

Working up a 'Red Eye'

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Plan for today

- ◆ What is an ocular emergency?
- ◆ Quick review of ocular anatomy
- ◆ How do we workup a 'red eye'?
 - ◆ Differentials and therapies
- ◆ When do I refer?



<https://www.vetboard.com/what-is-an-ocular-emergency-when-should-you-refer/>

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Can't get enough of eyeballs?!

- ◆ Gilger's Equine Ophthalmology 4th ed.
- ◆ Slatter's Fundamentals of Ophthalmology



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Why do we care about eyeballs?



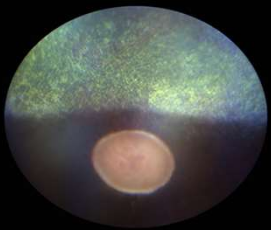
- ◆ Eyes are the window to the soul
- ◆ Ocular pathology HURTS
 - ◆ The cornea is the most densely-innervated structure in the body!
- ◆ The eyes are an important sentinel organ
 - ◆ Uveitis often has a systemic cause
 - EHV-1, leptospirosis, etc.
- ◆ Blinding consequences can occur quickly if not identified and treated in a timely manner

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The Equine Eye

A



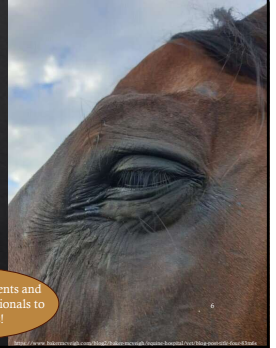
- Three tunics
 - Fibrous
 - Sclera & cornea
 - Vascular
 - Uvea = Choroid, ciliary body, & iris
 - Nervous
 - Neurosensory retina

Slatter's 5th ed. Fundamentals of Ophthalmology

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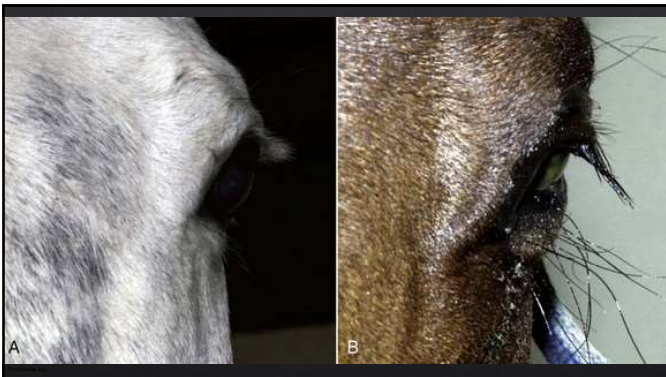
What does ocular pain look like?

- Squinting
- Third eyelid elevation
- Head-shy
- Rubbing the eye
- Being "quieter" than normal
- Reluctance to eat (retrobulbar space)
- Downward-pointing vibrissae



It is easy for clients and medical professionals to miss these signs!

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It's 5:00 pm on a Friday...



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Help, my horse's eye is red and squinty!



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An unfortunate acronym....

- ◆ GOSHUCK
- ◆ Glaucoma
- ◆ Orbital disease
- ◆ Scleritis/episcleritis
- ◆ Hyphema
- ◆ Uveitis
- ◆ Conjunctivitis
- ◆ Keratitis



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An unfortunate acronym....

- ◆ GOSHUCK
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- ◆ **O**rbital disease
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- ◆ **H**ypHEMA
- ◆ **U**veitis
- ◆ Conjunctivitis
- ◆ **K**eratitis



Emergent
Could be emergent
Not emergent

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Have a systematic way to approach ERs/unknown eye issues

- | | |
|--|--|
| ◆ Visual & neurologic assessment | ◆ Ocular exam |
| ◆ Navigation /behavior | ◆ Periocular area/ symmetry evaluation |
| ◆ PLR, dazzle, palpebral reflex, and menace response | ◆ Eyelids (superior, inferior, third) |
| ◆ Ocular diagnostics | ◆ Conjunctiva and cornea |
| ◆ STT | ◆ Anterior chamber |
| ◆ IOP | ◆ Lens |
| ◆ Fluorescein stain | ◆ Vitreous |
| | ◆ Fundus |

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Clinical signs



- ◊ Corneal edema
- ◊ Mydriasis
- ◊ Impaired/ absent vision
- ◊ Increased IOP (> 30 mmHg)
- ◊ Epiphora
- ◊ Blepharospasm
- ◊ Buphthalmia = "cow eye"
- ◊ *Keep in mind:
- ◊ Horses are prey species
- ◊ Owners need education about what eye pain looks like

Glaucoma

- ◊ Not a common disease, but a difficult one to manage in horses
- ◊ Most often *secondary* to uveitis
- ◊ Often present late in the disease process → options become more limited as the disease progresses



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Glaucoma

- ◊ Not a common disease, but a difficult one to manage in horses
- ◊ Most often *secondary* to uveitis
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Aphakic
Crescent

- ◊ Haab's Striae, AKA Linear Keratopathy

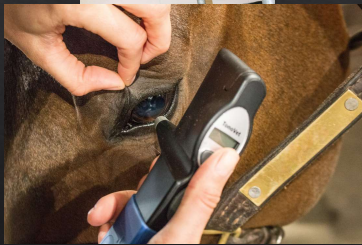


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Make sure the IOP is accurate!

- ✦ It is practically impossible to get a falsely low IOP
- ✦ A falsely high IOP is very common
 - ✦ Patient stress
 - ✦ Compression of the jugular vein(s)
 - ✦ Pressing on the globe
 - ✦ Retracting the eyelids too much



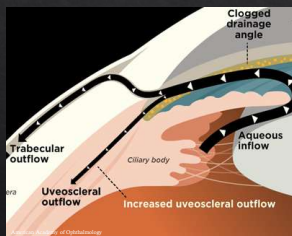
Glaucoma



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Glaucoma



- ✦ Primary glaucoma
 - ✦ Malformed "drain"
- ✦ Secondary glaucoma
 - ✦ Damaged "drain"
- ✦ High IOP damages retinal ganglion cells, causes axonal death → ultimately kills optic nerve
- ✦ Glaucoma self-perpetuates
- ✦ IOP spike → inflammation → IOP spike → etc.



Glaucoma



- ✦ Increased IOP
 - ✦ Best way to diagnose and monitor
- ✦ Ideally screening with OCT retinal imaging and visual field testing, but this is tricky for our patients!

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Treatment

- ◆ Priority is to treat primary cause, if present (uveitis)
- ◆ Not a lot of medical options
 - ◆ Dorzolamide or dorzolamide-timolol are most effective
 - ◆ Anti-inflammatory helps break the IOP-inflammation cycle
 - ◆ Latanoprost can be irritating and ineffective
- ◆ NEVER use mydriatics!
 - ◆ Stuffs iris tissue into iridocorneal angle
 - ◆ Can cause an IOP spike



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Surgical treatment: Early

- ◆ Transscleral cyclophotocoagulation
 - ◆ Diode laser ablation of the ciliary processes
 - ◆ "Gentle killing"
 - ◆ Reduces AH production, induces inflammation
 - ◆ Visual eyes
 - ◆ Ultimately will fail



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Surgical treatment: Early

- ◆ Gonioshunt
 - ◆ Ahmed valve, Baerveldt gonioimplant
 - ◆ Provides alternate route for AH outflow
 - ◆ Visual eyes



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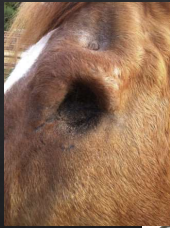
Surgical treatment: Late

- ◆ Ciliary body ablation (CBA)
 - ◆ Cidofovir, gentamicin
 - ◆ Allows patient to keep the eye
 - ◆ Not always effective at lowering IOP
 - ◆ Risks: Phthisis bulbi, hemorrhage, infection, lens trauma



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Surgical treatment: Late

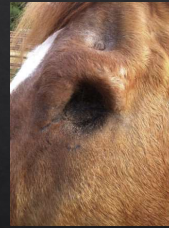


- ◊ Enucleation
 - ◊ Quickest return to comfort, fewest complications
 - ◊ Risks: Hemorrhage, infection, wound dehiscence, sinking in of orbit (cosmesis)
 - ◊ Intraorbital prosthesis
 - ◊ Can be completed under standing sedation with local blocks



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Surgical treatment: Late



- ◊ For any blind/ visually-compromised horse: Discuss spooking, etc. with the owner
- ◊ Take care with children, inexperienced individuals, and with riding

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Surgical treatment: Late



\$2,500-8,500

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When do I refer?

- ◊ IOPs are not responding despite appropriate therapy
- ◊ Owners are interested in surgical interventions
 - ◊ Gonioshunt
 - ◊ Trans-scleral cyclophotocoagulation
 - ◊ Earlier is better!!
- ◊ Multiple disease states
 - ◊ Secondary glaucoma from bad uveitis, lens luxation, etc.



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Glaucoma Takeaways

- ◆ 1. Do the eye pressures fit the presentation (i.e., do I have artifactually high eye pressures?)
- ◆ 2. What is the underlying condition?
- ◆ 3. What is the prognosis for this eye?
 - ◆ Typically poor due to Equine Recurrent Uveitis (ERU)

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Orbital disease

- ◆ Exophthalmia – **could be emergent**
 - ◆ Retrobulbar abscess/cellulitis
 - ◆ Retrobulbar neoplasia
 - ◆ Retrobulbar hydatid cyst, sialocele, etc.
 - ◆ Reduced retropulsion
 - ◆ Orbital fractures
 - ◆ *Compartment syndrome or secondary glaucoma*



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Orbital disease

- ◆ Retrobulbar abscesses and cellulitis
 - ◆ Foreign body from the oral cavity or penetrating foreign body
 - ◆ Infectious causes: Cryptococcus, Habronema, etc.
- ◆ Traumatic orbital fractures
- ◆ Nasal / Sinus cysts
- ◆ Neoplasia: lymphoma, SCC, etc.
- ◆ Extension of guttural pouch disease



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When do I refer?

- ◆ Orbital compartment syndrome
- ◆ Glaucoma secondary to orbital disease that is non-responsive
- ◆ Lack of response despite appropriate therapy
- ◆ Skull CT needed



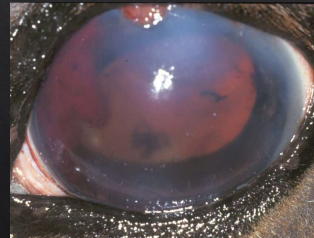
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Orbital disease takeaways

- ◆ 1. Find the underlying cause for retrobulbar disease.
- ◆ 2. Most retrobulbar abscesses can be managed medically.
- ◆ 3. Orbital disease is extremely uncomfortable

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Hyphema



- ◆ **Emergent**
- ◆ Trauma
- ◆ Uveitis
 - ◆ Requires further workup for potential systemic disease
- ◆ Coagulopathy/ blood dyscrasias
 - ◆ Rat poison ingestion, thrombocytopenia, viral arteritis, etc.
- ◆ Retinal detachment

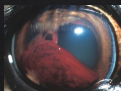
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Hyphema

- ◆ Concern for TBI with trauma
- ◆ Concern for systemic disease if uveitis or blood dyscrasias
- ◆ Concern for the eye is
 - ◆ Ongoing damage from inflammation
 - ◆ Secondary glaucoma from the RBCs "clogging the drain"
- ◆ Diagnostics to consider:
 - ◆ CBC/Chem
 - ◆ PT/PTT
 - ◆ Neurologic exam
 - ◆ Infectious disease testing
- ◆ Treatment:
 - ◆ Find the underlying cause and treat
 - ◆ Topical +/- systemic anti-inflammatories
 - ◆ Anti-glaucoma medications



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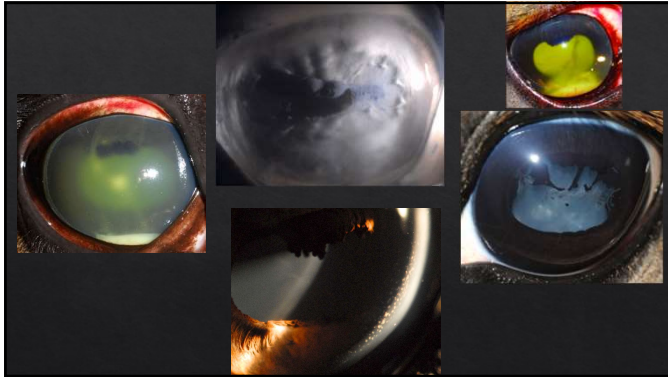
Uveitis

- ◆ **Emergent/Could be emergent**
- ◆ Corneal edema
- ◆ Red iris
- ◆ Small pupil
- ◆ Flare
- ◆ Low IOP (10 mmHg or below)
- ◆ Hypopyon (white blood cells in the anterior chamber)
- ◆ Hyphema (blood in the anterior chamber)
- ◆ Fibrin (inflammatory debris in the anterior chamber)
- ◆ Big questions to answer:
 - ◆ How is the patient systemically?
 - ◆ Systemic causes are common and can be deadly
 - ◆ What is the patient's visual status?
 - ◆ What is the patient's IOP?
 - ◆ A "normal" IOP may be abnormal for this patient



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Differentials

- Infectious/systemic disease
 - Leptospirosis
 - EEE/WEE/VEE (Eastern/Western/ Venezuelan encephalitis)
 - Equine Protozoal Myeloencephalitis
 - EHV
- Neoplastic
 - Lymphoma
 - Melanoma
- Inflammatory/ other
 - Trauma
 - ERU


♦ Corneal ulcer → *Infected*



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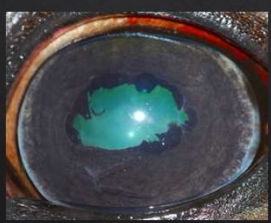
ERU

- Most common cause of blindness in horses worldwide
- 50-60% of horses will go blind and/or be unable to return to previous level of work
- Appaloosas are 8x more likely than other breeds to get ERU
 - LP/LP = leopard
- American Quarter Horse, Warmblood, Thoroughbred, American Paint
 - But any breed can get ERU!
- Infectious.....? Genetic.....?



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Uveitis treatment



- The main mistake people make = not being aggressive enough with treatment!
- Once chronic changes occur, these are difficult to overcome

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Treatment – Topical

- Atropine: q8h- 24h
 - Mydriasis
 - Stabilization of B.O.B.
 - Ciliary body paralysis
 - Decrease frequency once you achieve mydriasis
 - Monitor fecal output
- Corticosteroids: q4h-12h
 - Prednisolone acetate
 - Be aggressive with frequency at first!
 - NO corneal ulcers
- NSAIDs
 - Bromfenac, diclofenac, ketorolac.....
 - Not as powerful as steroids in acute uveitis
 - Good maintenance medication
 - Use if a corneal ulcer is present
- Immunomodulators
 - Cyclosporine
 - Tacrolimus
 - Maintenance medications

Treatment - Systemic

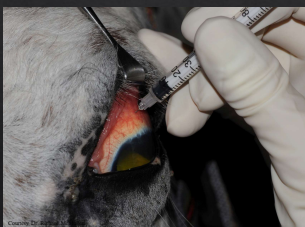
- NSAIDs
 - Banamine: first choice
 - 1.1 mg/kg 5-7d, then decrease
 - Phenylbutazone: Cost-effective
 - 4.4 mg/kg x 5-7d, then decrease
 - Firocoxib, Meloxicam
 - Check PCV/TS and creatinine → keep eye on GI and kidneys
- Corticosteroids
 - Dexamethasone
 - Prednisone
 - Careful of immunosuppression and laminitis
- Antibiotics
 - Doxycycline/minocycline for Lepto
 - Aqueous paracentesis for serum antibody titers
- Other medications as indicated by cause (Ponazuril, etc....)



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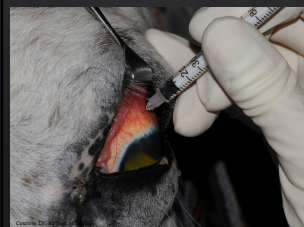
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Intravitreal injections



- Gentamicin
 - Controls active inflammation
 - Still have to deal with secondary effects (glaucoma, synechia, etc.)
 - Vitritis is slow (months) to resolve
- Triamcinolone
 - Depot of steroids (comes with risks because you can't remove it)
 - Effective
- Rapamycin (not as effective)

Intravitreal injections



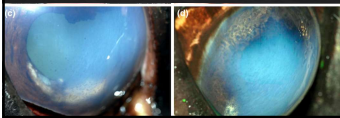
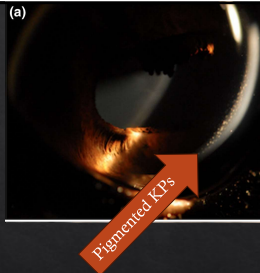
- Not all injections work for every horse → may not provide adequate control
- Risks: Infection, inflammation, lens trauma, iris trauma

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Heterchromic iridocyclitis & keratitis (HIK)

- Uveal inflammation with secondary keratitis
- An immune-mediated component?
- Aggressive tx with anti-inflammatories, but often ultimately unrewarding



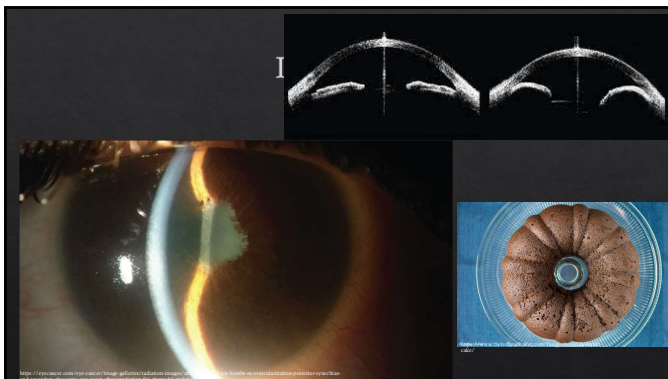
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The fear: Secondary changes!

- ◆ Secondary glaucoma
- ◆ Synechia
- ◆ Cataracts
- ◆ Retinal degeneration
- ◆ Retinal detachment
- ◆ Optic nerve atrophy
- ◆ These changes are often permanent!!



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When do I refer?

- ◆ 1. Advanced imaging is needed (Ultrasound, CT, MRI, etc.)
- ◆ 2. Lack of progress/worsening despite appropriate medical therapy.
- ◆ 3. Profound/scary uveitis.

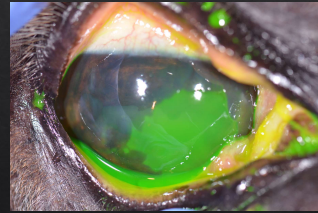
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Uveitis/ Hyphema takeaways

- ◆ 1. Be AGGRESSIVE with treatment
- ◆ 2. What is the underlying cause?

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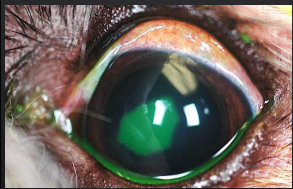
Keratitis



- ◆ Could be emergent
- ◆ Immune-mediated keratitis, eosinophilic keratitis, herpesvirus keratitis pannus
→ non-emergent unless concurrently ulcerated

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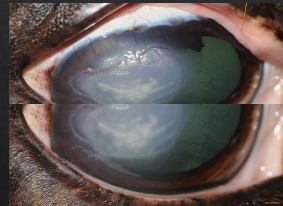
Keratitis



- ◆ Two categories: uncomplicated vs. complicated
- ◆ Huge implications for owner financial /time/ emotional commitment, prognosis for the eye, duration of treatment, potential for surgery, etc.!

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Corneal ulcer: 3 questions



- ◆ Superficial or deep?
- ◆ Infected or sterile?
- ◆ Predisposing or perpetuating cause?

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Corneal ulcer

- ◆ The answers to these questions tell us if this is an uncomplicated or a complicated ulcer

Superficial, uninfected,
no predisposing or
perpetuating causes?



Uncomplicated
- Heals in 3-7 days with
appropriate tx

Anything else!
- Stromal involvement
- Infection
- Hair abnormalities,
other causes

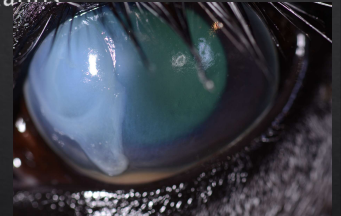


Complicated
- Needs workup,
further/ more
aggressive tx, longer
treatment duration

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Keratitis

- ◆ Complicated ulcers: any stromal loss, melting, other signs of infection, predisposing or perpetuating causes (KCS, hair abnormalities, foreign body,



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A stromal corneal ulcer is presumed infected until proven otherwise!

This distinction radically changes prognosis, medication selection, duration of treatment, and the likelihood of surgical intervention

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Keratitis

Infected ulcer treatment

- ◆ Broad-spectrum topical antibiotics (ofloxacin + cefazolin, e.g.) q1h – q8h
- ◆ Antifungal (voriconazole, miconazole, e.g.), q1h – q8h
- ◆ Topical atropine q24 – q8h
- ◆ Topical Serum q1h – q8h
- ◆ Anti-melt
- ◆ Oral anti-inflammatory of choice
- ◆ +/- oral antibiotics and/or antifungals

Uncomplicated ulcer treatment

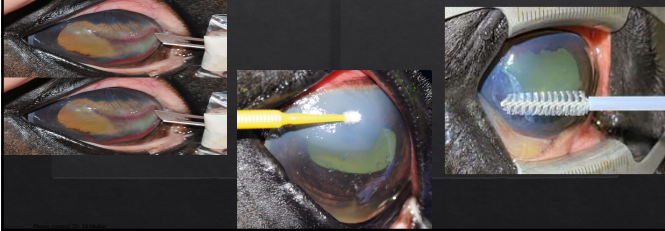
- ◆ Topical first-line antibiotic (terramycin, e.g.) 4x a day
- ◆ Oral anti-inflammatory of choice
- ◆ 1-2 doses of atropine PRN (long effect!)
- ◆ Recheck 5-7 days

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Corneal ulcer

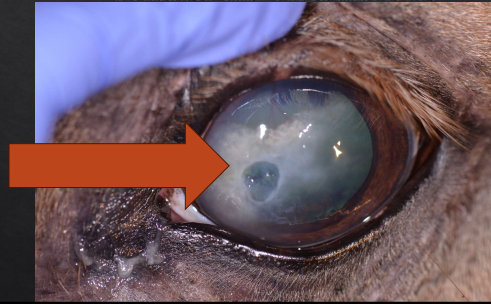
Further diagnostics are needed!

Corneal cytology, culture, and sensitivity



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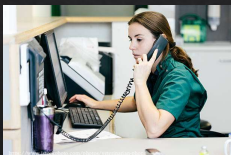
Consider this ulcer infected!



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When do I refer?

- ◆ Stromal loss of 50%+ = surgical emergency!
- ◆ Ulcer is not healing/getting worse in a reasonable time despite appropriate therapy
- ◆ Things not to do: Change antibiotics without a culture/sensitivity, debride without a diagnosis of an indolent ulcer, add a topical inflammatory



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Corneal ulcer takeaways

- ◆ 1. A stromal ulcer is considered infected until proven otherwise.
 - ◆ Never debride a stromal ulcer!
- ◆ 2. Answer your three questions:
 - ◆ Superficial or deep?
 - ◆ Infected or sterile?
 - ◆ Predisposing or perpetuation factors?
- ◆ 3. If the ulcer is not healing, don't change antimicrobials without cause (informed based on culture/sensitivity/cytology).

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Non-ulcerative keratitides: **Emergent**

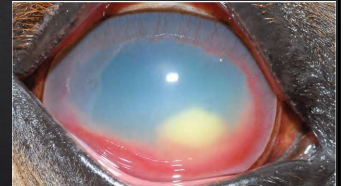


- No stain uptake
- Painful
- Focal area of creamy cellular infiltrate
- Marked reflex uveitis

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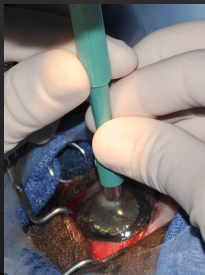
Stromal abscess

- ♦ Caused by microtrauma (hay, etc.)
- ♦ Epithelium covers microscopic puncture, but bacteria +/- fungus are trapped in stroma
- ♦ Stain negative!
- ♦ VERY painful
- ♦ Reflex uveitis often severe



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Stromal abscess



- ♦ Surgery is usually treatment of choice – need to cut out infection
- ♦ Otherwise, aggressive medical management
- ♦ SPL, topical +/- oral medications
- ♦ Corneal stromal injections



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Non-ulcerative keratitides: Non-emergent

- ♦ IMMK, EK are not emergent but should be addressed in a timely manner
- ♦ EK: Even 1 eosinophil is diagnostic on cytology!



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IMMK

- ♦ Chronic and/or progressive keratitis with mild to moderate cellular infiltrate and vascularization
- ♦ No uveitis
- ♦ +/- Mild discomfort, but not severe like an infected ulcer
- ♦ Can look like many things!

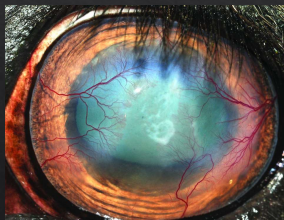


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IMMK



- ♦ Immune-mediated dz = immune-modulating tx
- ♦ Topical Diclofenac / bromfenac
- ♦ Topical Cyclosporine / tacrolimus
- ♦ Keratectomy of the lesion
- ♦ Photodynamic therapy

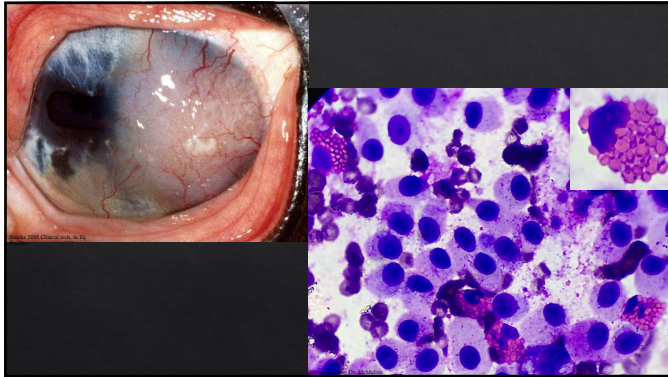
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EK

- ♦ Corneal erosions and infiltrate
- ♦ Creamy to white plaques on the cornea
- ♦ Neovascularization
- ♦ +/- ulcerations
- ♦ Diagnosed on cytology - even 1 eosinophil is diagnostic!



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EK

- ◊ Topical corticosteroids and/or NSAIDS
 - ◊ Be cautious with ulcers!
- ◊ Topical Cyclosporine / tacrolimus
- ◊ Keratectomy

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Corneal foreign bodies

- ◊ **Emergent**
- ◊ Usually a plant foreign body

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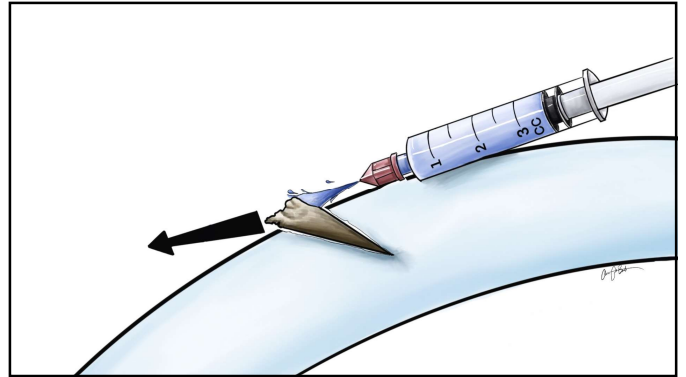
Corneal foreign bodies

- ◊ Often can be removed with hydropulsion alone (no surgery) unless full thickness or difficult to remove
- ◊ Topical +/- oral antibiotics, pain medications, oral anti-inflammatories

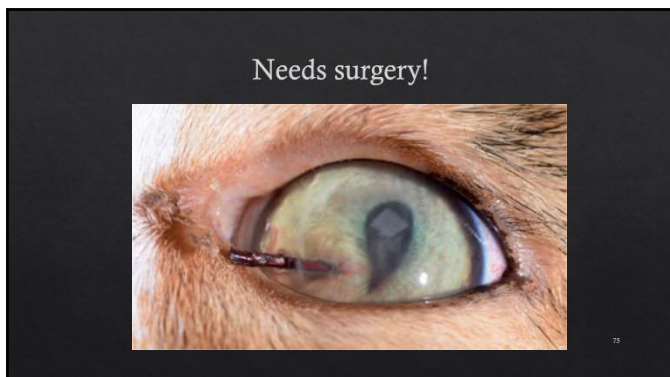
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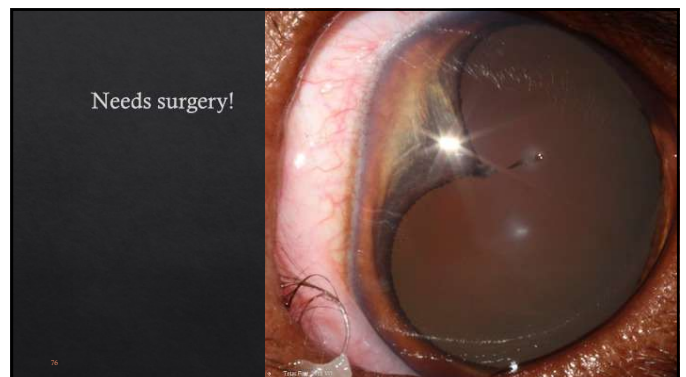
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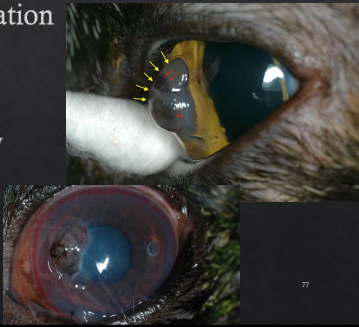
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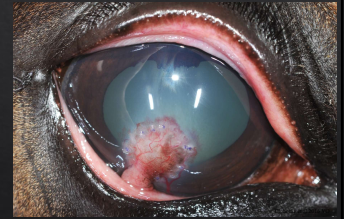
Ocular perforation

- ◊ Often the sequel of an untreated or progressive infected corneal ulcer
- ◊ Requires emergency surgery to stabilize
- ◊ Can look like a bubble or dark bump protruding from the corneal surface



Ocular perforation

- ◊ Early referral for surgical intervention
- ◊ We love to talk/look at photos to help guide treatment and referral!!!
- ◊ Lots of options for surgery, if needed
- ◊ A partnership!



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Foreign body/ perforation takeaways

- ◊ 1. A corneal foreign body has a ~50% chance of being full-thickness (in dogs).
 - ◊ Refer if possible, can attempt hydropulsion if you're sure it's not full-thickness
- ◊ 2. A perforated eye is a surgical emergency
 - ◊ Refer if possible, can attempt medical therapy otherwise.

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Overall takeaways

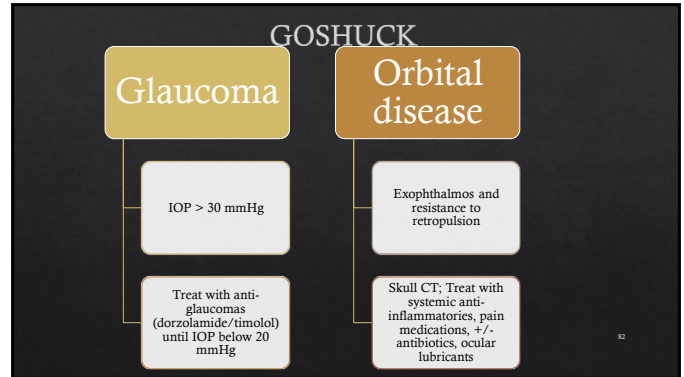
- ◊ Have a systematic way to approach ocular emergencies
 - ◊ Start with thorough ophthalmic exam and STT, IOP, fluorescein staining (EXCEPT if a deep corneal ulcer or perforation → less is more)
 - ◊ Remember that ocular diseases often indicate systemic causes
- ◊ Eyeballs can be weird, and we are here to help!!! ☺
 - ◊ Take photos!
- ◊ Eyeballs are also amazing and worth the time to investigate



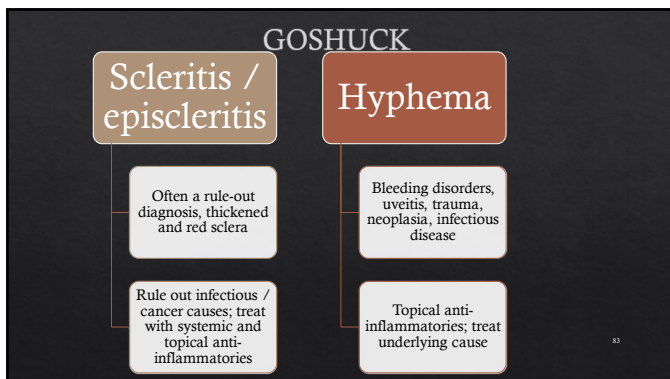
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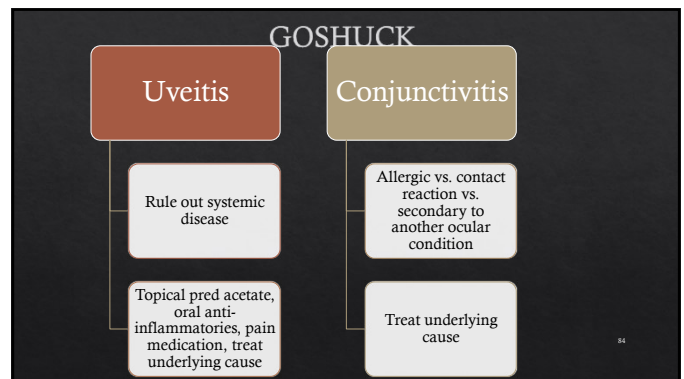
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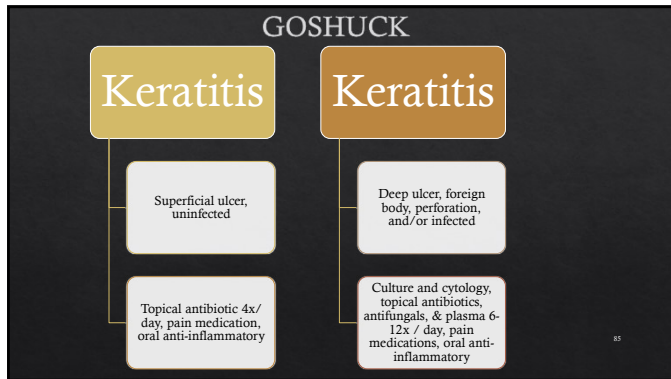
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