Understanding Canine Chiari Malformation and Syringomyelia

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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.

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.

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

Cavalier
Mild Chiari

Cavalier
Severe Chiari

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

Cerebellum forced below foramen magnum

Cerebellum pushed to level of foramen magnum

Red line = Foramen Magnum

MR images courtesy of Dr. K. Wolfe
Syringomyelia (Syrinx) images

Sagittal

Spinal Cord

Syrinx

Transverse

Spinal Cord

Syrinx

Sagittal

Syrinx

Spinal Cord

Syrinx
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.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)

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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

Small syrinx not affecting dorsal or ventral horns

Syrinx affecting ventral horn (green) only —> movement affected

Syrinx affecting dorsal horn (yellow) only —> pain

Syrinx affecting BOTH dorsal and ventral horns (yellow + green) —> pain + movement affected

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