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**CAUDAL CERVICAL
VERTEBRAL MALFORMATION
IN THE
DOBERMANN PINSCHER**

A thesis presented
in partial fulfilment of the requirements
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at Massey University

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Abstract

The objective of this research was to further the knowledge and understanding of caudal cervical vertebral malformation, a feature of caudal cervical spondylomyelopathy in the Doberman pinscher.

The first study involved surveying 170 Dobermanns to determine the prevalence of caudal cervical vertebral malformation and neurological signs associated with caudal cervical spondylomyelopathy within this sample population. In addition, the relationship between the presence of cervical vertebral malformation, body conformation and neurological findings was investigated. It was found that 48.8% of adult Dobermanns and 28% of puppies had some feature of caudal cervical vertebral malformation. Dogs with radiological signs of caudal cervical vertebral malformation were 5.56 times more likely to have neurological deficits. In both instances the severity of these changes increased with age. Although the radiological signs of caudal cervical vertebral malformation were present throughout a wide age range (3 to 156 months), the associated neurological signs tended to appear at a later age (six years and over). There was no statistically significant association between body conformation and the radiological signs of caudal cervical vertebral malformation.

The fact that caudal cervical vertebral malformation was found in young Dobermann puppies led to a morphological study of the post-natal ossification of the canine caudal cervical vertebrae. The caudal cervical spines of 51 puppies (aged from 0 to 12 weeks) were examined grossly, histologically and radiographically. This revealed that at birth, three centres of ossification were present: one in the vertebral body and one in the base of the pedicle of each neural arch. By one month of age, secondary centres of ossification were present in the cranial and caudal epiphyses of the vertebral body, and bony fusion of the laminae had occurred at the dorsal aspect of the neural arches. It was deduced that after one month of age and during normal development, the shape of the neural canal could be influenced only by changes within the physes between the vertebral body and the neural arch, or by remodelling of bone formed by intramembranous ossification.

A prospective study investigating the presence of caudal cervical vertebral malformation in 15 Doberman puppies (from 0 to 16 weeks of age) found that two of these puppies had radiological signs of the condition by six weeks, and another three by between 12 to 16 weeks of age. The diets of these puppies were either balanced or only transiently deficient or excessive in protein, calcium, phosphorus and/or magnesium. There was no significant association between the growth rate of the puppies, in terms of body weight gain or increase in ulna length, and the presence of caudal cervical vertebral malformation.

The cervical spines from 27 neonatal Dobermanns (Group D) were examined grossly, radiographically and using computerized tomography for the presence of any caudal cervical vertebral malformation changes. The findings were compared to those of six, similarly examined cervical spines from other large breed canine neonates (Group O). A significant difference was found between the two breed groups with the Dobermann spines having evidence of relative stenosis of the cranial neural canal opening ($p = 0.0001$) and some features of vertebral body asymmetry ($p = 0.04$). In addition, the seventh cervical vertebra was found to have the most marked morphological changes when compared to the fifth and sixth. It was concluded that cervical vertebral malformation is a congenital malformation in the Dobermann breed.

In addition to the above studies, the growth characteristics of three breeds of dogs, Dobermanns, Labrador retrievers and Heading Dogs were investigated. It was found that each individual breed grew at a different rate to the other (with the largest breed growing faster than smaller) and that males grew faster than females. It was also realized that both measurement of body weight and increase in bone length was required to characterize canine growth, since there was a poor predictive relationship between these two parameters as the puppies aged.

It was concluded from the studies that caudal cervical vertebral malformation is a congenital malformation and that growth rate, dietary imbalances and body conformation were not significant factors in its initial development. Possible implications of these findings and recommendations for future research are discussed.

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Dedication

I dedicate this thesis to four men in my life who, in their own way, graciously lifted me upon their shoulders so that I might see new horizons. They are my father, Ralph Burbidge, and my mentors Jim Hardy, Sandy Lyons and Brian Goulden.

Publications

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- Burbidge H.M., Thompson K.G., Hodge H. (1995). Post-natal development of canine caudal cervical vertebrae. *Research in Veterinary Science* **59**, 35-40.
- Burbidge H.M. (1995). A review of wobbler syndrome in the Dobermann pinscher. *Australian Veterinary Practitioner* **25**, 147-156.
- Burbidge H.M. and Pfeiffer D.U. (1998). The accuracy and reliability of linear measurements of the ulna for anthropometrical studies in dogs. *Research in Veterinary Science* **65**, 53-58.
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