

Common Corneal Diseases and Treatments

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In Memoriam - Dr. Milt Wyman

October 11, 1930 - September 27, 2021



Corneal Diseases

- Common corneal changes and how to differentiate between them
- Treatment for common diseases



Rules for examining corneal lesions

- Ask the owner about comfort at home
- Allow patient to calm, evaluate for comfort without touching
- Evaluate eyelid position without touching



Rules for examining corneal lesions

- Evaluate the entire eye
- Consider systemic disease
- Use signalment to your advantage



Disease - Alterations in Structure, Function or Both

What is it in the cornea?

- Things added:
 - Bacteria
 - Fungi (rare unless equine)
 - Edema
 - Vessels
 - Lipid
 - Calcium
 - Pigment

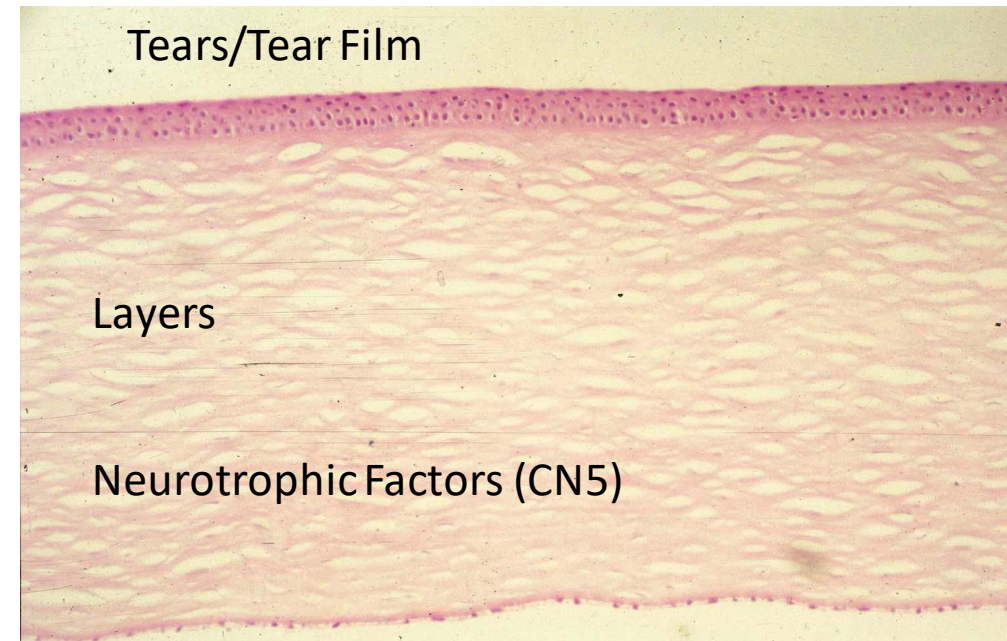
How did it get there?
Can I improve what is there?
Can I prevent it from getting worse/more?

- Things taken away:
 - Tear Film
 - Layers
 - Neurotrophic Factors

Disease - Alterations in Structure, Function or Both

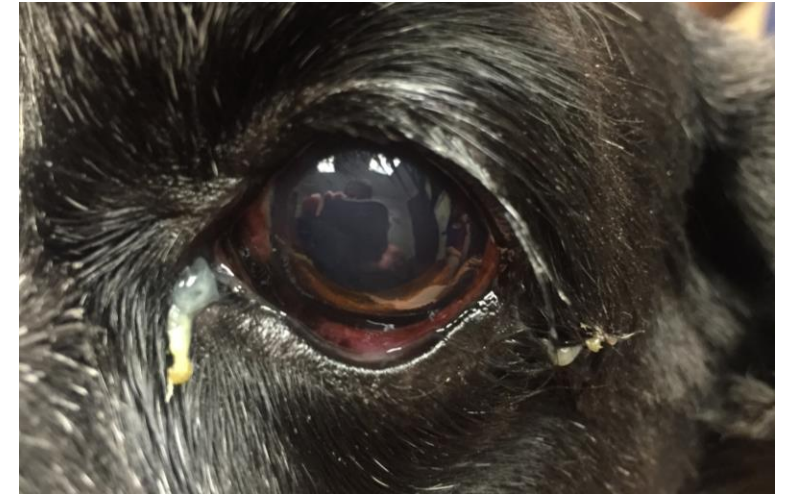
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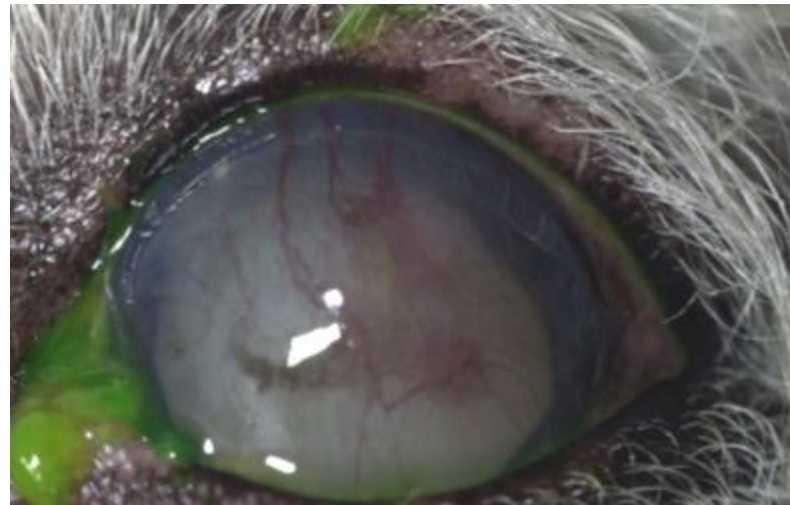


Things taken away: Tear Film

- #1 cause of corneal ulcers in small dogs
- Ocular Discharge
- Corneal Vascularization - starts dorsal
- Corneal Pigmentation - chronic
- Corneal Fibrosis - chronic



- Dogs need 5x the tears of humans
- Can't just supplement with OTC artificial tears like people can
- Recurrent corneal ulcers
- English & French Bulldogs



Things taken away: Tear Film

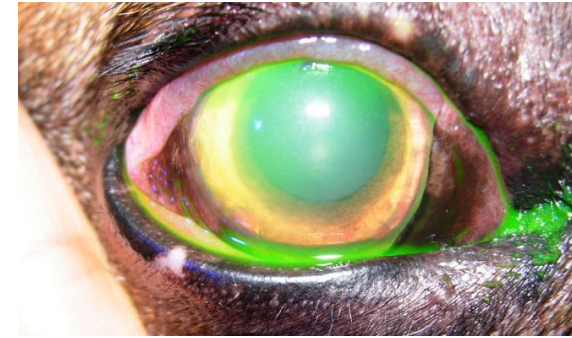
Quantitative Dry Eye



Normal STT: >15 mm/min
WITH NO SYMPTOMS

<20 mm/min WITH
SYMPTOMS (especially corneal
changes) = DRY EYE

Qualitative Dry Eye



Normal Tear Film Breakup Time:
>20 sec



Things taken away: Tear Film

- Lacrimostimulants: BID to TID

T-cell suppressors/lacrimostimulants BID-TID

- Optimune (0.2% Cyclosporine)
- Compounded Cyclosporine (1%, 2%)
Solution
Ointment
- Compounded Tacrolimus (0.02 – 1%)
Solution
Ointment

Will delay healing of
corneal ulcers

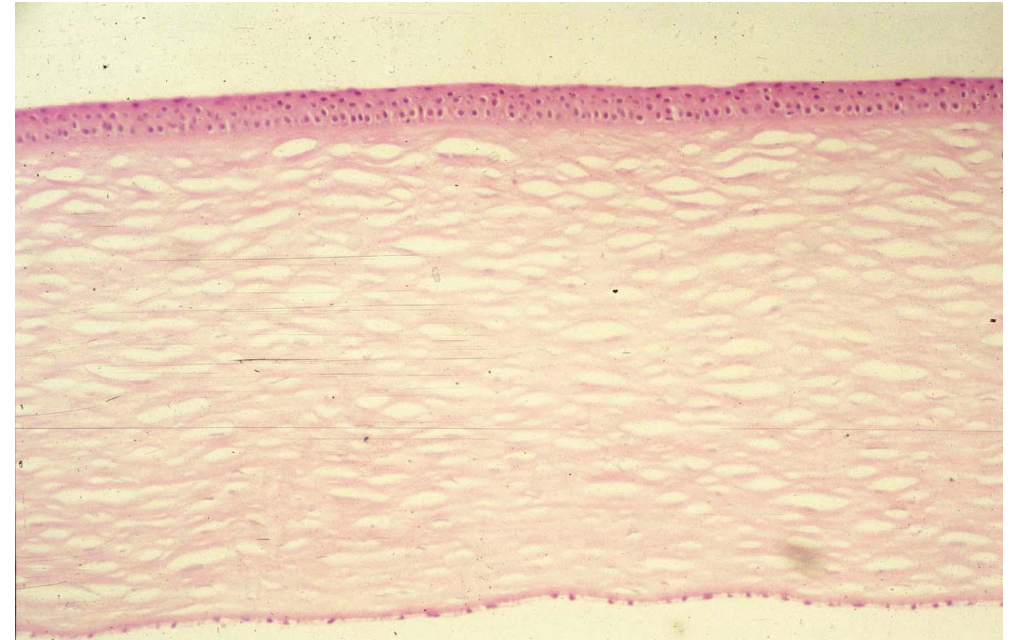
- Tear Replacer: QID

- Topical Steroid (NPDex or Dex): SID to TID

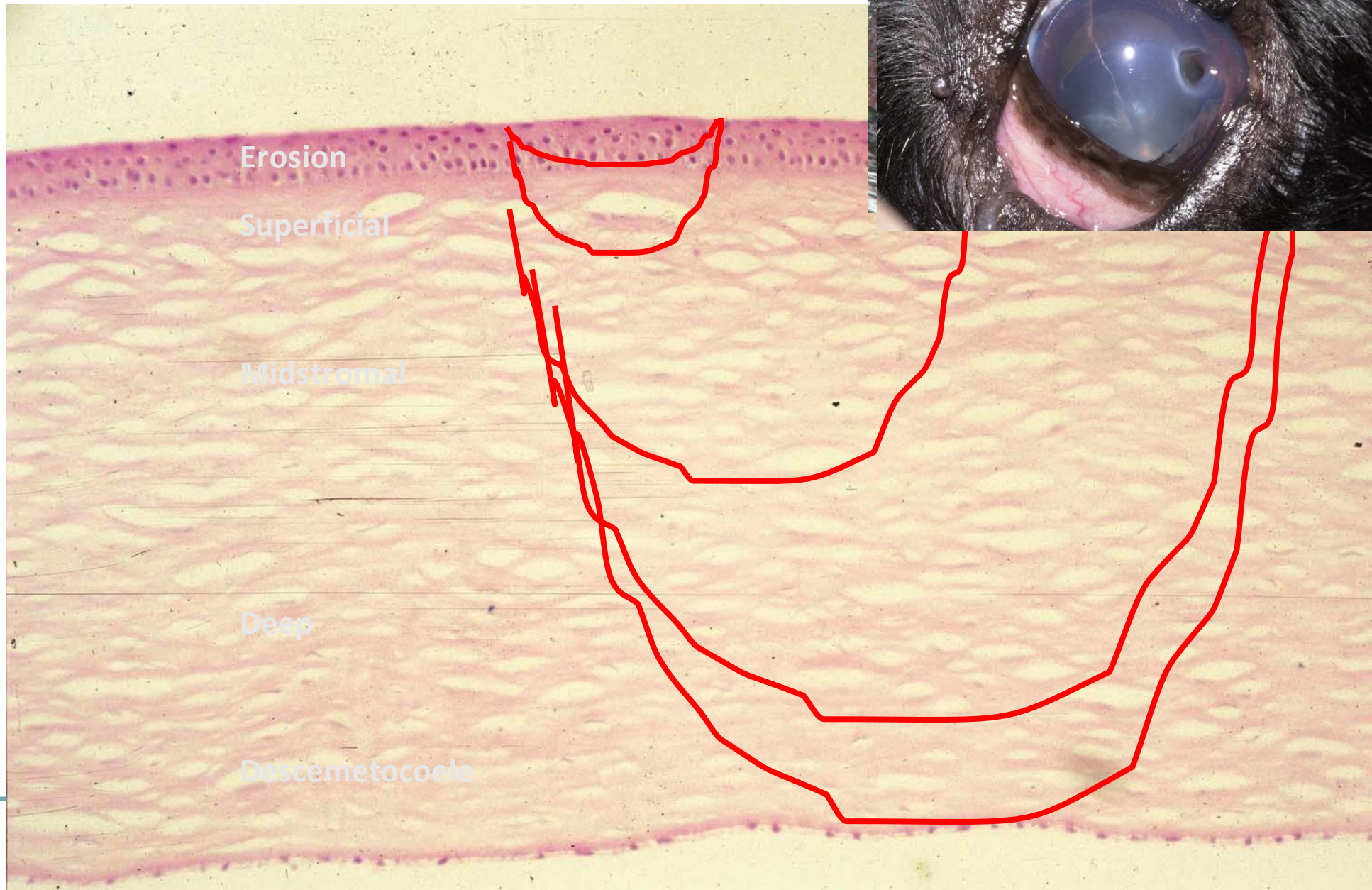
Disease - Alterations in Structure, Function or Both

How did it get there?
Can I improve what is there?
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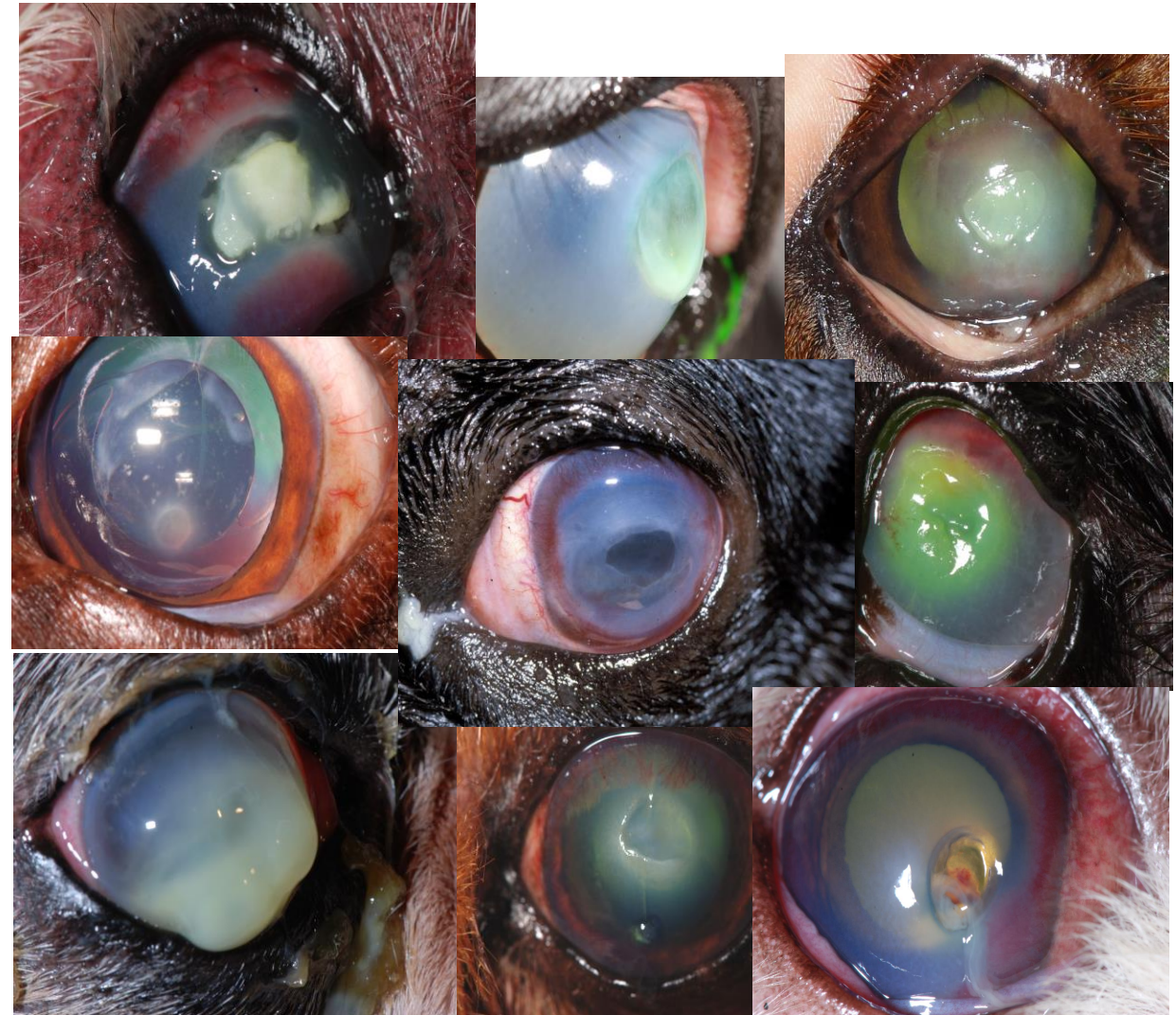
Corneal Ulcer

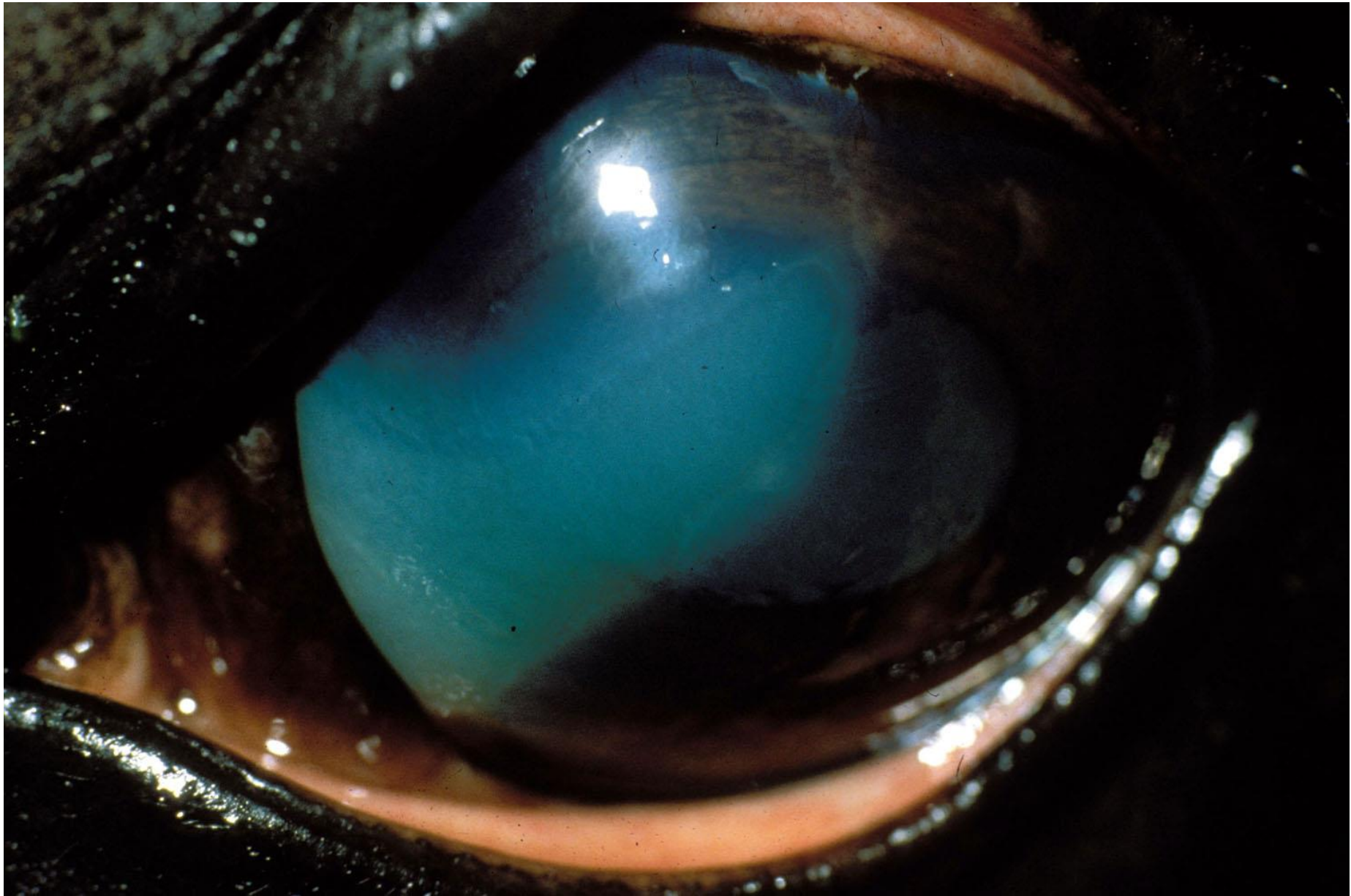


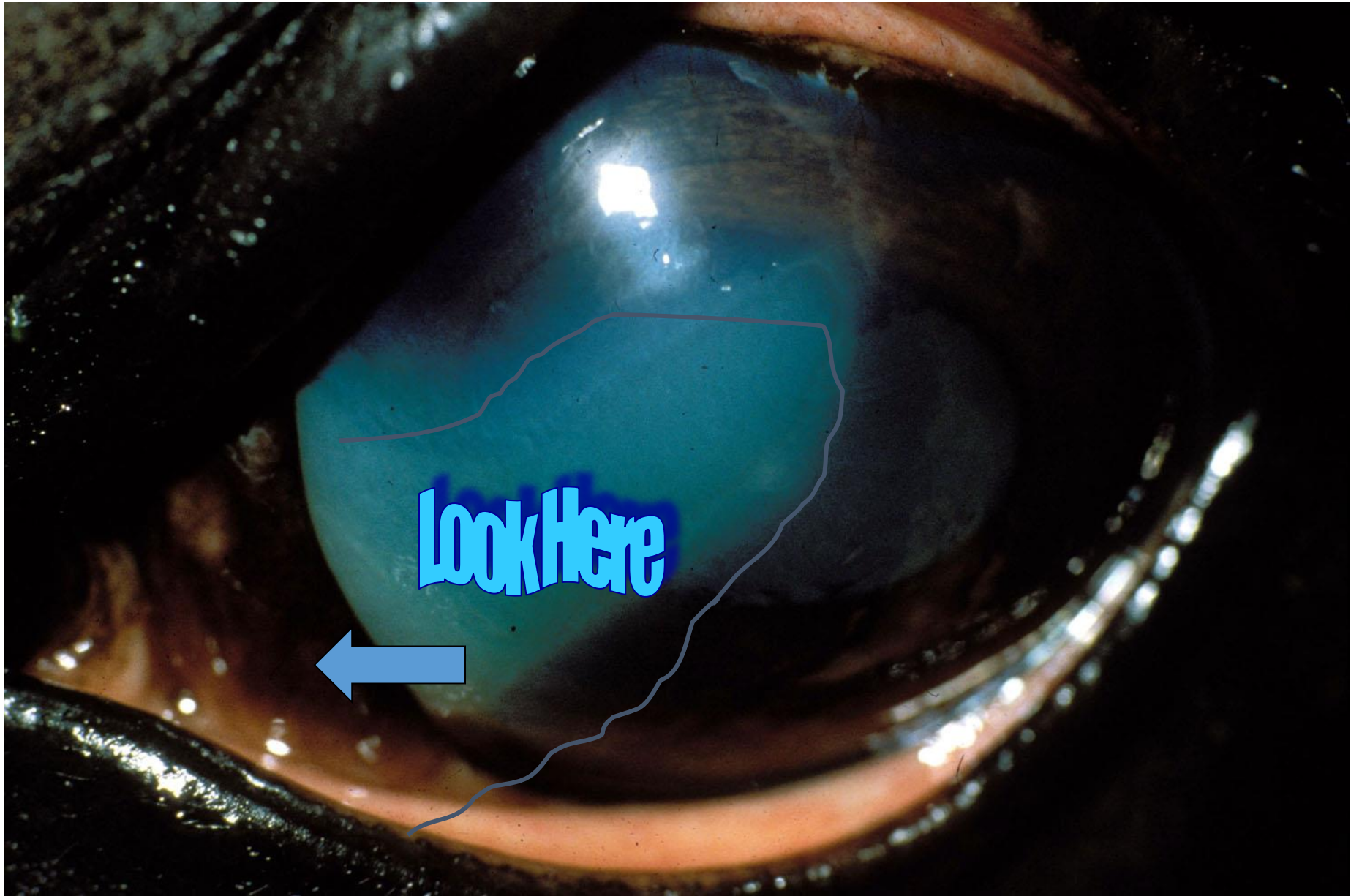
Corneal Ulcers - Always Ask Why

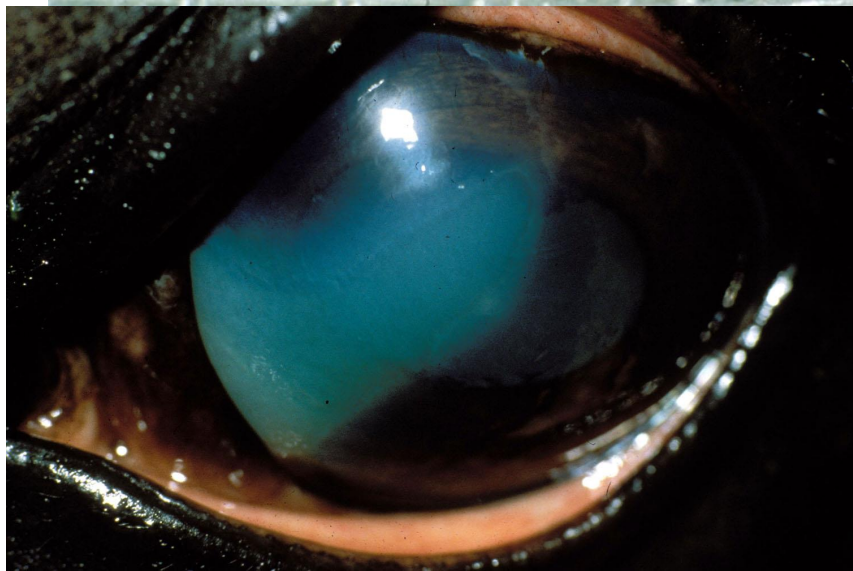
- Entropion
- Ectopic cilia
- Distichiae
- Indolent ulcer/SCED
- Dry eye - qualitative or quantitative
- Corneal calcium/lipid slough
- Endothelial degeneration
- Foreign body
- Herpes
- Trauma

Note: NOT CAUSED BY EYELID TUMORS!









Eyelid Abnormalities

Normal



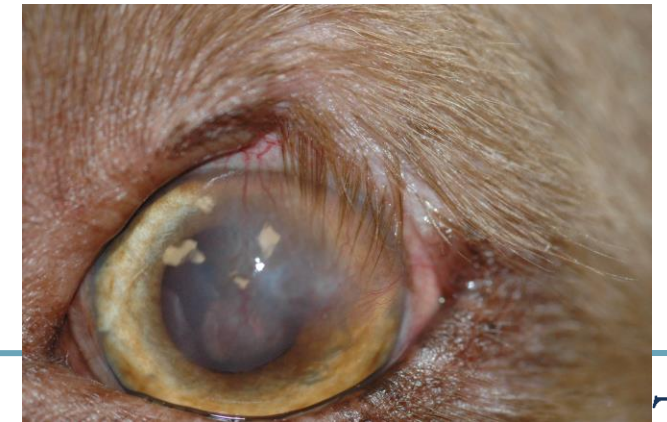
Distichia



Ectopic cilia



Trichiasis



Entropion

Corneal Additions & Differentiation

Disease - Alterations in Structure, Function or Both

- Things taken away:

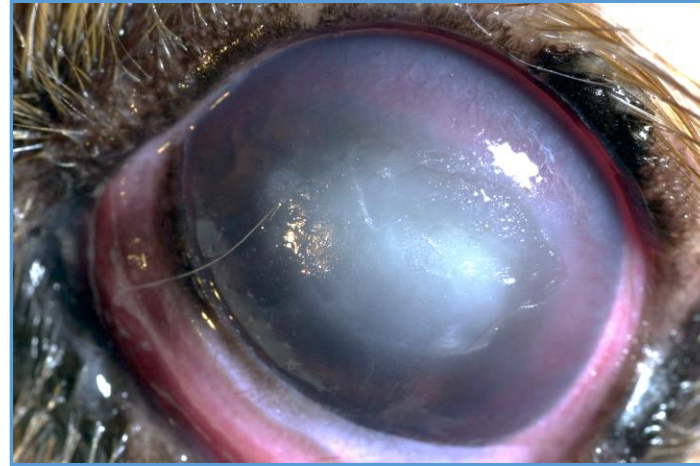
- Tear Film
- Layers
- Neurotrophic Factors

- Things added:

- Bacteria
- Fungi (rare unless equine)
- WBC
- Edema
- Vessels/Blood
- Lipid
- Calcium
- Pigment
- Fibrosis

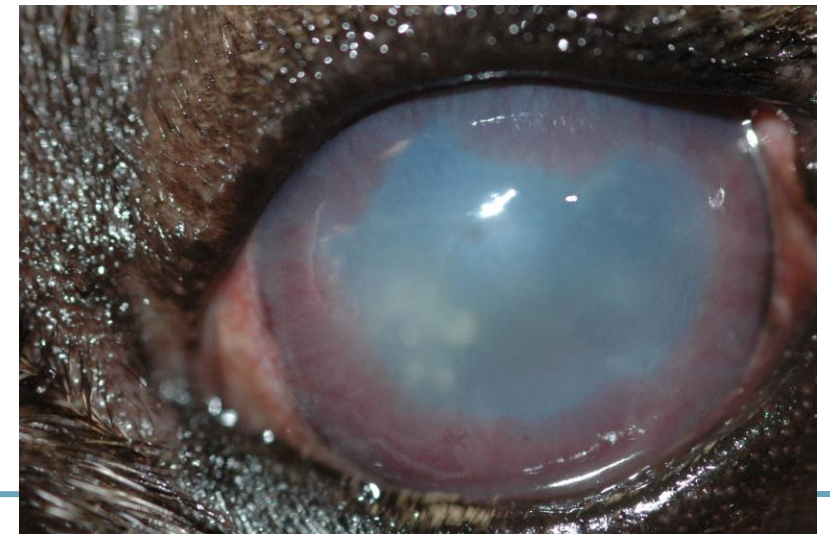
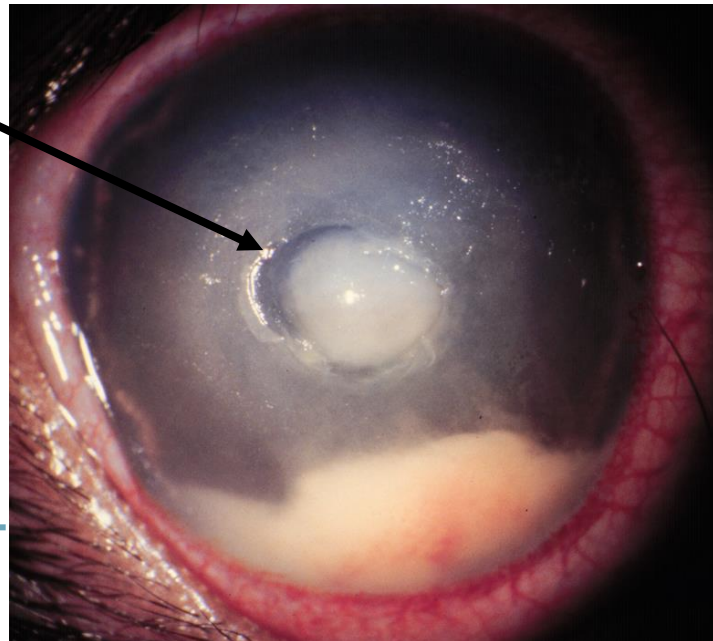
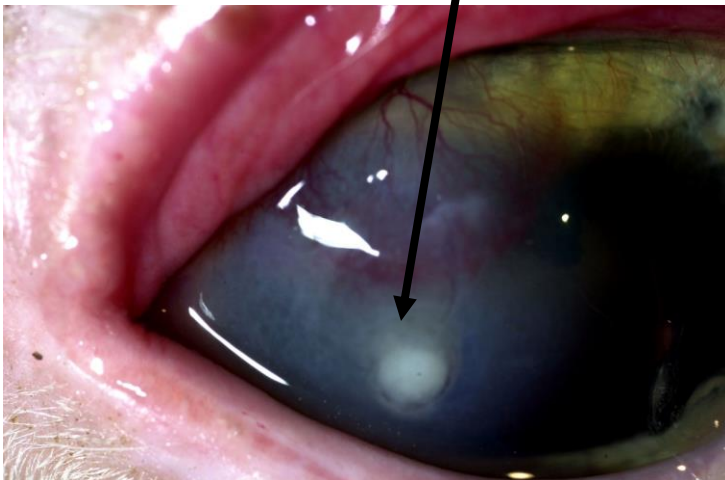
Infiltrate - Alterations in Structure, Function or Both

- White/Tan
- Better defined than edema
- Often accompanied by corneal vascularization



"stain negative"

Cellular Infiltrate



Disease - Alterations in Structure, Function or Both

- Things taken away:

- Tear Film
- Layers
- Neurotrophic Factors

- Things added:

- Bacteria
- Fungi (rare unless equine)
- **WBCs**
- Edema
- Vessels/Blood
- Lipid
- Calcium
- Pigment
- Fibrosis

Eosinophilic Keratitis

Topical steroids - Dex or NPDex

- + Effective
- Daily therapy
- Risk of herpes flare-up to ulceration
- Chronic use can cause lipid degeneration

Megesterol Acetate 2.5 mg capsules

- + Effective
- + SID x 7-10d, every other day for 2 weeks, then slow taper over 6 months with eventual q5-14d therapy
- + Capsule added to food
- Risk for diabetes

Megesterol Acetate topical

- + Variably effective
- + BID therapy at least
- + lower risk for diabetes



White raised plaques
Vascularization varies
Mild blepharospasm
Eosinophils on cytology

Disease - Alterations in Structure, Function or Both

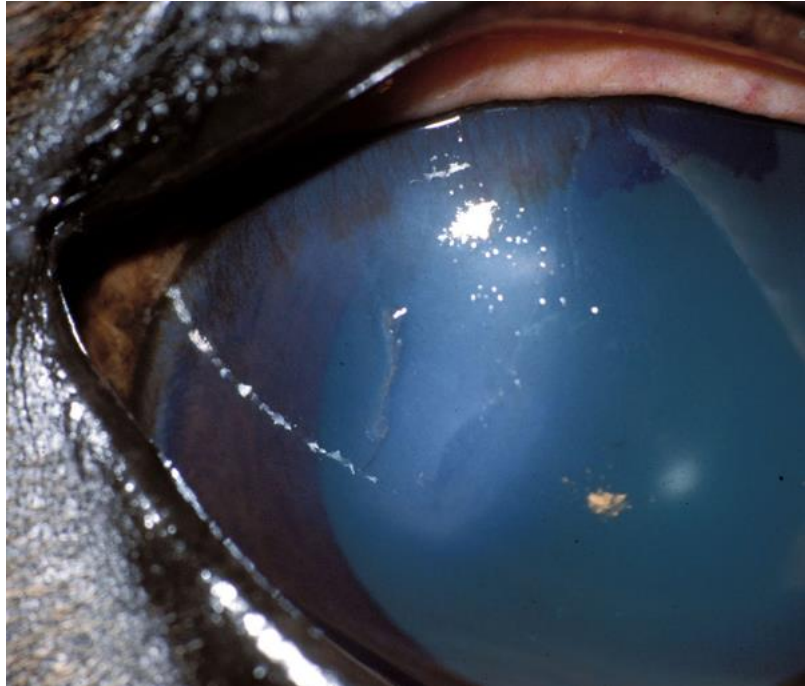
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- Things added:

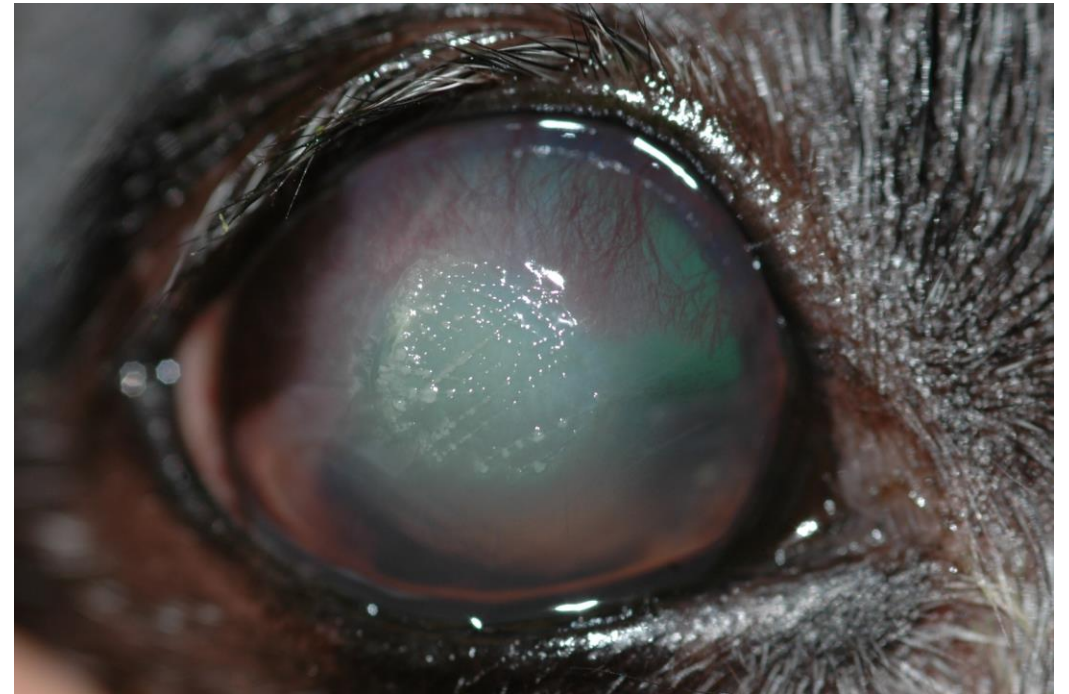
- Bacteria
- Fungi (rare unless equine)
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Edema - Alterations in Structure, Function or Both



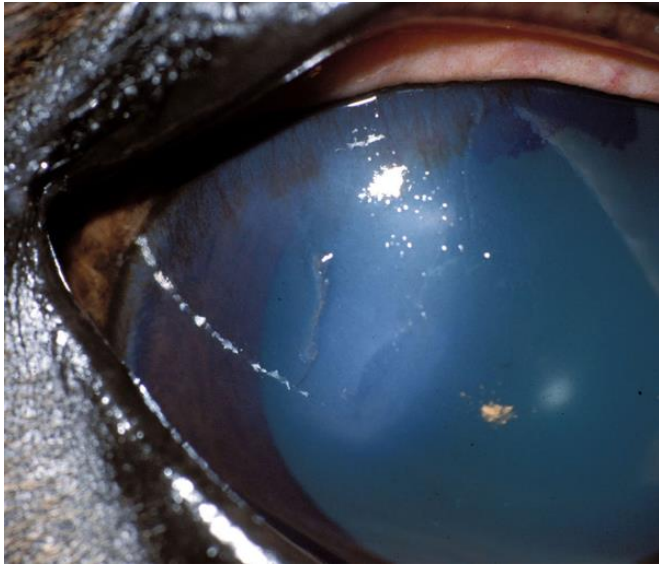
Edema without infection

“gray”
“ground glass”



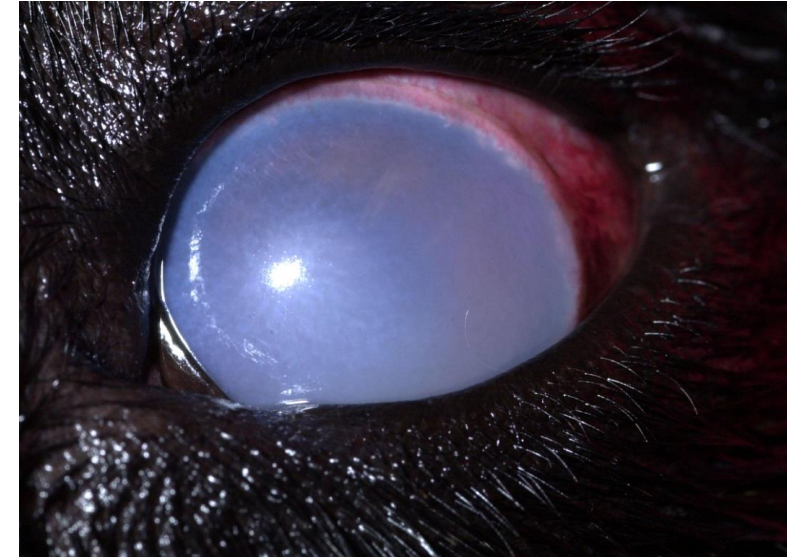
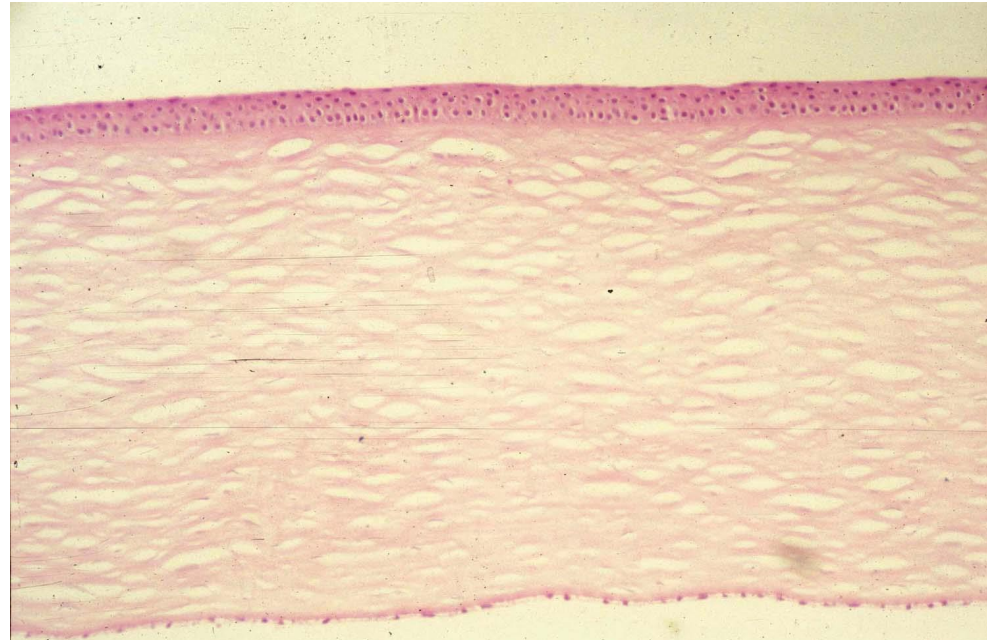
Edema with infection

Corneal Edema - from the outside or inside?



Epithelial disease

- Ulceration

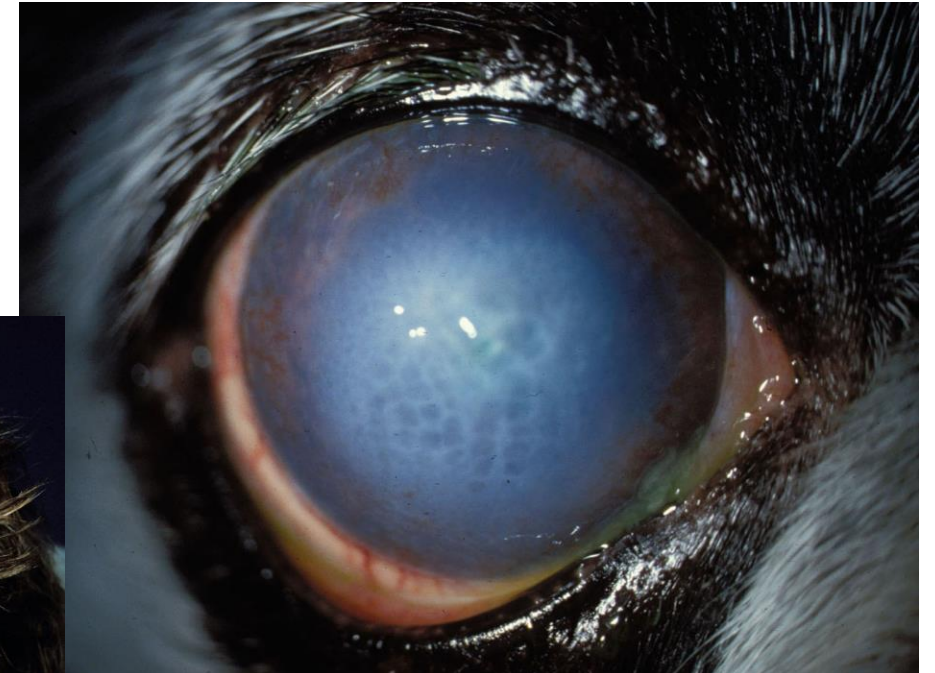


Endothelial disease

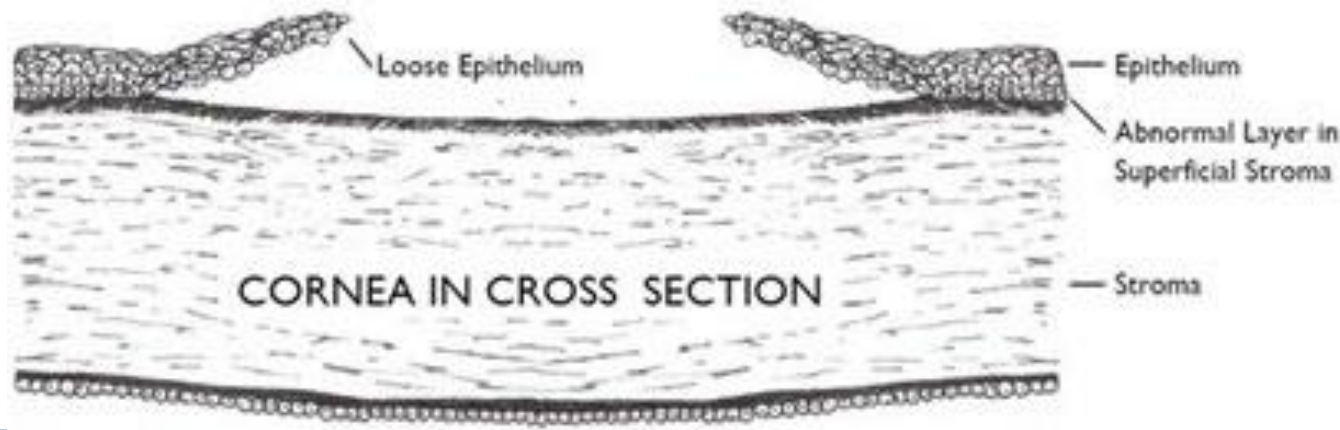
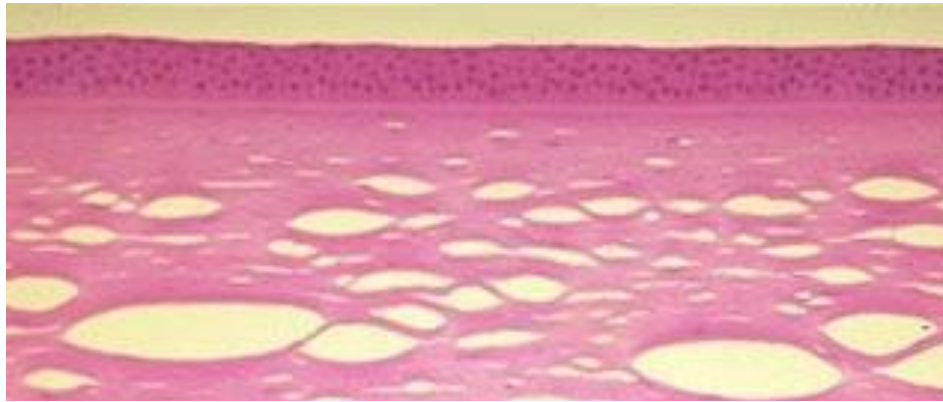
- No ulceration
- Breed predisposed aging
- Glaucoma
- Severe uveitis
- Lens luxation

Corneal Edema - from the inside - Endothelial Degeneration

- Aging disease, no other conditions
- >6 yrs of age (most 10+)
- Breed Predisposition
 - Boston Terrier
 - Shih Tzu
 - Basset Hound
 - Labrador Retriever



Corneal Edema - from the inside - Endothelial Degeneration



Endothelial Degeneration Treatment

Sodium Chloride BID-QID

Ointment better than drops

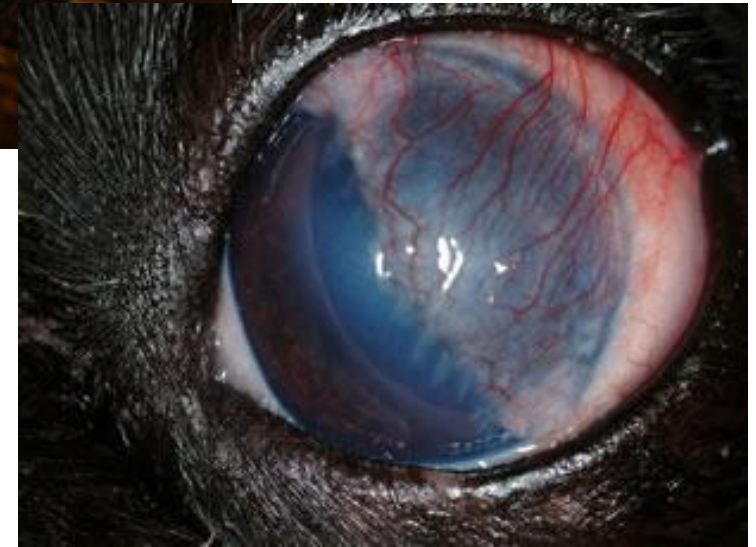
Lifelong therapy

Reevaluate corneal thickness/edema and for bullae every 4-6 months, adjusting therapy frequency

Gunderson Conjunctival Flap

Descemet's & Endo Corneal Transplant

Dr. Micki Armour, Wash DC



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- Neurotrophic Factors

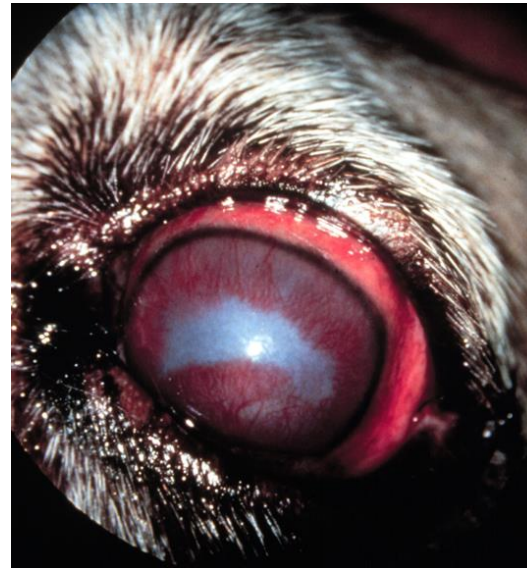
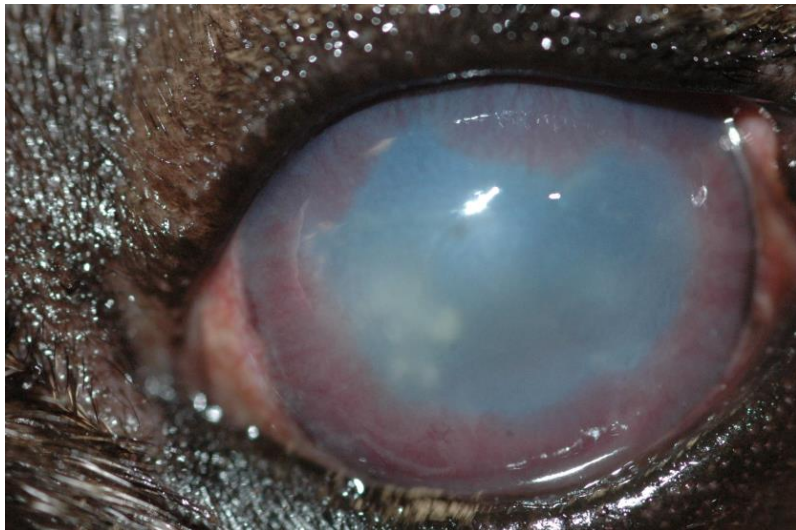
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- Fibrosis

Corneal Vascularization

Superficial:

- Long branching vessels
- Indicates surface disease



Deep:

- Brush border
- Multiple small vessels
- Indicates intraocular disease or very severe corneal disease usually with secondary infection

Corneal Vascularization - Immune Disease

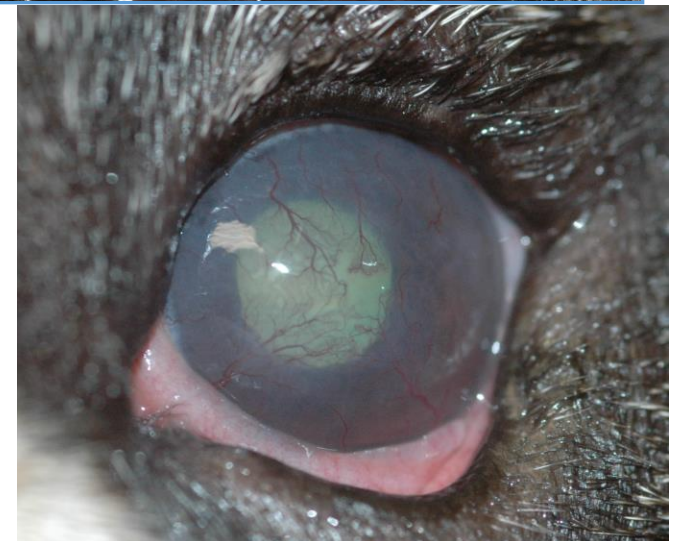
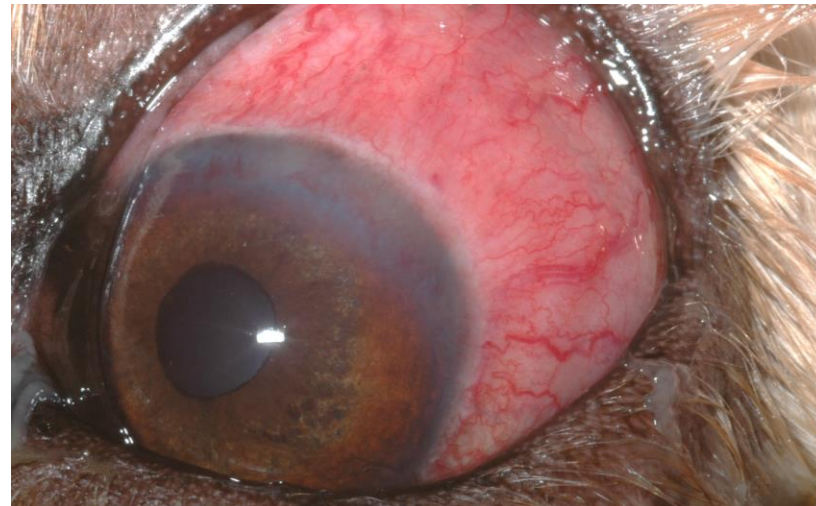
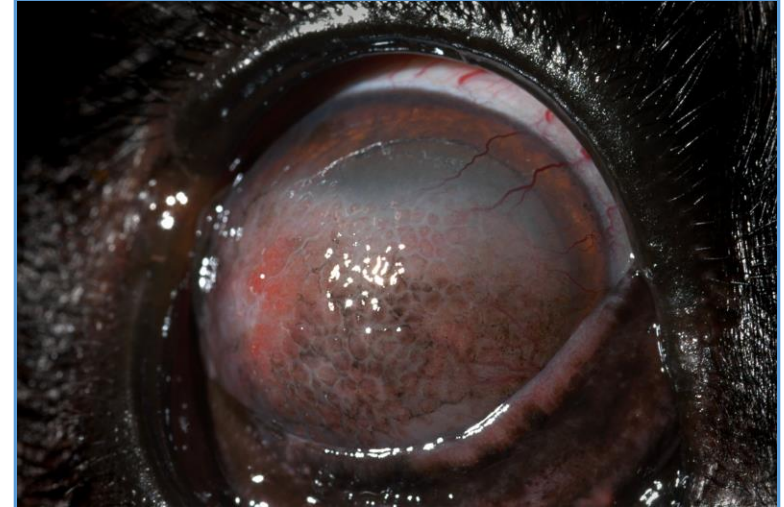
Immune Mediated Keratitis

Pannus (Chronic superficial keratitis)

Nodular granulomatous episcleral keratitis

Breed (Bulldog, Frenchie)

- Disease can be severe, but pain is minimal to absent
- Both eyes typically

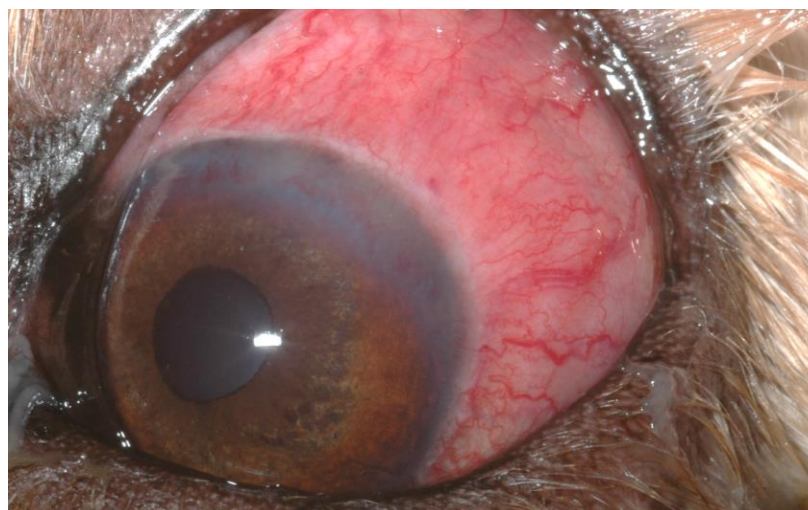


Treatment: Non-infectious Corneal Vascularization

Gain control:
Dexamethasone
NPDex ophthalmic
Pred acetate

Maintain control:
Tacrolimus
Optimmune

NOTE: NO NSAID on this list!



Ask yourself why?

Caution - Cats!

Ensure no ulceration or abscess

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Corneal Lipid

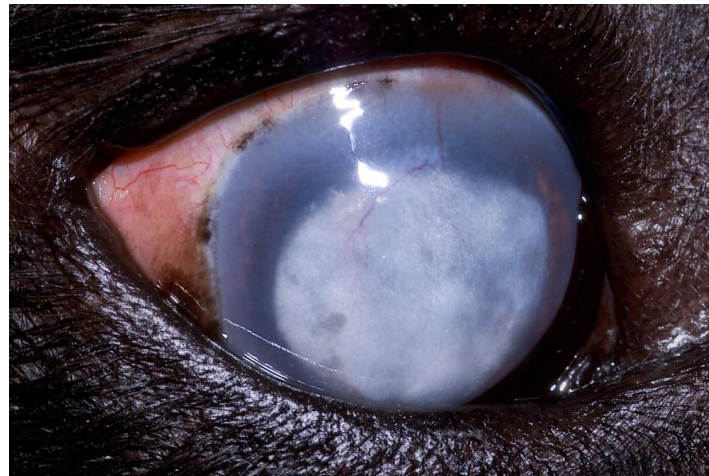
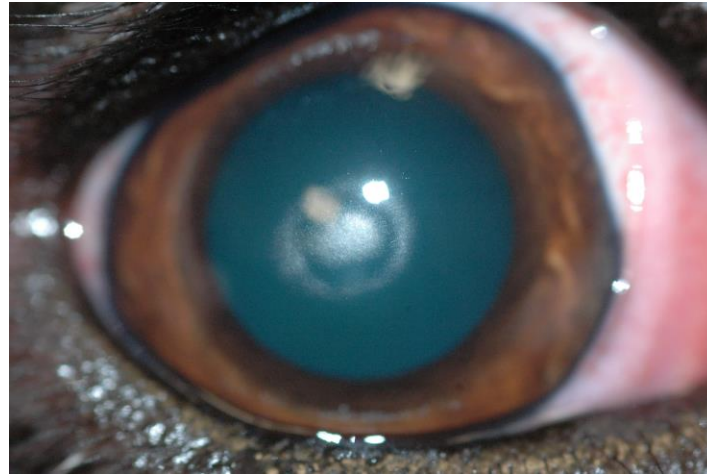
Shiny, not crunchy
Smooth surface
Typically non-painful

Dystrophy

- Inherited
- Rare to have hyperlipidemia or cholesterolemia
- Tends to be non-progressive unless:
 - High fat diet or supplements
 - Topical steroids prescribed

Degeneration

- With vascularization
- May have hyperlipidemia or cholesterolemia; tends to be progressive



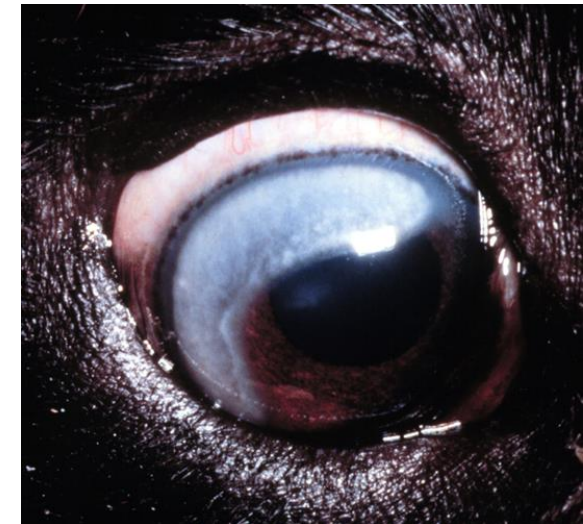
Treatment: Corneal Lipid

Tacrolimus ointment BID

Recheck 2-3 months for improvement

Consider maintaining on it, may be able to lower to SID after 6-12 months of therapy if mostly resolved

Risk for corneal ulceration lifelong (old paint on wood analogy)



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- Things added:

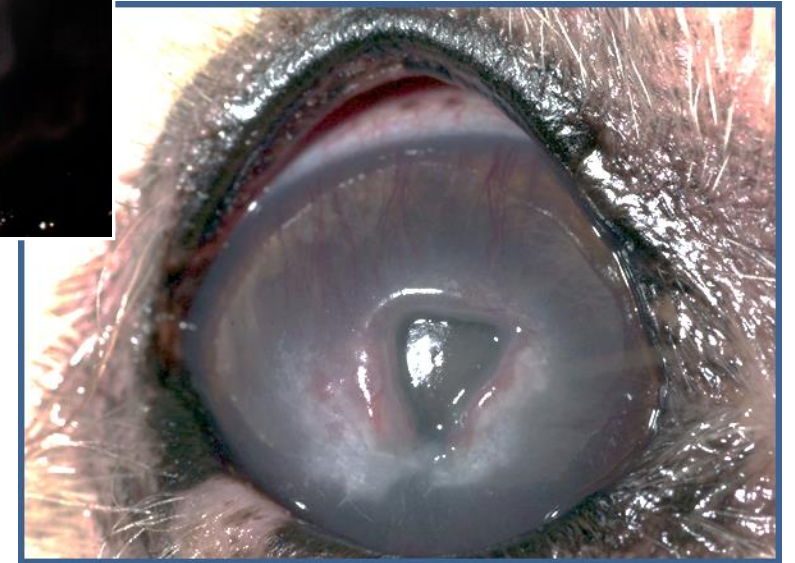
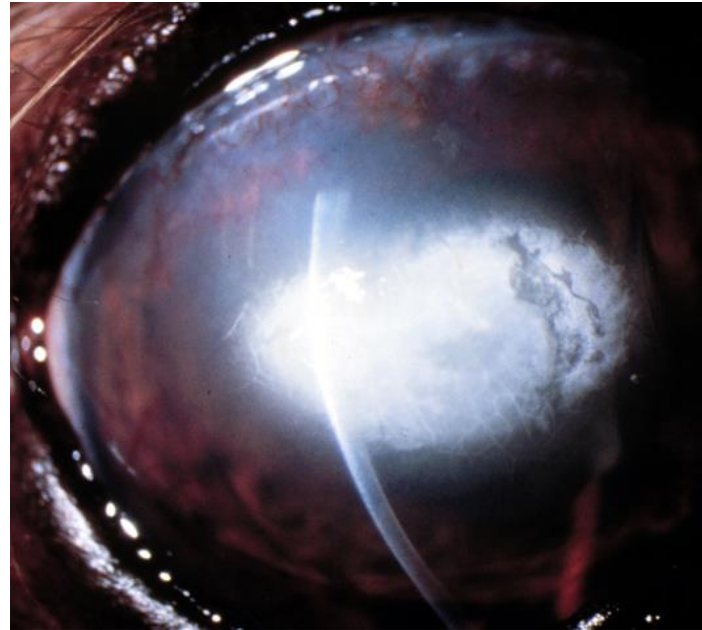
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Corneal Calcium Degeneration

Crunchy
Rough surface
Typically painful
Present with ulceration in one or both eyes
High risk for descemetocoele or rupture

Age
Renal Disease
Often both

Treatment:
2% EDTA ointment preferred, solution
sometimes necessary due to patient
noncompliance



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Corneal Pigment

- Indicates **CHRONIC** irritation
 - Anatomic - Entropion/Trichiasis/Distichiae
 - Environmental - Dry eye



Treatment: Corneal Pigment



Chronic medial entropion/trichiasis

Progressive pigmentation to blindness

Treatments:

- Medical

Optimmune BID

Tacrolimus BID

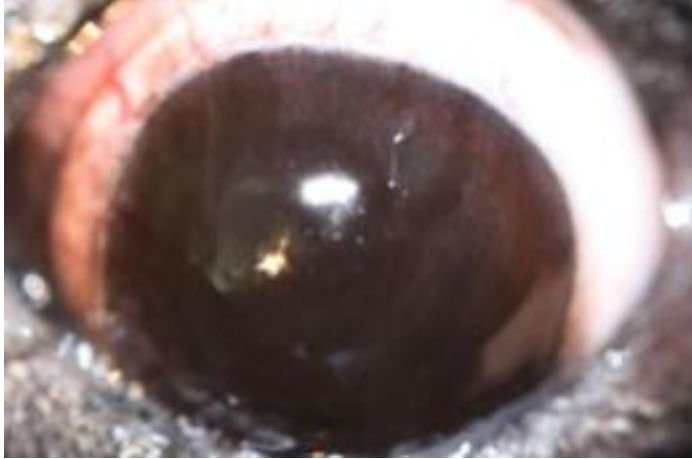
Ointment forms are always more effective due to contact time

- Surgical

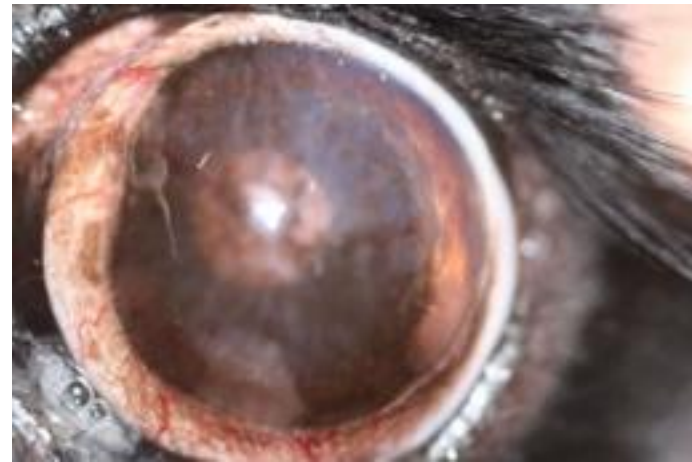
-medial canthoplasties - effective but once there is corneal pigment, Tacro or Optimmune are still needed

- cryosurgery but pigment recurs

Preop



5 days



15 days



60 days

Adjunctive cryotherapy for pigmentary keratitis in dogs: a study of 16 corneas

Thierry Azoulay

Clinique vétérinaire des Halles, 28 Faubourg de Saverne, 67000 Strasbourg, France

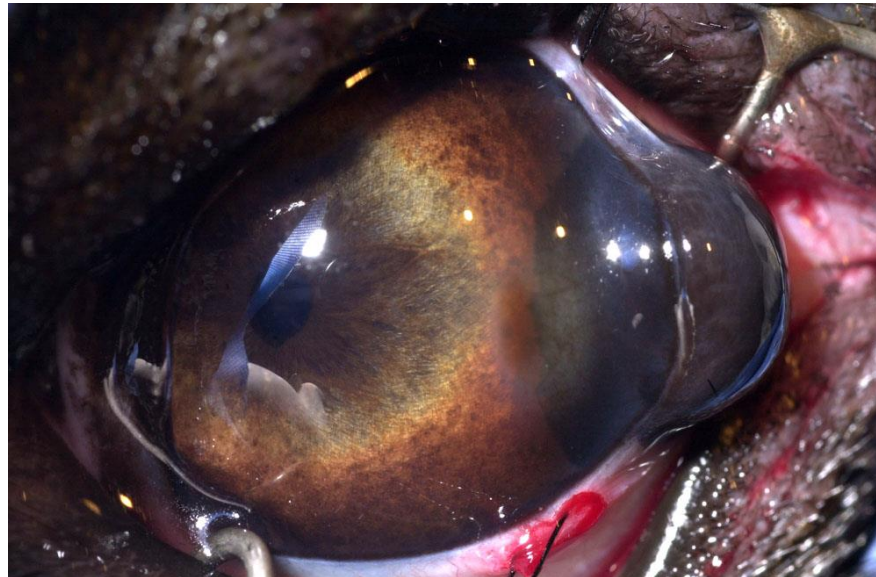
Corneal Pigment: Limbal Melanoma

Juvenile disease (<5 years of age)

Most often dorsal limbus, hidden by upper eyelid

Slow growth

Removal of the mass at an early stage is best prognosis to maintain the eye, vision and in most situations CURE!



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- Lipid
- Calcium
- Pigment
- **Fibrosis**

Corneal Fibrosis

Gray

"Quiet"

no squinting

no hyperemia

vessels are inactive

Can be a hidden indolent ulcer - can attempt debridement with cotton swabs under topical anesthetic - will not be able to be debrided



Diagnosing - Corneal Ulcers - now how to treat?

Consider:

Cause

Species

Breed of Dog

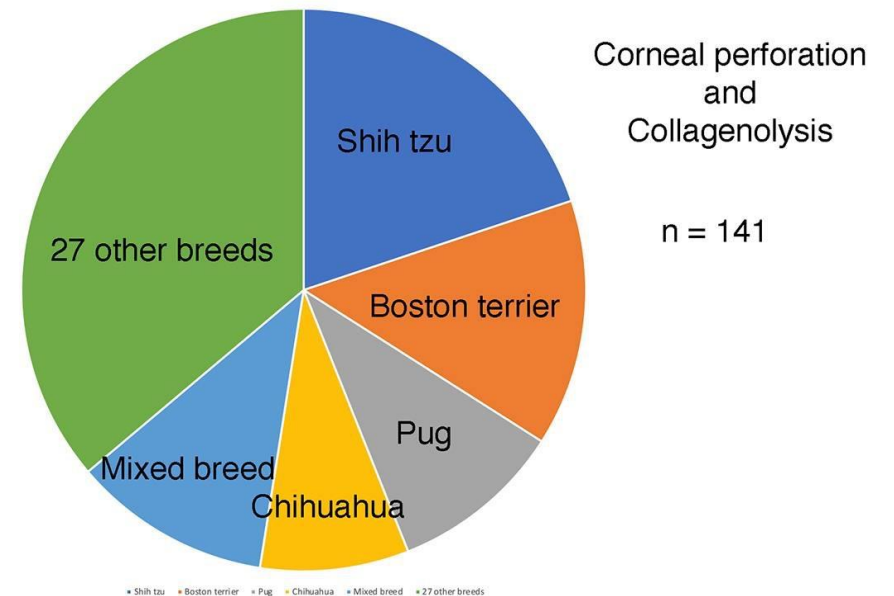
Age

Location in the cornea

Superficial, Mid-stromal or Deep?

Level of infection

Will the owner consider referral sooner than later?



Treatment - Corneal Ulcers

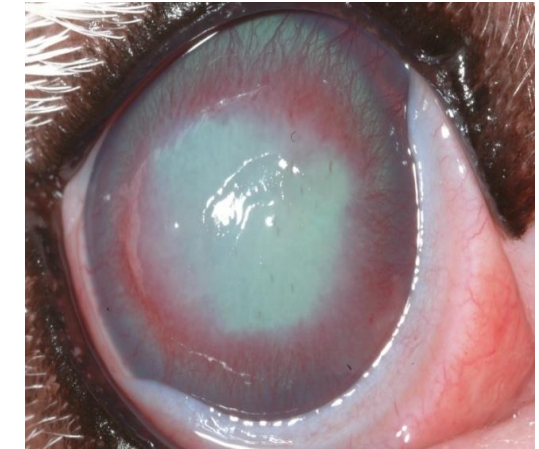
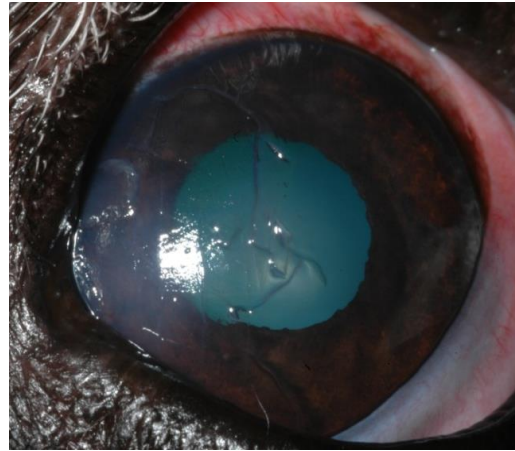
- Uncomplicated ulcers heal in 1-2 weeks often DESPITE what the Veterinarian does
- Need to decide:
 - Why did it develop an ulcer? Can I treat that condition now?
 - Is the ulcer simple/not infected or infected?
- Recheck and not healed:
 - Did I miss the etiology?
 - Is it infected now?
 - What drugs are being used?
 - Is it time to discuss surgery?

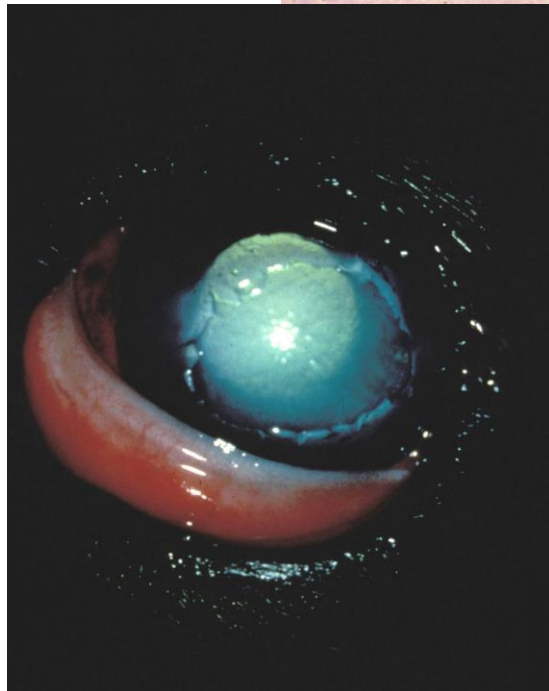
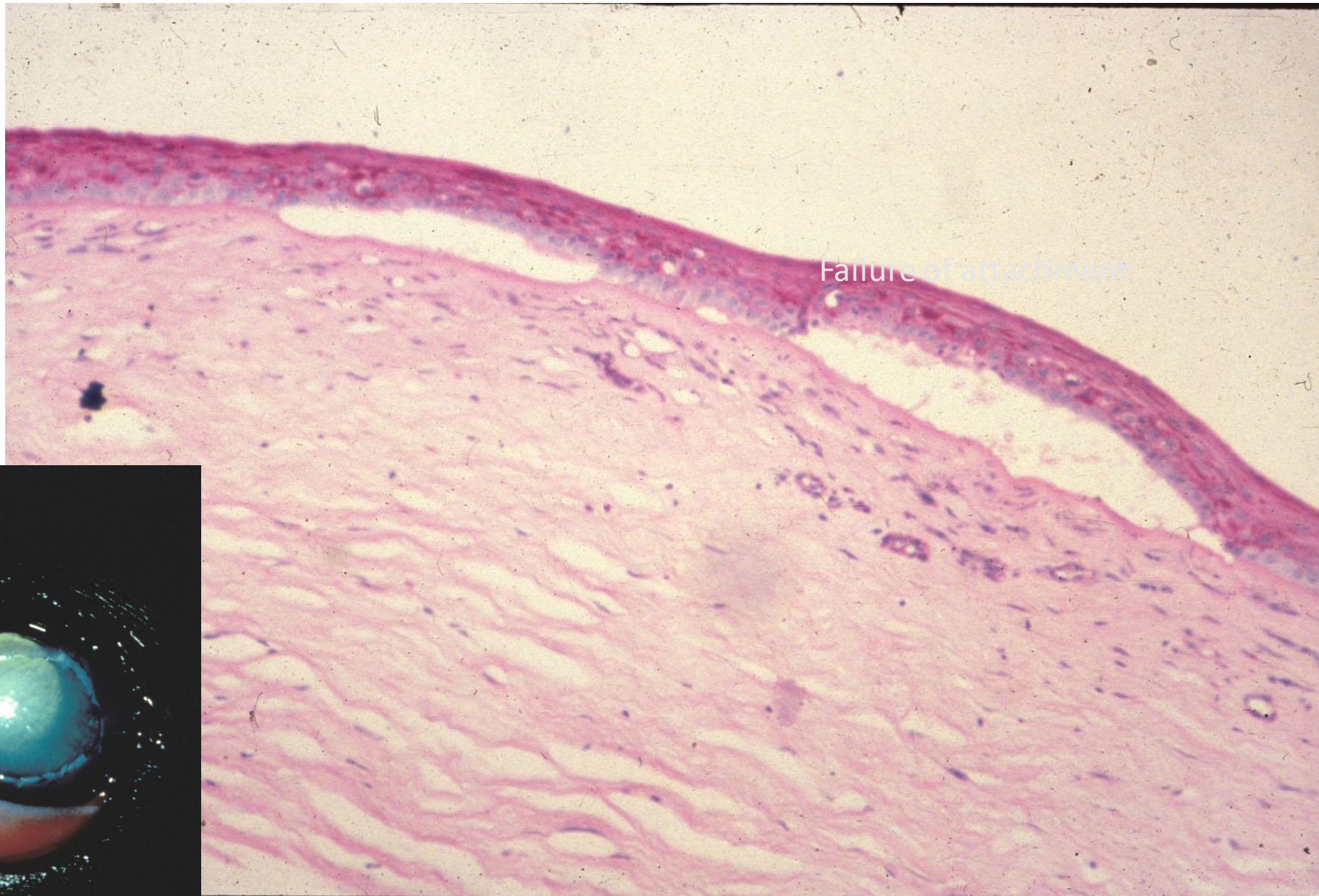
Indolent Corneal Ulcers

Indolent Ulcer - NOT EVERY NON-HEALING ULCER!

- Hallmark features:

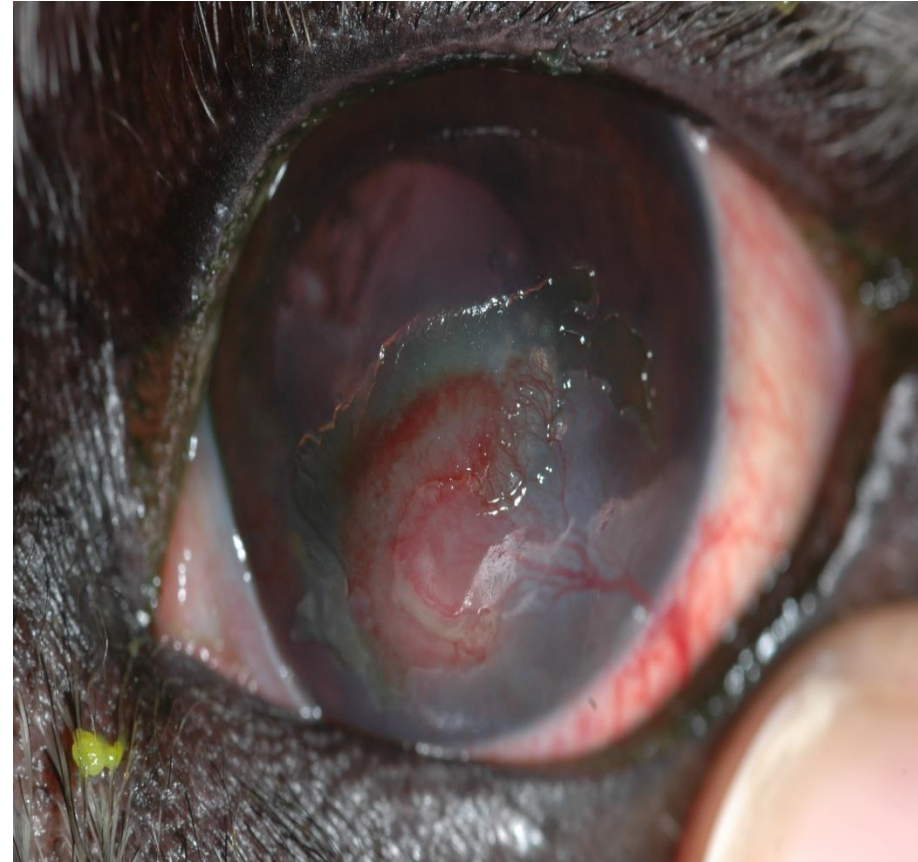
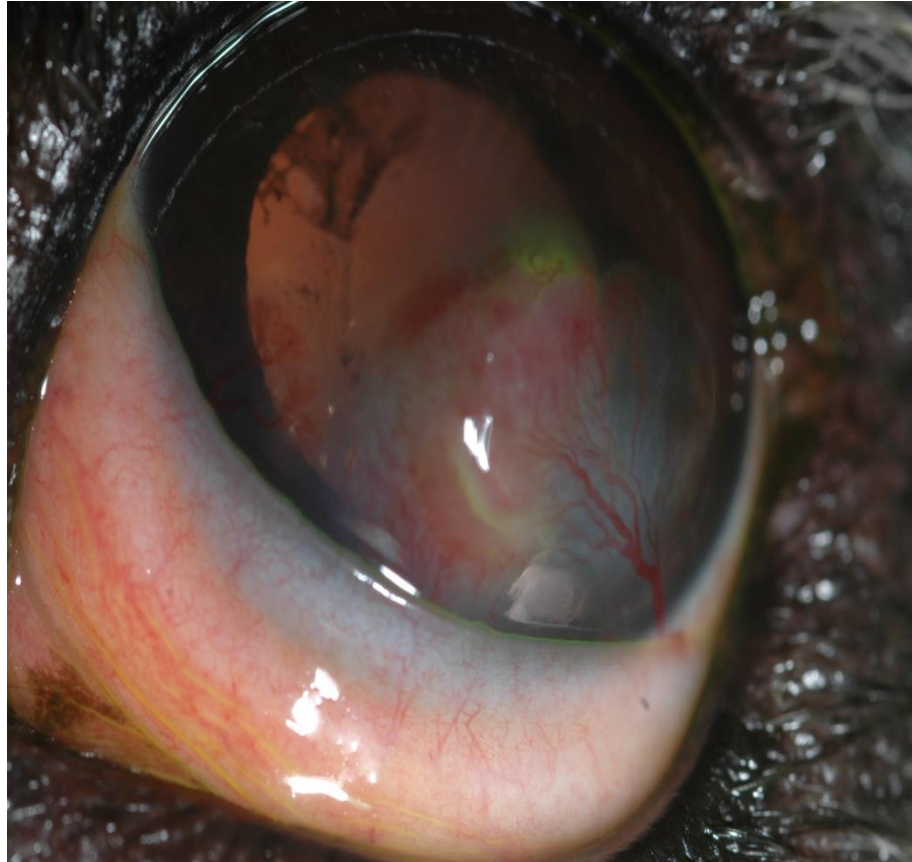
- DOG
- >6 yrs of age
- Superficial
- Nonpainful to mildly painful
- Loose or redundant epithelial borders
- Usually middle aged to older dogs
- Chronic in nature (doesn't heal within 2 weeks and fits the above criteria)
- Predisposed breeds - Boxer, Frenchie, Corgi





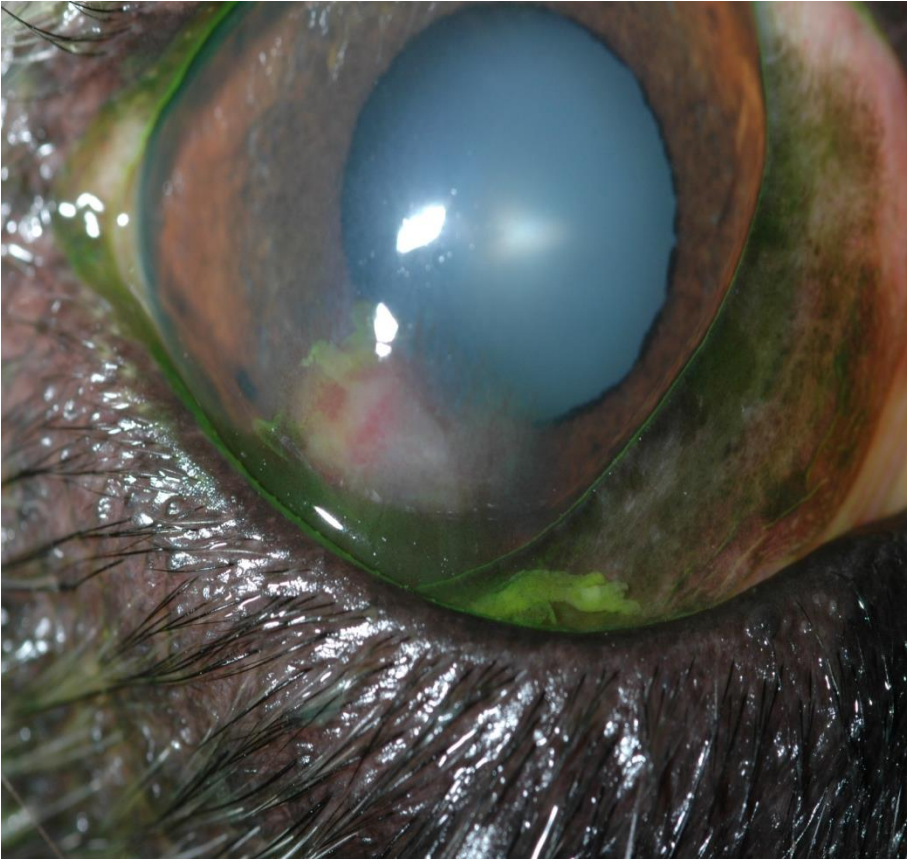
Indolent Ulcers

"No Stain Uptake"

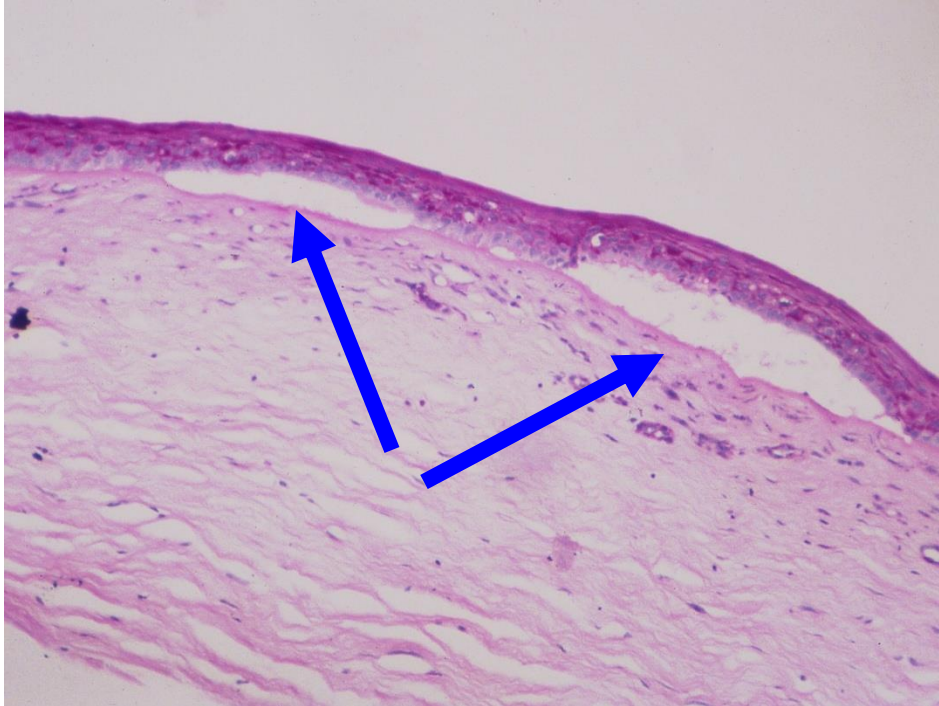


Indolent Ulcers

"No Stain Uptake"



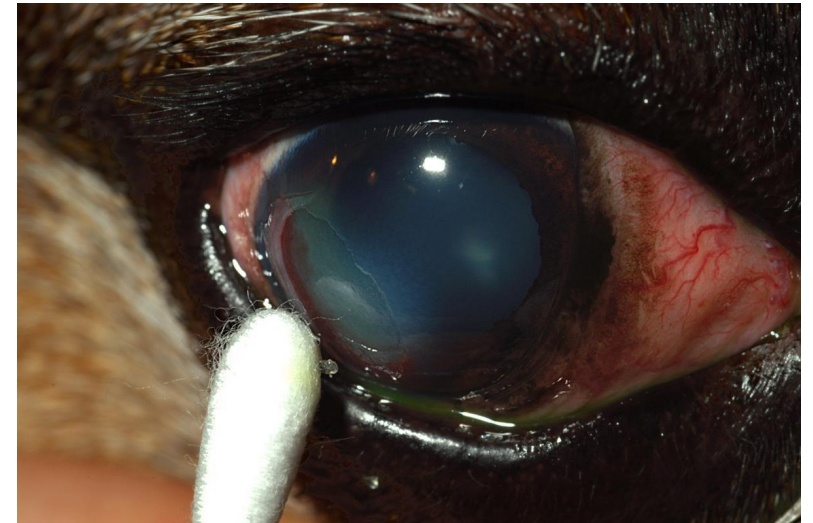
Function of Grid or Burr Keratotomy

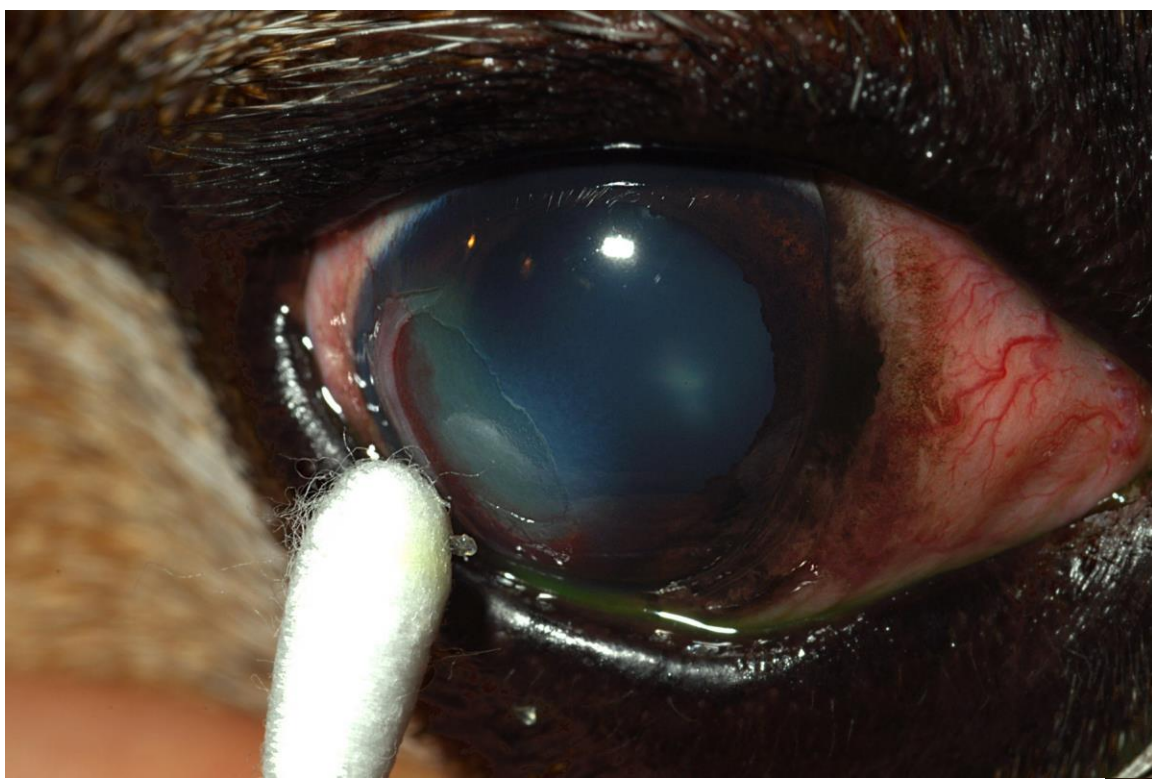


- Break up anterior stromal band
- Stimulate migration of epithelial cells
- Create a deeper place for epithelial migration for hemidesmosome attachment

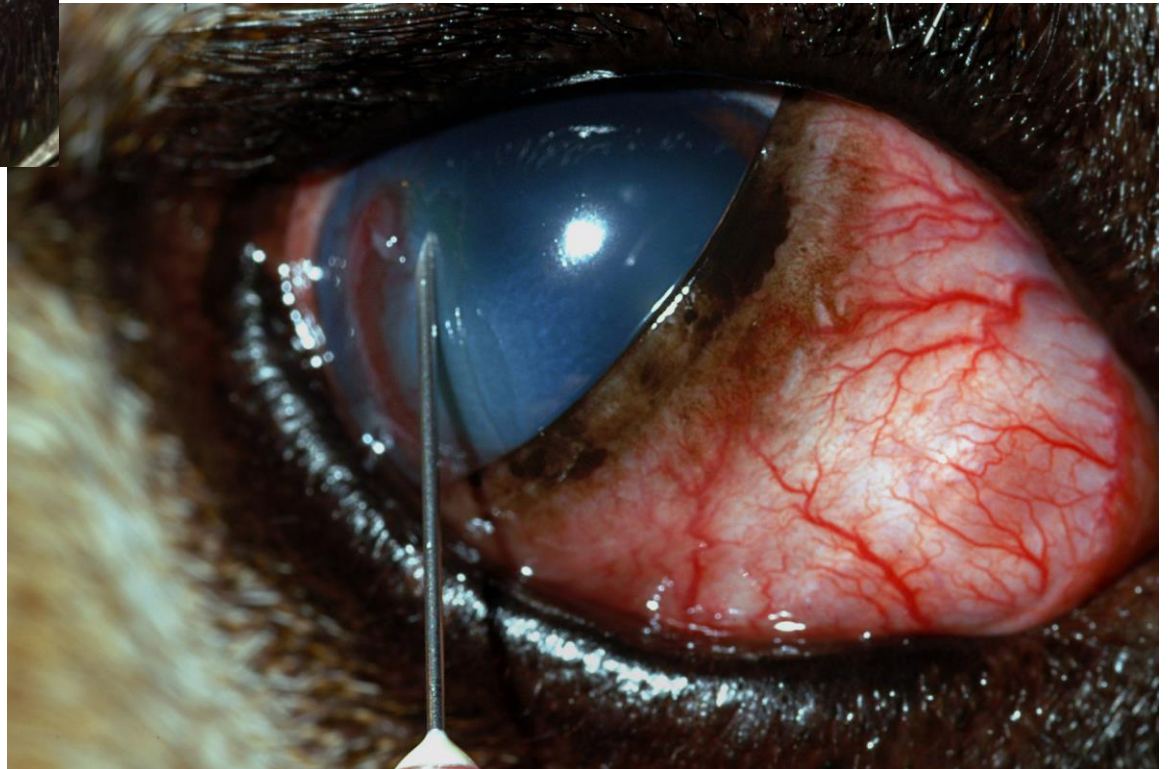
Indolent Ulcer

- Treatment:
 - Client education is essential
 - Remove loose, redundant epithelium
 - Gently break the basement membrane with 25g needle (Grid keratotomy)
OR
 - Diamond burr
 - Terramycin TID
 - 5% NaCl ointment TID
 - PO gabapentin or tramadol
 - +/- e-collar

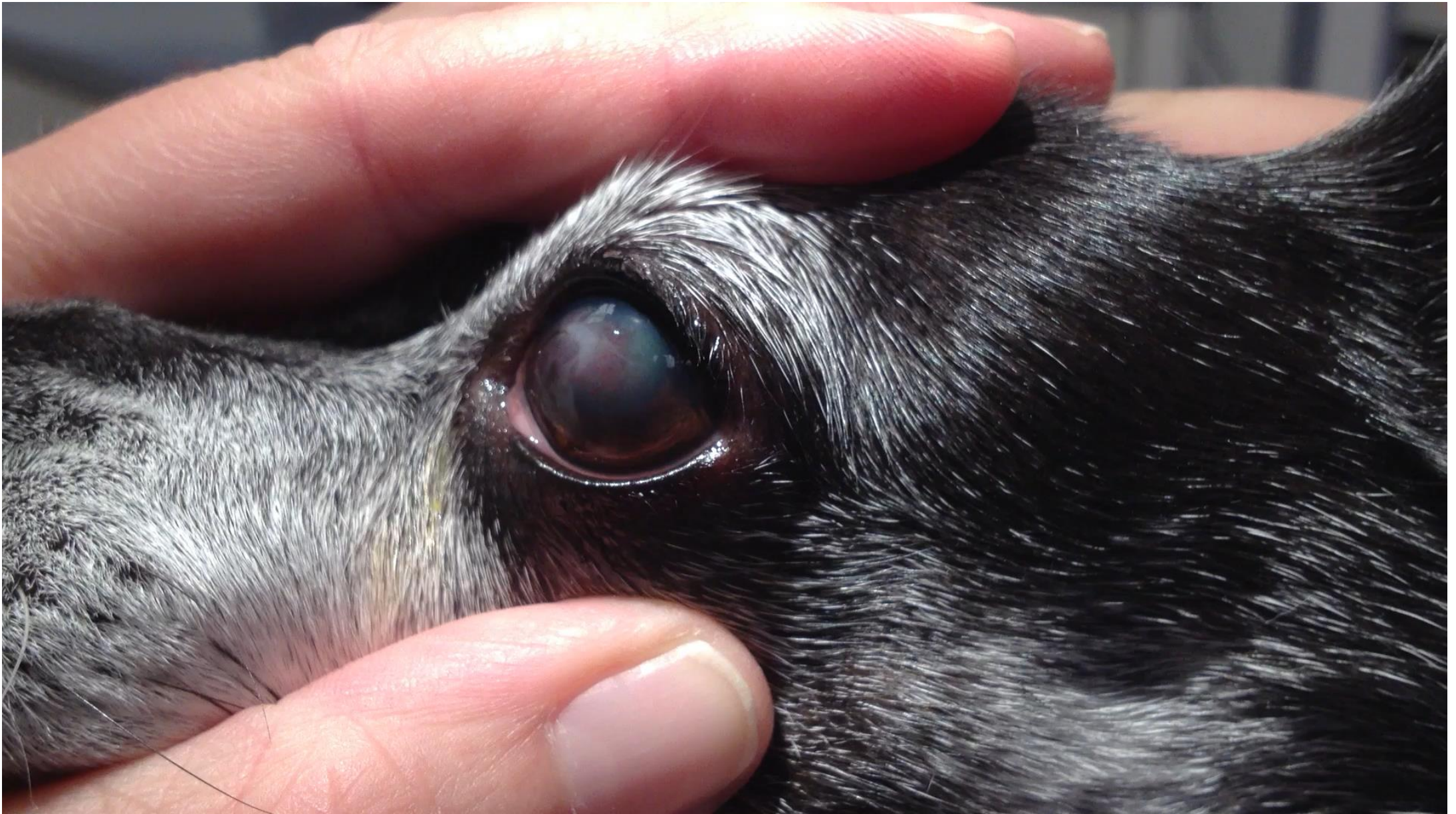




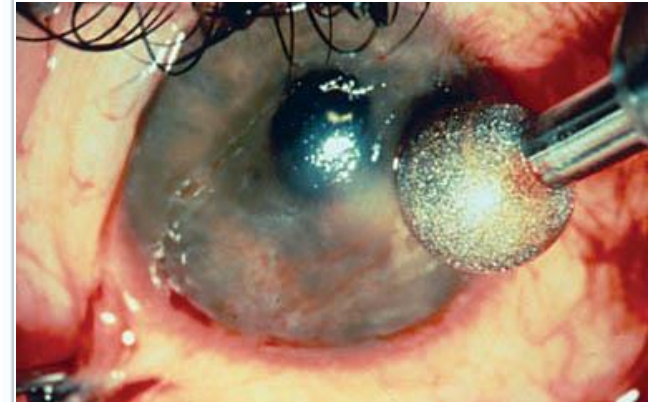
Debride



Grid Keratotomy



- Algerbrush diamond burr

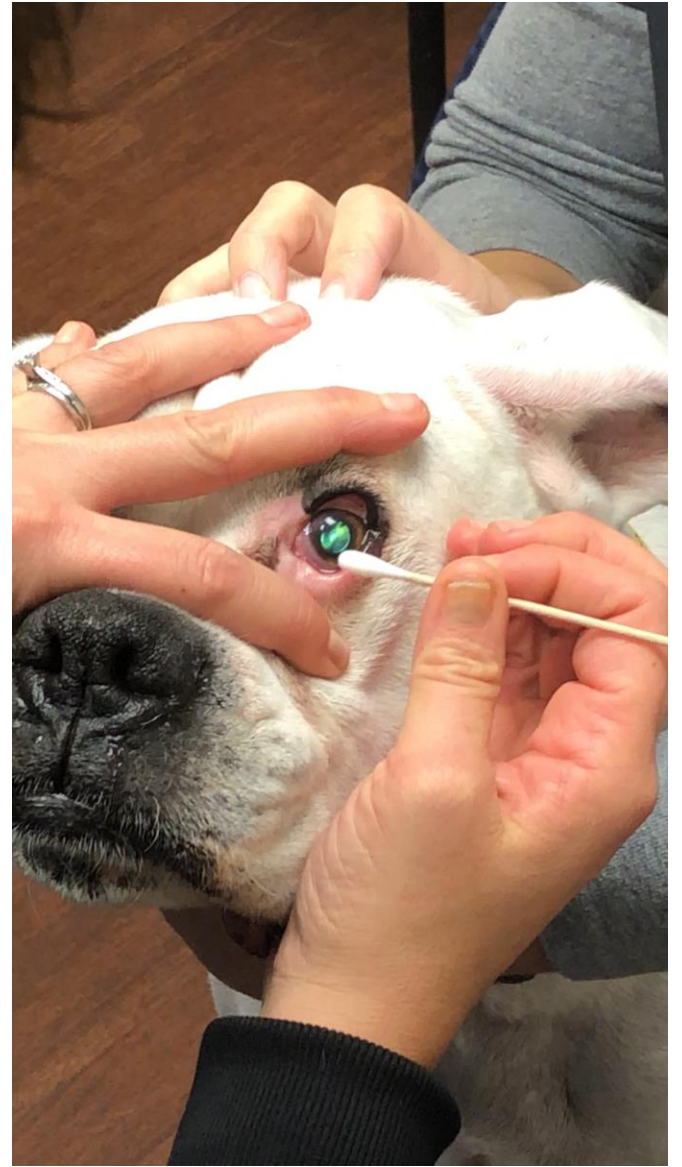


3.5mm, medium grit tip





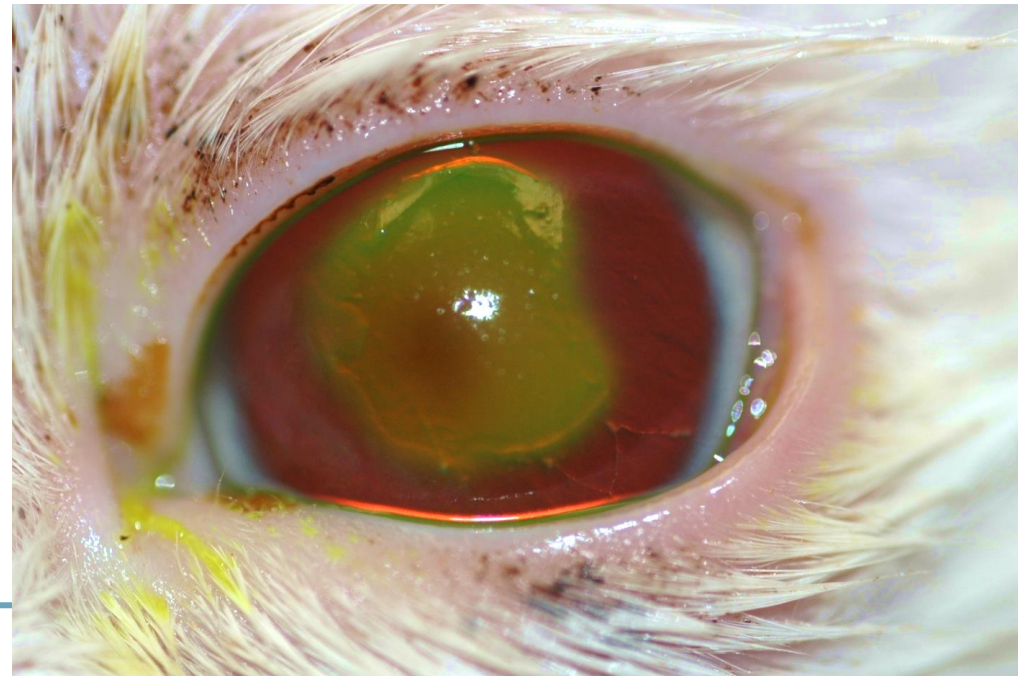




Feline Ulcers

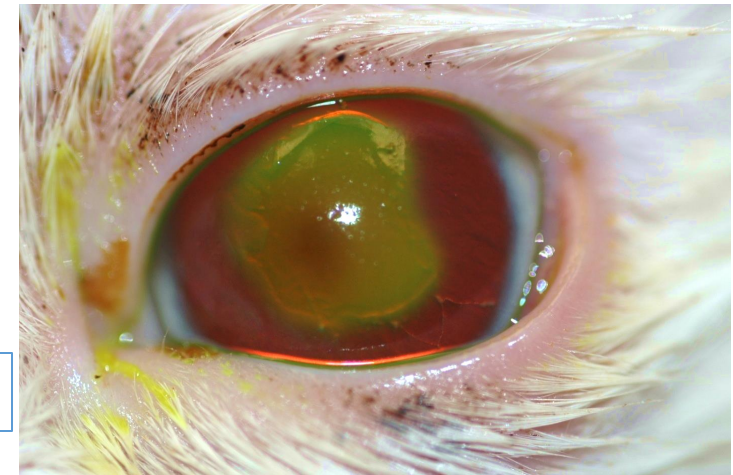
Corneal Ulcers - Feline

- Herpes
- Entropion
- Trauma
- CATS DO NOT GET “INDOLENT ULCERS”



Corneal Ulcers - Feline Treatment

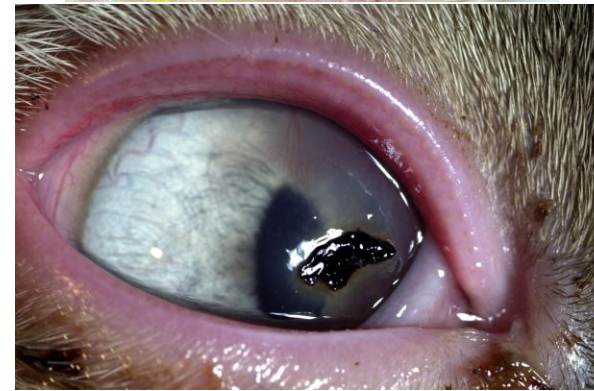
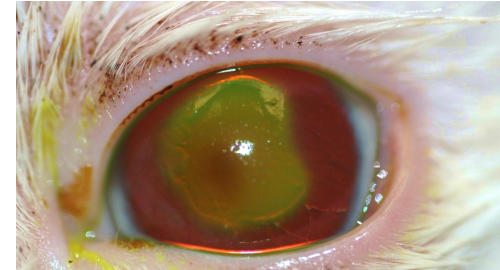
- Cidofovir BID
 - Alone if dendritic
 - Risk of secondary infection is low
- Terramycin BID-TID
- Ofloxacin
 - If has depth, color infiltrate
- OK to debride
- NOT OK to do grid/burr keratotomy



sequestrum

Corneal Ulcers - Sequestrum Treatment

- Keratectomy is best practice
- Medical therapy:
 - Cidofovir BID
 - Terramycin BID-TID
 - Waiting for slough, hoping it does not rupture
- Recheck 2 weeks, then monthly



Sequestrum
sloughing



Canine & Feline Ulcers

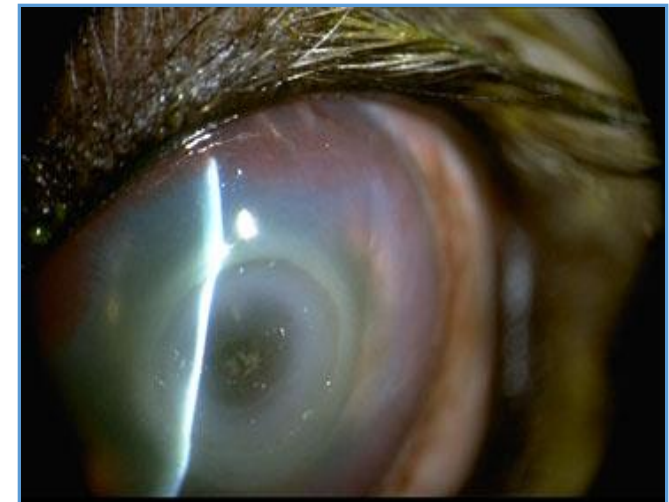
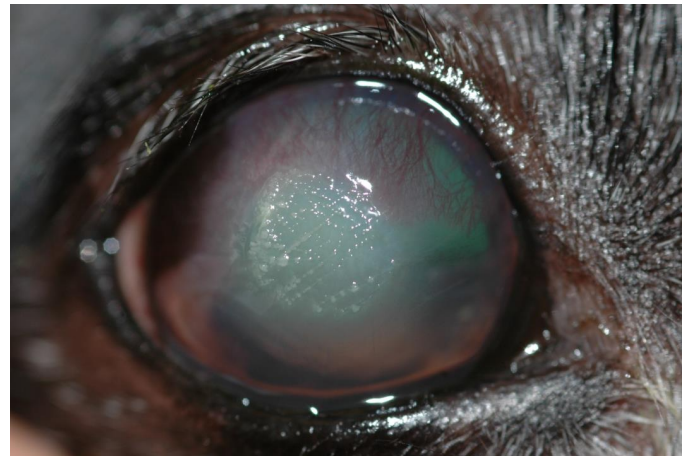
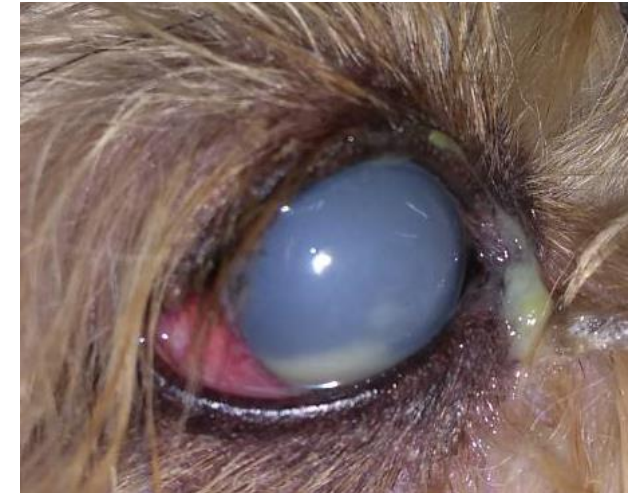
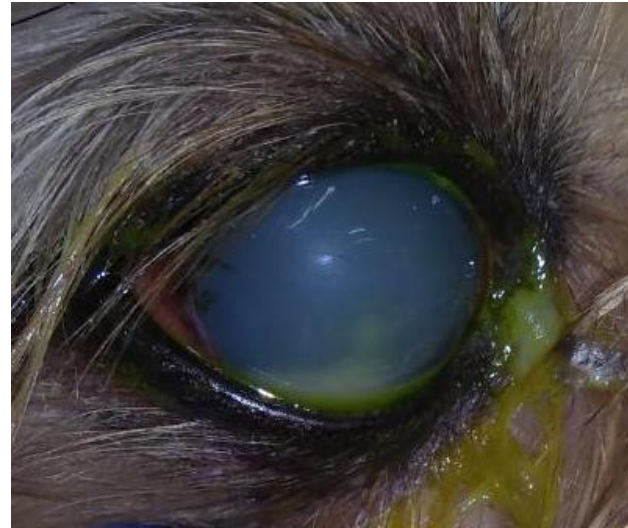
Superficial Corneal Ulcer

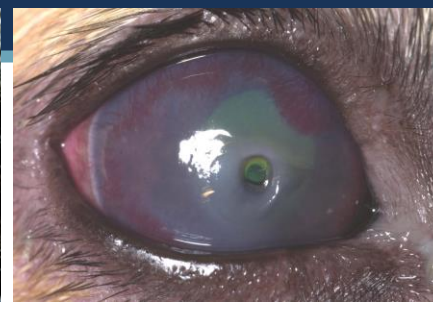
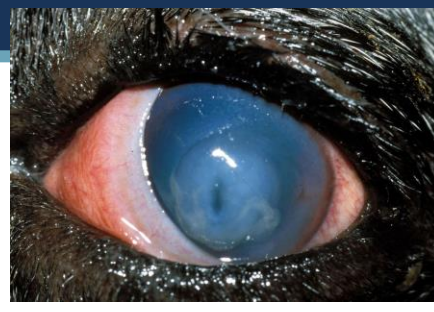
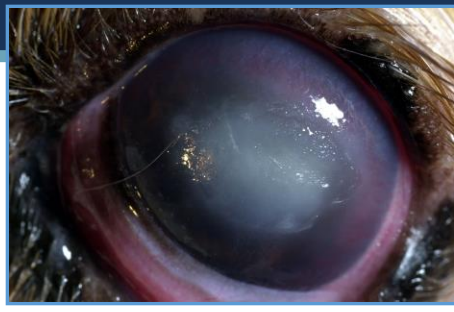
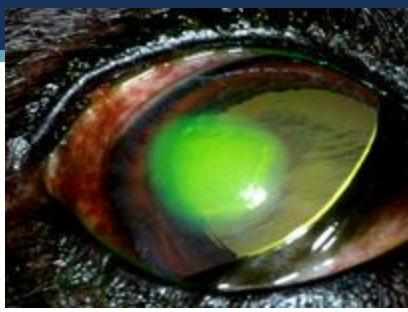
- Generally extremely painful
- Heal within 1 week when not complicated by an underlying cause, infection, or age
- If the ulcer has not resolved in 1-2 weeks:
 - cause is still present
 - ulcer is infected
 - indolent ulcer is present (if dog and over 6)



Treatment - Corneal Ulcers

- Consider infected if:
 - Pain is intense, ulcer is small
 - Uveitis
 - Yellow/tan discoloration
 - Loss of any stroma/depth

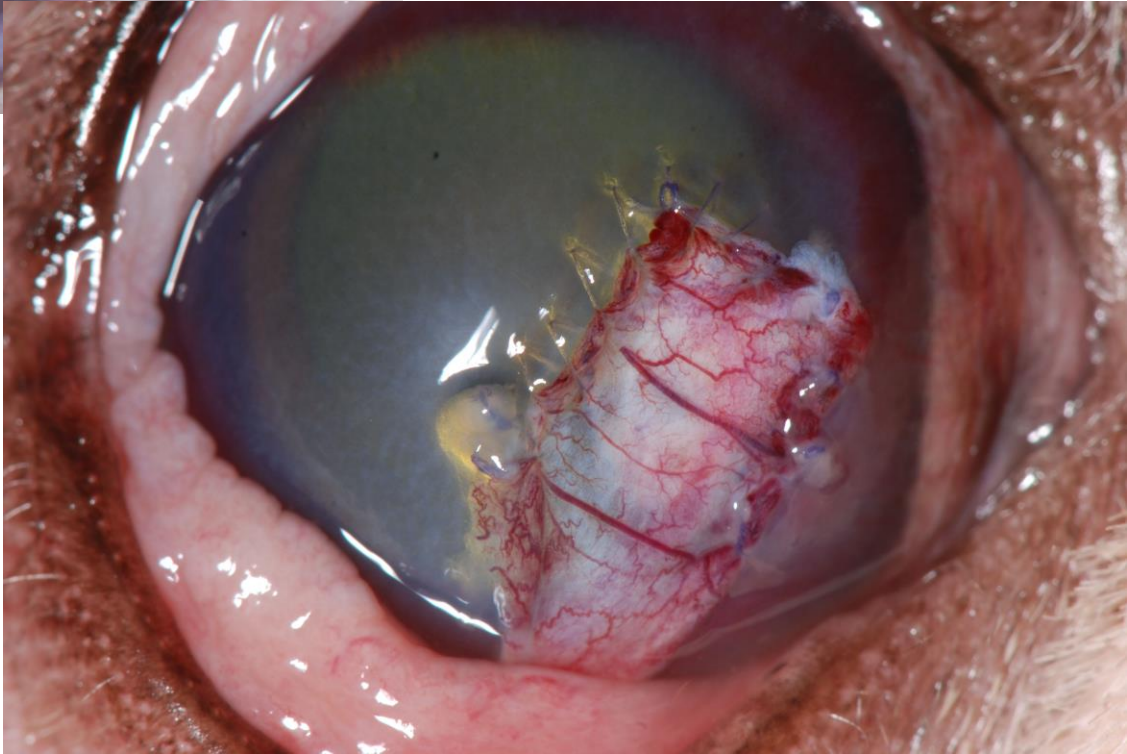
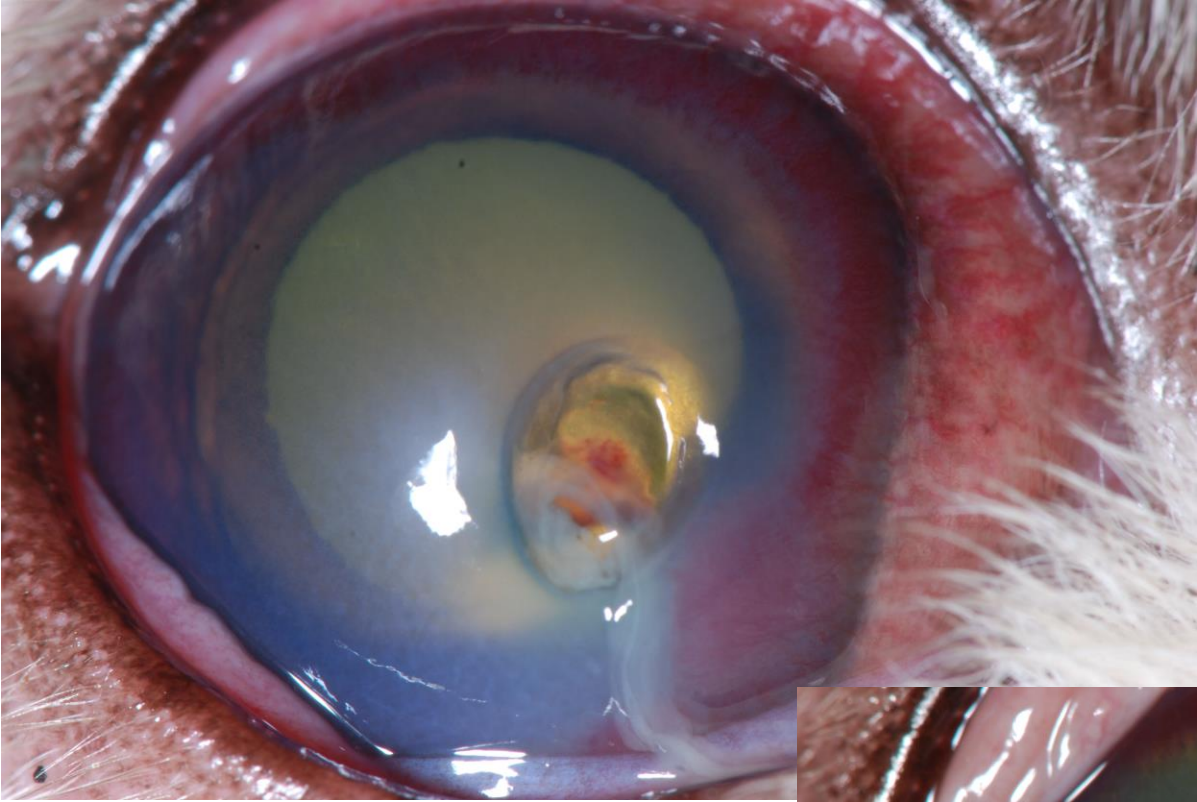


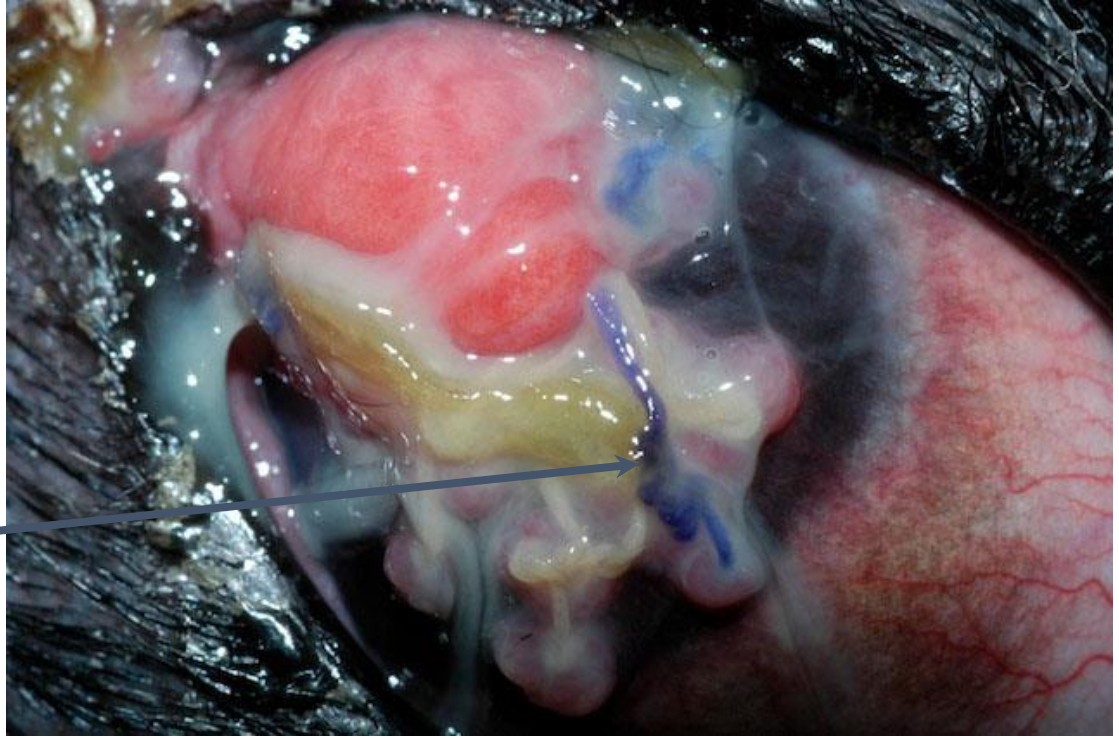


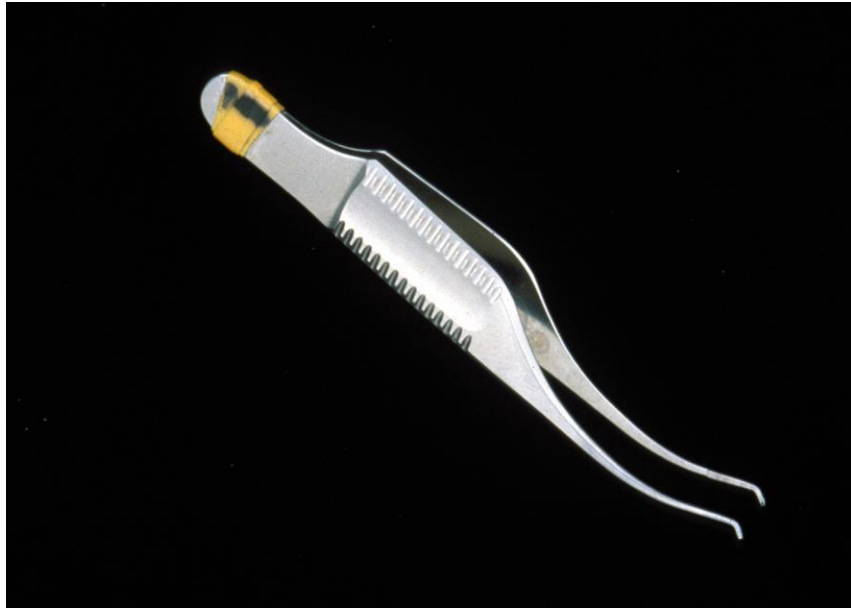
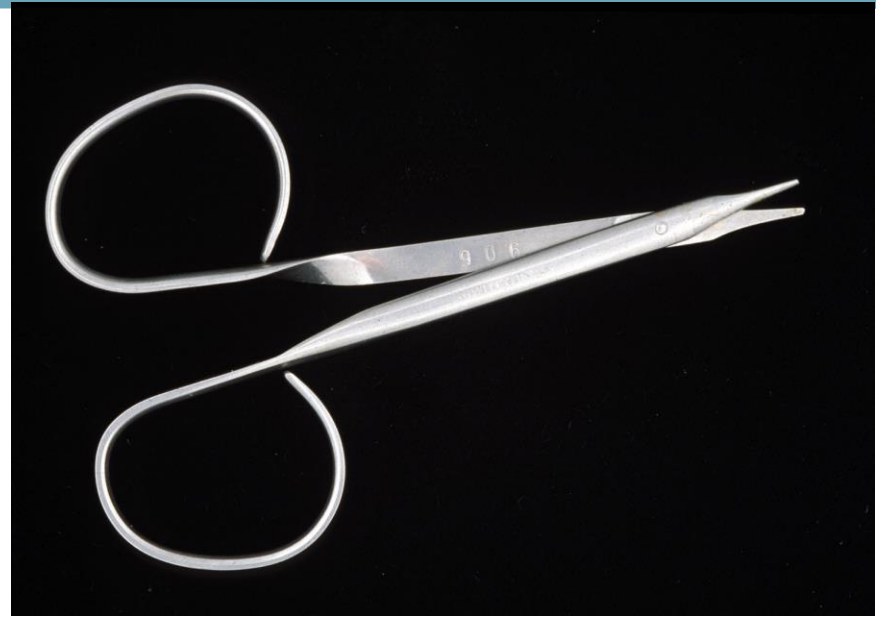
Superficial	Infected Sup/Mid Stromal	Abscess, Deep Stromal or Melting	Descemetocoele	Rupture
Ofloxacin TID-QID	Ofloxacin QID	Ofloxacin or Moxifloxacin QID	Ofloxacin or Moxifloxacin QID	Ofloxacin or Moxifloxacin QID
+/- Terramycin TID-QID	Terramycin QID	Terramycin QID	Terramycin QID	
single dose in-house	Atropine SID	Atropine SID	Atropine SID	Atropine sol SID
	+/- Doxycycline	Doxycycline	Doxycycline	Doxycycline
		Discuss Surgery	Discuss Surgery	Discuss Surgical Repair, Medical Attempt vs. Enucleation
Recheck 1-2 weeks	Recheck 5-7 days	Refer or recheck 3-5 days	Refer or recheck depends on owner's goals	Refer or recheck q2 weeks depending on owner's goals

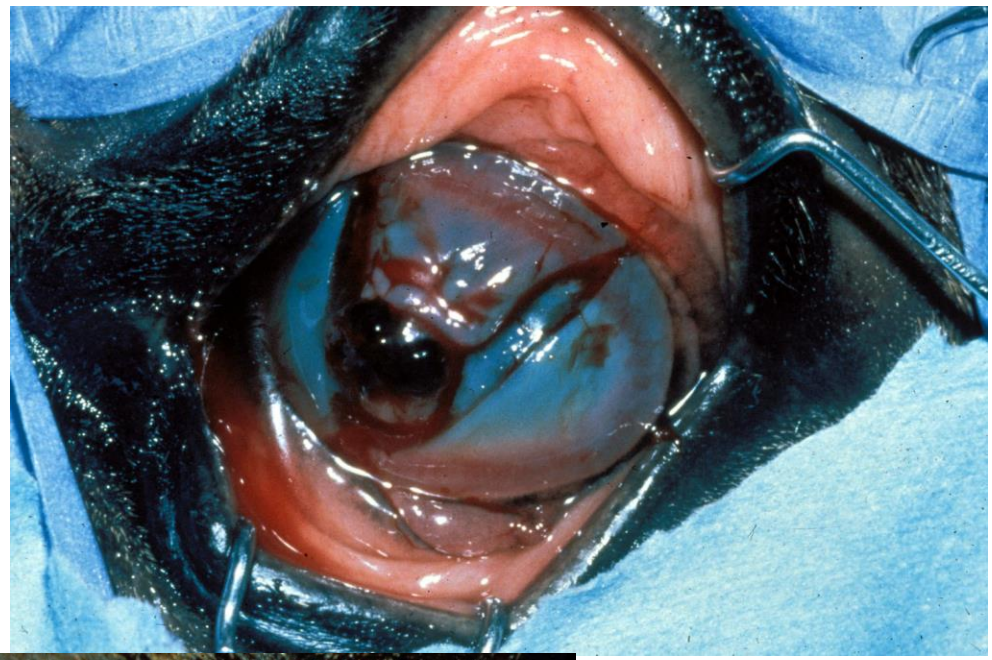
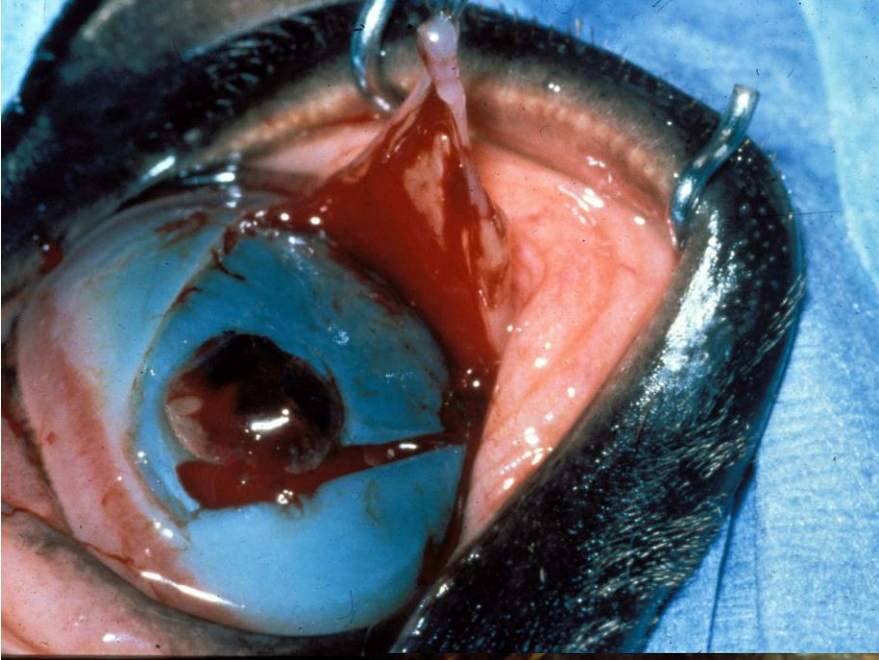
Treatment - Corneal Ulcers - But what about...

- **Topical NSAIDS**
 - Contraindicated!
 - Not useful as a pain medication
 - Treat the ulcer and any infection and the associated uveitis will resolve
 - Encourage melting of corneal ulcers and delay healing
 - Use other oral pain meds
- **Serum**
 - Only indicated for true melting ulcers
 - Does NOT increase wound healing rates; only tries to prevent further melting
 - Needs to be changed frequently for risk of contamination
 - Use terramycin instead
- **Corneal Wound Healing Gels**
 - Anecdotal increased risk for secondary infection
 - Expensive lubricant









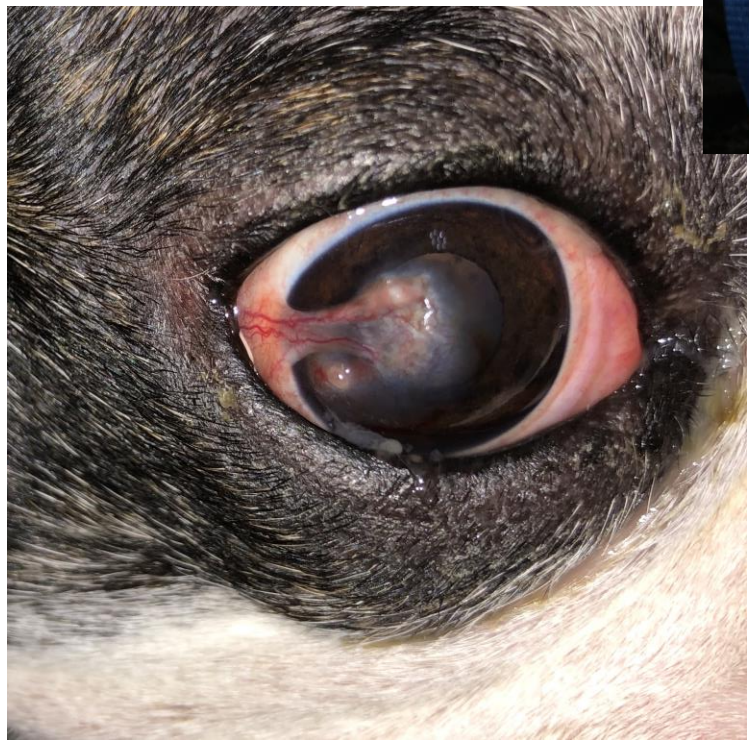


24 hr post-op

Feline corneo-conjunctival
transposition



1 yr post-op



Future Therapy: Corneal Cross-linking

Veterinary Ophthalmology (2014) 17, 1, 1–11

DOI:10.1111/vop.12027



Corneal collagen cross-linking (CXL) for the treatment of melting keratitis in cats and dogs: a pilot study

Bernhard M. Spiess,* Simon A. Pot,* Marion Florin*¹ and Farhad Hafezi†

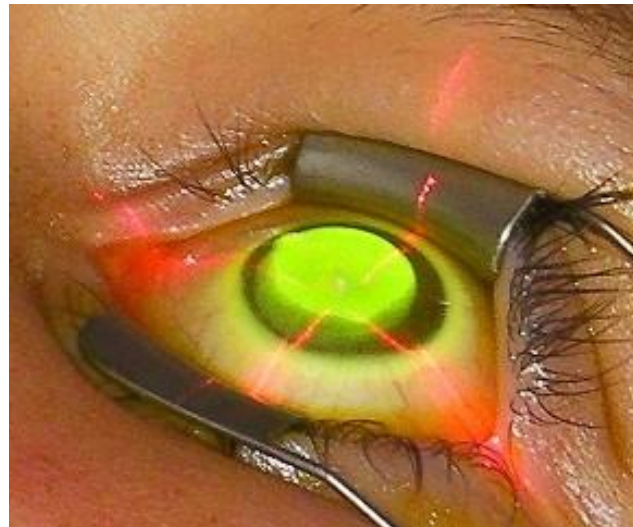
Riboflavin-photosensitizer



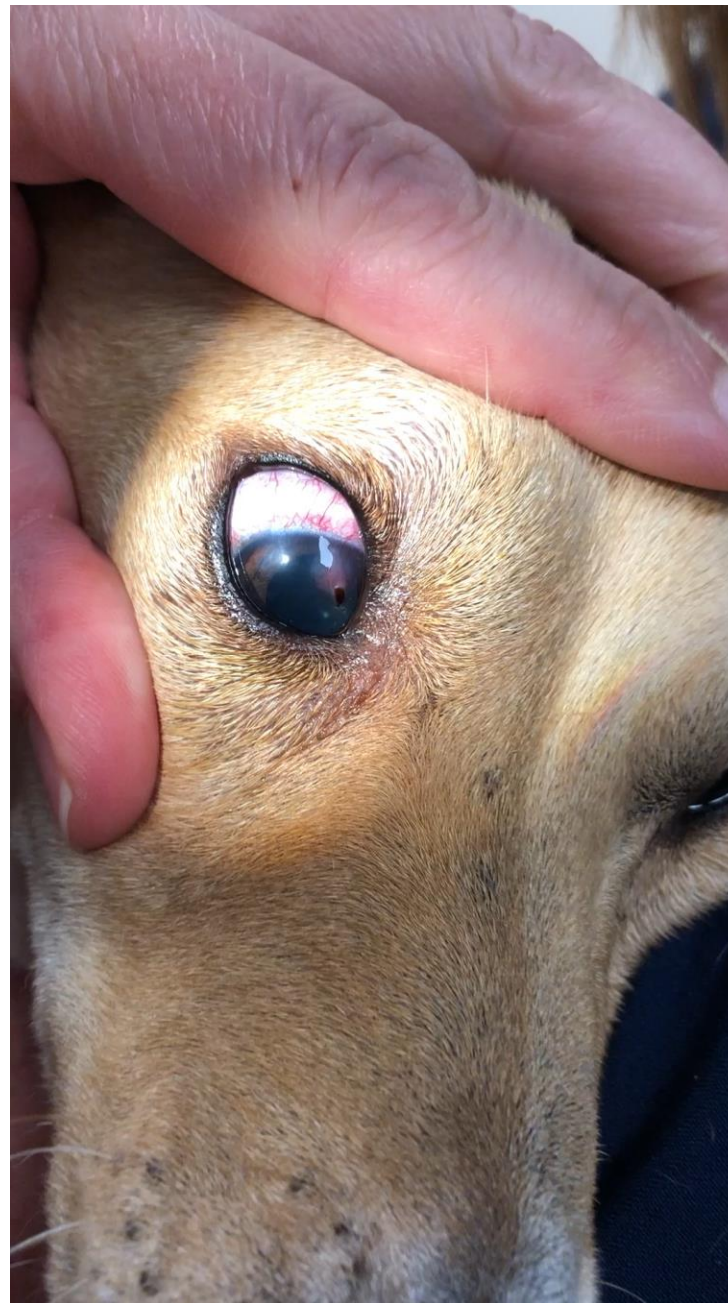
UV-A



Corneal cross-linking



Miscellaneous - Corneal Foreign Body



Packaging

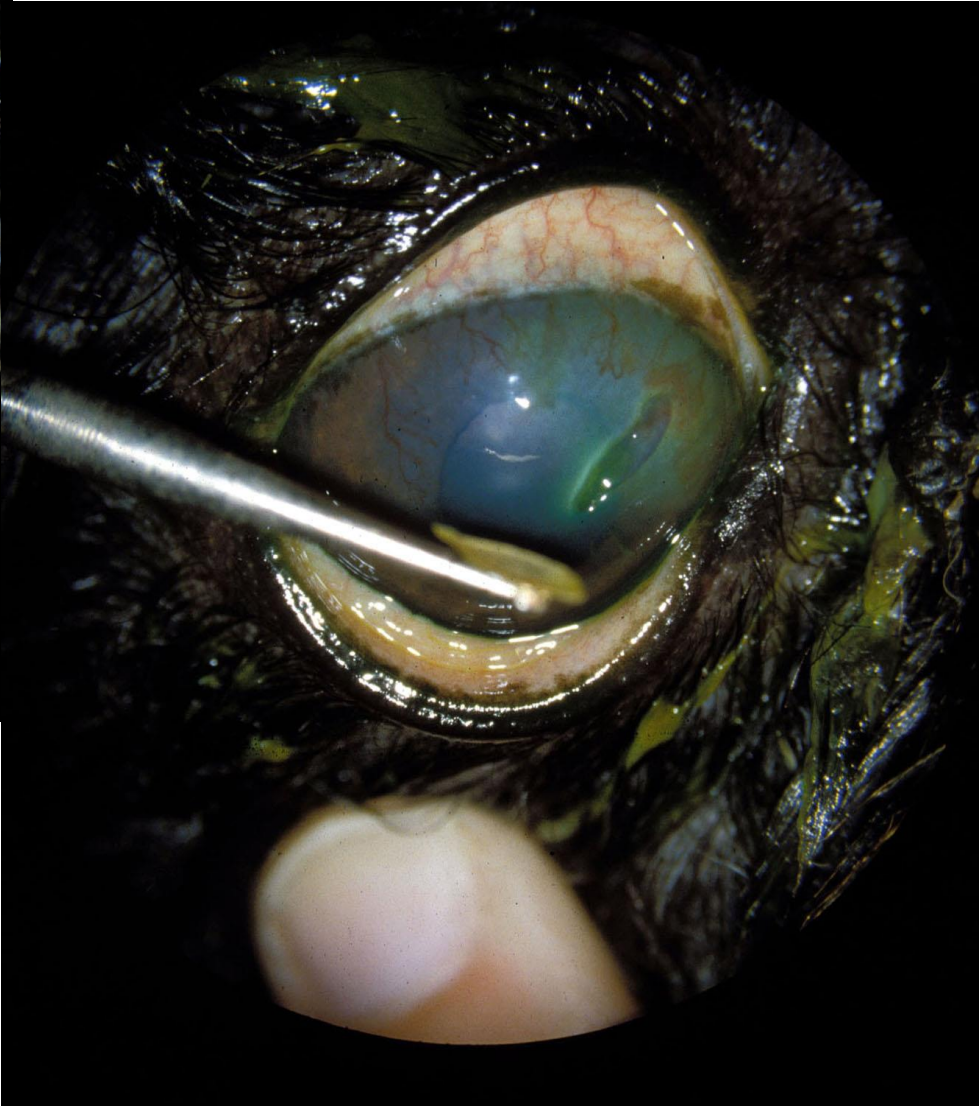
Package contains 400 applicators, four tubes of 100 applicators each.

- **Regular Size**
 - Blue, Green, Peach, Purple
 - Product No. MRA400
- **Fine Size**
 - Pink, Yellow
 - Product No. MFA400
- **Superfine Size**
 - White
 - Product No. MSF400



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Miscellaneous - Corneal Laceration

Refer within 3 days for the best outcome

80% heal without surgery and appropriate therapy that depends on:

depth of laceration

lens involvement or not

Until referral:

Ofloxacin QID

Atropine SID

PO prednisone 0.5 mg/kg PO BID

PO clavamox or cipro PO BID

E-collar

Miscellaneous: Corneal Dermoid

- French Bulldog
- Shih Tzu
- German Shepherd

- Choristoma of the (usual) lateral limbus and/or eyelid(s)
 - Superficial pigmentation
 - Blepharospasm
 - Mucoid discharge

- Treatment: Superficial keratectomy/conjunctivectomy +/- eyelid reconstruction



Thank you for your
attendance!

Feedback Appreciated
MedVet survey or
email: terah.webb@medvet.com
jenese.wallace@medvet.com

