Anterior Uvea & Lens

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The eye is the “window” to systemic information

The eye has the highest blood flow by weight of any organ

Anterior Uveitis
- Miosis

Anterior Uveitis
- Miosis
- Flare
Anterior Uveitis
- Miosis
- Flare
- Redness
- Photophobia
- Pain
- Keratic precipitates
- Hypotony

Posterior Uveitis
- Chorioretinitis
  - Hemorrhage
  - Vasculitis
  - Edema
  - Transudate
  - Exudate

Anterior Uveitis
- Ocular Etilelogies
  - There are only 4 main ocular causes, rule them out first

Anterior Uveitis
- Ocular:
  - Corneal ulceration
  - Lens-induced
Anterior Uveitis

- Ocular:
  - Corneal ulceration
  - Lens-induced
  - Ocular trauma

- Neoplasia
  - Primary vs secondary

Ocular Oncology

Primary - intraocular
Secondary - intraocular
Melanoma
Lymphosarcoma
Adenoma/Adenocarcinoma
Carcinoma
Spindle cell sarcoma - cat
Sarcoma

The etiologies of anterior uveitis can be either ocular or systemic.
**Uveitis**

**Anterior Uveitis**
- Systemic Etiologies:
  - Bacteremia, viremia, or septicemia
  - Systemic mycoses
  - Autoimmune
  - Metastatic neoplasia
  - A complete physical examination is therefore essential.

**Canine Uveitis**
- Mean Age: 6.2 ± 3.6 years
- No gender differences
- Breeds:
  - Golden Retriever (n=14)
  - Mixed breeds (n=12)
  - Labrador Retriever (n=9)

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**Systemic Etiologies:**
- Bacteremia
- Viremia
- Septicemia
- Mycoses
- Autoimmune
- Metastatic neoplasia

**A complete physical examination is therefore essential.**

**Canine Uveitis**
Auto-immune

Canine Uveitis
- Systemic infectious disease (17.5%)
  - Younger (mean 2.1 yrs), Male
  - No breed

Systemic Infectious Disease
- Ehrlichia canis (39%)
- Blastomycosis dermatitidis (28%)
- RMSF

Dr. Munoz
Auto-immune

Uveo-Dermatologic Syndrome


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Systemic Infectious Disease

- Ehrlichia canis (39%)
- Blasto(myco)sis dermatitidis (28%)
- RMSF
- Dirofilaria immitis

Angiostrongylus

Systemic Infectious Disease

- Ehrlichia canis (39%)
- Blasto(myco)sis dermatitidis (28%)
- RMSF
- Dirofilaria immitis
- Lyme disease

Systemic Infectious Disease

- Ehrlichia canis (39%)
- Blasto(myco)sis dermatitidis (28%)
- RMSF
- Dirofilaria immitis
- Leishmania - Italy

Canine Uveitis

- Neoplasia (24.5%)
- Seen in older dogs (mean 7.5 years)
Canine Neoplastic Uveitis

- Lymphosarcoma (68%)
- Undifferentiated sarcoma
- Metastatic carcinoma

Lymphosarcoma

Canine Neoplastic Uveitis

Histiocytic Sarcoma

Feline Uveitis


Multiple Myeloma
**Feline Uveitis**

- Mean Age - 8.6 yrs
- 2.6 : 1 male to female
- Most breeds w/ DSH or DLH predominate

**Feline Uveitis**

- Idiopathic / Immune-mediated (33-58%)
- Neoplasia (13-23%)
- Systemic infectious disease (24-83%)

**Feline Infectious Disease**

- FELV (12%)
- FIP (5-19%)
- Toxo (5-75%)
- FIV (13-21%)
- Crypto (2%)
- Bartonella

Cat may have more than one of these

**Incidence of Bartonella Infection in US Cats**

- 20% OVERALL
- 9% 17%
- 22% 25%

Incidence of Bartonella infection in cats increases in hot and humid climates because fleas flourish in these conditions.

**Risk Factors for Bartonella-infection in Cats**

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Number Tested</th>
<th>Infected: WB+3 or +4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stray cat</td>
<td>4,148</td>
<td>2,523 46%</td>
</tr>
<tr>
<td>Shelter cat</td>
<td>3,170</td>
<td>1,549 49%</td>
</tr>
<tr>
<td>Multi-cat household</td>
<td>7,745</td>
<td>3,731 48%</td>
</tr>
<tr>
<td>Exposed - live w/ Bh*cat</td>
<td>1,101</td>
<td>872 55%</td>
</tr>
<tr>
<td>Fleas - present or past</td>
<td>3,046</td>
<td>1,779 56%</td>
</tr>
<tr>
<td>CBD case in household</td>
<td>205</td>
<td>184 85%</td>
</tr>
<tr>
<td>Totals:</td>
<td>19,585</td>
<td>9,745 50%</td>
</tr>
</tbody>
</table>

Bartonella-Associated Diseases

- Oral Disease:
  - Gingivitis
  - Stomatitis
  - Oral Ulcer
  - Submandibular lymphadenopathy

- Respiratory Disease:
  - URI
  - Rhinitis
  - Sinusitis

- Cutaneous Disease:
  - Uveitis
  - Conjunctivitis
  - Keratitis

- GI Disease:
  - Infl. Bowel Disease: IBD
  - Chronic Vomiting
  - Chronic Diarrhea

- Other Diseases:
  - Lymphadenopathy
  - Bacillary Angiomatosis
  - Neurological Disorders
  - Valvular Heart Disease
  - Fever of Unknown Origin

Feline Neoplastic Uveitis
- Lymphosarcoma (6-20%)
- Uveal melanoma (6-10%)

Anterior Uveitis - systemic
- Diagnostic Tests
  - History - Duration, progression of disease
  - Physical examination
  - Complete blood count
  - WBC count, Differential
  - Platelet count
Anterior Uveitis

- Diagnostic Tests
  - Biochemical profile
  - Serology
  - Radiology
  - Ultrasound
  - Cytology/Histopathology

Anterior Uveitis

- Serology – REMEMBER CO-INFECTIONS
  - Blasto, Hista, Crypte
  - RMSF, Ehrlichia canis/platys, Lymes, ICH, Distemper
  - FeLV, FIV
  - Toxo - request IgG, IgM, and Toxo antigen tests
  - Bartonella
  - Leishmania

Anterior Uveitis

- Treatment
  - As you can see from the extensive list of etiologies it is impossible to give you one treatment that will apply to every case.
  - We therefore divide treatment into specific and non-specific therapy.

Anterior Uveitis

- Specific Treatment:
  - directed towards the inciting cause
  - requires you to correctly diagnose the etiology and, if possible, eliminate it
  - Antimicrobials – antibiotics, antifungal, other
  - Immunotherapy
  - Chemotherapy
  - Other

Anterior Uveitis

- Non-Specific Treatment
  - Topical
    - Atropine 1%
    - Corticosteroids
    - Non-steroidals
  - Systemic
    - Anti-inflammatories
    - Immunosuppression

Sequelae of Anterior Uveitis

- Anterior &/or posterior synechia
- Cataract
- Glaucoma
- Blindness
- Phthisis bulbi
Glaucoma, by definition, is an increase in the IOP to a level that is incompatible with the health of the eye.

- Increased IOP - always the result of a decrease in outflow
- Decreased IOP - always the result of a decrease in production (uveitis)

Is the glaucoma primary or secondary?

- Is it acute or chronic?
Glaucoma
- Is the glaucoma primary or secondary?
- Is it acute or chronic?
- The answers to these questions will help you to select the therapy of choice.

Intraocular Pressure Determination
- There are 3 specific ways to determine intraocular pressure:
  - Indentation tonometry
  - Applanation tonometry
  - Rebound tonometry

Applanation Tonometry
- Transducer tip

Primary Glaucoma
- Not associated with any other ocular disease
- No antecedent cause

Primary Glaucoma
- This is generally seen in predisposed breeds:
  - Poodle, Basset hound, Beagle, Afghan
  - American & English Cocker Spaniel
  - English Springer Spaniel
  - Arctic breeds - Husky, Elkhound, Sameyed, etc.
  - Shar-Pei, Chow Chow, Dalmation, Bouvier, Other
Gonioscopy

Primary Glaucoma
- predisposed to bilateral involvement
- bilateral involvement is 50% within 2 years
- unaffected eye requires preventive therapy
  - IOP monitoring
  - Prophylactic Rx

Secondary Glaucoma
- The result of some other event in the eye which results in a decrease in aqueous humor access to the drainage angle or a decrease in outflow

Secondary Glaucoma
- Etiologies
  - Anterior lens luxation
Lens Instability

- Genetic Testing
  - Gene for PLL identified at University of Missouri and AHT
  - Simple recessive trait
  - Homozygous affected luxated by 4-8 yr

- Homozygous affected
  - When to operate?
  - What Technique? Phaco vs ICL\E
  - Wait to luxate – 40% failure rate
  - Prophylactic lensectomy – 95% success???

Secondary Glaucoma

- Etiologies
  - Anterior lens luxation
    - Breed related - Terriers
    - Secondary to glaucoma
    - Displacement by an intraocular neoplasia
    - Trauma

- Anterior lens luxation
  - Synechia

Secondary Glaucoma

- Etiologies
  - Anterior lens luxation
  - Uveitis

K9 Blasto, uveitis, glaucoma
Hypermature cataract, Lens-induced uveitis, Secondary glaucoma

Why does this happen?

PIFM

FeLV, Uveitis, Secondary Glaucoma

**Secondary Glaucoma**

- Etiologies
  - Anterior lens luxation
  - Synechia
  - Uveitis
  - Pre-iridal fibrovascular membrane

**Secondary Glaucoma**

- Etiologies - PIFM
  - Pre-iridal fibrovascular membrane
    - Uveitis #1
    - Intraocular Neoplasia
    - Retinal Detachment

Normal Iris

- Chronic uveitis
- Intraocular neoplasia
- Retinal detachment/ degeneration

Glaucoma
Secondary Glaucoma
- Etiologies
  - Anterior lens luxation
  - Uveitis
    - Pre-iridal fibrovascular membrane
    - Hyphema/Hypopyon
- Neoplasia

Feline Iris Cyst
- Clinical significance?
  - Elevated IOP in cats
- Treatment:
  - None
  - Laser Ablation

Diode laser ablation

Uveal Cysts and Glaucoma
Secondary Glaucoma
- Etiologies
  - Anterior lens luxation
  - Synechia
  - Uveitis
  - Pre-iridal fibrovascular membrane
  - Hyphema/Hypopyon
  - Neoplasia
  - Pigmentary
    - Cairn Terrier

Acute Glaucoma
- These patients are true medical &/or surgical emergencies
- Hours make the difference between seeing and being blind

Normal Vision

Moderate Glaucoma
Acute Primary Glaucoma

- These patients are true medical &/or surgical emergencies
- Hours make the difference between seeing and being blind

Acute Glaucoma

- Clinical Signs
  - Corneal edema
  - Decreased to absent menace
  - Sluggish PLR, pupil dilate
  - Episcleral vessels engorged
  - Pain - epiphora, blepharospasm

Redness
Deep corneal vessels
Dilated Pupil
Diffuse Corneal Edema

Infarction secondary to acute glaucoma

Glaucoma
Acute Glaucoma

- Treatment
  - Personal preference:
    - Latanoprost
    - Mannitol if latanoprost ineffective
  - Topical and Systemic CAI
  - Referral for Sx

Prostaglandins
- Latanoprost 0.005% (Xalatan)

Miosis

Dorzolamide reaction

Passive Paracentesis – 30 guage needle

Retinal and Optic Nerve Edema Post Tx
Assess Vision, Vessels, Optic Nerve

Retinal infarction secondary to acute glaucoma
Retinal edema secondary to acute glaucoma

Acute Glaucoma

Treatment
Surgical Therapy
Cyclophotoablation

Cyclophotocoagulation
Iris
Cornea
Ciliary body

Lens
Iris
Cornea
Ciliary body

TSOP
Success at 1 year:
Canine: 50-60%
Equine: >80%

Laser targets Ciliary Processes
Success at 1 year:
Canine: >80%

Acute Glaucoma

- Treatment
- Surgical Therapy
- Filtering Procedures
Chronic Glaucoma

- These are not emergencies as is the case with the acute patient
- Treatment
  - Prosthesis
  - Enucleation
  - Pharmacologic ablation

Normal Canine

Chronic Glaucoma Canine

Normal Canine

Chronic Glaucoma Canine

Nerve fiber and Ganglion cell layer
Chronic Glaucoma

- Treatment
  - Eviseration with Prosthesis
  - Remove internal contents of the globe
  - Insert a 19mm silicone sphere
  - Cornea will vascularize over the next 2-4 weeks.

K9 Intrascleral Prosthesis

http://youtu.be/lF0bOb42oNs
K9 ISP 1 week post-op.

K9 ISP 2 week post-op.

K9 ISP 10 week post-op.

K9 ISP 1 year post-op.

K9 ISP OU 2yr post-op.

K9 ISP OD, enucleation OS 1yr post-op.
Cataract

Etiology of Cataracts
- Hereditary
- Metabolic
- Inflammatory
- Traumatic
- Toxic
- Nutritional
- Radiation
- Electric

Canine

Feline

Cataract - location
- Location
  - Capsular

Cataract - location
- Location
  - Capsular
  - Cortical

Cataract - location
- Location
  - Capsular
  - Cortical
  - Nuclear

Cataract - location
- Location
  - Capsular
  - Cortical
  - Nuclear
  - Equatorial
Cataract

- Age of onset
  - Congenital
    - at birth
  - Developmental
    - < 6yr
  - Senile
    - >6-9yr

Cataract - severity

- Progression
  - Incipient

Cataract - severity

- Progression
  - Incipient
  - Immature

Cataract

Equatorial vacuoles - immature
Cataract
Posterior cortical - immature

Cataract - severity
- Progression
- Incipient
- Immature
- Mature

Cataract
Mature cataract

Cataract - severity
- Progression
- Incipient
- Immature
- Mature
- Hypermature

Hypermature
Hypermature

Mature

Hypermature

Hypermature with Retinal detachment

Hypermature cataract with LIU

Lens induced uveitis

Lens induced uveitis with secondary glaucoma

Ocular Ultrasound

Normal eye 10 MHz
Cataract Surgery

- Ultrasound
  - Vitreous Degeneration
    - Immature - 2%
    - Mature - 7%
    - Hypermature - 20%

Vitreous degeneration

Cataract Surgery

- Ultrasound
  - Retinal Detachment
    - Immature - 2%
    - Mature - 5%
    - Hypermature - 12-15%
Cataract Surgery

- Electroretinogram
- Awake or under anesthesia

Photopic
Scotopic

When to Refer?
- Referral should be done early
- We no longer wait for a mature “ripe” cataract
- Refer early immature and all cataracts that are progressive

Cataracts in 44 dogs (77 eyes): A comparison of outcomes for no treatment, topical medical management, or phacoemulsification with intraocular lens implantation

Christine C. Lin, Shannon G. Baker, Cheryl L. Wachtler, Lynne S. Sandmeyer, Bruce H. Gold

Abstract — Objective: To assess the outcomes of various treatments for cataract in dogs. Design: Prospective, randomized, blinded study. Setting: Referral veterinary ophthalmology practice. Patients: Dogs with cataracts. Interventions: No treatment, topical medical management, or phacoemulsification with intraocular lens implantation. Outcome Measures: Visual function, ocular comfort, complications, and satisfaction. Results: There were no statistically significant differences in visual function, ocular comfort, or satisfaction between the treatment groups. The complication rates were lowest for phacoemulsification, intermediate for topical medical management, and highest for no treatment. Conclusion: Phacoemulsification with intraocular lens implantation is the preferred treatment for cataract in dogs, followed by topical medical management and no treatment with the lowest complication rates. Keywords: Cataract, Phacoemulsification, Intraocular Lens Implantation, Topical Medical Management.
16th CENTURY

Surgeon

Anesthesiologist

Steps

- Incision
- Capsulorhexis
- +/- hydrodissection
- One vs two-handed phacoemulification
- Cortical aspiration
- +/- posterior capsulorhexis
- IOL
- Closure

Sir Harold Ridley

Emmetropia

Aphakia -14D

The first intraocular lens to the replacement of cataract was implanted by Sir Harold Ridley on 20th February 1949.
1 Year - old Dog
Phaco -8 sec, 50ml

AcriVet 60V IOL

2 yr post op IOL’s

We now have an Equine IOL – Acri.Vet

Lens Luxation
- Partial vs Total
- Anterior vs Posterior
Lens Luxation
- Etiology
  - Primary
    - predisposed breeds
    - all terrier breeds
    - Predisposed to bilateral involvement

Lens Instability
- Genetic Testing
  - Gene for PLL identified at University of Missouri and AHT
  - Simple recessive trait
  - Homozygous affected luxated by 4-8 yr

Lens Instability
- Homozygous affected
- When to operate?
- What Technique? Phaco vs ICLE
- Wait to luxate – 60% failure rate
- Prophylactic lensectomy – 95% success???
Lens Luxation

- Treatment
  - All patients with lens luxations must have their IOP measured.

Lens Luxation

- Treatment Anterior Luxation
  - Surgical emergencies if acute and primary
  - Best therapy is referral
  - Do not advise any medical therapy unless an ophthalmologist is not available in which case the IOP must be reduced to prevent retinal damage.
    - Mannitol - 1-2gm/lb IV slowly over 10-15 min

Questions?