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A Review of Horner's Syndrome in Cat & Dogs

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Introduction

Horner's syndrome is a neuro-ophthalmic condition seen in cats and dogs. It is a term used to define a group of clinical signs related to lesions disrupting the sympathetic innervation to the eye. Horner's syndrome is classified as first (central), second (preganglionic) or third order (postganglionic), according to where the lesion is located within the oculosympathetic pathway.

Neuroanatomy

Sympathetic innervation to the eye is a three-neuron pathway (Fig. 1).**First Order (Upper Motor) Neurons**

The cell bodies located at hypothalamus and rostral mid-brain, projects axons through the brain stem and cervical spinal cord, where they synapse on second order neurons.

1. **Second Order (Preganglionic) Neurons**

The cell bodies are located in the lateral horn of the spinal cord grey matter at the level of T1-T3. The axons leave the spinal cord and join thoracic sympathetic trunk. It passes through the cervicothoracic and middle cervical ganglion. At the level of thoracic inlet, the sympathetic trunk fuses with vagus nerve within a common epineurium. The sympathetic trunk deviates and terminates in the cranial cervical ganglion, located ventromedial to the tympanic bulla.

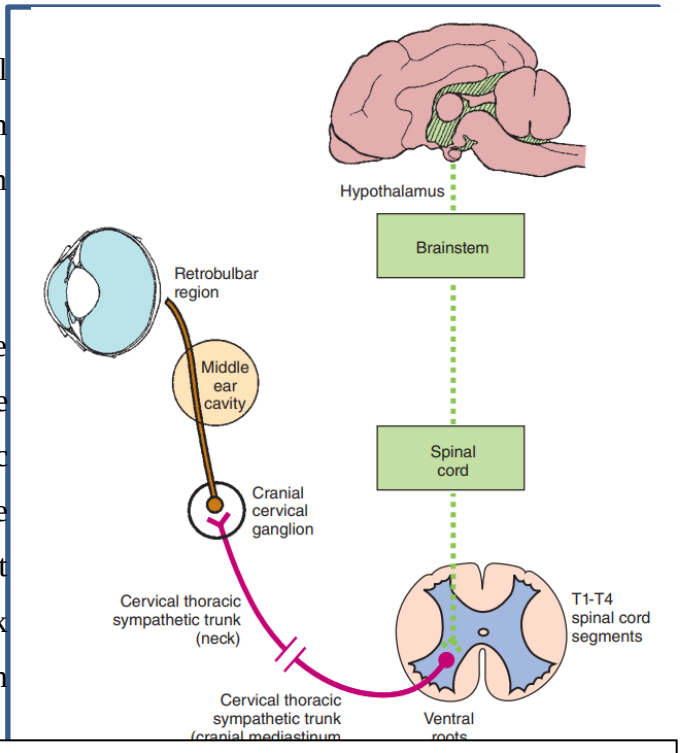

Fig 1. Oculosympathetic pathway

2. **Third Order (Postganglionic) Neurons**

The axons exit cranial cervical ganglion and form plexus around the internal carotid artery. Some of the fibers pass through the tympanic bulla on the ventral surface and post ganglionic fibers may continue with internal carotid artery and enter the cranial cavity via the tympanooccipital fissure and carotid canal. Once within the calvarium, postganglionic fibers course ventral to the trigeminal ganglion and exit with the ophthalmic branch of trigeminal nerve through the occipital fissure. The fibers become nasociliary and long ciliary nerve, which supplies to iris dilator muscle, muscles of the periorbita and eyelids. Cats have sympathetic innervation of smooth muscles within the third eyelid, a feature that is absent in the dogs.

Fig 2. A nine-month-old male Siamese cat with right sided Horner's syndrome. Notice the third eyelid protrusion, enophthalmos and upper eyelid ptosis in the right eye

Clinical Signs

The lack of sympathetic innervation to the eye results in following clinical signs (Fig 2 and Fig 3):

1. **Miosis**

When the sympathetic pathway is compromised, the inhibitory effect of the parasympathetic innervation to iris dilator muscle further prevents pupil dilation and exacerbates the miosis. As a result, anisocoria develops. Pupillary light reflex and vision remains intact in the affected eye.

2. **Ptosis**

Ptosis develops because of loss of sympathetic tone in the thin muscles of the eyelids.

Fig 2. A seven-year-old male Labrador retriever with left sided Horner's syndrome. Notice the miosis and the third eyelid protrusion the left eye

3. **Enophthalmos**

The periorbital smooth muscles help maintain globe in the anterior position within the orbit. When these muscles relax without sympathetic input, the retractor bulbi muscles are without antagonism and they actively retract the globe in to orbit, producing enophthalmos.

4. **Third eyelid protrusion**

The protrusion is passive in dogs and secondary to enophthalmos. In cats, its mainly due to sympathetically mediated smooth muscles in the third eyelid.

First order Horner's syndrome is associated with diseases affecting hypothalamus, brain stem and cervical spinal cord. The most common causes are trauma, neoplasia, infection, inflammation and cervical intervertebral disc protrusion.

Second order Horner's syndrome appears secondarily to lesions in the T1-T3 spinal cord segments, or in the cranial thoracic sympathetic trunk towards the cranial cervical ganglion. The common causes are trauma, neoplasia, cranial mediastinal mass (thymoma/lymphoma) and brachial plexus avulsion. Signs associated with second order Horner's syndrome may include ipsilateral thoracic limb paresis/paralysis and loss of contraction of the ipsilateral trunci muscle.

Third order Horner's presents secondarily to the lesions affecting the sympathetic pathway from the cranial cervical ganglion to the orbit. The common causes are otitis media/interna, vestibular disease, retrobulbar injury and neoplasia. Third order Horner's syndrome has also been reported as a complication to total ear canal ablation combined with lateral bulla osteotomy (TECA- LBO).

Systemic diseases such as hypothyroidism, diabetes mellitus, lymphoma and *Neospora canis* infection have also been associated with Horner's syndrome.

Diagnosis

Many ophthalmologists use the minimal dilation of miotic pupil to parasympatholytics (Tropicamide) and the complete ophthalmologic examination to rule out subtle uveitis and keratitis. For localization of the lesion, a dilute direct sympathomimetic (Phenylephrine) is instilled in both eyes. If the lesion is postganglionic (third order Horner's), a drop of 1% phenylephrine will create pupillary dilation, resolve enophthalmos, third eyelid protrusion and ptosis in under 20 minutes, while it will not dilate normal pupil. When the Horner's syndrome has been present for longer than 3 weeks and the pupil fail to respond to 1% phenylephrine, bilateral instillation of 1 drop of 10% phenylephrine is pursued and again the response is timed. Both the normal and affected pupil should dilate within 20 minutes, the lesion is localized as postganglionic (third order Horner's). If the response time is between 20-45 minutes, the lesion is localized as preganglionic (second order Horner's). If the response time is more than 45 minutes or no resolution, then the lesion is localized as upper motor neuron (first order Horner's).

Ancillary Diagnostics

Further diagnostics are warranted to investigate the etiology of Horner's syndrome. In case of postganglionic lesions, a thorough otoscopic examination should be performed. A complete blood count and serum biochemistry are advisable, to rule out metabolic disorders such as hypothyroidism and

diabetes mellitus. Cervical and thoracic radiographs are indicated in cases of preganglionic lesions. Magnetic Resonance Imagining (MRI) or Computed Tomography (CT) is warranted in all cases of central lesions.

Treatment and Prognosis

Treatment and prognosis are dependent upon the underlying etiology. Symptomatic treatment with 1% or 10% phenylephrine can be used for short-term improvement of signs. Since there is no specific etiology for idiopathic Horner's syndrome, there is no specific treatment. Most cases of idiopathic Horner's will show improvement within several weeks to months. When permanent deficits occur, they are largely considered to be cosmetic with minimal to no impact on patient's quality of life.

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