


**Strabismus, nystagmus and eyelids – when the nervous system is not working**

**Abnormal eye movements**



**RVC** Royal Veterinary College University of London

Elsa Beltran, Ldo Vet, PGDipVet Ed, FHEA, DipECVN  
Associate Professor in Veterinary Neurology/Neurosurgery  
Royal Veterinary College, University of London

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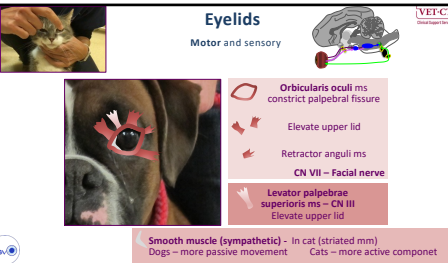
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**Eyelids**  
Motor and sensory



Orbicularis oculi ms  
constrict palpebral fissure

Elevate upper lid

Retractor anguli ms  
CN VII – Facial nerve

Levator palpebrae superioris ms – CN III  
Elevate upper lid

Smooth muscle (sympathetic) - In cat (striated mm)  
Dogs – more passive movement    Cats – more active componet

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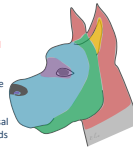
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**The facial nerve**

- CN VII
- Motor function to the muscles of facial expression and the caudal portion of the digastric muscle (muscles of mastication)
- Sensory function to the rostral two-thirds of the tongue and palate (sense of taste) and inner part of the pinna
- Parasympathetic function to the lacrimal glands, glands of the nasal mucosa, palatine mucosa, mandibular and sublingual salivary glands



**RVC**

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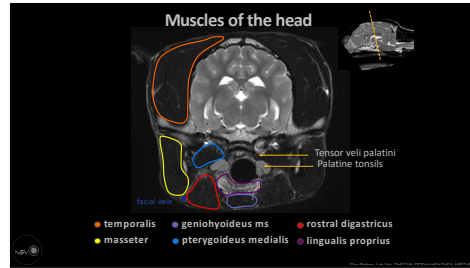
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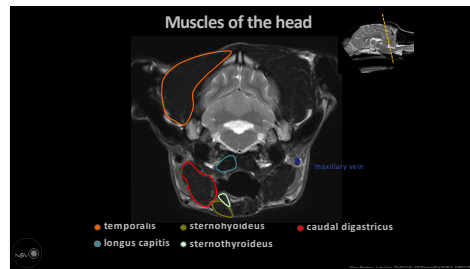
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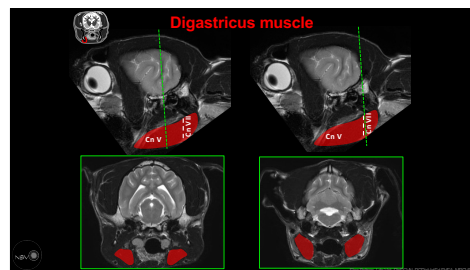
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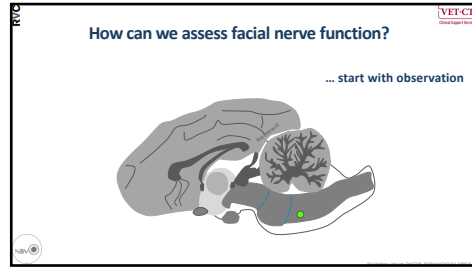
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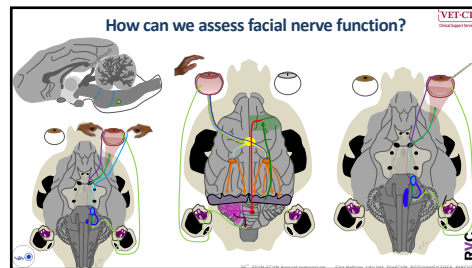
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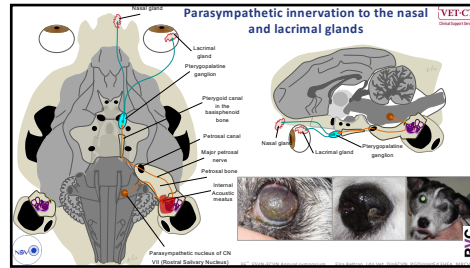
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**Canine facial neuropathy : Clinical signs**

- Unilateral or bilateral
- Absent menace response, inability to voluntarily blink, absent palpebral reflex
- Lip droop
- Ear droop
- Hypersalivation on the side with facial droop
- Deviation of the nasal philtrum toward the normal side
- Neurogenic Keratoconjunctivitis Sicca and Xeromyxemia may be present if the parasympathetic branches of the facial nerve that innervate the lacrimal glands and nasal gland are also affected
- Eye ulceration can occur due to reduced to absent blink +/- NKCS
- Associated vestibular signs are common

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**Magnetic resonance imaging of the caudal portion of the digastric muscle in canine idiopathic facial neuropathy**

*Vet Radiol Ultrasound. 2021;62:455-462.*

Ombelina McGregor | Mark J. Plested | Elsa Beltran

- Some degree of muscle atrophy (n = 17, 89%)
- Hyperintensity in T2W (n = 17, 89%)
- Pre-contrast T1W (n = 15, 79%) images, Contrast enhancement of the affected muscle (n = 14, 74%) and affected facial nerve (n = 9, 47%).
- There was no statistically significant correlation between atrophy or enhancement of the affected caudal portion of the digastric muscle nor between enhancement of the affected facial nerve and outcome.
- Hyperintensity both in T2W images and pre-contrast T1W images was significantly correlated with a worse prognosis.
- Ensuring inclusion and evaluation of this muscle in MRI may therefore be indicated in canine idiopathic facial neuropathy

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**Idiopathic facial neuropathy**

- Accounting for up to 75% of all cases presented with facial neuropathy
- Diagnosis is based on neurological signs and exclusion of all other causes
- The minimum database includes haematology, biochemistry, and thyroid hormone level
- Otoscopy should be performed on all patients as well as a Schirmer tear test and fluorescein staining
- Advanced imaging such as MRI is performed to evaluate the path of the facial nerve, including brainstem, inner, and middle ear



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**Position of the eyeball relative to the orbit**

- 4 rectus muscles **Dorsal, Ventral, Medial, Lateral**
- 2 oblique muscles **Dorsal, Ventral**
- Cranial nerves **III (oculomotor), IV (trochlear), VI (abducens)**

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**Oculomotor nerve (CN III)**

- Motor and parasympathetic
- Travels through middle cranial fossa
- Emerges through **orbital fissure**

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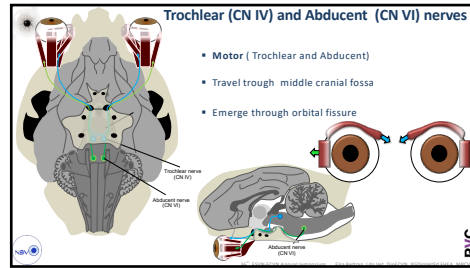
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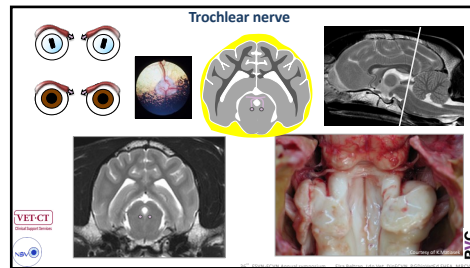
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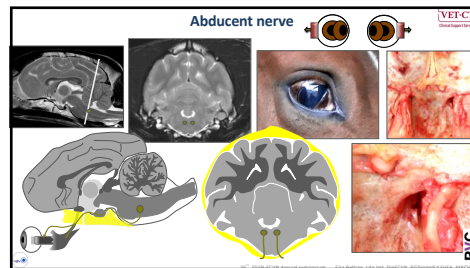
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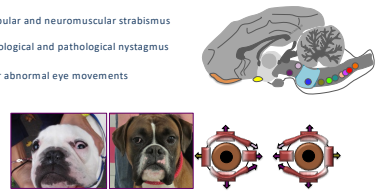
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**Strabismus, pathological nystagmus and eyelid dysfunction**

- Vestibular and neuromuscular strabismus
- Physiological and pathological nystagmus
- Other abnormal eye movements



The slide contains a 3D anatomical diagram of a dog's head showing the vestibular system. Below it are two photographs of dogs: one with a white dog's face and another with a brown dog's face. To the right of the photos are two diagrams of eyes showing strabismus (crossed eyes).

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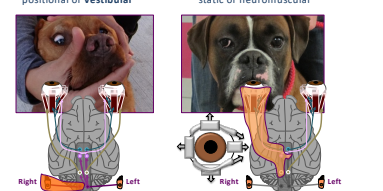
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**Position of the eyeball relative to the orbit**

strabismus - abnormal position of the eyeball relative to the orbit

positional or vestibular      static or neuromuscular



The slide features two photographs of dogs with strabismus. Below each photo is a diagram of the eye and orbit. The left diagram is labeled 'positional or vestibular' and shows the eye shifted. The right diagram is labeled 'static or neuromuscular' and shows the eye in a different position. Both diagrams include labels for 'Right' and 'Left'.

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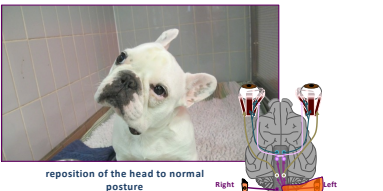
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**Function and dysfunction of the vestibular system**

positional - vestibular strabismus



The slide shows a photograph of a white dog with strabismus. Below the photo is a diagram of the vestibular system with labels for 'Right' and 'Left'. The text 'reposition of the head to normal posture' is written below the diagram.

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**Position of the eyeball relative to the orbit**

strabismus - abnormal position of the eyeball relative to the orbit

positional or vestibular      static or neuromuscular

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**Function and dysfunction of the vestibular system**

pathological nystagmus – horizontal, vertical and rotatory

slow phase – fast phase

fast phase – fast phase away from the lesion

Why we do not say ... **Slow phase towards** the lesion

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**CLINICAL AND MAGNETIC RESONANCE IMAGING FEATURES OF IDIOPATHIC OCULOMOTOR NEUROPATHY IN 14 DOGS**

ROSEK TETAS POST, COURTESY FREEMAN, RUTH DENNIS, CLAUDIA HARTLEY. *J Vet Radiol Ultrasound*, Vol. 58, No. 3, 2017, pp. 334-342

- Idiopathic oculomotor neuropathy
- Clinical signs ONLY of oculomotor dysfunction
- MRI only changes in this area
- **Good prognosis**
- Clinical signs do not progress and some dogs can improve without any treatment

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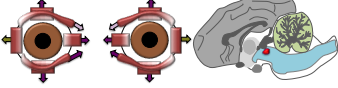
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**CASE REPORT** Journal of Veterinary Internal Medicine

**Saccadic oscillations in 4 dogs and 1 cat**

Edward J. Hess<sup>1</sup> | Edward Mackillop<sup>2</sup> | Natasha J. Olby<sup>3</sup> | *J Vet Intern Med.* 2018;1-5.

Saccades - The process of controlling eye movement (different systems)- all must work together in harmony.



Disorders affecting the control eye movement

**jerk nystagmus vs disorder of the control of the saccades**

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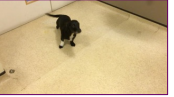

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**Saccadic Oscillations**

**Opsoclonus**

- Rapid and multidirectional eye movement
- Without interval between saccades
- Exact pathophysiology - unknown
- Cerebellar lesion (NCL, idiopathic generalised tremor syndrome)

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**Saccadic Oscillations**

**Macrossaccadic oscillations**


- Horizontal saccades induces when shifting gaze, normal intersaccadic interval (200ms)
- Build up and then decreased in amplitude
- Oscillate around a fixated point
- NCL - Cerebellum, Retina, Multifocal

*J Vet Intern Med.* 2018;1-5.

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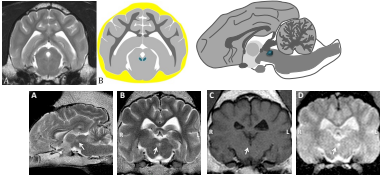
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**Convergence-retraction pulses**

**Convergence-Retraction Nystagmus Associated with Dorsal Midbrain Lesions in Three Dogs**

A.H. Crawford, E. Beltran, R. Lam, and P.J. Kenny *Case Report*  
J. Vet. Intern. Med. 2014;30:1229-1234



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Specific signs- dorsal midbrain lesion

Most frequent underlying causes in human  
**vascular** inflammatory, neoplastic

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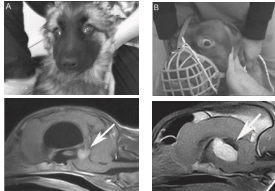
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**Dorsal midbrain syndrome associated with persistent neck extension: Clinical and diagnostic imaging findings in 2 dogs**

Sara Canal, Massimo Baroni, Cristian Falzone, Giulia M. De Benedictis, Marco Bernardini  
CVJ / VOL 59 / DECEMBER 2015



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Case Report  
**Convergence-Retraction Nystagmus in a Dog With Presumptive Ischemic Encephalopathy Following Acute Cervicothoracic Myelopathy**  
 Theophanes Liatis, DVM<sup>1</sup>, Ana Rita Faraolo, BVSc (Cer/PPVT)<sup>2</sup>, Panagiotis Maniis, DVM PhD DACT/CDT<sup>3</sup>, Giulio Bruno Chetani, DVM DigtCVN<sup>4</sup>

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**Pseudoabducens palsy**

- Contralateral esotropia (medial strabismus) due to a paramedian thalamic lacunar infarct
- Interruption of descending inhibitory pathways that traverse the paramedian thalamus, decussate in the subthalamic region and innervate the contralateral CN III, which results in tonic activation of the medial rectus

Received 17 November 2023 | Accepted 15 December 2023  
 DOI: 10.1111/jvim.15916

CASE REPORT *Journal of Veterinary Internal Medicine* ACVIM

**Medial strabismus (esotropia) at rest associated with contralateral paramedian thalamic ischemic infarction in 2 dogs**

Theofanis Liatis<sup>1</sup> | Ioannis N. Plessas<sup>2</sup> | Holger Volk<sup>3</sup> | Danielle Whittaker<sup>4</sup>

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Supranuclear lesions, the vestibulo-ocular reflex is expected to be intact.

Structural episodic nonintentional head tremor

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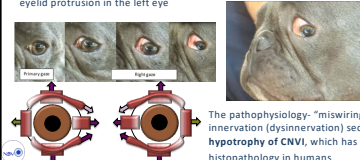
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**Extraocular muscle dysinnervation disorder resembling Duane retraction syndrome in a 9-month-old French Bulldog**

Lorenzo Mari,\* Benjamin T. Blacklock,† Renata Stavinohova† and Luisa De Ritis\*  
 \*Neurology/Neurosurgery Service, Center for Small Animal Studies, Animal Health Trust, Northwich, UK and †Ophthalmology Service, Center for Small Animal Studies, Animal Health Trust, Northwich, UK  
 Veterinary Ophthalmology (2017) 20, 5, 472–476

9mo, ME, French Bulldog 1month history of mild lateral strabismus and intermittent third eyelid protrusion in the left eye



The pathophysiology—“miswiring” of the extraocular innervation (dysinnervation) secondary to the absence of histopathology in humans

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**CASE REPORT** Veterinary Ophthalmology (2015) 18, 4, 341–344

**Presumed canine trigemino-abducens synkinesis in a dog**

Sath Eswaranga,\*† David Williams† and Giustina Brato Cherschini\*  
 \*Neurology and Neurosurgery, Doherty Referrals, Station Farm, Limbick Road, Six Mile Bottom CO8 6E3L, UK; and †Department of Veterinary Medicine, University of Cambridge, Madingley Road, Cambridge CB3 0ET, UK

**Synkinesis** - involuntary movement by one part of the body when an intentional movement is made by another part...



10yo, MN, Rhodesian ridgeback, 2 weeks history of abnormal bilateral protrusion of third eyelid when chewing...

Aberrant neural connections either at the PNS or at the brainstem nuclei level, between CN VI and the mandibular branch of the CN V

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**Congenital pendular resting nystagmus**



It may be a result of abnormal sensory input to the system that controls the eye movements related to vision

Aberration of the architecture of the visual pathway (common factor)

- Siamese, White Persian Cats exhibits excessive contralateral projection of optic nerve axons
- Belgian Shepherds shows complete lack of any contralateral projection

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What do you think?



Pupillary hippus

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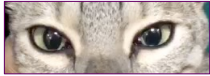
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Pupillary hippus



Hippus Pupilar - spasmodic, rhythmic, but regular dilating and contracting pupillary movements between the sphincter and dilator

Human - Epileptic seizures .. and other lesions of the CNS

Reference: O'Brien AD, 2011  
doi:10.1111/j.1365-3113.1107.201.00197.x

**BRIEF COMMUNICATION**

**Epilepsy causing pupillary hippus: an unusual semiology**  
\*[Maria Centeno, \*][Maria Feldmann, ][Neil A. Harrison, \*][Fergal J. Rugg-Gunn, \*][Umar Chaudhary, ][Carlos Falcon, \*][Louis Lemieux, \*][Maria Thom, \*][Elizabeth J.M. Smith, and \*][Sanjay M. Sisodia

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What do you think?



Iridodonesis

Tremulousness of the iris on movement of the eye, occurring in subluxation of the lens

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