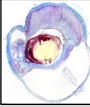
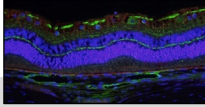





Pathology of the Vitreous, Retina e Optic Nerve

Leandro Teixeira DVM, MSc, DACVP
Associate Professor of Anatomic Pathology
Richard R. Dubielzig Professor of Comparative Ocular Pathology
Director of the Comparative Ocular Pathology Laboratory of Wisconsin - COPLOW
University of Wisconsin-Madison School of Veterinary Medicine



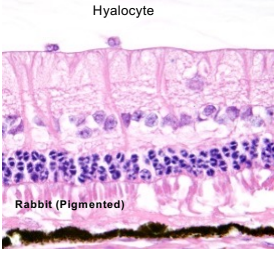

1



Vitreous

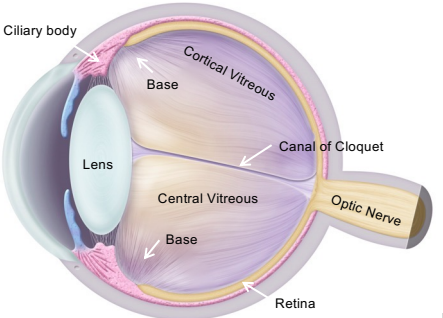
General Considerations

- Macroscopic appearance during trimming important!
- Vitreous is difficult to evaluate histologically
- Liquefied vitreous may not or only partially survive processing



Hyalocyte

Rabbit (Pigmented)



Ciliary body

Base

Cortical Vitreous

Canal of Cloquet

Central Vitreous

Base

Lens

Optic Nerve

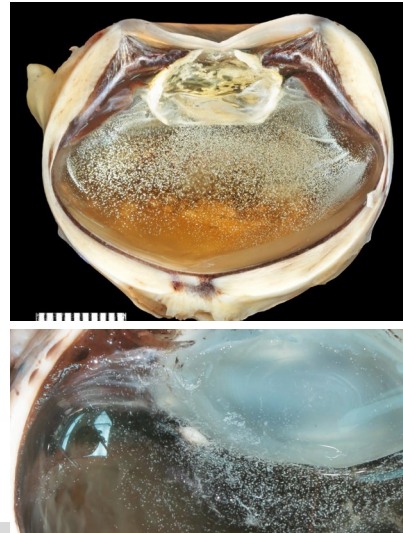
Retina

2

Asteroid Hyalosis

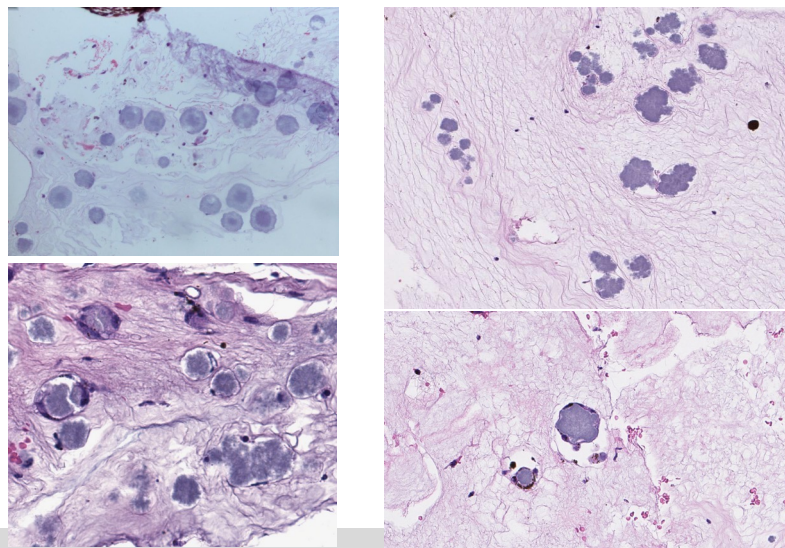
Sea Lion

- Dogs +/- other species
- One form of vitreal degeneration
- Lipid-calcium complex
- Age related and secondary to disease
- Often seen with neoplasms (iridociliary neoplasms, melanocytic neoplasms)
- The exact composition of asteroid bodies varies between studies



3

Asteroid Hyalosis

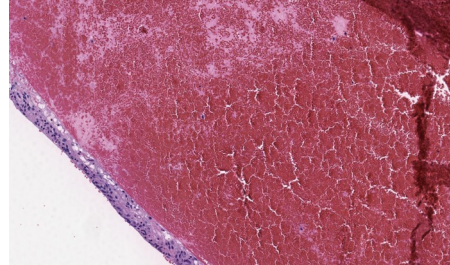


4

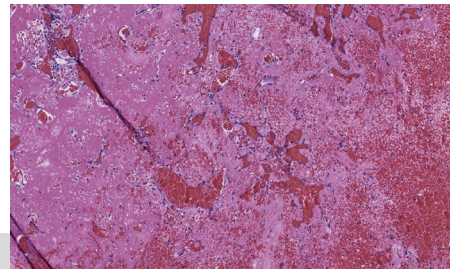
Vitreous Hemorrhage

- Normal vessels (trauma, uveitis)
- Immature vessels (fibrovascular membranes, neoplasia)
- Abnormal vessels (systemic hypertension, PHPV/PTVL)
- Blood disorders (coagulopathies)

Acute



Chronic

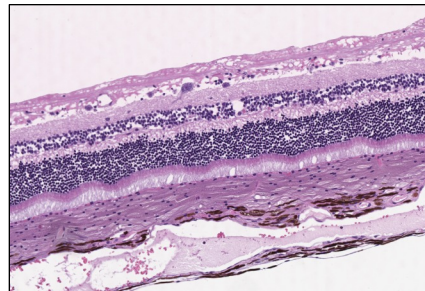


5

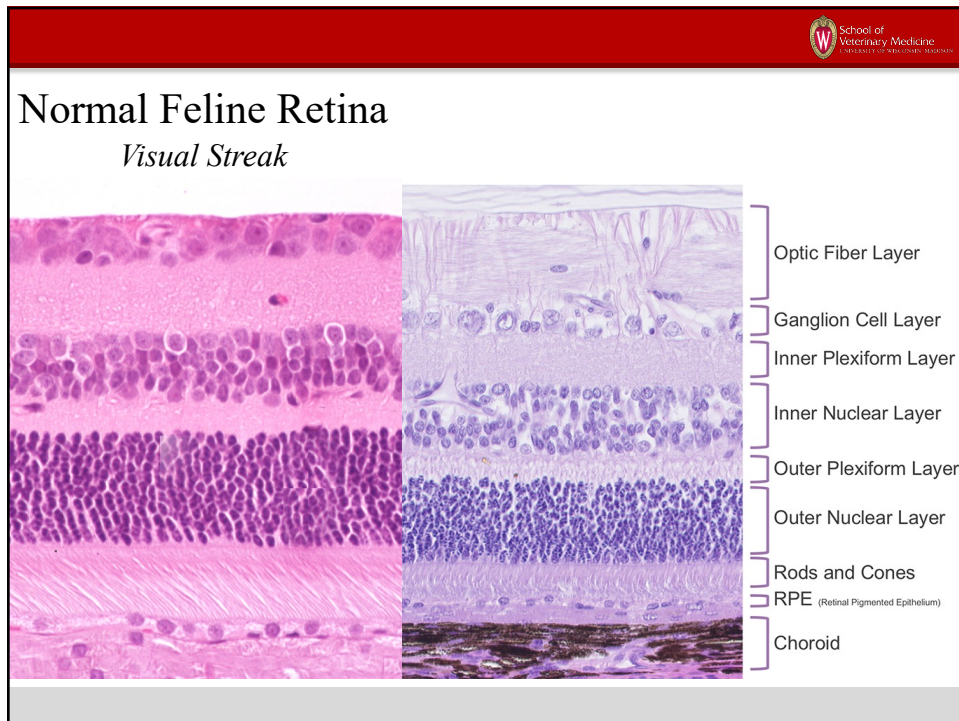
Retina

General Considerations

- Glaucoma related changes discussed elsewhere
- Minimal healing capacity
- Continuation of the CNS and ON



6



7

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Cystoid Change in Dogs, Cats and Horses

Dogs

- Cystic degeneration in the retinal neuropil
- Cystic spaces have hyaluronic acid
- Age related

Cats

- Cystic changes are in the pars plana epithelium
- Cystic spaces filled with hyaluronic acid
- Age related



8

Retinal Detachment

- Separation of the neurosensory retina from the retinal pigment epithelium
 - Tight junctions Müller cells and RPE
 - Vitreous body provides gentle support
- Risk Factors for Detachment
 - Trauma
 - Inflammation
 - Neoplasia
 - Vasculopathies
 - Traction
 - Congenital lesions
 - Retinal degeneration
 - Glaucoma/buphthalmos



9

Retinal Detachment - Serous

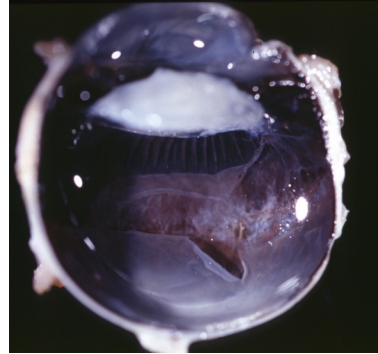
- Breakdown of the blood eye barrier with protein exudation from choroidal vessels into the subretinal space
 - Hypertensive vasculopathy
 - Retinal and choroidal vessels
 - Chorioretinitis
 - Choroidal neoplasia



10

Retinal Detachment - Traction

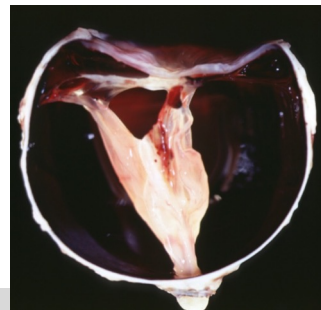
- **TRACTION** on the retina from vitreal traction bands
 - Uveitis
 - Lens luxation
- **RHEGMATOGENOUS**
 - Liquid vitreous dissects through a retinal tear into the subretinal space



11

Retinal Detachment

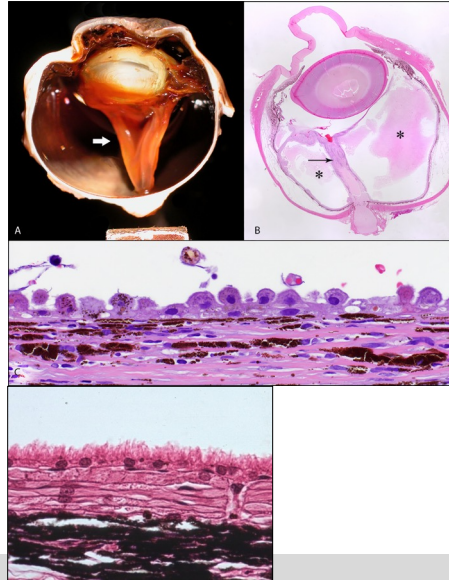
- Partial or complete
 - Partial: confined to a localized area
 - Complete retinal detachments (“morning glory”): retina billows into the vitreous, attached only at the optic disc and ora ciliaris.



12

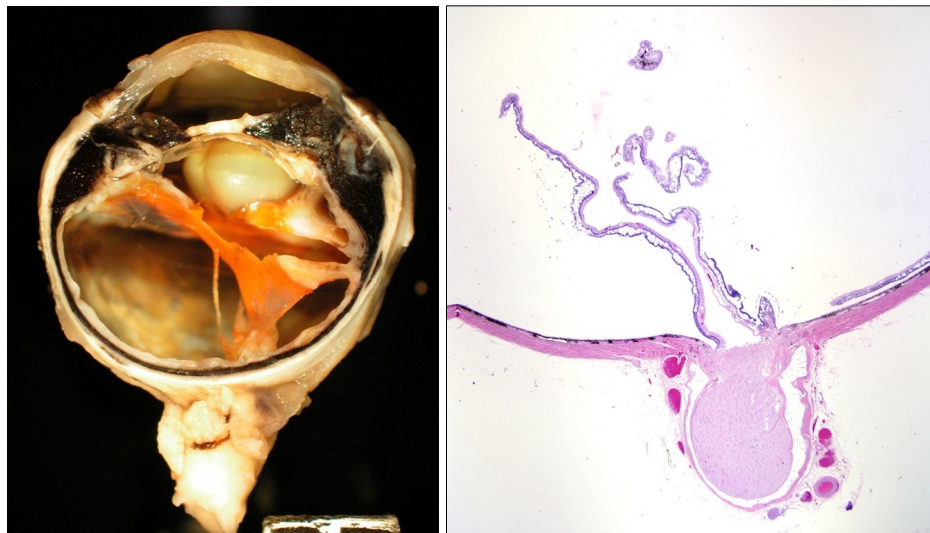
Retinal Detachment

- Histopathology
 - Serum, blood, cells in the subretinal space
 - Hypertrophied RPE (tombstone appearance)
 - The presence of photoreceptors adherent to the RPE cells is an indicator of artifactual retinal separation



13

Retinal Detachment + Tear



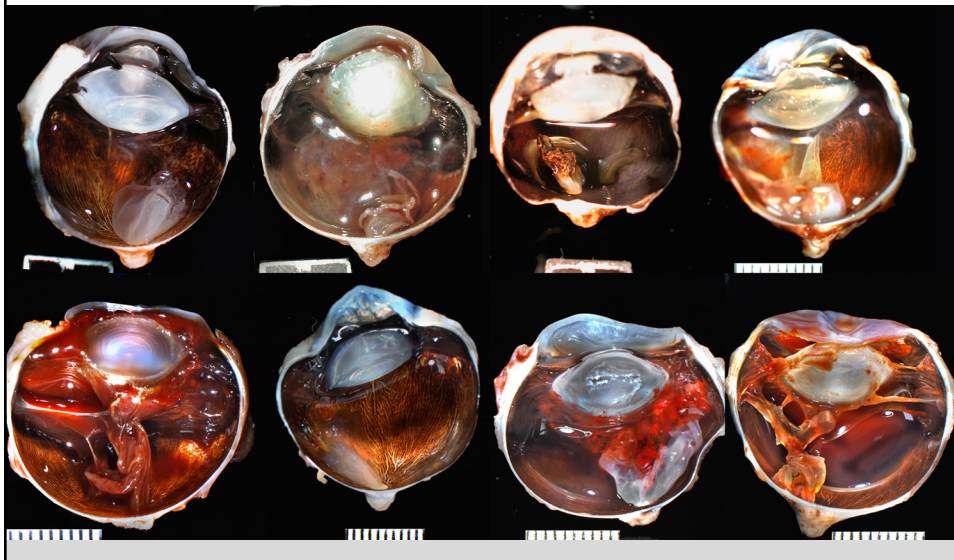
14

Vitreoretinal dysplasia

- General characteristics
 - Liquid vitreous or vitreous strands
 - Retinal detachment and giant tear in severe cases
 - Disorganized retina, rarely
- Oculoskeletal syndrome in dogs (see congenital lecture)
- Shih Tzu vitreoretinopathy
- Feline Neovascular vitreoretinopathy

15

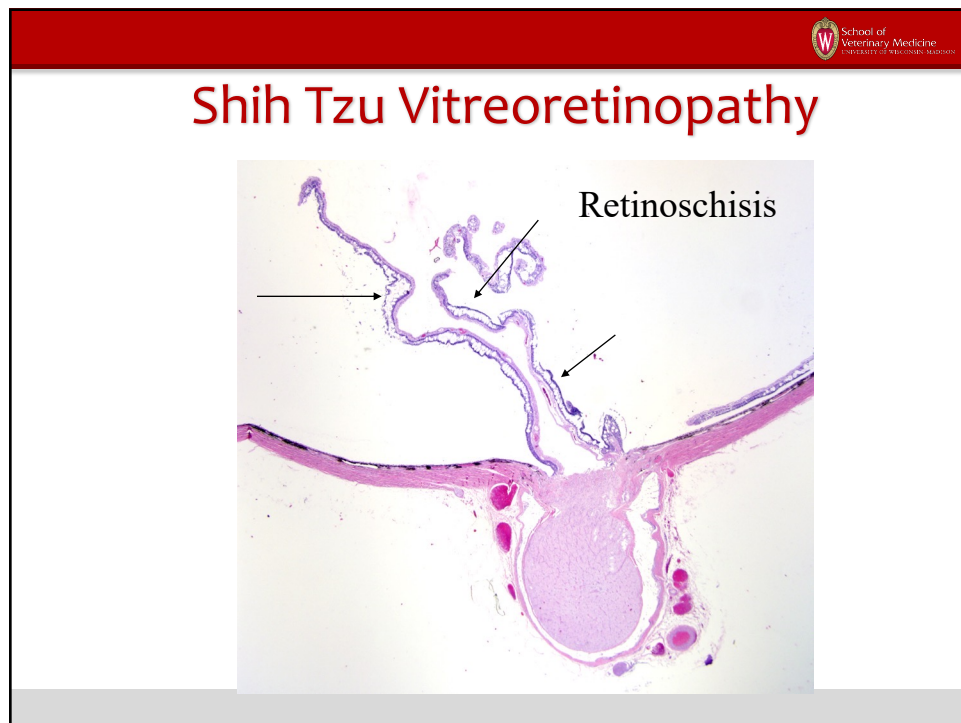
Shih Tzu Vitreoretinopathy



16



17



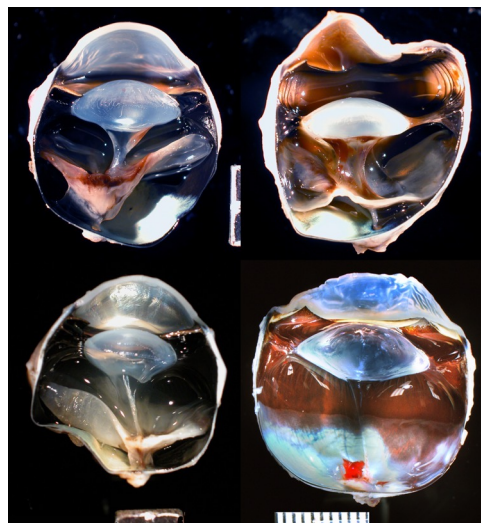
18

Feline neovascular vitreoretinopathy

- 25 cases in the COPLOW database
- Seen as a developmental disorder in young cats
- Avascular and gliotic peripheral retina and vascularized vitreous in the area of the central retina
- Anterior segment dysplasia
- Features other than the primary lesions
 - Retinal detachment
 - PIFM and PAS
 - Glaucoma
 - Hemorrhage

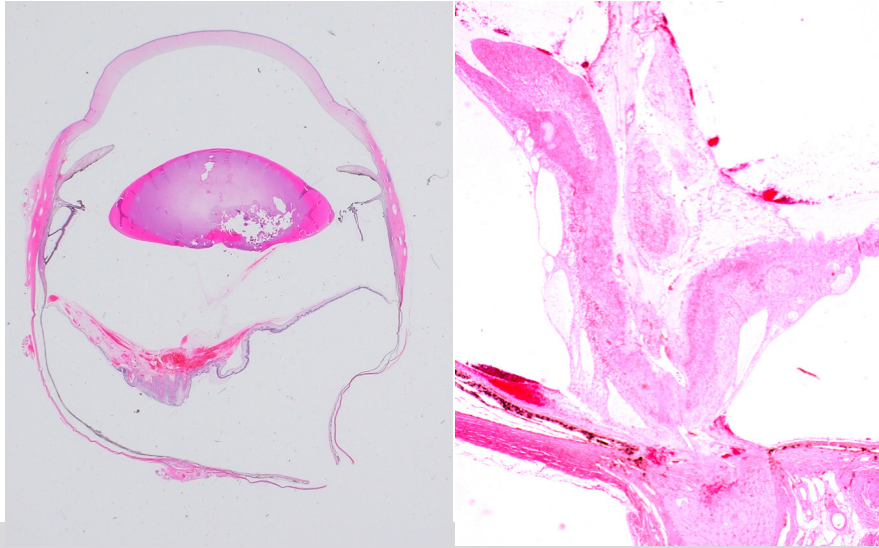
19

Feline neovascular vitreoretinopathy



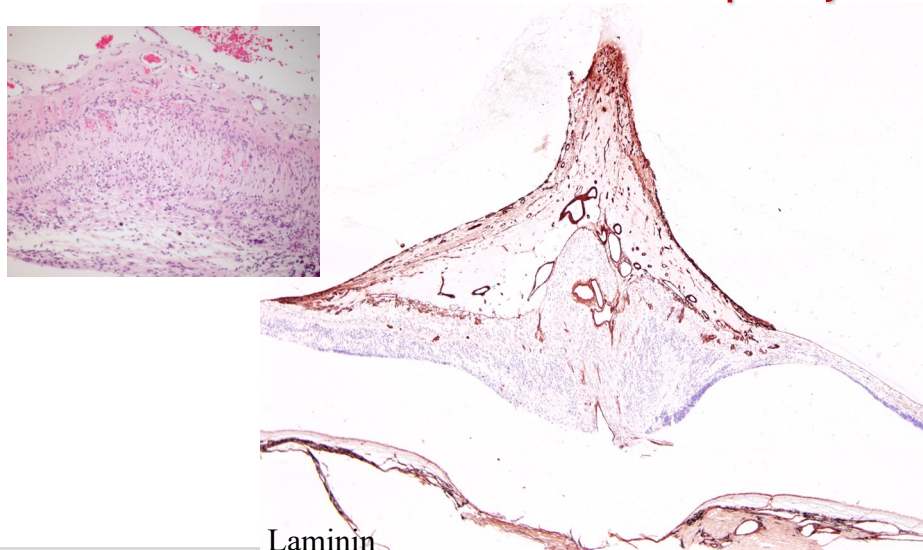
20

Feline neovascular vitreoretinopathy



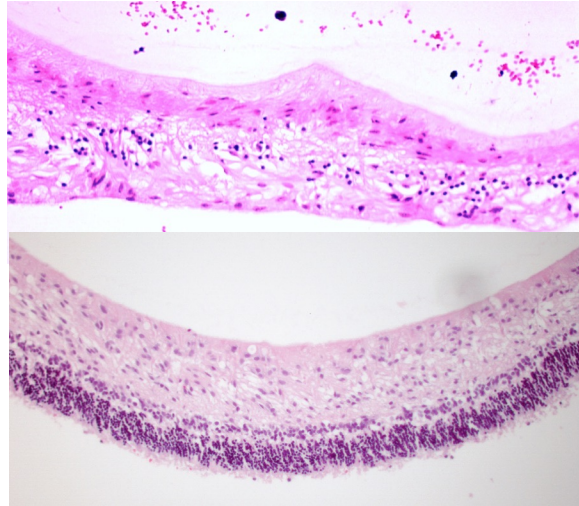
21

Feline neovascular vitreoretinopathy



22

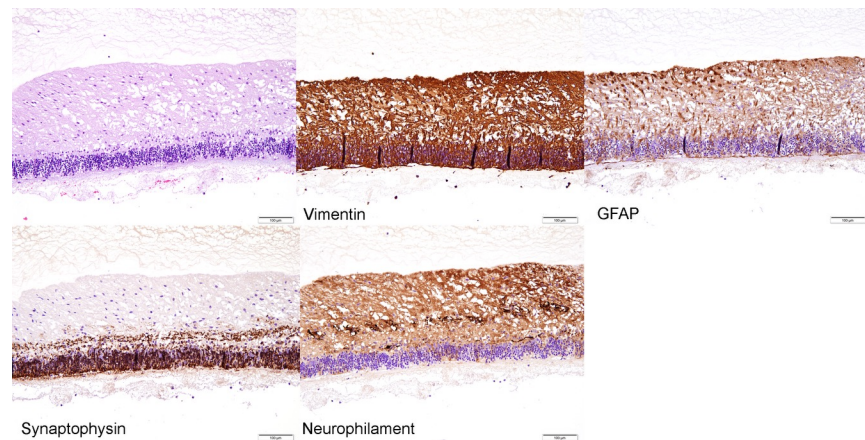
Feline neovascular vitreoretinopathy



Avascular Peripheral Retina

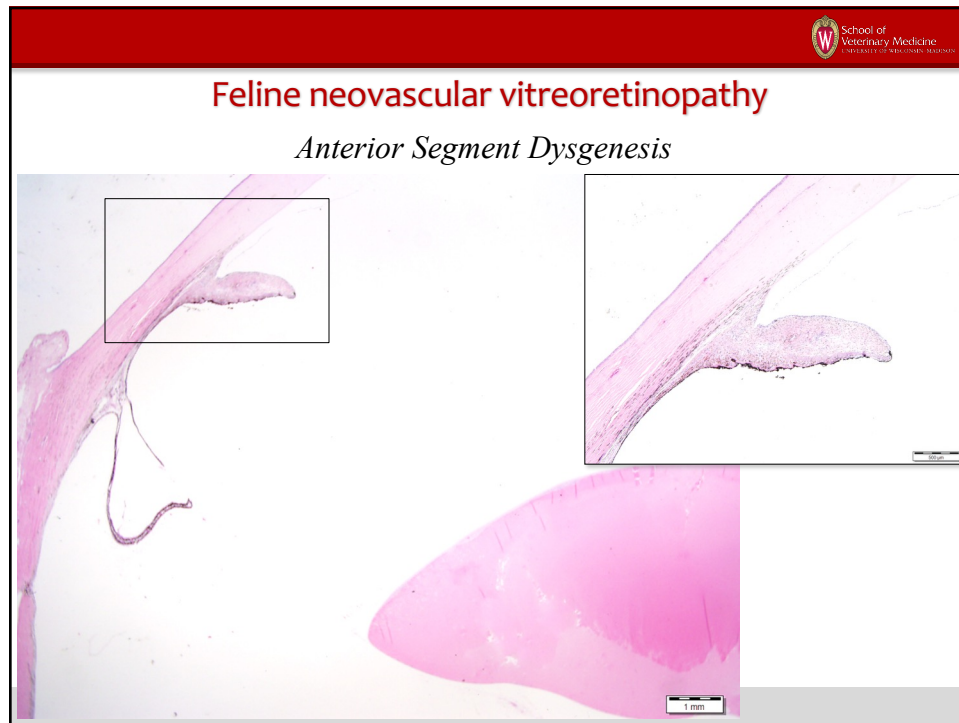
23

Feline neovascular vitreoretinopathy



Avascular Peripheral Retina

24



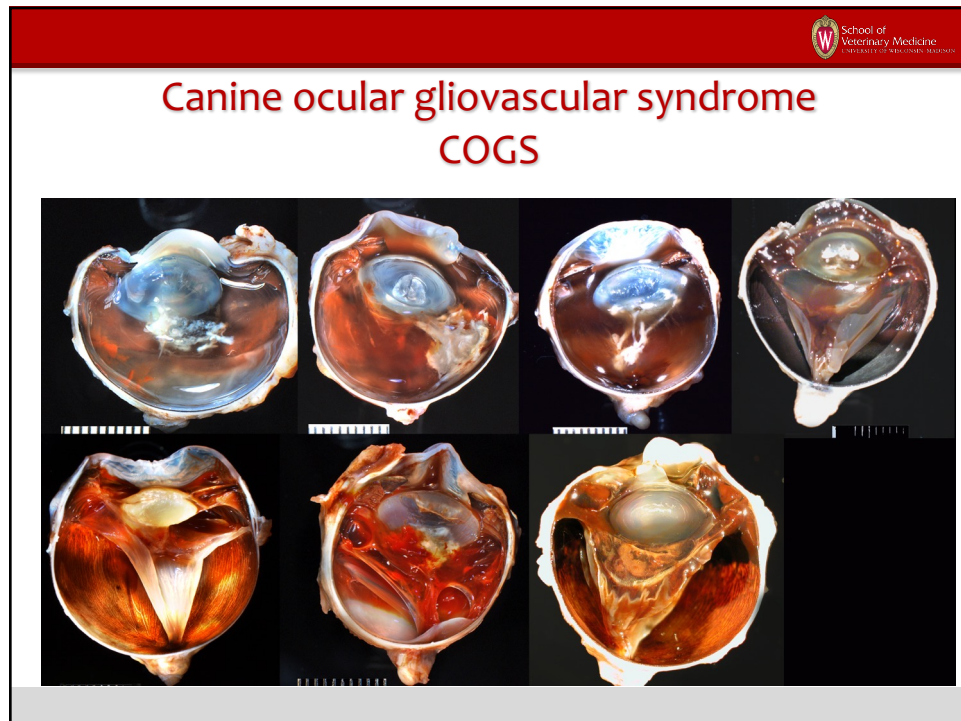
25

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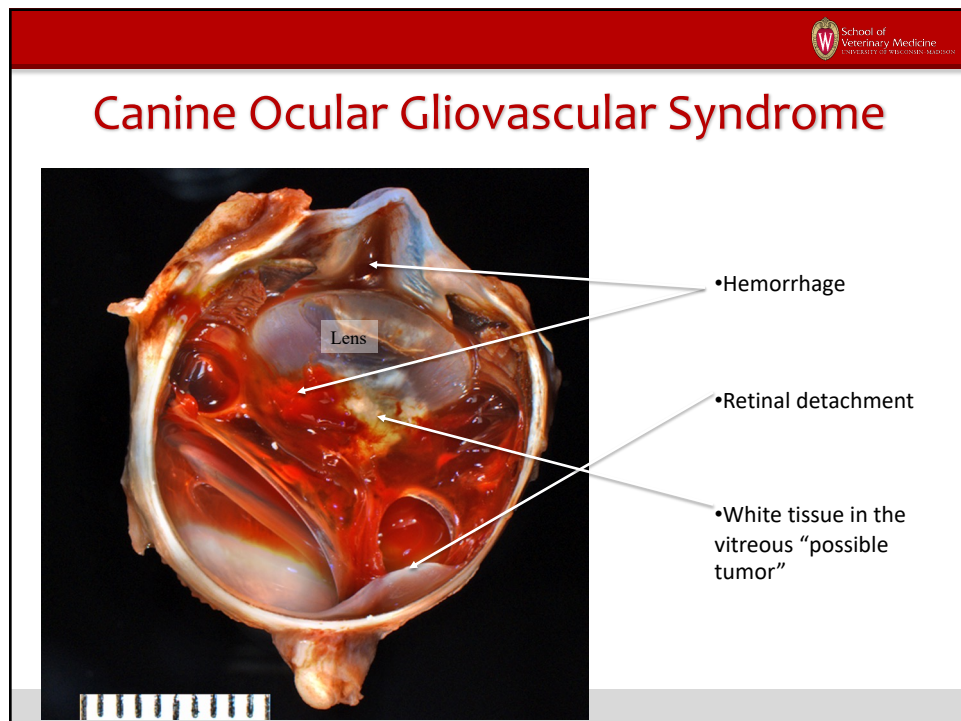
Canine ocular gliovascular syndrome COGS

- The syndrome consists of the following:
 - About half the cases are Labrador Retrievers
 - Intraocular hemorrhage
 - Neovascular glaucoma
 - Retinal detachment
 - Clusters of GFAP+ cells in the vitreous behind the lens
 - Neovascular proliferation extending into the vitreous from the retina or optic nerve head
 - Glassy hyalin collagen surrounds the neovascular proliferation

26

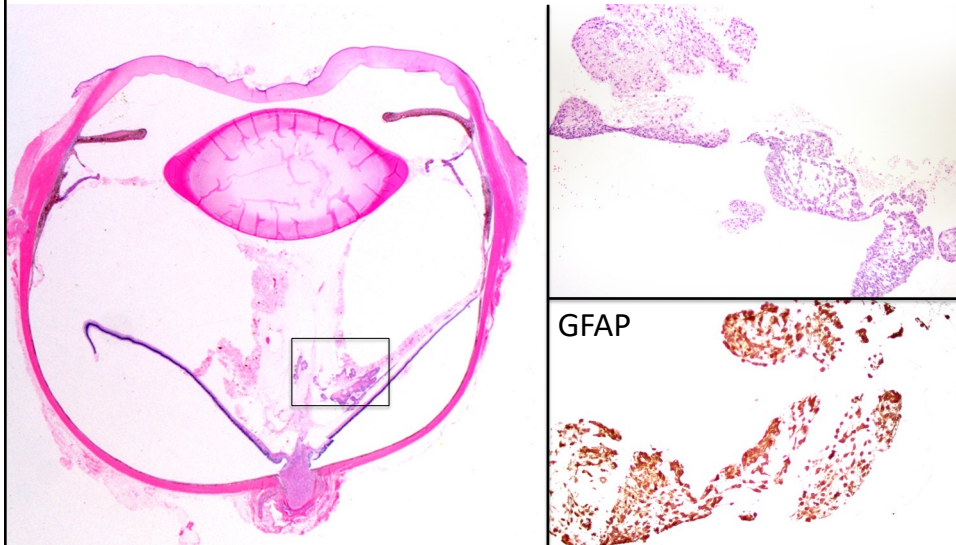


27



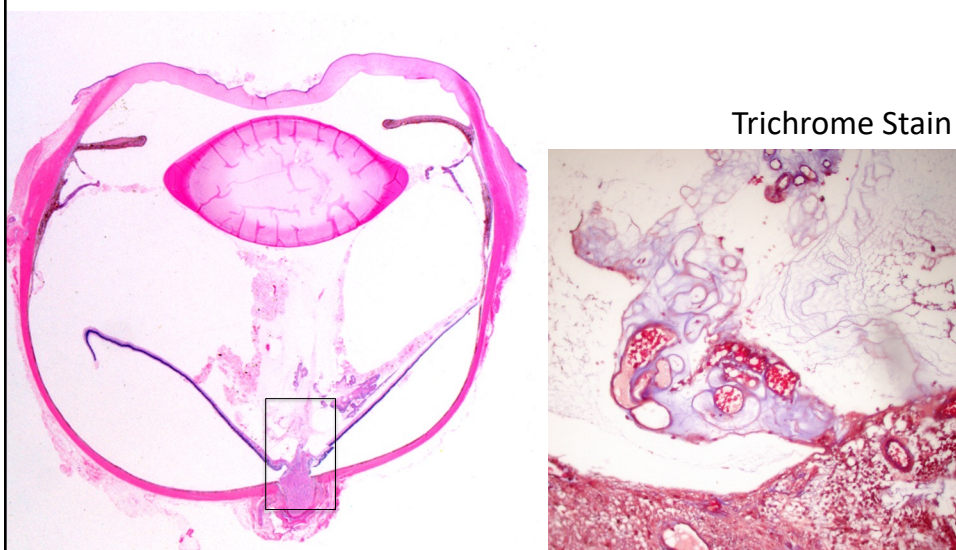
28

Canine Ocular Gliovascular Syndrome

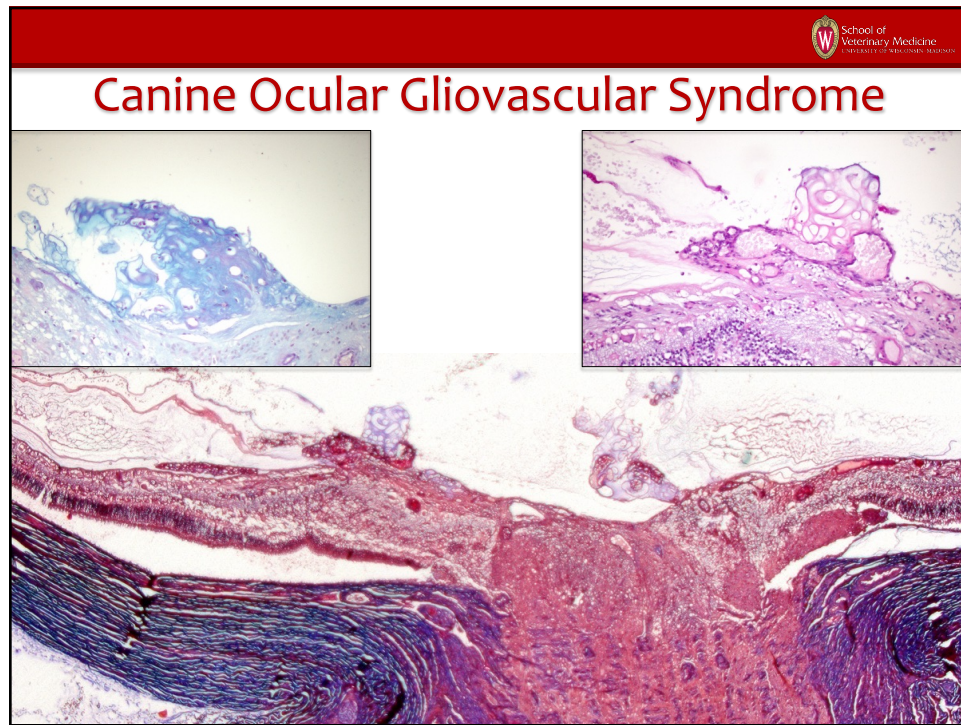


29

Canine Ocular Gliovascular Syndrome



30



31



32

Retinal atrophy

Patterns:

- **Inner retinal atrophy**
 - Loss of ganglion cells and neurons of the inner nuclear layer
 - Glaucoma
 - Optic nerve disease (trauma, compression, etc.)
- **Outer retinal atrophy**
 - Loss of photoreceptors (outer nuclear layer)
 - Primary photoreceptor disease
 - Toxic
 - Ischemia
 - Retinal detachment
- **Full-thickness retinal atrophy**
 - Chronic glaucoma in dogs
 - Chronic blunt trauma

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Photoreceptor Loss

Pattern: outer retinal atrophy

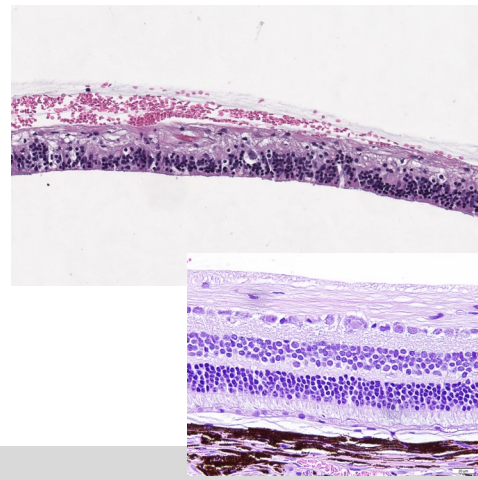
- Progressive Retinal Atrophy (PRA)
- Phototoxic Retinopathy
- Fluoroquinolone Toxicity in Cats
- Taurine Deficiency in Cats
- Oxidative Stress &/or Vit E Selenium Def.
- Sudden Acquired Retinal Degeneration (SARDS)
- Phototoxicity
- Other Toxic Reactions

34

Progressive Retinal Atrophy - PRA

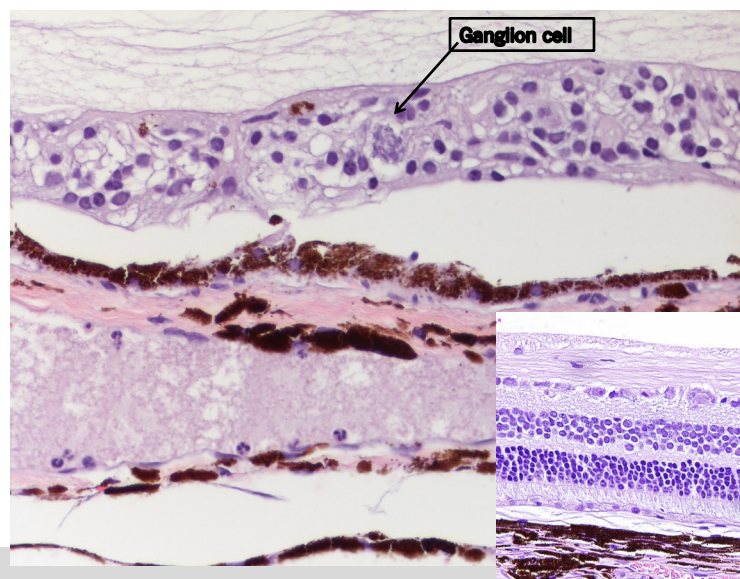
- Dogs +/- cats
- Inherited/presumed inherited
- Clinical evaluation required for the diagnosis
- Lesions in globes removed for other diseases
- Histologic evaluation has limited value
- Ddx include SARDS, Retinal detachment, toxic/nutritional retinal injury

Outer retinal atrophy



35

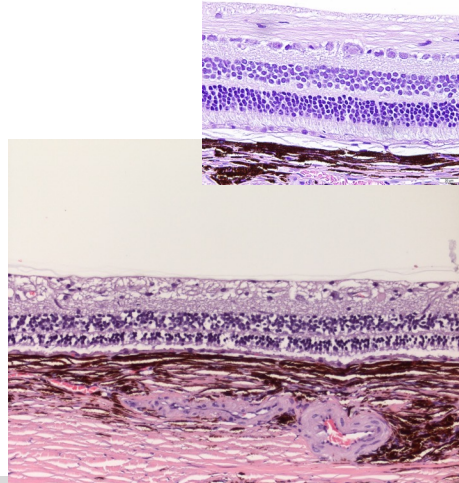
Progressive Retinal Atrophy



36

Sudden Acquired Retinal Degeneration Syndrome (SARDS)

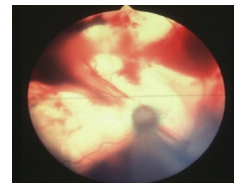
- Dogs, clinical evaluation required for the diagnosis
- Lesions in globes removed for other diseases
- Histologic evaluation has limited value
- Ddx include, progressive retinal atrophy, Retinal detachment, toxic/nutritional retinal injury
- Clinical diagnosis of SARDS in most cases



37

Hypertensive Chorioretinopathy

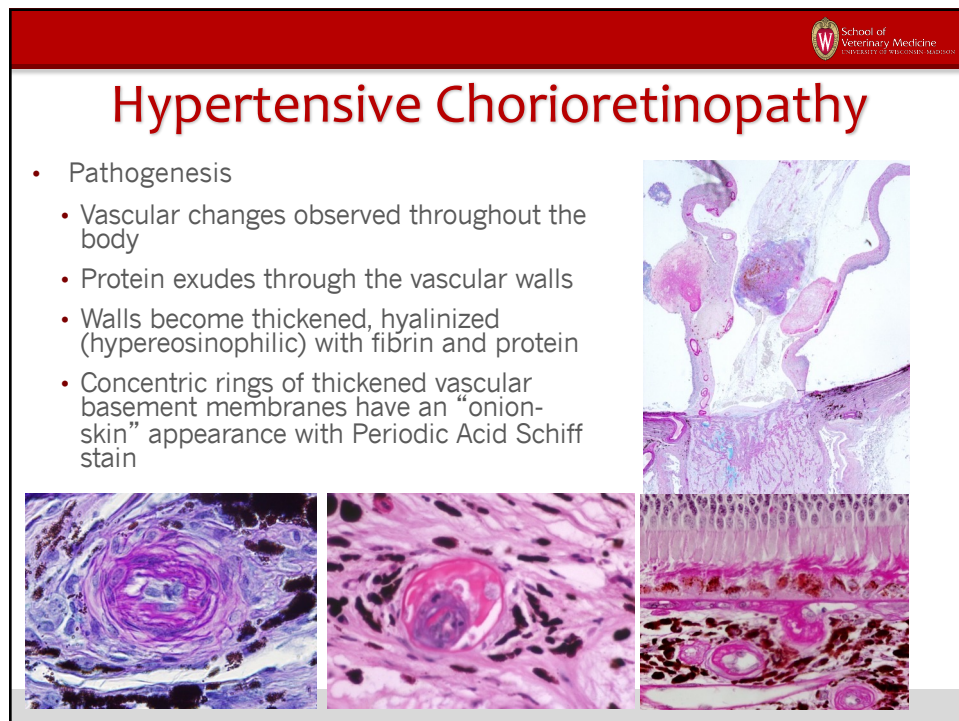
- Most commonly seen in the dog and cat
- Causes of hypertension
 - Primary hypertension (Essential hypertension)
 - Renal disease
 - Hyperadrenocorticism
 - Pheochromocytoma
 - Hyperthyroidism (cat)
 - Hypothyroidism (dog)



38



39

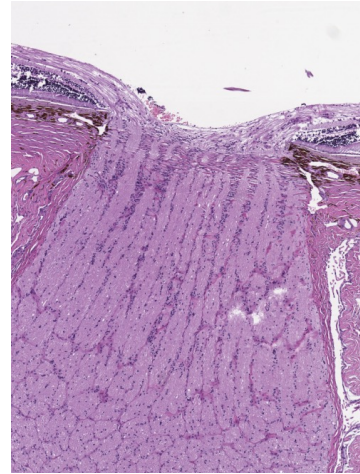


40

Optic Nerve

General Considerations

- Glaucoma related changes discussed elsewhere
- Misnomer
 - Not a peripheral nerve but a tract of the CNS



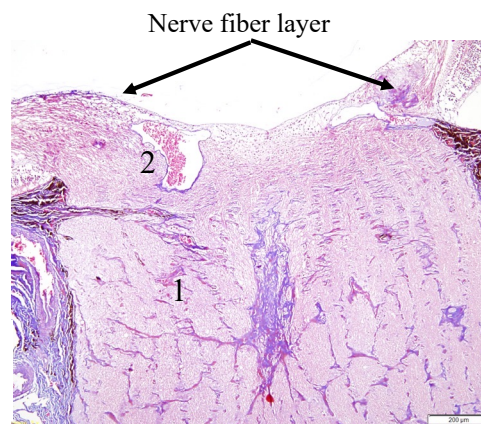
41

Optic Nerve

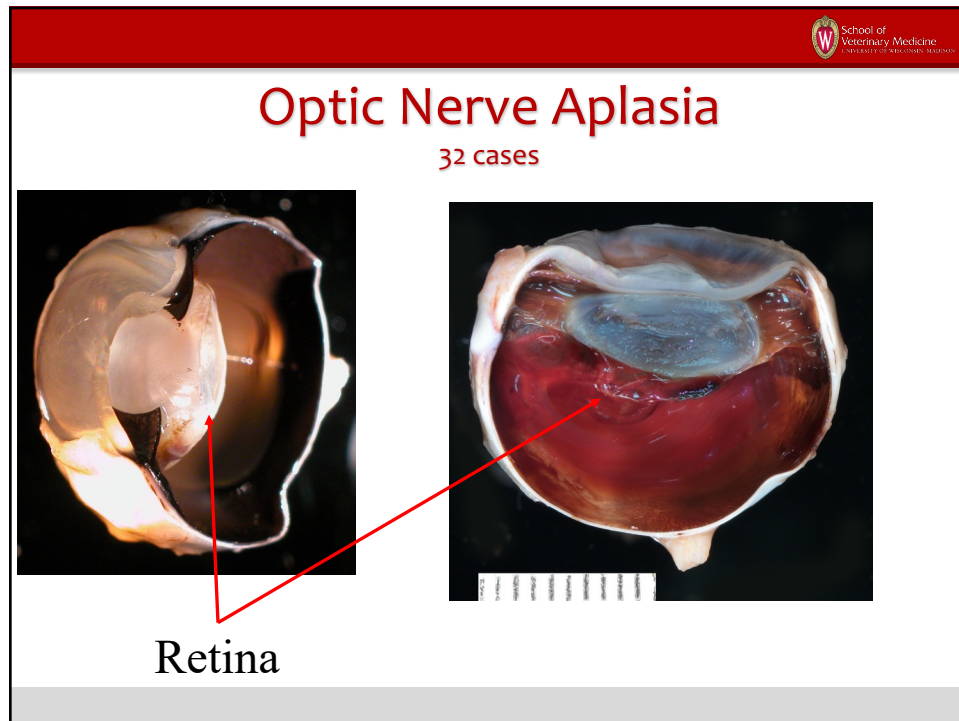
Tissue response generic and like CNS

- Gliosis
- Atrophy
- Malacia/necrosis
- Few anatomical particularities
 1. Lamina cribrosa
 2. Vascularization

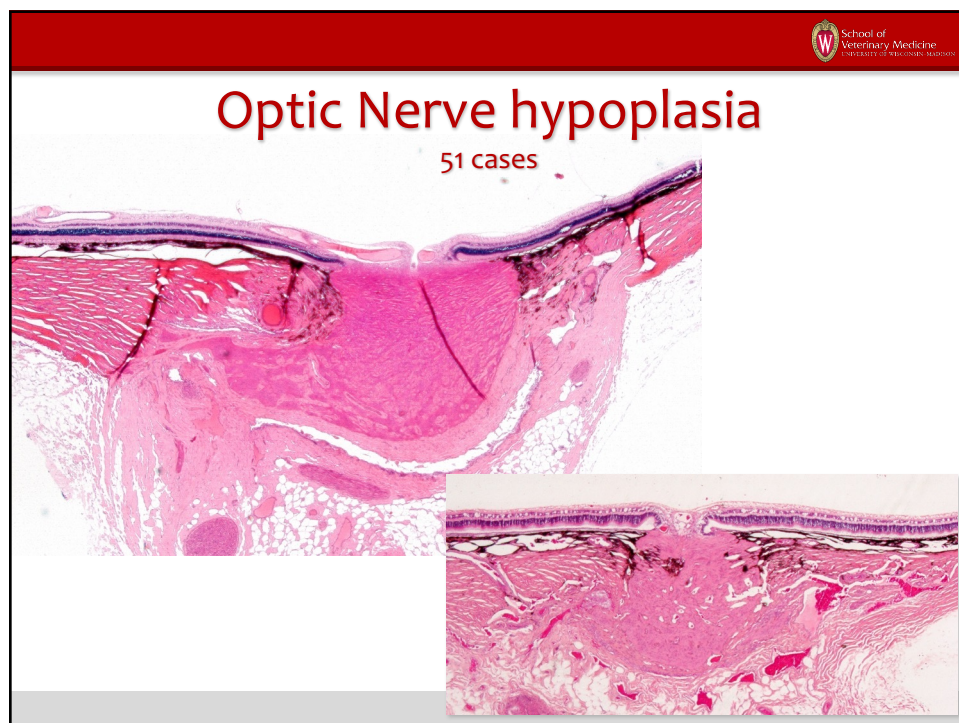
Short
Posterior
Ciliary
Artery



42



43



44

Trauma

- Proptosis
 - Necrosis/malacia
 - Hemorrhage
 - Atrophy, gliosis and fibrosis with chronicity
- Horses
 - Necrosis with Gitter cells
 - Atrophy and fibrosis with chronicity
 - Gitter cells may extend in the vitreous (exudative optic neuropathy).

45

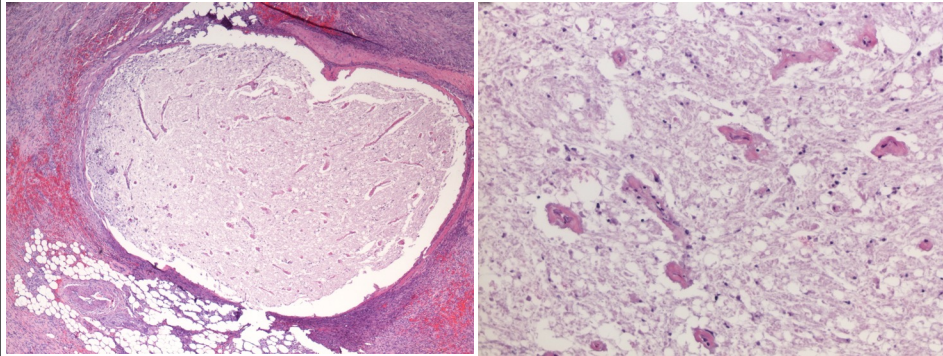
Traumatic Ocular Proptosis

Global Optic Nerve Necrosis



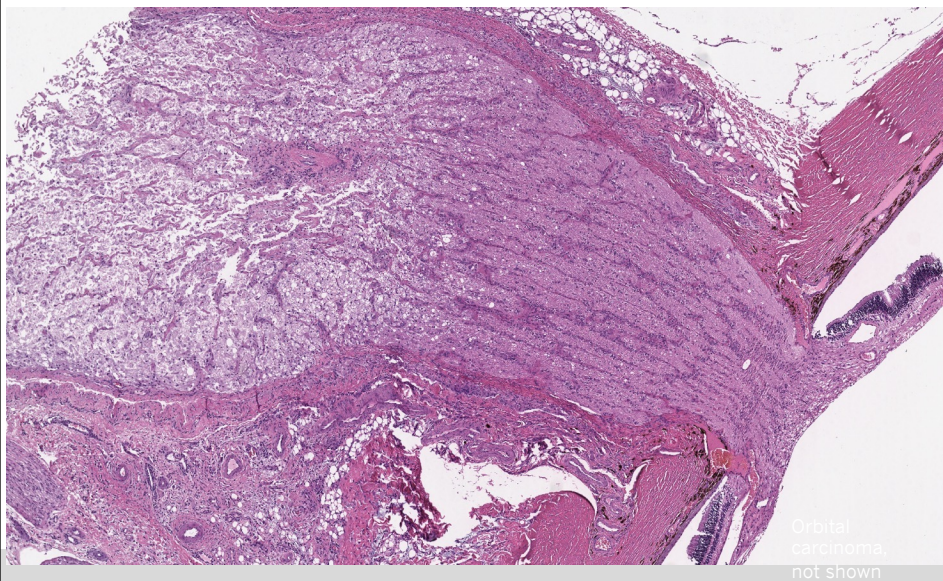
46

Trauma



47

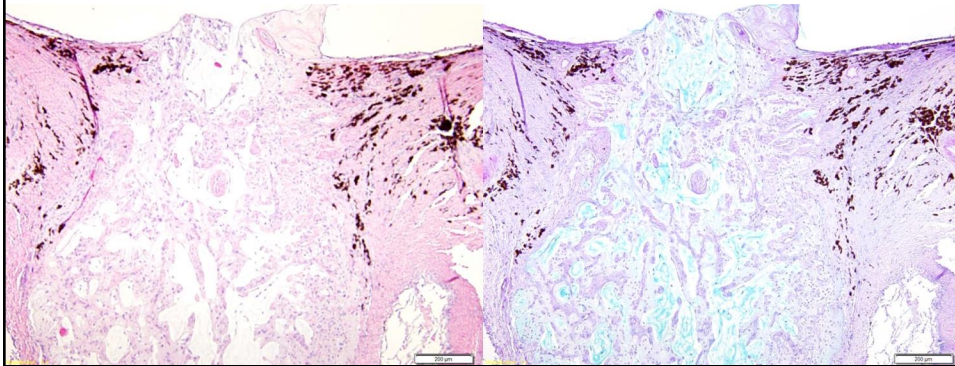
Compression



48

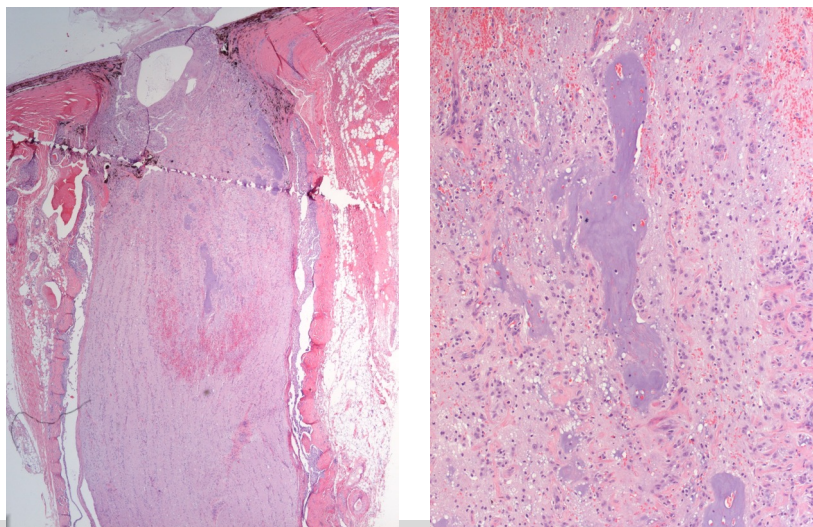
Schnabel's Cavernous Atrophy

- Dogs
- Glaucoma
- Vitreous extends in the cavitated optic nerve



49

Schnabel's Cavernous Atrophy



50

