Sudden Onset Blindness

From the ophthalmologist perspective

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Plan

- Blindness
  - Ocular blindness:
    - Cataracts and other intraocular disease – away from the scope of this lecture
    - Retinal origin:
      - Inherited
      - Acquired
  - Optic nerve origin: inherited and acquired
  - Toxic: retinal Vs CNS toxicity
  - Mechanical/Vascular/Traumatic blindness

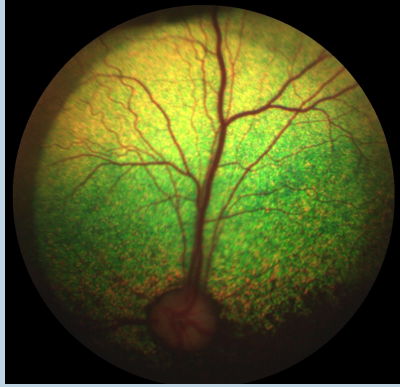
Acquired retinopathies

- Retinal Detachment
  - Dehiscence of the neuroretina from the RPE – lack of nutrition and degenerates leading to blindness
  - Hypertensive retinopathy
- Inflammatory / Infectious
  - *Leishmania spp.*, *Ehrlichia spp*, *Cryptococosis spp*, *Toxoplasma spp*. ...
  - Immunemediated chorioretinitis
  - Hyperviscosity syndrome
- Toxic /Iatrogenic
  - Enrofloxacin in cats
  - Ivermectin or other “mectins”
  - Mouth gags cats
- SARDS / IMR

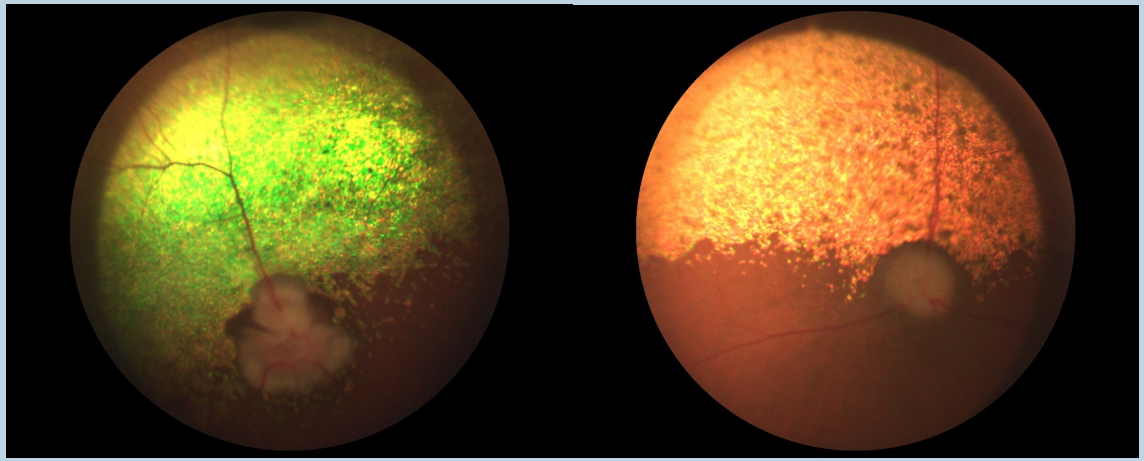
Inherited retinal diseases

- List of diseases constantly changing – needs frequent updating
- Most relevant
  - PRA (progressive retinal atrophy)
    - prcd: (progressive rod cone degeneration)
  - RPED (retinal pigmented epithelium dystrophy)
    - Has neurological implications and requires treatment to avoid progression

PRA (progressive retinal atrophy)

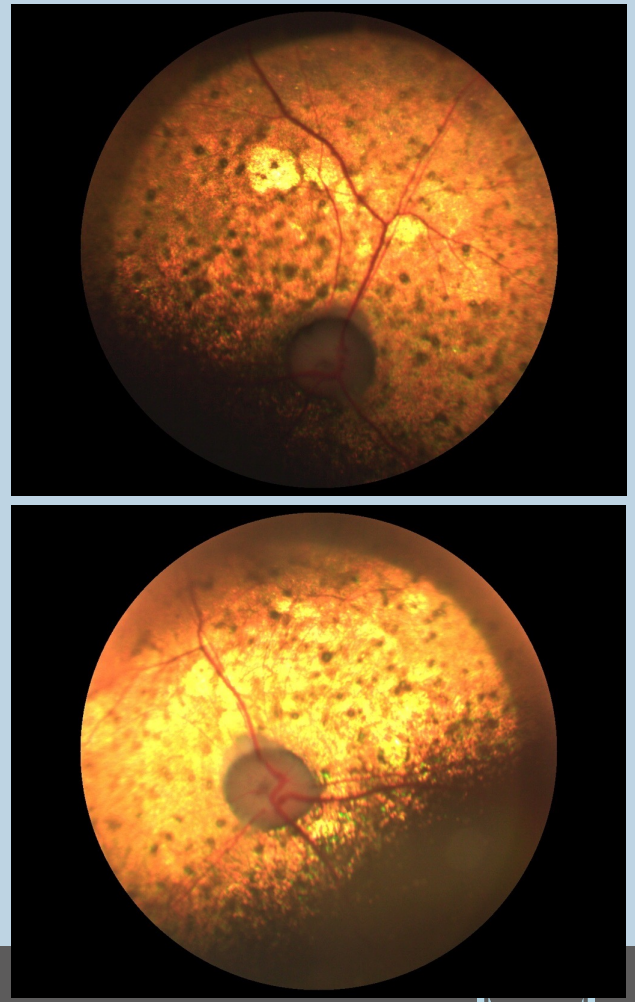


- Described in many canine breeds
- Most common:
  - prcd: starts with nyctalopia (night blindess) and progresses within years in day blindness too
- Hyperreflectivity of the tapetum
- Vascular atenuation
- Optic nerve head paleness
- Secondary cataracts common



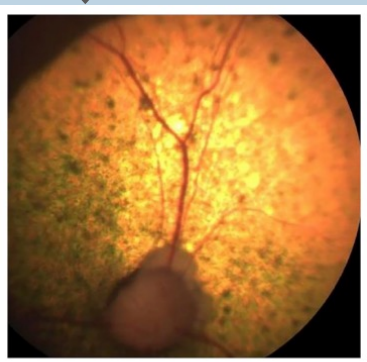
Retinal pigmented epithelium dystrophy

- Described in English Cocker Spaniel
- Causes visual deficits, nyctalopia, PLR reduction
- Changes on funduscopy; hiperpigmented multifocal lesions on the tapetal fundus
- These hyperpigmented changes are due to lipofucsin accumulation in the RPE (retinal pigmented epithelium)
- Neuro signs: propioceptive changes in affected patients
- Diagnosis: Vitamine E concentration in serum (alfa-tocoferol)
- Treatment: supplementation of Vit E will reduce progression but not revert changes
- Whats new?



Retinal pigmented epithelium dystrophy

- Whats new?
- ECVO abstract 2024
  - Gwas evaluation revealed a locus on chromosome 29 associated with RPED and adjacent to alfa-tocopherol transfer protein gene (TTPA)
  -



RPED in an English Cocker Spaniel

ABSTRACT

S-01-04 | Retinal pigment epithelial dystrophy in the English cocker spaniel: A genetic investigation

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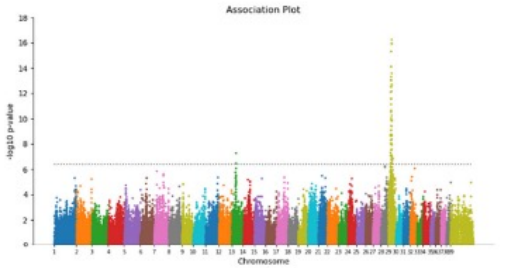
Purpose: To investigate the genetic basis of Retinal Pigment Epithelial Dystrophy (RPED) in the English Cocker Spaniel. Primary Vitamin E deficiency, occasionally associated with ataxia, has been documented in RPED-affected English Cocker Spaniels forming the basis for genetic investigations into the molecular cause of the disease.
Methods: DNA samples from 50 English Cocker Spaniels were genotyped on the 230K SNP CanineHD BeadChip array (Illumina), comprising 30 with normal fundic examinations aged 6 years or older (controls) and 20 with RPED and low plasma α-tocopherol concentrations (cases). A genome-wide association study (GWAS) was performed on 18 of the cases and the 30 controls to identify a genomic locus associated with RPED. Whole genome sequencing (WGS) was performed in two cases, data were aligned to canine genome build canFam4 and variants filtered against 307 dogs of multiple breeds without RPED and on the predicted effect on the protein.
Results: The GWAS revealed a locus on canine chromosome 29 that was statistically associated with RPED and which was adjacent to the α-tocopherol transfer protein gene (*TTPA*). WGS analysis revealed a 102 bp deletion in *TTPA* in the RPED cases which was absent in the 307 other dogs and that is currently being investigated as a strong causal candidate for this disease.
Conclusion: This study has identified a genomic locus, adjacent to *TTPA*, that is strongly associated with RPED in English Cocker Spaniels. *TTPA* is an excellent candidate gene for RPED as mutations in *TTPA* have previously been reported to be associated with retinitis pigmentosa with ataxia in humans.
Conflict of Interest: I do not declare any conflict of interest.



Association Plot of 18 RPED Cases and 30 Controls

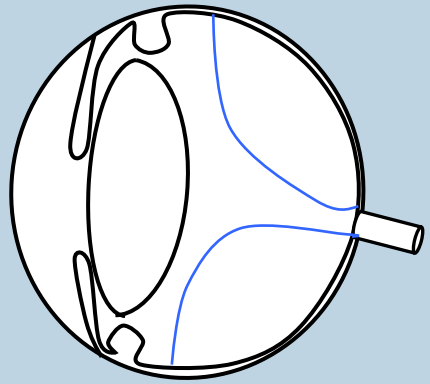
RPED patient

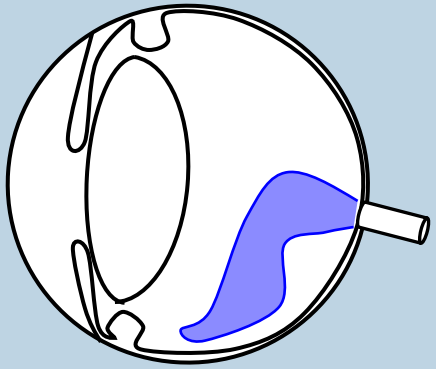
Plan

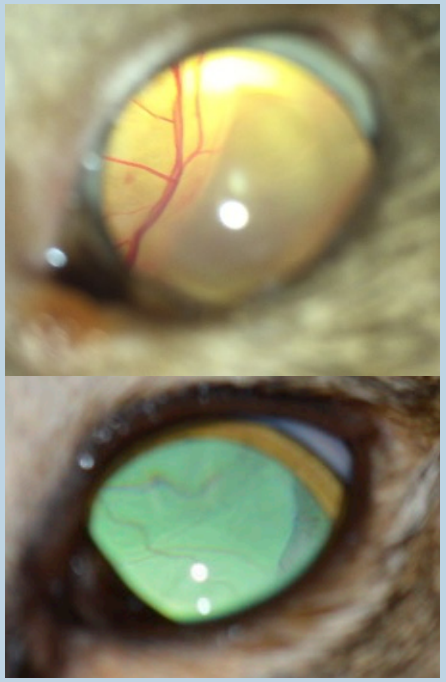
- Blindness
  - Ocular blindness:
    - Cataracts and other intraocular disease – away from the scope of this lecture
    - Retinal origin:
      - Inherited
      - Acquired
  - Optic nerve origin: inherited and acquired
  - Toxic: retinal Vs CNS toxicity
  - Mechanical/Vascular/Traumatic blindness

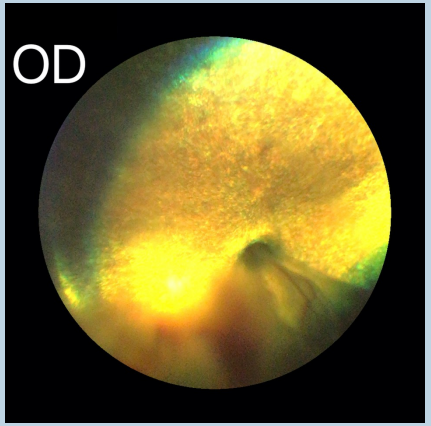
Retinal Detachment

- Neuro-retina detaches from the retinal pigment epithelium
- Two types:
  - **Inflammatory**: retina is pushed by fluid
    - **(Bullous)**
  - **Rhegmatogenous:** retinal tear
  - **Disinsertional**: retina loses peripheral attachments



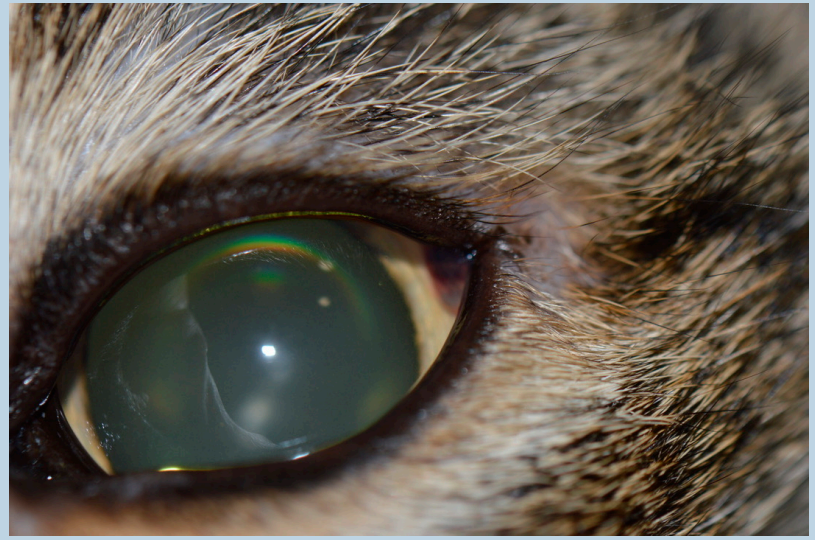


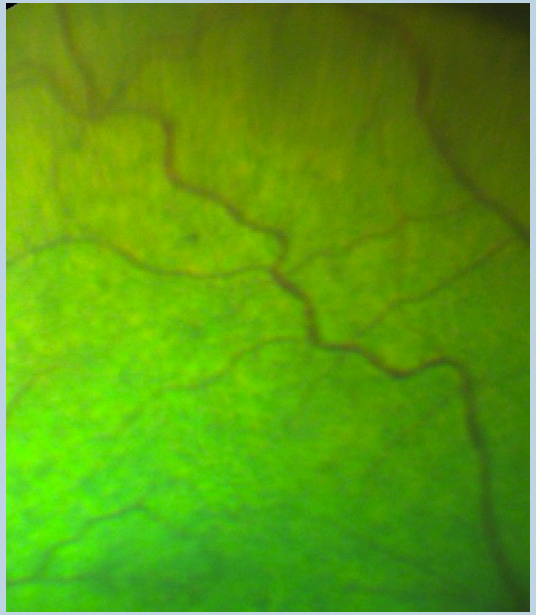




Hypertensive retinopathy

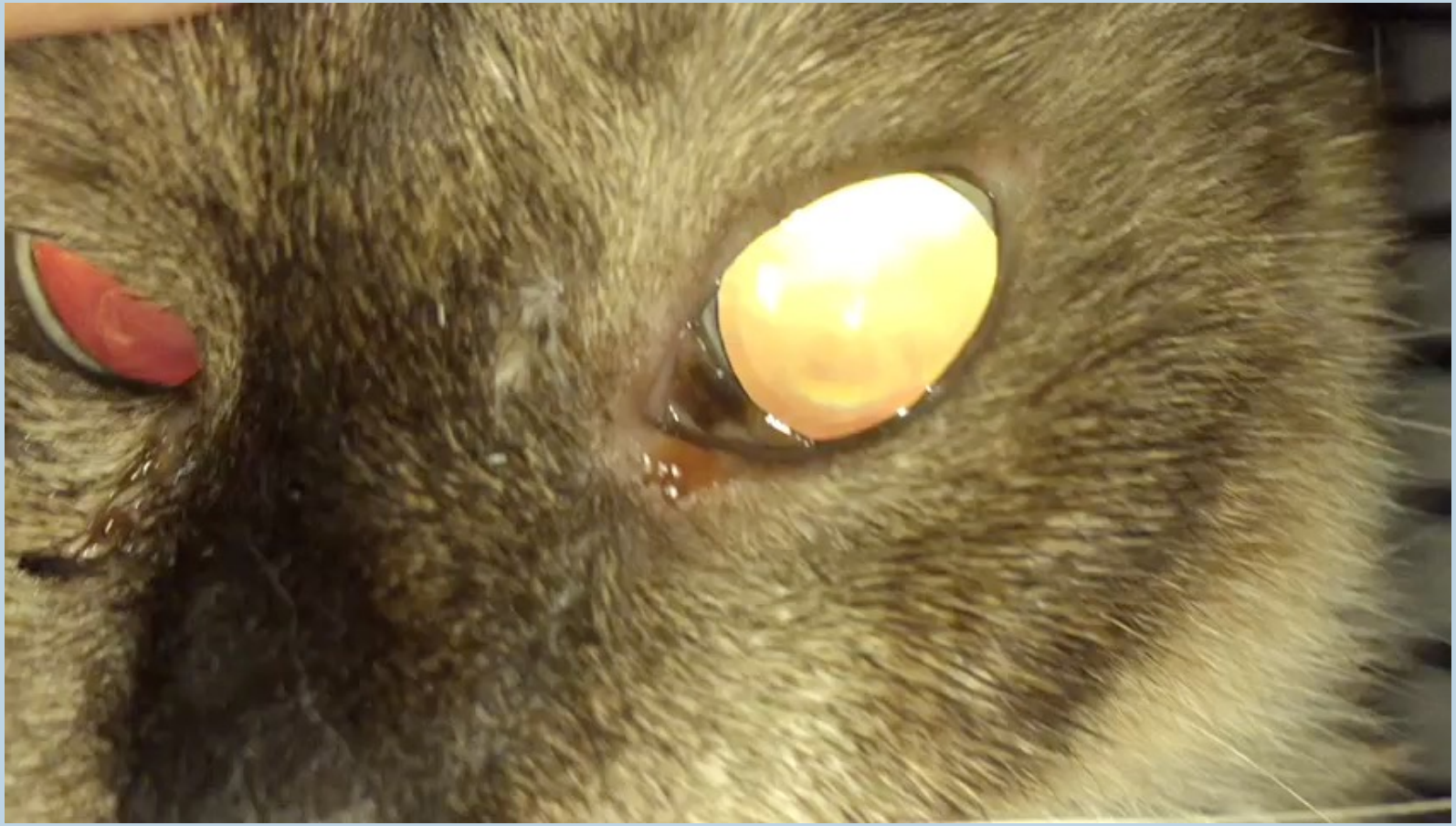
- Ophthalmic clinical signs:
  - Iridal hemorrhages
  - Iridal aneurysms
  - Hyphema
  - Vitreal heamorrhages
  - Retinal detachment
  - Retinal hemorrhages
  - Narrowing/Pseudonarrowing arterioles
- Amodip is standart treatment (Cats)
- Various degrees of fundic changes
  - 50% will improve with treatment 3 weeks later
- Cats over 8yold: rule out: CRF, hyperthyroidism and diabetes mellitus



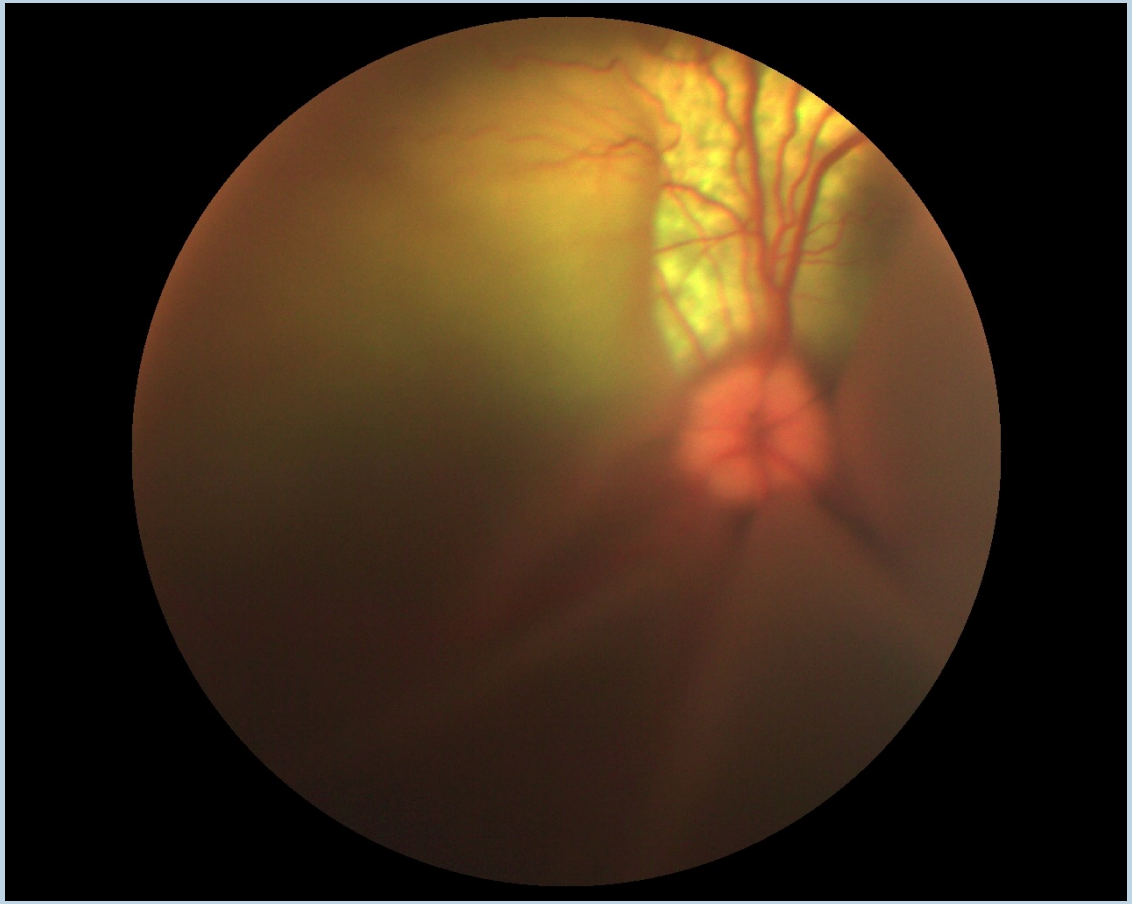


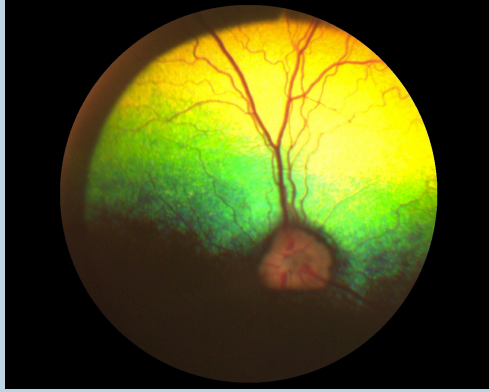
Amlodipine gingival changes
(Cirla VO2020)

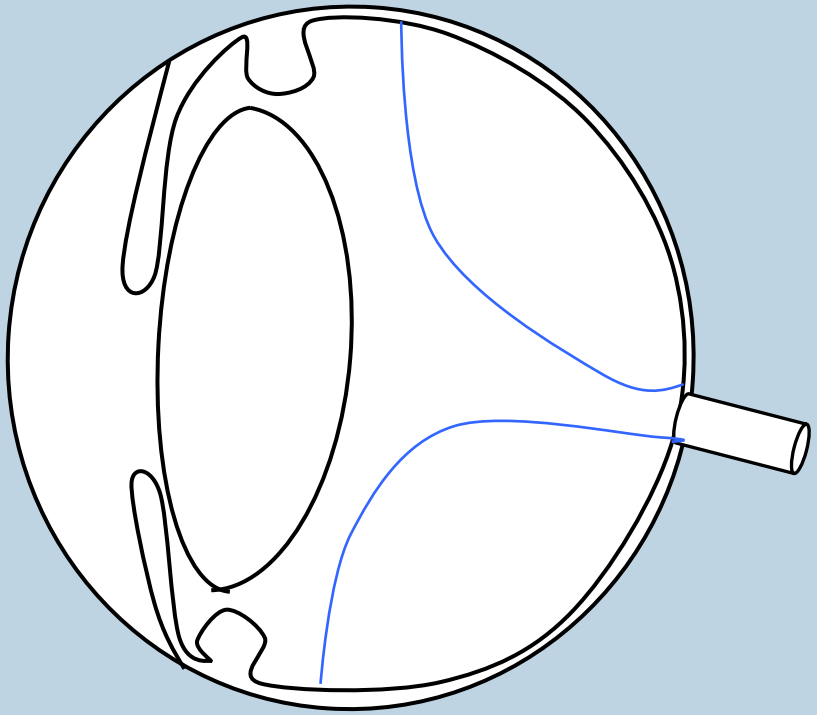
Retinal detachment



Inflammatory retinal detachment (Bullous)

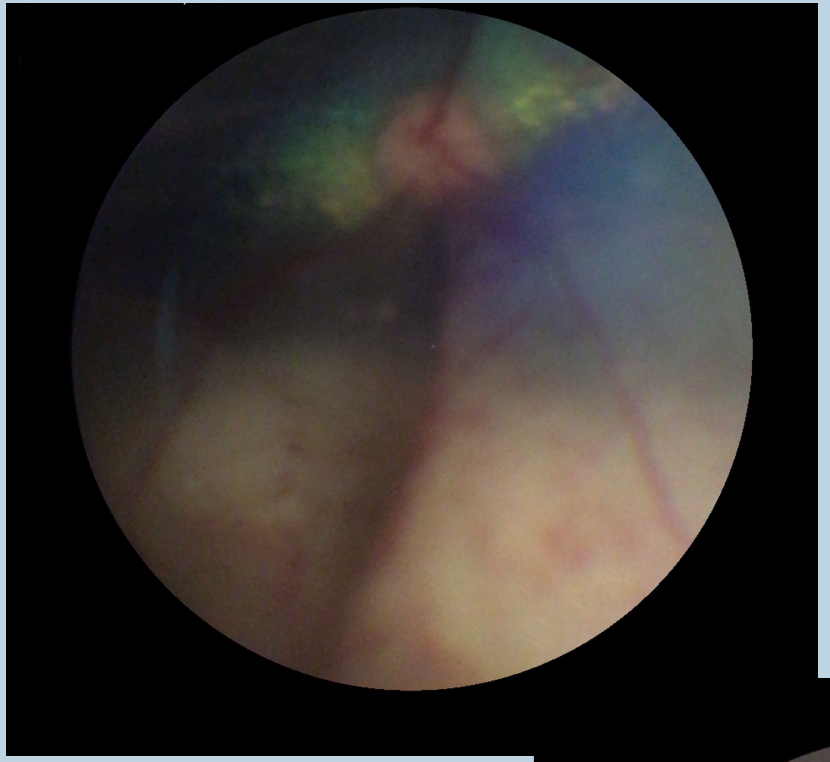


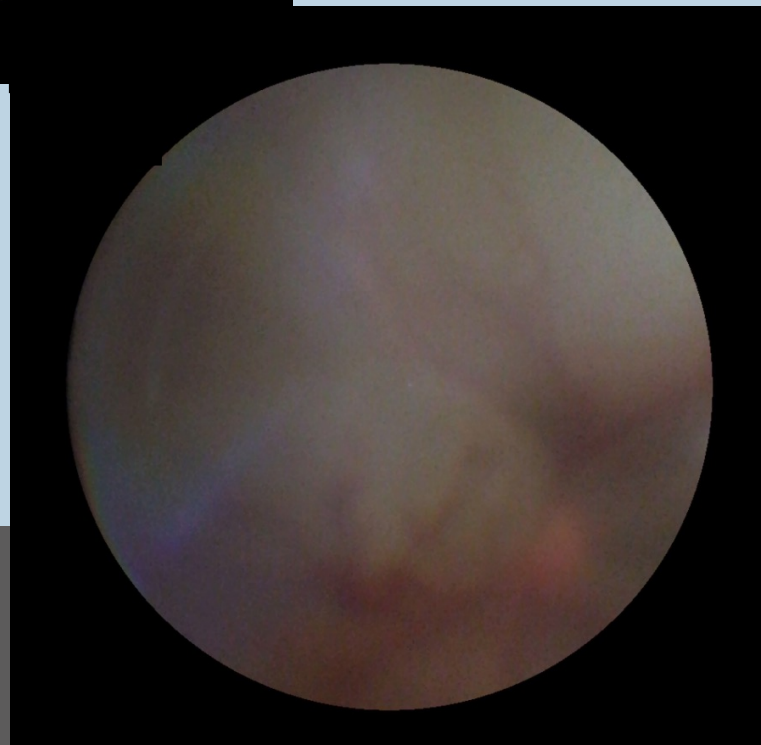




Dolça

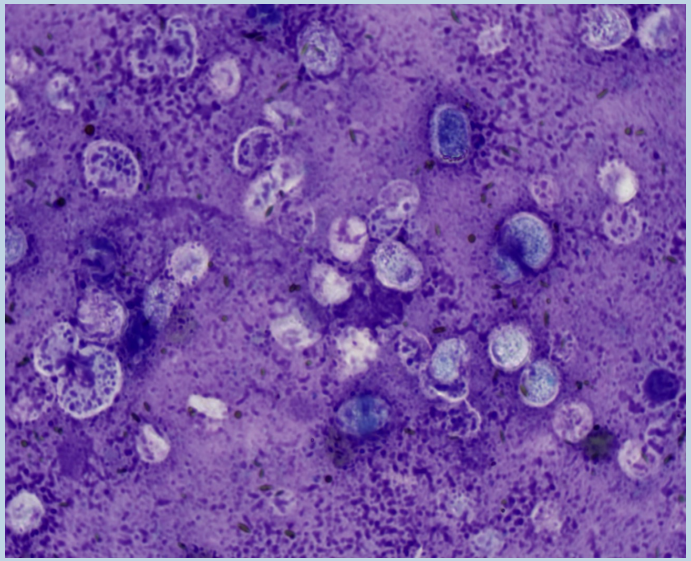
- Cross breed 7yold female spayed
- Chronic diarrhoea work up includes
  - Abdominal ultrasound
  - Endoscopy for GI biopsies
  - Blood work largely unremarkable
- Comes to Memvet for blindness

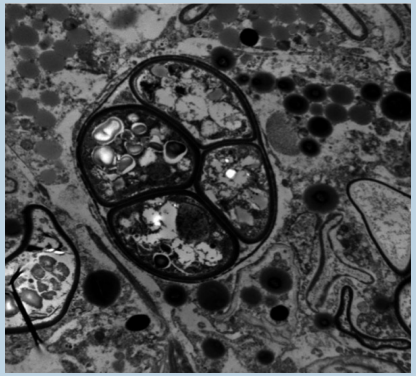




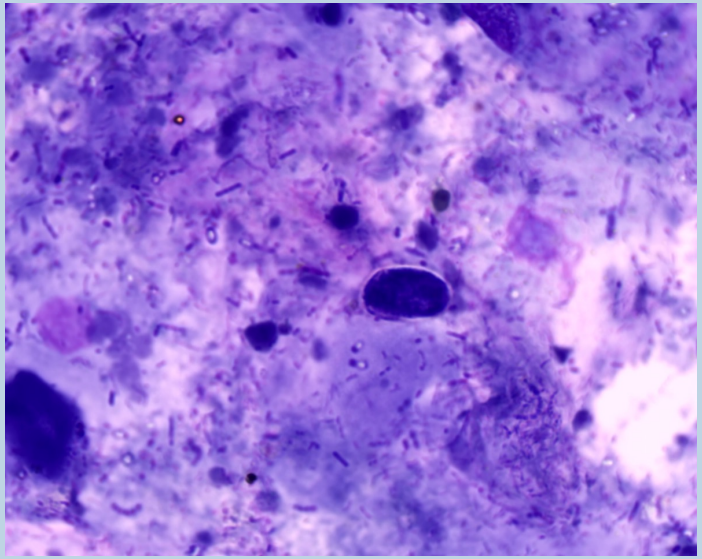
Dolça

- Since OS was severely damaged decided to do vitreocentesis
- Observed structures compatible with fungal or algal
- Definitive diagnosis: ocular prototecosis
- Treatment: Itraconazol and steroids
- 1 month later neurological signs and was euthanised



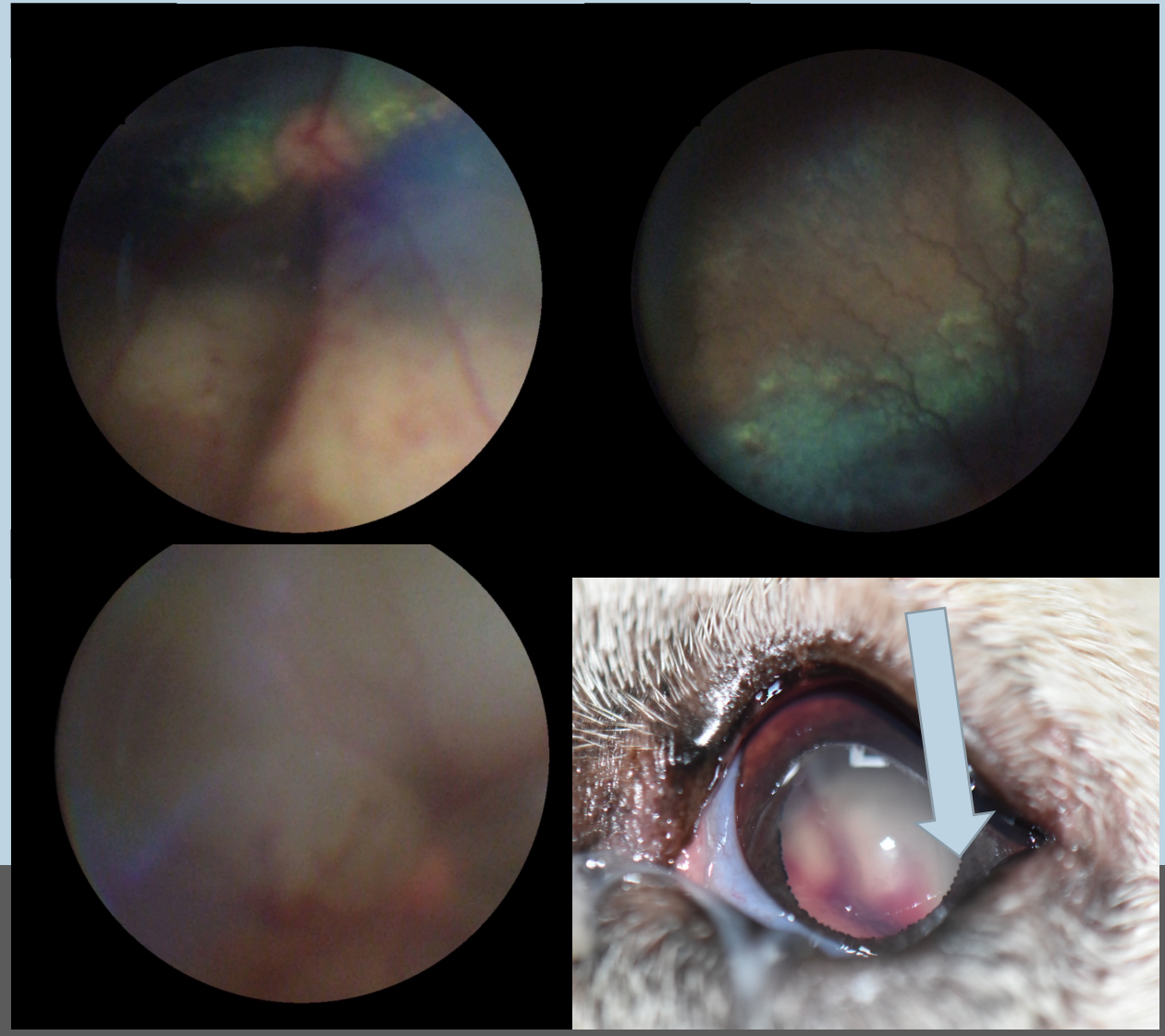


Transmission electron microscopy image of a Prototheca organism. Shank *et al*. 2015.



Work up in bullous exudative detachment

- Uveitis – choroiditis
  - (small uveal cysts on pupil)
- Uveitis work up
  - Blood work
  - Imaging (chest Xrays, abdominal ultrasound, or CT)
  - Infectious diseases
- Aqueocentesis ??
- Vitreocentesis ??



Causes of uveitis in dogs: 102 cases (1989–2000)

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Abstract

Uveitis is one of the most common ocular diseases and one of the most common causes of blindness in dogs. The purpose of this retrospective study was to correlate the signalment, history, clinical signs and ophthalmic findings of dogs with uveitis with the underlying etiology. We conducted a retrospective study of 102 dogs presented to the NCSU-VTH from 1989 to 2000 with clinical signs of uveitis. Medical records of dogs presented for uveitis were reviewed. Dogs were included in the study only if a complete diagnostic work-up database was collected, if sufficient follow-up was documented, and if the uveitis was not secondary to trauma or a hypermature cataract. The mean age ± SD of all dogs in this study was 6.2 ± 3.6 years. There were 33 intact and 16 castrated males, and 14 intact and 27 neutered females. Fourteen breeds were represented, with the Golden Retriever (n = 14) most common. Fifty-nine dogs (58%) were diagnosed with idiopathic/immune-mediated uveitis, neoplasia was diagnosed in 25 dogs (24.5%) and 18 dogs (17.6%) were diagnosed with infectious causes of uveitis. Aqueous flare was the most common clinical sign, occurring in 88 dogs (86%). The most common infectious organisms associated with uveitis in the dogs of this study were *Ehrlichia canis* (n = 7). Lymphosarcoma (n = 17) was the most common neoplasm. In ≈ 60% of dogs presenting for uveitis an underlying cause was not found, and a diagnosis of immune-mediated or idiopathic uveitis was made. However, ≈ 25% of dogs had ocular and/or systemic neoplasia (with 17% of cases having lymphosarcoma) and 18% with an underlying infectious cause for uveitis. Because of the high percentage of systemic disease associated with uveitis in dogs, extensive diagnostic testing is recommended before instituting symptomatic anti-inflammatory therapy.

A multicenter retrospective study into endogenous causes of uveitis in cats in the United Kingdom: Ninety two cases

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Abstract

Purpose: The purpose of this study was to investigate the most common causes of endogenous feline uveitis in a UK referral population and to investigate associations based on signalment.

Methods: Retrospective multicenter cross-sectional study from 2010 to 2019 including cats presented to the Animal Health Trust and the Royal Veterinary College with clinical signs consistent with uveitis. Cats were included in analyzes if they had a full physical examination including an ophthalmic examination, complete blood count, serum biochemistry, and infectious disease testing for at least two diseases unless the diagnosis was found on clinical examination (eg, neoplasia).

Results: A total of 92 cats were included in the study. The majority of cats presenting with uveitis were male (66.3%). The most common causes of endogenous uveitis were idiopathic uveitis (42/92 45.7%), feline infectious peritonitis (FIP) 15/92 16.3%), and lymphoma (10/92 10.9%). Fisher's exact test showed differences in breed across diagnosis groups (p = .002) with purebred cats being overrepresented in the lymphoma and FIP groups. Kruskal-Wallis test showed differences in median age across diagnosis groups (p < .001) with cats in the FIP group having the youngest age (median 1.4 years, interquartile range (IQR) 0.4–1.8 years) and cats in the neoplasia (primary or paraneoplastic) group having the oldest age (median 12.8 IQR 10.8–13.8). Idiopathic uveitis was unilateral in 56.1% of cases, and infectious causes were unilateral in 47.8% of cases.

Conclusions: The most common cause of endogenous uveitis in a population of cats in the UK was idiopathic uveitis, followed by FIP and lymphoma.

KEYWORDS
endogenous, feline, idiopathic, infection, neoplasia, uveitis

Veterinary Ophthalmology (2015) 1–8 DOI:10.1111/vop.12324

Causes of endogenous uveitis in cats presented to referral clinics in North Carolina

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Abstract

Objective To investigate the causes of endogenous uveitis in cats presenting to referral ophthalmology clinics in North Carolina.

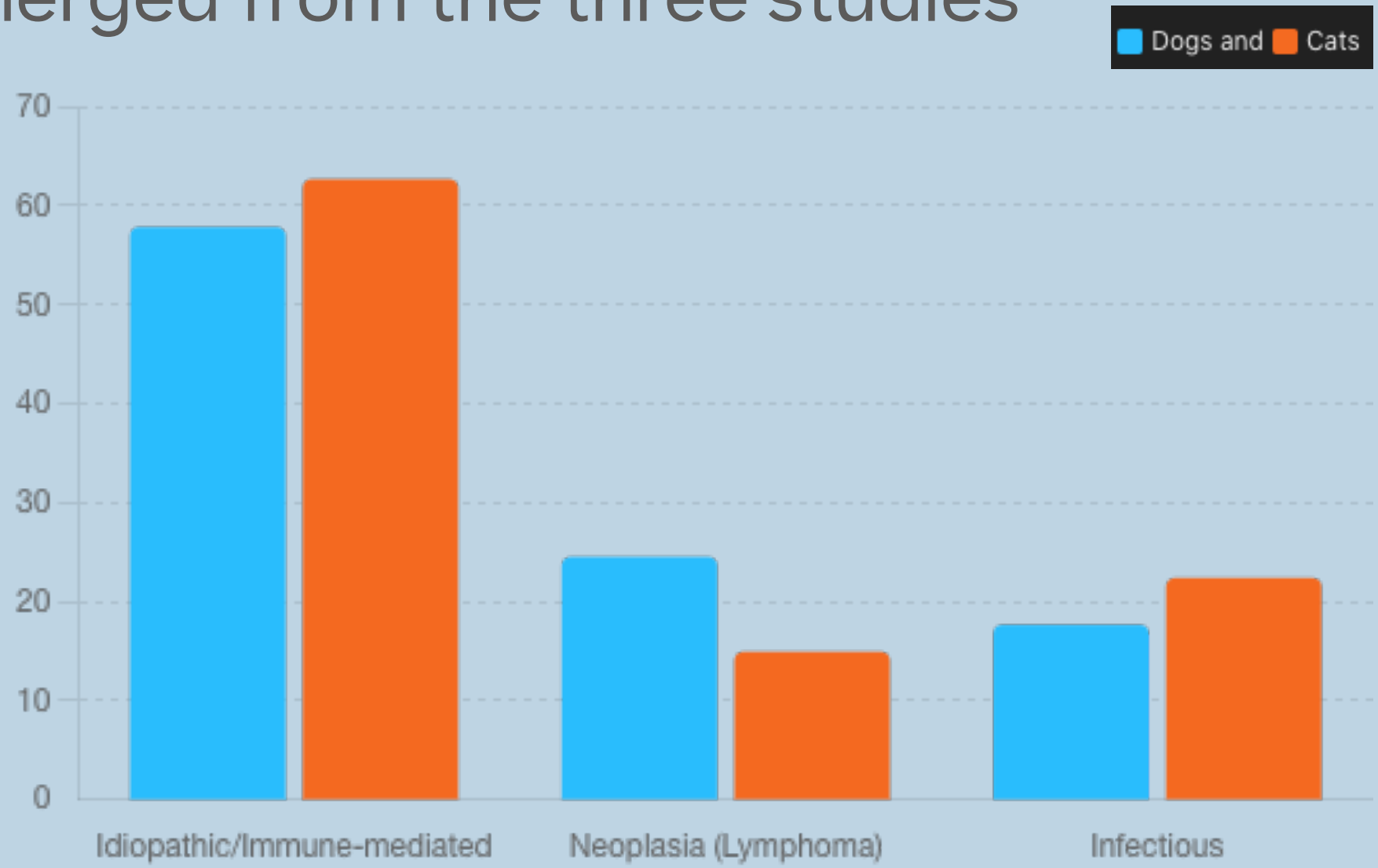
Procedure Medical records of cats diagnosed with endogenous uveitis at North Carolina State University's College of Veterinary Medicine (NCSU-CVM) or Animal Eye Care Associates of Cary, NC between 2003 and 2015 were reviewed. Inclusion criteria were cats that had complete diagnostic workups, including clinical, clinicopathological, serological, and histopathological data, as well as imaging modalities. Serology was consistently completed for feline leukemia virus (FeLV), feline immunodeficiency virus (FIV), feline coronavirus (FCoV), Toxoplasma gondii, and Bartonella spp.

Results One hundred and twenty cats met the inclusion criteria. Seroprevalence of FeLV (2.7%), FIV (7.3%), FCoV (34.7%), *T. gondii* (23.7%), and Bartonella spp. (43.2%) was observed, with a combined seroprevalence of 59.2%. Nineteen cats (15.8%) were diagnosed with feline infectious peritonitis (FIP) based on clinical, hematological, serological, histopathological, and necropsy findings. The average age of all cases was 7.62 years, while the average age of cats diagnosed with FIP was 1.82 years. Neoplasia was diagnosed in six cats (5.0%). No underlying etiology was found in 49 cats (40.8%).

Conclusions Both idiopathic and neoplastic causes of uveitis were less prevalent than previously reported in studies, while seropositivity was higher than previously reported for the study area. This may be due to improved diagnostic capabilities or that cats with infectious disease were more likely to be referred. Because of the high prevalence of FIP, young cats with uveitis should be evaluated for hyperglobulinemia and FCoV serology should be performed as minimal diagnostics.

No studies separate anterior uveitis from posterior uveitis

Data merged from the three studies



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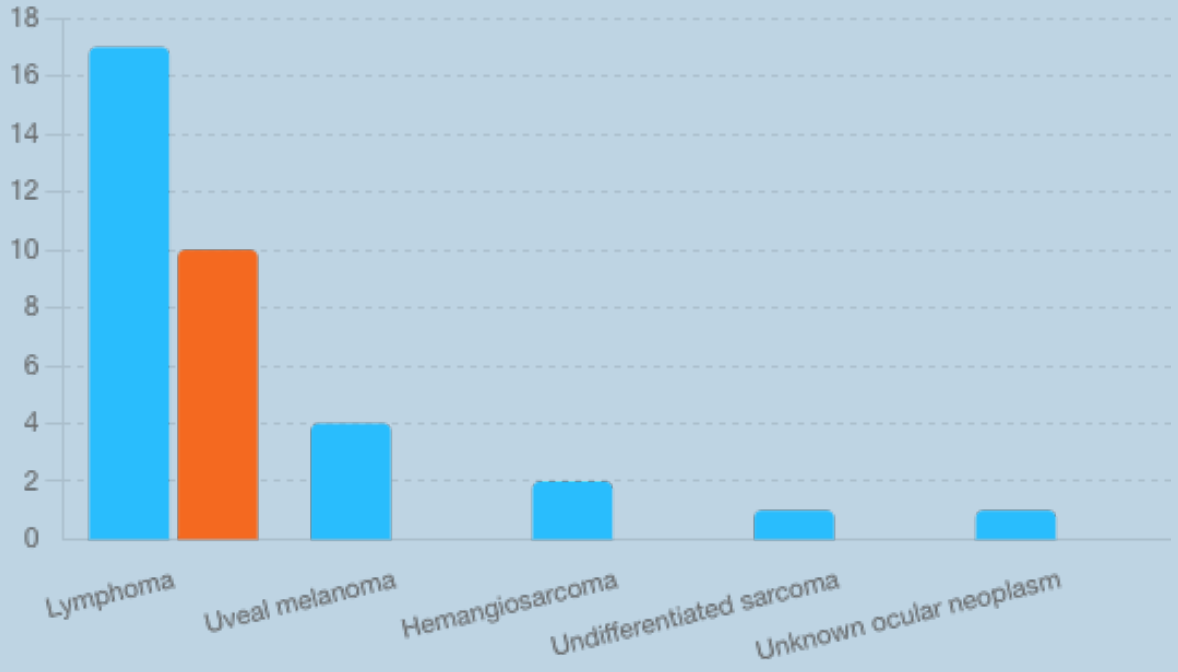
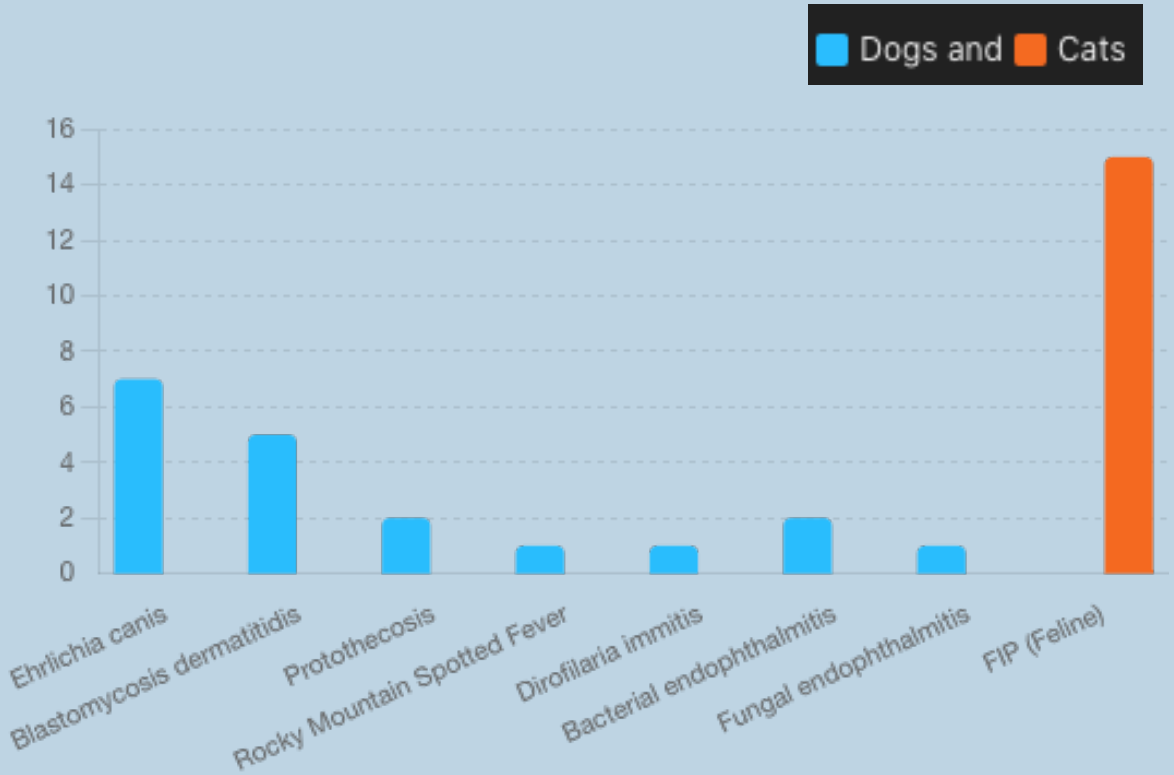
Disclosure: these charts have been generated with IA based on the three studies above

Tumours and infectious diseases





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Disclosure: these charts have been generated with IA based on the three studies above

Aqueocentesis?

Veterinary Ophthalmology (2015) **18**, 4, 326–334 DOI:10.1111/vop.12245

Validity of aqueocentesis as a component of anterior uveitis investigation in dogs and cats

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Abstract

Objective To describe aqueocentesis cytopathology results from dogs and cats presenting for uveitis investigation and to determine whether this is a useful and safe procedure.

Animal Studied Dogs and cats presenting for investigation of anterior uveitis (April 2008–December 2013).

Procedures Aqueous was collected via limbal entry under sedation/general anesthesia, for cytopathology and occasionally bacterial culture or polymerase chain reaction (PCR) testing. Further workup included blood testing (hematology, biochemistry, and serology), diagnostic imaging, nonocular cytopathology, and available histopathology.

Results Fifty-six dogs and 39 cats were included in the study. An aqueous cytopathologic diagnosis of lymphoma (or discrete cell neoplasia) was made in six dogs and seven cats, and a diagnosis of large cell carcinoma made in one dog. This diagnosis of lymphoma was confirmed by ocular histopathology in two dogs and one cat; nonocular cytopathology corroborated lymphoma in another three dogs and five cats. Lymphoma was not evident on aqueous cytopathology but confirmed on nonocular histopathology in two dogs and by cytopathology in one cat. Additionally, aqueous cytopathology in three cats suggested, but was not considered diagnostic of, lymphoma; one of these cats had a confirmatory diagnosis of lymphoma on subsequent clinical investigation. Aqueous humor cytopathology alone was not diagnostic in non-neoplastic anterior uveitis cases, but supplemented the clinical picture with other systemic diagnostic tests. No clinically important complications were reported in association with aqueocentesis.

Conclusions Aqueocentesis is performed readily with minimal risk. The results were primarily useful in aiding a diagnosis of lymphoma in both dogs and cats.

Key Words: anterior uveitis, aqueocentesis, cats, cytopathology, dogs, lymphoma

Veterinary Ophthalmology (2013) 1–9 DOI:10.1111/vop.12075

Diagnostic utility of aqueocentesis and aqueous humor analysis in dogs and cats with anterior uveitis

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Abstract

Objective To evaluate diagnostic utility of aqueous humor analysis in animals with anterior uveitis.

Animals Client-owned dogs (n = 12) and cats (n = 10).

Procedures Examination findings and diagnostic test results including aqueous humor cytology were compared.

Results Disease duration prior to aqueocentesis was not significantly different between dogs with idiopathic anterior uveitis and those with an etiologic diagnosis, but was shorter in cats with feline infectious peritonitis (FIP) than those with idiopathic uveitis. Microbial nucleic acids, antigens, or antibodies against them were seldom found in blood/serum; however, serum feline coronavirus titers ≥1:6400 were detected only in cats with FIP. Aqueous humor cytology was diagnostic in no cats and two dogs, both with neoplasia. Although aqueous humor contained predominantly neutrophils in cats with FIP and large reactive lymphocytes and plasma cells appeared more frequent in cats with idiopathic uveitis, neither clinical nor cytologic assessment of anterior chamber contents differed significantly between cats with idiopathic or FIP-associated uveitis. Cytologically assessed plasma cell number was correlated with keratic precipitates and disease duration. Clinically detectable hyphema and cytologic erythrocyte number were correlated. However, cytologic cell grades and clinical grade of flare or cell numbers within the anterior chamber were not correlated.

Conclusions Aqueous humor cytology permitted diagnosis of neoplasia in dogs with anterior uveitis but was generally not helpful in cats. Poor correlation between clinical and cytologic assessment of cell numbers and type within the anterior chamber dictates that clinical grading should not be the sole criterion for electing to perform aqueocentesis.

Key Words: clinical pathology, diagnostic testing, feline infectious peritonitis, infectious disease, iridocyclitis, neoplasia

Aquocentesis in uveitis?

Points in common

- Recognition of diagnostic limitation in non-neoplastic causes of anterior uveitis
- **Lymphoma Diagnosis**: they both identify lymphoma as a common neoplastic cause that can be diagnosed through cytologic assessment of aqueous humor

Points of disagreement

- One key point of divergence is in the perceived utility of aqueocentesis in diagnosing lymphoma in cats.
  - Linn-Pearl reported a relatively higher diagnostic utility, particularly for lymphoma, whereas
  - Wiggans noted that cytologic assessment of aqueous humour did not correlate well with final diagnoses in cats
- Selection Criteria and Diagnostic Approach:
  - Linn-Pearl performed aqueocentesis as a routine part of the initial diagnostic workup
  - Wiggans et al., 2013, conducted it only after other diagnostic tests failed to provide an aetiology
- Geographic and Sample Size Considerations:
  - Linn-Pearl had a larger sample size and included cases from a broader geographic area - might have contributed to differences in the reported prevalence and diagnostic success rates

Mishi, 10yo, FS

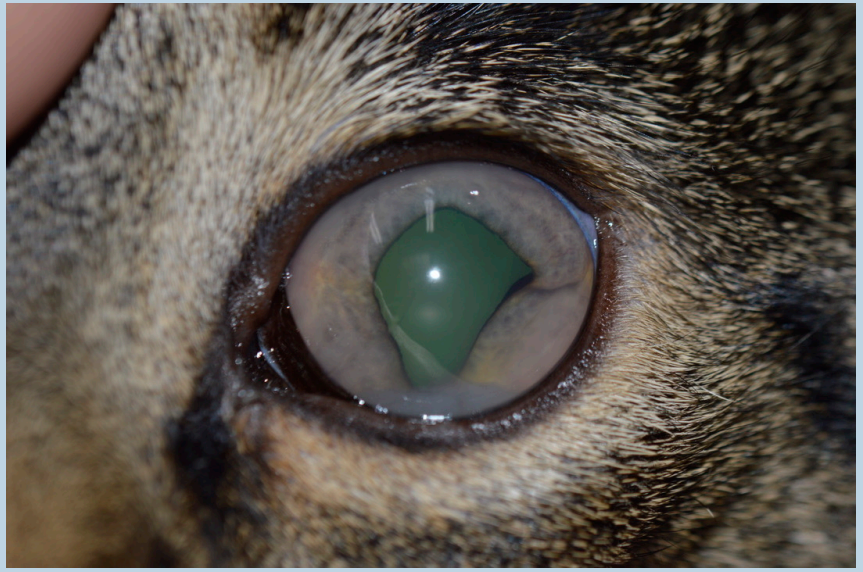
- Suspected blindness
- Hypopion in both eyes
- Otherwise well in herself

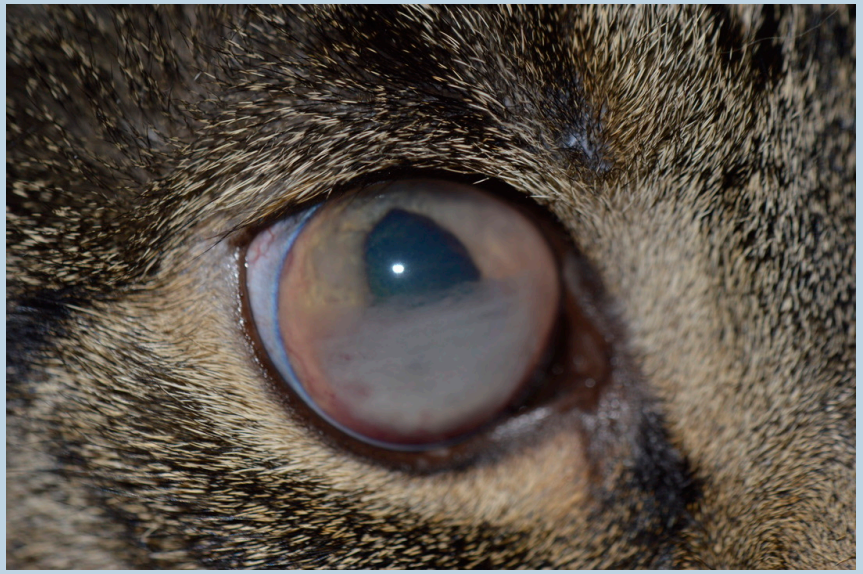
Mishi, 10yo, FS

- Suspected blindness
- Hypopion in both eyes
- Otherwise well in herself
- Ophtho:
  - IOP: 32-36mmHg (OD-OS)
  - Hypopion severe in both eyes
  - Retina not visible
- Search for systemic disease

Mishi, 10yo, FS

- Work up – Uveitis: imaging- full body
- CBC
- Biochemistry – protein electrophoresis
- Infectious diseases:
  - Ehrlichia
  - Bartonella
  - Leishmania
  - Coronavirus titre
  - FIV-FeLV

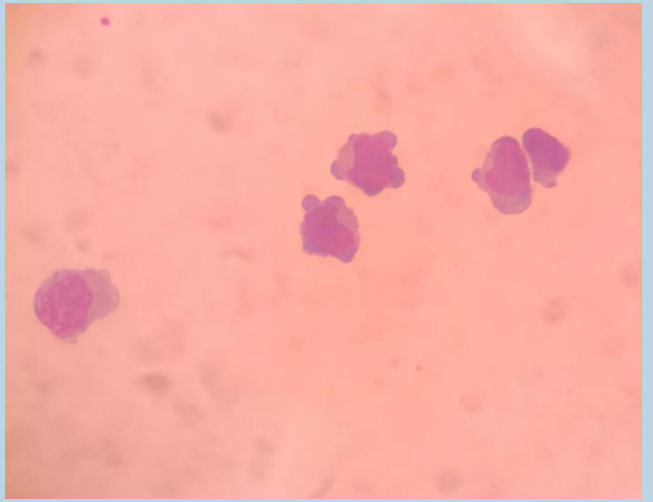




Mishi, 10yo, FS

- Aqueocentesis
  - Needs to be evaluated quickly as cells will degenerate despite use of EDTA
  - EDTA for 0,25mL

- Diagnosis from clinical pathologist:
  - Lymphoma suspect
  - PARR performed confirmed diagnosis (antigen receptor rearrangements)



In house cytospin 40x Diff Quick

Fel ocular lymphoma

- Ocular lymphoma described:
  - Presumed solitary ocular lymphoma (PSOL)
    - Survival time: 154 days
  - Suspectes systemic involvement (SSI)
    - Survival time: 69 days
  - PSOL 64% - SSI 36%
  - Subtype of lymphoma did not affect survival time

> Vet Ophthalmol. 2020 Jan;23(1):77-89. doi: 10.1111/vop.12692. Epub 2019 Jul 22.

Clinical and histopathological classification of feline intraocular lymphoma

Ayla R Musciano [1], Matthew R Lanza [1], Richard R Dubielzig [2], Leandro B C Teixeira [2], Amy C Durham [1]

Affiliations + expand

PMID: 31328872 DOI: 10.1111/vop.12692

Abstract

This retrospective study aimed to describe and classify cats with intraocular lymphoma, determine the proportion of cases with presumed solitary ocular lymphoma (PSOL) compared with ocular manifestations of multicentric disease and assess the clinical outcomes of these patients. One hundred seventy-two cases identified through biopsy submissions were reviewed histologically; 163 of these cases were subtyped according to the WHO classification system. Cases were categorized as having PSOL or ocular lymphoma with suspected systemic involvement (SSI) based on submission forms and follow-up data. The majority of cases exhibited concurrent uveitis (75%) and secondary glaucoma (58%). Diffuse large B-cell lymphoma was the most common subtype (n = 86; 53%), followed by peripheral T-cell lymphoma (n = 44; 27%). Other subtypes included anaplastic large T- (n = 8; 5%) and B-cell (n = 4; 2.5%) lymphomas, and 15 cases (9%) were negative for all immunohistochemical markers. In sixty-nine cases (40%), adequate clinical data and sufficient survival data were obtained to distinguish PSOL from SSI. PSOL comprised the majority of cases (64%), while 36% had SSI. When covarying for age at diagnosis, the median survival time was significantly higher (P = 0.003) for cases of PSOL (154 days) versus those with SSI (69 days); hazards ratio of 0.47 for PSOL (95% CI: 0.241-0.937). The subtype of lymphoma did not affect survival time. Cats with PSOL represent a greater proportion of the disease population, and this subset of cats with intraocular lymphoma has a better clinical outcome.

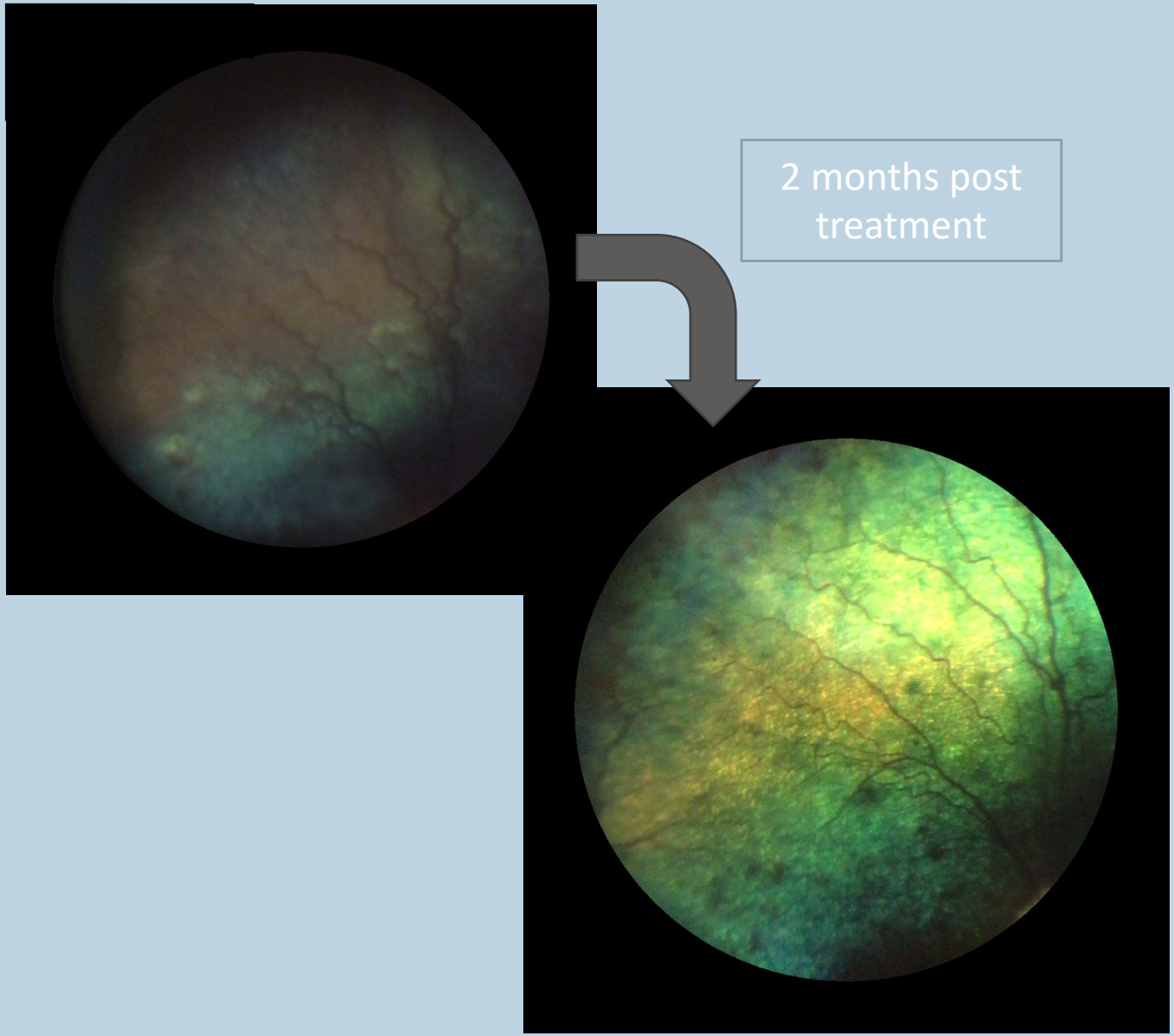
Keywords: eye; feline; lymphoma; ocular neoplasia.

Working up panuveitic cases

- At the time of investigation consider topical treatment
  - Subconjunctival dex?
- Treat primary cause
- If no primary cause assume immunemediated
  - Oral steroids
  - Oral cyclosporine PO

Case Luna

- Came for red eyes – allergy?
- Left eye reduced menace
- Flare +2 OU
- “Pupillary cysts”
- Chorioretinitis – infiltrates
- Work up: no abnormalities
- Vitreocentesis OS
  - Inflammatory
  - No organisms
- Treatment:
  - Oral steroids
  - Oral cyclosporine PO



Plan

- Blindness
  - Ocular blindness:
    - Cataracts and other intraocular disease – away from the scope of this lecture
    - Retinal origin:
      - Inherited
      - Acquired
  - Optic nerve origin: inherited and acquired
  - Toxic: retinal Vs CNS toxicity
  - Mechanical/Vascular/Traumatic blindness

SARDS / IMR

- SARDS (Sudden acquired retinal degeneration syndrome)
  - **Acute/ Sub-acute vision loss**
  - PLR may or may not be present
  - Ophthalmic examination otherwise unremarkable
  - Reduced olphaction (Abrams VO23)
  - **Diagnostic test: ERG (electroretinography)**

- IMR (Immunemediated retinopathy)
  - Similar changes to SARDS / not well caracterized

Olfaction evaluation in dogs with sudden acquired retinal degeneration syndrome

Kenneth L. Abrams[1] | **Daniel A. Ward**[2] | **Agnieszka Sabiniewicz**[3,4] | **Thomas Hummel**[3]

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[2]Department of Small Animal Clinical Sciences, College of Veterinary Medicine, University of Tennessee, Knoxville, Tennessee, USA

[3]Department of Otorhinolaryngology, Smell and Taste Clinic, Technische Universität Dresden, Dresden, Germany

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Abstract

Purpose: To evaluate olfaction in dogs with sudden acquired retinal degeneration syndrome (SARDS) compared with sighted dogs and blind dogs without SARDS as control groups.

Animals Studied: Forty client-owned dogs.

Procedure: Olfactory threshold testing was performed on three groups: SARDS, sighted, and blind/non-SARDS using eugenol as the test odorant. The olfactory threshold was determined when subjects indicated the detection of a specific eugenol concentration with behavioral responses. Olfactory threshold, age, body weight, and environmental room factors were evaluated.

Results: Sixteen dogs with SARDS, 12 sighted dogs, and 12 blind/non-SARDS dogs demonstrated mean olfactory threshold pen numbers of 2.8 (SD = 1.4), 13.8 (SD = 1.4), and 13.4 (SD = 1.1), respectively, which correspond to actual mean concentrations of 0.017 g/mL, 1.7×10^{-13} g/mL and 4.26×10^{-13} g/mL, respectively. Dogs with SARDS had significantly poorer olfactory threshold scores compared with the two control groups ($p < .001$), with no difference between the control groups ($p = .5$). Age, weight, and room environment did not differ between the three groups.

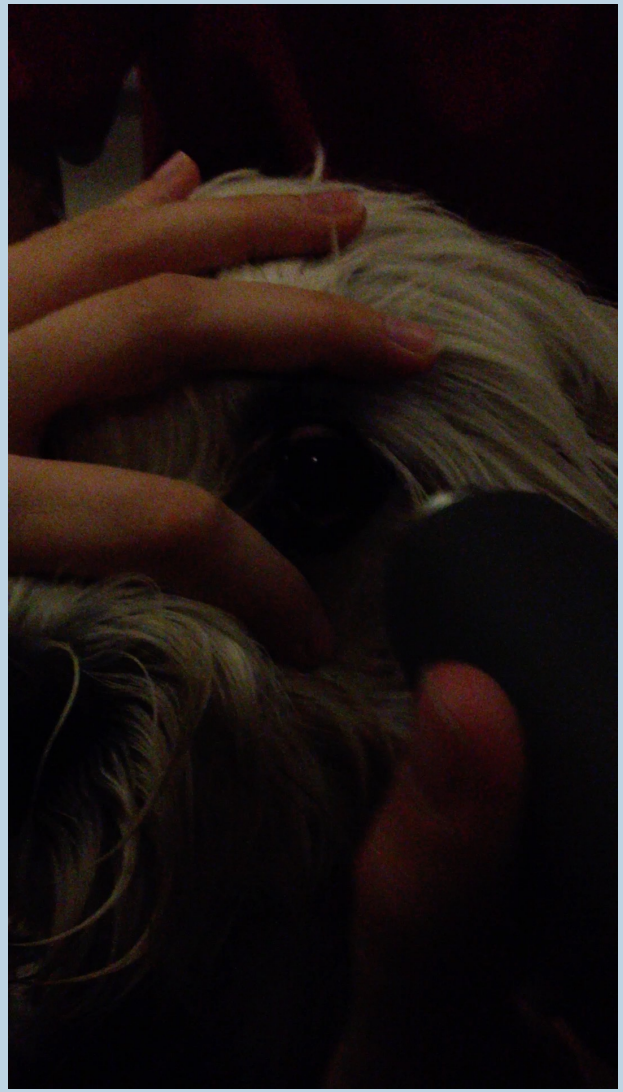
Conclusions: Dogs with SARDS have severely decreased olfaction capabilities compared with sighted dogs and blind/non-SARDS dogs. This finding supports the suspicion that SARDS is a systemic disease causing blindness, endocrinopathy, and hyposmia. Since the molecular pathways are similar in photoreceptors, olfactory receptors, and steroidogenesis with all using G-protein coupled receptors in the cell membrane, the cause of SARDS may exist at the G-protein associated interactions with intracellular cyclic nucleotides. Further investigations into G-protein coupled receptors pathway and canine olfactory receptor genes in SARDS patients may be valuable in revealing the cause of SARDS.

KEYWORDS
dysosmia, electroretinogram, endocrinopathy, hyposmia, olfactory threshold, retinal degeneration

SARDS

- Female > male
- History of Pu/Pd
- Sudden apoptosis of photoreceptors

- Pupillary colorimetry (not validated)
  - Blue: positive response
  - Red: negative or reduced response

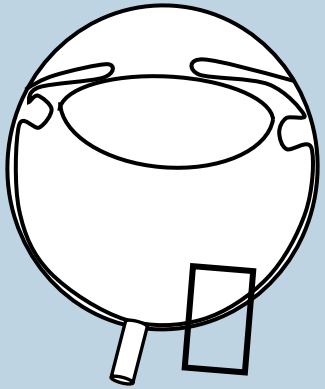


Ganglionar cells:

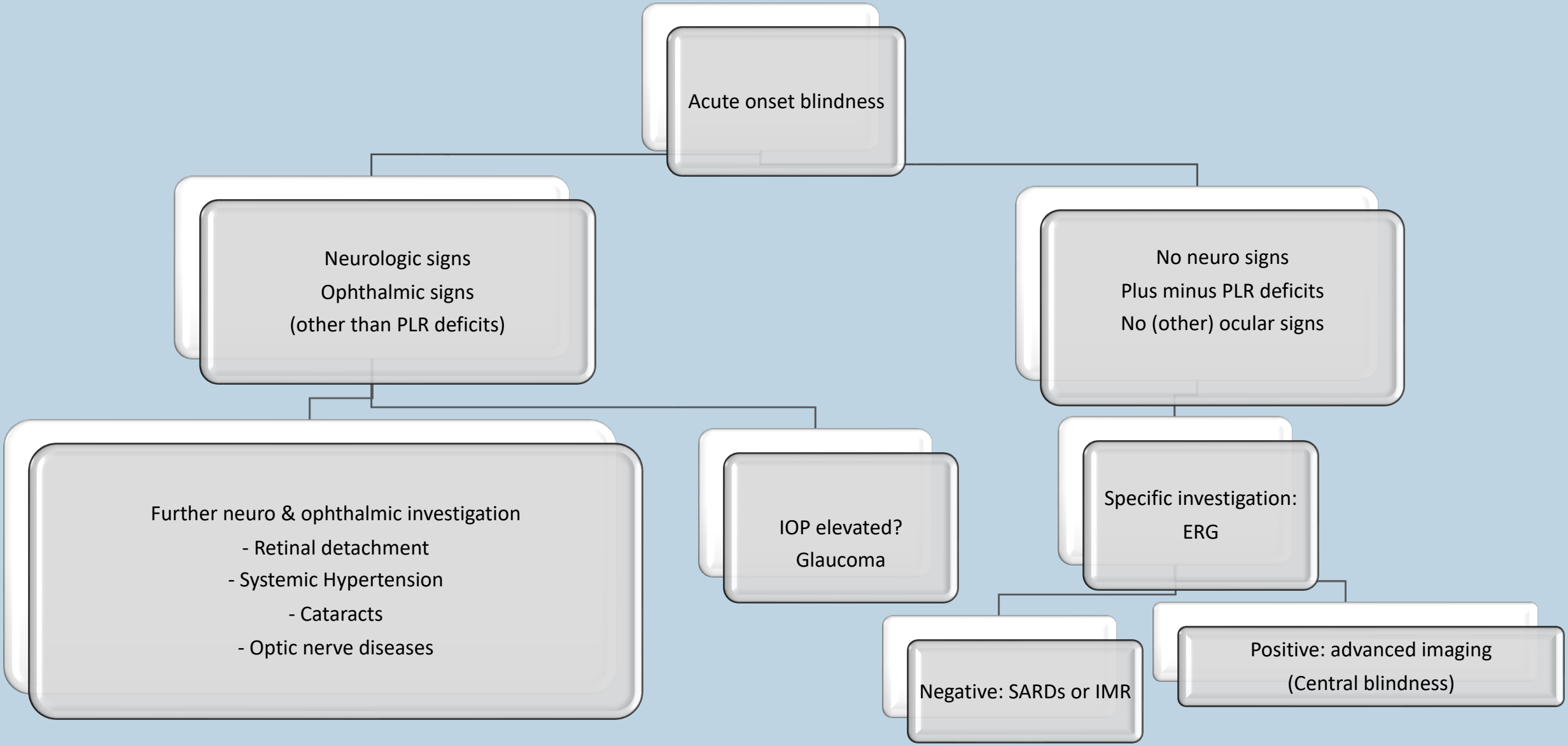
Melanopsine

Photoreceptors:

Rhodopsine



ERG


Acute onset blindness
Neurologic signs
Ophthalmic signs
(other than PLR deficits)
No neuro signs
Plus minus PLR deficits
No (other) ocular signs
Further neuro & ophthalmic investigation
- Retinal detachment
- Systemic Hypertension
- Cataracts
- Optic nerve diseases
IOP elevated?
Glaucoma
Specific investigation:
ERG
Negative: SARDs or IMR
Positive: advanced imaging
(Central blindness)

Recommended reading

Veterinary Ophthalmology (2016) **19**, 4, 319–331 DOI:10.1111/vop.12291

REVIEW ARTICLE

Sudden acquired retinal degeneration syndrome (SARDS) – a review and proposed strategies toward a better understanding of pathogenesis, early diagnosis, and therapy

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Abstract

Sudden acquired retinal degeneration syndrome (SARDS) is one of the leading causes of currently incurable canine vision loss diagnosed by veterinary ophthalmologists. The disease is characterized by acute onset of blindness due to loss of photoreceptor function, extinguished electroretinogram with an initially normal appearing ocular fundus, and mydriatic pupils which are slowly responsive to bright white light, unresponsive to red, but responsive to blue light stimulation. In addition to blindness, the majority of affected dogs also show systemic abnormalities suggestive of hyperadrenocorticism, such as polyphagia with resulting obesity, polyuria, polydipsia, and a subclinical hepatopathy. The pathogenesis of SARDS is unknown, but neuroendocrine and autoimmune mechanisms have been suggested. Therapies that target these disease pathways have been proposed to reverse or prevent further vision loss in SARDS-affected dogs, but these treatments are controversial. In November 2014, the American College of Veterinary Ophthalmologists' Vision for Animals Foundation organized and funded a Think Tank to review the current knowledge and recently proposed ideas about disease mechanisms and treatment of SARDS. These panel discussions resulted in recommendations for future research strategies toward a better understanding of pathogenesis, early diagnosis, and potential therapy for this condition.

Key Words: autoimmune retinopathy, blindness, canine, endocrinopathy, hyperadrenocorticism, sudden acquired retinal degeneration syndrome

Electroretinography (ERG)

- Electrophysiologic test to evaluate inner neuro-retinal function
  - Does NOT test:
    - Ganglion cells
    - RPE (retinal pigmented epithelium)

- Might need sedation if nervous
- Will inform us if there is cone/rod functionality

Plan

- Blindness
  - Ocular blindness:
    - Cataracts and other intraocular disease – away from the scope of this lecture
    - Retinal origin:
      - Inherited
      - Acquired
  - Optic nerve origin: inherited and acquired
  - Toxic: retinal Vs CNS toxicity
  - Mechanical/Vascular/Traumatic blindness

Enrofloxacin induced retinopathy

- Study in cats using 10x the recommended dose
- Toxic sudden degeneration of photoreceptors
- Individual cases with similar signs in cats using recommended dose of marbofloxacin too

- Neuro signs:
  - Lethargy
  - Nervousness
  - Ptyalism
  - Lack of grooming
  - Rigidness
  - Tremors
  - Convulsions
  - Blindness
  - Ataxia
  - Circling

Ocular and systemic manifestations after oral administration of a high dose of enrofloxacin in cats

Marnie M. Ford, DVM, PhD; Richard R. Dubielzig, DVM; Elizabeth A. Giuliano, DVM, MS; Cecil P. Moore, DVM, MS; Kristina L. Narfström, DVM, PhD

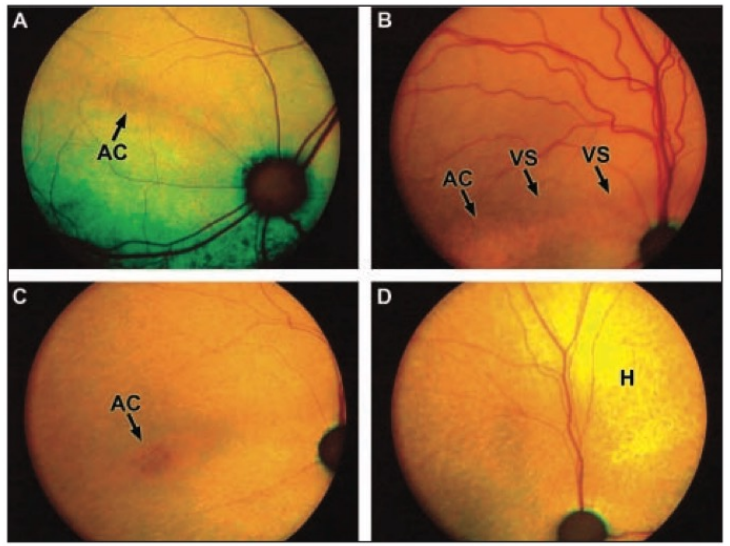


Figure 1—Funduscopic photographs of a representative control cat on day 1 with a normal-appearing fundus (A) and a representative enrofloxacin-treated cat on days 3 (B), 5 (C), and 7 (D). In the enrofloxacin-treated cat, notice the progressive change in granulation and graying of the area centralis (AC) and visual streak (VS), as seen on day 3; vascular attenuation observed on day 5; and marked tapetal hyperreflectivity (H) on day 7. Day of initial daily administration of enrofloxacin (50 mg/kg, PO) or control solution (1 mL of water, PO) was designated as day –1.

AJVR, Vol 68, No. 2, February 2007

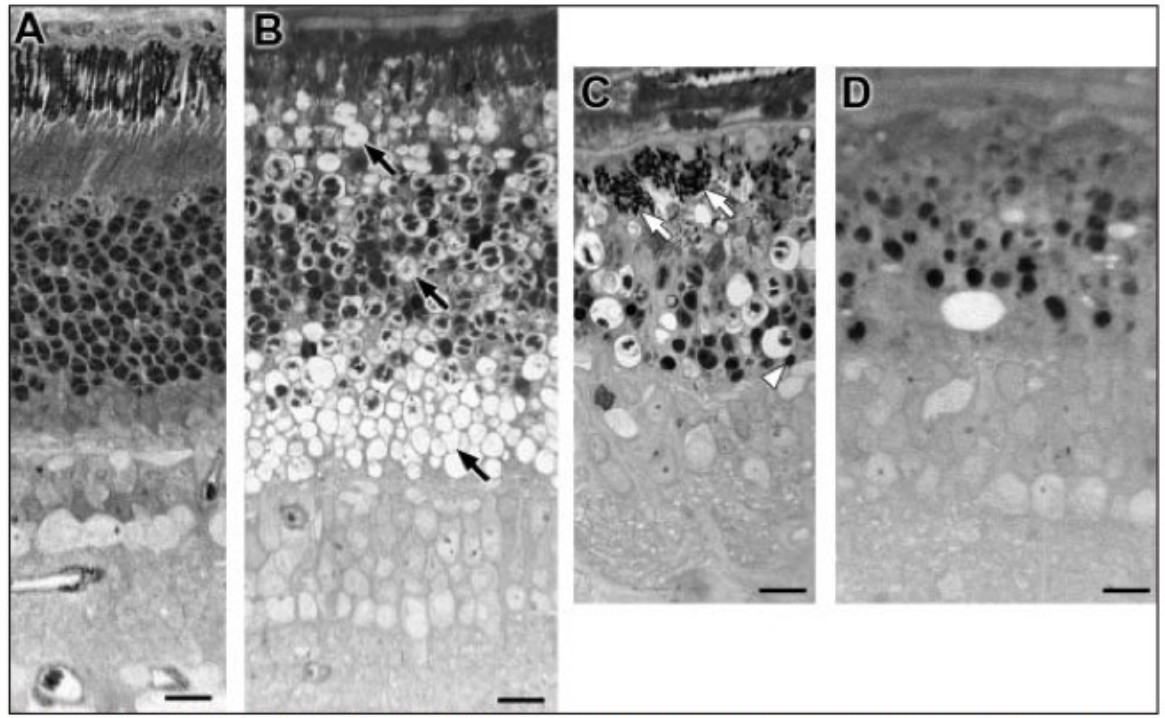


Figure 4—Photomicrographs of sections of retinal tissues obtained from enrofloxacin-treated cats on days –1 (A), 3 (B), 5 (C) and 7 (D). Notice the progressive change from severe vacuolization (black arrows) in the P-IS, ONL, and OPL on day 3 to degeneration of photoreceptors with pyknosis of photoreceptor nuclei on day 5; swollen RPE cells are evident (white arrows). By day 7, only a few abnormal photoreceptor nuclei (white arrowhead) remain and the P-IS and P-OS are not visible. Toluidine blue stain; bar = 10 µm.

Ivermectine toxicosis

- Act on GABA and glutamate-gated chloride channels, which are present in both parasites and host animals
- Dogs, horses, mules, cats
- Blindness
- Non responsive pupils
- Obtundation/depression
- Ataxia
- Tremors

Case Reports > J Am Vet Med Assoc. 2015 Jun 1;246(11):1238-41.
doi: 10.2460/javma.246.11.1238.

Retinopathy associated with ivermectin toxicosis in five cats

Jessica M Meekins [1], Sarah C Guess, Amy J Rankin

Case Reports > J Am Vet Med Assoc. 2008 Jul 15;233(2):279-84.
doi: 10.2460/javma.233.2.279.

Retinopathy associated with ivermectin toxicosis in two dogs

Patrick J Kenny [1], Karen M Vernau, Birgit Puschner, David J Maggs

Case Reports > J Vet Emerg Crit Care (San Antonio). 2013 Jan-Feb;23(1):58-62.
doi: 10.1111/vec.12016. Epub 2013 Jan 14.

Ivermectin-induced blindness treated with intravenous lipid therapy in a dog

Steven E Epstein [1], Steven R Hollingsworth

Case Reports > Vet Ophthalmol. 2018 Jan;21(1):82-87. doi: 10.1111/vop.12410.
Epub 2016 Jul 20.

Electroretinographic changes after intravenous lipid emulsion therapy in a dog and a foal with ivermectin toxicosis

Danielle Pollio [1], Tammy M Michau [1], Ellen Weaver [2], K Leann Kuebelbeck [2]

Case Reports > J Am Vet Med Assoc. 2008 Jul 15;233(2):279-84.
doi: 10.2460/javma.233.2.279.

Retinopathy associated with ivermectin toxicosis in two dogs

Patrick J Kenny [1], Karen M Vernau, Birgit Puschner, David J Maggs

Affiliations + expand

PMID: 18627233 DOI: 10.2460/javma.233.2.279

Free article

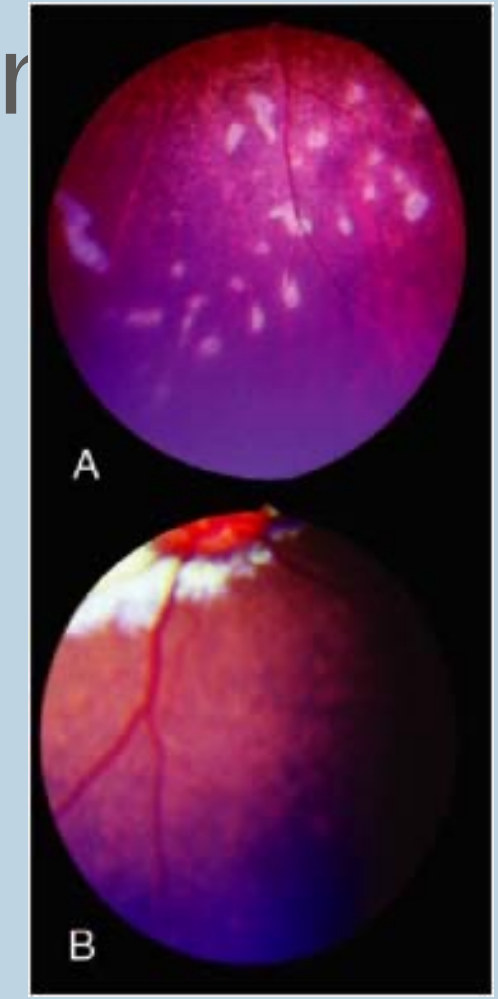
Abstract

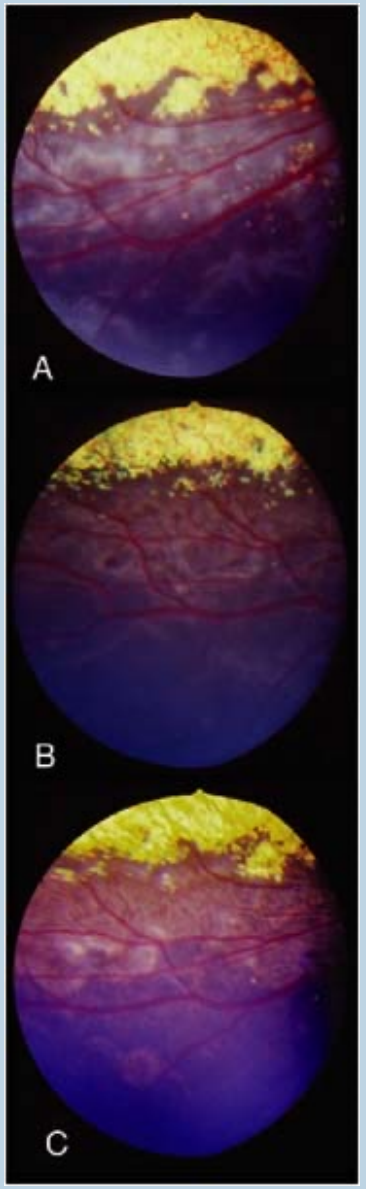
Case description: 2 dogs (dogs 1 and 2) were examined for sudden onset of blindness. Both dogs had mild obtundation and mydriasis in both eyes. It was thought that dog 1 may have ingested ivermectin; dog 2 had been treated with ivermectin for demodectic mange.

Clinical findings: On initial examination, both dogs had mydriasis and decreased pupillary light reflexes in both eyes. Dog 1 had an absent menace response bilaterally. Fundic examination of both eyes in both dogs revealed regions of multifocal retinal edema and folds with low-lying retinal separation. The electroretinogram was extinguished in dog 1 and attenuated in dog 2. Ivermectin was detected in serum samples from both dogs.

Treatment and outcome: Both dogs made a complete clinical recovery following cessation of exposure to ivermectin; electroretinographic findings improved, and retinal edema resolved with some residual chorioretinal scarring.

Clinical relevance: To our knowledge, this is the first report of resolution of retinal edema and electroretinographic changes associated with ivermectin toxicosis in dogs. In dogs that develop blindness suddenly, fundic examination, electroretinography, and assessment of serum ivermectin concentration are diagnostically useful, even if exposure to ivermectin is unknown.





Abamectine intoxication

Abamectine: used to reat a beetle that kills the palm treas

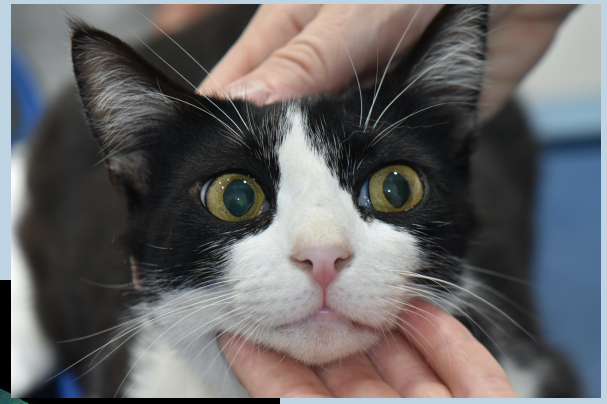
Tutors decided to use it to their cat

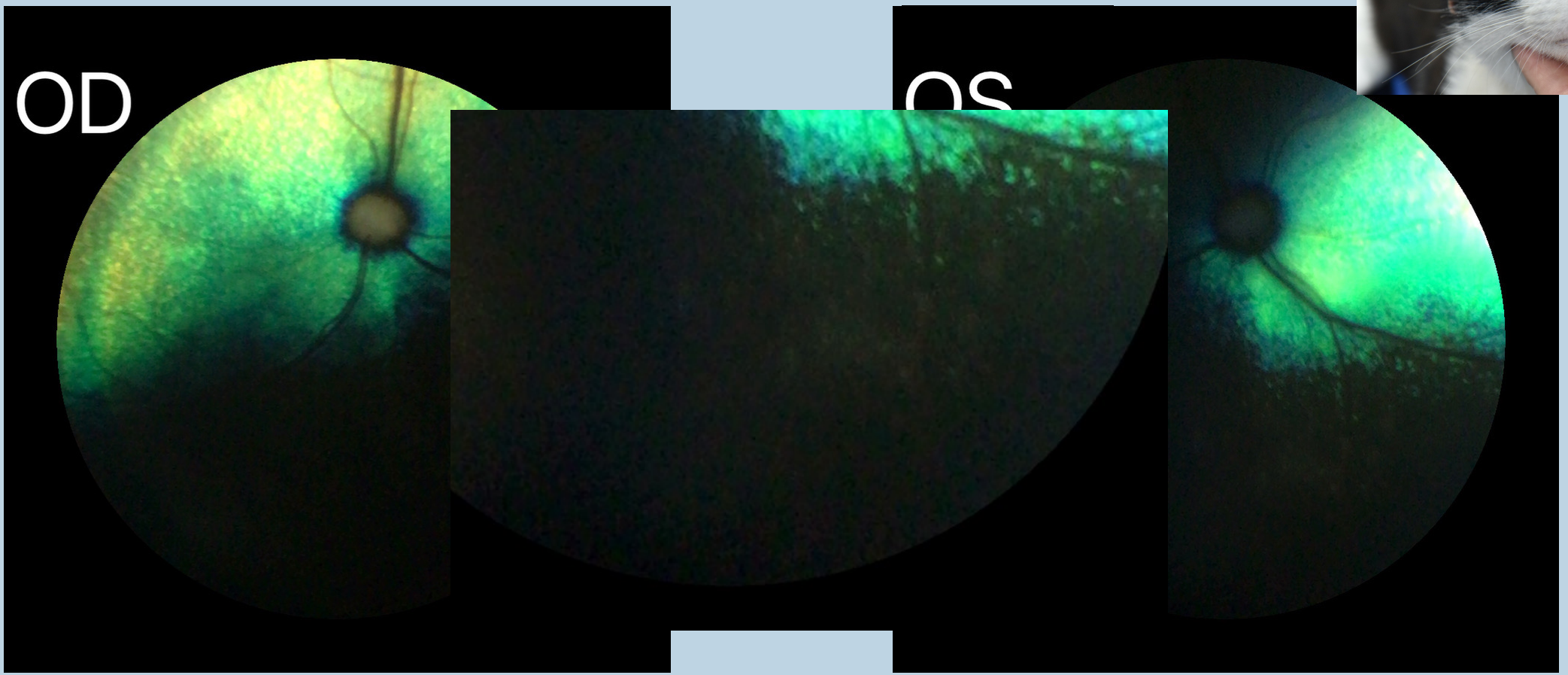
Tremors, ataxia, blindness

Tutors accepted ophtho examination but not ERG nor futher tests

Fundic changes very subtle

Abamectine intoxication





Case Reports > J Am Vet Med Assoc. 2015 Jun 1;246(11):1238-41.
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Retinopathy associated with ivermectin toxicosis in five cats

Jessica M Meekins [1], Sarah C Guess, Amy J Rankin

Affiliations + expand

PMID: 25970221 DOI: 10.2460/javma.246.11.1238

Free article

Abstract

Case description: 5 cats from the same household were examined because of a sudden onset of tremors, obtundation, blindness, and dilated pupils. Approximately 12 hours prior to evaluation, the owner had attempted to treat the cats for suspected ear mite (Otodectes cynotis) infestation by aural administration of a dose of an ivermectin paste intended for oral administration to horses (approx 22 mg/cat; half of the dose was administered into each ear canal).

Clinical findings: None of the cats had a menace response; all cats had dilated pupils and decreased pupillary light reflexes. Findings of fundic examination were unremarkable. Electroretinography was performed for 4 cats, and b-wave responses were identified as diminished. Toxicological assay results for serum samples from 2 cats confirmed the presence of ivermectin (450 and 610 µg/L).

Treatment and outcome: All 5 cats made a complete recovery. Neurologic abnormalities resolved, electroretinographic responses improved, and vision was restored with no residual pathological changes detected during fundic examination.

Clinical relevance: To the authors' knowledge, the information reported here provided the first description of ophthalmic and electroretinographic findings in cats with ivermectin toxicosis resulting from transdermal administration. Clinical signs, including blindness, resolved with time, without additional medical intervention.

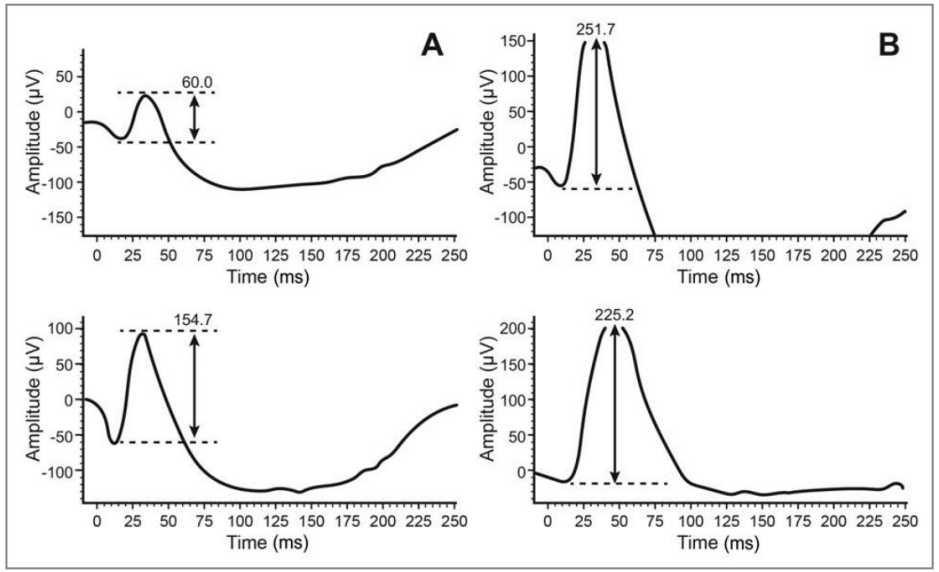


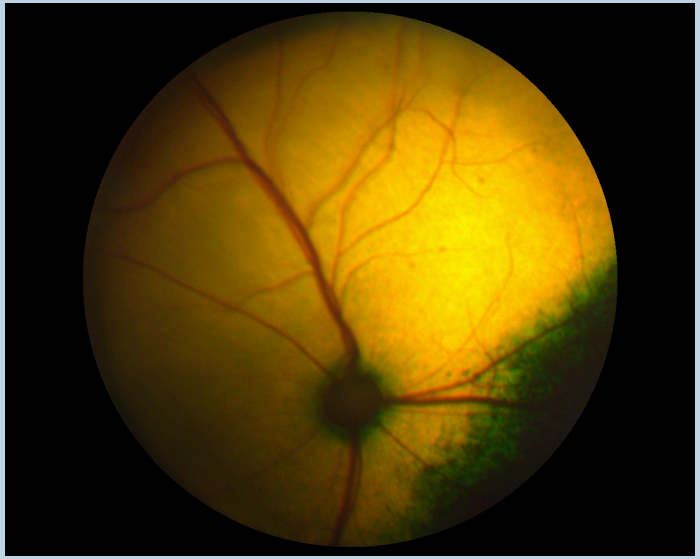
Figure 1—Representative ERG recordings for the right eye (top row) and left eye (bottom row) of a cat with a sudden onset of tremors, obtundation, blindness, and dilated pupils after aural administration of a dose of ivermectin paste intended for oral administration to horses (approx 22 mg/cat; half of the dose was administered into each ear canal). Recordings were obtained 12 hours (A) and approximately 4 weeks (B) after ivermectin administration. The b-wave amplitudes (height of waveform measured from trough to peak; dashed lines and arrows) noticeably improved with time, which corresponded to resolution of clinical signs of vision loss.

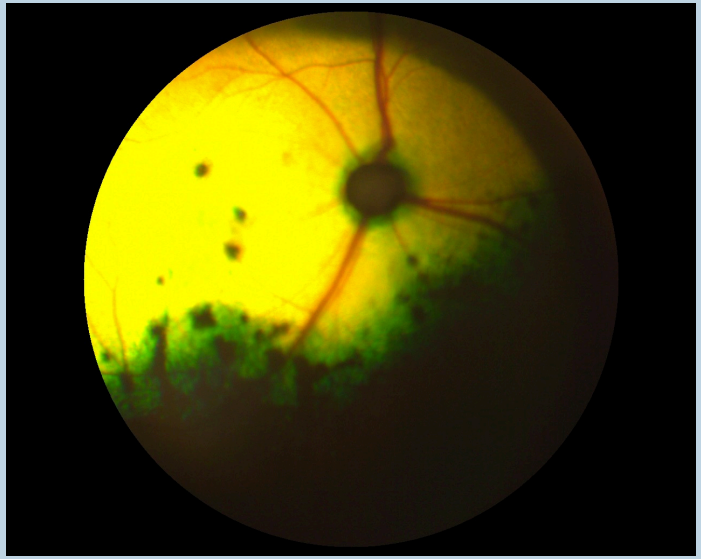
Plan

- Blindness
  - Ocular blindness:
    - Cataracts and other intraocular disease – away from the scope of this lecture
    - Retinal origin:
      - Inherited
      - Acquired
  - Optic nerve origin: inherited and acquired
  - Toxic: retinal Vs CNS toxicity
  - Mechanical/Vascular/Traumatic blindness

Quiasmatic lesions – blindness after enucleation

- Blindness or marked reduced vision after the surgery
- Mydriatic pupils / loss of PLRs
- Due to short optic nerve in cats – any rostral tension during enucleation can lead to quiasmatic damage

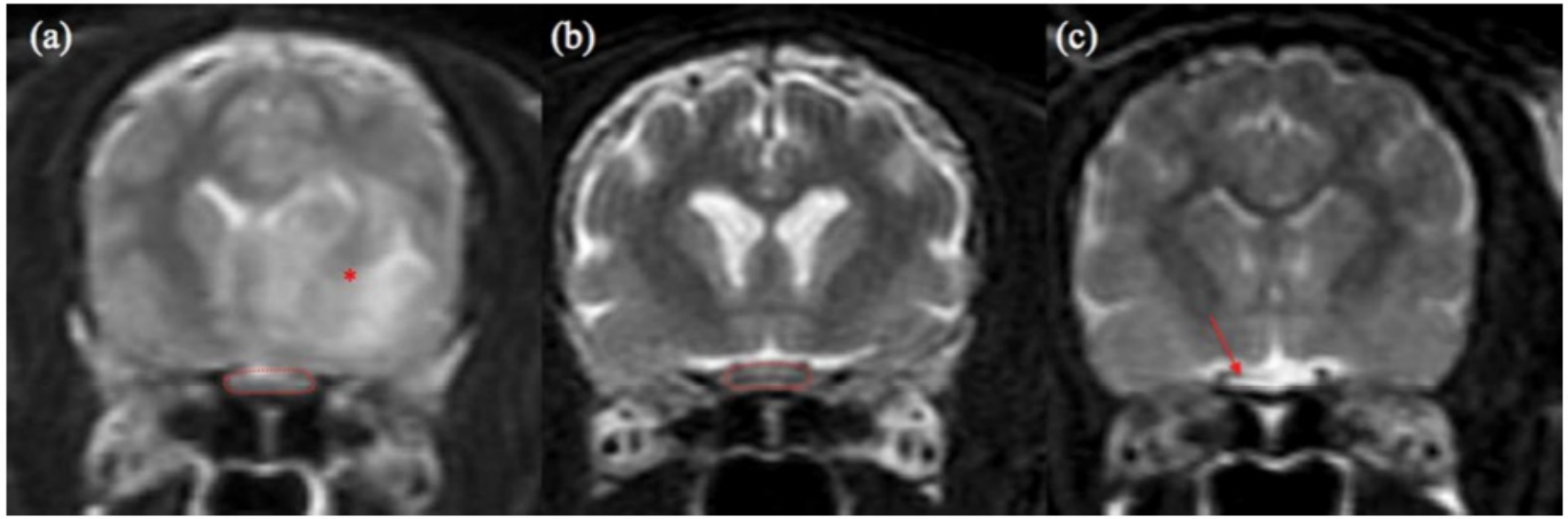




Case Reports > Vet Ophthalmol. 2014 Sep;17(5):373-84. doi: 10.1111/vop.12104.
Epub 2013 Oct 17.

Contralateral optic neuropathy and retinopathy associated with visual and afferent pupillomotor dysfunction following enucleation in six cats

David Donaldson [1], Màrian Matas Riera, Andrew Holloway, Elsa Beltran, Keith C Barnett



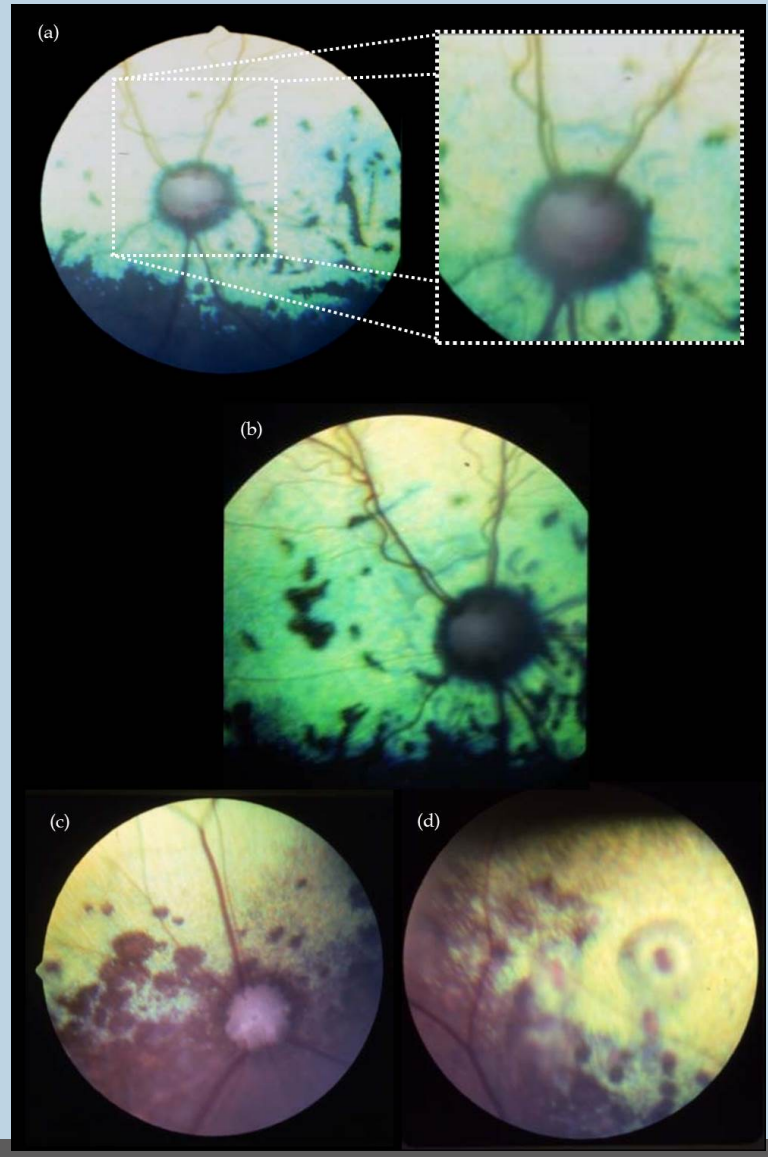
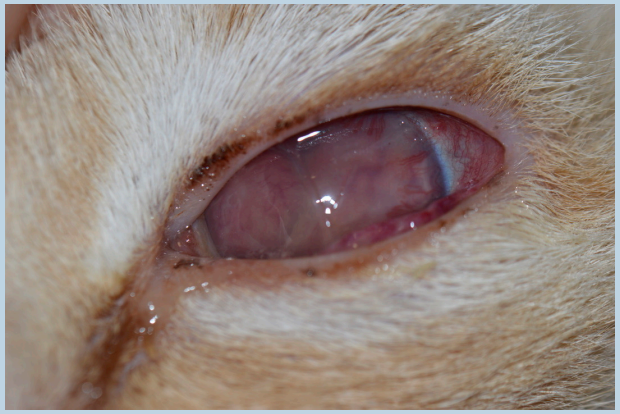
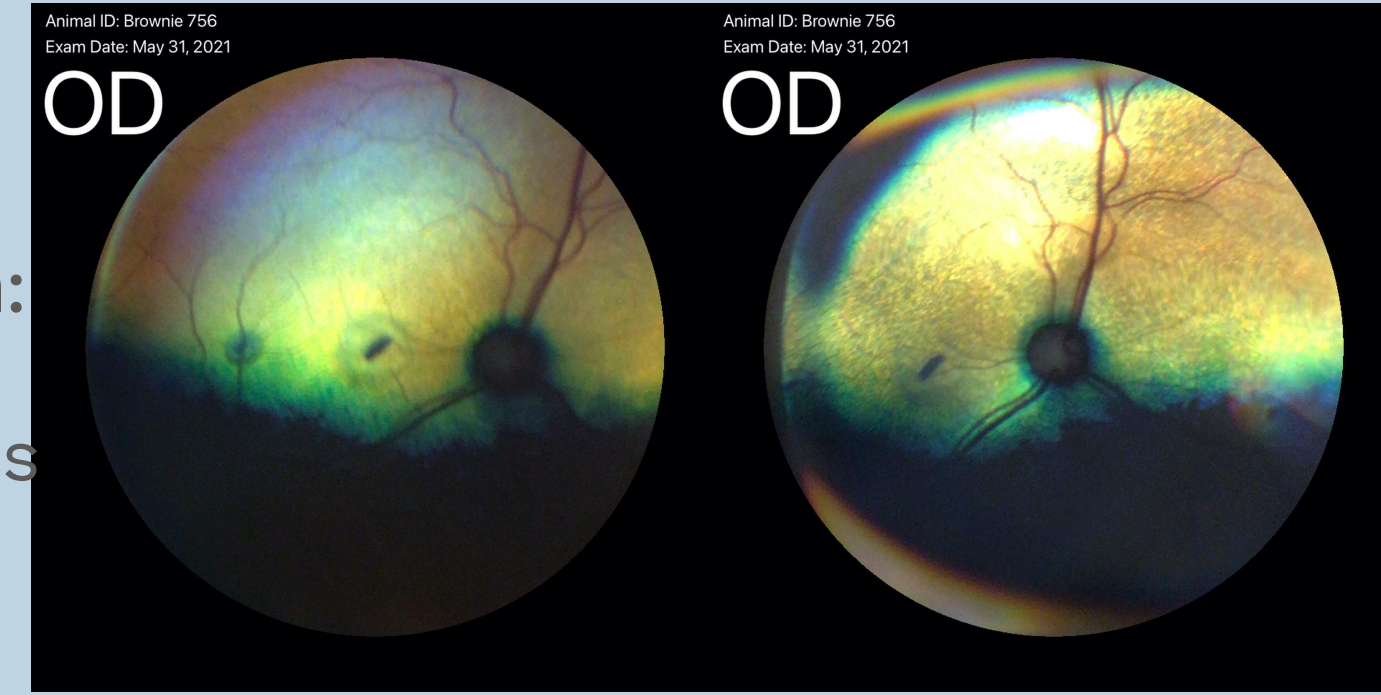


Figure 4. Transverse T2W MRI images at the level of the optic chiasm in (a) control cat: 15-year-old male-neutered DSH cat in which the right eye was enucleated without complication three years previously. There is no evidence of atrophy at the level of the optic chiasm (outlined). n.b. the brain pathology (*) was unrelated to the cat's ocular condition. (b) Normal cat: 15-year-old, male-neutered DSH cat with no history of neuro-ophthalmic disease. The border of the optic chiasm is outlined. (c) Affected cat: the left eye had been enucleated leading to contralateral optic nerve damage. The left side of the optic chiasm is absent. The right side of the optic chiasm (arrow) is atrophied and can only be identified on thin slice (2 mm) images. CSF fills the area between the hypothalamus and the sphenoid bone.

Brownie 7yo, MN



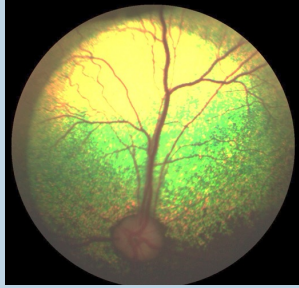
- Enucleated at the ref. vet.
- Blind after the surgery
- Pupil completely dilated
- Ophthalmic examination:
  - Reduced reflexes
  - Retina with circular lesions with hyperpigmented centrered area



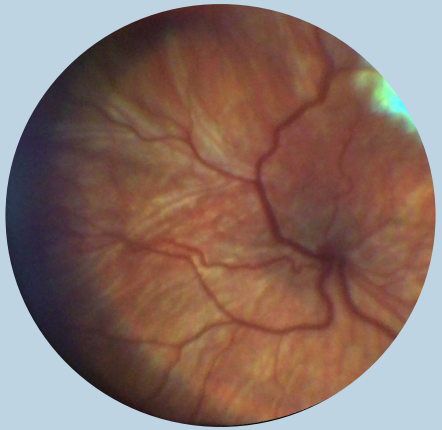
Optic nerve diseases

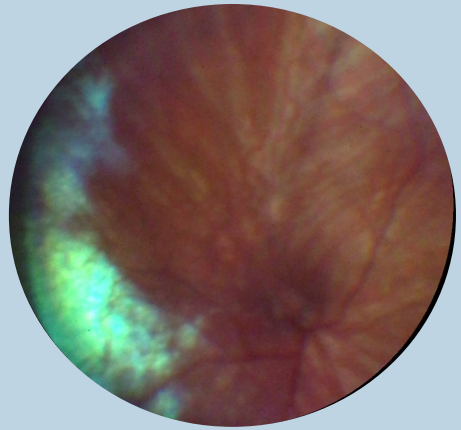
- Inherited:
  - Aplasia or hypoplasia
- Acquired:
  - Meningoencephalitis of Unknown Origin/Aetiology (MUO/A)
    - Isolated form
    - Generalized form – as part of multifocal
  - Infectious diseases
    - Distemper
    - Ehrlichia
    - Cryptococcus
- Optic nerve neoplasia
  - Meningioma (most common neoplasia of optic nerve)

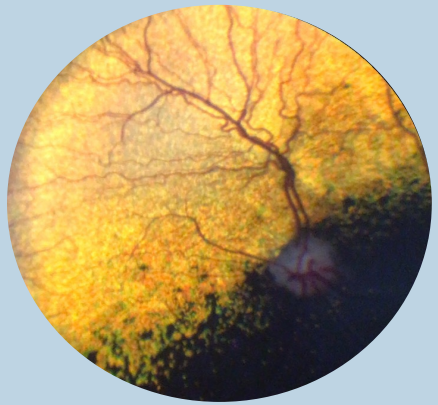
Optic disc: aplasia or hypoplasia



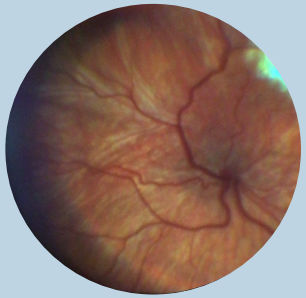
- Infrequent
- Blindness if severe
- Ophtho exam:
  - Normal PLR or reduced
  - Darkened or diminished optic disc
- No treatment
- Shih-tzu overrepresented







Optic disc: aplasia or hypoplasia



- ON aplasia
  - Unilateral
  - Retinal blood vessels NFL and RGC were totally absent
  - Retinal disorganization was severe
  - Anterior segment dysgenesis in some cases
- ON hypoplasia
  - bilateral
  - Different degrees and gliosis
  - Ectopic vestigial optic nerve remnants within orbital nerves and connective tissues
  - NFL identified in majority
  - RGC rare or absent
  - Regional peripheral retinal blood vessel extension into the vitreous leaving the peripheral retina avascular

› Vet Ophthalmol. 2008 Jan-Feb;11(1):23-9. doi: 10.1111/j.1463-5224.2007.00596.x.

Distinctive histopathologic features of canine optic nerve hypoplasia and aplasia: a retrospective review of 13 cases

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Affiliations + expand

PMID: 18190348 DOI: 10.1111/j.1463-5224.2007.00596.x

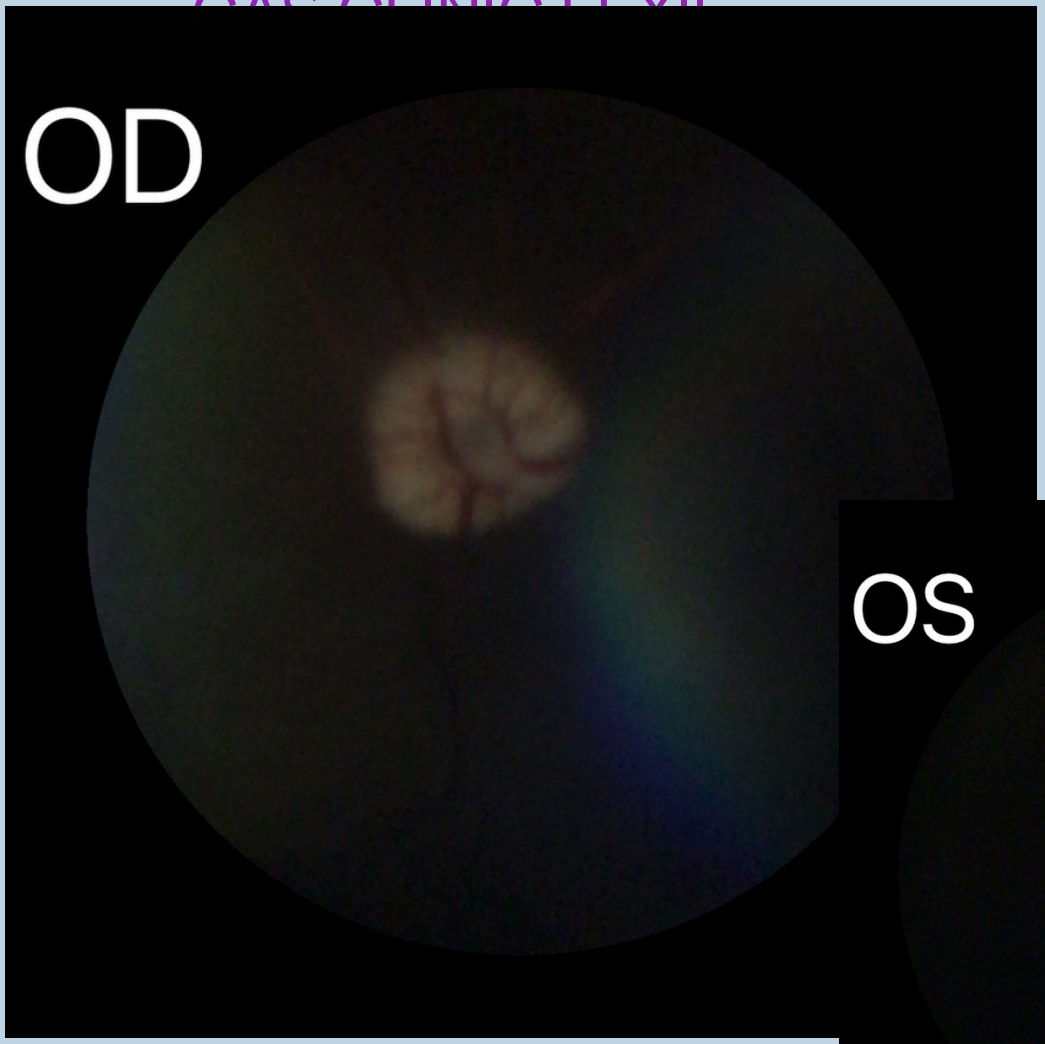
Abstract

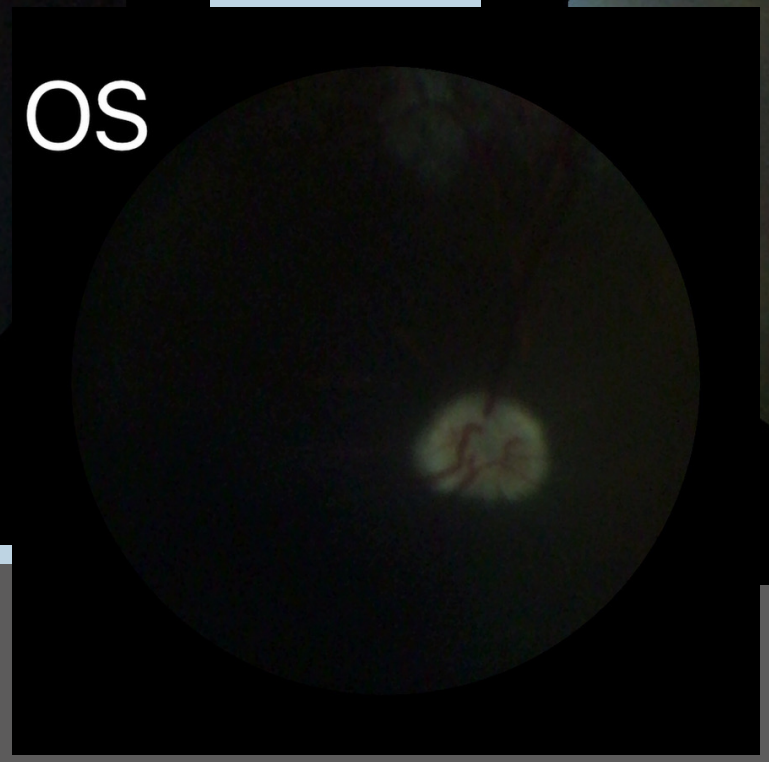
Canine optic nerve hypoplasia (ONH) and aplasia (ONA) are significant neuro-ophthalmologic disorders that have been reported in several species. The purpose of this study was to describe the distinctive histopathologic features of ONH and ONA in canine patients identified from a collection of 20 000 ocular submissions at the comparative ocular pathology laboratory of Wisconsin from 1989 to 2006. The following information about ONH and ONA cases was collected: signalment, and clinical and gross findings, including unilateral vs. bilateral involvement. Microscopic evaluation was performed, with attention to optic nerve malformation, retinal ganglion cell (RGC) and nerve fiber layer (NFL) loss, and retinal disorganization. The distribution of retinal vasculature was recorded and a search for unusual findings of ONH and ONA was performed. Information and histologic documentation was available for 13 cases. Eight cases of ONH and five cases of ONA were identified. The average group age was 20.2 months and 16.1 months, respectively. The most common breed was the Shih Tzu (3/13). ONH usually presented bilaterally (7/8); all ONA cases presented as a unilateral disease (5/5). The morphologic findings in the optic nerve (ON) in ONH included variable degrees of ON hypoplasia and gliosis, as well as ectopic vestigial ON remnants within orbital nerves and connective tissues. The NFL was detected in the majority of the ONH cases; however, RGCs were rare or absent. Mild retinal disorganization was seen occasionally. Most cases of ONH were associated with regional peripheral retinal blood vessel extension into the vitreous, leaving the peripheral retina avascular. In ONA cases the retinal blood vessels, NFL and RGCs were totally absent and retinal disorganization was severe. Distinctive microscopic features encountered in ONA included anterior segment dysgenesis in some cases. The retina in these cases was stretched across the posterior lens capsule, never making contact with the posterior pole of the globe. The current study reviews the human and veterinary literature pertaining to ONH and ONA, compares ONH and ONA in dogs, and presents related ophthalmic histopathologic findings that have not been reported previously.

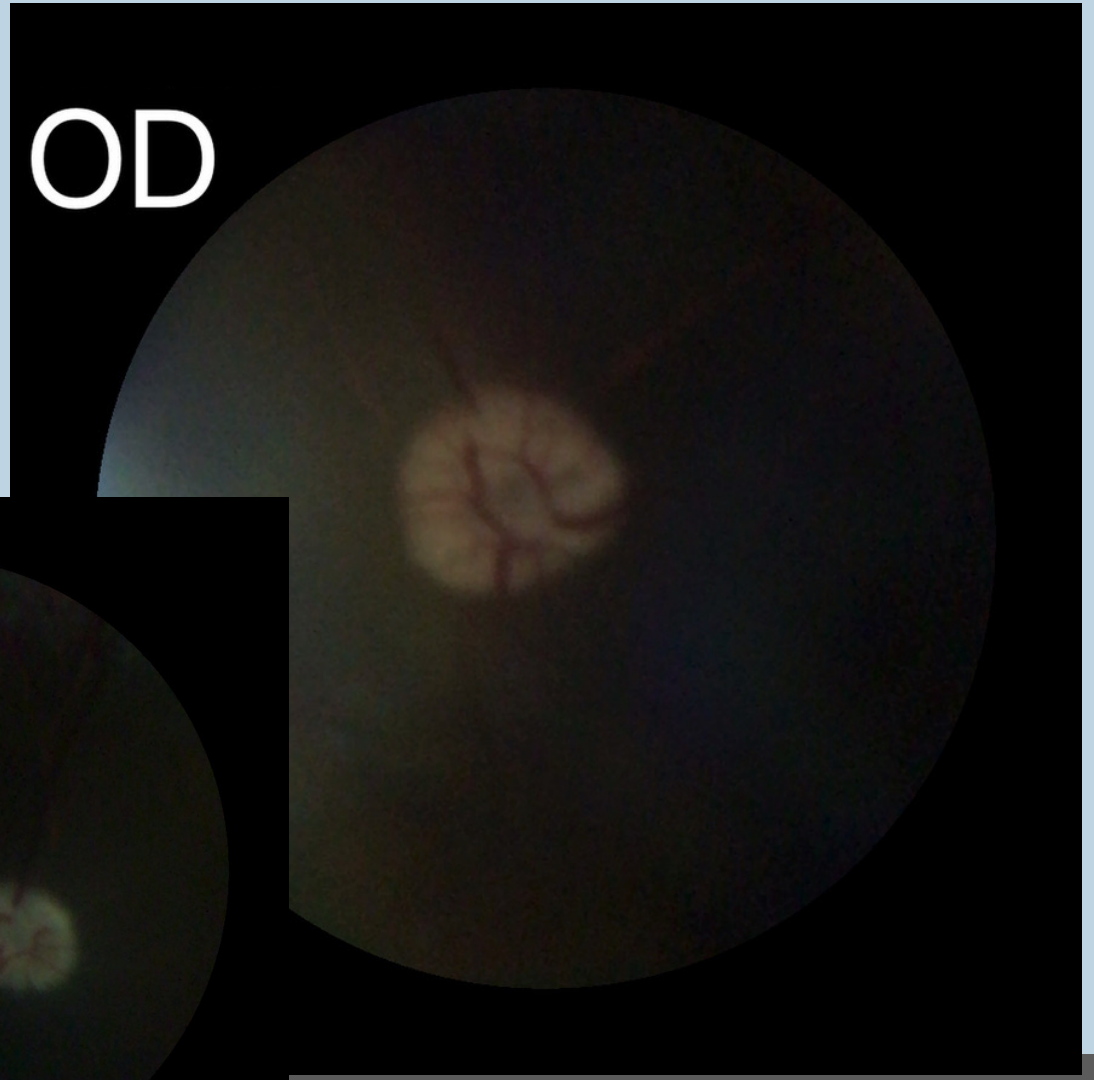
Lexi

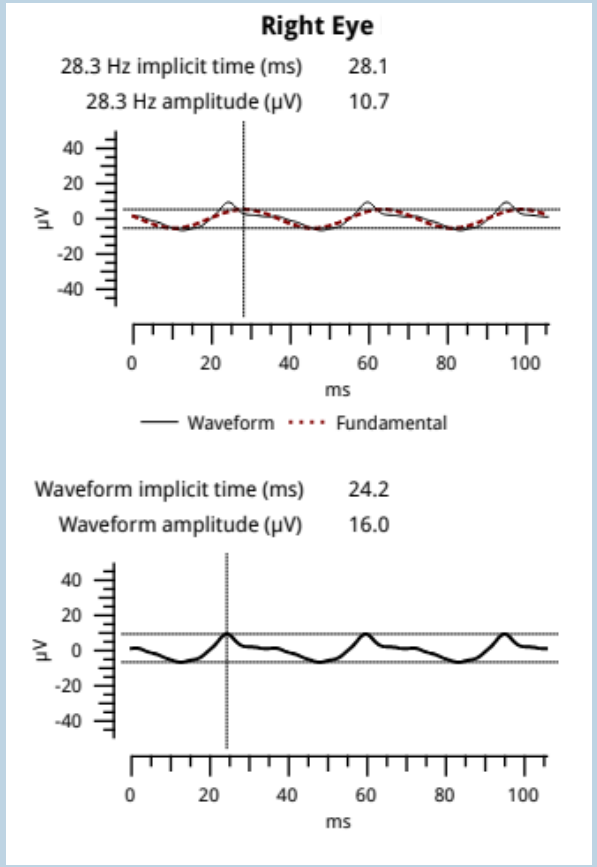
- Frenchie 3y old Female Entire
- Rescued 5 months before with bad condition
- Leishmaniosis (current treatment) and Ehrlichiosis (treated with doxycycline)

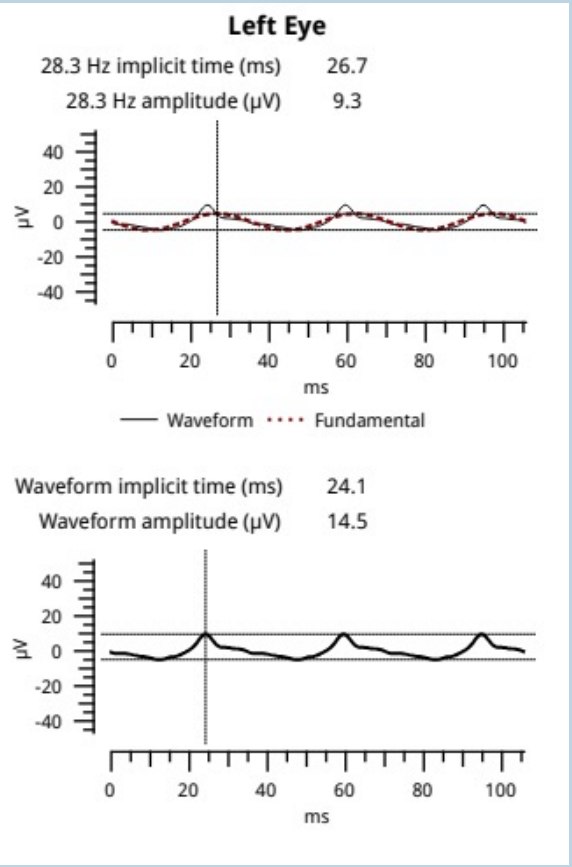
- Ophtho exam:
  - Negative menace response
  - PLR positive but slow OU
  - iPLR positive but slow OU
  - Dazzle negative OU
  - Mild swelling of the ONH in OD
  - IOP: 20-19mmHg


OD


OS

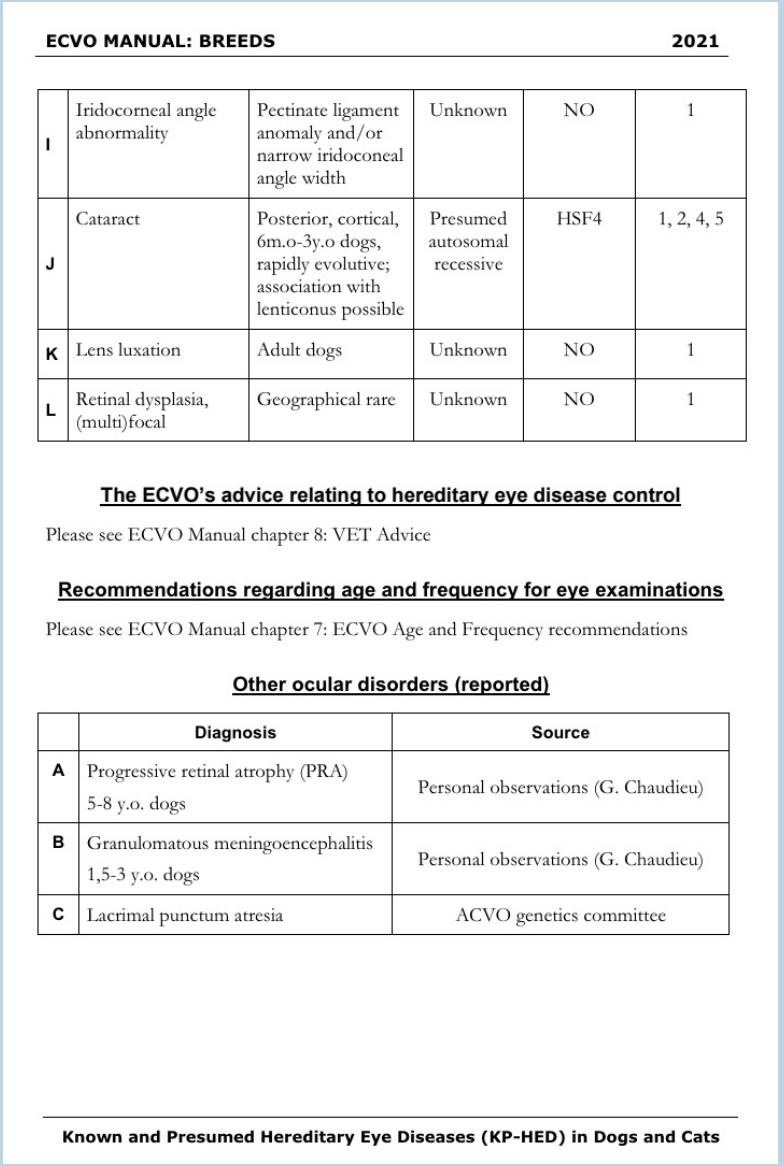

OD


Right Eye
28.3 Hz implicit time (ms) 28.1
28.3 Hz amplitude (μV) 10.7
μV
ms
Waveform
Fundamental
Waveform implicit time (ms) 24.2
Waveform amplitude (μV) 16.0


Left Eye
28.3 Hz implicit time (ms) 26.7
28.3 Hz amplitude (μV) 9.3
μV
ms
Waveform
Fundamental
Waveform implicit time (ms) 24.1
Waveform amplitude (μV) 14.5

- Do we need to worry?
- Do we say it is SARDS?

- Difficult retinal evaluation when there is small tapetum and pigmented RPE



I	Iridocorneal angle abnormality	Pectinate ligament anomaly and/or narrow iridoconeal angle width	Unknown	NO	1
J	Cataract	Posterior, cortical, 6m.o-3y.o dogs, rapidly evolutive; association with lenticonus possible	Presumed autosomal recessive	HSF4	1, 2, 4, 5
K	Lens luxation	Adult dogs	Unknown	NO	1
L	Retinal dysplasia, (multi)focal	Geographical rare	Unknown	NO	1

The ECVO's advice relating to hereditary eye disease control

Please see ECVO Manual chapter 8: VET Advice

Recommendations regarding age and frequency for eye examinations

Please see ECVO Manual chapter 7: ECVO Age and Frequency recommendations

Other ocular disorders (reported)

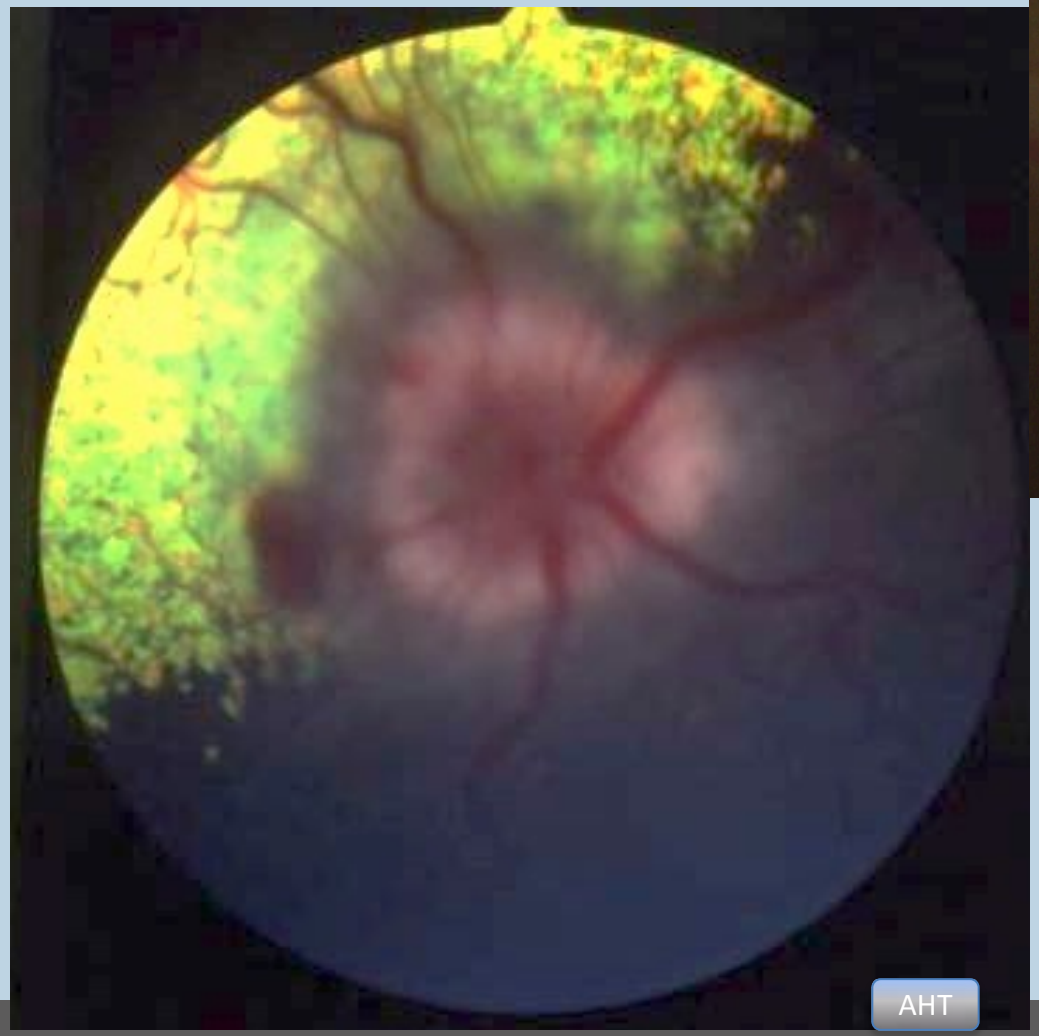
	Diagnosis	Source
A	Progressive retinal atrophy (PRA) 5-8 y.o. dogs	Personal observations (G. Chaudieu)
B	Granulomatous meningoencephalitis 1,5-3 y.o. dogs	Personal observations (G. Chaudieu)
C	Lacrimal punctum atresia	ACVO genetics committee

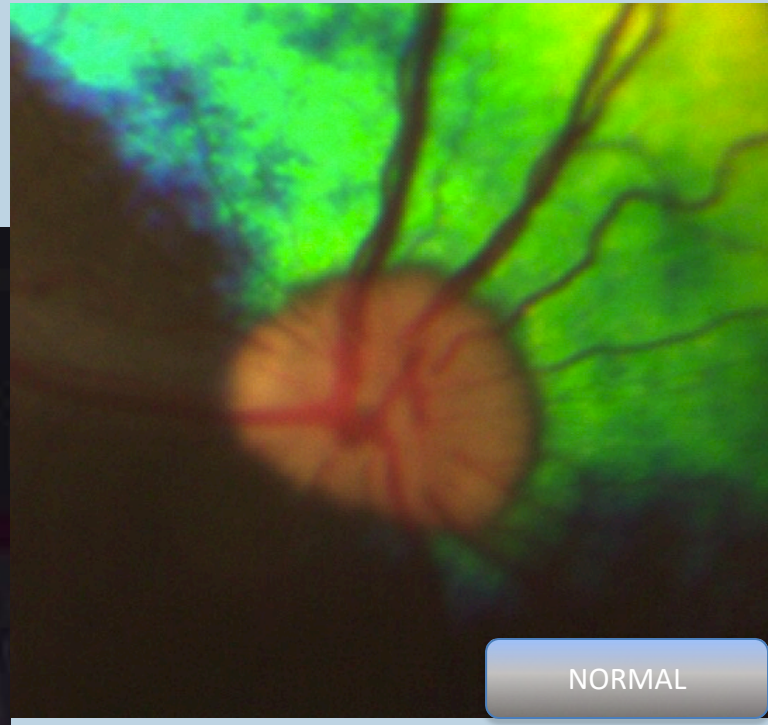
Lexie has PRA and MUE

- Lexie underwent CT and CSF
  - Contrast uptake on both optic nerves OU
  - Cell count: 32 nuclear cells/mL (normal value <5 nuclear cells/ML)
  - Cytology: lymphocytic pleocytosis
  - CSF PCR: Leishmania, Toxoplasma, Neospora, Ehrlichia, Anaplasma and Cryptococcus: all negative
- Treatment:
  - Prednicortone 1mg/kg BID
  - Omeprazol 1mg/kg BID
  - Clindamicine was given until the PCR results
- After PCR results started cytarabine subcutaneously
- Lexie recovered vision in OS and recovered PLRs after 10d of treatment

Optic neuritis

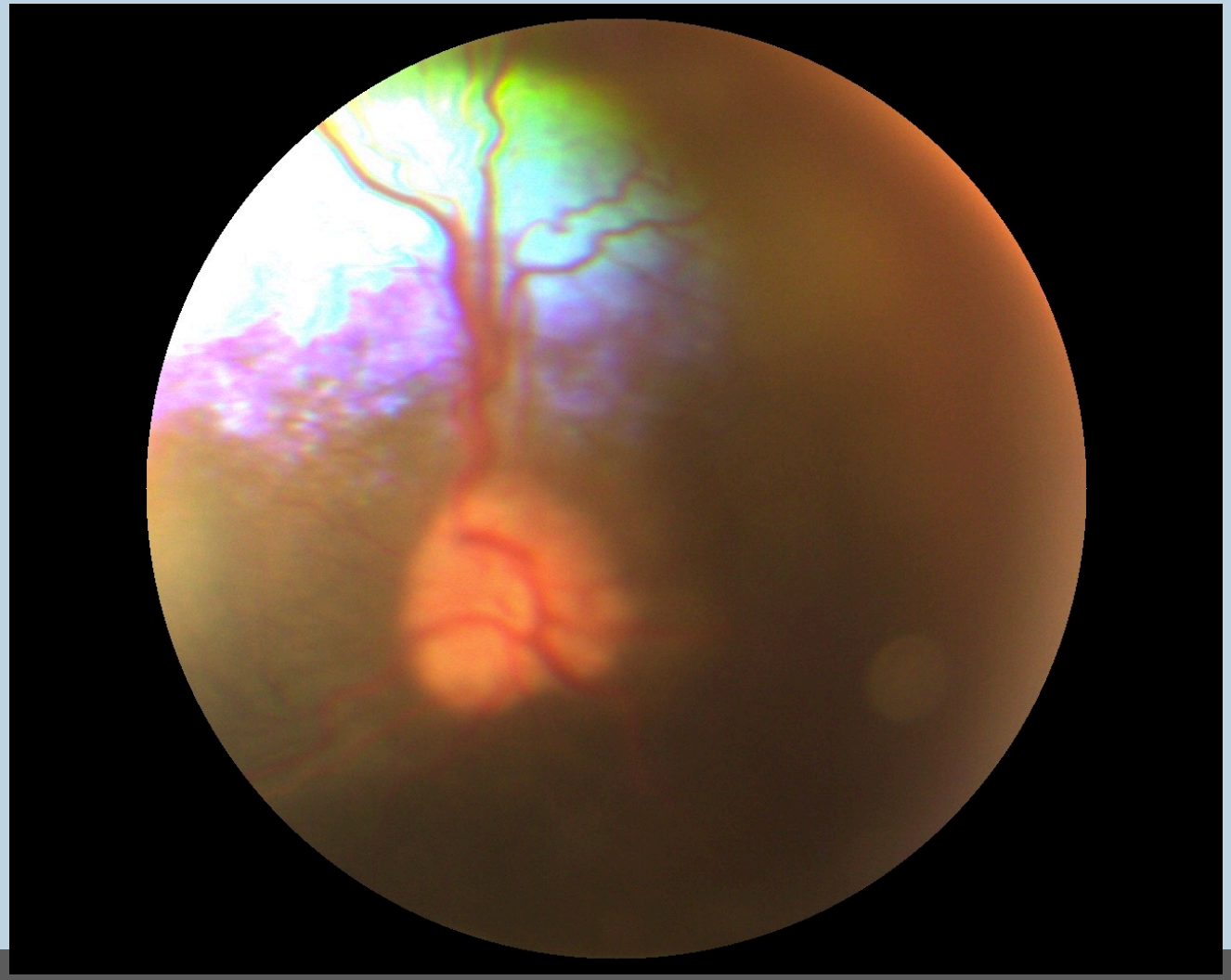
- Hyperhemia of the papilla
- Vascular congestion
- Peripapillary hemorrhages
- Peripapillary retinal detachment



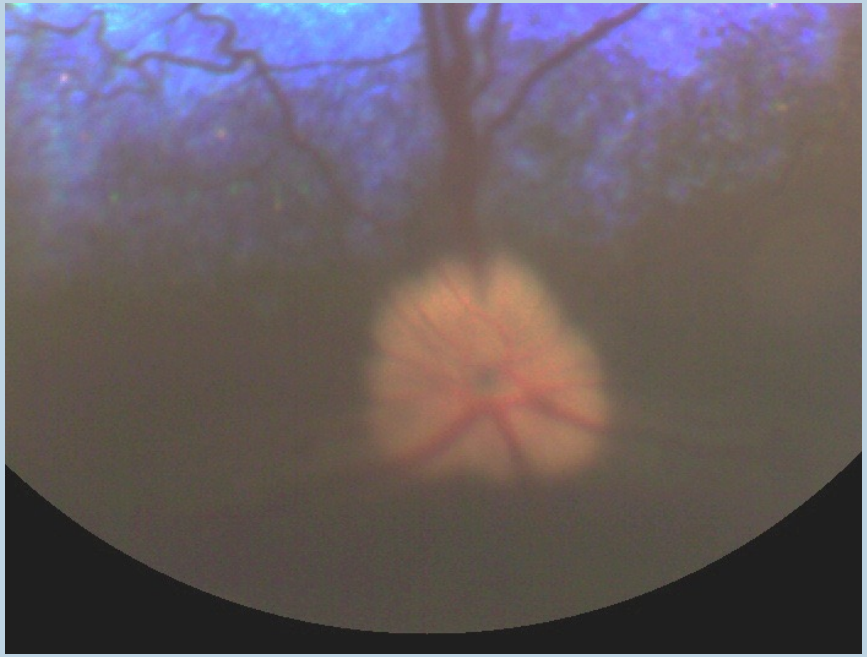


Optic neuritis

Left eye

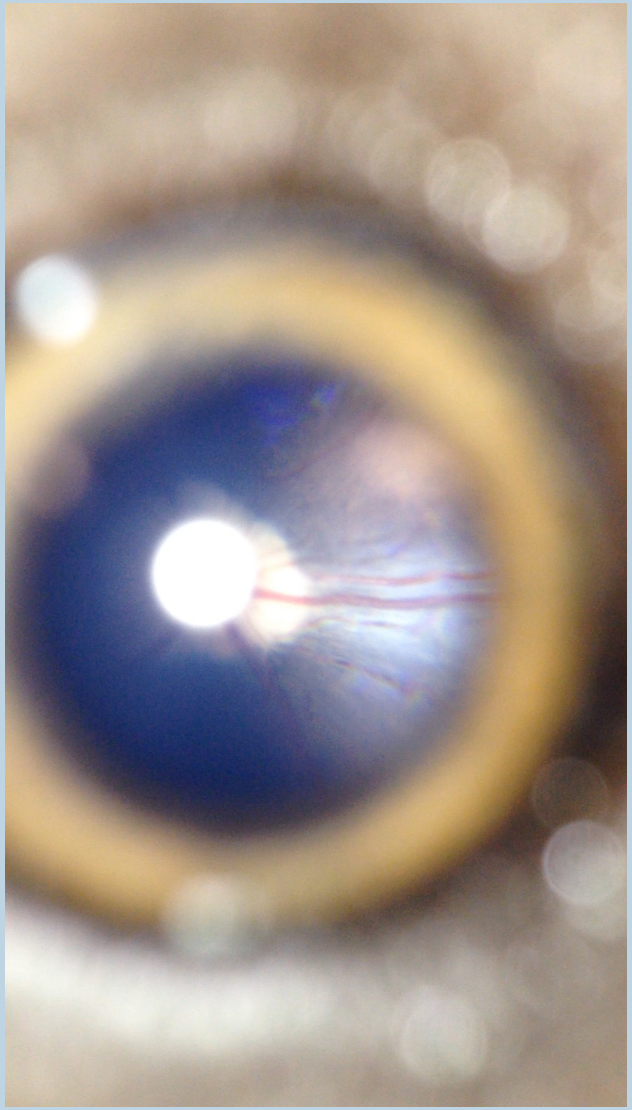


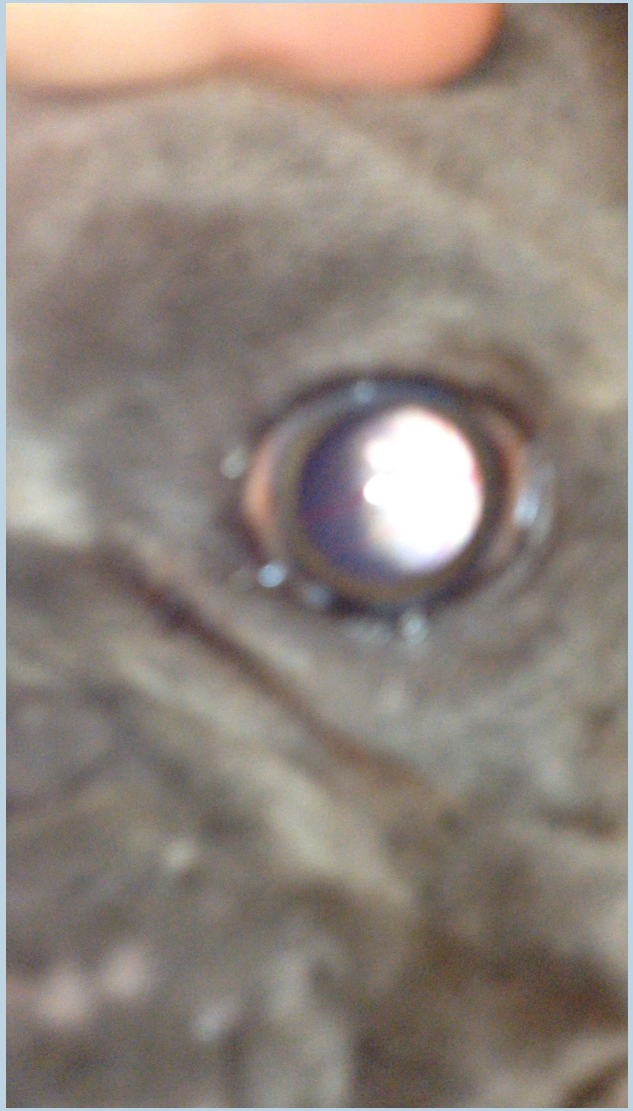
Right eye



Optic neuritis

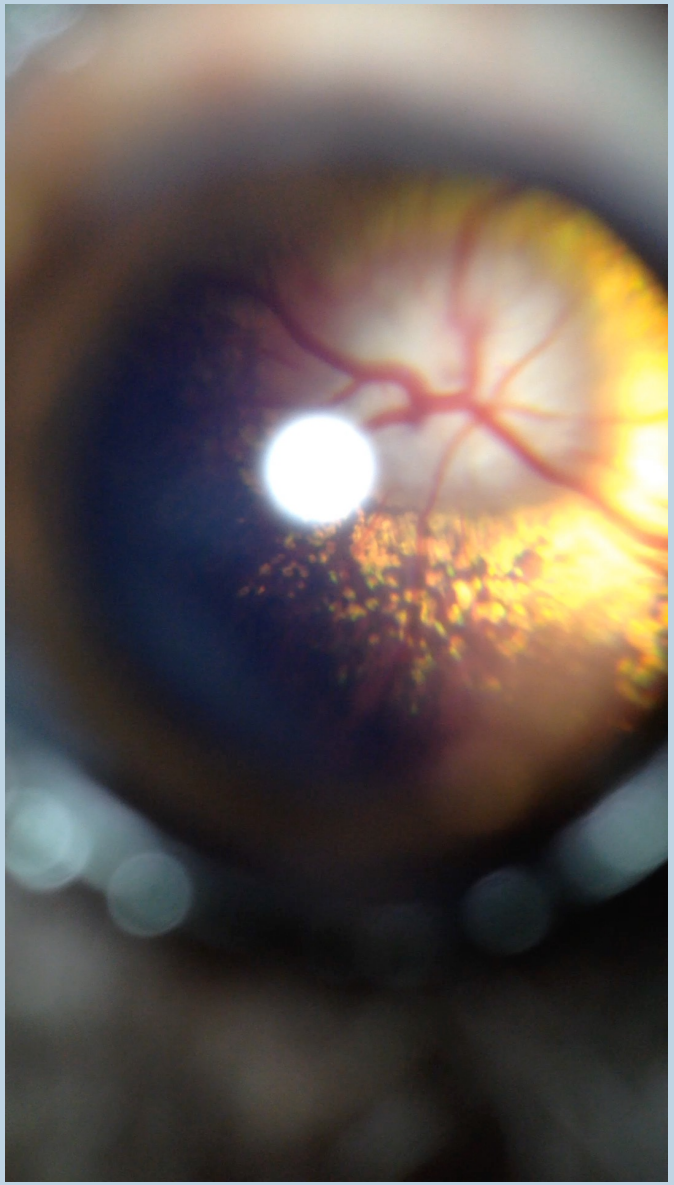
Right eye



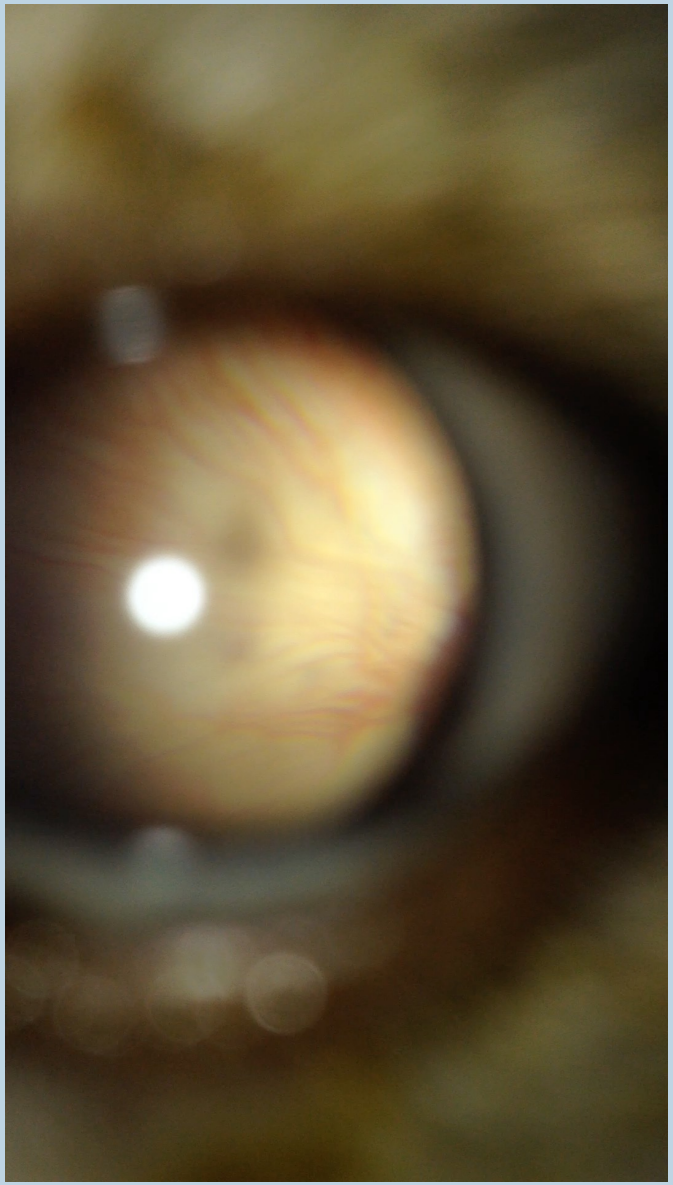


Left eye

Optic neuritis



Cupping



Optic neuritis

Retrospective study 96 cases (Smith et al VO 2017)

Two groups:

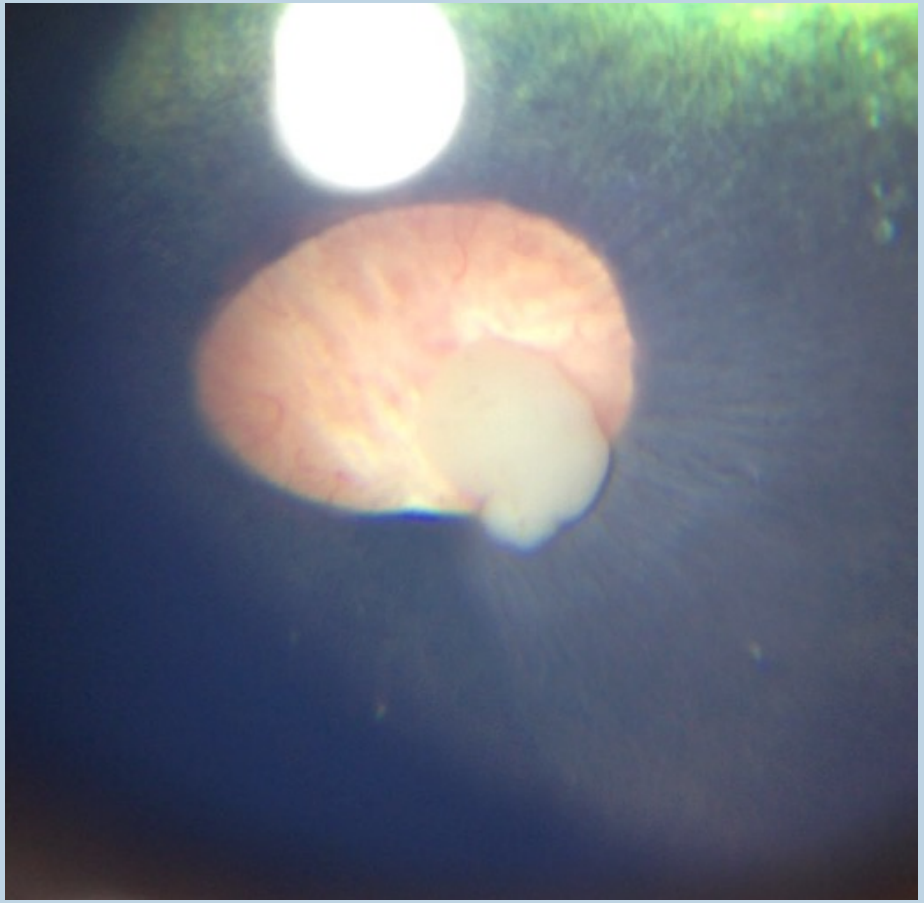
- Associated with multifocal MUE
- Isolated as the sole neurologic finding

- Similar incidence between the two groups
- Suggest that a clinical syndrome of isolated optic neuritis, distinct from multifocal MUE, occurs in dogs

- MUE
- I-ON
  - More commonly male
  - Medium to large breed
- 50/72 remaind blind
- 10/72 partial visual improvement
- 12/50 normal vision

Neoplasia

- Neoplasias affecting optic nerve are uncommon
- Secondary invasion occurs in feline posttraumatic sarcoma, feline SCC and canine choroidal melanomas
- Orbital meningioma most common but comprises only 3% of all meningiomas in dogs
- Clinical signs: blindness, PLR issues



Glenn, GR, 10y old MN

Golden retriever

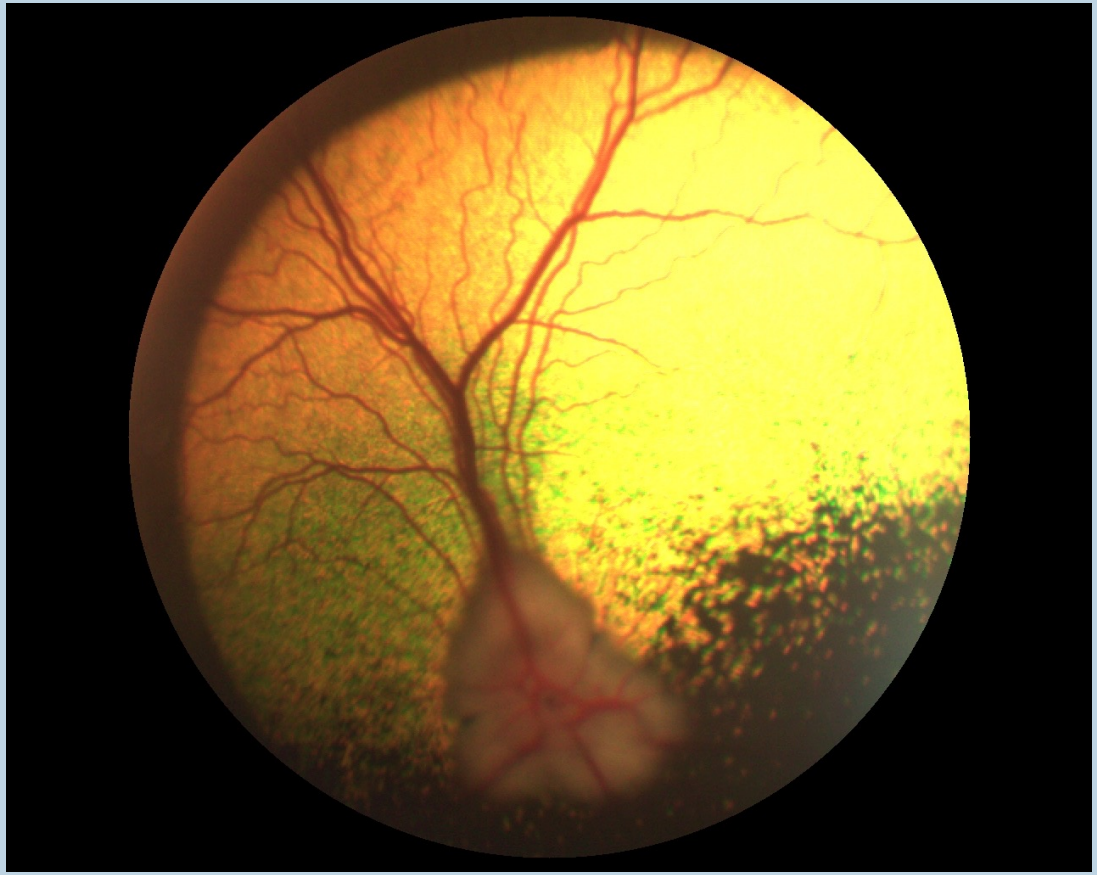
10yold male neutered

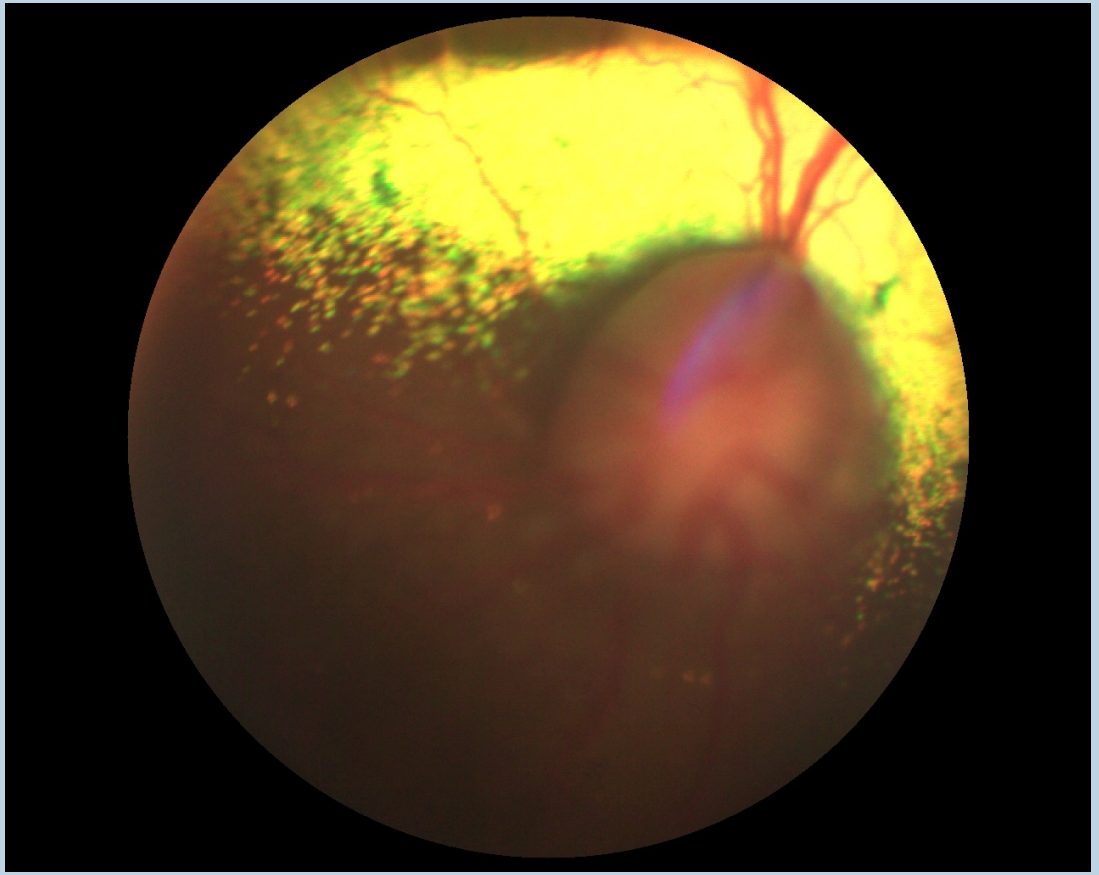
Owners noticed over a year ago blindness from left eye

Ophthalmic exam

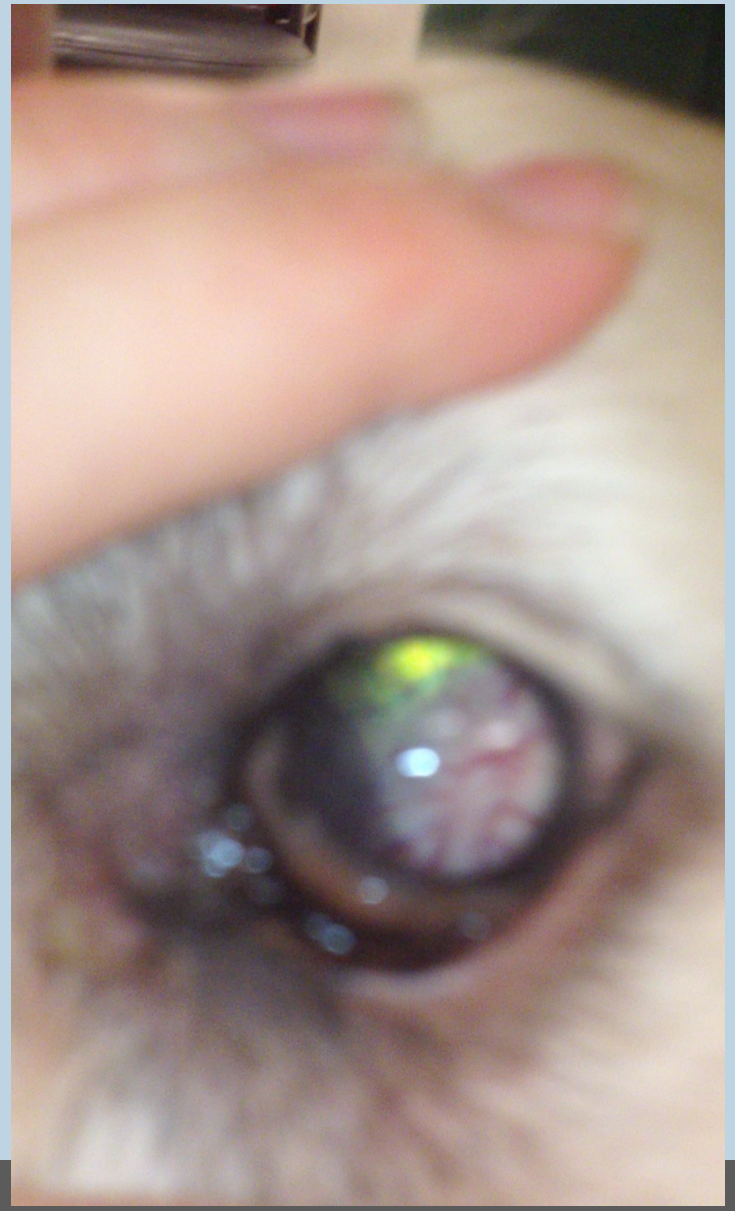
- Anterior segment NAD
- IOP: 14-21mmHg OD-OS
- Posterior segment (see pictures and describe changes)

Glenn, GR, 10y old MN

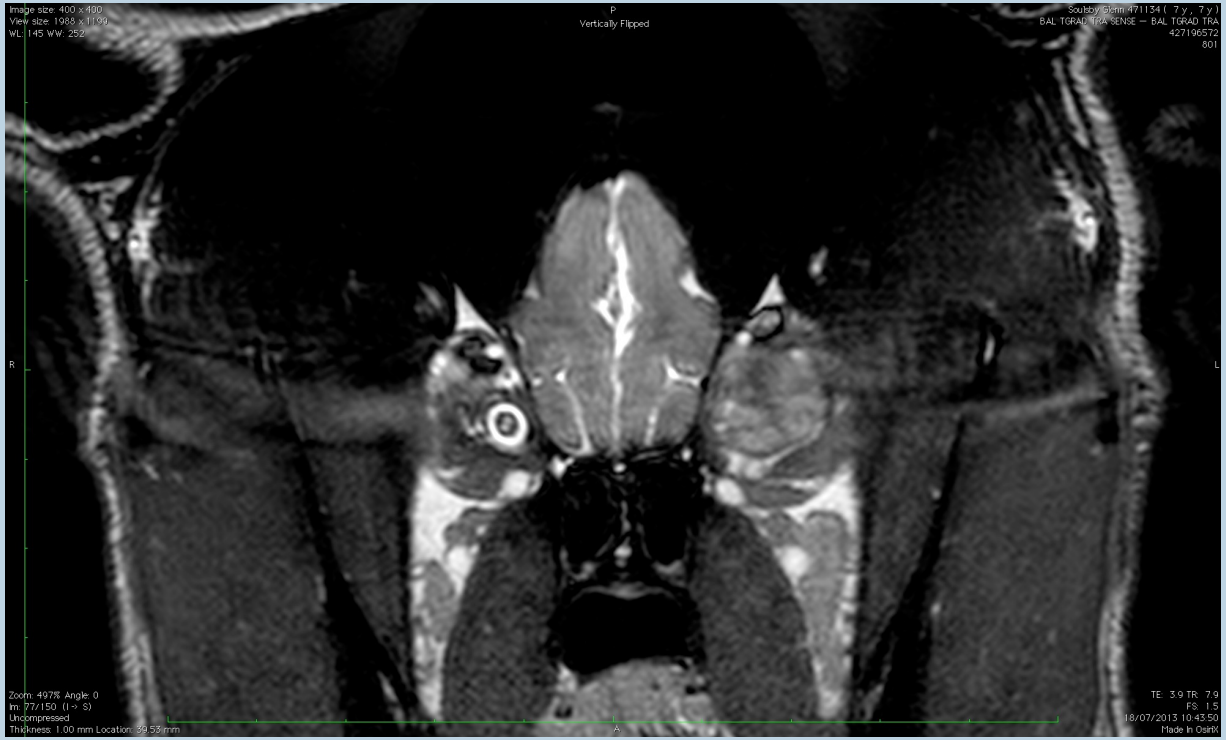


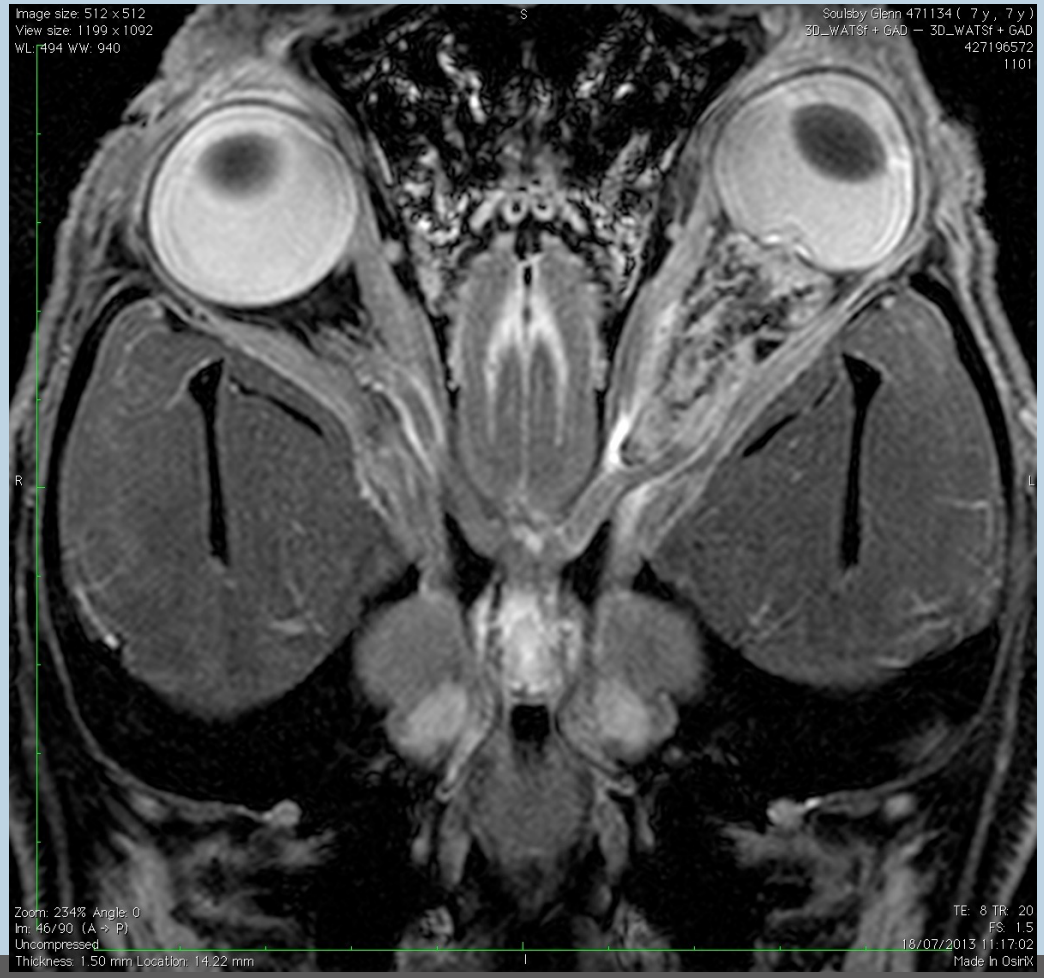


Glenn, GR, 10y old MN



Glenn, GR, 10y old MN





Glenn, GR, 10y old MN

Intraconal mass

Calvarium not infiltrated macroscopically

Plan:

- Surgical excision: exanteration
- +/- radiation and or chemotherapy

Plan

- Blindness
  - Ocular blindness:
    - Cataracts and other intraocular disease – away from the scope of this lecture
    - Retinal origin:
      - Inherited
      - Acquired
  - Optic nerve origin: inherited and acquired
  - Toxic: retinal Vs CNS toxicity
  - Mechanical/Vascular/Traumatic blindness