Anisocoria

From the ophthalmologist perspective

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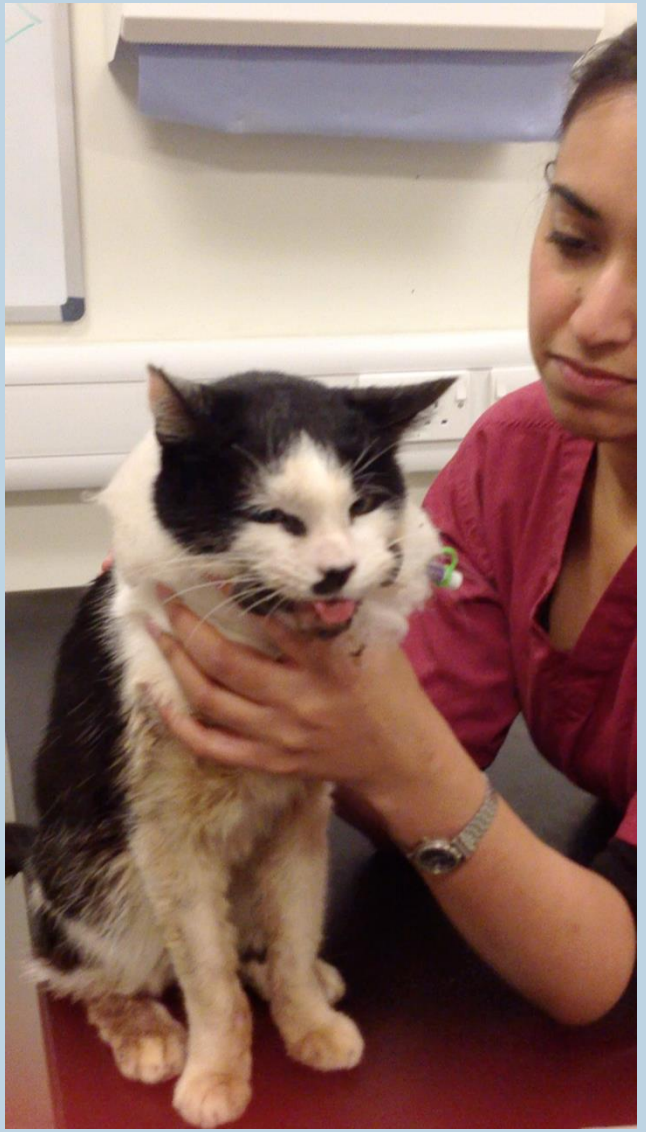
Brief

- Revision of autonomic innervation - basic
- How to work up an anisocoric patient
  - From iridal abnormalities to Horner´s
- Understand the drugs!

Anisocoria

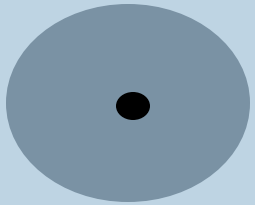
- 5 year old – suffered RTA 2 days ago
- Inhouse consultation due to a marked anisocoria despite being stable otherwise
- Jaw wire applied due to mandibule fracture
- O-tube for feeding



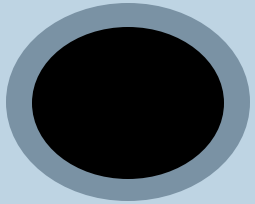
Causes of anisocoria

- Neurologic:
  - cnIII parasimpathetic branch – Medial cranial fossa disease
  - Sympathetic branch – Horner´s disease
- Systemic drug related:
  - Ketamine: mydriasis in cats
  - Opioids: miosis in dogs, mydriasis in cats
- Ophthalmic treatments
  - Mydriatics: atropine, tropicamide, cycloplentolate
  - Miotics: prostaglandine analogues (latanoprost, travoprost…)
- Iridal abnormalities

Ophthalmic causes of anisocoria



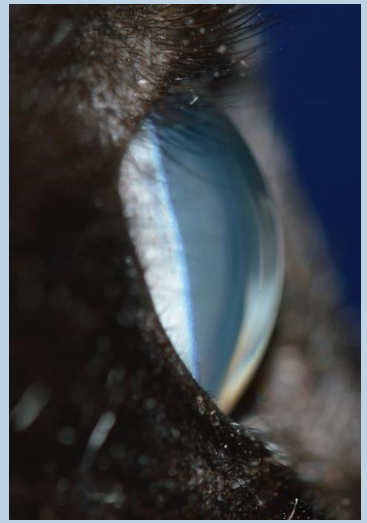
- Miosis:
  - Uveitis:
    - Reflex uveitis: Corneal ulcer or abscess – cause of reflex uveitis which leads to ipsilateral miosis
    - Uveitis: inflammation, infection – “ocular lymphadenopathy”
    - Anterior segment uveal neoplasia

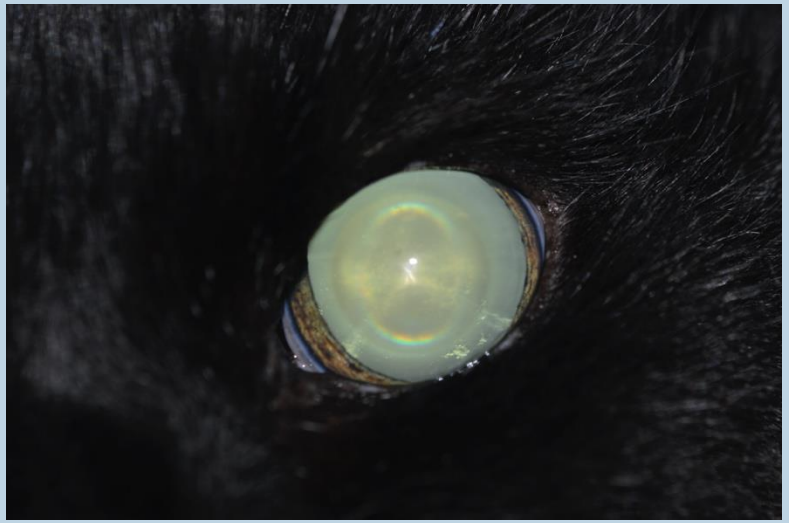


- Mydriasis
  - High intraocular pressure – causes damage to nerves and muscles
  - Anterior lens luxation or lens subluxation – lens in abnormal location interferes with iridal movement
  - Iridal muscle changes

Patient with anisocoria

- Full ophthalmic examination to identify which pupil is abnormal
- Assess patient on normal consult light and in dim light
- Assess patient
  - Corneal ulcer or abscess
  - Intraocular pressure
  - Assess the position of the lens
  - Iridal appearance





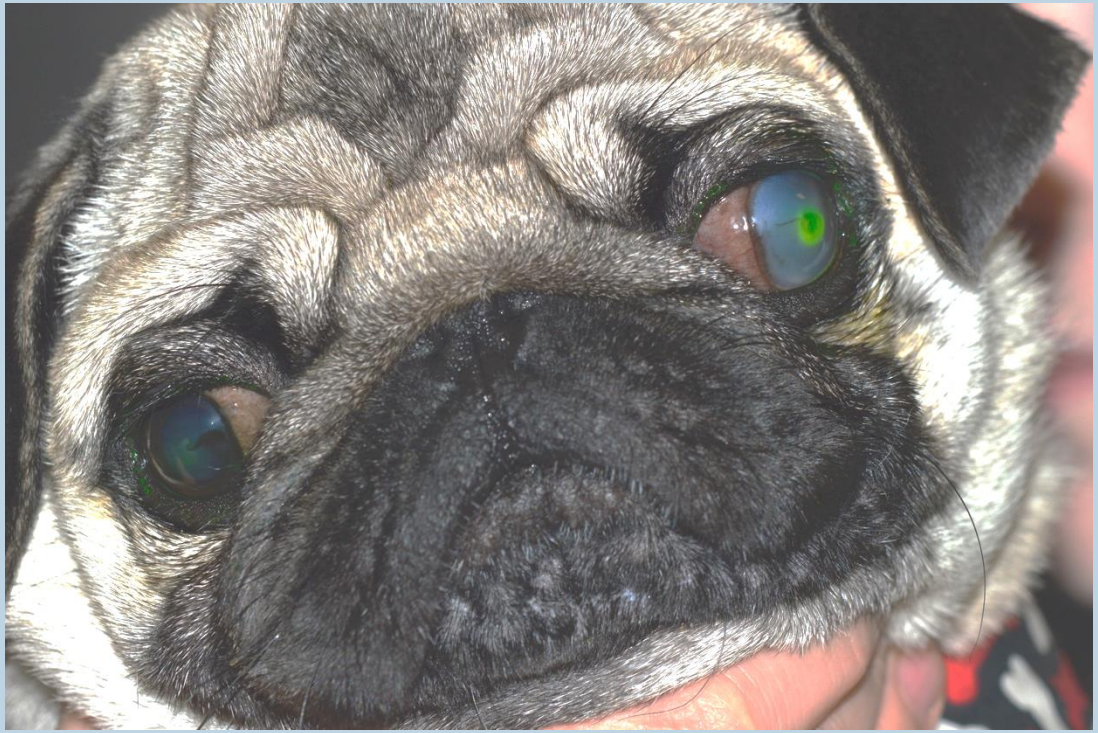
Misdirection Syndrome

Patient with anisocoria

- Assess PLRs
- LIGHTED ROOM
  - Check pupil size – be suspicious of the dilated pupil
- DIMMED-DARKENED ROOM
  - Check pupil size – be suspicious of the miotic pupil

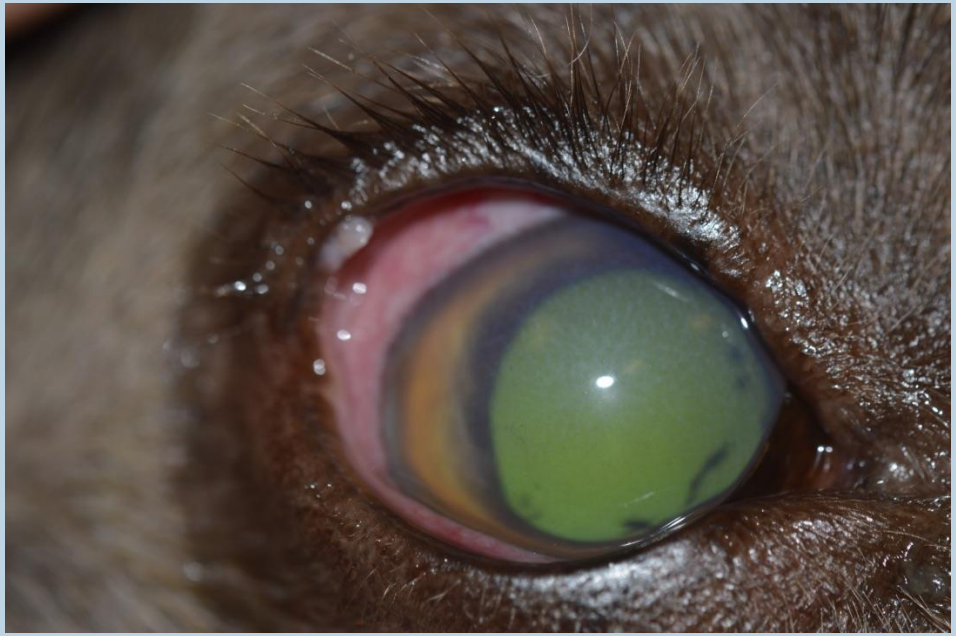
Patient with anisocoria

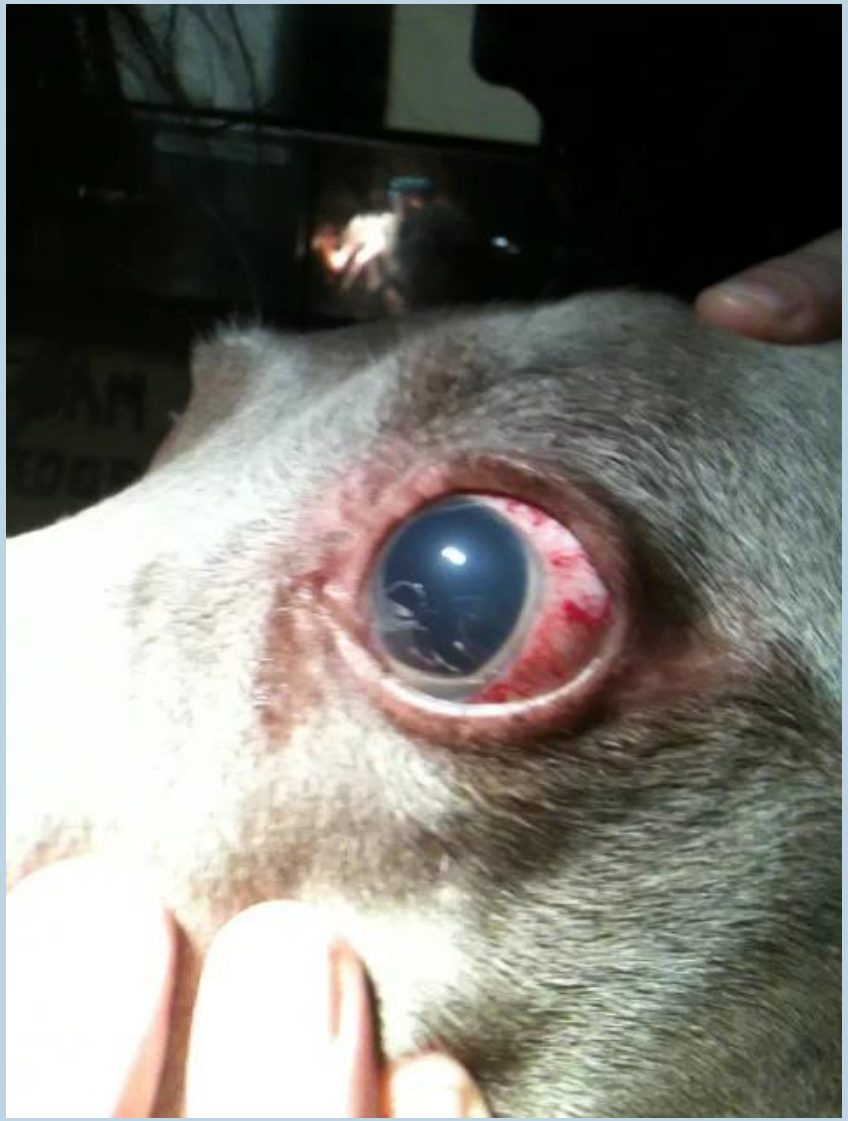
- Corneal ulcer or abscess which could be cause of miosis



Patient with anisocoria

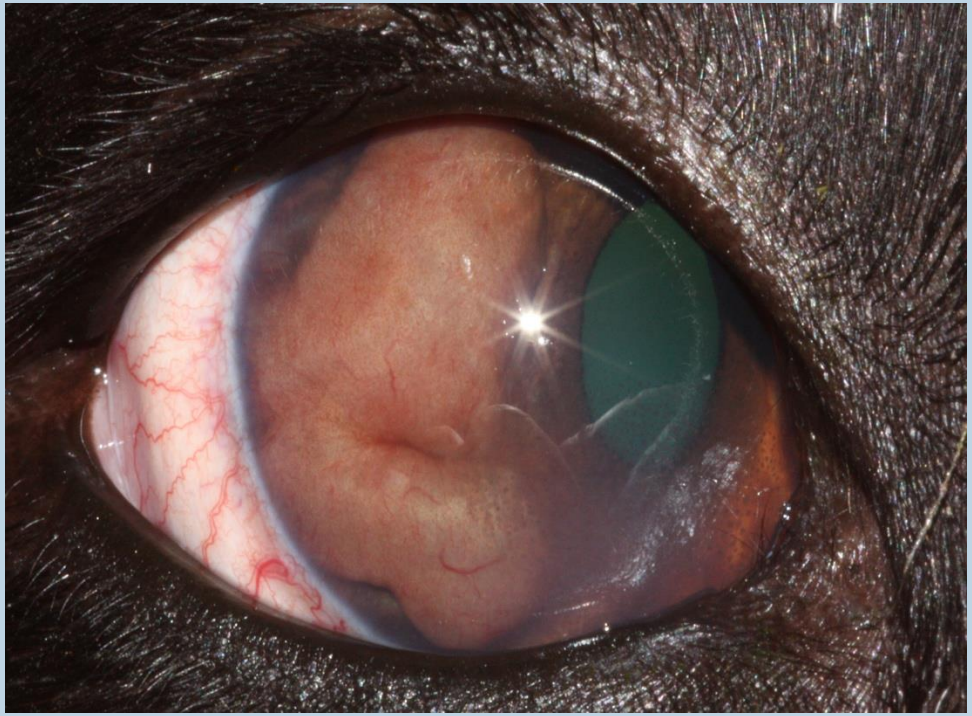
- Check IOPs

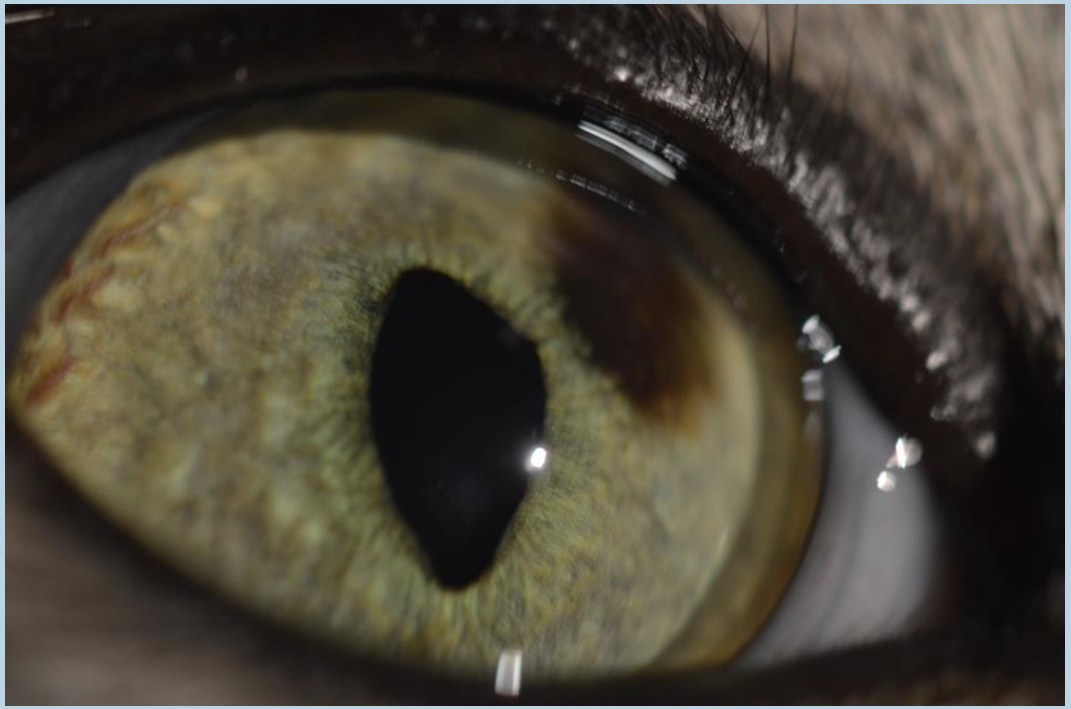


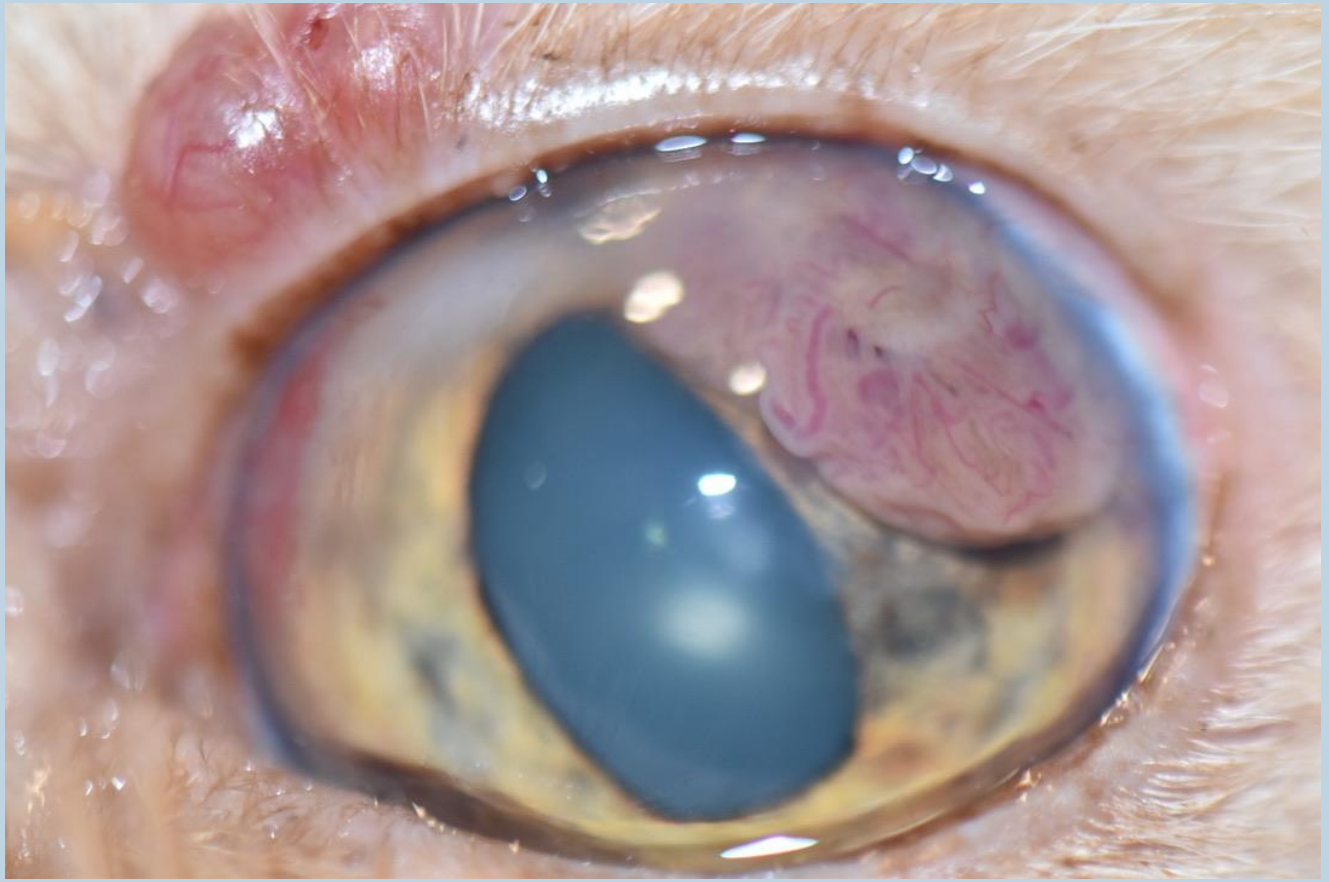


Patient with anisocoria

- Evaluate the iridal appearance to identify lesions or changes

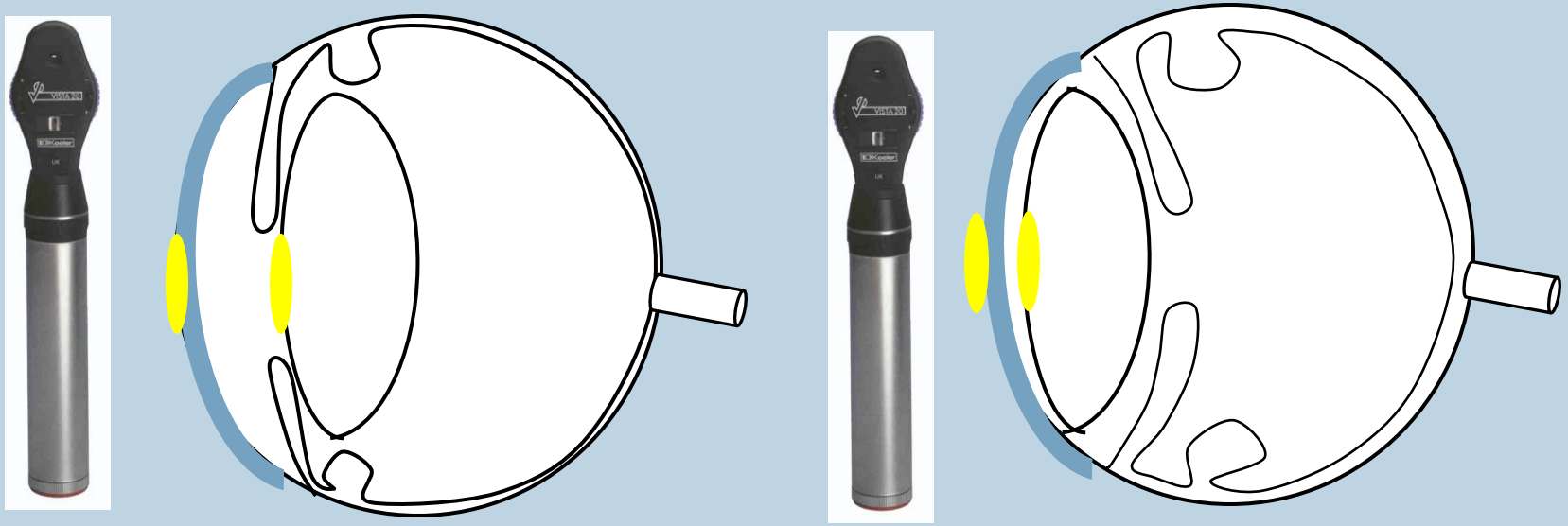


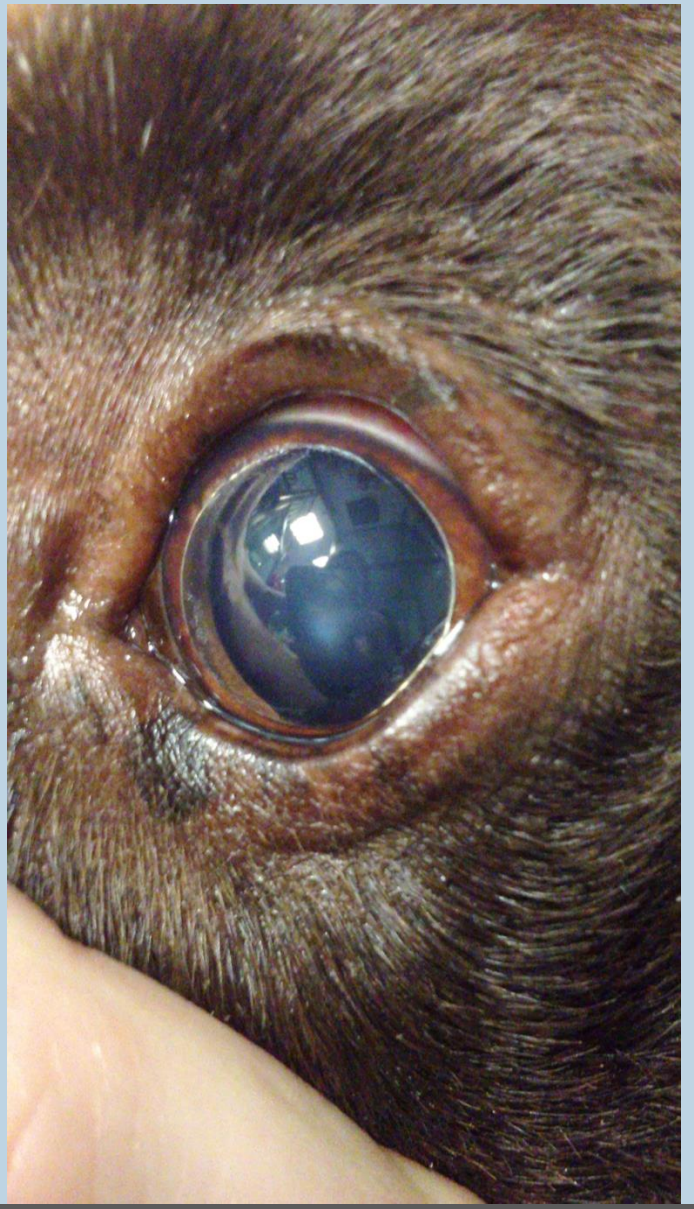




Patient with anisocoria

- Assess the position of the lens within the eye (ocular ultrasound)

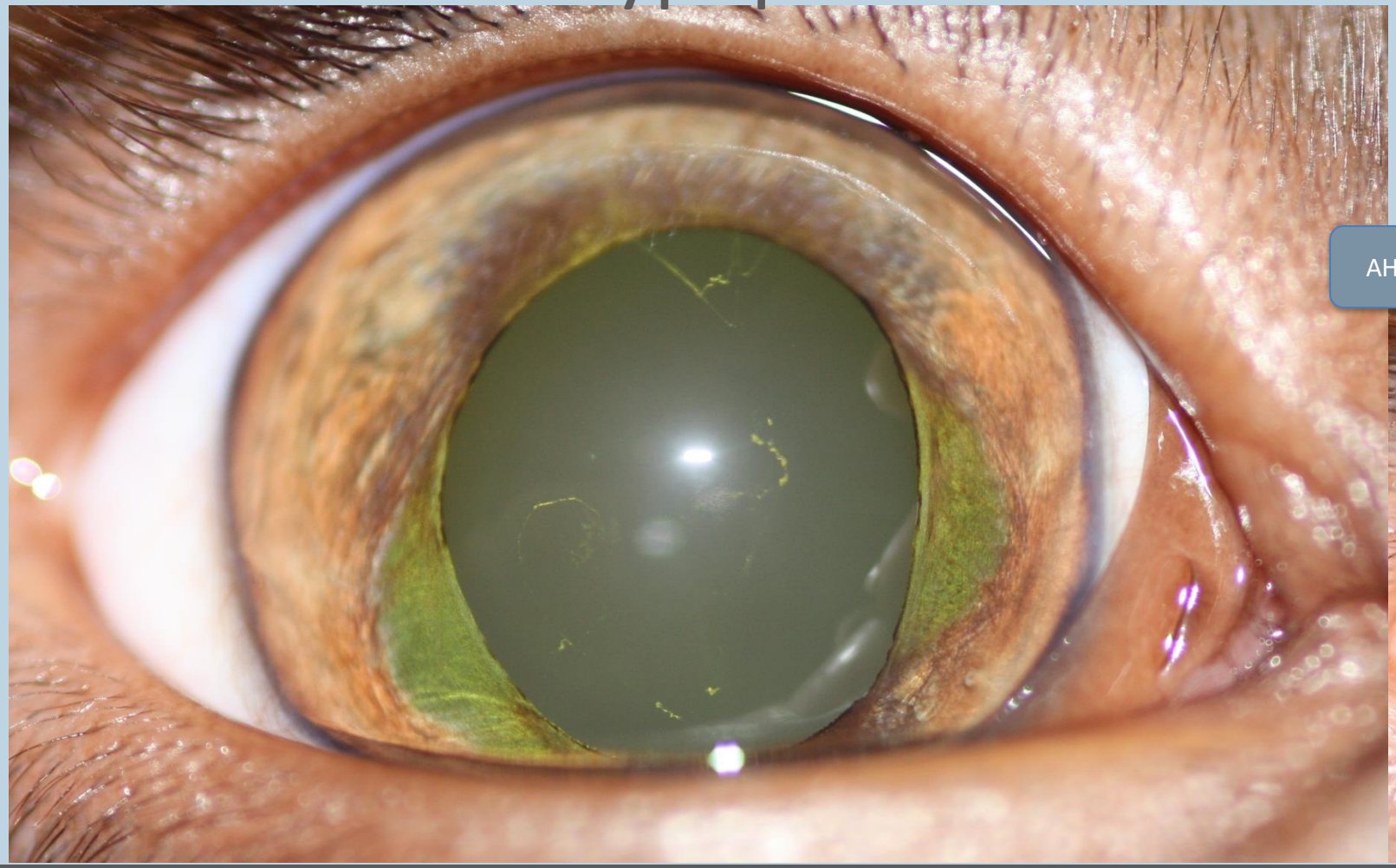




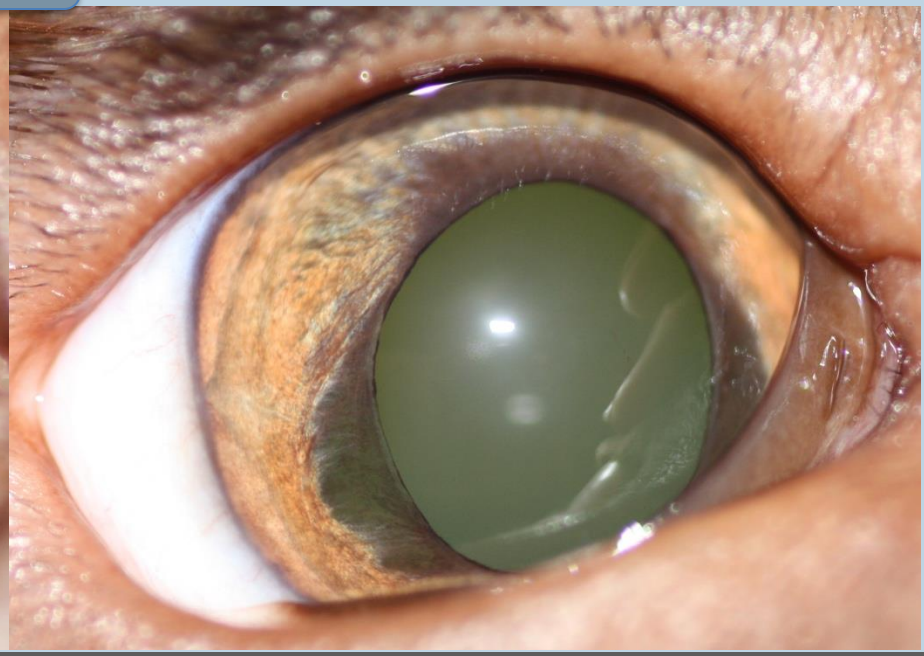
Patient with anisocoria

- Evaluate the iridal appearance to identify lesions or changes
  - Hypoplasia: thinning of the iridal structure
  - Atrophy: moth-eaten appearance of the pupillary border
  - Coloboma: typically defect at 6h position or atypical in other areas

Iridal hypoplasia



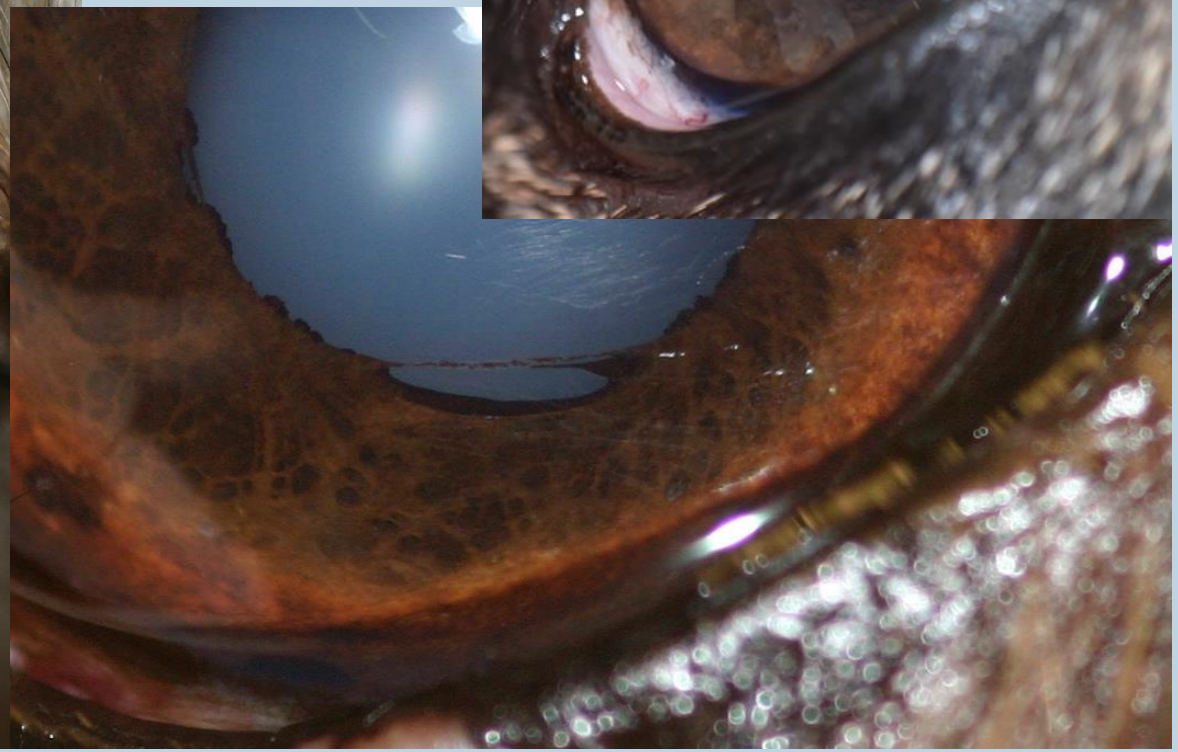
AHT



Iridal coloboma (atypical)

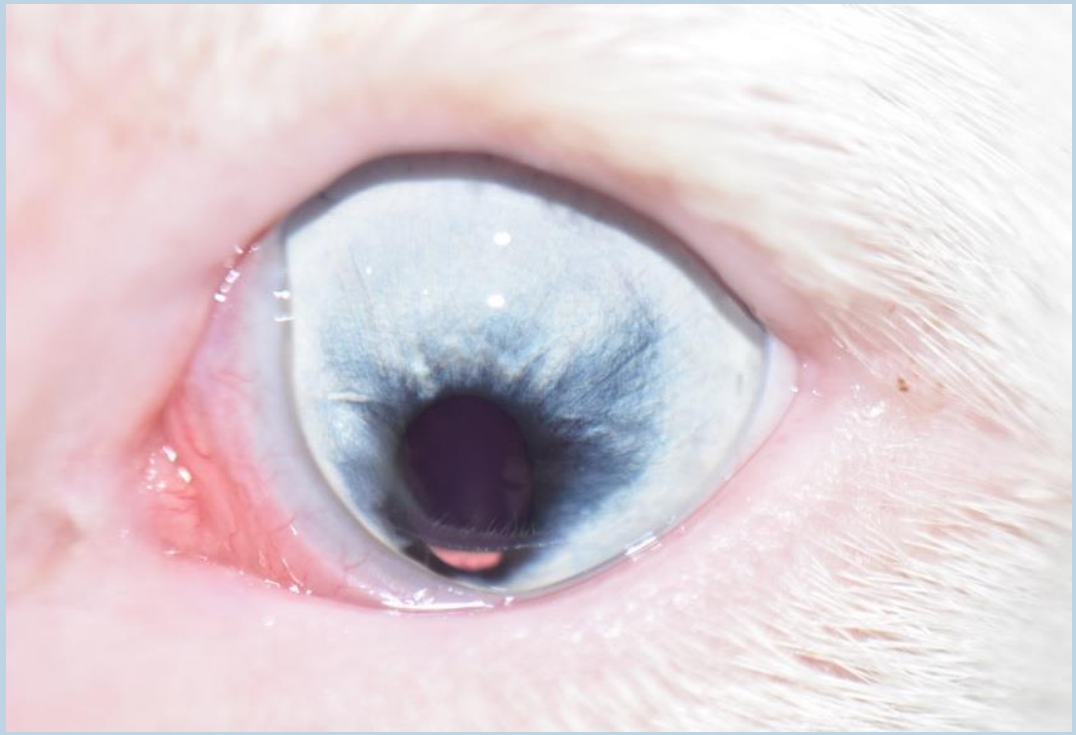
Iridal atrophy (irregular pupillary border)

Iridal coloboma (at 6h position)



Iridal atrophy - iridal stromal loss

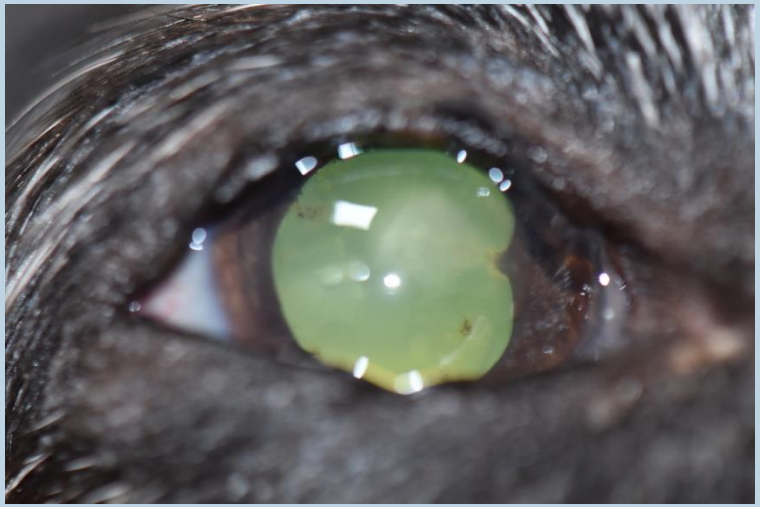
Other causes of anisocoria



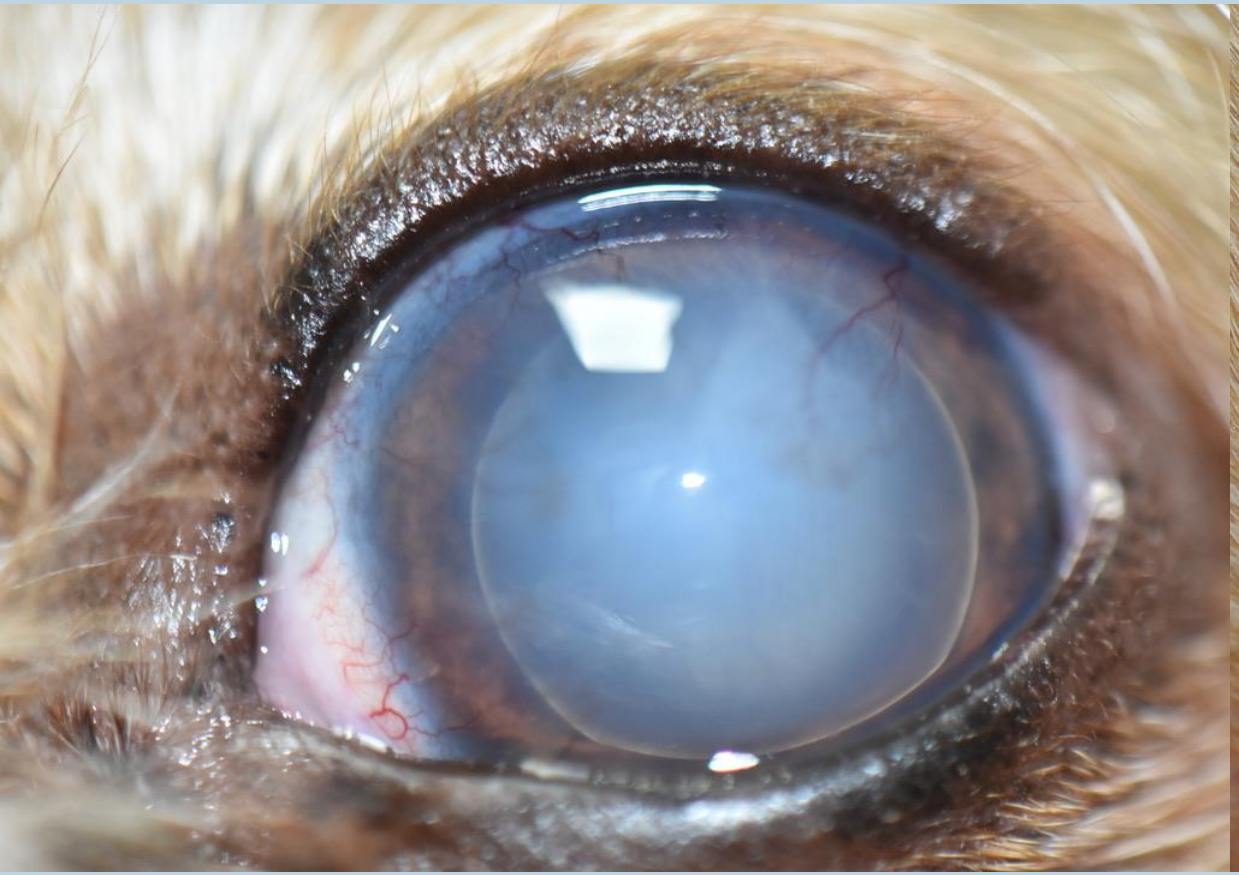
Multiple ocular defects

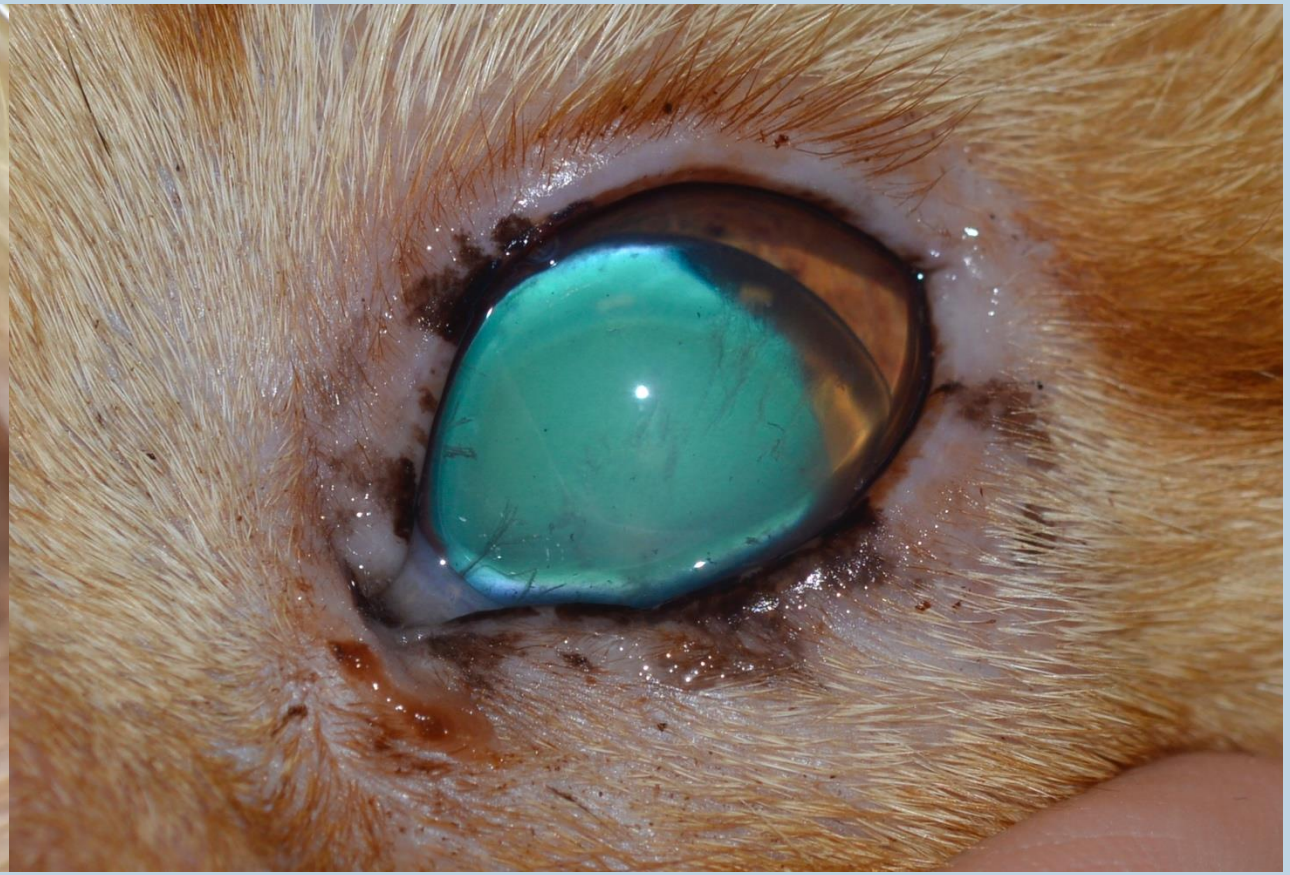
Uveal cysts

Synechiae

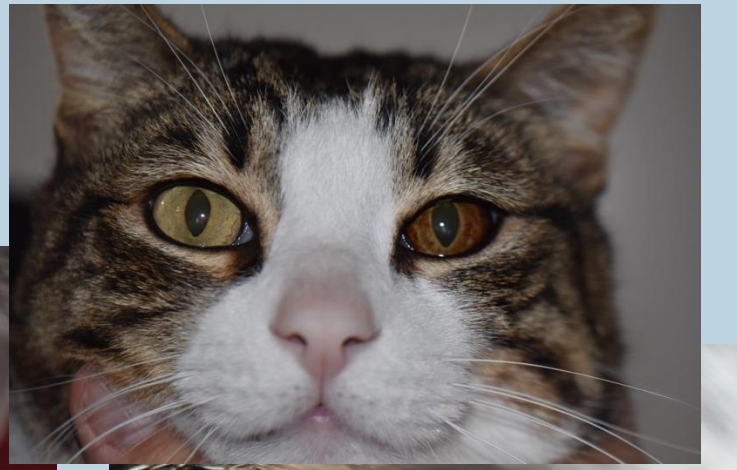


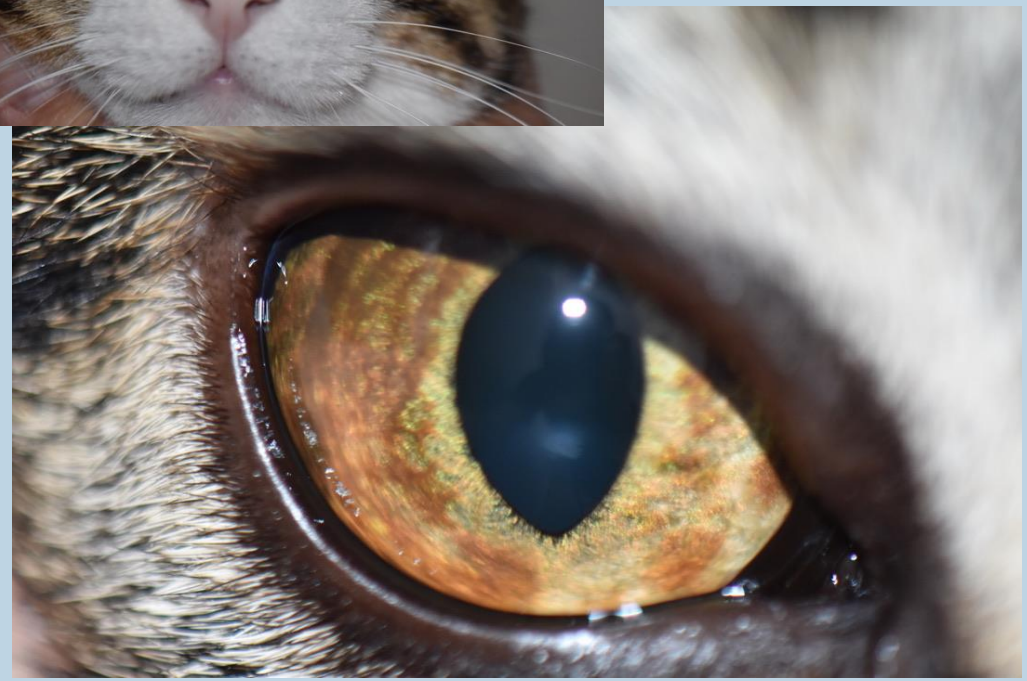
Anterior lens luxation



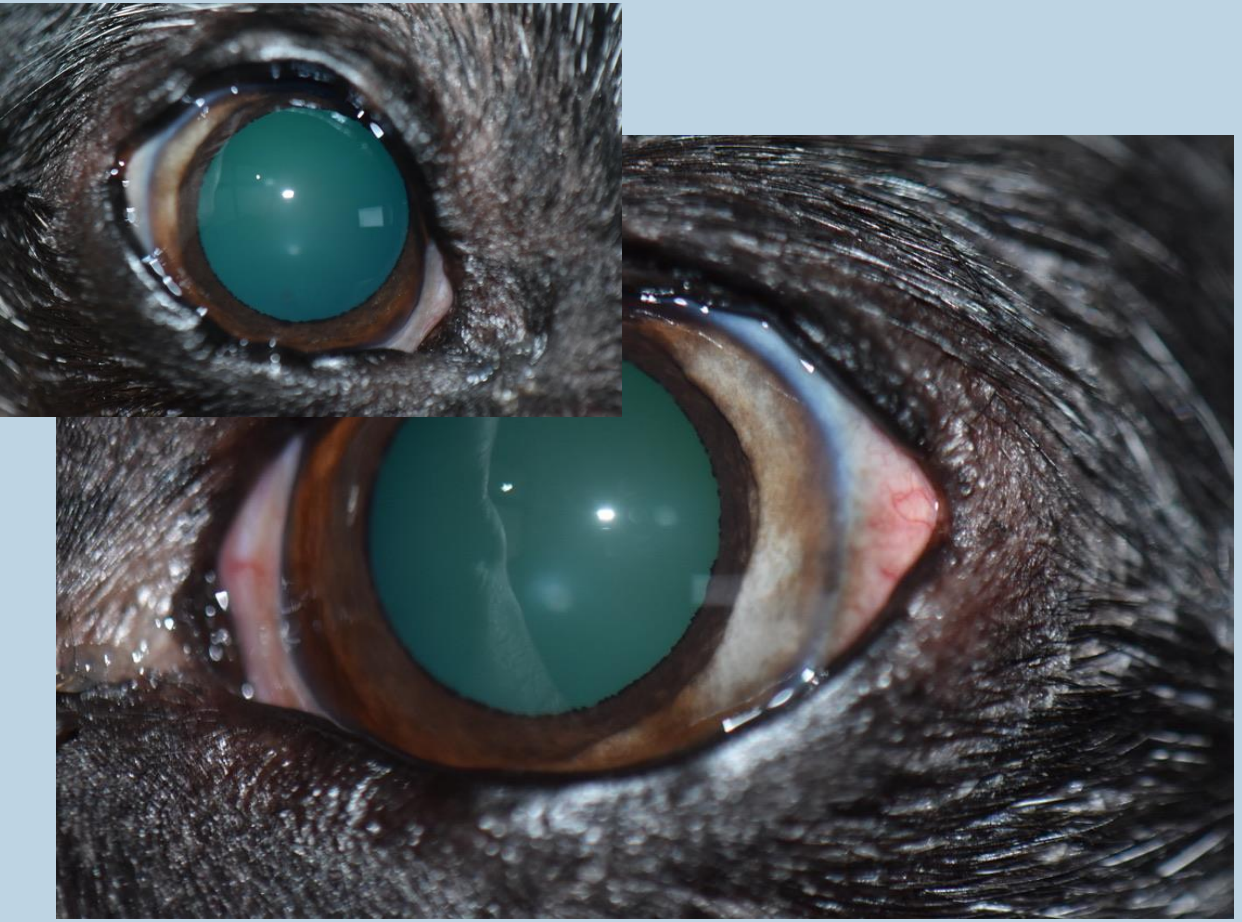


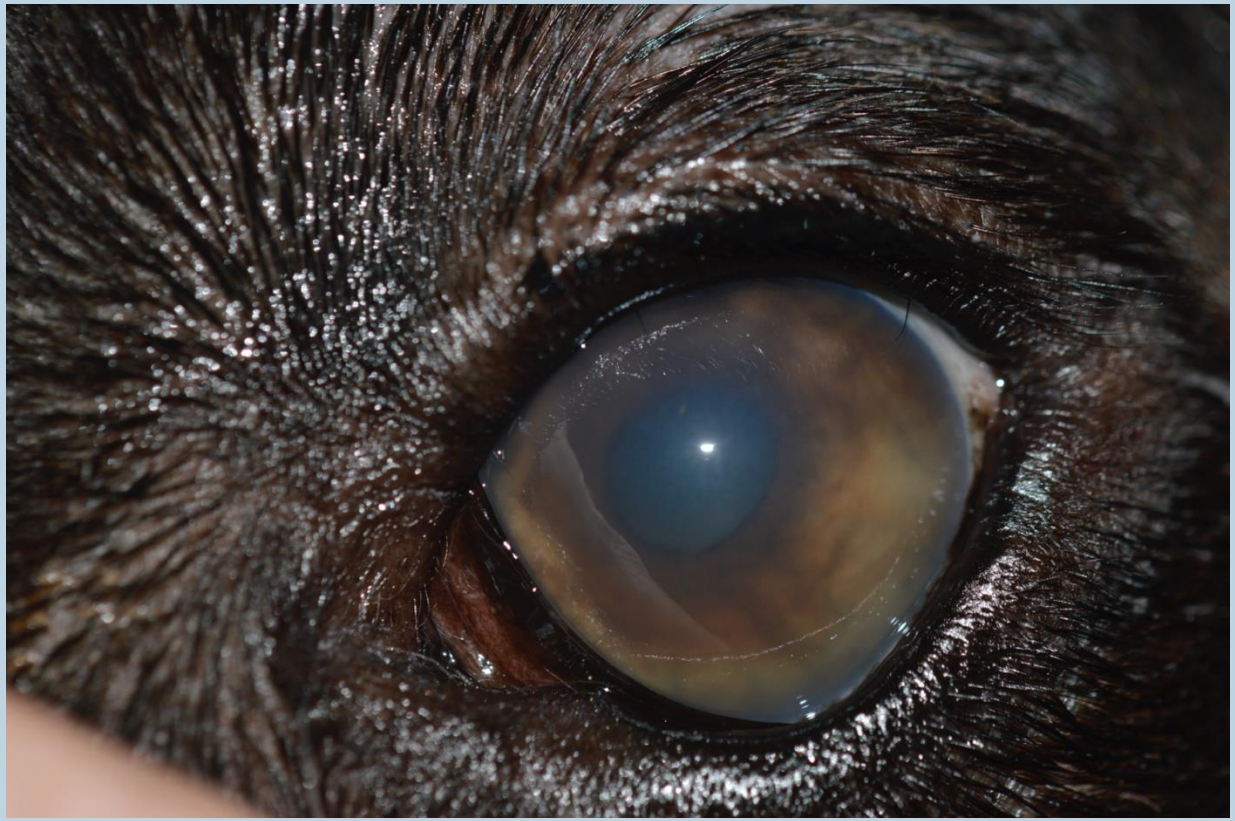
Infiltration of the iris





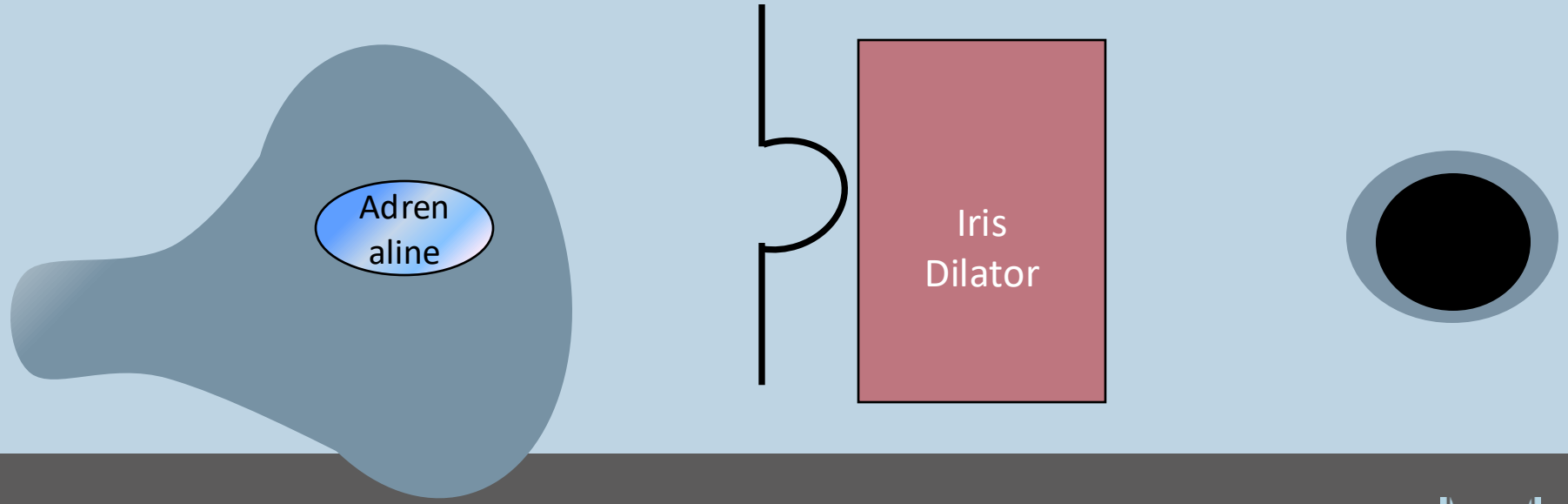
Nodular iridal infiltrates





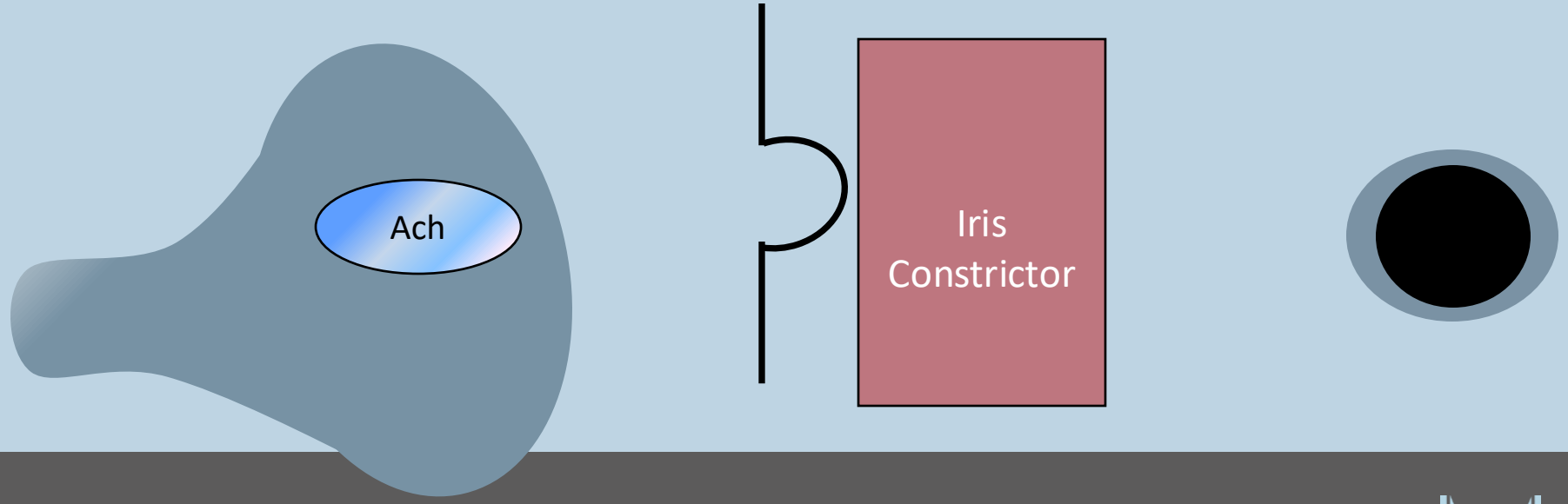
Working up an anisocoric patient

Assess the patient in dim light to assess capacity of dilation of the iridal muscle



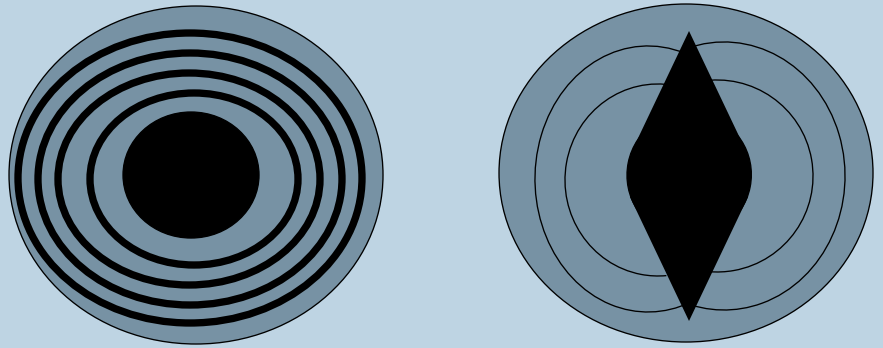
Working up an anisocoric patient

In dim light, shinning a bright light to assess constrictor muscle

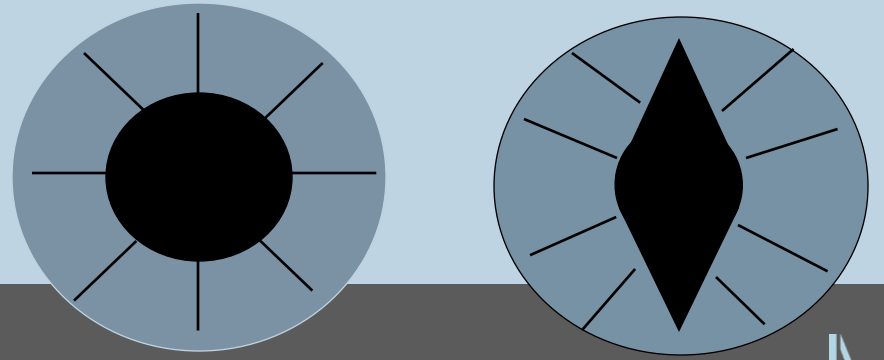


Working up an anisocoric patient

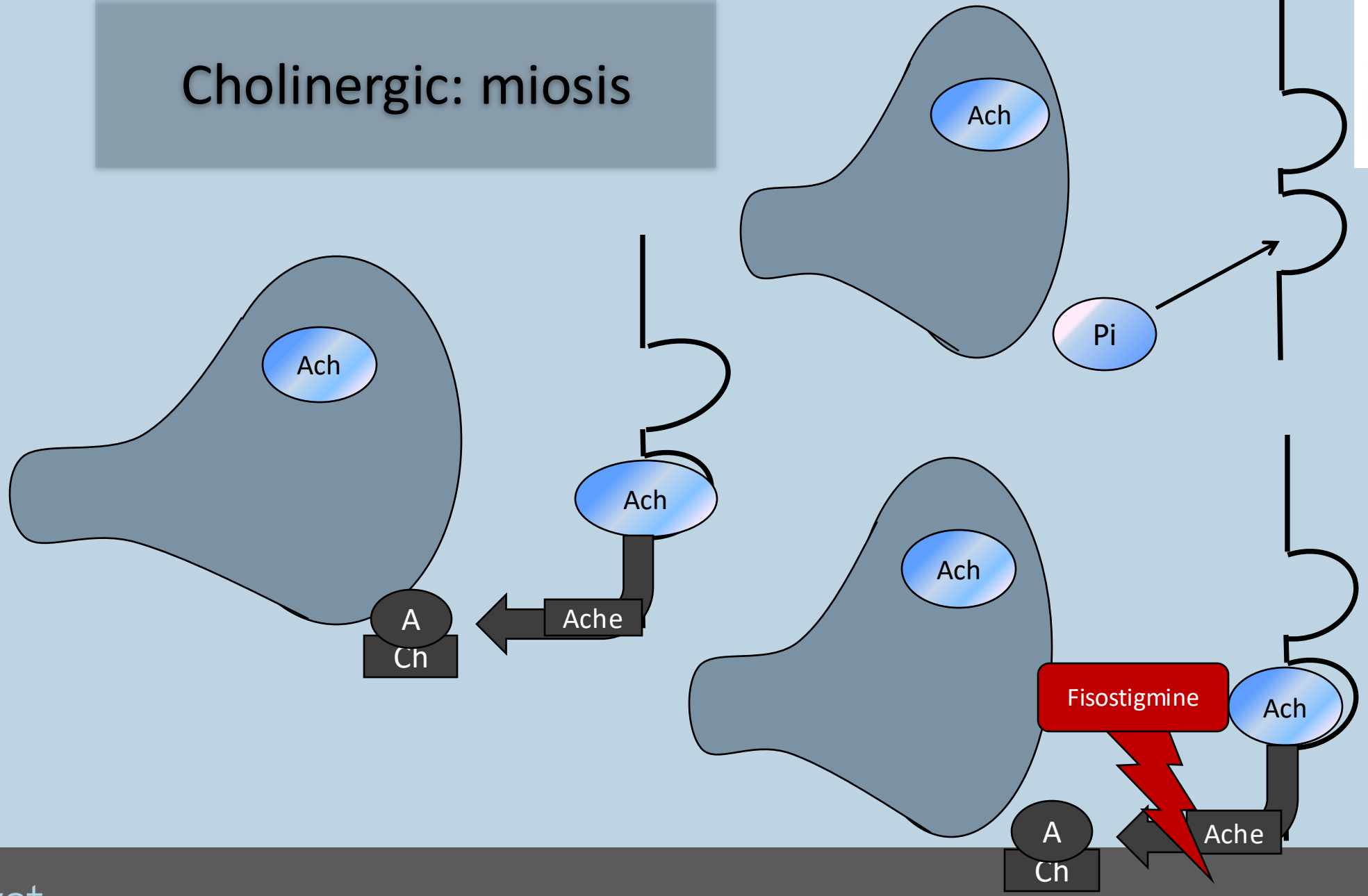
Iridal sphyncter ➔ parasympathetic (cn.III) - Acetylcholine



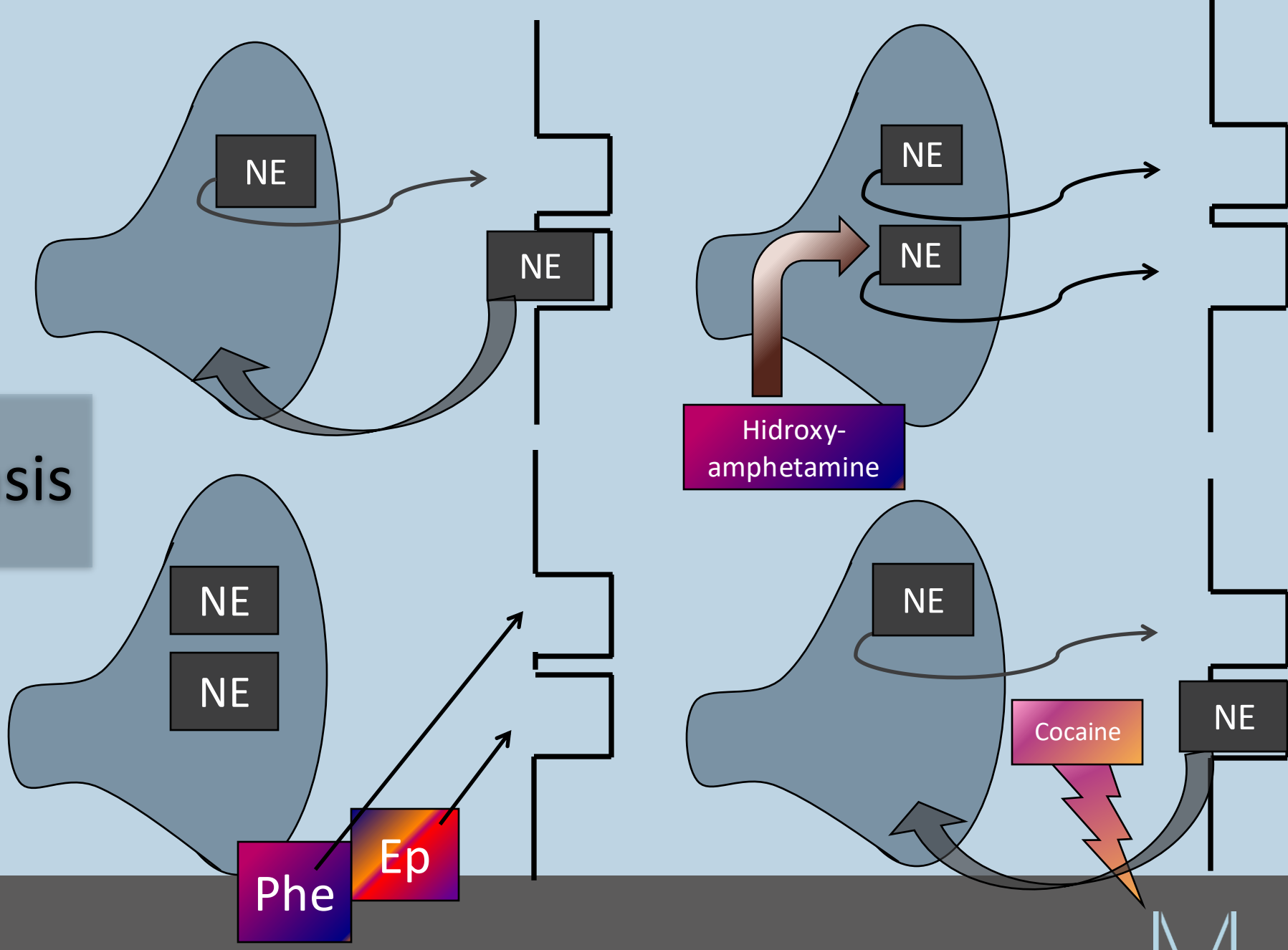
Iridal dilator ➔ sympathetic (runs in orbit with cn.V) - Adrenaline



Cholinergic: miosis



Adrenergic: mydriasis



Common query from neurologists

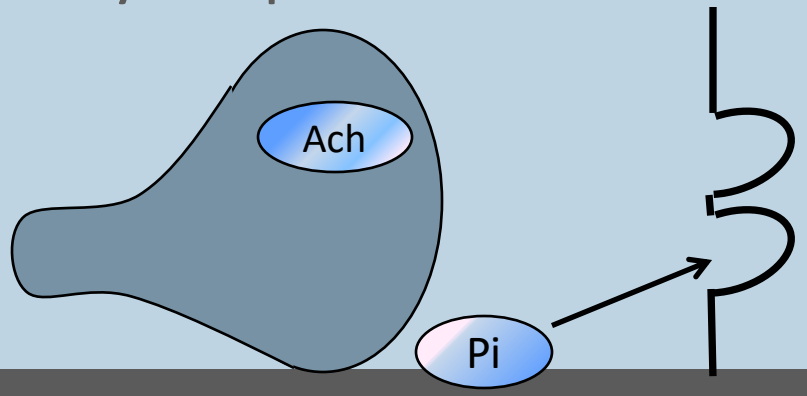
- Is this pupil dilated due to iridal atrophy?

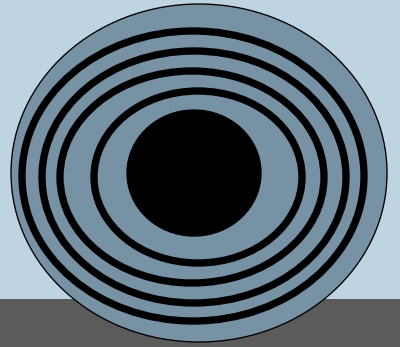
Working up an anisocoric patient

Iridal sphyncter ➔ parasympathetic (cn. III) – Acetylcholine

Pilocarpine eyedrop 1% once to see response

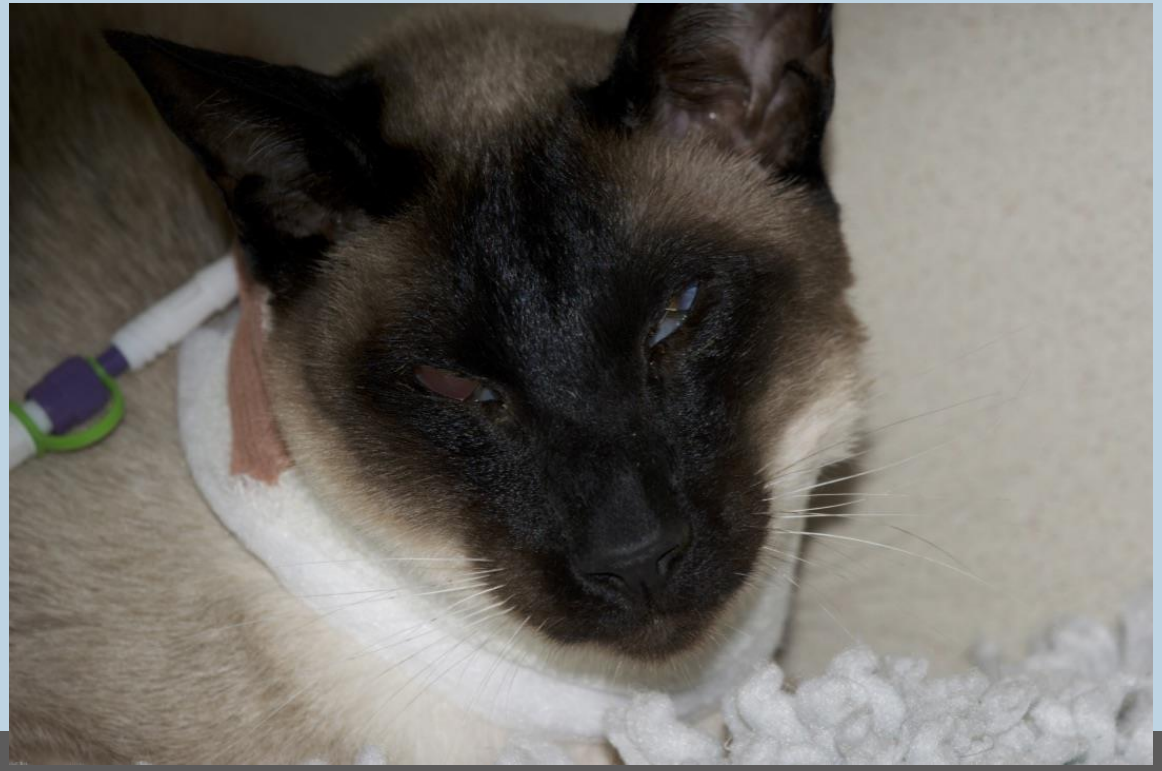
- pH very acidic, can be quite painful
- Only in specific cases





Common query from neurologists

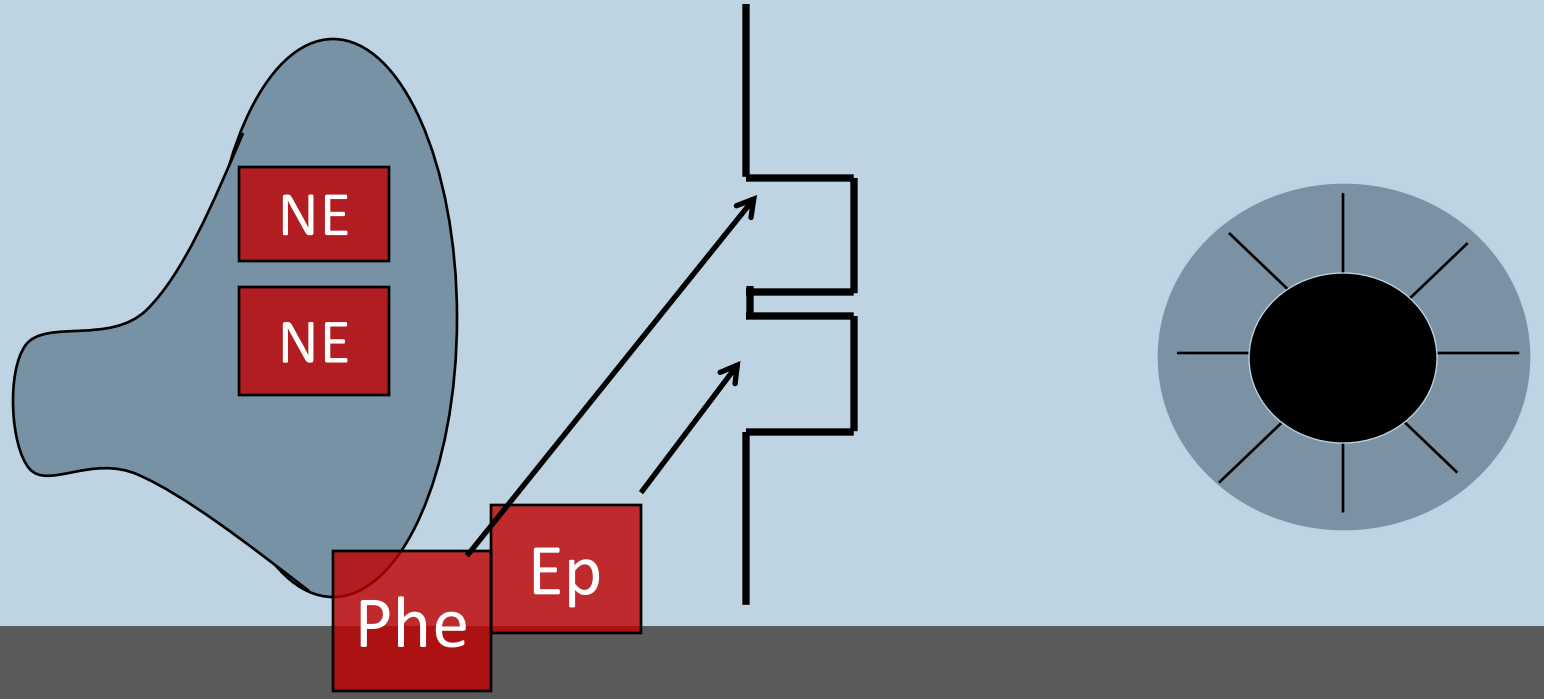
- Is this pupil miotic due to an ocular disease?



Working up an anisocoric patient

Iridal dilator ➔ sympathetic – Adrenaline

Phenilefrine topically at 2.5% (care systemic effects if using 10% specially in small patients)



Working up an anisocoric patient

- Iridal dilator ➔ sympathetic – Adrenaline
- Phenilefrine topically at 2.5% (care systemic effects if using 10% specially in small patients)
- **Not used in clinical daily basis**, as miotic pupils tend to have an ocular reason (ulcers, uveitis) or we might be dealing with a Horner´s Syndrome, which we might consider low doses of phenilefrine to diagnose the condition
- Reminder: Atropine, Tropicamide and Cyclopentolate: are parasympaticolitics, so will not have an effect on the iridal dilator – only inhibits the iridal sphyncter

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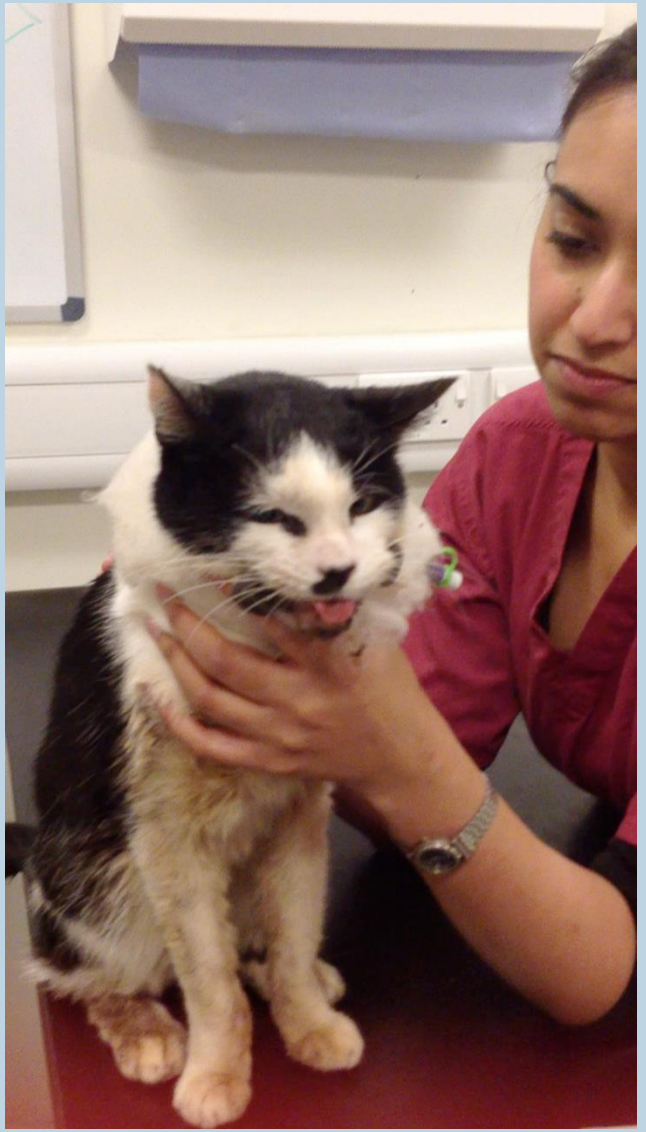
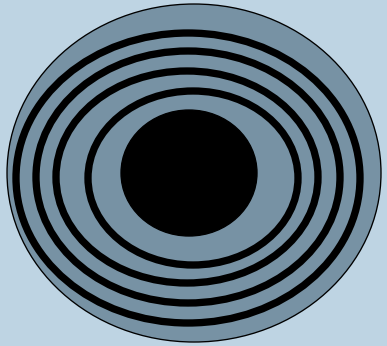
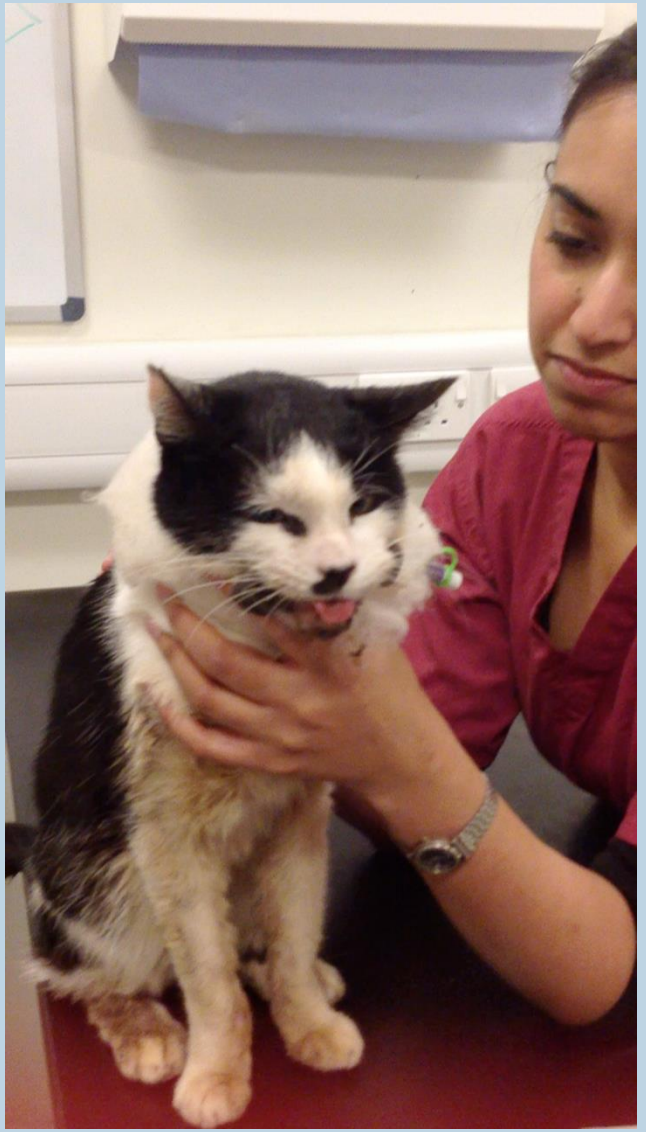


Anisocoria

- What would be your next step?
- Testing patient's iridal sphyncter
  - Pilocarpine?





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Common query from neurologists

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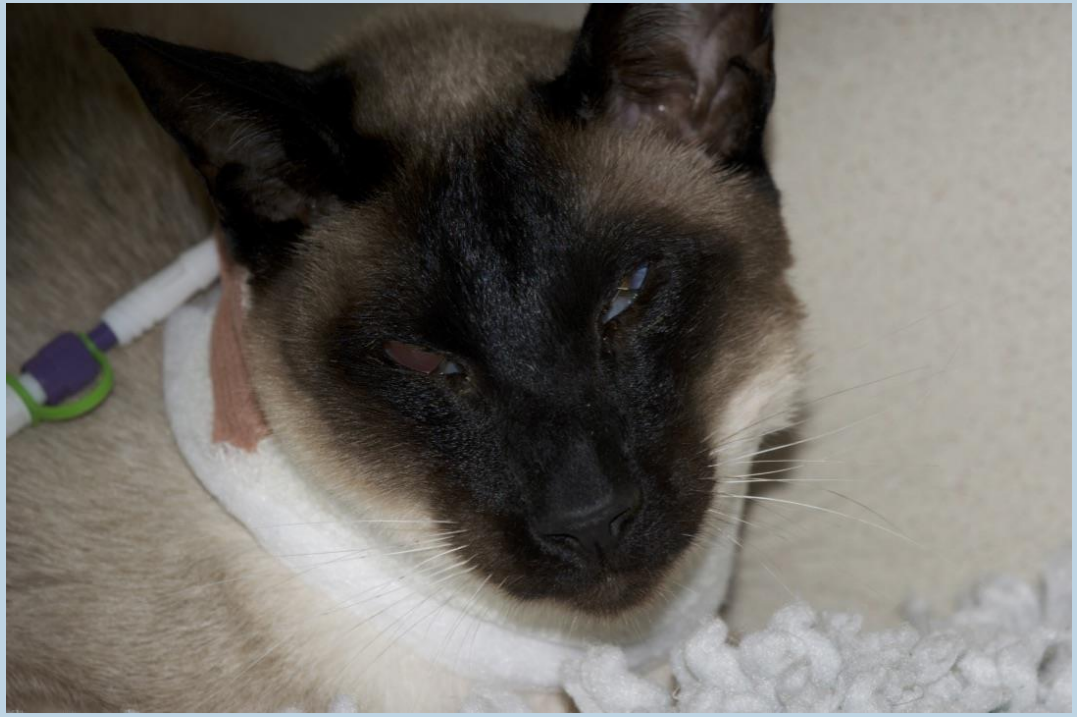
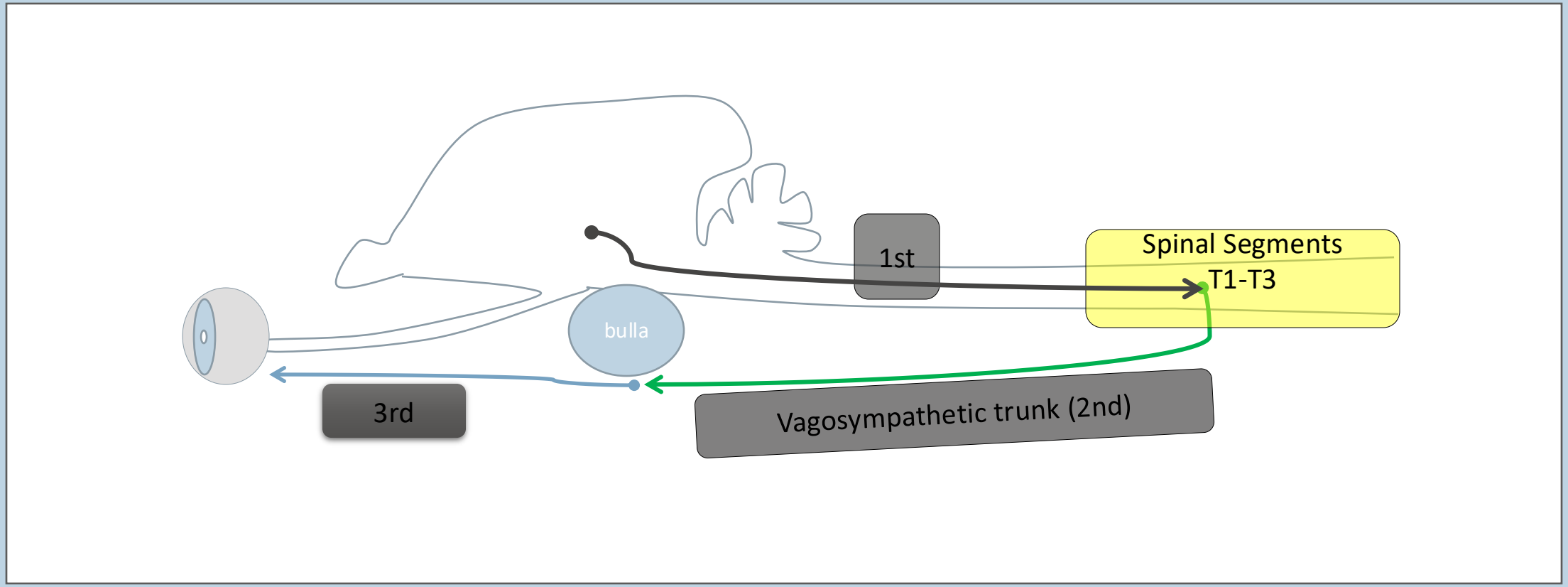


Sympathetic innervation of the eye

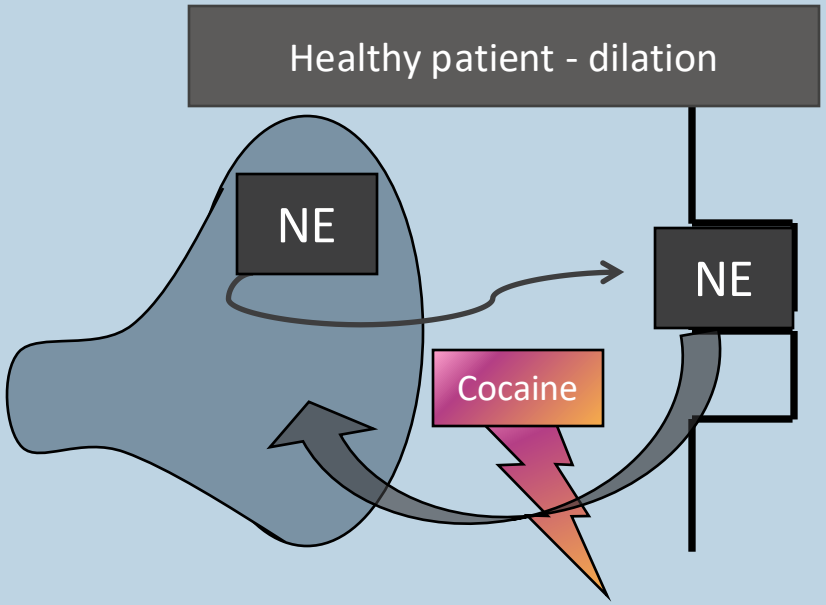


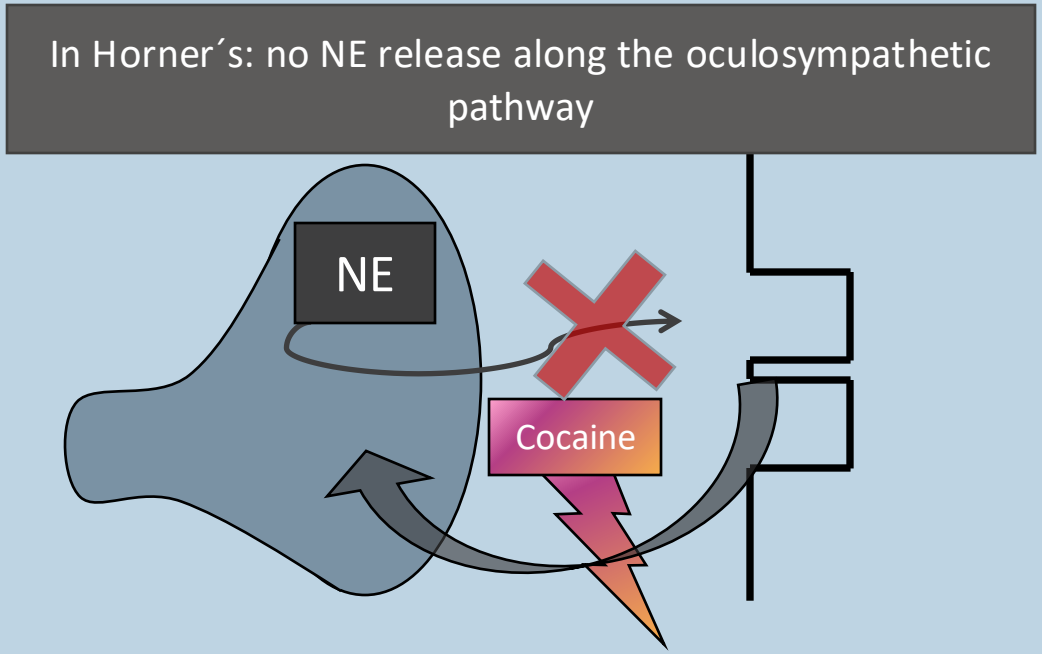
Horner’s Syndrome

- To test or not to test?
- Pharmacological testing with 1% or 10% phenylephrine usually results in resolution of the miosis within 20 minutes.
- In a dog or cat with an acute onset of Horner’s syndrome that demonstrates rapid resolution following topical phenylephrine testing, and where there is no evidence of underlying clinical or neurological deficits or ear disease, it would be reasonable to make a diagnosis of idiopathic Horner’s syndrome

Horner’s Syndrome - To test or not to test?

- The gold standard test for Horner’s syndrome in all animals is the topical application of 1 drop of a 5% or 10% solution of cocaine





Horner’s Syndrome - To test or not to test?

- To test or not to test?
- Many ophthalmologists simply use the minimal dilation of the miotic pupil to parasympatholytics and the complete ophthalmologic examination to rule out subtle uveitis and keratitis
- Apraclonidine (weak alfa1adrenergic): might be toxic to cats at the commercial dose (Miller AmJVetRes 1996) not recommended in dogs either (Willis VO2002)

A review of Horner’s syndrome in small animals

Danielle M. Zwueste and Bruce H. Grahn

Pharmacological localization?

- Completed in 2-3 visits

A review of Horner's syndrome in small animals

Danielle M. Zwueste and Bruce H. Grahn

Table 1. Summary of pharmacological diagnosis and localization of Horner's syndrome.

Drug	Mechanism of action	Use	Effect
Cocaine (5% or 10%)	Prevents norepinephrine reuptake	Confirm Horner's syndrome	No effect on Horner's pupil/Dilates normal pupil
Apraclonidine (0.5% or 1%)	Weak α-1 adrenergic agonist	Confirm Horner's syndrome	Dilates Horner's pupil (not validated in veterinary patients)
Phenylephrine (0.1% or 1%)	Direct sympathomimetic	Localize Horner's syndrome	Dilates with postganglionic lesion < 20 min No effect on preganglionic, central lesions or normal eye
Hydroxyamphetamine (1%)	Indirect sympathomimetic	Localize Horner's syndrome	Dilates with preganglionic or central lesion, normal eye < 45 min No effect on postganglionic lesion

Pharmacological localization?

- 1% Pheny is most commonly reported, authors also report 0,1%
- Imperative to apply bilaterally and simultaneously
- In unilateral, the non-affected serves as control, as will not dilate in the first 20min of application

A review of Horner's syndrome in small animals

Danielle M. Zwueste and Bruce H. Grahn

Pharmacological localization?

- 3rd order unilateral: most common

- Localization 1% Phenylefrine:
  - 3rd order:
    - Mydriasis and resolve enophthalmos and NM protrusion and ptosis under 20min
  - 2nd-1st order or Healthy (dog, cat, horse)
    - No change

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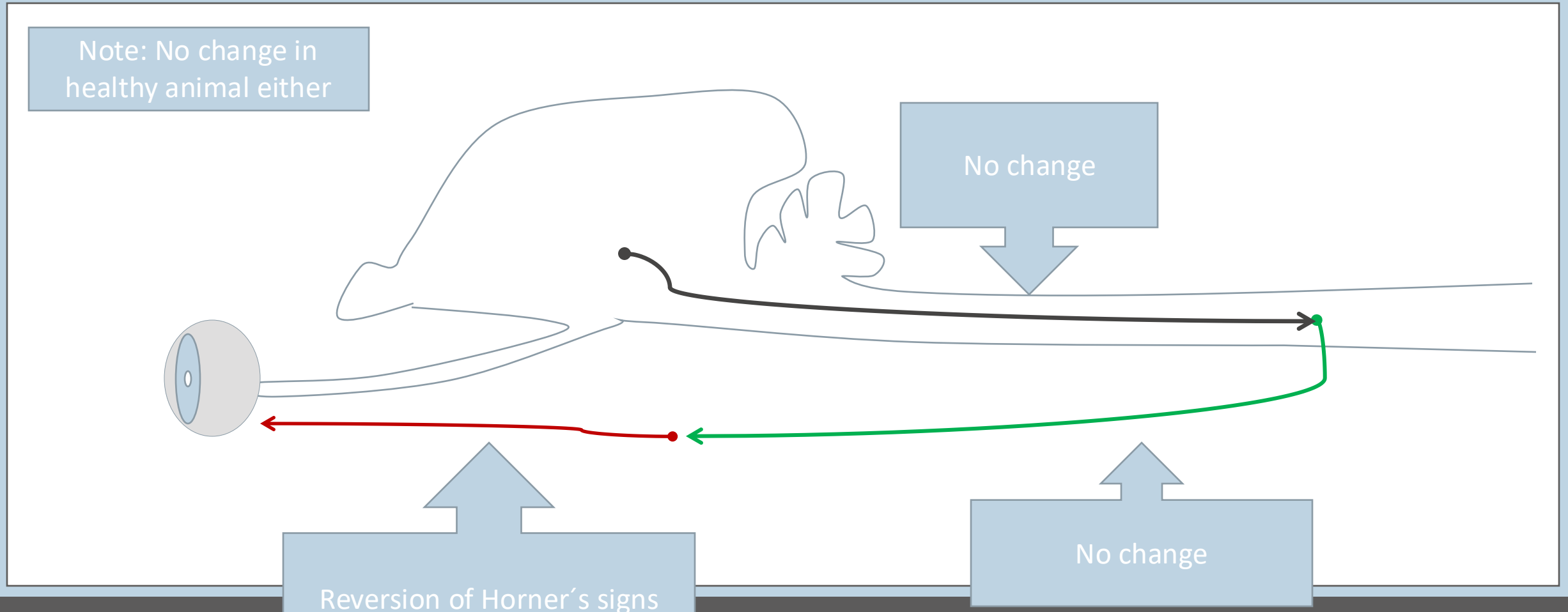
Phenylefrine 1% less 20min

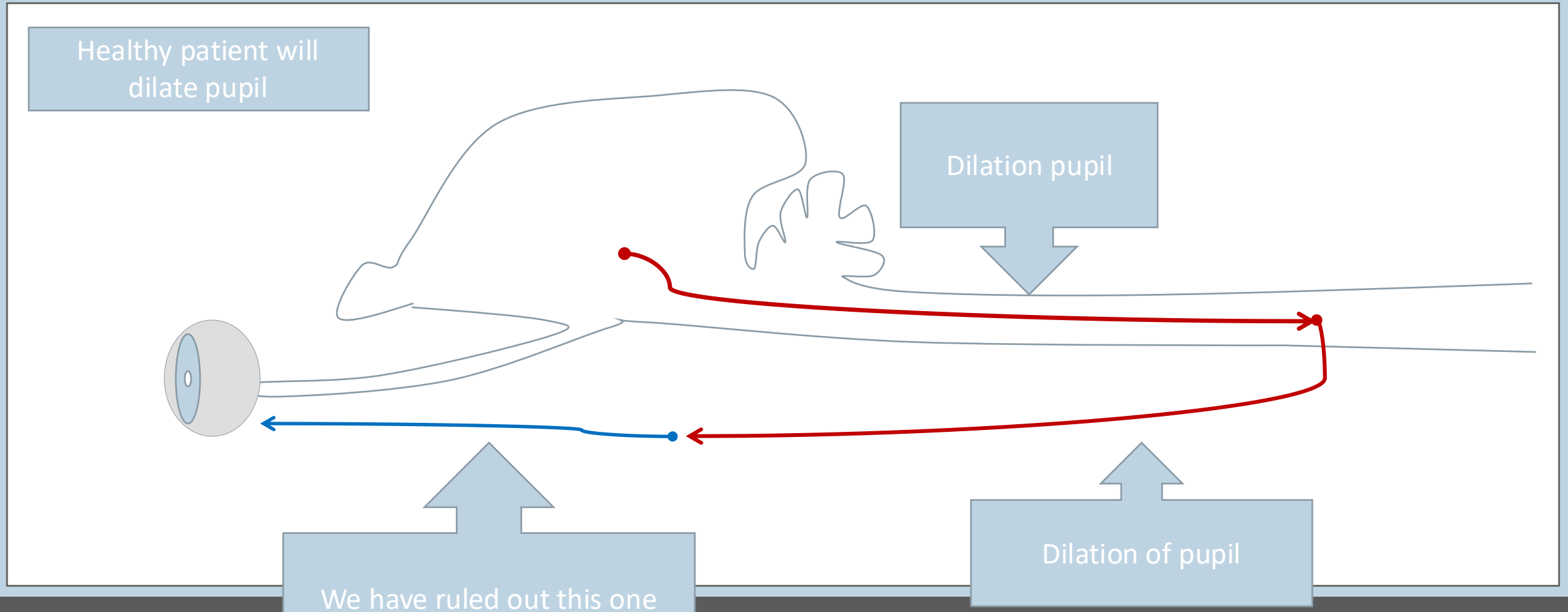


If no 3rd order is identified we follow:

- When Horner´s been present for more than 3 weeks and a pupil fails to respond to 1% phenylephrine, application of 10% is pursued
- Both normal and affected pupil should dilate within 20-40min

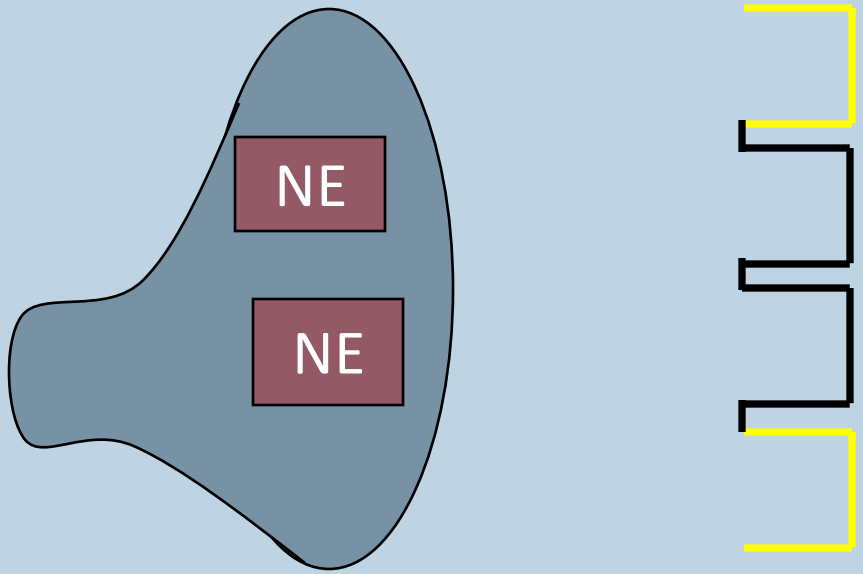
- There has yet to be developed a pharmacological method for differentiating a first and second order Horner's syndrome
- Development of a first order lesion in the absence of other thalamic, brainstem or myelopathic deficits is very unlikely

Phenylefrine 10% 20-40 min



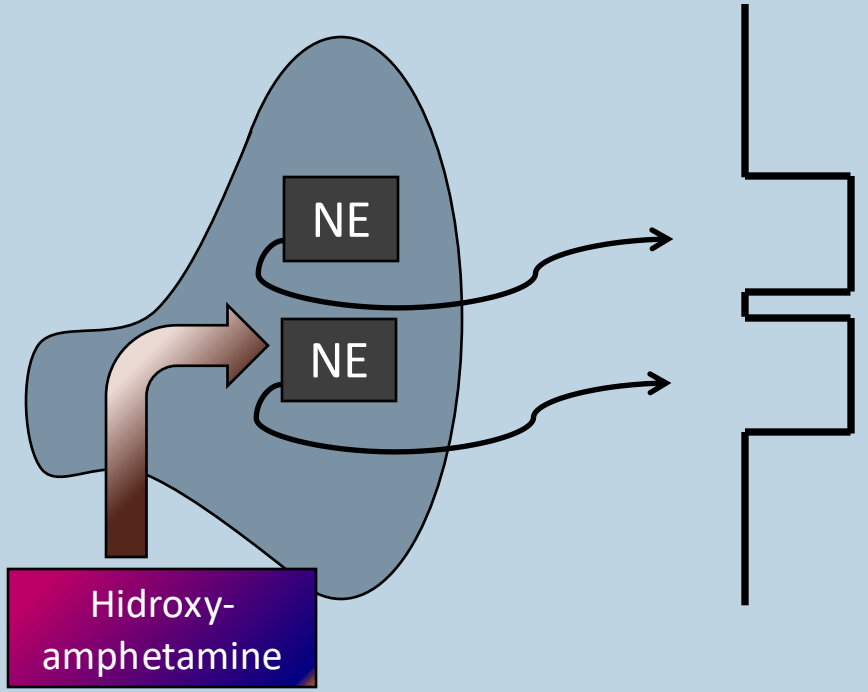
Denervation hypersensitivity (DH)

- Needed to localize Horner´s with Phenylephrine
- Variability described 2-10 days and 2-3 weeks (Morgan 1989, Collins 1990)
- Testing prior DH will lead to falsely localize as preganglionic
- Also needed for apraclonidine localization

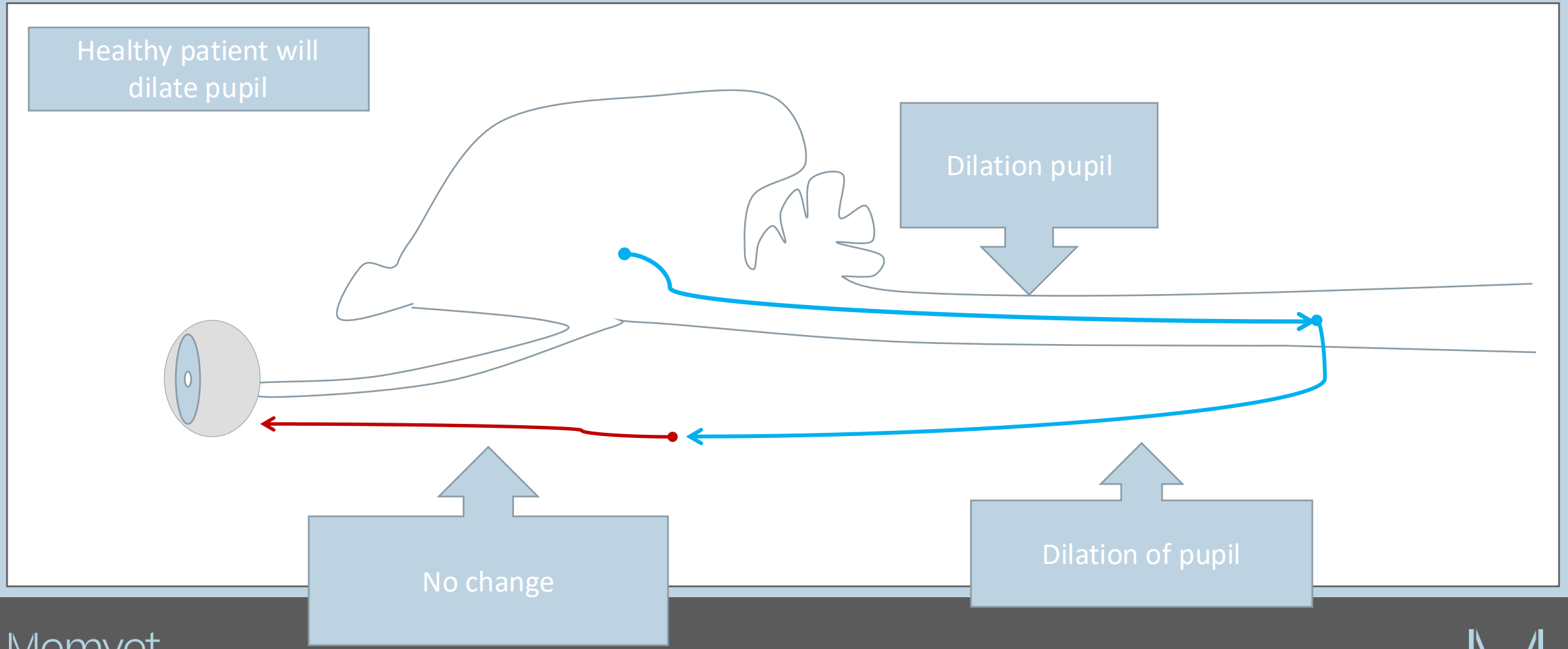


Other paths to localizing Horner´s

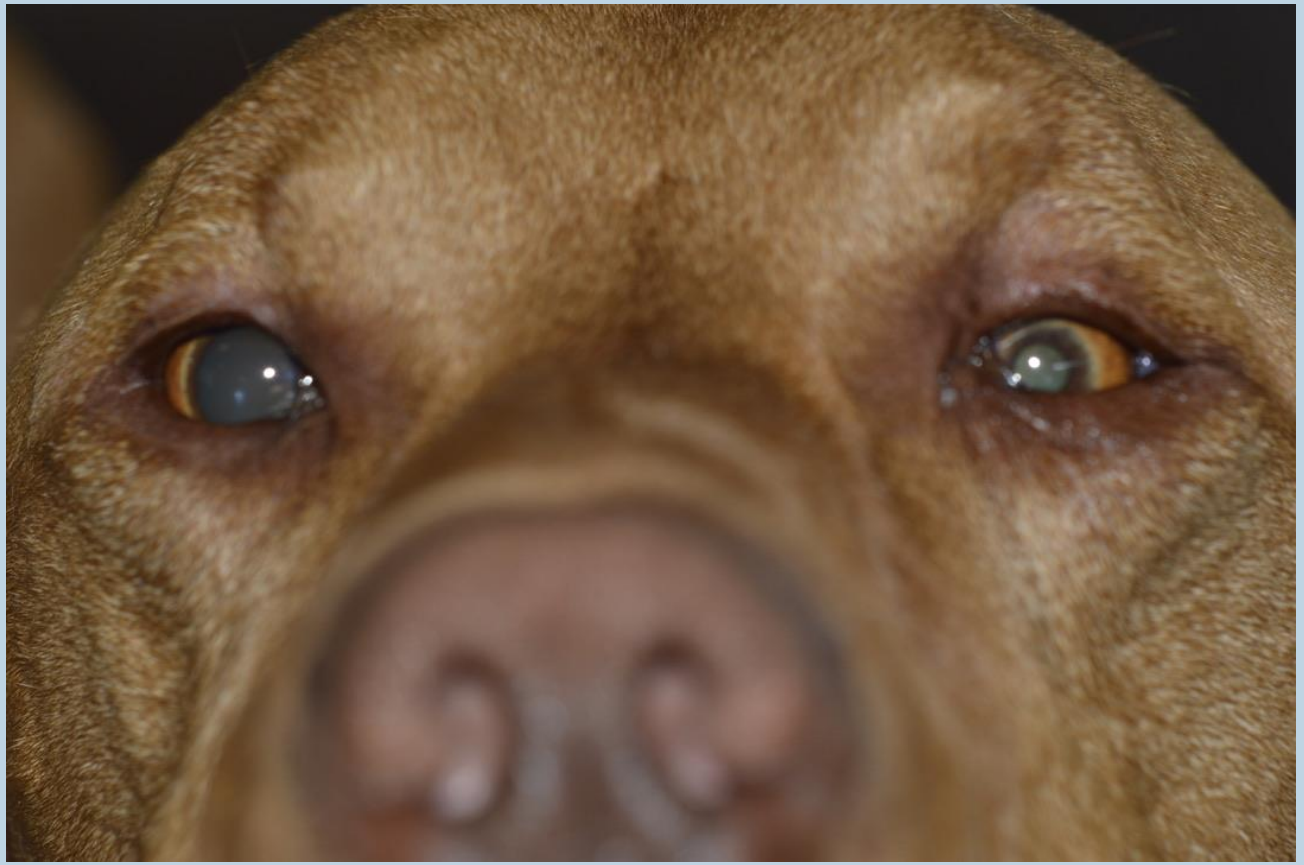
- Hydroxyamphetamine 1%
- Stimulates release of NE
- In 45min will dilate pupil in 1st 2nd order and healthy patient
- 3rd order is damaged, therefore there will not be NE supply and will NOT dilate
- Less reliable than Phenylephrine?

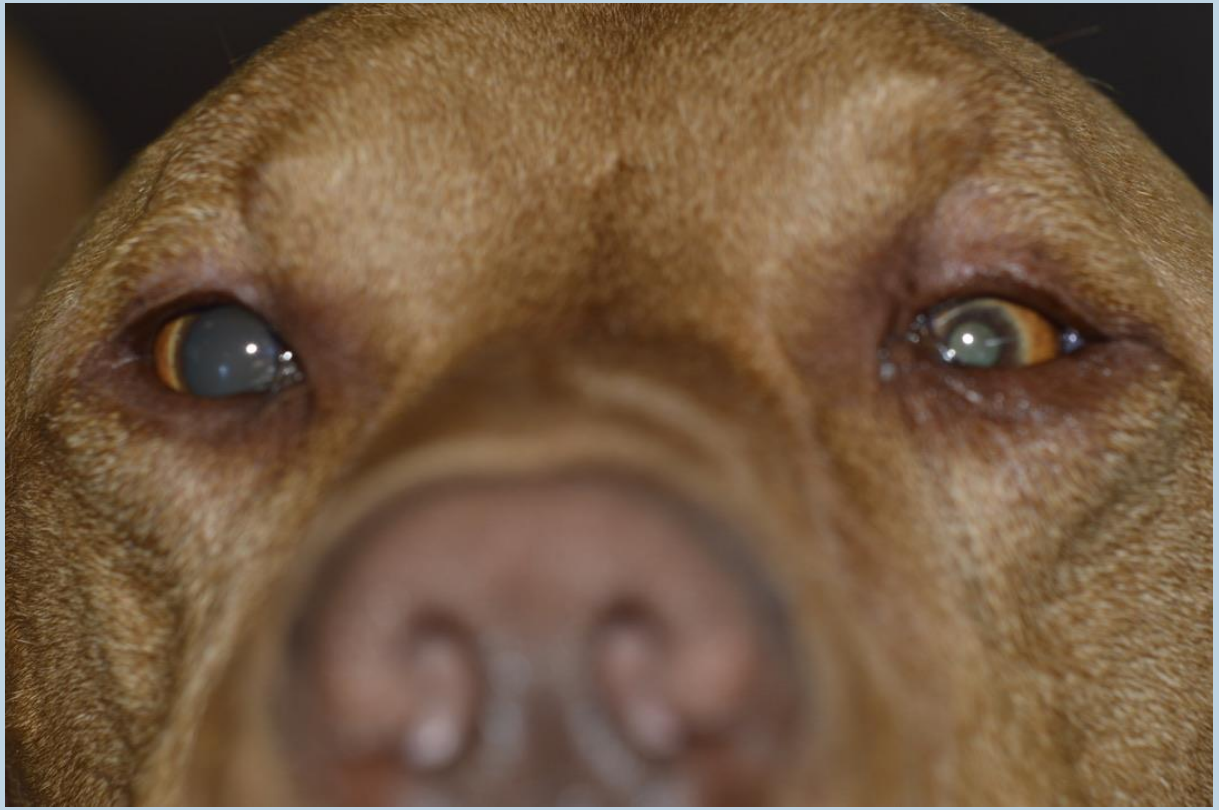


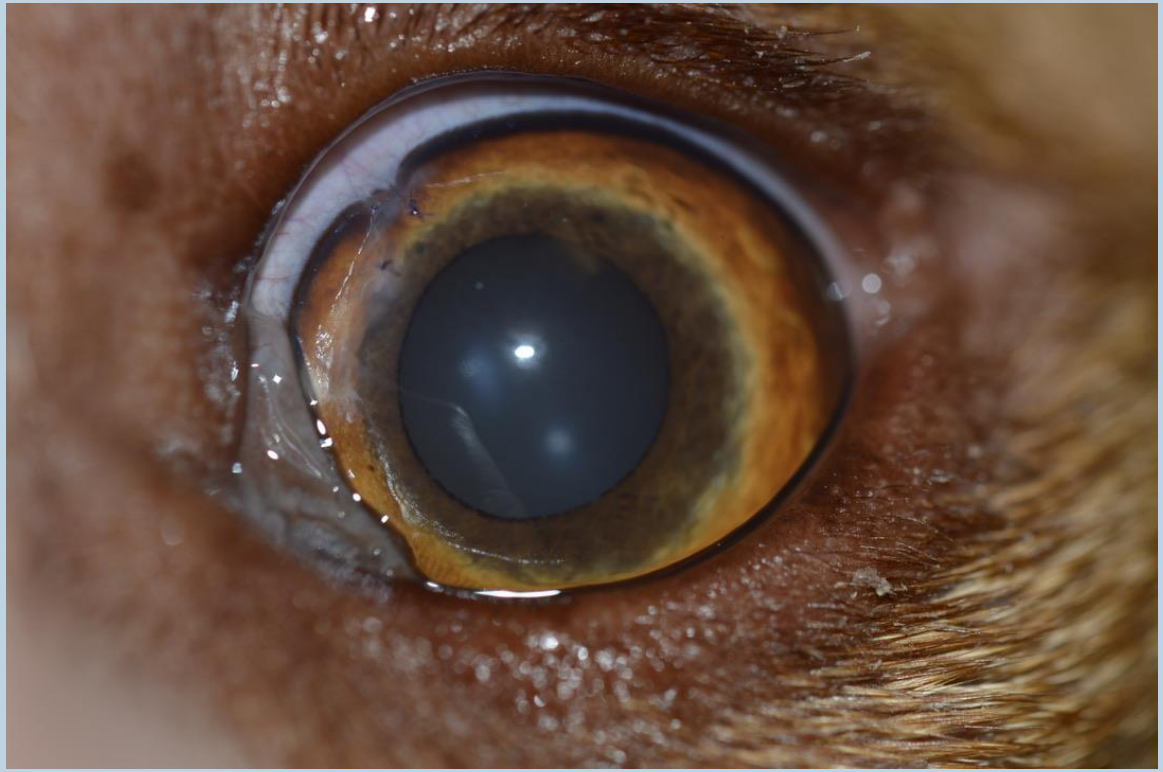
Hydroxyamphetamine 45 min



Clinical case







Case

- Tutor has cameras at home
- Seen weird eyes when nocturnal setting
- During the day tutor does not see them

Brief

- Revision of autonomic innervation - basic
- How to work up an anisocoric patient
  - From iridal abnormalities to Horner´s
- Understand the drugs!