Contents under pressure: vascular fibrous proliferation and gliosis within the brain of Cavalier King Charles spaniels affected with syringomyelia

Clare Rusbridge^{1,2}, Silvia Guil-Luna³, Daniela Menezes¹, Duncan Grainger¹, Anna Tauro², Nicholas Jeffery⁴, Fernando Constantino-Casa⁵, Penny Watson⁵, Francisco Salguero¹

- 1 School of Veterinary Medicine, University of Surrey, Guildford, UK
- 2 Fitzpatrick Referrals, Godalming, UK
- 3 Department of Comparative Pathology, University of Cordoba, Cordoba, Spain
- 4 College of Veterinary Medicine, Iowa State University, Iowa, USA
- 5 Department of Veterinary Medicine, University of Cambridge, Cambridge, UK

Chiari-like malformation (CM) is characterised by shortening of the basicranium, reduced supraoccipital bone convexity, invagination of the cerebellum under the occipital lobes and into the foramen magnum and increased proximity of the atlas to the occiput. The neural tissue overcrowding within the craniocervical junction results in obstruction of cerebrospinal fluid pathways and failure to accommodate the arterial pulse wave leading to variable ventriculomegaly and syringomyelia (SM). The mechanism of SM is debated. The most accepted hypothesis is that there is a mismatch in timing between arterial and CSF pulse peak pressure resulting in fluid flowing into

the perivascular space. However this theory is not well supported by histopathological studies of the spinal cord in the cavalier King Charles spaniel (CKCS). In this breed with a high prevalence of CM and SM, the dominant feature is angiogenesis and fibrous tissue proliferation in blood vessels adjacent to syrinx cavities suggesting a response to elevated intra-cord pressure. An alternative hypothesis of SM is that there is reduction in venous compliance resulting in increased pulse pressure, disruption of the blood brain barrier, increased interstitial fluid (pre-syrinx) and ultimately SM. In this retrospective cohort study we investigate the vascular changes related to CM and SM in the cerebral cortex.

The formalin fixed brains from 26 CKCSs (18 affected by CM and SM with ventriculomegaly and 8 without SM) were processed for histopathological analyses. The pathological material had been obtained from dogs humanely destroyed and donated by their owners. Tissue sections were stained with haematoxylin and eosin, trichrome martius scarlet blue and immunohistochemistry for glial fibrillary acidic protein. Morphometric and digital image analyses were used to quantify the number of vessels, width of the arteriolar wall and number of astrocytes in the cerebrum adjacent to the lateral ventricles. SM affected animals showed a significant increase in the number of blood vessels, associated with an increase in the width of the arteriolar walls due to a proliferative fibrous response. Moreover, there was a significant astrogliosis and astrocytosis in the areas adjacent to the ependymum. The logical explanation of this histomorphological change is a mechanical response to elevated arterial pressure. This arterial stiffening may further affect the ability to reduce the arterial pulse wave and decrease the CNS compliance.

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Linear traction-stabilisation for traction-responsive cervical spondylomyelopathy.

Matej Matiasovic, Viktor Palus, Salih Eminaga, Giunio B. Cherubini

Dick White Referrals, Six Mile Bottom, UK

INTRODUCTION

Surgery is currently the treatment of choice for traction-responsive cervical spondylomyelopathy (TRCSM). Determination of the traction-responsive component is essential for the selection of the appropriate surgical technique, and has been described using traction magnetic resonance imaging (MRI). Traction/distraction during surgery has been reported to being performed via manual traction, or directly with various distractors or retractors. This way the degree of distraction achieved may not be identical to that seen with traction MRI. By using the identical traction for the surgical procedure as during the MRI study, identical spinal cord decompression is expected to be achieved.

OBJECTIVE

The objective of this retrospective study is to present a

technique using linear traction during surgical stabilisation for treatment of TRCSM and the outcomes of this procedure.

METHODS

On examination, dogs were graded based on their neurological status. Magnetic resonance imaging diagnosis of single or multiple adjacent traction-responsive cervical spondylomyelopathy lesions was made. Twenty-one dogs met the inclusion criteria. Dogs were treated solely by traction-stabilisation with positive threaded pins and polymethylmethacrylate, without performing ventral slot. Traction was achieved using the identical apparatus that alleviated spinal cord compression during MRI. Traction was applied by weight-loading a soft tie secured to the superior canine teeth of the dorsally recumbent patient, with the fore limbs retracted and secured caudally. Neurological grading was assessed at time of discharge, and on short- and long-term follow up.

RESULTS

At the time of discharge and short-term follow up (<3 months), 76% and 95% of dogs had improved neurological scores, respectively. Twelve dogs (60%) had an improved CSM-related neurological status from admission until data collection or death from unrelated causes. Progression of suspected CSM signs occurred in 8 dogs (40%), however,

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