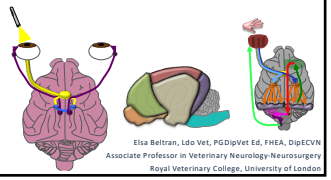
Welcome to day 1

1. The neurological examination for Ophthalmologists – What is important?
2. Sudden onset blindness- a systematic approach
3. Meningoencephalitis of unknown aetiology – What is new for ophthalmology?
4. Anisocoria the neurologist's approach.
5. Anisocoria the ophthalmologist's approach.
6. Interactive cases

Royal Veterinary College University of London

1

The neurological examination for Ophthalmologists – What is it important?



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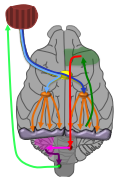
Royal Veterinary College, University of London

2

Why do we bother doing the neuro-ophthalmic examination?

- Confirm that the **problem is neurological**
- **Localise** the lesion in the nervous system
- **Severity and extend** of the lesion



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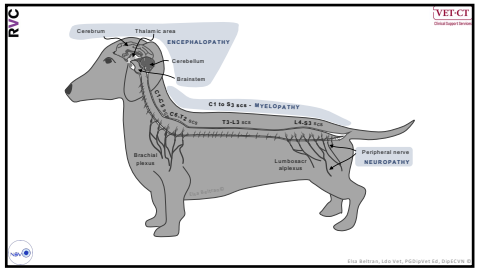
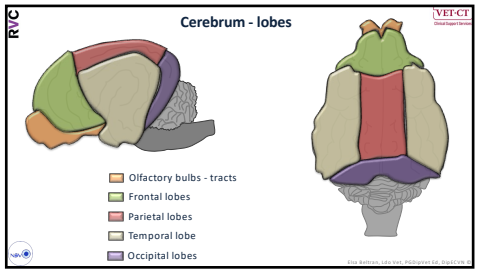
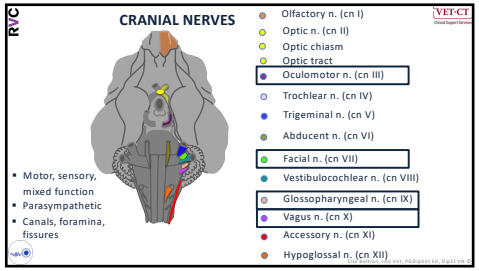

RVC
VET-CT
Cerebrum
Thalamic area
ENCEPHALOPATHY
Cerebellum
Brainstem
C1 to S2 sca - MYELOPATHY
T3-L3 sca
L4-S3 sca
Brachial plexus
Lumbosacral plexus
Peripheral nerve
NEUROPATHY

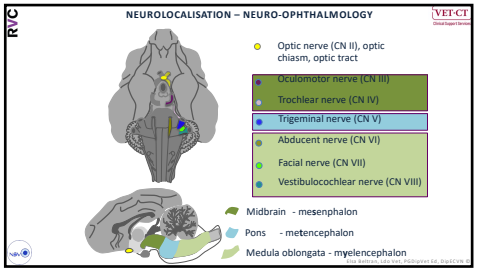
4


RVC
VET-CT
Cerebrum - lobes
Olfactory bulbs - tracts
Frontal lobes
Parietal lobes
Temporal lobe
Occipital lobes

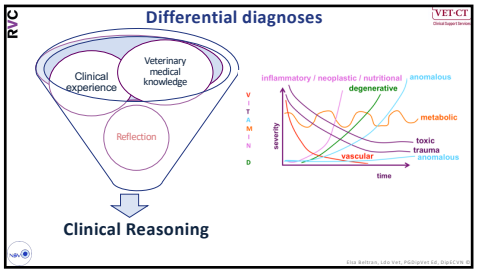
5


RVC
VET-CT
CRANIAL NERVES
Motor, sensory, mixed function
Parasympathetic
Canals, foramina, fissures
Olfactory n. (cn I)
Optic n. (cn II)
Optic chiasm
Optic tract
Oculomotor n. (cn III)
Trochlear n. (cn IV)
Trigeminal n. (cn V)
Abducent n. (cn VI)
Facial n. (cn VII)
Vestibulocochlear n. (cn VIII)
Glossopharyngeal n. (cn IX)
Vagus n. (cn X)
Accessory n. (cn XI)
Hypoglossal n. (cn XII)

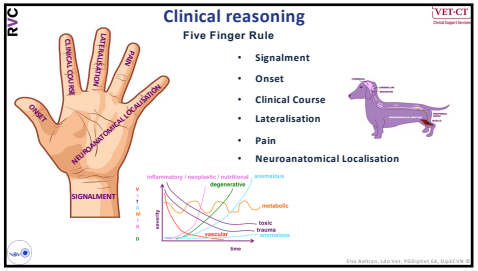
6


RVC
NEUROLOCALISATION – NEURO-OPHTHALMOLOGY
VET-CT
Optic nerve (CN II), optic chiasm, optic tract
Oculomotor nerve (CN III)
Trochlear nerve (CN IV)
Trigeminal nerve (CN V)
Abducent nerve (CN VI)
Facial nerve (CN VII)
Vestibulocochlear nerve (CN VIII)
Midbrain - mesenphalon
Pons - metencephalon
Medula oblongata - myelencephalon

7


RVC
Differential diagnoses
VET-CT
Clinical experience
Veterinary medical knowledge
Reflection
Clinical Reasoning
VITAMIND
severity
time
inflammatory / neoplastic / nutritional
anomalous
degenerative
metabolic
toxic
trauma
vascular

8


RVC
Clinical reasoning
VET-CT
Five Finger Rule
Signalment
Onset
Clinical Course
Lateralisation
Pain
Neuroanatomical Localisation
SIGNALMENT
ONSET
CLINICAL COURSE
LATERALISATION
PAIN
NEUROANATOMICAL LOCALISATION

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Parts of the Neurological examination

- Observation (**hands-off** examination) + history

- **Hands on** examination + physical examination

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Observation

- **Mental status** and **behaviour**
- **Posture** and **body position** at rest
- Evaluation of **gait**
- Abnormal involuntary movements

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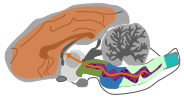
observation – hands off

mental status



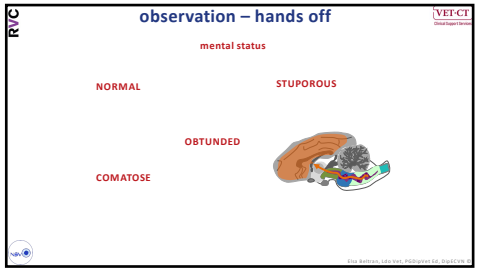
ARAS (ascending reticular activating system) activity

Reticular formation - collection of neuronal cell bodies – meshwork

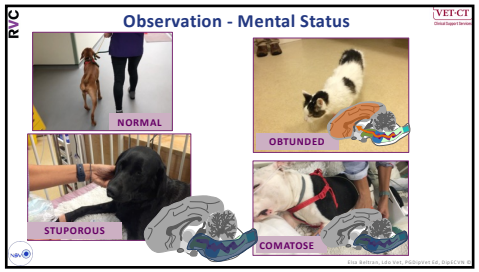
activating the cerebral cortex

- awake state
- level of consciousness

12


RVC
observation – hands off
VET-CT
mental status
NORMAL
STUPOROUS
OBTUNDED
COMATOSE

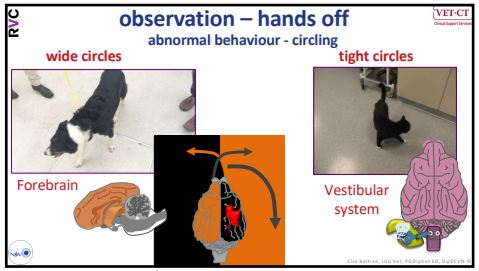
13


RVC
Observation - Mental Status
VET-CT
NORMAL
OBTUNDED
STUPOROUS
COMATOSE

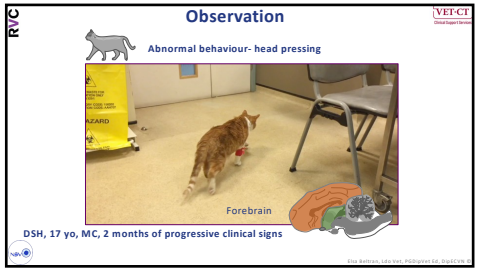
14


RVC
Observation - Mental Status
VET-CT
abnormal behaviour - disoriented

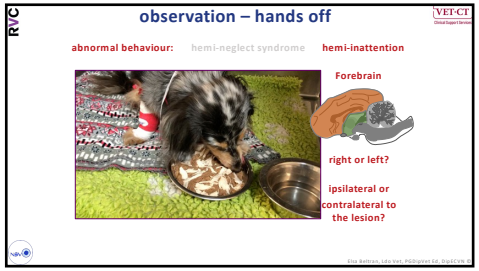
15


RVC
observation – hands off
VET-CT
abnormal behaviour - circling
wide circles
tight circles
Forebrain
Vestibular system

16


RVC
Observation
VET-CT
Abnormal behaviour- head pressing
Forebrain
DSH, 17 yo, MC, 2 months of progressive clinical signs

17


RVC
observation – hands off
VET-CT
abnormal behaviour:
hemi-neglect syndrome
hemi-inattention
Forebrain
right or left?
ipsilateral or contralateral to the lesion?

18


RVC
Forebrain - Clinical signs - dysfunction
VET-CT
abnormal behavior – hemi-neglect syndrome

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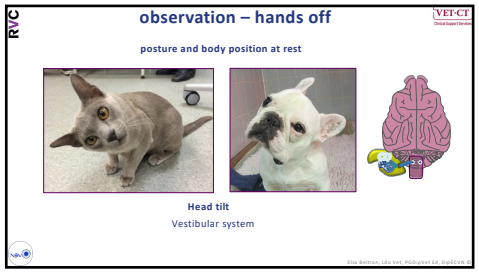
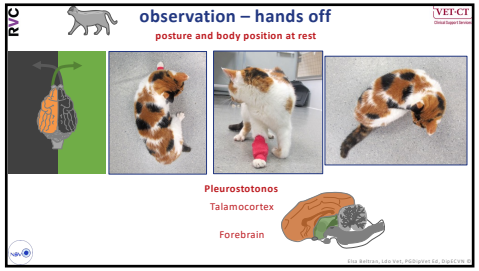
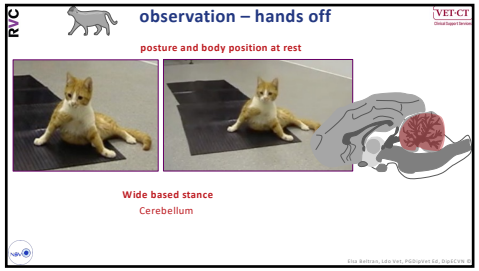

RVC
observation – hands off
VET-CT
posture and body position at rest
Head tilt
Vestibular system

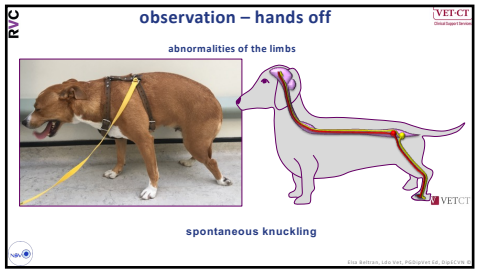
20


RVC
observation – hands off
VET-CT
posture and body position at rest
Pleurostotonos
Talamocortex
Forebrain

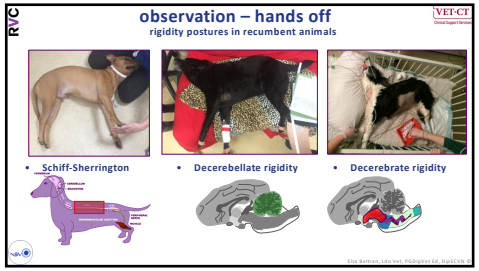
21


RVC
observation – hands off
VET-CT
posture and body position at rest
Wide based stance
Cerebellum

22


RVC
observation – hands off
VET-CT
abnormalities of the limbs
VETCT
spontaneous knuckling

23


RVC
observation – hands off
rigidity postures in recumbent animals
VET-CT
Schiff-Sherrington
Decerebellate rigidity
Decerebrate rigidity

24

observation – hands off

gait analysis – non slippery floor

- Coordinated or uncoordinated?
  Uncoordinated - **ATAXIA**
- Loss of motor function? **PARESIS/PLEGIA**
- Lame? ORTHOPAEDIC/NEUROLOGIC?
  NERVE ROOT SIGNATURE

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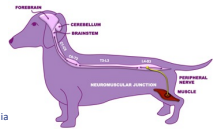
observation – hands off

gait – SENSORY FUNCTION– non slippery floor

- **ataxia** - uncoordinated gait
  - **cerebellar** ataxia
  - **vestibular** ataxia
  - **general proprioceptive** ataxia



26

observation – hands off

Gait- cerebellar ataxia

27

observation – hands off

gait- vestibular ataxia

Vestibular system

28

observation – hands off

gait- proprioceptive ataxia

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observation

gait – MOTOR FUNCTION– non slippery floor

- **paresis (tetra, para, mono)** - partial loss of motor function- inability to support weight
  - **ambulatory**
  - **non-ambulatory**
- **plegia (tetra, para, mono)** - complete loss of motor function

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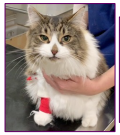
Abnormal gait in Neuro-Ophthalmology

Hemiplegia + Horner's syndrome

31

Observation

Abnormal movement



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Parts of the Neurological examination

- Observation (**hands-off** examination) + history

- **Hands on** examination + physical examination

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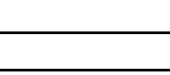
Learning objectives – hands on

- **Postural reaction** testing, **How** to do it and **Why** to do it ?
- **Spinal reflexes, muscle mass and tone**
- **Cranial nerve assessment – How and Why?**
- **Palpation – areas of pain/discomfort**




34

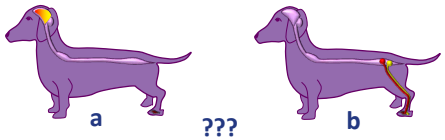
Postural reactions

Conscious perception or reflex?

35

Postural reactions

Conscious perception or reflex?



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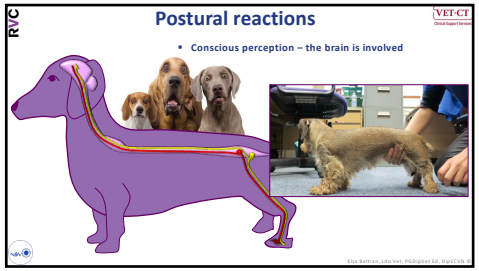
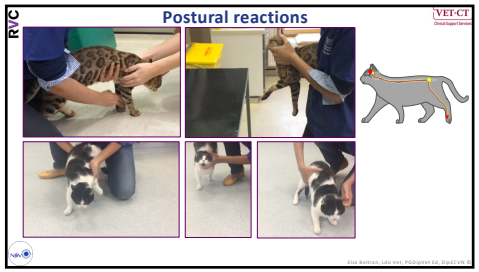
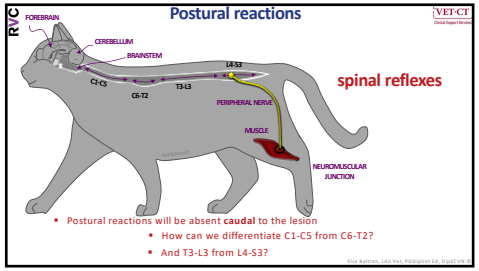

RVC
Postural reactions
VET-CT
Conscious perception – the brain is involved

37


RVC
Postural reactions
VET-CT

38


RVC
Postural reactions
VET-CT
FOREBRAIN
CEREBELLUM
BRAINSTEM
C1-C5
C6-T2
T3-L3
L4-S3
PERIPHERAL NERVE
MUSCLE
NEUROMUSCULAR JUNCTION
spinal reflexes
Postural reactions will be absent caudal to the lesion
How can we differentiate C1-C5 from C6-T2?
And T3-L3 from L4-S3?

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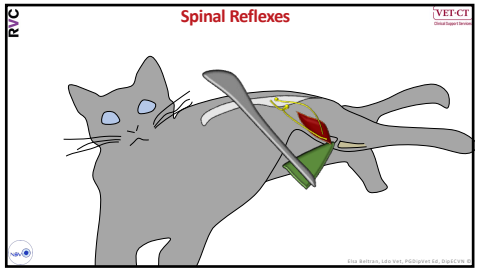
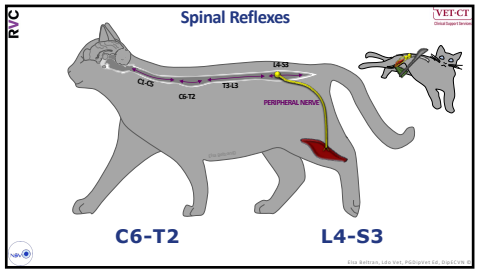
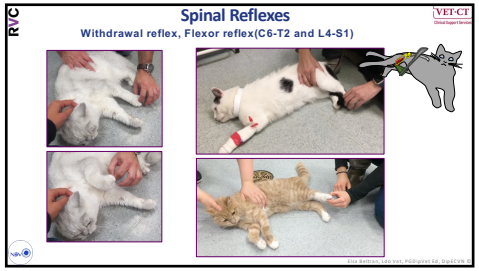

RVC
Spinal Reflexes
VET-CT

40


RVC
Spinal Reflexes
VET-CT
C1-C5
C6-T2
T3-L3
L4-S3
PERIPHERAL NERVE
C6-T2
L4-S3

41


RVC
Spinal Reflexes
VET-CT
Withdrawal reflex, Flexor reflex(C6-T2 and L4-S1)

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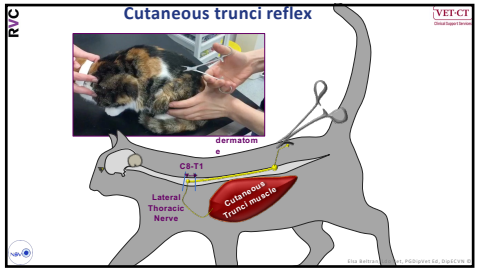
RVC
Cutaneous trunci reflex
VET-CT
dermatom
e
C8-T1
Lateral
Thoracic
Nerve
Cutaneous
Trunci muscle

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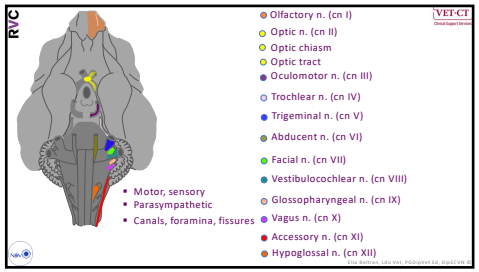
RVC
VET-CT
Olfactory n. (cn I)
Optic n. (cn II)
Optic chiasm
Optic tract
Oculomotor n. (cn III)
Trochlear n. (cn IV)
Trigeminal n. (cn V)
Abducent n. (cn VI)
Facial n. (cn VII)
Vestibulocochlear n. (cn VIII)
Glossopharyngeal n. (cn IX)
Vagus n. (cn X)
Accessory n. (cn XI)
Hypoglossal n. (cn XII)
Motor, sensory
Parasympathetic
Canals, foramina, fissures

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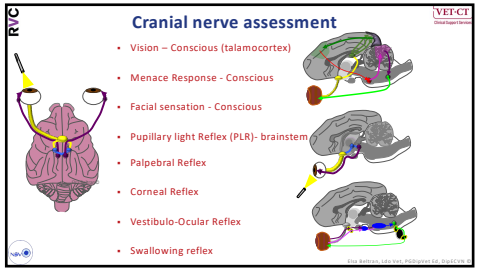
RVC
Cranial nerve assessment
VET-CT
Vision – Conscious (talamocortex)
Menace Response - Conscious
Facial sensation - Conscious
Pupillary light Reflex (PLR)- brainstem
Palpebral Reflex
Corneal Reflex
Vestibulo-Ocular Reflex
Swallowing reflex

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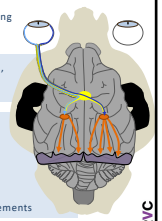
Visual Pathways

- Vertebrate eyes mediate both visual imaging and non-imaging functions
- Imaging vision, with its high spatial and temporal resolution, allows the animal to detect and track objects in the visual world
- Vision that does not form images provides a measure of ambient luminance
  - Synchronize the animal's biological clock
  - Control pupil size
  - Tracking objects by unconscious eye and head movements



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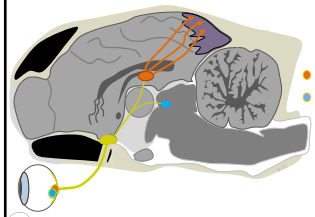
Visual signals



- **Visual perception**
- **Visual reflexes**
  - Body and ocular reflex
  - Accommodation
  - Pupillary constriction
  - Pupillary dilation

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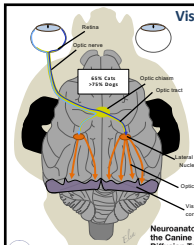
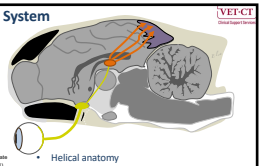
Visual System





- Helical anatomy
- Optical radiations from the LGN, two fiber loops carry information to the visual area: the Meyer loop (WM temporal lobe) and the Baum loop (occipital lobe)

Neuroanatomical Reconstruction of the Canine Visual Pathway Using Diffusion Tensor Imaging

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How can we assess visual perception?

- In dim light and normal light
- Watching the patient move in an unfamiliar environment
- How it negotiates obstacles
- Touch positioning
- Menace Response
- The Cotton Test
- Laser (cats)

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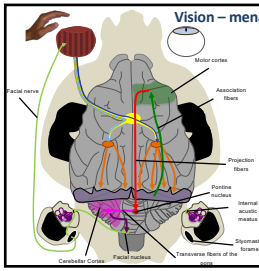
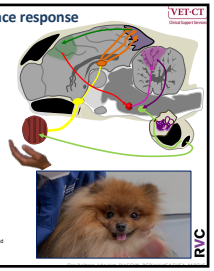
Vision – menace response





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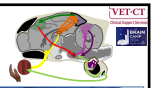
Vision – menace response

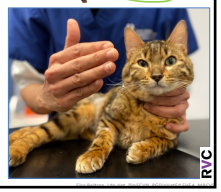
Accepted: 21 June 2018

Assessment of menace response in neurologically and ophthalmologically healthy cats

Pia R Quitt[1], Sven Reese[1], Andrea Fischer[1], Simon Bertram[1,2], Clara Tauber[1] and Lara Matiasek[1,2]

- Most revealed strong/complete RdA when the contralateral eye remained uncovered
- 40% failed when the contralateral eye was covered
- The most reliable examination mode was achieved standing behind the cat





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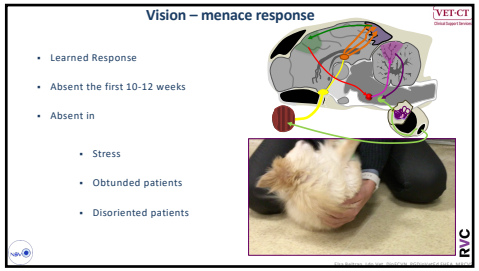
Vision – menace response
VET-CT
Learned Response
Absent the first 10-12 weeks
Absent in
Stress
Obtunded patients
Disoriented patients
RVC

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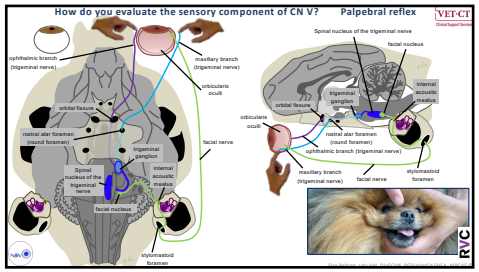
How do you evaluate the sensory component of CN V?
Palpebral reflex
VET-CT
ophthalmic branch (trigeminal nerve)
maxillary branch (trigeminal nerve)
orbicularis oculi
orbital fissure
rostral alar foramen (round foramen)
trigeminal ganglion
Spinal nucleus of the trigeminal nerve
internal acoustic meatus
facial nucleus
facial nerve
stylomastoid foramen
RVC

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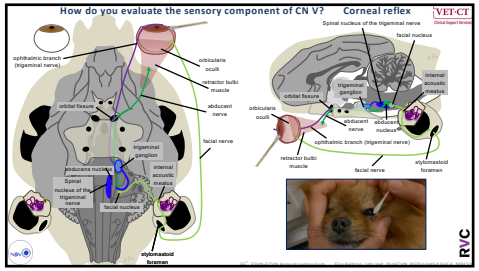
How do you evaluate the sensory component of CN V?
Corneal reflex
VET-CT
ophthalmic branch (trigeminal nerve)
orbicularis oculi
retractor bulbi muscle
abducent nerve
orbital fissure
trigeminal ganglion
facial nerve
abducens nucleus
Spinal nucleus of the trigeminal nerve
internal acoustic meatus
facial nucleus
stylomastoid foramen
RVC

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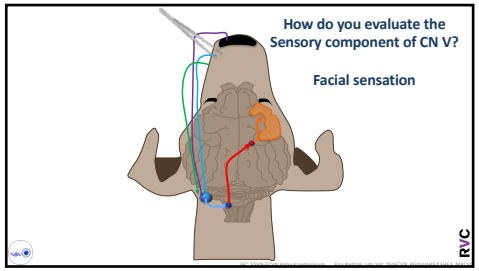
How do you evaluate the Sensory component of CN V?
Facial sensation
RVC

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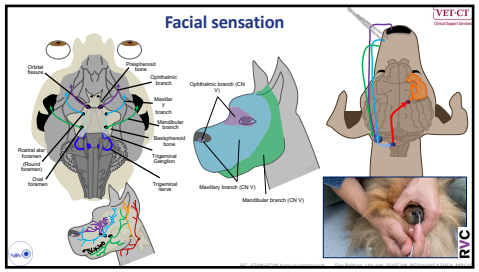
Facial sensation
VET-CT
Orbital fissure
Presphenoid bone
Ophthalmic branch
Maxillary branch
Mandibular branch
Basisphenoid bone
Rostral alar foramen (Round foramen)
Oval foramen
Trigeminal Ganglion
Trigeminal nerve
Ophthalmic branch (CN V)
Maxillary branch (CN V)
Mandibular branch (CN V)
RVC

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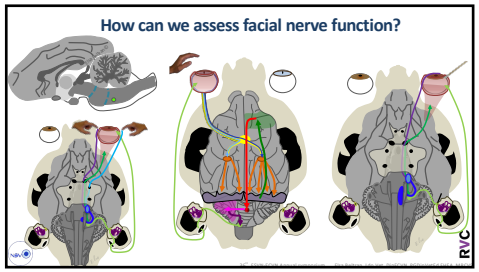
How can we assess facial nerve function?
RVC

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How can we assess facial nerve function?
VET-CT
RVC

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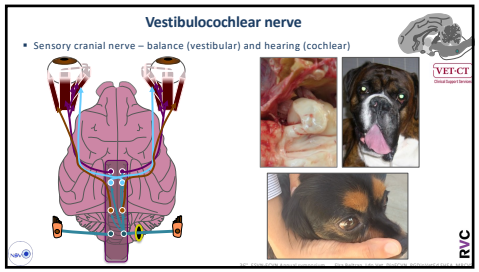
Vestibulocochlear nerve
Sensory cranial nerve – balance (vestibular) and hearing (cochlear)
VET-CT
RVC

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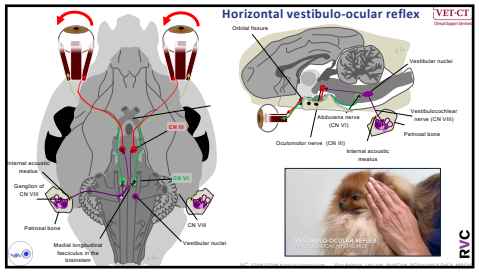
Horizontal vestibulo-ocular reflex
Orbital fissure
Vestibular nuclei
Abducens nerve (CN VI)
Vestibulocochlear nerve (CN VIII)
Petrosal bone
Oculomotor nerve (CN III)
Internal acoustic meatus
CN III
CN VI
CN VIII
Ganglion of CN VIII
Petrosal bone
Medial longitudinal fasciculus in the brainstem
Vestibular nuclei
VET-CT
RVC

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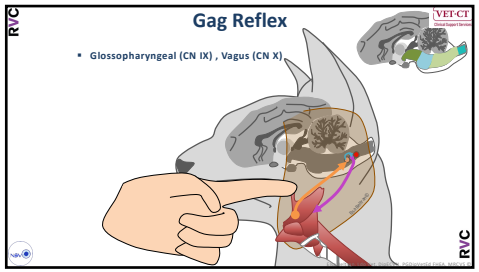
Gag Reflex
Glossopharyngeal (CN IX) , Vagus (CN X)
RVC
VET-CT
RVC

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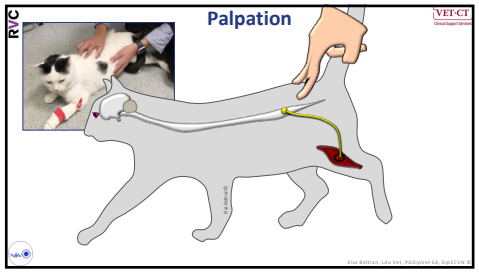
Palpation
RVC
VET-CT

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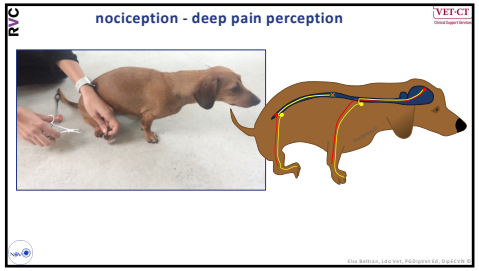
nociception - deep pain perception
RVC
VET-CT

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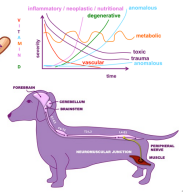
clinical reasoning

Five Finger Rule – Ready to apply this?



- Signalment
- Onset
- Clinical Course
- Lateralisation
- Pain
- Neuroanatomical Localisation

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Thank you so much

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