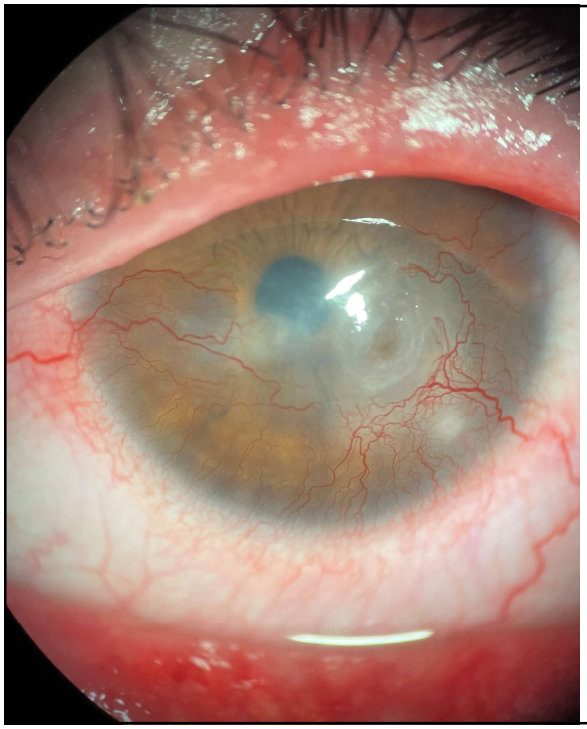

The Diagnostic Detective: Clinical Clues of the Anterior Segment

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TOA Eyecon 2026

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Disclosures

- No financial disclosures
- Associate Professor, RMUoHP

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Course Objectives

1. Comprehend the pathogenesis and clinical features of common clinical signs of the anterior segment.
2. Understand associated etiologies of the unique clinical signs of the anterior segment.
3. Formulate a list of differential diagnoses based on unique clinical signs of the anterior segment in red eye presentations.

3

50F
"My eye is still red"

4

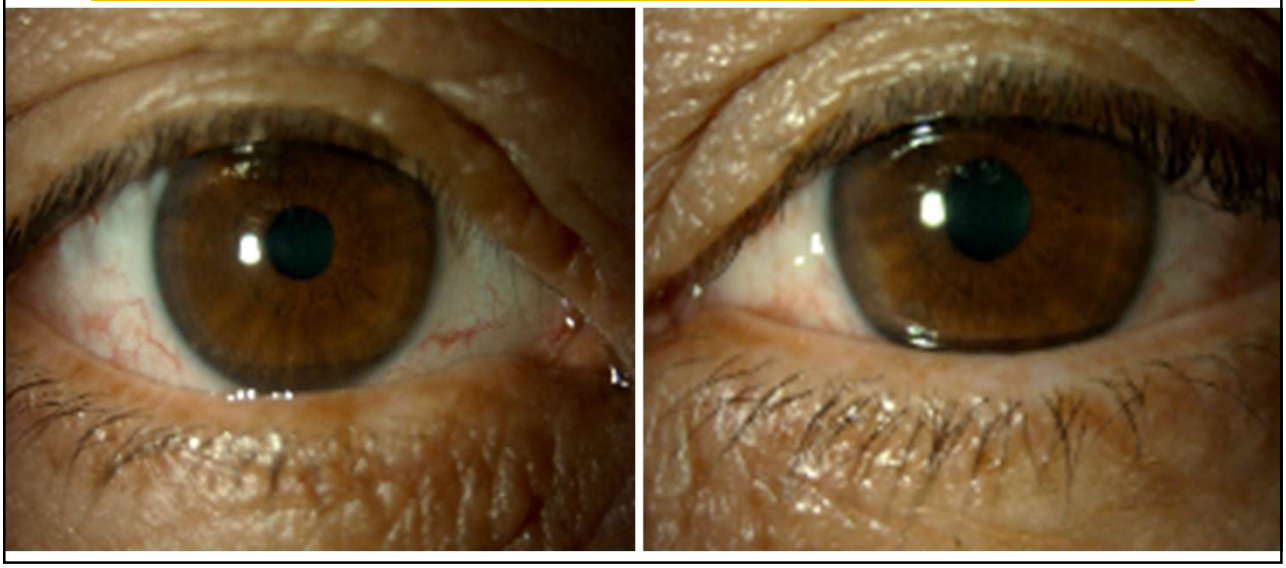
"My eye is still red"

HPI	• Came back 2 months ago but would come and go over the last 6 months
	• OS >> OD
	• Redness, excessive tearing; Denies eye pain or recent illness
	• Saw an eye doctor 2 months ago and told she had allergies and an infection
	  • Given unknown topical allergy drop which provided minimal relief
	  • Used ciprofloxacin gtt for about a week but no relief

POH	• LEE 2 months ago • Cataracts
PMH	• LPE 10 months ago • HTN, thyroid disorder
FHx	• "Diabetes in the eye" – brother • Stroke - brother
MEDs	• Levothyroxine • Losartan
ALL	• Environmental – animal dander • NKDA
SH	• Denies tobacco/alcohol use • Works as a cook at a restaurant

5

"My eye is still red"



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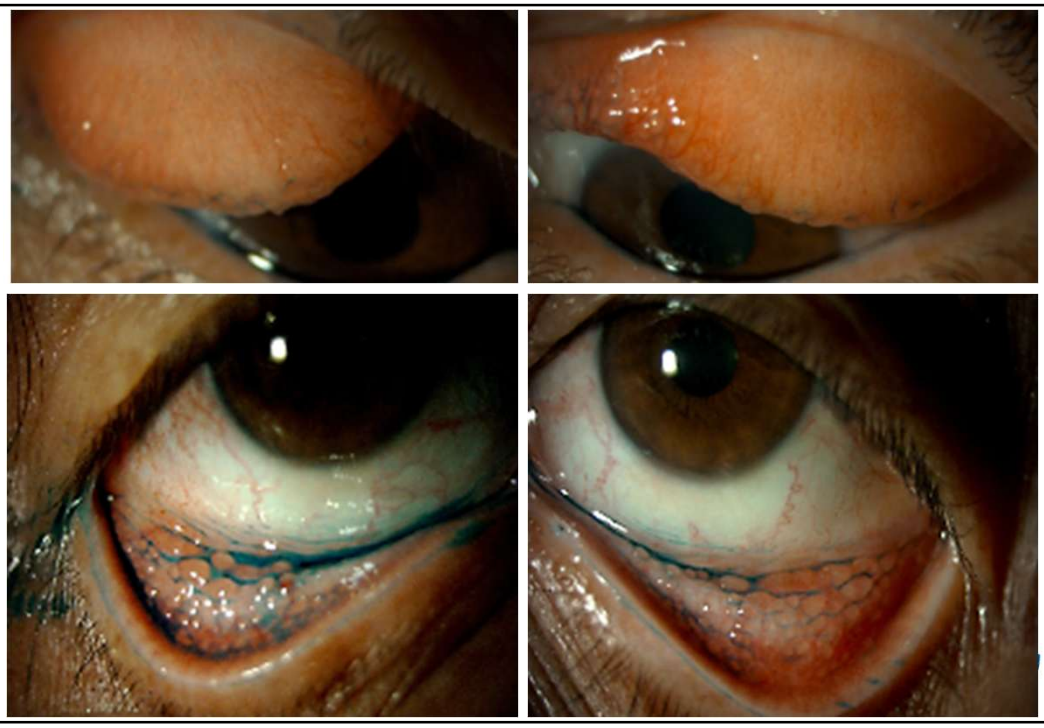
Anterior Segment



7

Differential Diagnoses?

8

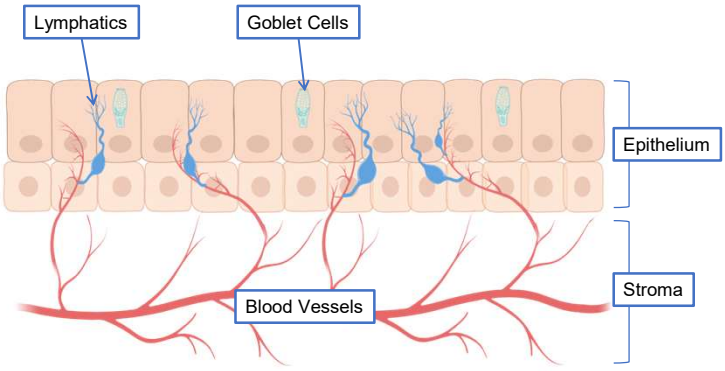
Common Palpebral Reactions

Papillae vs. Follicles

9

Anatomy Review: Palpebral Conjunctiva

- Features non-keratinized stratified columnar epi with goblet cells
- Columnar cells are connected side to side by intercellular junctions (i.e. desmosomes, zonular adherens)
- Vascularization and lymphatic systemic resides in conjunctiva stroma



10

Papillae Presentation

- Fleshy, pink, round elevation, often similar in size in the earlier stages
- Blood vessels course through center of papillae

Fine Papillae

- Smaller, regular in size
- Common in:
  - Seasonal/perennial allergic conjunctivitis
  - Bacterial infections
  - CL wear

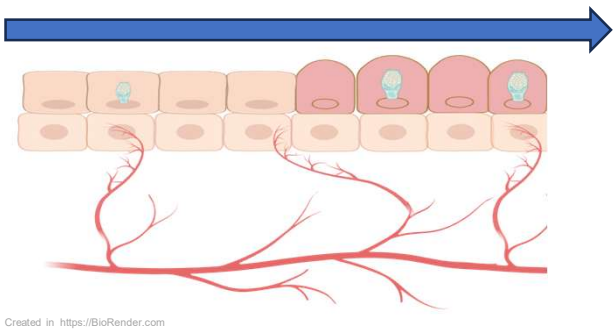
Giant Papillae

- Larger, cobble-stone
- Associated with:
  - Chronic CL over-wear or reaction to modulus
  - Vernal keratoconjunctivitis
  - Atopic keratoconjunctivitis

11

Pathogenesis: Smaller Papillae

Enlarged of columnar cells secondary to mechanical irritation and early infiltration of inflammatory cells



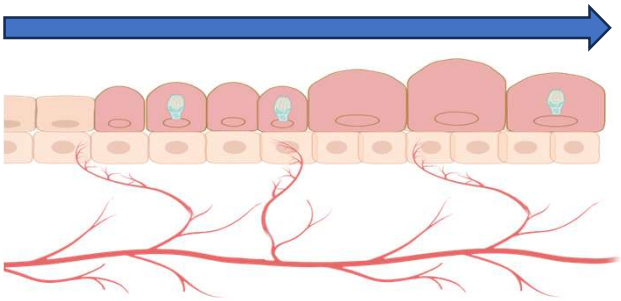
Created in https://BioRender.com

https://www.eyedolatryblog.com/2012/03/patients-guide-to-ocular-allergies.html (Photo from andrewgasson.co.uk)

12

Pathogenesis: Larger or Giant Papillae

Enlargement of columnar cells secondary to ***chronic*** mechanical irritation or hypersensitivity reactions leading to an accumulation of inflammatory cells (i.e. histamine, eosinophils, macrophages, etc).



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Presentation of Follicles

- Clear, fluid-filled lesions of the conjunctiva as a result of increased activity of the lymph system
- Blood vessels pass above or around it

Smaller Follicles

- < 2 mm in size
- Associated with acute viral infections, chronic toxicity of bacterial byproducts, chronic toxicity from ocular preservatives or topical medications

Larger Papillae

- >2 mm in size
- <u>*Highly*</u> associated with *Chlamydia trachomatis*
- Variable size in acute presentation may indicate activity of lymphatic system

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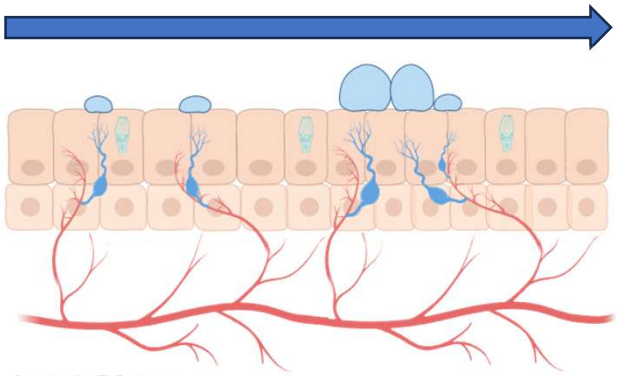
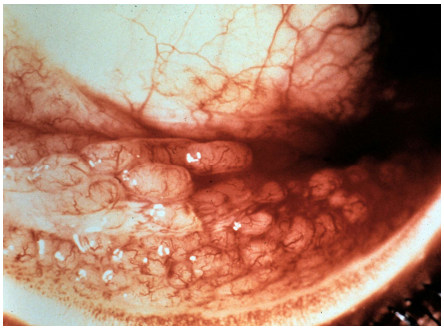
Pathogenesis: Follicles

- Infiltration of inflammatory cells from the lymphatic system
- Inflammatory cells include lymphocytes (oftens with germinal center), macrophages, and dendritic cells





Rajak, Saul & Collin, J & Burton, Matthew. (2012). Trachomatous Trichiasis and its Management in Endemic Countries. Survey of ophthalmology. 57. 105-35. 10.1016/j.survophthal.2011.08.002

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Papillae vs. Follicles

Papillae

- Often ***unspecified*** inflammation (unless giant)
- Onset:
  - Acute: Often result of bacterial infection
  - Chronic:
    - Persistent inflammation
    - Response to byproducts of pathogen (e.g. Staph)

Follicles

- ***Specific*** inflammatory response
- Onset:
  - Acute: Viral infection
  - Chronic:
    - Prolonged infection (e.g. HSV, Chlamydia, molluscum)
    - Chronic inflammation
    - Toxicity (e.g. topical medications, makeup)

16

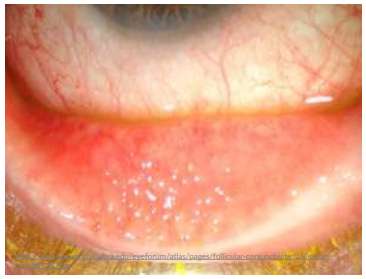
Clinical Differentiation of Papillae vs. Follicles

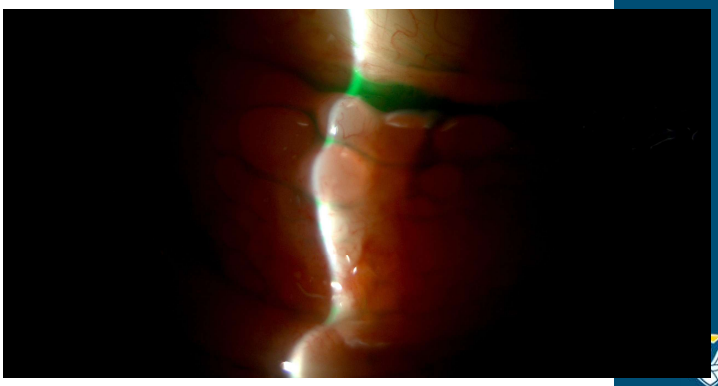
How would you differentiate?

- Color?
- Size?
- Course of vessels?

Tools:

- White light observation
- Vital dyes
- *OPTIC SECTION*!





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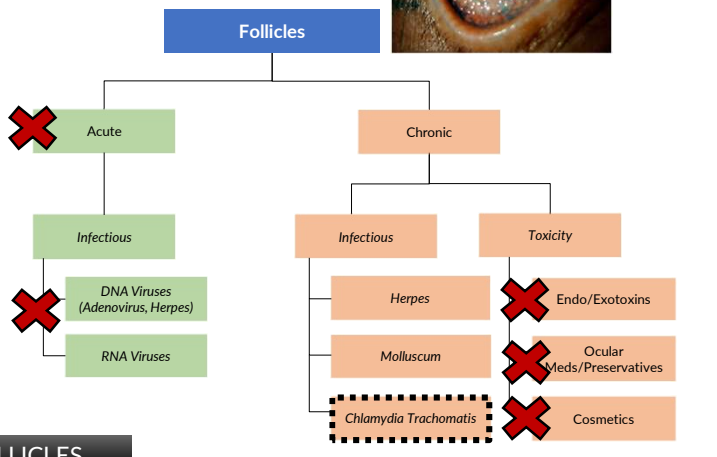
Case: Clinical Clues

- Chronic, wax/wane ~ 5 months
- No recent illness, cold sores, or travel
- No prior history of lid disease/chronic OSD
- Denies using any other topical eyedrop or makeup/creams
- No improvement with topical antihistamine or antibiotic



Recurrent, unilateral red eye with FOLLICLES
LL > UL with scant discharge, +/- PA node

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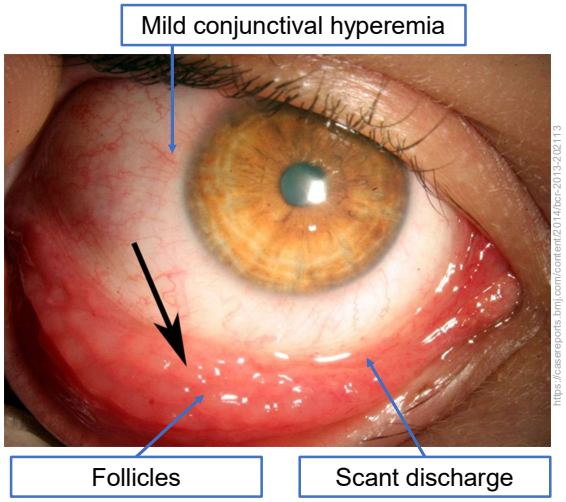
(Adult) Inclusion Conjunctivitis

- Chronic, recurrent ocular infection caused by *C. trachomatis serovar D-K*
- **Consider AIC with history of unilateral, recurrent, chronic red eye with follicles!**
- Clinical presentation:
  - Follicular conjunctivitis: Large follicles (more dense inferior than superior) palpebral conjunctiva
  - (+) PA node is possible
- Drug of choice:
  - Per CDC: Doxycycline 100 mg po x 7 days
  - Use to be Azithromycin 1g single dose



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2

35M
"Bumpy and swollen"

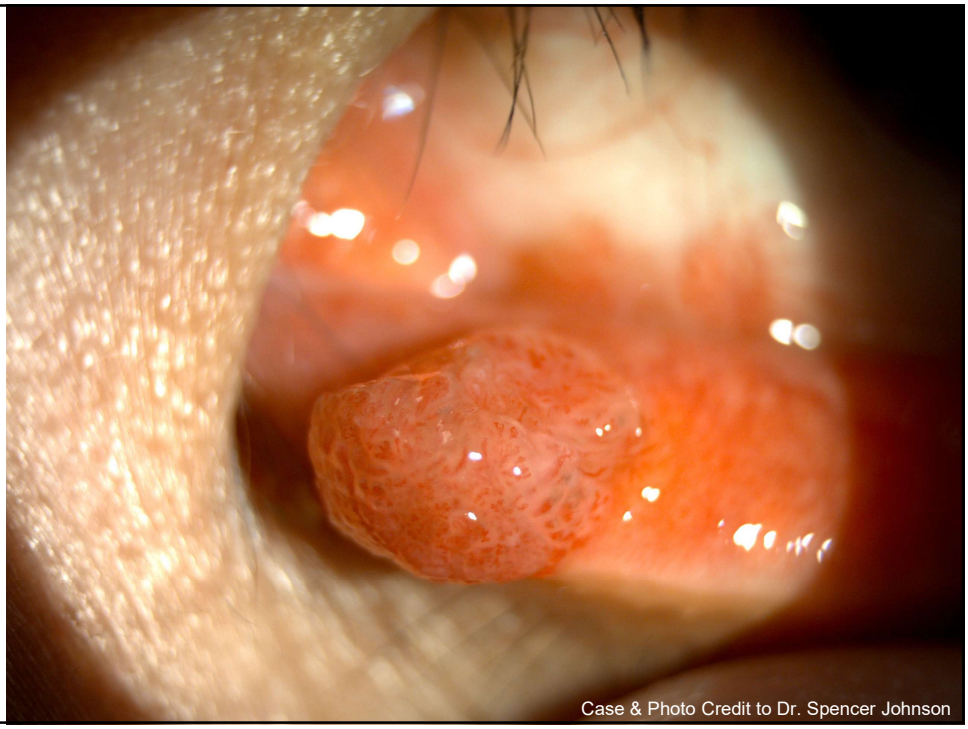
20

"Bumpy and swollen"

HPI	• OS lower eyelid • Onset 3 months ago and noticed rapid change over last month • (+) irritation, FBS, redness • (-) pain, discharge, trauma, infections • Visine gtts which aids in redness relief
POH	• LEE: never • Denies ocular surgery/ trauma / infections
PMH	• LPE: 2 years ago - unremarkable
FHx	• Lung cancer – father • SLE – sister • T2DM / HTN / hyperlipidemia – several family members
MEDs	• Visine PRN
ALL	• Environmental – pollen • NKDA
SH	• Works in lawncare / landscaping • 2-3 beers weekly • Tobacco use x 15 years

21

Anterior Segment



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Differential Diagnoses?

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Eyelid & Conjunctival Lesions

Benign vs. Malignant
Diagnostic Approach

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Lesions: Benign vs. Malignant

Benign

- Lobular capillary hemangioma (pyogenic granuloma)
- Squamous papilloma
  - Eyelid
  - Conjunctiva

Pre or Malignant

- Actinic keratosis (AK)
- Basal cell carcinoma (BCC)
- Squamous cell carcinoma (SCC)

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Lobular Capillary Hemangioma

- Misnamed pyogenic granuloma
- Reactive (not granulomatous inflammation) proliferation of vascular endothelial cells and granulation tissue
- Rapid development
- Response to inciting event:
  - Ocular surgery
  - Inflammation
  - Trauma
  - Punctal plugs

http://webeye.ophth.uiowa.edu/eyeforum/atlas/pages/granuloma-pyogenicum.html#gsc.tab=0

26

(Eyelid) Squamous Papilloma

- Most common benign eyelid lesion
- Flesh-colored pedunculated or sessile lesion with fibrovascular core and overlying acanthosis and hyperkeratosis

Credit to Chapter 12.7, Figure 12.7.2 of Yanoff, Myron, and Jay S. Duker. Ophthalmology. Available from: VitalSource Bookshelf, (6th Edition). Elsevier - OHCE, 2022.

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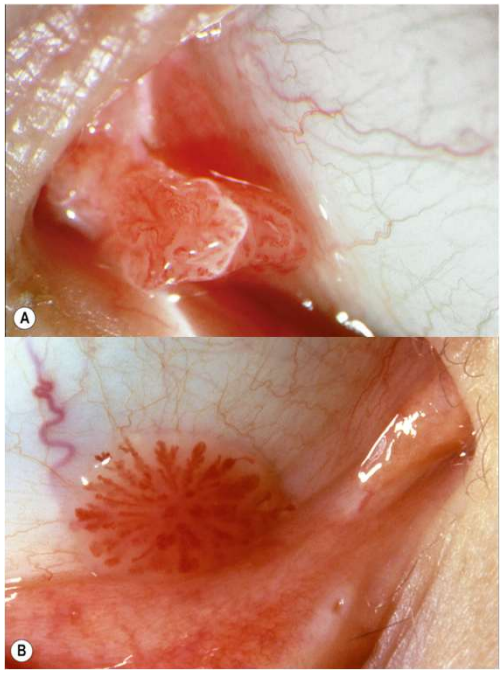
Conjunctival Squamous Papilloma

- Uni- or bilateral benign lesion
- Rises from any part of the conjunctiva
- Characterized by central vascular core with external covering of squamous epithelium
- Most often pedunculated (stalk-like) or sessile (flat)
- Strong association with human papilloma virus (HPV) subtypes 6 and 11



Credit to Chapter 51, Figure 51.3 of Mannis, Mark, J. and Edward J. Holland. Cornea. Available from: VitalSource Bookshelf, (5th Edition). Elsevier - OHCE, 2021.

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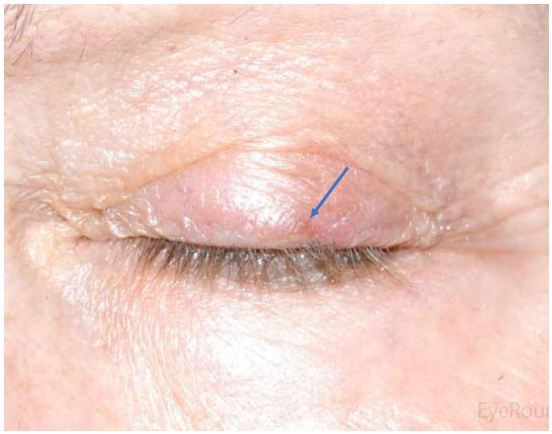
Actinic Keratosis

- Typically small, round, scaly plaques with erythematous base
  - Few millimeter in diameter
  - Can present with horn or wart-like appearance
- Premalignant lesion → 17% risk of transition to SCC over 10-year period
- Associated with UV radiation
- Can become activated (from increase sun exposure) or spontaneously resolve
- Most common in middle-aged to older individuals with light complexion



https://webeye.ophth.uiowa.edu/eyeforum/tutorials/malignant-lesions-of-ext-periocular-tissues/index.htm#ak

29

Basal Cell Carcinoma

- Accounts for 90% of eyelid malignancies
- Nodular, firm, pearly, dome-shaped lesion with surface telangiectasia
  - Found primarily at the lower eyelid followed by medial canthus
  - Can be progress to a central ulceration (rodent ulcer)
- Risk factors include light complexion, UV exposure
- Most common in older patients but up to 15% can occur in ages 20-40 yros
- Rarely metastasizes

Credit to Chapter 28, Figure 28.1 of Mannis, Mark, J. and Edward J. Holland. Cornea. Available from: VitalSource Bookshelf, (5th Edition). Elsevier - OHCE, 2021.

30

Squamous Cell Carcinoma

- Can present on:
  - Eyelid
  - Ocular surface: conjunctiva, limbus, cornea
- Histopathological similarities
- Overlapping risk factors:
  - Older patients
  - Cumulative UV exposure
  - HPV

Sato Y. Squamous cell carcinoma of eyelid. In: Schmidt-Erfurth U, Köhnen T, eds. *Encyclopedia of Ophthalmology*. Springer; 2018. doi:10.1007/978-3-540-69000-9_188

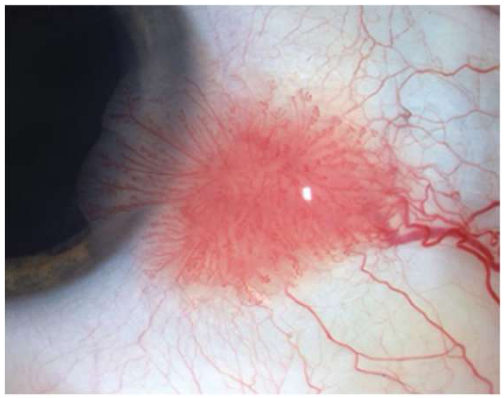


Figure 4.8.8, Yanoff, Myron, and Jay S. Duker. Ophthalmology. Available from: VitalSource Bookshelf, (6th Edition). Elsevier - OHCE, 2022.

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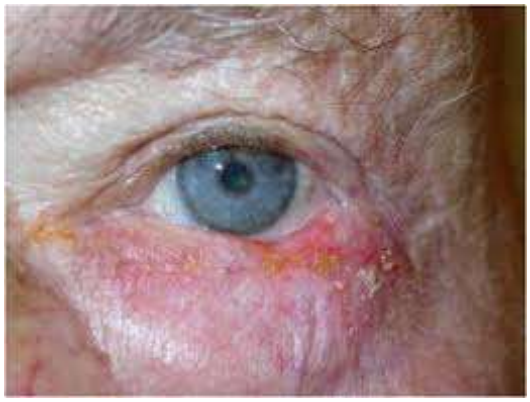
SCC of Eyelid

- 2nd most common eyelid malignancy
  - More likely to present on lower lid
  - Compared to BCC, more likely to present on upper lid and lateral canthus
  - Can arise from AK or de novo
- Epidemiology:
  - Fair skin
  - Higher risk in Black in presence of scarring
- Greater risk of metastases → Up to 24% will have lymph node metastases
- Risk factors include UV exposure, ionizing radiation, arsenic ingestion, HPV



Science Photo Library. *Squamous cell cancer on the eyelid* [photograph]. Accessed September 5, 2026. https://www.sciencephoto.com/media/414574/view/squamous-cell-cancer-on-the-eyelid

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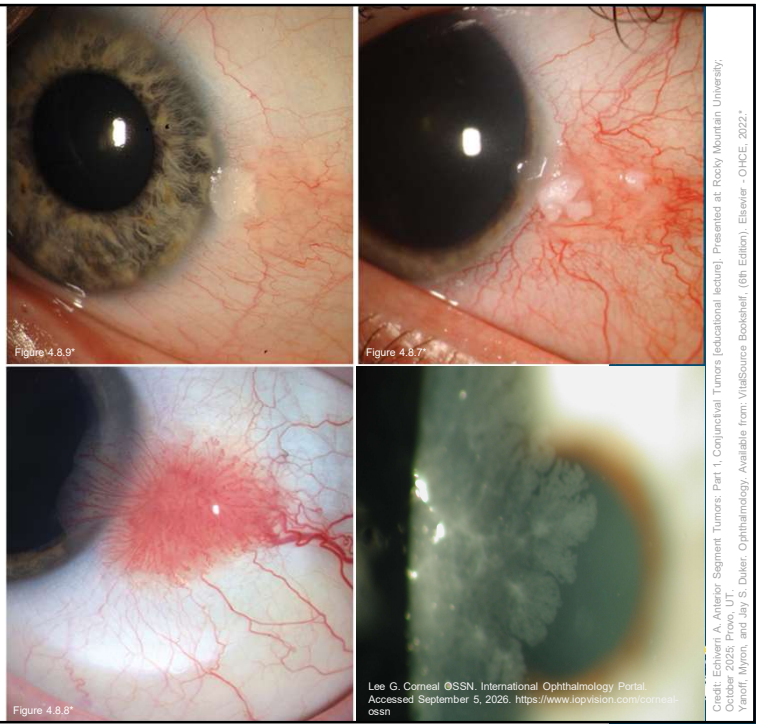
Ocular Surface Squamous Neoplasia

- Spectrum of squamous epithelial ocular surface tumors:
  - Conjunctival intraepithelial neoplasia (CIN)
  - Corneal epithelial dysplasia
  - Squamous cell carcinoma
- Most often at nasal or temporal limbus due to sun exposure
- Risk factors:
  - Tobacco use
  - HIV, HPV
  - Autoimmune condition
  - Organ transplantation



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OSSN Spectrum

Conjunctival Intraepithelial Neoplasia

- Squamous neoplasia contained to epithelium
- Full-thickness replacement of neoplastic cells → Carcinoma in situ

Squamous Cell Carcinoma

- Squamous neoplastic invasion into basement membrane and stroma → Resulting in immobility
- Potential to spread onto cornea
- Pigmented and diffuse are more common characteristics of SCC

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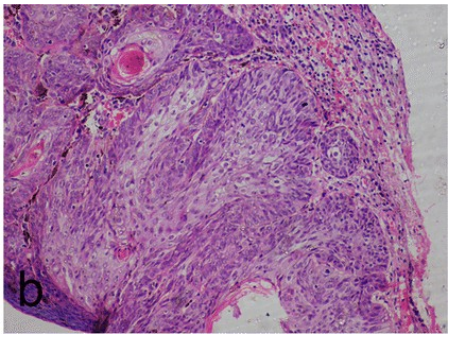
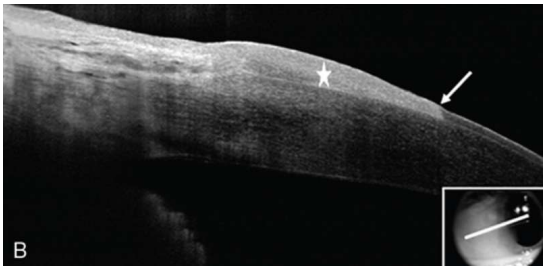
Diagnostic Approach

- Gold standard is histopathologic evaluation
- Impression cytology
- Ultrasound biomicroscopy
- Anterior segment OCT for OSSN:
  - Thickened epithelium
  - Hyperreflective epithelium
  - Abrupt transition from normal to abnormal epithelium

Location dictates the diagnostic modality!



Differential Expression of Stem Cell Markers in Ocular Surface Squamous Neoplasia - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Histopathology-of-ocular-surface-squamous-neoplasia-OSSN-a-Photomicrograph_fig2_307576874 [accessed 5 Sept 2026]



Riaz, Brett Levinson, Faskia Woreta, K. Clinical Atlas of Anterior Segment OCT: Ocular Coherence Tomography. Available from: VitalSource Bookshelf, Elsevier - OHCE, 2024.

35

SCC of Palpebral Conjunctiva

- Limited literature on this subtype → Extremely rare
- Reported as extreme presentation of ocular surface squamous neoplasia spectrum overlap with eyelid presentation
- Often masquerades as:
  - Recurrent Chalazion
  - Chronic conjunctivitis
  - Blepharoconjunctivitis
- Differentiate from sebaceous cell carcinoma

36

3

63M:
"My right eye is blurry"

37

"My right eye is blurry."

HPI	• OD • 1 month duration • Gradual blur at all ranges • Severity 7 out of 10 • Mild photophobia, tearing, redness • Denies pain / irritation / FBS
POH	• LEE 3 months - July 2017 • CE OD/OS – July 2017 • "Eye infection" - August 2017
PMH	• Hypothryoidism • HTN
FHx	• Skin cancer – sister • T1DM – son • T2DM – mom • ARMD - father
MEDs	• Levothyroxine • Losartan
ALL	• NKDA, NKA
SH	• Lawyer • Denies tobacco use • Social drinker – 1-2 drinks/month

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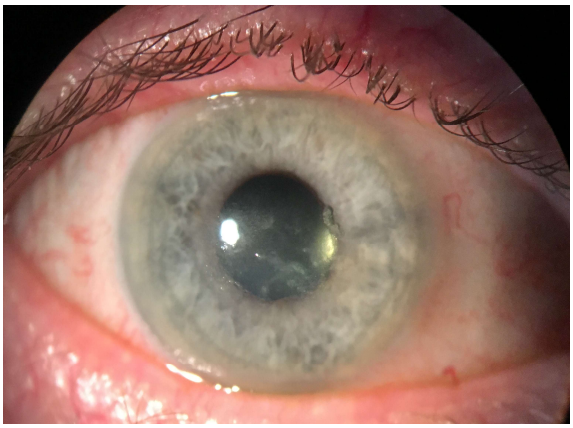
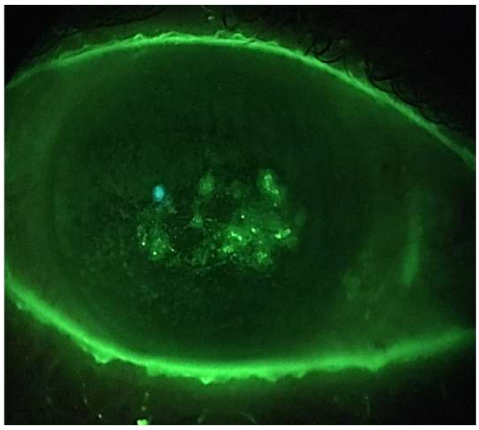
OD Anterior Segment





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Differential Diagnoses?

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Superficial Cellular Defects

Clinical Signs of the Corneal Epithelium

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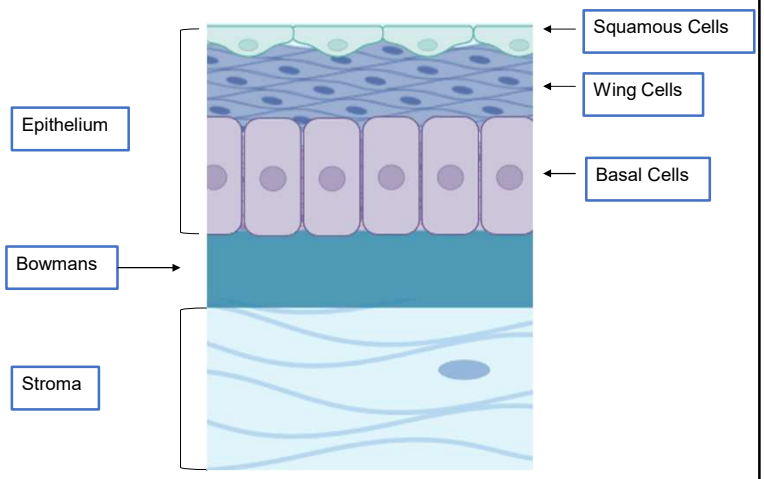
Anatomy Review: Anterior Cornea

- Non-keratinized, epithelium made of three layers
  - Squamous: Most superficial; Flattened cells made up of 1-3 layers
  - Wing cells: Middle; made up of 2-3 layers
  - Basal cells: Deepest; monolayer of columnar cells
- Junctional complexes:
  - Tight junctions between cells
  - Hemidesmosomes to anchor layers to Bowmans



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Types of Micro Defects

- Assess by evaluating the density, location, and laterality or photo-documentation
- Remember the role of vital dyes
- Wratten filter!

Superficial Punctate Staining (SPS)

Punctate staining *without* inflammation

Superficial Punctate Keratitis (SPK)

Small, fine staining accompanied by inflammation

Punctate Epithelial Erosions

Fine to course staining with progressive/worsening due to repetitive breakdown

Persistent Epithelial Defects

Chronic epithelial defect that fail to reepithelialized in the expected time frame (usually > 2 weeks)

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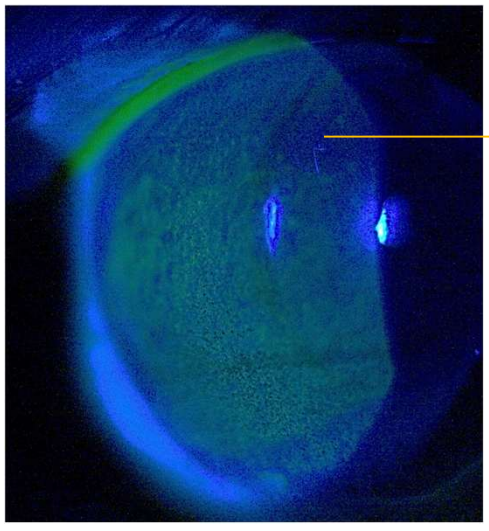
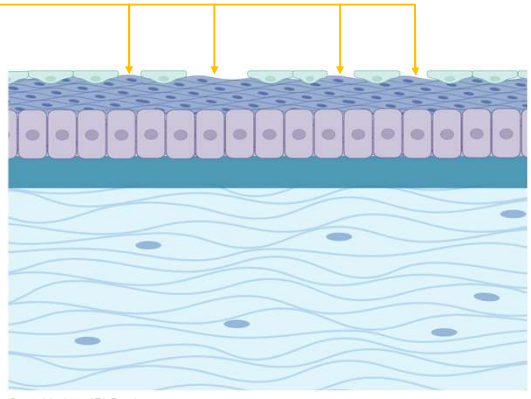
Superficial Punctate Staining





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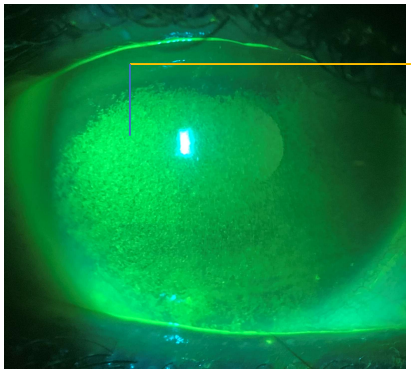
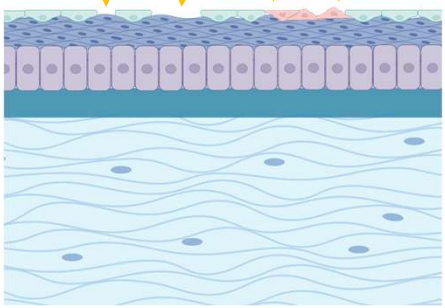
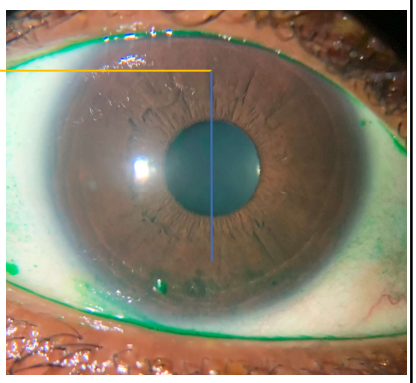
Superficial Punctate Keratitis (SPK)

SPK can stain with NaFl & LG/RB. Accompanying inflammation includes epithelial edema, conjunctival hyperemia, haze, etc.







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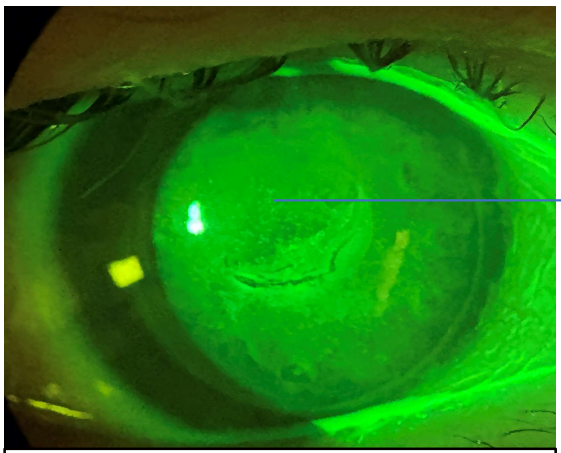
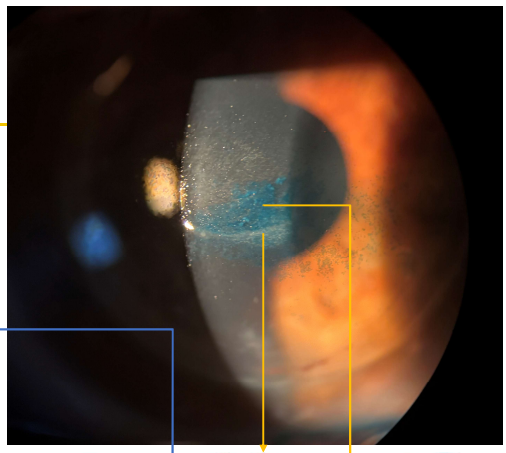
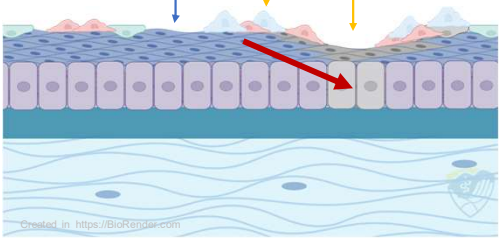
Punctate Epithelial Erosions (PEE)



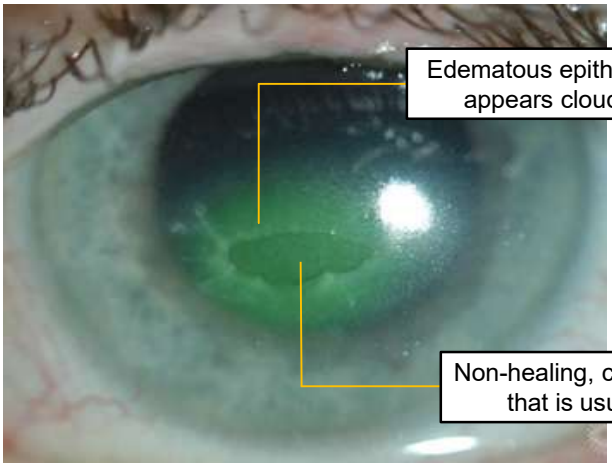
- Coarse, confluent staining
- Repetitive breakdown of epithelium trying to heal but then eroding again



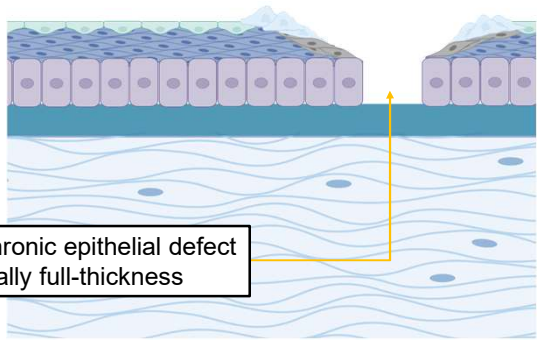


46

Persistent Epithelial Defects



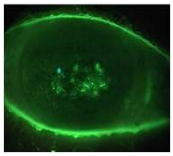
https://www.reviewofoptometry.com/article/fixing-a-hole-how-to-heal-persistent-epithelial-defects



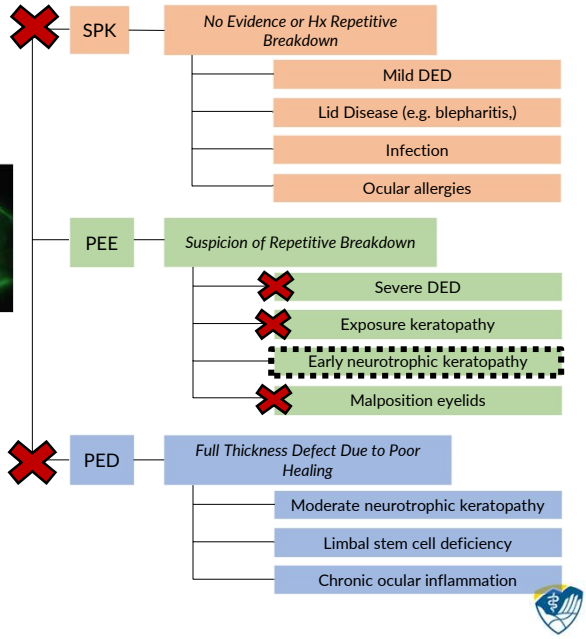
47

Case: Clinical Clues

- Lack of full-thickness defect
- Hx of chronic surface disease (DED)
- Unilateral
- No evidence of lagophthalmos or malposition eyelids



Unilateral PEE with disconnect between signs and symptoms



48

Neurotrophic Keratopathy

ASSOCIATIONS	CLINICAL PRESENTATION
Anything that impairs the trigeminal pathway that can impact the corneal nerves	
• Herpes simplex virus • Varicella zoster virus • Surgical trauma impacting the trigeminal nerve • Diabetes mellitus 1 or 2 • Abuse of topical anesthetic • Blunt or chemical trauma • Intracranial masses • Multiple sclerosis	• ***Hallmark sign: decreased corneal sensitivity by qualitative or quantitative measures*** • Signs outweigh symptoms • SPK/PEE • Anterior corneal edema • +/- neovascularization • Risk of perforation

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Assessing Sensitivity: Dental Floss

Patient consented to recording and future presentations

50

NK: Treatment & Management

Preserve	*Heal*	*Prevent*
• PF lubricants • D/C any preserved topical medications • Punctal occlusion • Serum (autologous/umbilical cord/PRP)	• Cenegermin (Oxervate ®) • Prophylactic PF antibiotics • MMP inhibitors (e.g., doxycycline) • Therapeutic CL (BCL/scleral) • Cryopreserved AM or fresh AM	• Synthetic tissue adhesion • Tarsorrhaphy • AM transplantation • Corneal neurotization

Dana R, Farid M, Gupta PK, et al. Expert consensus on the identification, diagnosis, and treatment of neurotrophic keratopathy. *BMC Ophthalmol*. 2021;21(1):327. Published 2021 Sep 8. doi:10.1186/s12886-021-02092-1

51

41F
"Eye hurts"

52

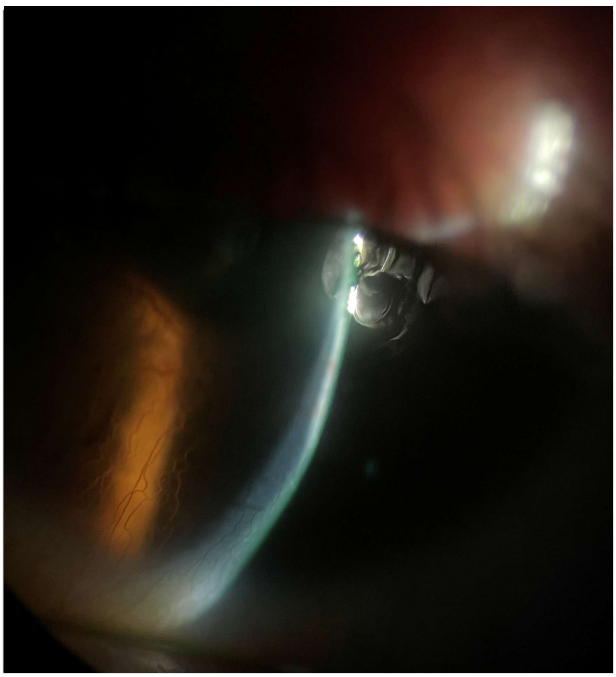
"Eye hurts."

HPI	• OS • Onset 1 year ago • 3 separate episodes of intermittent "pin-point" pain with redness, itchiness that lasts a couple of days • Denies discharge or CL wear
POH	• LEE: 3 months ago • Ocular allergies • Refractive amblyopia OD, OS – Habitual Rx started in early 20s
PMH	• LPE: 7 months ago • Unremarkable
FHx	• HTN – MGF, father, MGM • T2DM – siblings, father, mother
MEDs	• Ketotifen gtts PRN
ALL	• Environmental • NKDA
SH	• Denies tobacco or alcohol use

53

Clinical Examination

Test	Findings
BCVA	OD 20/30 OS 20/60
IOP	OD 14 mmHg OS 18 mmHg
SLE	OD • Thickened lid margins • 1+ papillae with 1+ palpebral hyperemia • Clear cornea
	OS • OS Thickened lid margins • 1+ papillae with 1+ palpebral hyperemia • Corneal thinning (~2/3 loss), round in shape, surrounded by superficial neovascularization
Corneal Sensation	OD = OS by dental floss



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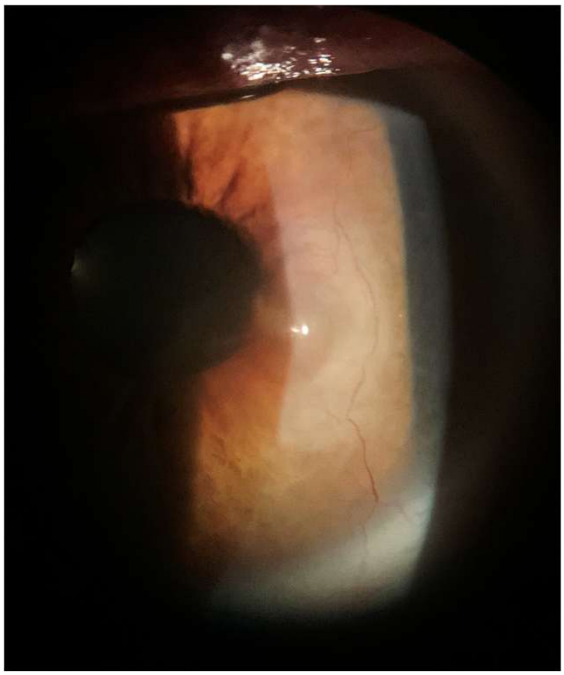
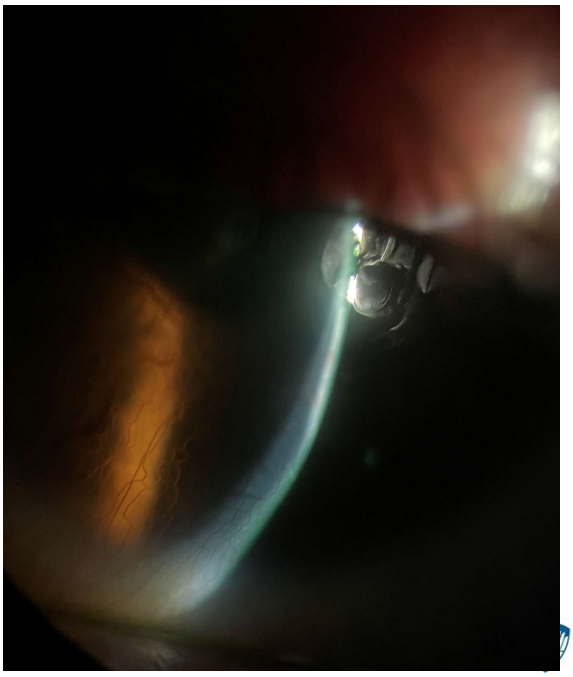
Anterior Segment





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Differential Diagnoses?

56

Corneal Neovascularization

Types of Corneal Neovascularization (and the Company It Keeps)

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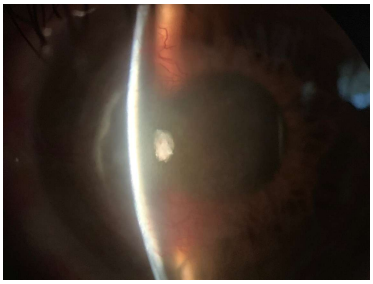
Stromal Neovascularization

Definition: Formation of New Blood Vessels

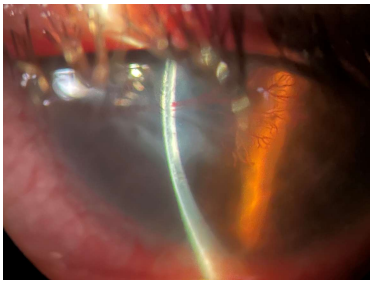
Superficial

- Located anterior stroma
- Response to superficial disease, hypoxia
- Conjunctival or superficial episcleral plexuses



Middle

- Located from mid-stroma
- Chronic inflammation
- Deep episcleral plexus vessels



Deep

- Located in the posterior stroma
- Chronic inflammation
- Deep episcleral plexus vessels

58

Course of Neovascularization

Inciting Event: Microbe, Trauma, Inflammation, Autoimmune

1	2	3	4
Hyperemia	**Stromal Neovascularization**	**Inflammatory Cells**	**Clinical Presentation**
Vasodilation and engorgement	Vascular pathway into avascular cornea	Release of leukocytes and inflammatory cytokines	Infiltrates +/- Edema +/- Suppuration

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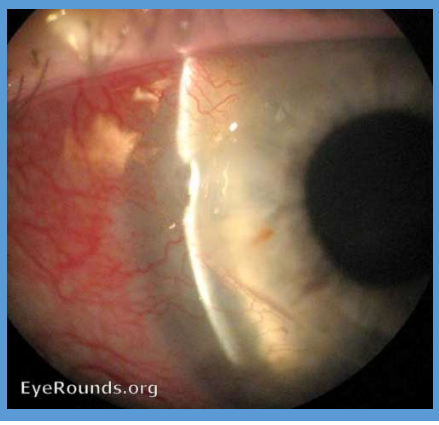
Keratolysis (aka Corneal Melt)

Definition:
Process of progressive corneal necrosis



https://www.eyerounds.org/atlas/pages/peripheral-ulcerative-keratitis-PUK-in-rheumatoid-arthritis.html#gsc.tab=0

Infection
- Risk with any microbe
- More likely with unresponsive/unresolving

Immune-Mediated
- Autoimmune conditions
- Ocular or systemic inflammation

Trauma
- Surgical
- Chemical

Topical Ophthalmic Medications
- Topical NSAIDs
- Topical corticosteroids

60

From Epi Break to Perforation

Pathogenesis of Corneal Melt

1 → 2 → 3 → 4

Epithelial Compromise

PEEs or PEDs; Repetitive breakdown or inability to heal

Immune Reaction

Stromal lysis due to proteases released from host immune or microbe

Structural Change

Stromal lysis resulting in Descemetocele

Perforation

Can result from progressive lysis or trauma-induced break

Definition of Clinical Sign - Descemetocele:
Destruction of the entire epithelium and stroma, leaving only Descemet membrane and endothelium

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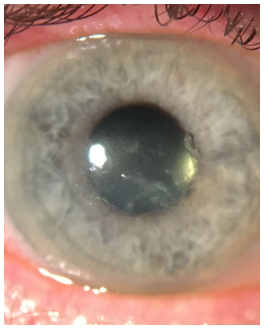
From Epi Break to Perforation

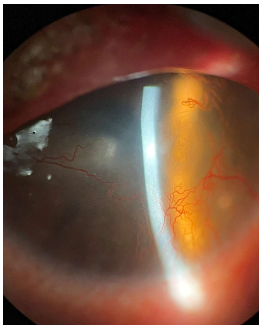
Clinical Presentation

1 → 2 → 3 → 4

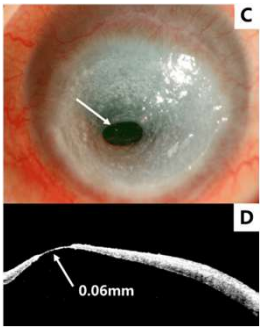
Epithelial Compromise



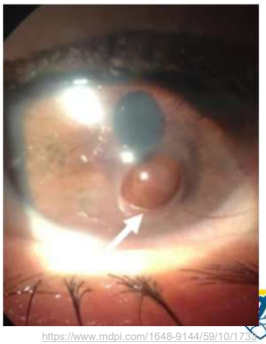
Immune Reaction



Structural Change



Perforation



https://www.mdpi.com/1648-9144/59/10/1755
https://joii-journal.springeropen.com/articles/10.1186/s12348-020-0195-8

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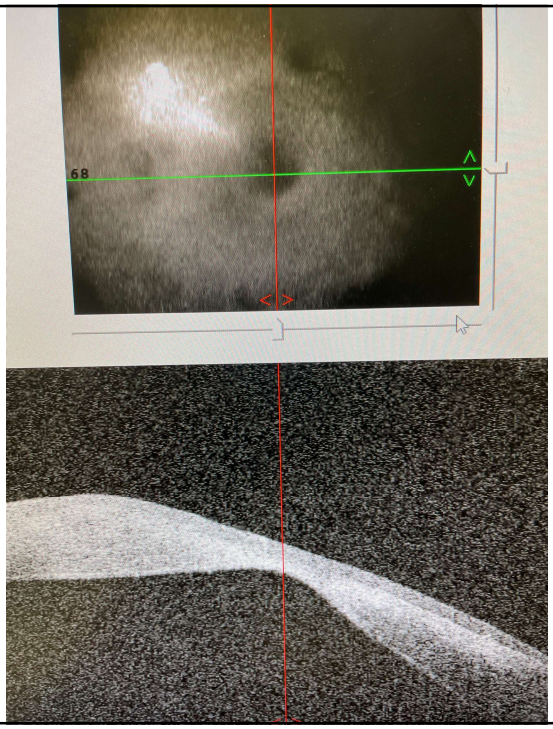
Descemetocele

- Destruction of the epithelium and stroma, leaving only Descemet membrane and endothelium
- Risk of corneal perforation
- Etiologies:
  - Microbial keratitis
  - Neurotrophic keratopathy
  - Severe ocular surface disease
  - Autoimmune disorders
  - Inflammatory corneal melting disorders

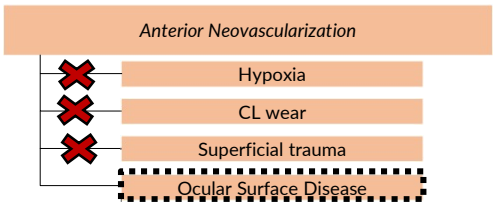


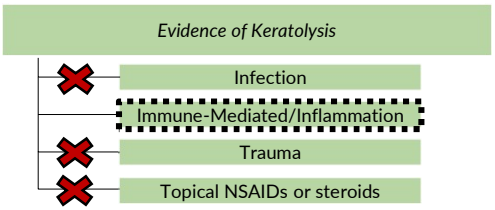
63

Case: Clinical Clues

- Unilateral, chronic red eye
- Superficial neovascularization with associated descemetocele
- No trauma, previous infection
- Unremarkable systemic health

Evidence of ocular inflammation with associated corneal melt → Rule out systemic before deeming it local





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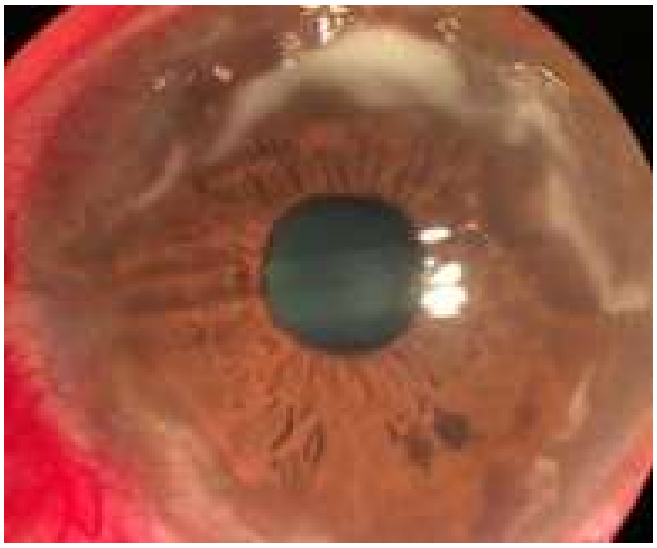
Systemic vs. Local Associations of Corneal Melts

- Systemic:
  - Rheumatoid arthritis
  - Granulomatosis with polyangiitis Systemic lupus erythematosus (SLE)
  - Polyarteritis nodosa
  - Relapsing polyangiitis
- Local:
  - Mooren's ulcer
  - Severe ocular surface inflammatory disorders (e.g., GVHD, SJS, OCP)
  - Staph. marginal keratitis
  - Phlyctenulosis



65

27M
"I think I have an infection"

66

"I think I have an infection"

HPI	• OS • Started 10 months ago • Redness, discomfort, very cloudy vision • Denies pain or itchiness • Given NaCl gtts by PCP 10 months ago – no relief
POH	• LEE: Never • Denies trauma / infections / ocular surgeries
PMH	• LPE 10 months ago • Unremarkable
FHx	• Hyperlipidemia – parents • Unknown cancer - MGM
MEDs	• None
ALL	• NKDA, NKA
SH	• Construction work • 3-4 beers /week • Former tobacco use

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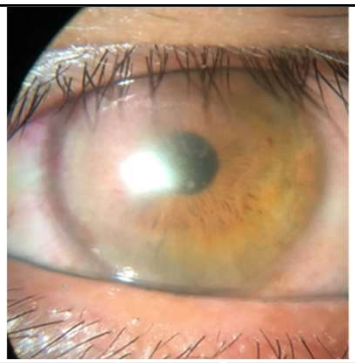
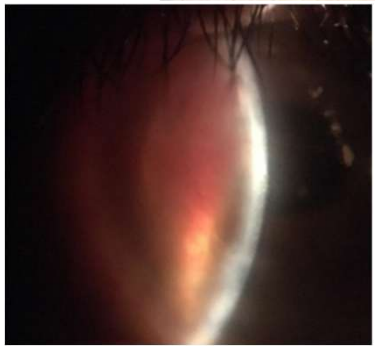
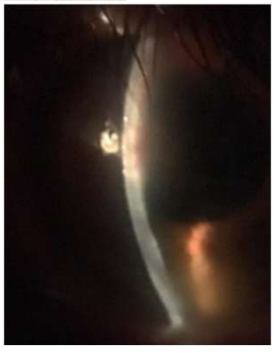
Clinical Examination

- BCVA OD 20/20, OS 20/200 NIPH
- IOP OD 13 mmHg, OS 20 mmHg
- N/T pinguecalae OD, OS
- 2+ nasal injection OS







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Differential Diagnoses?

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Infiltrates

Infiltrates of the Cornea Based on Layers

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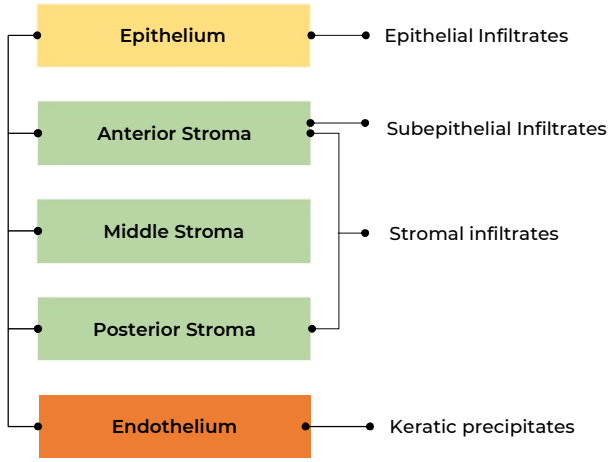
Localizing Infiltrates

What Are Infiltrates?

Inflammatory cells composed of leukocytes

Can be single, multiple, or diffuse



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Corneal Epithelium Infiltrates

- Uncommon presentation of infiltrates
- Can present in corneal graft rejection

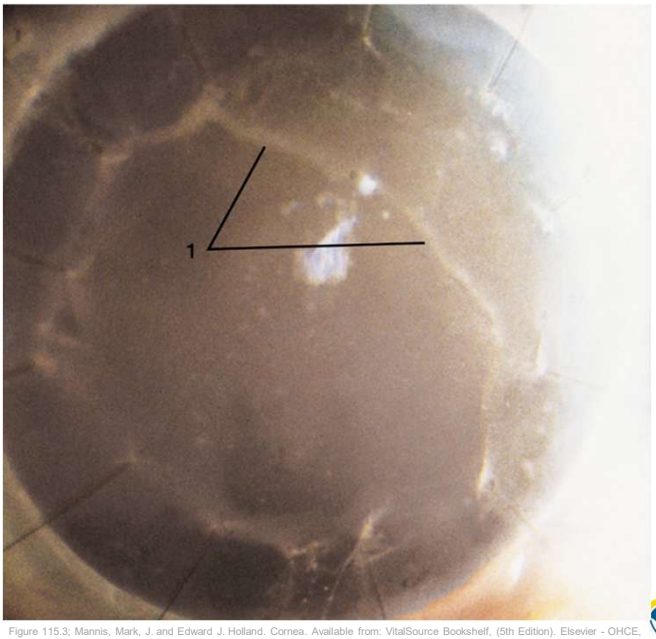
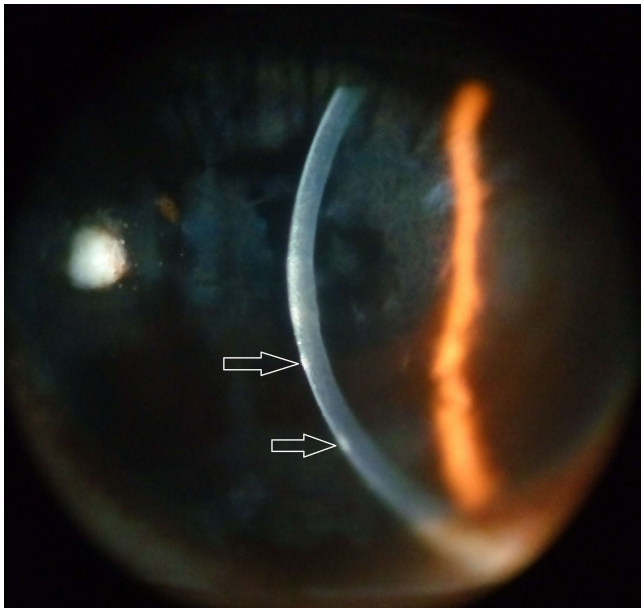


Figure 115.3; Mannis, Mark, J. and Edward J. Holland. Cornea. Available from: VitalSource Bookshelf, (5th Edition). Elsevier - OHCE, 2021.

72

Subepithelial Corneal Infiltrates

- Less common presentation of infiltrates
- Located in anterior stroma and often round
- Can present diffusely with overlying defect (e.g., dendritic keratitis)



https://upload.wikimedia.org/wikipedia/commons/8/8f/Subepithelial_corneal_infiltrates.jpg

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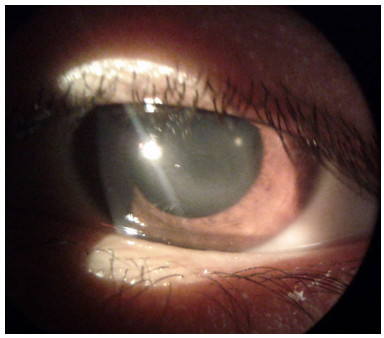
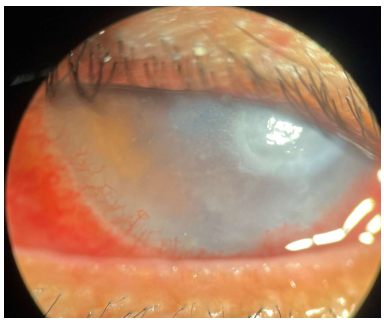
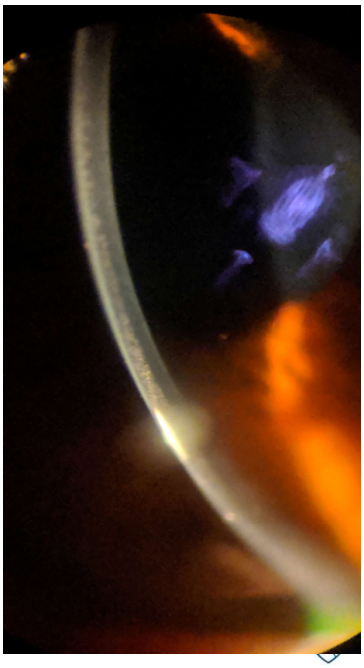
Corneal Stromal Infiltrates

- Indistinct faint to dense grainy haze
- Varying presentations and density
- May be accompanied by:
  - Middle / deep neovascularization
  - Edema







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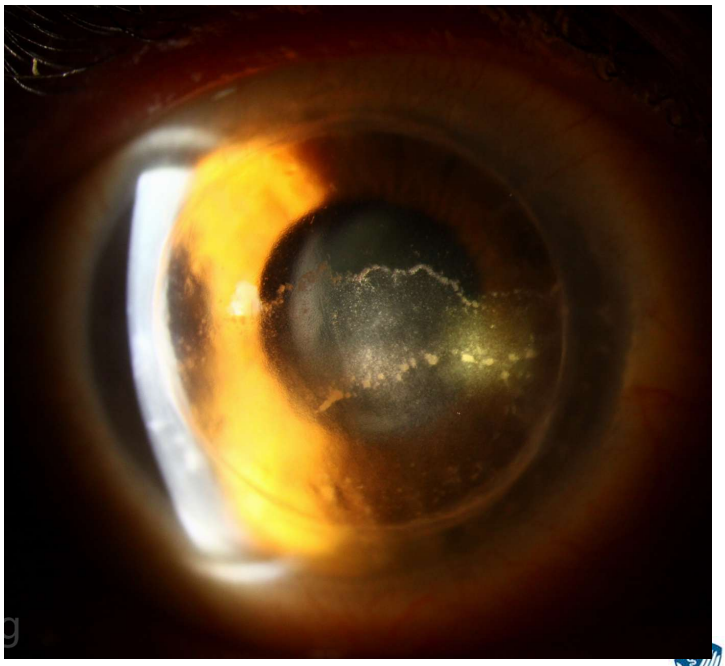
Infiltrates on the Endothelium

- Presents on the back of the endothelium
- Various:
  - Shapes: fine, stellate, large
  - Pattern: diffuse, linear, coin-like



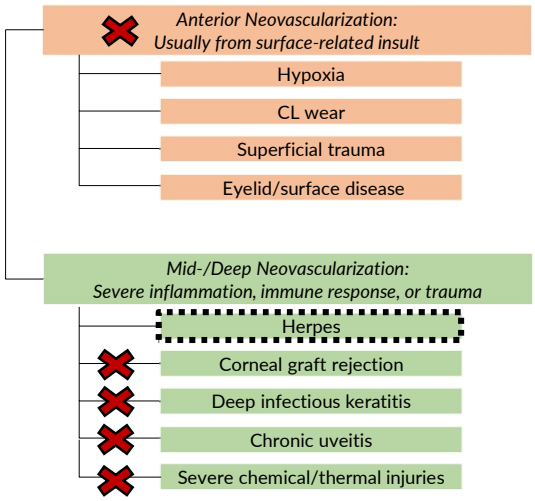
Provencher L, McGehee T. *Khodadoust line.* Photograph by Jody Troyer. EyeRounds.org Atlas of Ophthalmology, University of Iowa Department of Ophthalmology and Visual Sciences. Accessed September 5, 2026. https://webeye.ophth.uiowa.edu/eyeforum/atlas/pages/khodadoust-line.htm

75

Case: Clinical Clues

- Location mid-stroma
- No history of trauma or prior eye surgeries
- Severe corneal involvement with no hx of photophobia
- No evidence of corneal ulcer
- Unilateral
- (-) Eye pain

Unilateral stromal infiltration +/- deeper neovascularization in absence of sharp eye pain



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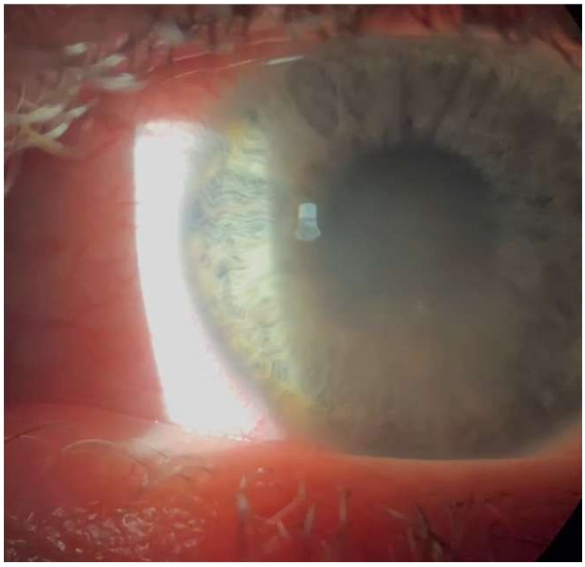
Immune-Mediated Stromal Keratitis

- ***Immune-mediated*** response to:
  - Viral particles of Herpes (HSV, VZV, CMV) → ***Associated with decreased K-sensitivity!***
  - Others: Treponema pallidum
- Clinical features:
  - Diffuse, multifocal, or focal infiltrates within stroma
  - +/- middle to deep neovascularization
  - Nonulcerative
  - Stromal edema may be present
- Tx: Aggressive topical steroids with consideration of etiology



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6

56WM
"My eye hurts"

78

"My eye hurts"

HPI	• OD • Started 3 months ago • Dull achy eye pain, worse with lights • Photophobia was 10/10 but now 3/10 • Denies discharge or recurrence • Treated by eye doctor 2 months ago for unknown red eye → noticed slight improvement but did not continue after 2 weeks of care; unknown Rx eye drops and no longer taking
POH	• LEE: 2 years ago • Dry eyes
PMH	• LPE 7 months ago • Hypertension • Hyperlipidemia
FHx	• Unknown; adopted
MEDs	• Rosuvastatin • Amlodipine
ALL	• Sulfa allergies • Animal dander
SH	• Tax accountant • Rare alcohol use – 1x a month • Former smoker in 20s

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Clinical Examination

- BCVA OD 20/20, OS 20/20
- Non-reactive pupil OS, (-) APD OD, OS
- IOP OD 22 mmHg, OS 14 mmHg
- AC OD trace cell, no flare; OS (-) C/F
- Broken posterior synechiae OS
- Transillumination iris defect (TID)

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Differential Diagnoses?

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Iris Abnormalities

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Iris Abnormalities

- Inflammatory nodules
- Iris neovascularization
- Dyscoria
- Iris atrophy
- Posterior synechiae
- Transillumination iris defects

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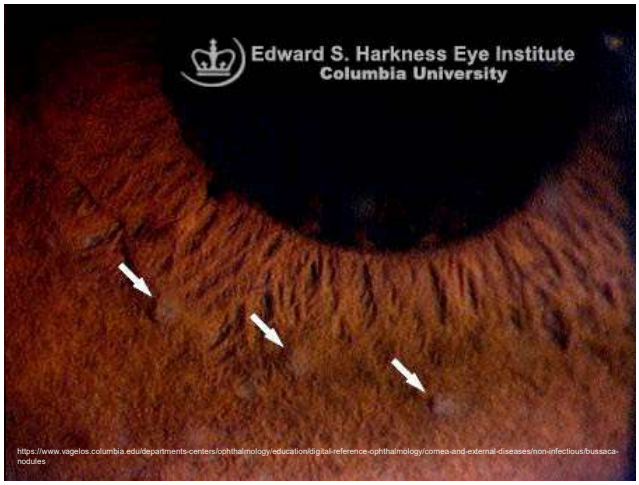
Iris Inflammatory Nodules

- Koeppe nodules:
  - Inflammatory nodules located at the pupillary margin
  - Can be present in non-granulomatous or granulomatous inflammation
- Busacca nodules:
  - Inflammatory nodules located in the midperiphery
  - Pathognomonic for GRANULOMATOUS inflammation



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Iris Neovascularization

- Also referred to as iris rubeosis
- Indicator of ocular ischemia
  - Proliferative diabetic retinopathy
  - Vascular occlusions
  - Ocular ischemic syndrome
- Can result in neovascular glaucoma

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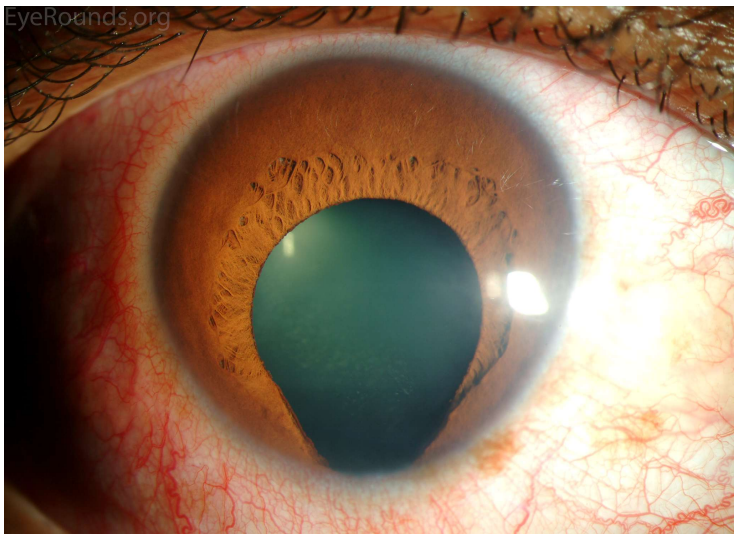
Dyscoria

- Irregular pupil shape
- Can be associated with congenital defects, trauma, surgery, inflammation, or neurological/systemic causes

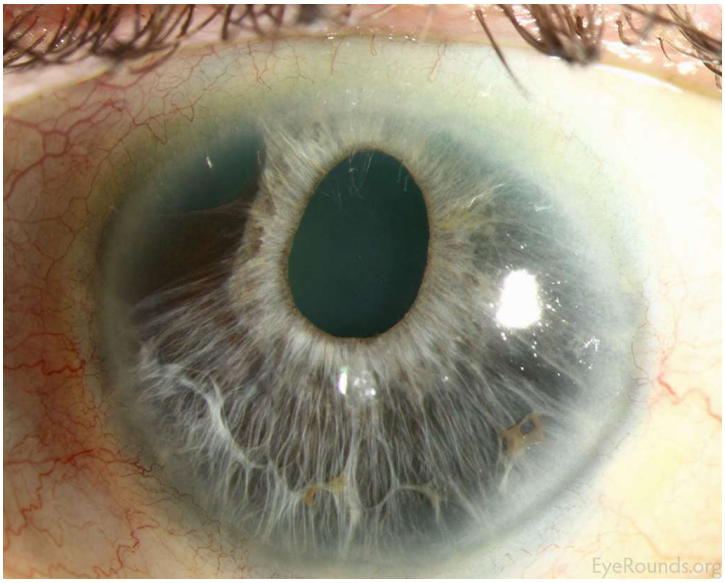


DrVislisel J. *Iris coloboma*. Photograph by Stefani Karakas, CRA. EyeRounds.org Atlas of Ophthalmology, University of Iowa. Published July 12, 2016. Accessed September 5, 2016.

86

Iris Atrophy

- Thinning or degenerative change of the tissue
- Can present in congenital conditions, aging degenerative changes, viral infections, trauma, surgery
- Clinically can present as dyscoria, irregular/loss of iris pigmentation, and heterochromia



Vislisel J. *Essential iris atrophy, iridocorneal endothelial (ICE) syndrome.* In: *EyeRounds.org Atlas of Ophthalmology.* University of Iowa Department of Ophthalmology and Visual Sciences. Photograph by Chan C. Accessed September 5, 2026. https://eyerounds.org/atlas/pages/essential-iris-atrophy/

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Posterior Synechiae

- Adhesions of posterior iris to the anterior surface of the crystalline lens due to ocular inflammation
- Detectable on biomicroscopy, particularly after mydriasis
- High association with uveitis, especially with *significant flare*
- Broken synechiae are evident by remnants of iris tissue, pigment, and fibrosis

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Transillumination Iris Defects

- Complete or almost complete absence of iris tissue
- Associated with:
  - Congenital conditions
  - Trauma
  - Herpetic infections
  - Secondary glaucoma:
    - Pigmentary glaucoma
    - Pseudoexfoliative
    - ICE syndrome

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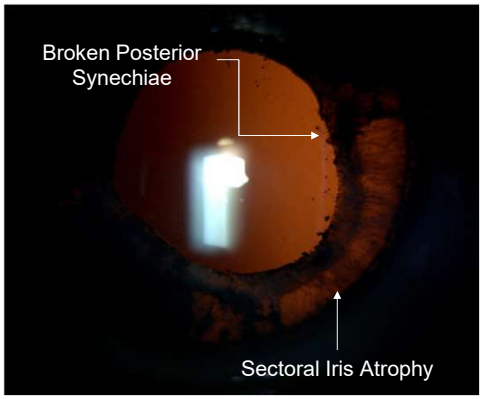
Case: Clinical Clues

Unilateral, non-granulomatous anterior uveitis that appears to be chronic with sectoral iris atroph

Chronic, unilateral
Trace anterior chamber reaction
Ocular hypertension



Courtesy of Dr. Sophia Leung

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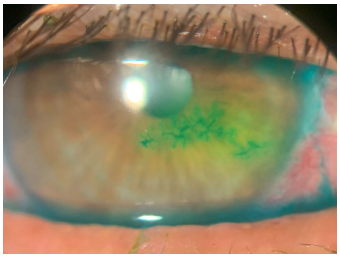
Ocular Herpes

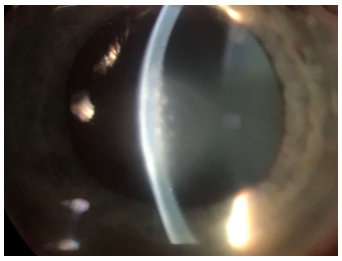


HSV-1

- Infectious, dendritic keratitis or immune-mediated stromal keratitis
- More frequent but less severe keratitis

VZV

- Immune-mediated stromal keratitis
- Less common but tends to be more severe



CMV

- Endotheliitis with coin-shaped KPs
- Tends to occur in immunocompromised

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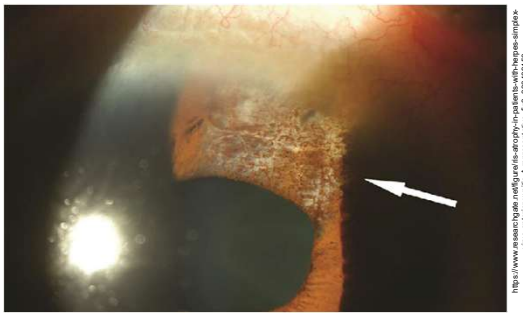
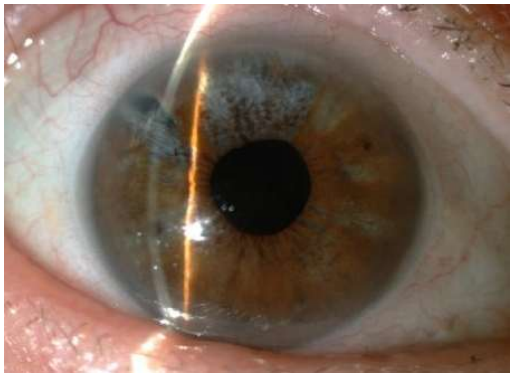
Iris Atrophy

- Herpes, one of the etiologies of uveitis, can present with iris atrophy due to inflammation and ischemia of the stromal bed of the iris.
- HSV and VZV → more likely to present as SECTORAL iris atrophy
- CMV → more likely to present as PATCHY iris atrophy



https://www.researchgate.net/figure/Iris-atrophy-in-patients-with-herpes-simplex-virus-anterior-uveitis-A-representative_fig3_333409190



https://www.researchgate.net/figure/Sectoral-iris-atrophy-is-typical-of-herpetic-uveitis_fig1_260716168

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Herpetic Uveitis

- Can present as non-granulomatous or granulomatous inflammation
  - VZV is more likely to present as granulomatous inflammation
- Etiology can be HSV, VZV, or CMV
- Potential associated findings (but can differ btwn HHV):
  - Adnexal/lid lesions
  - Ocular hypertension
  - Iris atrophy
  - Keratitis
  - Stellate KPs

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Differentiating HHV Anterior Uveitis

Features	HSV	VZV	CMV
Age	• < 50 yros • Overlap with VZV for age range 50-60	• ≥ 60 yros • Overlap with HSV for age range 50-60	Varies significantly
Pattern of recurrence	Frequent	Less frequent	Rare
Immune status	Immunocompetent	Immunocompetent	Immunocompromised
Severity	More mild	More severe	More severe but highly dependent on immune status
Clinical findings	• Keratitis (any layer) is present in about 1/3 of eyes with HSV uveitis • Sectorial iris atrophy	• Concurrent or recent dermatome rash • Sectoral iris atrophy	• Endotheliitis is more common with CMV than HSV/VZV • Coin-shaped KPs is highly suggestive of CMV • Patchy iris atrophy

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SUN Classification of Herpetic Anterior Uveitis

HHV Type	Evidence of anterior uveitis	Laterality or PCR	Evidence of viral ocular infection
HSV	a. AC cells b. If anterior vitreous cells, less severe than AC c. No evidence of retinitis	a. Unilateral uveitis ***OR*** b. (+) aqueous PCR for HSV	a. (+) aqueous PCR for HSV ***OR*** b. Sectoral iris atrophy in patient ≤ 50 yro ***OR*** c. Herpes simplex keratitis
VZV		a. Unilateral uveitis ***OR*** b. (+) aqueous PCR for VZV	a. (+) aqueous PCR for VZV ***OR*** b. Sectoral iris atrophy in patient ≥ 60 yro ***OR*** c. Concurrent or recent dermatomal herpes zoster
CMV		N/A	a. (+) aqueous PCR for CMV

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Clinical Pearls

- **Localize before you diagnose:**
  The precise location of an ocular finding often narrows the differential diagnosis more effectively than the finding itself.
- **Signs greater than symptoms? Think neurotrophic disease.**
  Significant corneal pathology with surprisingly little discomfort should always prompt assessment of corneal sensation.
- **Unilateral, chronic, or recurrent disease is a red flag.**
  When inflammation persists or repeatedly returns in one eye, broaden the differential to include infectious, autoimmune, and masquerade conditions.

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- Dr. Angelica Echiverri
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Questions?

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