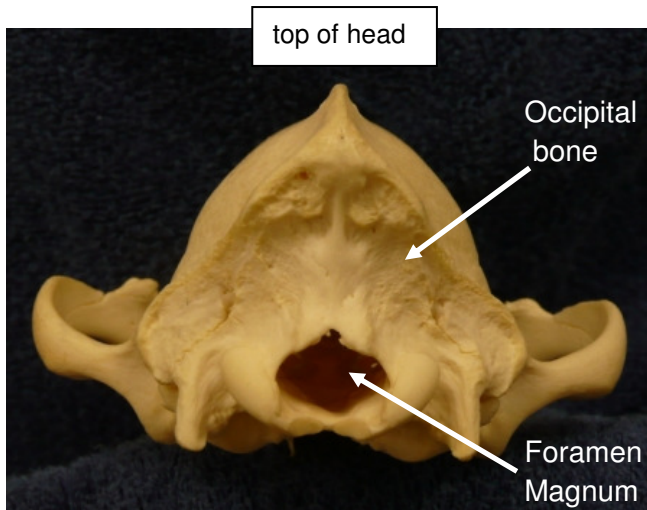
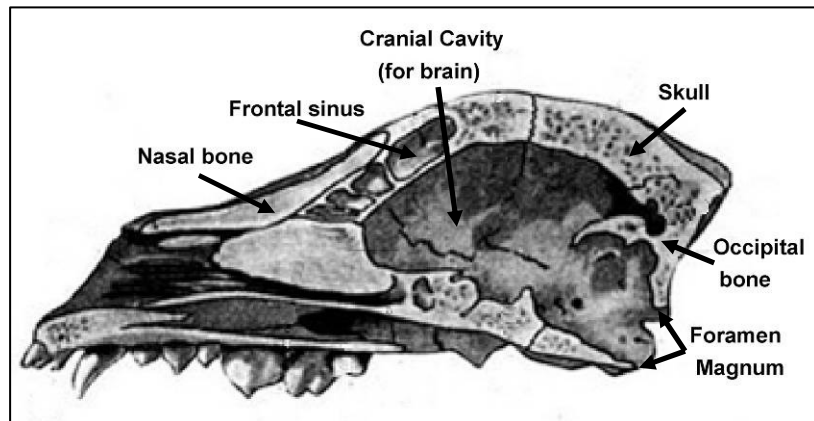


Understanding Canine Chiari Malformation and Syringomyelia

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.



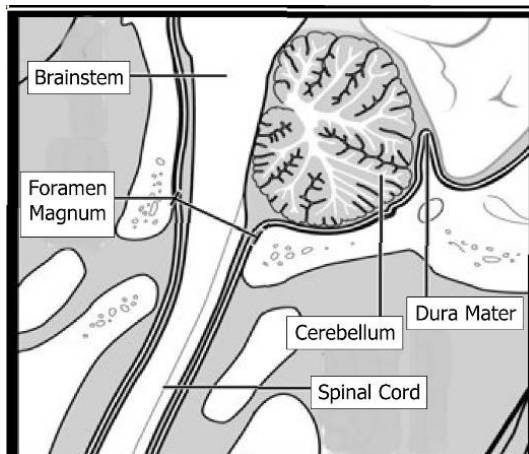
Photograph of the back a canine skull



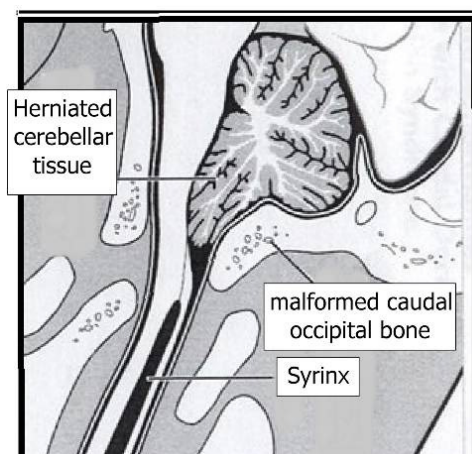
Inside of skull from the side

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



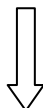
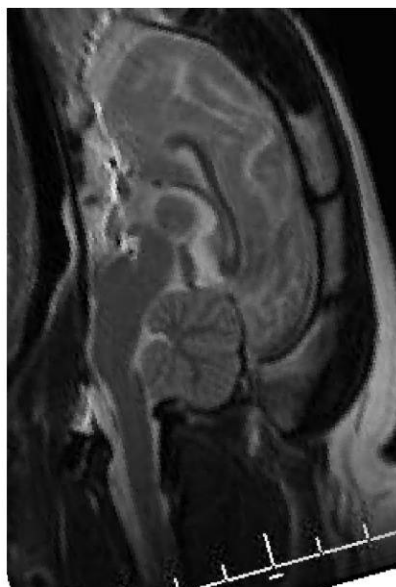
Chiari Malformation



Diagrams courtesy of Dr. Dominic Marino. For further information on cranioplasty surgery, visit: www.livs.org

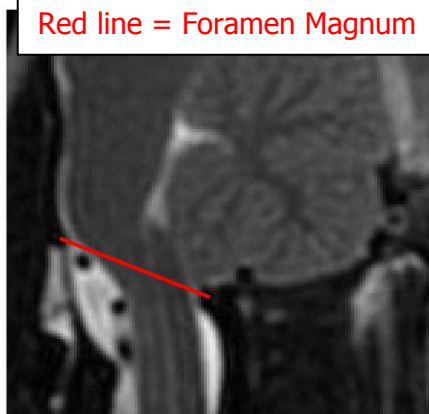
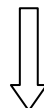
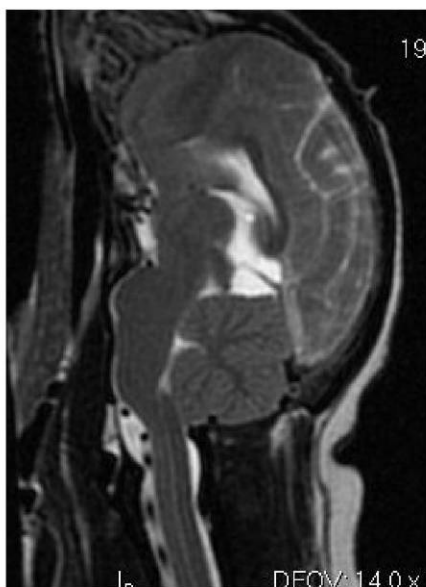
Craniocervical Junction - Cerebellum and Skull Base

Mixed Breed
Normal



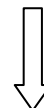
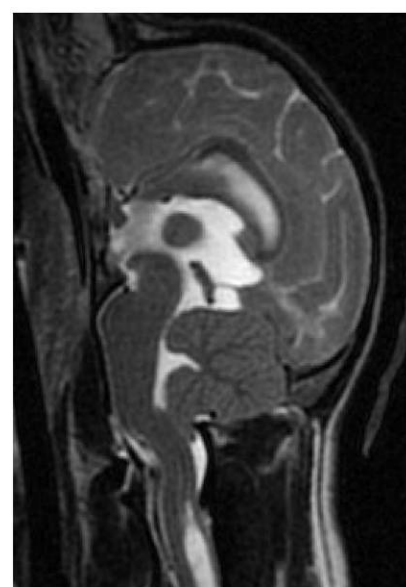
Cerebellum above foramen magnum with CSF (white) visible above foramen magnum

Cavalier
Mild Chiari

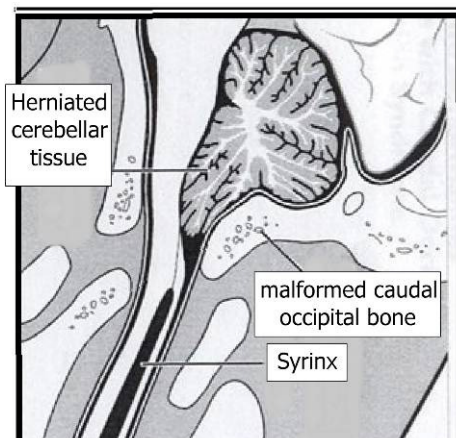
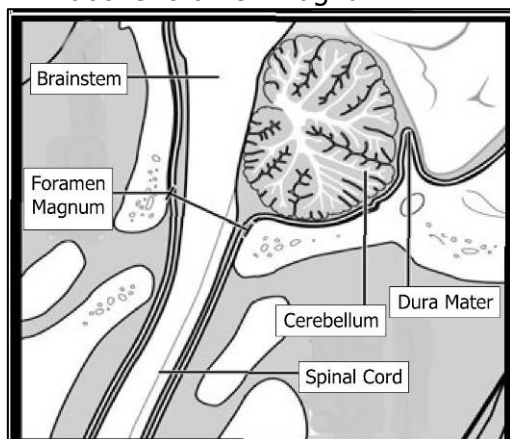


Cerebellum pushed to level of foramen magnum

Cavalier
Severe Chiari

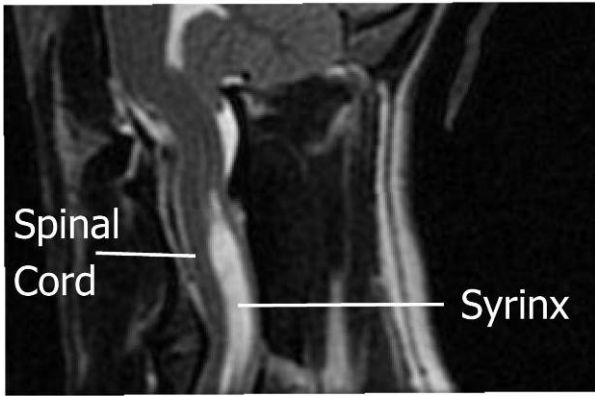


Cerebellum forced below foramen magnum

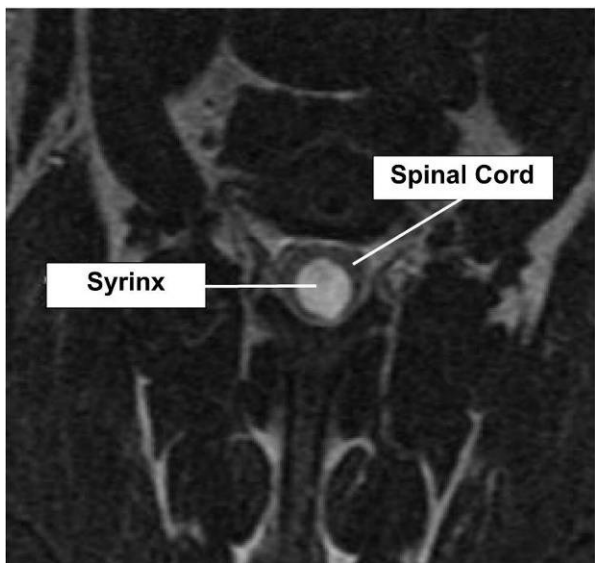


Syringomyelia (Syrinx) images

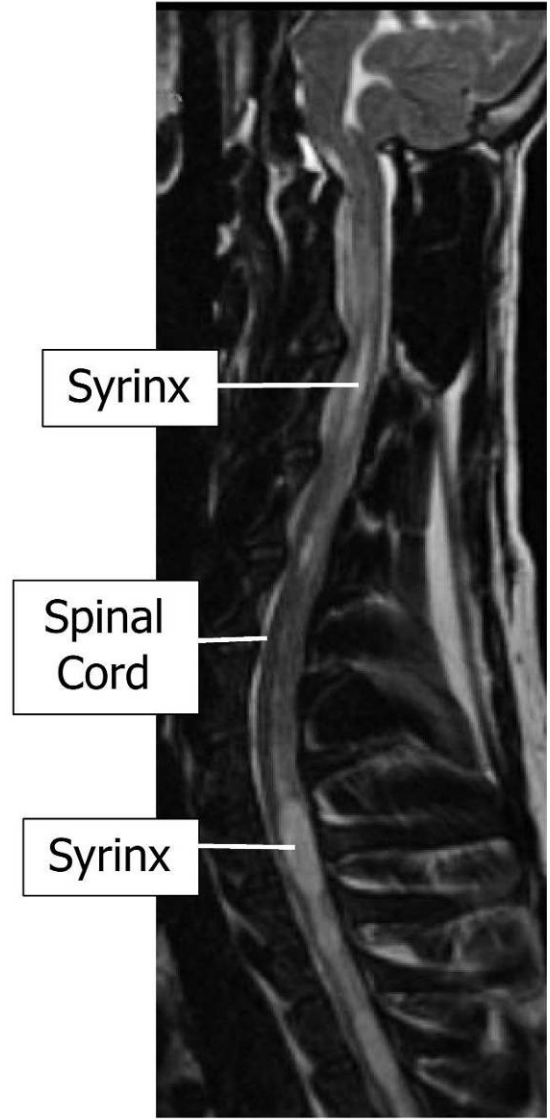
Sagittal



Transverse

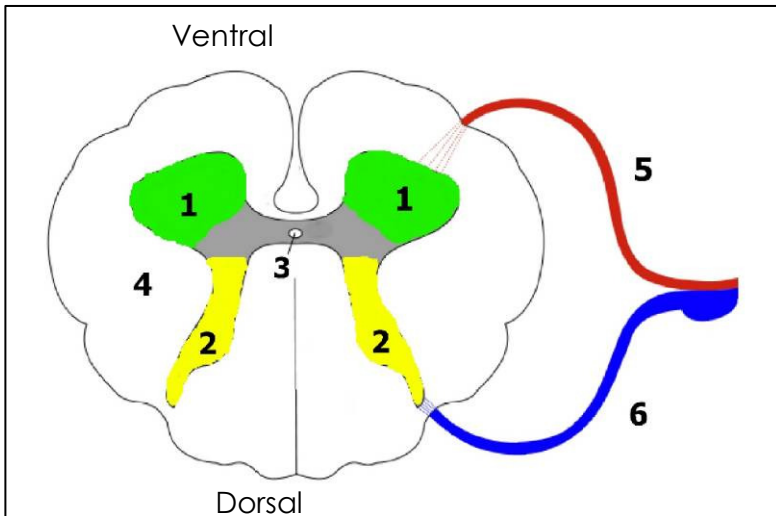


Sagittal

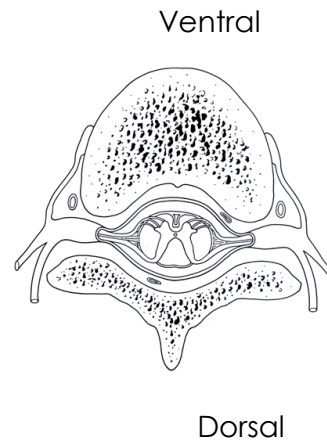


Simplified Anatomy and Function of the Spinal Cord

Grey and White Matter



- | | |
|--------------------------|-----------------------|
| 1. Ventral/Anterior Horn | 4. White Matter |
| 2. Dorsal Horn | 5. Ventral Nerve Root |
| 3. Central Canal | 6. Dorsal Nerve Root |



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.¹

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

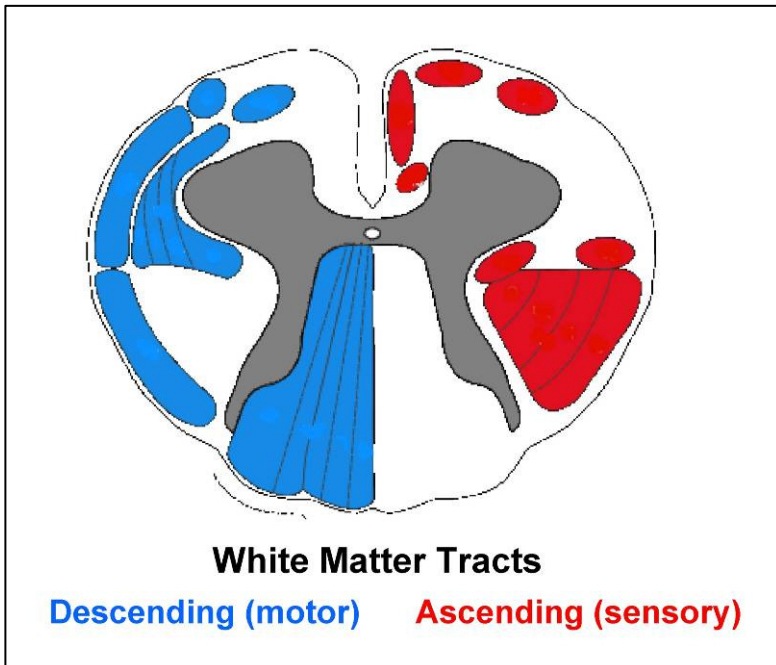
White matter - tissue through which messages pass between different areas of grey matter

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



White Matter Tracts

Descending (motor) **Ascending (sensory)**

¹ Wikipedia

Effects of a Syrinx Simplified

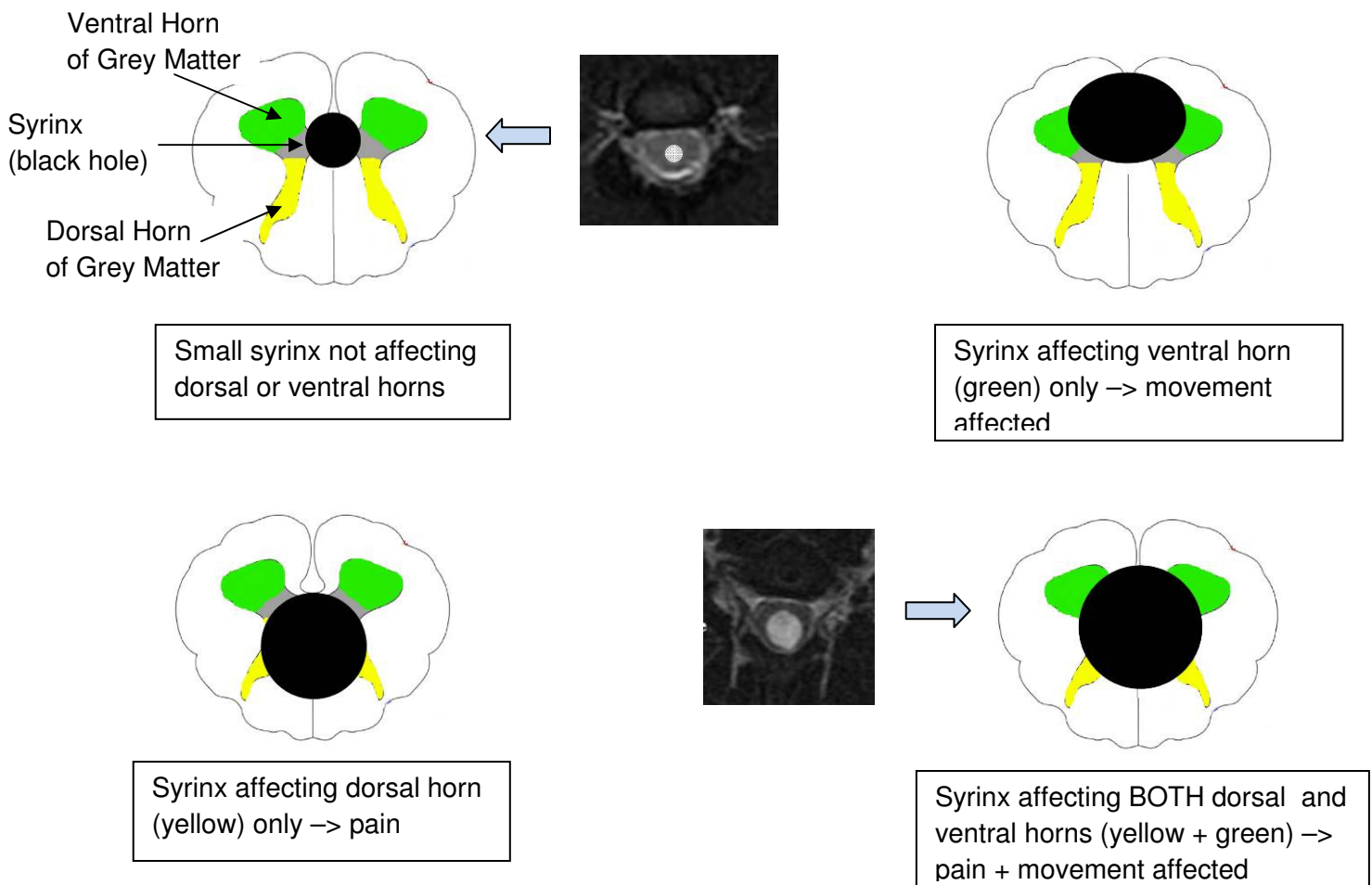
CLINICAL SIGNS

In a study by Dr. Clare Rusbridge et al ², 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.³

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



² 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.

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