THE COMPLICATED THINGS: GLAUCOMA, UVEITIS AND RETINAL DISEASE

KRISTIN FISCHER, DVM, DACVO

GLAUCOMA

- Leading cause of blindness in dogs
- Increased pressure within the eye
- Decreased outflow
- Damage to the retinal ganglion cells and optic nerve

ACUTE CLINICAL SIGNS

- Pain
  - Generalized
  - Migraine
  - Lethargy, anorexia
- Corneal edema
  - Endothelial cell dysfunction
  - Blindness

ACUTE CLINICAL SIGNS

- Mydriasis
  - Fixed
- Episcleral injection
  - Ropey, engorged vessels

CHRONIC SIGNS

- Corneal (Haab’s) stria
  - Small breaks in Descemet’s membrane
- Buphthalmia
  - Big eye=Blind eye!
CHRONIC SIGNS

• Optic disc cupping
  • Secondary to myelin loss and buphthalmia

• Lens subluxation
  • Zonules don’t tolerate buphthalmia

WHY IS VISION LOST WITH GLAUCOMA?

• Irreversible damage to the retinal ganglion cells
• Irreversible damage to the optic nerve

DIAGNOSIS

• Tonometry (Normal IOP 10-20mmHg*)
  • Tono-pen®, Tono-vet®, Schiotz

GLAUCOMA: CAUSES

• Primary Glaucoma
  • Genetic
    • Breed predispositions
  • Goniodysgenesis

• Secondary Glaucoma
  • Any cause of uveitis (acute or chronic)
  • Post-operative complication of phacoemulsification surgery
  • Anterior lens luxation
  • Pigmentary Uveitis
  • Intraocular neoplasia

PRIMARY VERSUS SECONDARY

• What is the pupil doing?
  • Mydriasis- primary
  • Miosis- secondary
  • Aqueous flare!
  • Synechiae, keratic precipitates, hypopyon, hyphema, iris bombé!
GONIOSCOPY

- Allows visualization of the angle

TREATMENT GOALS

- Identify whether primary or secondary
  - If secondary treat underlying cause
- Maintain safe IOP
  - Goal of <15mmHg
- Maintain Comfort
  - Goal of <35-40mmHg

TREATMENT GOALS

- Dogs can lose vision permanently in less than one day if pressures are elevated and rapid therapy is not instituted
- Treat acute high pressures as an EMERGENCY
- Goal is to re-establish vision and normal IOP ASAP then institute maintenance therapy

MEDICAL THERAPY

- Timolol 0.5%
- Dorzolamide 2%
- Cosopt (Tim/Dorz)
- Prostaglandin analogs
  - Xalatan (latanoprost)
  - Lumigan (bimatoprost)
- Systemic CAIs
- Mannitol
- Neuroprotectants

TIMOLOL 0.5% (TIMOPTIC)

- Non-selective β blocker
- Decreases aqueous humor production
- Decreases IOP by 5-8mmHg

TIMOLOL 0.5% (TIMOPTIC)

- Best use: In contralateral eye of primary glaucoma dog
- Helpful hints: BID administration, Very inexpensive, avoid use in patients with asthma or heart block
<table>
<thead>
<tr>
<th><strong>DORZOLAMIDE 2% (TRUSOPT)</strong></th>
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<tbody>
<tr>
<td>• Carbonic anhydrase inhibitor (CAI)</td>
<td>• Best use: Cases with high-normal pressures in early glaucoma suspects</td>
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<tr>
<td>• Decreases aqueous humor production</td>
<td>• Helpful hints: TID administration</td>
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<td>• Decreases IOP by 8-10mmHg</td>
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<tr>
<th><strong>DORZOLAMIDE/TIMOLOL (COSOPT)</strong></th>
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<tr>
<td>• Carbonic anhydrase inhibitor/ β-blocker</td>
<td>• Best use: Pressures less than 30mmHg, contralateral primary glaucoma eye when IOP rises to high-normal range on timolol alone</td>
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<tr>
<td>• Drugs are synergistic</td>
<td>• Helpful hint: BID administration, large bottle, midrange price</td>
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<td>• Decreases IOP by 10-15mmHg</td>
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<td>• Prostaglandin analog</td>
<td>• Mechanism is debatable, likely a combo of decreased production, increased unconventional outflow, miosis</td>
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<tr>
<td>• Decreases IOP by a bunch!</td>
<td>• Best use: Any glaucoma case with IOP greater than 30mmHg, emergency glaucoma therapy, Posterior lens luxation</td>
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<tr>
<td>• Essentially replaces Mannitol as emergency glaucoma therapy</td>
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LATANOPROST 0.005% (XALATAN)

- Contraindications: Anterior lens luxation, secondary glaucoma
- Helpful hints: BID visual eye, SID blind eye, extreme miosis, refrigerate, used to be very $$$ now relatively inexpensive, small bottle

ONE MORE THING...

- Prostaglandin analogs are ineffective in cats
  - Commercial prostanoids are selective F receptor agonists
  - Cats have primarily E and D receptors

ORAL CARBONIC ANHYDRASE INHIBITOR

- Methazolamide 2-5mg/kg BID to TID
- No synergy with topical CAIs
- **Side effects:** Metabolic acidosis (transient)
  - Topicals are not associated with systemic side effects

MANNITOL INJECTION

- Dose 1-1.5 g/kg IV slowly
  - Short term/emergency treatment only
  - Dehydrates the aqueous and vitreous
  - Effect within 30 minutes, lasts about 5-6 hours

SURGICAL THERAPIES FOR VISUAL DOGS

- Anterior chamber shunts (Gonioimplant)
  - Endoscopic cyclophotocoagulation

GONIOIMPLANT

- Uni-directional valve
- Extra-scleral implant
**COMPLICATIONS**

- Excessive fibrosis of filtering bleb
- Erosion of implant leading to exposure
- Tube occlusion
- Endophthalmitis
- Inappropriate tube length
- Endothelium contact

**ENDOSCOPIC CYCLOPHOTOCOAGULATION**

- Visualize and target ciliary processes for more precise cyclodestruction
- Post-operative pressure elevation and hospitalization
- Requires phacoemulsification

**SURGICAL THERAPIES FOR BLIND DOGS**

- Cyclodestructive procedures
  - Enucleation
  - Evisceration

**TRANS-SCLERAL CYCLOPHOTOCOAGULATION**

- Diode laser
  - Preferentially destroys pigment containing tissue
  - Non-invasive
  - Post-op IOP spike common
  - May be repeated
  - 51% maintain IOP <30mmHg
  - 12 months postop

**INTRAVITREAL GENTAMICIN INJECTION**

- Usually about 25mg
- +/- dexamethasone
- Direct needle towards optic nerve into vitreous body
- 10-12 mm from the limbus
- May need to remove some vitreous if liquefied

- Success?
  - 82% with first injection
  - 91% after second
  - 98% that responded were maintained with NO medications

**ENUCLEATION**
PROGNOSIS FOR OPPOSITE EYE DEVELOPING GLAUCOMA:

- Poor if primary
- Timolol BID

UVEITIS

- Inflammation of the uvea
  - Uvea
    - Iris
    - Ciliary body
    - Choroid

UVEITIS

- Breakdown of the Blood-Aqueous Barrier (BAB)
  - Vascular endothelium of the iris
  - Tight junctions between non-pigmented ciliary body epithelial cells and the posterior pigmented epithelial cells of the iris
  - Severity of the BAB breakdown is directly related to AH protein content

OPHTHALMOSCOPIC SIGNS

- Aqueous flare
- Miosis
- Corneal Edema
- Episcleral Injection

OPHTHALMOSCOPIC SIGNS

- Keratic precipitates
- Synechia
- Hypopyon
- Hyphema
- Low IOP

SEQUELAE

- Secondary Glaucoma
- Iris Bombé
- Cataract
- Lens Luxation
- Pre-iridial Fibrovascular Membrane (PIFM)
ETIOLOGIES OF UVEITIS

• Idiopathic
• Lens induced uveitis
  • Phacolytic
  • Phacoclastic
• Immune Mediated
  • Uveodermatologic syndrome
• Infectious
  • Algal, bacterial, viral, protozoal, parasitic, fungal, Rickettsial

DIAGNOSTIC TESTING

• A good physical exam!
• Minimum Database
  • CBC, Chem, Lytes, UA
  • Thoracic Radiographs
• Blood pressure
• Blastomyces Urine Antigen
• Tick Serology
• Toxoplasmosis Serology
• Other Fungal tests
  • Cryptococcus, Histoplasma, etc
• Aqueocentesis
• Enucleation

TREATMENT

• Topical Corticosteroids +/- Atropine
  • +/- Topical NSAIDS (Flurbiprofen, Ketorolac, Diclofenac, Bromfenac)
  • +/- Systemic Corticosteroids
  • +/- Systemic NSAIDS
  • +/- Glaucoma meds for secondary glaucoma
  • +/- Enucleation

IDENTIFY UNDERLYING CAUSE AND TREAT IT!

IDIOPATHIC UVEITIS

• Most likely immune mediated
• Rule out all other causes

LENS INDUCED UVEITIS- PHACOLYTIC

• Lens fiber liquefaction and protein leakage
• Secondary to hypermature cataracts
• Usually Diabetic dogs or Miniature Schnauzers
• Decreases surgical success

LENS INDUCED UVEITIS- PHACOCLASTIC

• Traumatic lens capsule rupture
  • Penetrating injury
  • Intumescent cataract with capsule rupture
• Zonal inflammation
• Very difficult to control medically
UVEODERMATOLOGIC SYNDROME

• Similar to human Vogt-Koyanagi Harada Syndrome
• Immune mediated attack against uveal melanocytes
• Northern (Arctic) Breeds
• Ocular signs before skin signs

UDS- DIAGNOSIS & TREATMENT

• Diagnosis
  • Biopsy
    • Interface dermatitis
    • Granulomatous panuveitis
    • Melanomacrophages
  • Treatment
    • Topical steroids and atropine
    • Systemic immunosuppression

• Treatment

INFECTIOUS UVEITIS

• Algal
  • Protococcus sp.
• Bacterial
  • Bartonella sp.
• Viral
  • Adenovirus
• Protozoal
  • Toxoplasma gondii

INFECTIOUS UVEITIS

• Parasitic
  • Dipsera larva
  • Toxocara sp.
• Rickettsial
  • Ehrlichia canis
  • Rickettsia rickettsii

• Fungal
  • Blastomyces dermatitidis
  • Histoplasma capsulatum
  • Cryptococcus neoformans
  • Coccioides immitis

EHRLICHIA CANIS

• Ocular signs
  • Hemorrhagic uveitis
  • Retinal hemorrhages
  • Engorged retinal vessels with perivascular infiltrate
  • Retinal detachment
  • Optic neuritis
• 10-15% of naturally infected dogs
• 50% of experimentally infected dogs
• 9/11 dogs in one study had mild ocular signs
  • Conjunctivitis and chemosis
  • Retinal vasculitis
  • Anterior uveitis (mild)
  • Petechiae of the conjunctiva, iris and retina
• Treat uveitis topically
  • Doxycycline

ROCKY MOUNTAIN SPOTTED FEVER—RICKETTSIA RICKETTISI"

• Ocular lesions seen in 48% of infected dogs
  • 3% may be the only sign of infection
  • 50% of lesions are bilateral
  • Hematogenous spread to the choroid

BLASTOMYCES DERMATIDITIS

• Itraconazole
  • Organisms may still be observed budding in the face of itraconazole
  • Can it reach the eye?
• Topical prednisolone acetate
• Atropine for normotensive eyes
• +/- topical glaucoma medications
• Enucleate blind, painful eyes

BLASTOMYCOIS: TREATMENT

• 39% of dogs in one study had ocular lesions
• Ocular signs = Stage V
• Usually bilateral
• Lymphoma is the most common metastatic tumor of the uvea in the dog, cat, cow, and horse

LYMPHOMA

• Primary intraocular neoplasia
  • Usually benign (4% metastasis rate)
  • Can be locally invasive
• Metastatic neoplasia
  • Hemangiosarcoma, melanoma, carcinomas, transmissible venereal tumor, transitional cell carcinoma, neurogenic sarcoma, rhinotransitional sarcoma, angiosarcoma, plasmacytoma, osteosarcoma, laryngeal papilloma, parotid salivary, adrenal, renal, pancreas, osteosarcoma

OTHER NEOPLASTIC PROCESSES

• PIGMENTARY UVEITIS
  • AKA Golden Retriever Uveitis
• Inherited condition in Golden Retrievers
• Radial pigment streaking on the anterior lens capsule
• +/- pigmented uveal cysts
• Eventually causes secondary glaucoma
• Treatment
  • Topical anti-inflammatories
  • Topical glaucoma medication

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**RETINAL DISEASE**

- Tapetum
- Nontapetal retina
- Retinal vessels
- Optic disc
- Choroid

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**THE FUNDUS**

- Tapetum
- Nontapetal retina
- Retinal vessels
- Optic disc
- Choroid

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**GENERAL HISTOLOGY**

- Nerve fiber layer
- Ganglion cell layer
- Bipolar cell layer
- Photoreceptor cell layer
- Retinal pigment epithelium
- Choroid
- Sclera

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**NORMAL CANINE RETINA**

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**CHORIORETINITIS**

- Inflammation of the choroid and retina
- Clinical signs
  - +/- visual deficits
  - +/- anterior uveitis
  - +/- systemic signs
- Etiologies
  - Similar to uveitis plus Canine Distemper Virus

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**CHORIORETINITIS APPEARANCE**

- Focal / multifocal
- Dull gray, white, light yellow in color
- Poorly demarcated
  - ± “mass”
  - ± hemorrhage
CHORIORETINAL SCARS

- Focal / multifocal
- Hyperreflective if in tapetum
- Depigmented if in nontapetum
- Well demarcated
- Flat
- No hemorrhage
- ± pigment clump in middle of lesion

ETIOLOGIES OF RETINAL DETACHMENT

- Bullous
  - Chorioretinitis
  - Hypertension
  - Neoplasia
  - Retinal dysplasia
  - Steroid-responsive retinal detachment
- Rhegmatogenous
  - Hypermature cataracts
  - Post cataract surgery
  - Post severe trauma
  - Breed related

RETINAL DETACHMENT

- Separation of the neurosensory retina from the underlying retinal pigment epithelium
- Results in marked vision loss
- Types of detachment
  - Bullous
  - Rhegmatogenous

RETINAL DEGENERATION

- Sudden Acquired Retinal Degeneration Syndrome (SARDS)
- Immune Mediated Retinopathy (IMR)
- Progressive Retinal Atrophy (PRA)

SUDDEN ACQUIRED RETINAL DEGENERATION SYNDROME (SARDS)

- Acute blindness
- Dilated pupils
- Normal eye exam
- Diagnosis
  - Clinical signs
  - ERG
  - Often pu/pd/pp
  - NOT Cushingoid so don’t treat for it!
- No treatment

IMMUNE MEDIATED RETINOPATHY (IMR)

- What is it?
  - Retinal degeneration suspected to be immune mediated
- How is it different from SARDS?
  - Not entirely sure
  - Patients seem to have some improvement with immunosuppression (life long)
  - May not fit the classic SARDS mold
- STAY TUNED!
**PROGRESSIVE RETINAL ATROPHY (PRA)**

- Inherited photoreceptor disease
- Nyctalopia (night-blindness)
- Tapetal hyperreflectivity
- Vascular attenuation
- Mydriasis
- Cataracts

**PRA**

- No treatment
- Do not breed
- Sequelae
  - Cataracts
  - Lens luxation
  - Secondary glaucoma
- Genetic testing available through www.Optigen.com