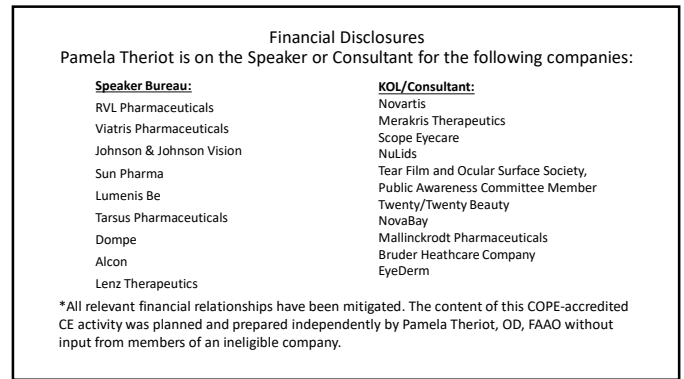


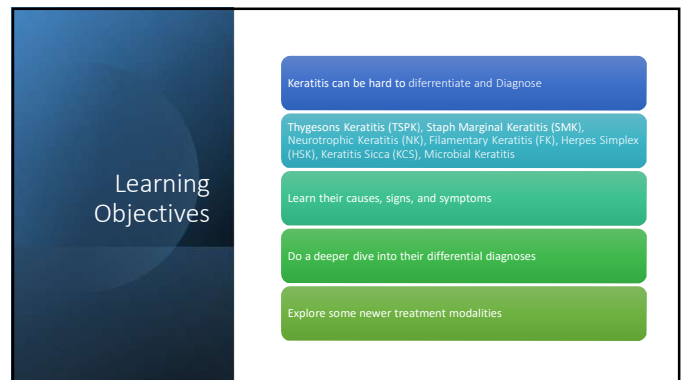
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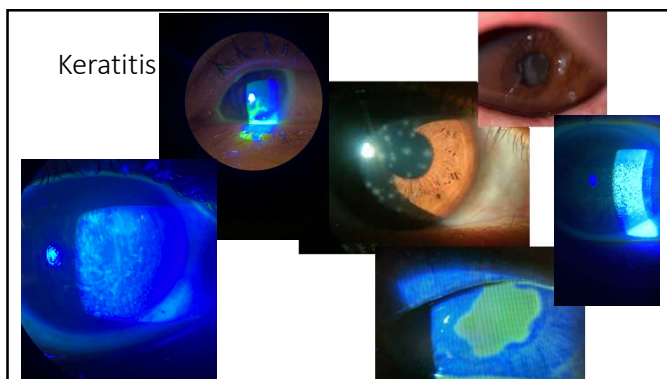
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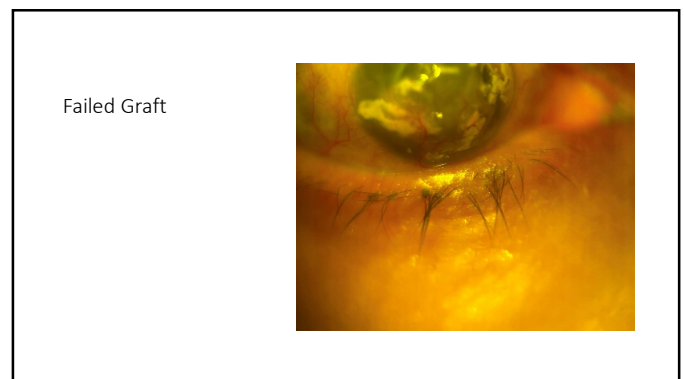
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5



6

Thygeson's Keratitis

Like Uveitis for the cornea

7

What the heck is TSPK anyway?

- Exact etiology remains unknown
- Auto-immune processes have been suspected
- Genetic association with HLA-DR3 – an antigen associated with several auto-immune disorders (like Sjogren's Syndrome)
- This antigen may alter the immune response in these patients which gives way to the prolonged disease course, and the fact that it waxes and wanes throughout years to decades

8

Who Gets TSPK?

- Slight female predilection
- Ages 3 - 70, mean age 29
- No racial bias

9

Signs

- Usually bilateral, but can be unilateral
- Multiple white-grey intra epithelial deposits,
- Lesions cause an elevation of the epithelium and classic negative staining with FL
- 1 – 50 lesions in the central cornea
- Typically 5 – 10 lesions

10

Conjunctiva is Clear

- Corneal sensation remains Normal – unlike in HSK
- Minimal to no conjunctival involvement
- Can be stellate or snowflake in appearance
- Vision is minimally affected
- Does not respond to antibiotic treatment



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Symptoms

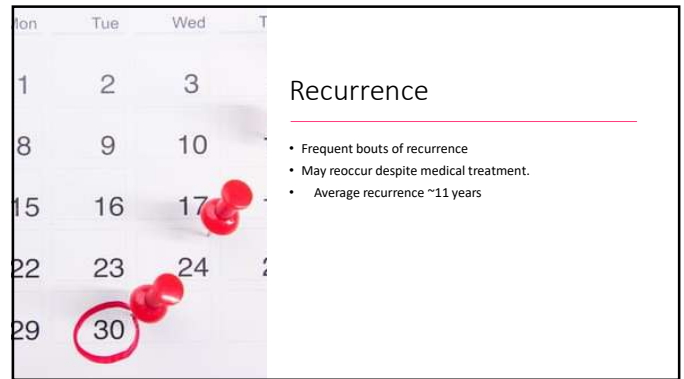
- Burning
- Irritation / foreign body sensation
- Tearing
- Photophobia



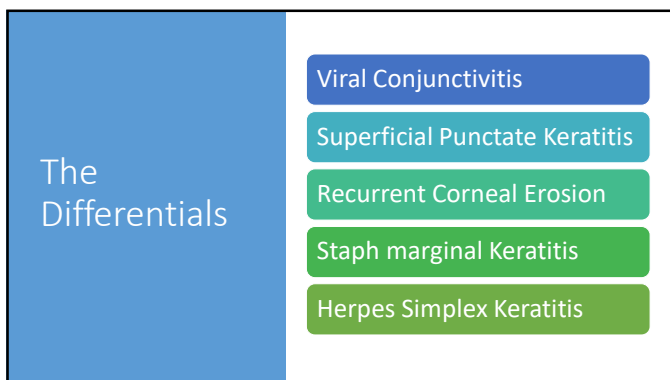
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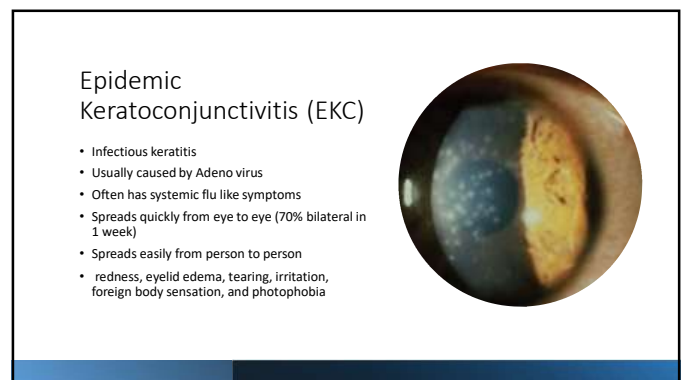
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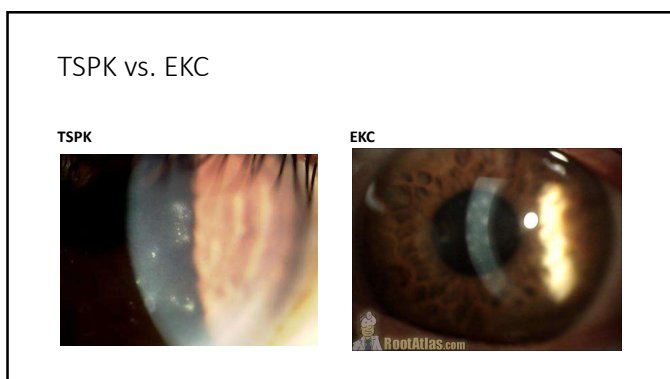
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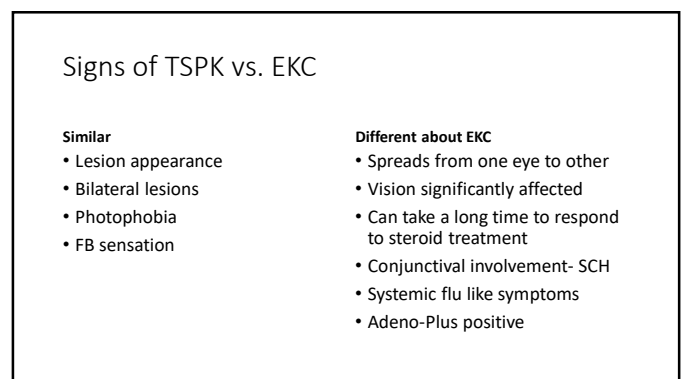
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17



18

4-Step Procedure

Collect sample



Assemble test



Run test



Read results



In Office Testing

- Approximately 1 in 4 patients with acute conjunctivitis have confirmed adenoviral conjunctivitis
- Detects all known serotypes of adenoviral conjunctivitis.
- Early and accurate diagnosis of pink eye may prevent serious consequences including morbidity.
- Overlap exists in the clinical signs and symptoms of acute conjunctivitis
- Can be easily misdiagnosis by eye care professionals
- Help reduce antibiotic resistance

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Superficial Punctate Keratitis

Epi defects, FB sensation, redness

Photophobia, irritation and tearing

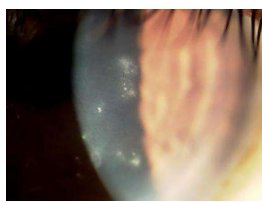
Causes:

- Exposure
- Chemical
- KCS
- Medicamentosa
- Allergy
- Infection: viral or bacterial


20

TSPK vs. SPK

TSPK



SPK



21

Signs of TSPK vs. SPK

Similar

- Lesion appearance
- Bilateral lesions
- Photophobia
- FB sensation

Different about SPK

- Lesion is superficial TSPK is intra-epithelial
- Lesions can be more confluent
- Appear in bands
- Vision may be more affected
- Usually conj involvement

22

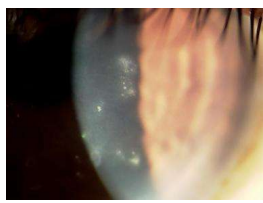
Recurrent Corneal Erosion

- Symptoms occur most often in the morning or middle of the night
- Usually only one lesion
- Significant sudden onset pain
- Sometimes resolve on their own
- May occur months after an initial abrasion

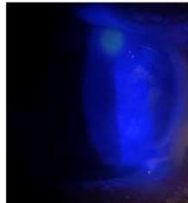
23

TSPK vs. RCE

TSPK



RCE



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Signs of TSPK vs. RCE

Similar

- Lesion appearance
- Photophobia
- FB sensation

Different about RCE

- Usually only one lesion at a time
- Vision may be more affected
- Initial onset is sudden

25

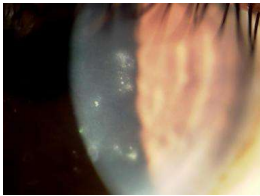
Staph Marginal Keratitis (SMK)

- Small round infiltrates at limbus
- Can be one or multiple
- Redness
- If untreated, lesions will coalesce into larger areas and stain
- Injection of bulbar conjunctiva adjacent to infiltrate
- Zone of clear cornea between limbus and lesion
- Red, watery, photophobia, FB sensation

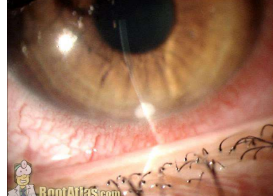
26

TSPK vs. SMK

TSPK



SMK



27

Signs of TSPK vs. SMK

Similar

- Lesion appearance
- Photophobia
- FB sensation
- Vision not significantly affected

Different about SMK

- Lesions are peripheral
- Presents with blepharitis as well

28

Herpes Simplex Keratitis

- Check corneal sensitivity
- HSK will have decreased sensitivity
- Severe infection that can lead to scarring and blindness
- Worsens with steroid

29

What triggers HSK

Fever

hormonal changes

ultraviolet exposure

psychological stress

ocular surgery

ocular trauma

Immunosuppression

Pregnancy

30



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TSPK vs. HSK

TSPK

- Stellate or snowflake lesion
- Little conjunctival injection
- Normal corneal sensation
- Does not respond to antibiotic or antiviral treatment
- High rate of recurrence
- Culture negative
- Usually no scarring

HSK

- Dendritic lesion
- Conjunctival redness
- Decreased corneal sensation
- Responds to antivirals
- 50% recur in five years and 63% at 20 years
- Can culture active lesion
- High probability of scarring

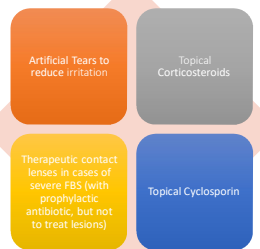
32

TSPK Management

- Not necessary to culture
- Can take slit lamp photos
- Follow up Q1week until lesions begin to resolve
- Q2-3 weeks to monitor IOP, depending on IOP elevation risk

33

TSPK Treatment



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Topical Treatment

- Topical Steroids mainstay: QID until the deposits resolve, slow taper.
- Can use topical Cyclosporine when steroids are contraindicated
- Steroid responder
- Cataract formation
- Long term treatment safe with Cyclosporine

35

TSPK Surgical Intervention?



- PRK and epiabradement have shown to be insufficient in alleviating the inflammation in these patients

36

Case Report JG

- 45 yo Caucasian Male
- Referred in from local optometrist
- Pain, light sensitivity OD X 3 weeks
- VA = 20/30
- Current Medications: Moxifloxacin TID

Most Important Differential

- Rule Out Herpes Simplex Keratitis
- History of fever blister
- Previous HSK infection
- Lesions on lids

37

38

Treatment Plan 1

- Oral Anti-viral
- Review of Dosages:
- Acyclovir – Zovirax – 400mg 5x/day
- Valacyclovir – Valtrex – 500mg TID
- Famciclovir – Famvir - 250mg TID
- 7 - 10 days

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Treatment Plan 2

- Pt did not respond to oral Acyclovir
- HSK Ruled Out!
- Now okay to add steroid
- Pred Forte QID until the deposits resolve
- Slow taper
- Can Rx QD or QOD steroid long term to reduce recurrences

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Filamentary Keratitis

New Treatments

41

Filamentary Keratitis

Key Findings


- Strands or filaments attached to the cornea
- Increased mucus to aqueous ratio in the tear film
- Schirmer's test shows low aqueous production
- Patient notes foreign body sensation

Tests for Filamentary Keratitis


- Slit lamp exam
- Vital dyes (lissamine, fluorescein, rose bengal)

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Treatment Options



- Topical lubricants (tears/ung)
- N-Acetylcystiene drops
- Bandage Contact lenses
- Biologic Membranes
 - Dehydrated AMT
 - AMT Cryopreserved
- Intense Pulsed Light
- Biologic Drops
 - Serum Tears
 - PRP
- Steroids
 - Loteprednol
 - Fluoromethalone
- Immunomodulators
 - Cyclosporine
 - Lifitegrast
- Scleral Contact Lenses



43


Cryopreserved Amniotic Membrane

- Approved by the FDA for:
 - Protective
 - wound healing
 - anti-inflammatory effects.
- Why is it so powerful:
 - extracellular matrix components
 - heavy-chain hyaluronic acids
 - growth factors
 - Fibronectin
 - Collagen
 - promote anti-inflammatory effects and healing



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Dehydrated Amniotic Membrane

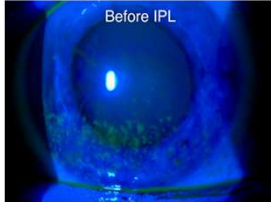


- Room temperature stable allograft derived from human placental tissue collected from consenting donors
- Extra cellular matrix acts as a reservoir of bioactive peptides:
 - Growth factors
 - Cytokines
 - Glycosaminoglycans
- Basement membrane interface acts as a substrate that supports:
 - cellular adhesion
 - transplanar migration
 - proliferation.

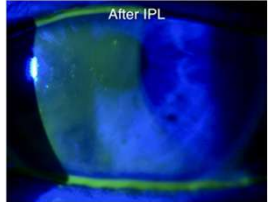
45

IPL for Sjogren's Syndrome, Filamentary Keratitis

Before IPL



After IPL (Photos courtesy of L. Hornick)




Huo Y, Wan Q, Hou X, Zhang Z, Zhao J, Wu Z, Jin X. Therapeutic Effect of Intense Pulsed Light in Patients with Sjögren's Syndrome Related Dry Eye. J Clin Med. 2022 Mar 2;11(5):1377. doi: 10.3390/jcm11051377. PMID: 35268468; PMCID: PMC8911075.

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Neurotrophic Keratitis

It's not rare when it's in your chair.



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Neurotrophic Keratitis Definition



- Degenerative corneal disease
- Damage to the trigeminal nerve (cranial nerve V)
- Loss of corneal sensation
- Breakdown of the corneal epithelium
- Impaired corneal healing
- Persistent epithelial defect → corneal ulceration → stromal melting and perforation

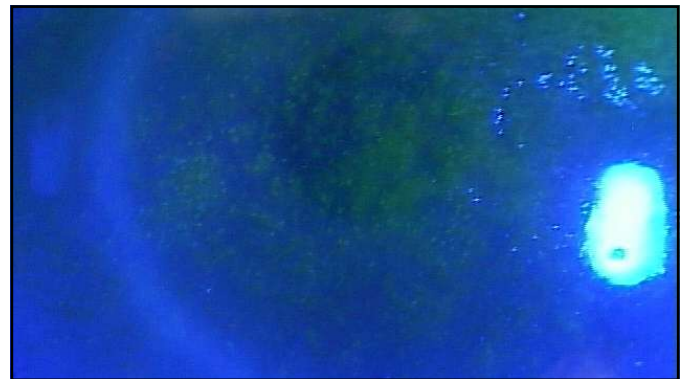
Hallmark: decreased sensation, decreased or no pain

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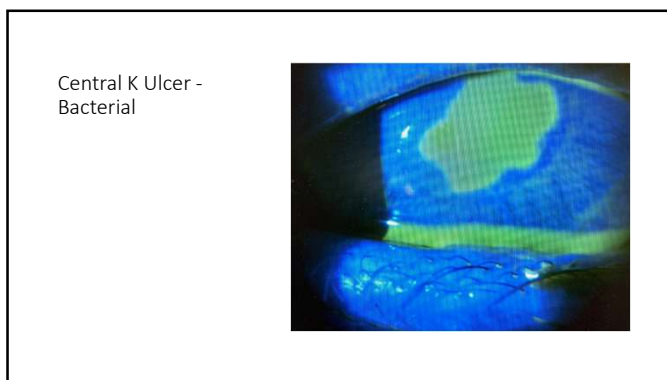
Severity-Based Therapy	Stage	Therapy
	1	<ul style="list-style-type: none"> • Preservative-free artificial tears formulations • Punctal occlusion • Hydrogel contact lens (consider large diameter) • Recombinant human NGF (rhNGF, cenegermin) • Serum/plasma/platelet rich plasma tears
	2	Supportive therapies plus: <ul style="list-style-type: none"> • rhNGF • Scleral lens (± serum/plasma/PRP tears) • Amniotic membrane • Botulinum induced ptosis, Tarsorrhaphy
	3	<ul style="list-style-type: none"> • rhNGF • Keratoplasty + scleral lens, tarsorrhaphy, neurotization

Sacchetti M, Lambiasi A. Diagnosis and management of neurotrophic keratitis. Clin Ophthalmol. 2014;8:571-579. Sheha H, Tighe S, Hashem O, Hayashida Y. Update on cenegermin eye drops in the treatment of neurotrophic keratitis. Clin Ophthalmol. 2019;13:1975-1980. Published Oct 17, 2019.

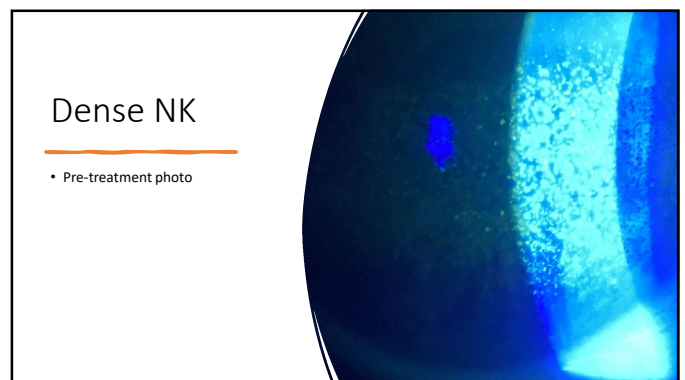
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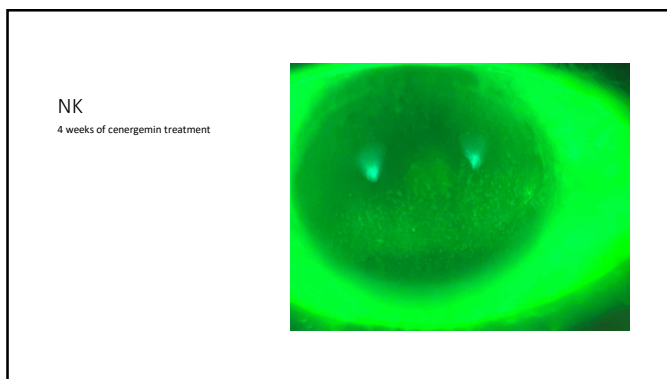
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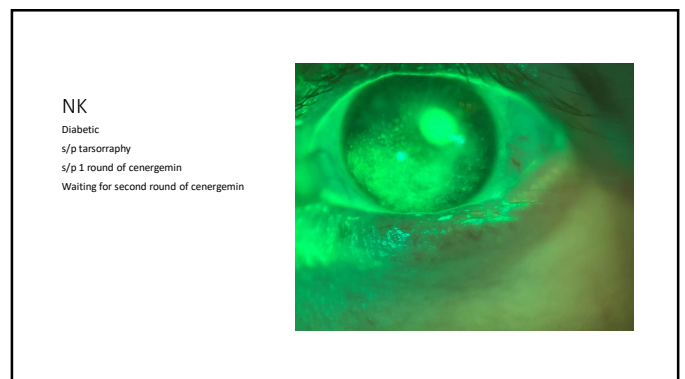
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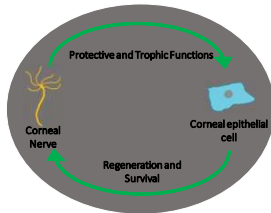


53



54

Corneal Innervation



1. Shaha H. Clinical Ophthalmology. 2019;13:1973-1980.
2. Versura P, et al. Eye and Brain. 2018;10:17-45.
3. Dua HS, et al. Prog Retinal Eye Res. 2018;66:107-131.
4. Saad S, et al. Ocular Surf. doi:10.1016/j.jos.2019.11.008.

The cornea is the most sensitive and densely innervated tissue in the human body^{1,2}

Corneal innervation is essential. Corneal epithelial cells act in a mutually supportive relationship with corneal nerves¹⁻⁴

Corneal nerves: maintain corneal integrity
Protective functions: blinking and tearing
Trophic support: neuropeptides (eg. substance P) promote epithelial cell proliferation, migration, adhesion
Epithelial cells: neurotrophic factors (neuronal extension and survival)

Corneal nerve damage = loss of corneal sensation, epithelial breakdown, poor healing^{1,2}

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Etiology



INFECTIOUS^{1,2}

- Herpes (simplex, zoster)
- Leprosy

IATROGENIC^{1,2}

- Trauma to ciliary nerves by laser treatment and surgery
- Corneal incisions
- LASIK

SYSTEMIC DISEASE^{1,2}

- Diabetes
- Multiple sclerosis
- Vitamin A deficiency

CORNEAL DYSTROPHIES^{1,2}

- Lattice
- Granular

TOXIC^{1,2}

- Chemical burns
- Carbon disulfide exposure
- Hydrogen sulfide exposure

TOPICAL MEDICATIONS^{1,2}

- Anesthetics (abuse)
- Timolol
- Betaxolol
- Sulfacetamide
- Diclofenac sodium
- Ketorolac

MISC³

- CTL
- Increasing age
- Dark eye color
- Adie syndrome
- Limbal stem cell failure (chronic)

FIFTH-NERVE PALSY^{1,2}

- Trigeminal neuralgia surgery
- Neuroplegia (acoustic neuroma)
- Aneurysms
- Facial trauma
- Congenital
- Riley-Day syndrome
- Goldenhar-Gorlin syndrome
- Möbius syndrome
- Familial corneal hypesthesia

1. Dua HS, et al. Prog Retinal Eye Res. 2018;66:107-131.
2. Shaha H. Clinical Ophthalmology. 2019;13:1973-1980.
3. Dua HS, et al. Prog Retinal Eye Res. 2018;66:107-131.

56

Endogenous nerve growth factor (NGF) and its role in NK:

Neurotrophic keratitis (NK) is a result from impaired trigeminal corneal innervation

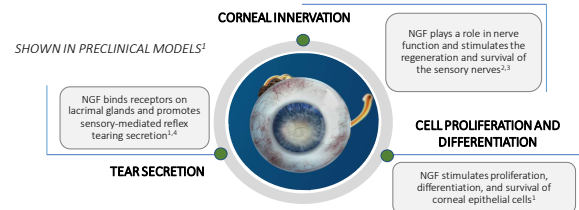
- ↓ Lacrimation and blink reflex
- ↓ Epithelial cell vitality, metabolism, mitosis
- ↓ Epithelial trophism and repair
- ↑ Stromal and intracellular edema
- ↓ Microvilli
- ↓ Development of the basal lamina

Mastropasqua et al. (2017) J Cell Physiol 232:717-24

57

Endogenous NGF Maintains Corneal Integrity By Three Mechanisms

Endogenous nerve growth factor acts through specific high-affinity (ie, TrkA) and low-affinity (ie, p75NTR) nerve growth factor receptors in the anterior segment of the eye to support corneal innervation and integrity.¹



1. Mastropasqua L, Mastropasqua G, Nubile M, Sacchetti M. Understanding the pathogenesis of neurotrophic keratitis: the role of corneal nerves. J Cell Physiol. 2017 Apr;232(4):717-724. 2. Miller LL, Marfurt CF, Kruse F, Tervo TM. Corneal nerves: structure, contents and function. Exp Eye Res. 2013 May;105(5):521-42. 3. Sacchetti M, Lombardi A. Diagnosis and management of neurotrophic keratitis. Clin Ophthalmol. 2014;8:571-9. 4. Mui S, Colafacciolo V, Sacchetti M, et al. Nerve Growth Factor in the Developing and Adult Lacrimal Glands of Rat With and Without Inherited Retinitis Pigmentosa. Cornea. 2002;20:1125-1128.

58

Treatment

- Continue:
 - Cyclosporine 0.05% BID OU
 - Heat Mask
- Stop
 - Oral ceterizine
- Order
 - Cenegermin 20 mcg/mL – Patient to call once meds come in to review meds / demo proper usage
 - Ceterizine ophth sol BID OU
- Follow Up
 - 3-4 months glaucoma / Dilate OCT - G

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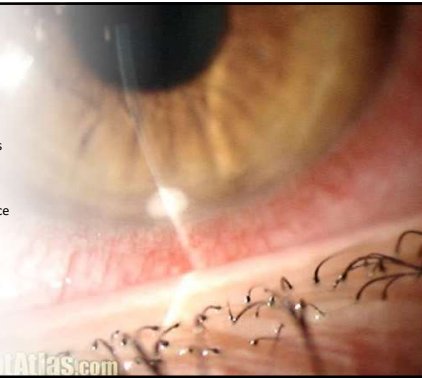
Staph Marginal Keratitis

Is it an ulcer or not... That is the question.

60

Signs of SMK

- Small round infiltrates at limbus
- Can be one or multiple
- Redness
- If untreated, lesions will coalesce into larger areas and stain
- Injection of bulbar conjunctiva adjacent to infiltrate
- Zone of clear cornea between limbus and lesion



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Symptoms of SMK



- Pain, Irritation
- Photophobia
- Watering
- Foreign Body Sensation
- Blurred vision

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Causes and Co-Conspirators

- Overgrowth of Staph aureus bacteria
- Co-Conspirators:
 - Contact Lenses
 - Poor makeup hygiene
 - Ocular rosacea
 - Blepharitis – almost 100%
 - Meibomitis



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Differentials

- Vernal keratoconjunctivitis
- HSV keratitis
- Bacterial keratitis and ulceration
- Old corneal scars
- Exposure keratopathy
- Contact lens induced peripheral ulcer



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SMK vs. VKC

SMK

- Peripheral lesions
- Little conjunctival injection
- Does not respond to antibiotic or antiviral treatment
- High rate of recurrence
- No itching
- Little watery discharge

VKC

- Shield Ulcer
- Conjunctival redness
- Responds to antihistamine & steroid
- High rate of recurrence
- Itching is hallmark
- Thickened discharge

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SMK vs. Exposure Keratopathy

SMK

- Lesions scattered on cornea
- Lesions do not stain
- Mild conjunctival injection
- High rate of recurrence
- Symptoms same all day

Exposure

- Lesions grouped in band
- Band of staining
- May have sig conj Injection
- Recurs until exposure eliminated
- Usually worse in am

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Differentiating an Infiltrate from an Ulcer

SMK - Sterile Infiltrate

- Small lesion <1mm
- Peripheral location – at limbus
- No mucus discharge
- No A/C reaction
- Foreign body sensation
- Mild photophobia
- Mild to no epi defect

Infectious Ulcer

- Large Lesion >1mm
- Central >2mm of limbus
- Mucus discharge
- + A/C reaction
- Significant pain
- Significant photophobia
- Large epi defect

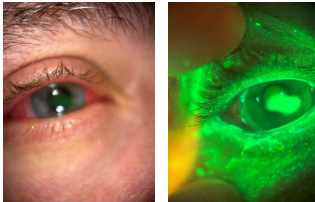
67

Differentiating SMK vs CL related Ulcer

- Sterile
- Localized Conjunctival injection
- Always at limbus
- Not necessarily a CL wearer
- Blepharitis
- Infectious
- Overall conjunctival injection
- Can be further into cornea
- Always related to CL wear
- Giant Papillary Conjunctivitis

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Contact Lens related Keratitis



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Contact Lens and Anterior Eye

Available online 20 December 2021, 101543

In Press, Corrected Proof



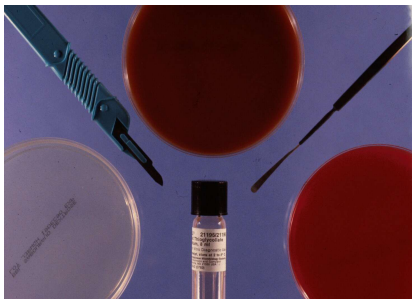
Clinical factors associated with positive corneal culture in suspected microbial keratitis

Matthew Green ^{a,*}, Susan Zhang ^{b,*,✉}, Thomas Nadivulath ^c, Andrew Apel ^d, Fiona Stapleton ^e

Conclusions

In this series positive cultures were associated with poor presenting VA contact lens keratitis (CLK), older age, anterior chamber reaction and no prior treatment with antibiotics.

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Corneal Scrapings

Be certain to remove excess mucous to avoid false negatives (necrotic tissue and PMNs)

Kimura spatula: culture the edge and base of the ulcer, serves to debride the lesion

Gram stain: only 12-60% accurate at predUseful to use **two solid media** (blood and chocolate). Helps to R/O contaminants and aids in ID if there's sparse growth If only one is used chocolate is preferred. Plate Sabouraud's last!

✓Add Lowenstein/Jensen, amoeba culture or HSV swab if necessary.

✓Hold fungal cultures **longer** to assure there is no growth.

✓If you use non-solid medias such as thioglycolate broth use a cotton-tip applicator that's **plastic, not wood** broken into the tube/culturing organism

Giemsa stain: provides better morphologic characteristics of organisms and helps to distinguish bacteria from fungi

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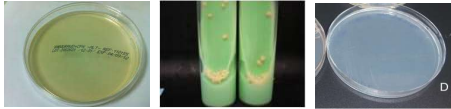
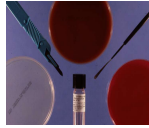
Culture Media

STANDARD MEDIA

- ✓ **Blood:** aerobic organisms, saprophytic fungi
- ✓ **Chocolate:** Neisseria, Moraxella, Haemophilus

SPECIALTY MEDIA

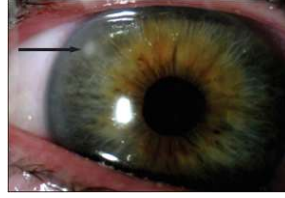
- ✓ **Sabouraud:** fungi (or Inhibitory Mold Agar)
- ✓ **Thioglycolate broth:** aerobic and anaerobic bacteria
- ✓ **Lowenstein-Jensen/slant test or Middlebrook 7H-9:** Nocardia, Mycobacteria species



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Two Treatment Arms for SMK

Resolve Corneal Infiltrate



Decrease Bacterial Overgrowth



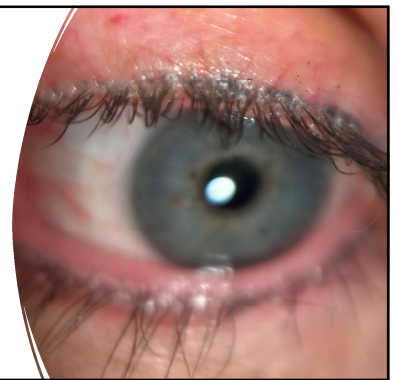
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Resolve Corneal Infiltrate

- Antibiotic followed by a steroid if there is significant epi defect
- Antibiotic / Steroid Combo
- Steroid Alone



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Treat Bacterial Overgrowth

- D/C Contact lens wear
- In office Treatment- Microblepharoexfoliation
- Topical Antibiotic drops or ointment – azithromycin, bacitracin, erythromycin
- Topical Antiparasitic - lotilaner
- Oral Doxycycline 20mg BID
- Lid Cleansers – Daily maintenance
- Makeup Removal
- Makeup Hygiene



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Treatment Options

Prescription
medications

At-home
treatments

In-office
treatments



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Blepharitis: At-Home Cleansing

- Remove Contact lenses
- Makeup Removal
- Lid Cleansers – Daily maintenance
 - Wipes
 - Foams
 - Spray

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Lid and Lash Hypochlorous Acid Cleansing Sprays

- Hypochlorous Acid sprays: naturally produced in the cells of our body
- Natural defense against micro-organisms
- Great for killing staph bacteria around eyes

PROS:

- Great for all skin types
- Found to kill COVID-19 virus
- Can also be applied to face
- Non-drying, Non-irritating
- Can also help to remove dust, dirt and pollens from lashes

CONS:

- Will not effectively eliminate Demodex when used alone
- Some concentrations can be irritating to very sensitive skin

Start with clean face
Remove makeup or moisturizers
Spray directly to closed lids
Allow to air dry

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Foaming Cleanser PROS and CONS

PROS:

- Great to use in the shower
- Can be used after makeup removal to cleanse lids
- Better for oily skin types

CONS:

- Can be drying to the skin as many contain soap
- May Contain Tea Tree Oil

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Eyelid Wipes PROS and CONS

PROS:

- Convenient
- Easy to carry with you

CONS:

- Extra waste products due to individual packaging
- Most still need to be rinsed away
- May Contain Tea Tree Oil

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5 Categories of Makeup Removers

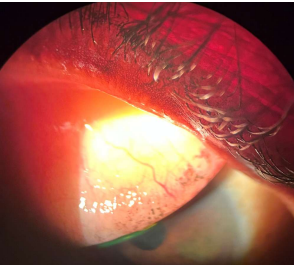
- Micellar
- Oil-Free
- Oil-Based
- Wipes
- Cloths

Must Remove Eye Makeup
Every Night

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Makeup Rules for Best Ocular Health

- Always remove makeup nightly
- No water-proof makeup
- No glitter in your eye shadow
- Avoid powdered eye shadow
- Apply primer to lids before shadow and liner
- Pencil eye liners are best
- No water-lining or tight-lining
- Avoid toxic and irritating ingredients
- Toss out your makeup on time
- Never share your eye makeup
- Never Moisten cosmetics with saliva
- Never alter your makeup with heat
- Never apply makeup on the go
- Never put a product not intended for the eye on the eye

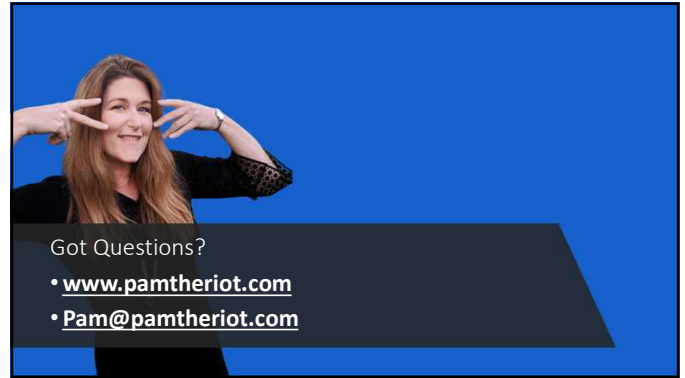


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If not you,
then
who...



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Got Questions?

- www.pamtheriot.com
- Pam@pamtheriot.com

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Thank You

- Vision Expo West
- All of the Meeting Sponsors
- Attendees

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On behalf of Vision Expo, we sincerely
thank you for being with us this year.

Vision Expo Has Gone Green!

We have eliminated all paper session evaluation forms. Please be sure to complete your electronic session evaluations online when you login to request your CE Letter for each course you attended! Your feedback is important to us as our Education Planning Committee considers content and speakers for future meetings to provide you with the best education possible.



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