

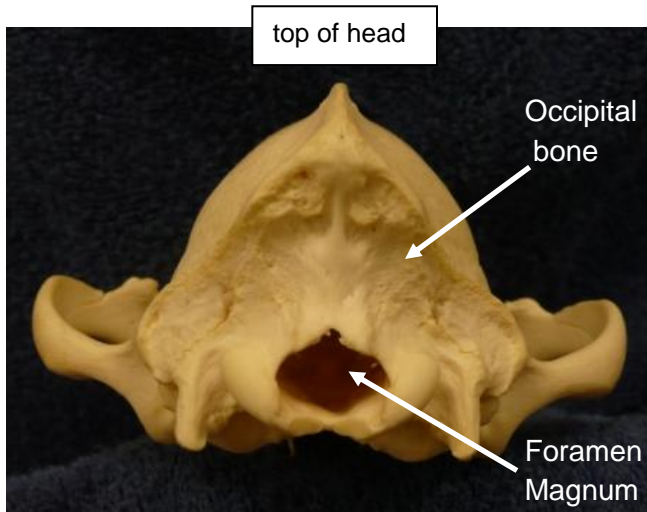
# Understanding Canine Chiari Malformation and Syringomyelia

By Karen Kennedy, RTMR, MappSc

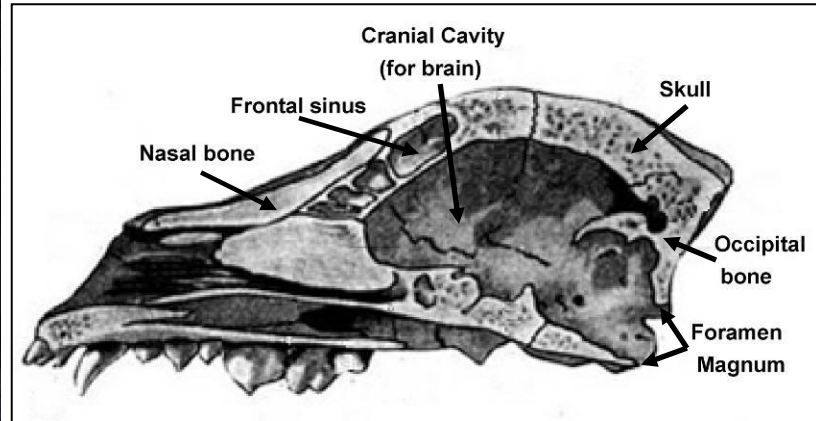
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This article was written for the Health Committee of the  
Cavalier King Charles Spaniel Club of Canada

A Chiari Malformation (CM) occurs at the craniocervical junction. This is where the skull and the top of the spine meet. At the bottom of the skull, there is a large hole called the foramen magnum. The foramen magnum allows the brainstem to exit the skull and become the spinal cord.



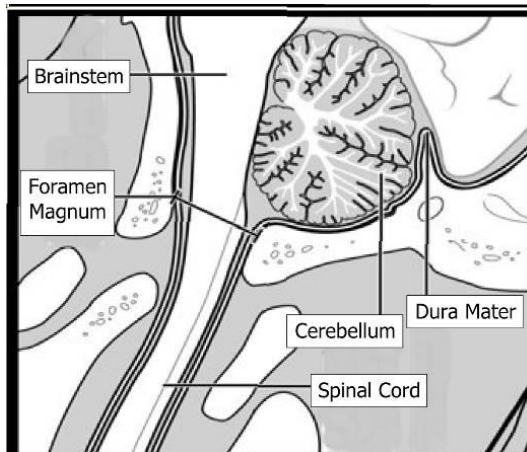
Photograph of the back a canine skull



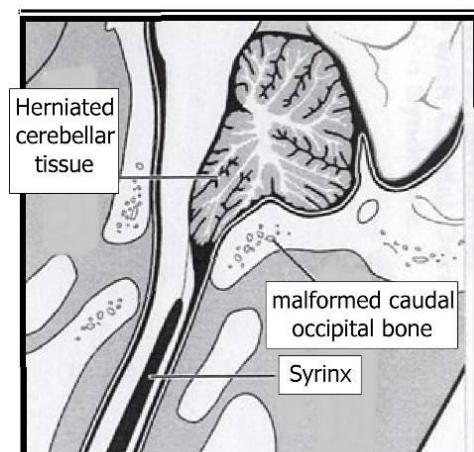
Inside of skull from the side

When the lower lobe of the brain, the cerebellum, is displaced to the level of the foramen magnum (mild CM) or through the foramen magnum (severe CM) there is overcrowding in the foramen magnum. This causes obstruction of the normal flow of CSF from the brain down to the spinal cord. Many dogs with CM develop syringomyelia (SM). Syringomyelia is a condition where cavities, or holes, called a syrinx, develop within the spinal cord.

## Normal



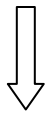
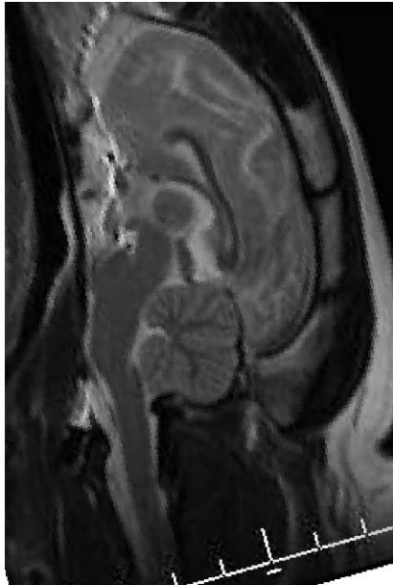
## Chiari Malformation



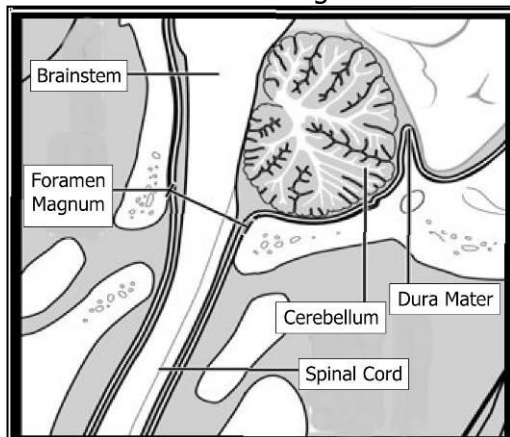
Diagrams courtesy of Dr. Dominic Marino. For further information on cranioplasty surgery, visit:  
[www.livs.org](http://www.livs.org)

# Craniocervical Junction - Cerebellum and Skull Base

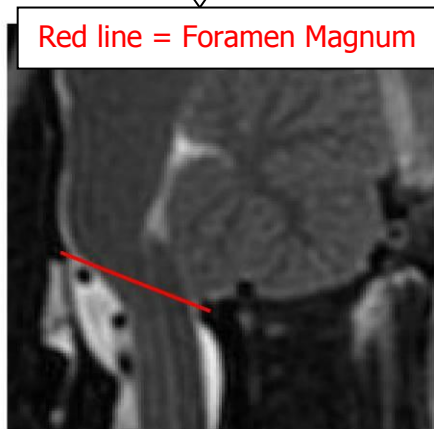
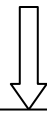
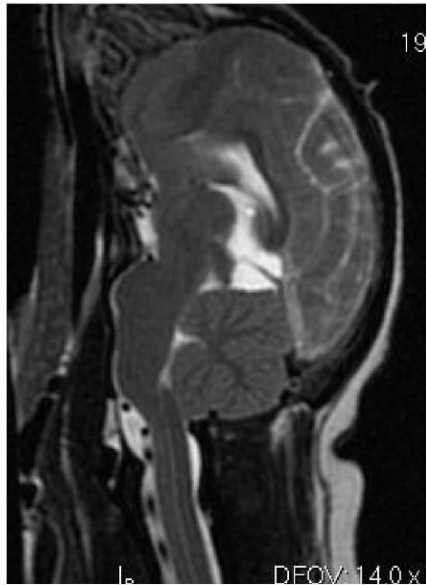
Mixed Breed  
Normal



Cerebellum above foramen magnum with CSF (white) visible above foramen magnum

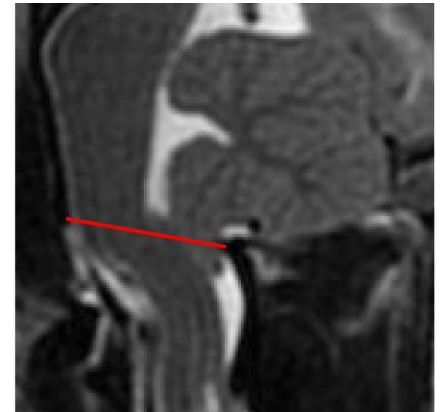
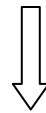
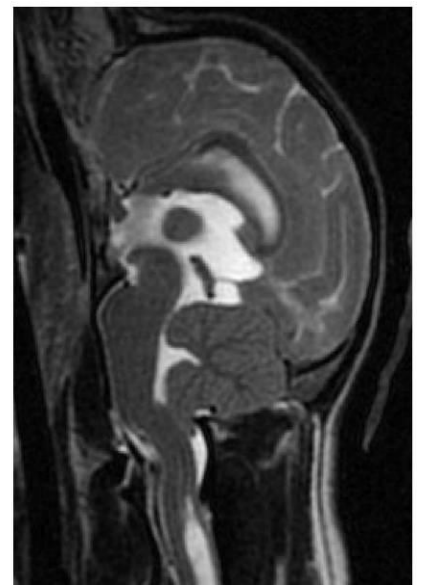


Cavalier  
Mild Chiari

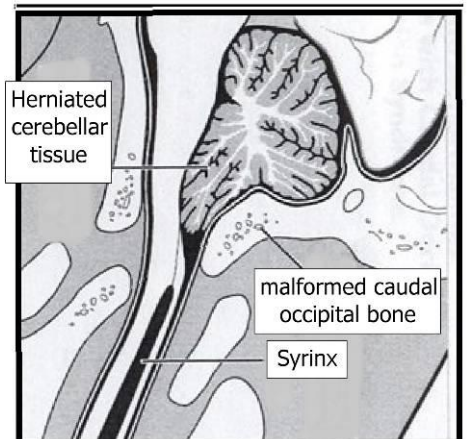


Cerebellum pushed to level of foramen magnum

Cavalier  
Severe Chiari

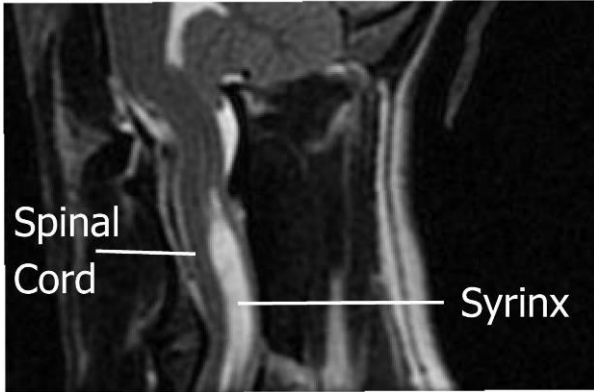


Cerebellum forced below foramen magnum

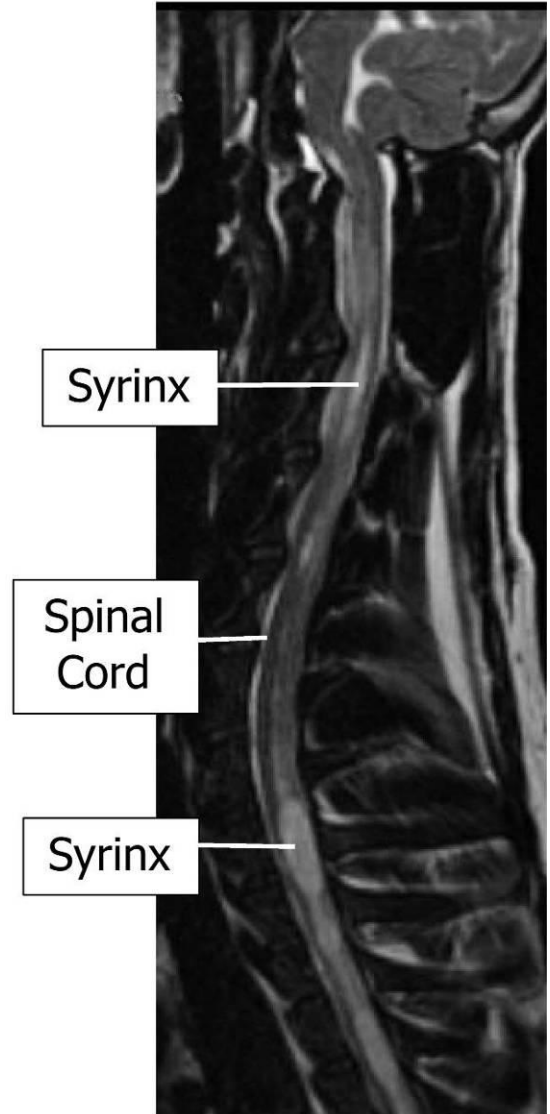


# Syringomyelia (Syrinx) images

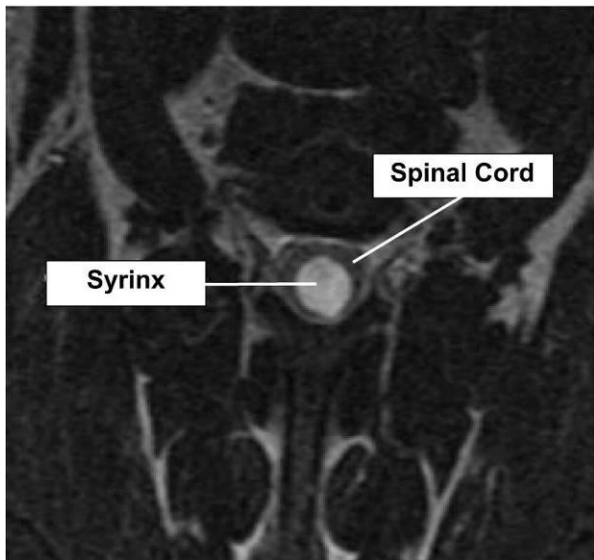
**Sagittal**



**Sagittal**



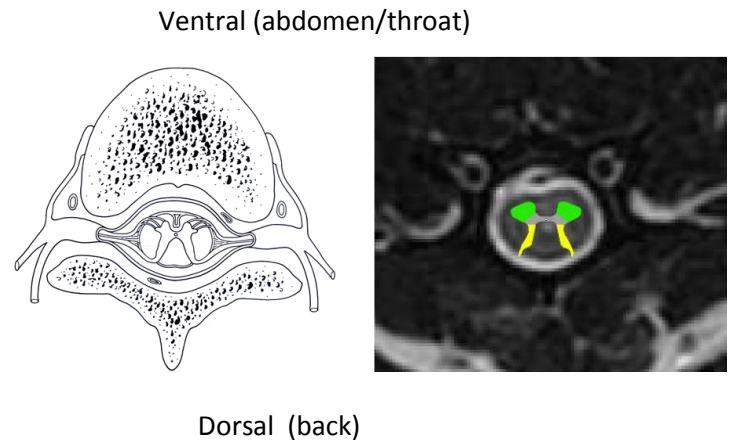
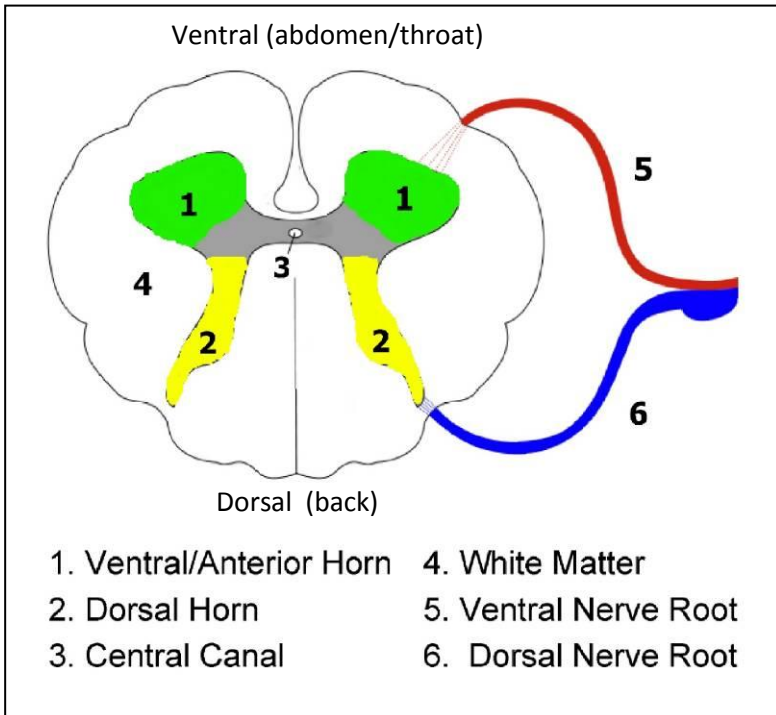
**Transverse**





# Simplified Anatomy and Function of the Spinal Cord

## Grey and White Matter



The spinal cord is made up of grey and white matter. Using a computer network as an analogy, the grey matter can be thought of as the actual computer, whereas the white matter represents the network cables connecting the computers together.<sup>1</sup>

**Grey matter** - central “butterfly” shaped area of spinal cord containing neurons

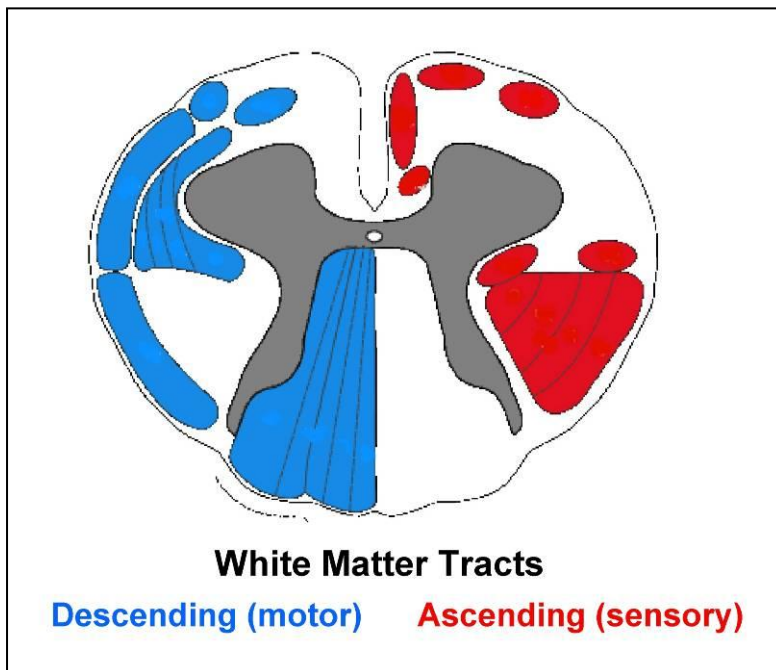
**White matter** - tissue through which messages pass between different areas of grey matter

### Spinal Pathways

Ascending (located in dorsal horn)  
- sensory information  
(e.g. Pain, touch, temperature)

Descending (located in ventral horn)  
- motor (movement)

**Transverse cross-section of the spinal cord**  
**“butterfly” in centre is grey matter**



<sup>1</sup> Wikipedia

# Effects of a Syrinx Simplified

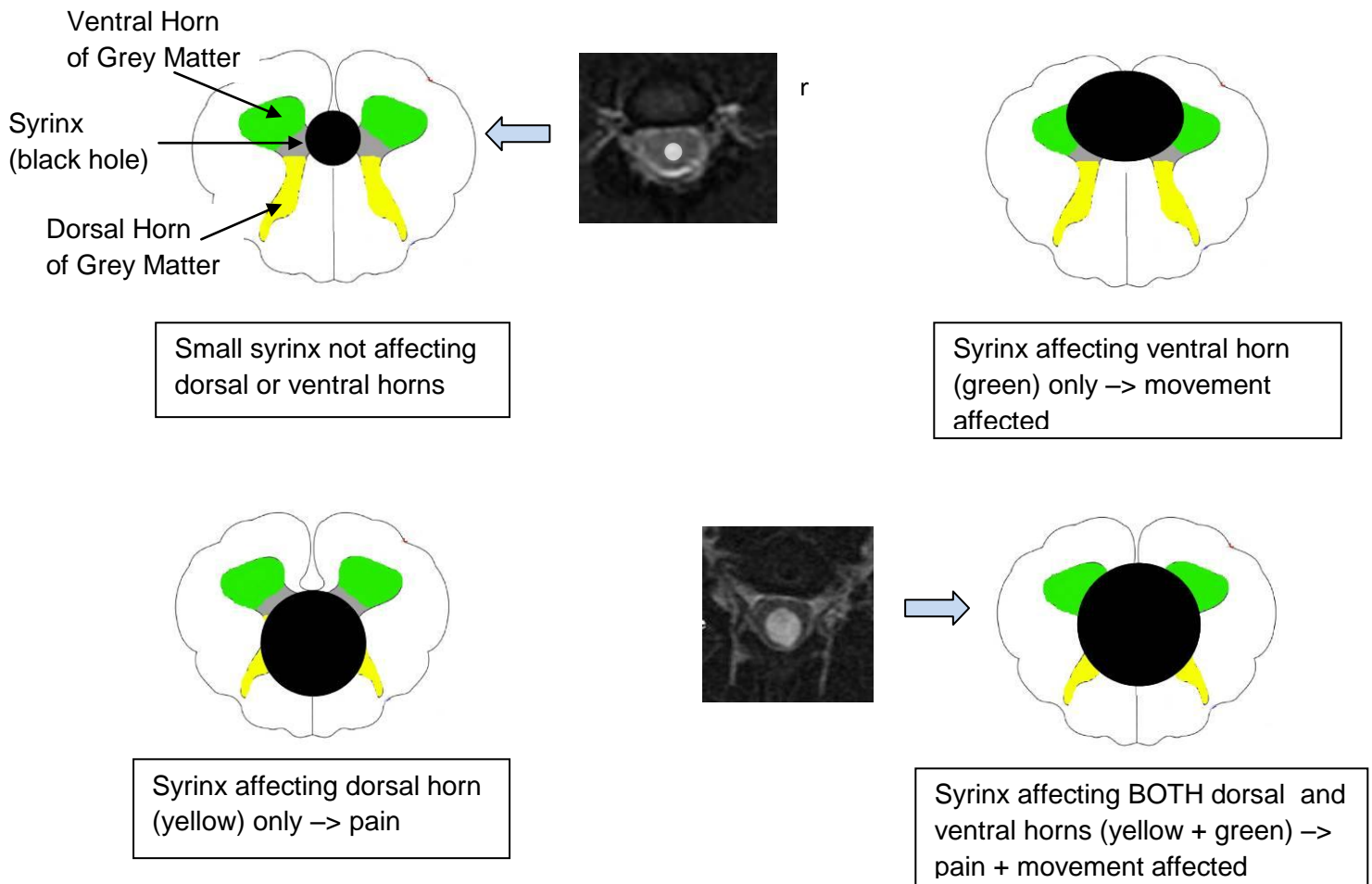
## CLINICAL SIGNS

In a study by Dr. Clare Rusbridge et al <sup>2</sup>, they found that pain is related to syrinx width and symmetry. Dogs with a wider, asymmetrical syrinx are more likely to experience pain, and dogs with a small, narrow syrinx may be asymptomatic.

**Ventral Horn Damage** - Syrinxes that damage the ventral horn, may result in neurological deficits such as decreased spinal reflexes, muscle atrophy and limb weakness.<sup>3</sup>

**Dorsal Horn Damage** - Syrinxes that damage the dorsal horn of the grey matter are most likely to cause persistent pain. Dr. Clare Rusbridge also found that the larger the width of the syrinx, the more likely it was that the dog would exhibit pain and scratching behaviour.

## Simplified Diagrams of Spinal Cord Cross Section with Syrinx



<sup>2</sup> Syringomyelia in cavalier King Charles spaniels: the relationship between syrinx dimensions and pain. C Rusbridge , H Carruthers , M-P Dubé , M Holmes , N D Jeffery. J Small Anim Pract. 2007 Jun 30.

<sup>3</sup> Syringohydromyelia in cavalier King Charles spaniels. C Rusbridge, JE MacSweeney, JV Davies, et al. Journal American Animal Hospital Association. 2000;36:34-41