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College of Veterinary Medicine

What's Cooking in the Cornea? Avoiding a Cornea Catastrophe

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Case 1: Squinting, Excessive Tearing

- Toby, 5 year old M/C Chihuahua mix



Case 1:

- History: Owners have notice that Toby was rough housing with other dog in the house and started acutely squinting and tearing in the right eye. He has been trying to rub the right eye. Otherwise Toby has been healthy without concerns.
- What is the next step for evaluating Toby?

Toby, the Chihuahua mix

- Step 1: Menace and PLRs
 - Present OU
- Step 2: Schirmer's Tear test
 - OD = 30 mm/min, OS = 18 mm/min
- Step 3: Fluorescein stain
 - OD = Positive, OS = negative
- Step 4: Tonometry
 - OD = 9 mmHg, OS = 13 mmHg

Toby, the Chihuahua mix

- Ocular examination:
 - OD – Mild diffuse conjunctival hyperemia, severe blepharospasm, moderate to severe serous discharge, focal edema
 - OS – No obvious abnormalities noted on exam
 - What is next step?

Toby, the Chihuahua mix



Toby, the Chihuahua mix

- Differential diagnoses?
 - Simple corneal ulcer
 - Indolent corneal ulcer
 - Non-healing corneal ulcer
 - Allergic conjunctivitis

Toby, the Chihuahua mix

- How do we know what Toby has?
 - Simple corneal ulcer → history, signalment, appearance
 - Indolent corneal ulcer → too young of a dog, acute nature
 - Non-healing corneal ulcer → too old of a dog, acute nature
 - Allergic conjunctivitis → not common in dogs

Toby, the Chihuahua mix

- Diagnosis: Superficial corneal ulcer
 - WHY?!

Toby, the Chihuahua mix

- Simple corneal ulcers → increased tear production and are extremely painful due to nerve endings exposed
- Clinical signs are consistent with simple ulcer: severe serous discharge, severe blepharospasm, focal edema
- History → consistent with simple corneal ulcer!!

Toby, the Chihuahua mix

- Treatment of simple corneal ulcers
 - NeoPolyBac or Terramycin OD TID-QID
 - Atropine OD q24 hr- BID
 - Oral NSAIDs and/or Gabapentin PO BID-TID
 - E collar at all times!
- How long does a simple corneal ulcer take to heal?

Simple Corneal Ulcer in a Nutshell

- Identification → skin peeled off a grape
 - No loss of underlying stroma
 - Distinct borders of fluorescein uptake
- Clinical Signs
 - Blepharospasm
 - Serous discharge
 - Conjunctival hyperemia
 - Focal corneal edema
- Healed within 5-7 days

Case 2: Squinting, Excessive Tearing

- Riley, 7 year old MC Labrador retriever



Case 2

- History: Owners have noticed squinting, tearing and redness for the past 10 days.
- What is the next step for evaluating Riley?

Riley, the Labrador retriever

- Step 1: Menace and PLRs
 - Present OU
- Step 2: Schirmer's Tear test
 - OD = 18 mm/min, OS = 30 mm/min
- Step 3: Fluorescein stain
 - OD = negative, OS = positive
- Step 4: Tonometry
 - OD = 10 mmHg, OS = 7 mmHg

Riley, the Labrador retriever

- Ocular examination:
 - OS – Mild diffuse conjunctival hyperemia, severe blepharospasm, moderate to severe serous discharge, focal edema, few perilimbal vessels
 - OD – No obvious abnormalities noted on exam
 - What is next step?

Riley, the Labrador retriever

- Classic treatment post initial exam:
 - Started on NeoPolyBac ointment OS QID and atropine OS BID
 - Carprofen 2.2 mg/kg PO BID x 5 days
 - E collar
 - Recheck in 7 days

Riley, the Labrador retriever

- Recheck exam in 7 days
 - OS – Mild diffuse conjunctival hyperemia, moderate blepharospasm, moderate serous discharge, focal edema, few perilimbal vessels
 - Fluorescein stain → positive (bright central stain with faint halo appearance at periphery)
 - OD – No obvious abnormalities noted on exam
 - What is next step?

Riley, the Labrador retriever

- Differential diagnoses:
 - Superficial corneal ulcer
 - Indolent corneal ulcer
 - Non-healing corneal ulcer

Riley, the Labrador retriever

- What Do You Think is the Next Step for Riley?
 - 1) Switch topical antibiotic
 - 2) Consider corneal debridement
 - 3) Refer to ophthalmologist for further evaluation

Riley, the Labrador retriever

- Diagnosis: Indolent corneal ulcer
 - Why?

Riley, the Labrador retriever

- How do we know what Riley actually has?
 - Simple corneal ulcer → ulcer did not heal in 7 days
 - Indolent corneal ulcer → history, clinical signs
 - Non-healing corneal ulcer → not a young dog

Indolent Corneal Ulcers in a Nutshell



Who is Predisposed to Development of Indolent Ulcers?

- Middle aged to older dogs
- Females are often predisposed
- Originally termed Boxer ulcers
→ identified first in Boxers
 - Multiple names: spontaneous chronic corneal epithelial defects (SCCEDs), indolent ulcers, non-healing ulcer, Boxer ulcer, etc.

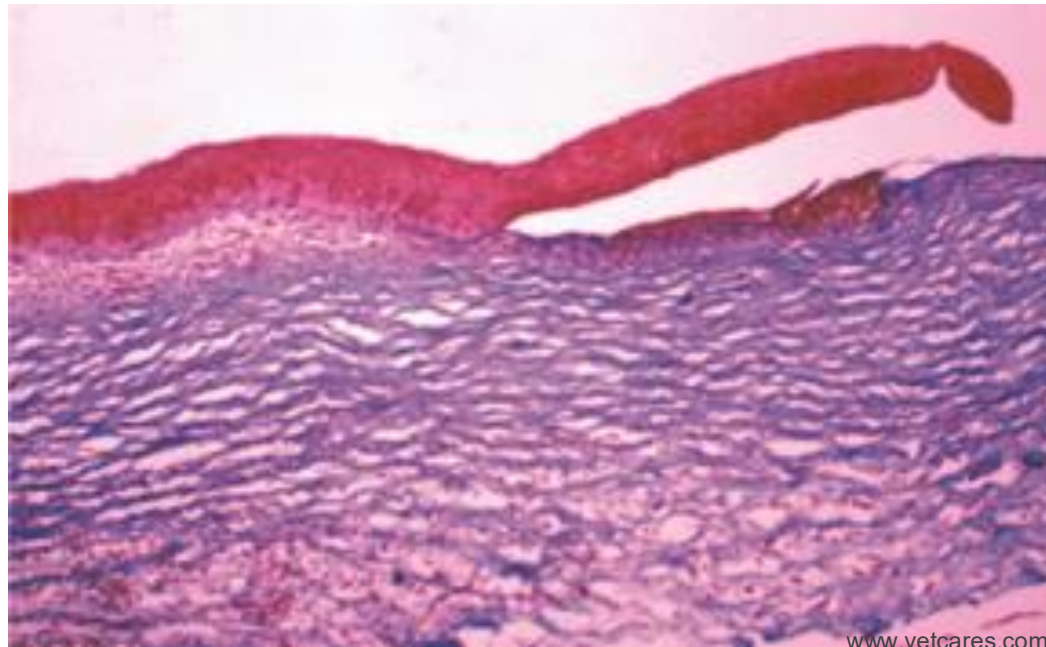


How do I know if it's an Indolent Ulcer?

- History → waxing/waning ocular discomfort
- Superficial corneal ulcer that does not heal in normal 5-7 days
- Cotton tip debridement confirms peeling of outer epithelium
 - Epithelium cannot be debrided if healthy!!

What is the Proposed Etiology of Indolent Ulcers?

- Abnormal adhesion of the outer epithelium to the underlying stroma due to suspected basement membrane defect



www.vetcares.com

Treatment of Indolent Ulcers

- Cotton tip debridement
 - Resolves corneal ulcer ~50% of cases
- Cotton tip debridement + Grid keratotomy
 - Resolves corneal ulcer ~85-90% of cases
- Cotton tip debridement + Diamond burr debridement
 - Resolves corneal ulcer ~85-90% of cases

Treatment of Indolent Ulcers

- Superficial keratectomy
 - 100% success rate for healing



Indolent Corneal Ulcers

Cotton tip debridement + Diamond burr debridement

- <https://www.youtube.com/watch?v=oX3mYu0jLOA>

veterinarymedicine.dvm360.com

Diamond Burr Debridement



www.mspca.org

Diamond Burr Debridement

- Alger brush hand-piece + 3.5 mm diamond burr tip
- Gentle pressure on the cornea
 - polish the ulcer bed and beyond margins of the indolent ulcer
 - 1 minute duration

Grid Keratotomy Needle Preparation

Hemostat to Bend Bevel of Needle 90 Degrees



Post 90 Degree Bend

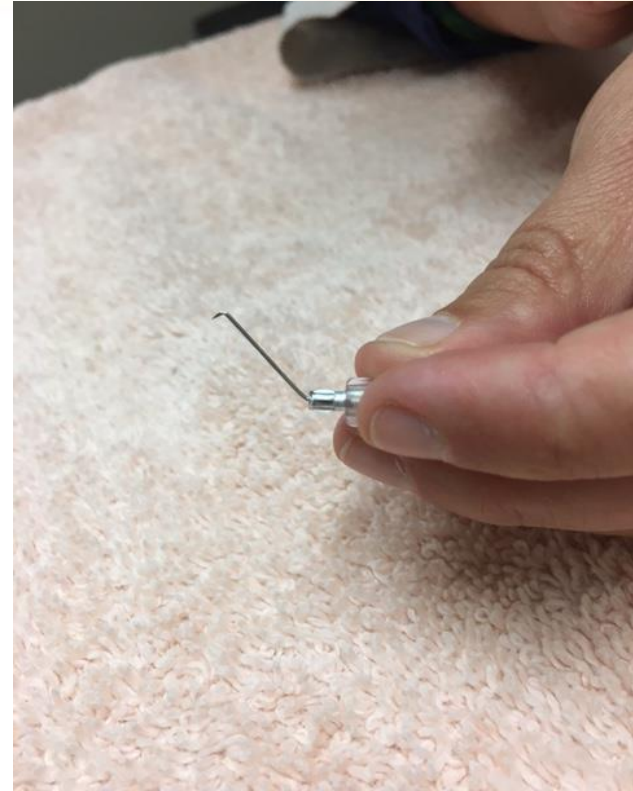


Grid Keratotomy Needle Preparation

Bend Needle Base 45 Degrees



Final Needle Appearance



Grid Keratotomy

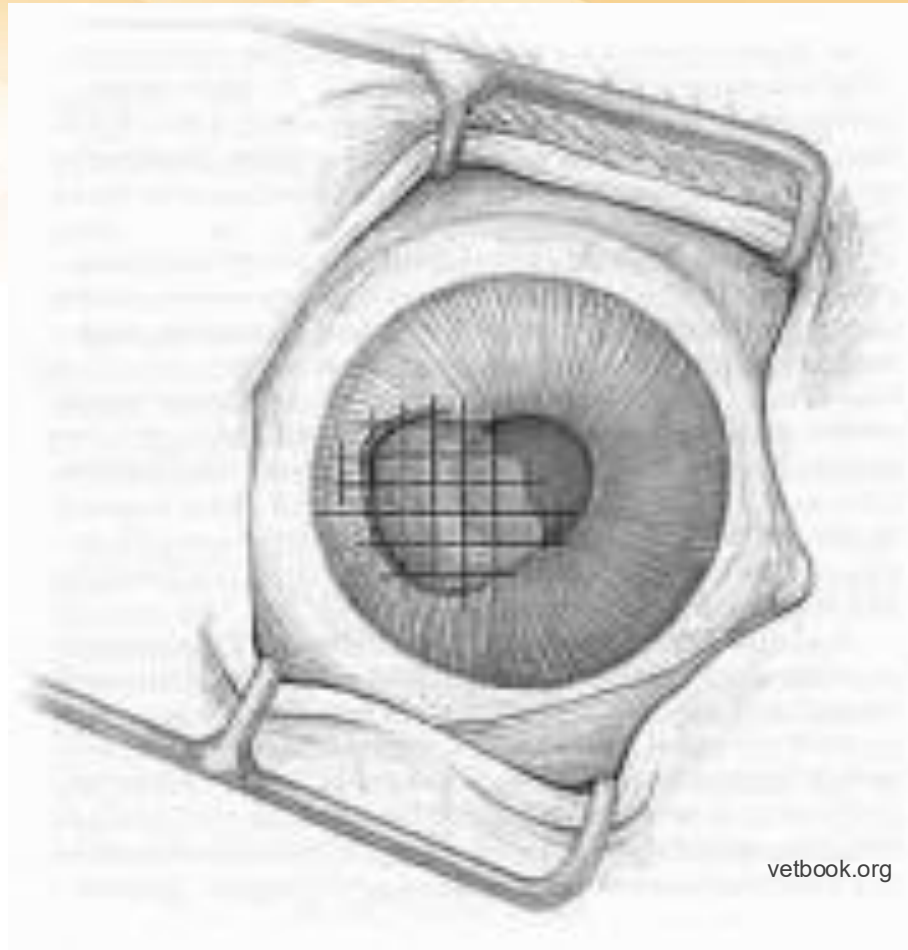


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Grid Keratotomy



Grid Keratotomy

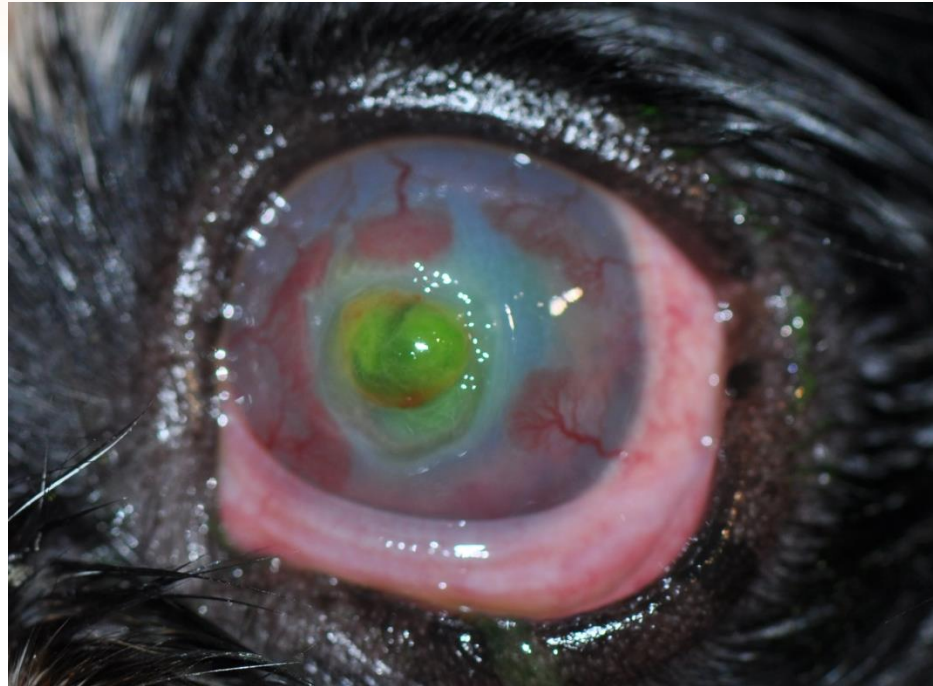


Therapy Post Indolent Ulcer Procedure

- Prophylactic antibiotic [Terramycin], atropine, ± bandage contact lens
- Oral NSAIDS x 5-7 days, +/- oral Gabapentin PO BID-TID
- Recheck in 14 days
- Repeat procedure often needed in 10-15% cases

Case 3: Squinting, Excessive Tearing

- Puggles, 8 year old MC Pug



Puggles, the Pug

- History: Owners have noticed squinting, tearing and redness for the past 10 days.
- What is the next step for evaluating Puggles?

Puggles, the Pug

- Step 1: Menace and PLRs
 - Present OU
- Step 2: Schirmer's Tear test
 - OD = 5 mm/min, OS = 15 mm/min
- Step 3: Fluorescein stain
 - OD = negative, OS = faint positive
- Step 4: Tonometry
 - OD = 10 mmHg, OS = 5 mmHg

Puggles, the Pug

- Ocular examination:
 - OS – Moderate diffuse conjunctival hyperemia and chemosis, moderate blepharospasm, moderate seromucoid discharge, focal corneal edema with focal cavitation, corneal vessels
 - OD – moderate diffuse conjunctival hyperemia and chemosis, moderate blepharospasm, moderate seromucoid discharge, corneal vessels
 - What is next step?

Puggles, the Pug

- Differential diagnoses:
 - Indolent corneal ulcer
 - Infected corneal ulcer
 - Keratoconjunctivitis sicca
 - Allergic conjunctivitis
 - Bacterial conjunctivitis

Puggles, the Pug

- Diagnosis:
 - Infected corneal ulcer OS
 - Keratoconjunctivitis sicca (dry eye) OU

Puggles, the Pug

- Why?!
 - Ulcer type
 - Indolent corneal ulcer – skin peeled off a grape, typically serous discharge
 - Infected corneal ulcer – loss of corneal thickness, muco-purulent discharge
 - Conjunctivitis cause
 - Keratoconjunctivitis sicca – decreased STT in combination with mucopurulent discharge
 - Allergic conjunctivitis – uncommon in dogs
 - Bacterial conjunctivitis – no true primary disease in dogs unlike cats!

Infected Corneal Ulcers in a Nutshell

- Malacic cornea → margins have a melting appearance (snot-like appearance on the cornea that does not remove with CTA)
- Corneal stromal involvement



What Causes Corneal Malacia (aka Melting)?

- Proteinases → Collagenase and Gelatinase
 - Bacteria
 - Gram positive: Staph and Streptococcus spp.
 - Gram negative: Pseudomonas
 - Neutrophils
 - Neutrophil elastase (most common serine proteinase)
 - Cornea
 - Matrix metalloproteinases (MMP 2 and 9)

What Medications Cease Corneal Malacia?

- Serum or Plasma
 - Alpha 2 macroglobulins & Alpha 1 anti-trypsin
 - MMP and serine proteinase inhibitor
- 1% Disodium ethylene-diaminetetra-acetic acid (EDTA)
 - Chelates Ca & Zn
 - MMP inhibitor
- Tetracyclines 0.1%
 - Chelates Ca & Zn
 - MMP inhibitor
- N-Acetylcysteine 5-10%
 - Chelates Ca & Zn
 - MMP inhibitor



Infected Corneal Ulcer: What to do Next?

- Obtain and submit aerobic culture/sensitivity
- Corneal cytology
 - Blunt edge of scapel blade
 - Cytobrush (Microbrush international)
 - Kimura spatula



What Location for Your Culture/Cytology Sample?!

- Central or Periphery?
 - Periphery!



Treatment of Infected Corneal Ulcers

- Broad spectrum antibiotic
 - Based on corneal cytology
- Serum
 - Blood in a red top tube
 - Allow blood to clot for 10 minutes
 - Centrifuge for 10 minutes
 - Sterile removal of serum into 1 cc tuberculin syringe (remove needle and use syringe as dropper)
 - Keep refrigerated and discard after 10-14 days
- Atropine
- Systemic anti-inflammatory/oral pain medication

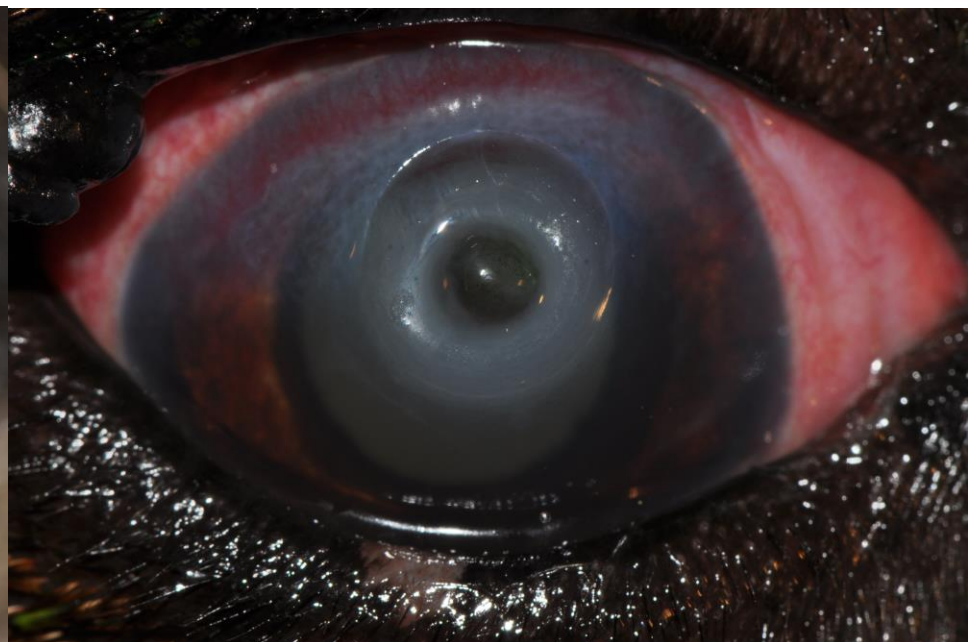
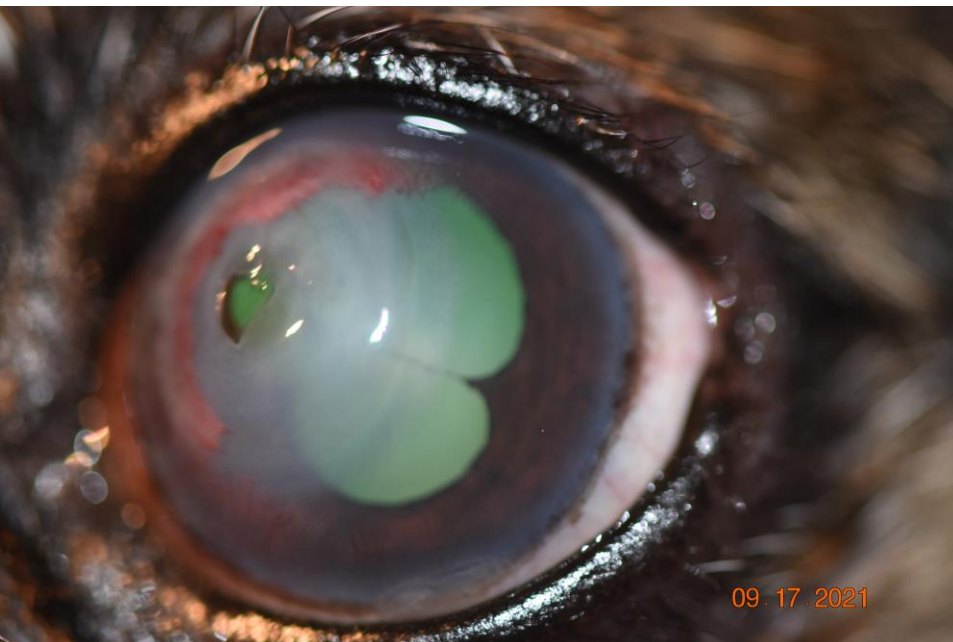


Treatment of Infected Corneal Ulcers

- Serum
 - Administer every 1-2 hours initially
- Broad spectrum antibiotic
 - Administer every 1-2 hours initially
- Atropine
 - Administer every 12-24 hours if severe reflex uveitis and no evidence of secondary glaucoma
- NSAIDs PO & Gabapentin PO every 8-12 hrs PRN
- Recheck in 24-48 hours

Treatment of Infected Corneal Ulcer

- If $> 50\%$ stromal loss
 - Conjunctival flap placement (Gold standard)



Conjunctival Flap



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Case 4: Squinting, Excessive Tearing

- Ernie, 2 yo MC Shih tzu



Ernie, the Shih tzu

- History: Owners have noticed over the past day or so, that Ernie has been squinting with watery discharge OS.
- What is the next step for Ernie?

Ernie, the Shih tzu

- Step 1: Menace and PLRs
 - Present OU
- Step 2: Schirmer's Tear test
 - OD = 15 mm/min, OS = 25 mm/min
- Step 3: Fluorescein stain
 - OD = negative, OS = positive
- Step 4: Tonometry
 - OD = 14 mmHg, OS = 9 mmHg

Ernie, the Shih tzu

- Ophthalmic examination
- OS – Moderate conjunctival hyperemia, blepharospasm, moderate to severe serous discharge, focal edema with a few superficial corneal vessels, trace flare, mild miosis, remainder of exam WNL
- OD –No obvious abnormalities
- What is the next step?

Ernie, the Shih tzu

- Start prophylactic antibiotics (NeoPolyBac OS QID)
- Atropine OS q24 hours
- Oral NSAID and oral Gabapentin (if excessively painful)
- Place a hard plastic e collar
- Recheck in 5-7 days

Ernie, the Shih tzu

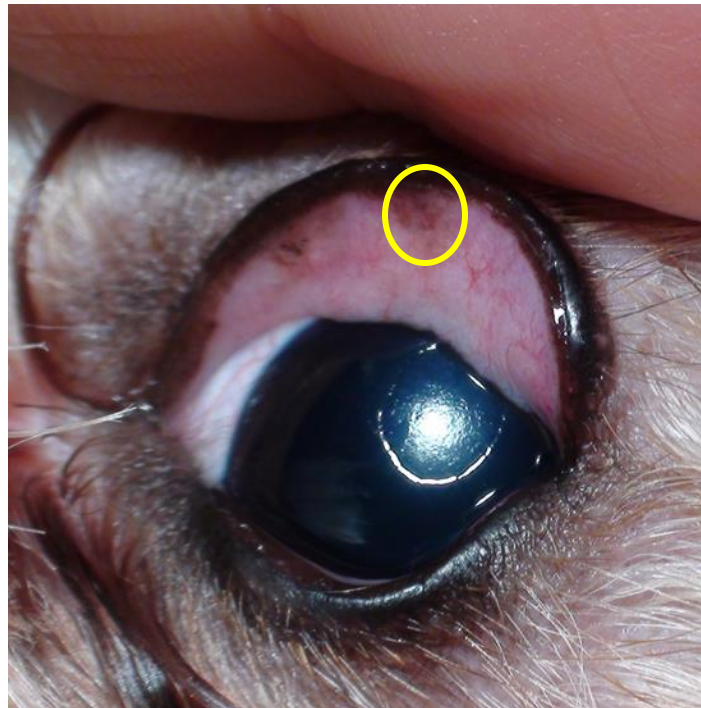
- Recheck exam:
 - Still fluorescein positive and Ernie still has similar clinical signs as the initial exam OS.
- What is the next step for Ernie?

Ernie, the Shih tzu

- What do you think the next step is for Ernie?
 - 1) Switch topical antibiotic
 - 2) Consider corneal debridement
 - 3) Look for another cause (hair, foreign body, etc.)
 - 4) Refer to ophthalmologist for further evaluation

Ernie, the Shih tzu

- Diagnosis: Non-healing superficial corneal ulcer OS



Ernie, the Shih tzu

- How do we know what Ernie actually has?
 - Superficial corneal ulcer → ulcer did not heal in 7 days
 - Indolent corneal ulcer → not middle age dog, clinical signs don't fit
 - Non-healing superficial corneal ulcer → young dog with a persistent superficial ulcer (secondary to ectopic cilia) in this case
 - Infected corneal ulcer → no evidence of stromal loss

Non-Healing Superficial Corneal Ulcers in a Nutshell

- Young dog (<4 years)
- Superficial corneal ulcer
>7 days duration
- Look for an underlying
cause in location of ulcer
 - Ectopic cilia
 - Distichiasis
 - Entropion
 - Conjunctival foreign body



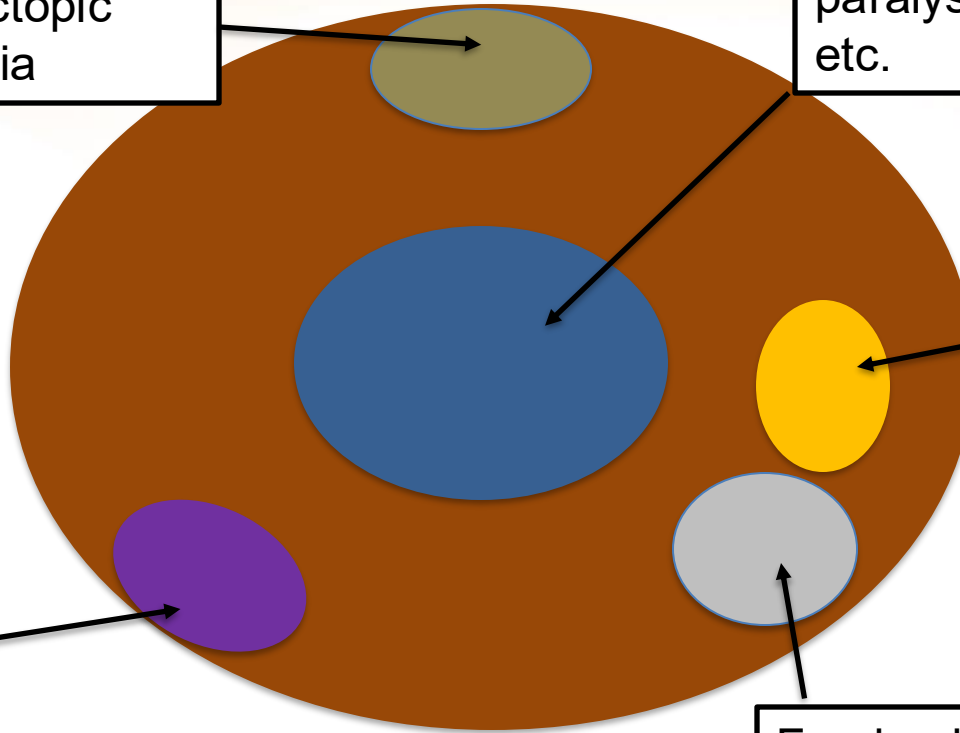
Non-healing superficial corneal ulcers

- Location, location, location...

Ectopic cilia

Exposure (numerous causes!): KCS, facial nerve paralysis, post anesthesia, etc.

RIGHT EYE



Nasal trichiasis/entropion

Entropion

Foreign body behind 3rd eyelid

Treatment

- Remove the irritating component delaying wound healing
- Triple antibiotic ointment TID-QID, Atropine q24 hr-BID, Oral NSAIDs



Conclusion

- Removal of irritation → corneal ulcer heals within 7 days!

Questions?

