° of rotation, at which time, the nystagmus reverses. If nystagmus is noted on both sides, the side of the involved canal demonstrates the most intense response. Although the Dix-Hallpike maneuver is the gold standard for testing for vertigo, extreme caution should be exercised in cases with a history of cervical spine issues, in which case the side-lying maneuver is preferred.[10] The *side lying maneuver* involves the patient sitting on the edge of a bed with the head turned 45° *away* from the suspected ear. The patient is then moved into side-lying position on the suspected side. If the test shows positive results for the canal being tested, signs of nystagmus appear, up-beating and torsional in nature as described earlier. Once nystagmus has subsided, the patient is returned to sitting with the head still turned *away* from the suspected lesion.

Testing for the horizontal canal is done with the patient in supine position (lying on the back) and the head in approximately 20°-30° of flexion. The head is turned from side to side, and if the nystagmus appears the result is positive, this time of a horizontal direction rather than torsional nature. If the nystagmus is down-beating (geotrophic) on the side toward which the head is turned, this indicates the involved canal is on the side toward which the head is turned. If it is up-beating (ageotrophic), it indicates the affected canal is on the opposite side.

In practice, the aforementioned procedures are usually modified so that once the affected side is identified, the practitioner moves directly to the treatment position described below, without returning the patient to sitting. This becomes even more practical when treating our canine patients.

The Epley Repositioning Maneuver

This maneuver has been identified as the most effective in treating symptoms of BPPV caused by otoliths in the posterior canal. Following the Dix-Hallpike testing position, the head is then turned 90° to the *unaffected* ear and held in that position for approximately 30 seconds. The trunk and the head together are then turned another 90° toward the unaffected side for a further 90 seconds. The success rate of this therapeutic repositioning maneuver has been reported as high as 90% after a single repetition. Repeating the maneuver may improve that rate in some cases.[10,12,15]

Semont Liberatory Maneuver

This repositioning maneuver can be an alternative for patients with cervical spine issues. The patient sits with their head turned *away* from the affected side and is then moved to the side, lying on the affected side with the head still turned away from the affected side. Once nystagmus subsides, the patient is made to lie on the opposite side while maintaining the head turned *away* from the affected side.[10] In the canine patient, the starting position would be in sternal recumbency with the head turned *away* from the affected side, followed by the rest of the procedure described earlier.

Horizontal Canal Repositioning Maneuver

The human patient is positioned in supine (lying on their back) position, with the head turned *toward* the affected side. Once cessation of nystagmus takes place (approximately 30 seconds), the head is turned *away* from the affected side, again waiting about 30 seconds. The patient is then rolled to a prone position