# A STUDY OF NEUROMUSCULAR DYSFUNCTIONS IN GERIATRIC DOGS

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## SUMMARY

Humans with Alzheimer's disease show seizures and signs of motor deficits. Since Canine Cognitive Dysfunction Syndrome is considered an Alzheimer-like disease in dogs, it was stipulated to document concurrent behavioral and neurological signs in aging dogs. Two hundred and forty eight dogs of different age and breeds were included to study neurological disorders. It was found that with increase in age, the neuromuscular disorders show progressive increase in severity.

**Key words:** Neuromuscular disorders, geriatric dogs

Ageing represents a complex biological process characterized by a progressive modification of tissues and cells with a gradual loss of adaptive capacity. Older dogs are susceptible to many of the diseases that affect humans viz. arthritis, heart disease, cancer, diabetes, and a canine version of Alzheimer's disease. Canine Cognitive Dysfunction Syndrome (CDS) is a condition that appears to be a geriatric onset of gradual behavioral changes in dogs, which are not entirely attributable to other general medical conditions. Clinical signs include cognitive dysfunction, personality change, anxiety, confusion and altered special orientation. Large breeds show these signs of aging earlier than small breeds. Some giant breeds show these signs at 5 or 6 years of age, while some of the smaller breeds show few signs of aging by 10 years of age. There is no blood test or scan to diagnose canine cognitive dysfunction. The cause of canine cognitive dysfunction is unknown, but physical evidence found only in autopsies reveals degenerative brain lesions. In the present study, prevalence of neuromuscular dysfunctions in geriatric dogs were studied.

A total of 248 geriatric dogs (> 5years of age) of different age and breeds brought to the Referral Veterinary Polyclinic during September 2009 to April 2010 were included in this study. These animals were divided in four groups on the basis of their age (Table 1). In order to determine the prevalence of neurological signs, a screening interview was performed through a questionnaire. The questionnaire was developed on the

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basis of the geriatric signs already reported in literature (Pugliese et al., 2005). It has been reported that the diagnosis of senile neurological disorder in dogs includes the presence of one or more of the following five signs: Cognitive dysfunction, personality change, anxiety, confusion and altered special orientation. On the basis of presence of atleast one of the five disorders, animal was placed in 1st category. Similarly animals with any two disorders were placed in 2nd category and likewise in 3rd, 4th and 5th categories.

Of the 46 dogs in group B, 29% were placed in 1st category (Table 1). The age of affected dogs ranged from 8-10 years. None of the dogs from groups A, C and D was in this category.

23.6% of the 105 dogs in group A, 16% of the 46 dogs in group B, 9% of the 62 dogs in group C and 20% of the 38 dogs in group D were placed in 2nd category as the animals in this category showed two of the five disorders.

Nine percent of the 105 dogs in group A, 4.16% of the 46 dogs in group B, 30% of the 62 dogs in group C and 30% of the 38 dogs in group D were placed in 3rd category (Table 1).

3.6% of the 105 dogs in group A, 4.16% of the 46 dogs in group B, 21.2% of the 62 dogs in group C and 25% of the 38 dogs in group D were placed in 4th category as the dogs in this category showed four of the five disorders (Table 1).

8.3% of the 46 dogs in group B, .6% of the 62 dogs in group C and 10% of the 38 dogs in group D were placed in 5th category. The animals in this category showed all five disorders (Table 1).

**Table 1**

**Distribution and neuromuscular screening in different groups of geriatric dogs**

| Groups | Age (years) | No. of dogs | 1st category | 2nd category | 3rd category | 4th category | 5th category |
|--------|-------------|-------------|--------------|--------------|--------------|--------------|--------------|
| A | 5-7 | 105 | 0% | 23.6% | 9% | 3.6% | 0% |
| B | 8-10 | 46 | 29% | 16% | 4.16% | 4.16% | 8.3% |
| C | 11-13 | 63 | 0% | 9% | 30% | 21.2% | 6% |
| D | > 13 | 34 | 0% | 20% | 30% | 25% | 10% |

Data collected was in accordance with results obtained in other studies and provided estimates of various degrees of age-related neuromuscular changes (Bain *et al.,* 2001). However, the relationship between the number of signs in the categories and neuromuscular impairment was not directly proportional i.e. neither dogs in 1st category necessarily had mild impairment nor dogs in 2nd or higher categories showed severe impairment. Though our findings suggest that the dogs showed age-dependent deterioration in neuromuscular functions; there may be breed differences (Head *et al.,* 1997). In the present study, this factor could not be studied conclusively since a variety of breeds were there including a large number of mixed breed dogs. In human and canine senile brains, the main neurodegenerative changes are neuropathological (e.g. thickening of the meninges, gliosis and diffuse plaques) (Fukuoka *et al.,* 2004) and neurochemical (e.g. neuronal apoptosis, beta-amyloid deposits) (Head *et al.,* 2002). In this study, it was found that neuromuscular disorders increased with age. A decrease in catecholamines especially dopamine has been reported to correlate with neuromuscular and degenerative changes (Sastre *et al.,* 2001). Oxidative stress plays a pivotal role in the neurodegenerative processes associated with age-related neuromuscular disorders (Rofina *et al.,* 2004). A decline in glutamate receptors, mainly affecting the cortex and hippocampus areas has also been demonstrated in aged dogs (Head *et al.,* 1997). Significant quantitative reductions in neurotrophic factors such as brain derived neurotrophic factor and nerve growth factor have been reported. As oxidative stress is considered to be one of the main pathogenic factors in the age-related neuromuscular decline in dogs (Rofina *et al.,* 2004), compounds that prevent free radical production or scavenge them, have been suggested to augment neuromuscular function (Head

and Zicker, 2004). It was concluded that with increase in age, there was progressive depression in neurological functions in dogs. Further studies are required to validate the result of this study but it appears to be a simple and practical tool for initial assessment of geriatric subjects.

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