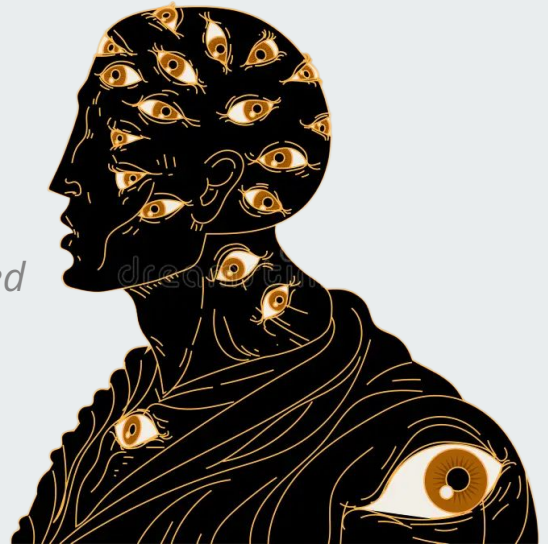
It’s all greek to me

CLINID conference
Hunter Ratliff
11/20/2025

Ages, dates, and other identifying information may have been changed
I have no conflict of interest in relation to this presentation



Shortcuts

Case 1 (toxo): Start | Summary slide
Case 2 (staph aureus): Start | Summary slide
Case 3 (NTM): Start | Summary slide
Discussion: Objectives

- **Eye anatomy/infections** | Conjunctivitis | Keratitis | Uveitis | chamber vs segment
- **NTM ocular infection** | NTM keratitis | NTM endophthalmitis

Takeaway slide

Case #1

Case 1: HPI

A **50 y/o F** with PMH including obesity, OSA, migraines p/w **acute, painful left eye vision loss**

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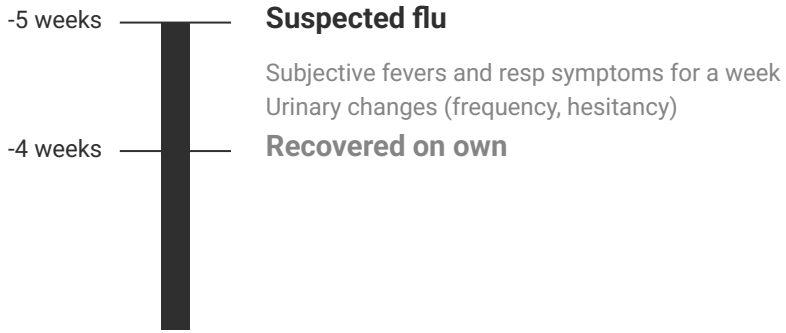


5 weeks ago:

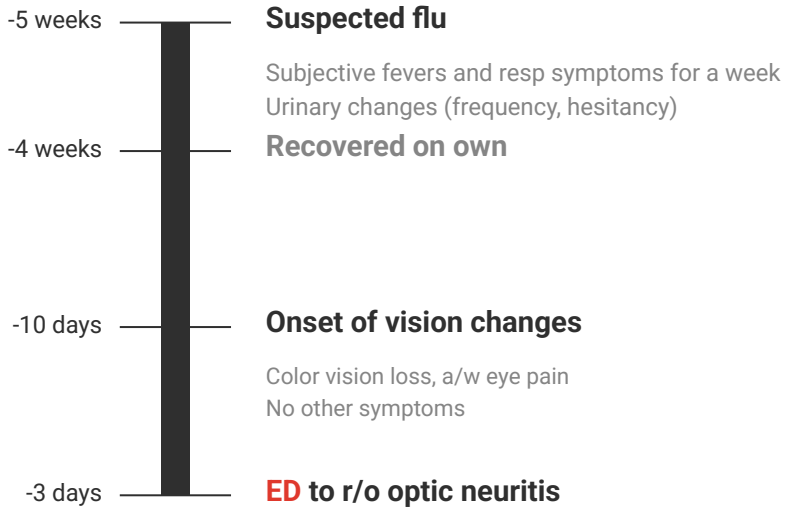
- Flu like illness, fevers for a week
- No dysuria but some frequency & hesitancy
- Took OTC meds for UTI
- Recovered well

Case 1: HPI

A **50 y/o F** with PMH including obesity, OSA, migraines p/w **acute, painful left vision loss** x10d

10 days ago: Left eye vision decreasing

- Progressive worsening
- Associated left eye pain
- No trauma, fevers, diplopia, photophobia, or other symptoms
- Outside optho ordered brain MRI
    - Told pt to go to ED

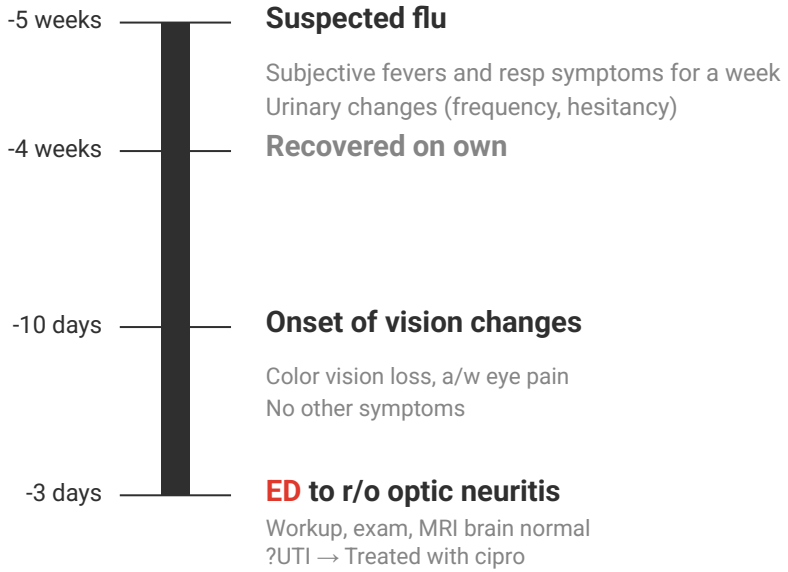


Case 1: HPI

A **50 y/o F** with PMH including obesity, OSA, migraines p/w **acute, painful left vision loss** x10d

3 days ago: ED visit

- Optho's outpatient MRI c/f optic neuritis
  - Told pt to go to ED
- Labs normal, except:
  - **ESR 26**
  - Pyuria w/ bacteria, **UCx grew E coli**
- Repeat MRI brain normal
- Eye exam *by ED* normal
  - Discharged with outpatient follow up
  - **Rx Cipro**



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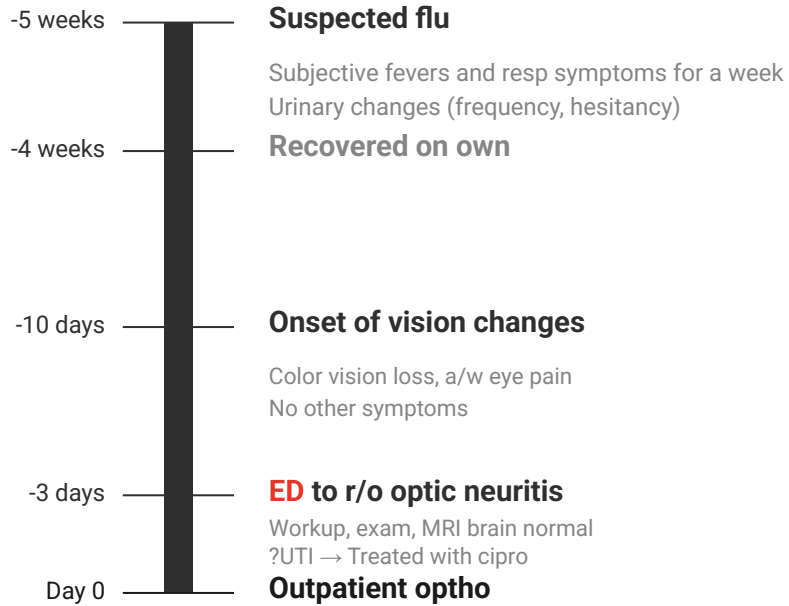
A **50 y/o F** with PMH including obesity, OSA, migraines p/w **acute, painful left vision loss** x10d

Day of admission: Outpatient optho



Case 1: Ophthalmology

A **50 y/o F** with PMH including obesity, OSA, migraines p/w **acute, painful left vision loss** x10d

Day of admission: Outpatient optho

Outpatient Optho HPI

Απώλεια όρασης στο αριστερό μάτι - Παρατηρήθηκε θόλωση της όρασης στο αριστερό μάτι, την επόμενη μέρα εμφάνισε πόνο πάνω από το αριστερό μάτι, η όραση επιδεινώθηκε – γκρίζα και θολή. Η όραση έγινε μαύρες σκιές.

Απώλεια όρασης OS – Ταχεία επιδείνωση

Πόνος με την καθοδική κίνηση του ματιού OS – αισθάνεται σφιχτό και επώδυνο

Αρνείται πόνο στον κρόταφο, ευαισθησία στο τριχωτό της κεφαλής, κροταφογναθική χωλότητα ή διπλωπία πριν την απώλεια όρασης

Αρνείται αδυναμία στα χέρια/πόδια

Καμία αλλαγή στα συμπτώματα με ζεστό ντους / υπερθέρμανση

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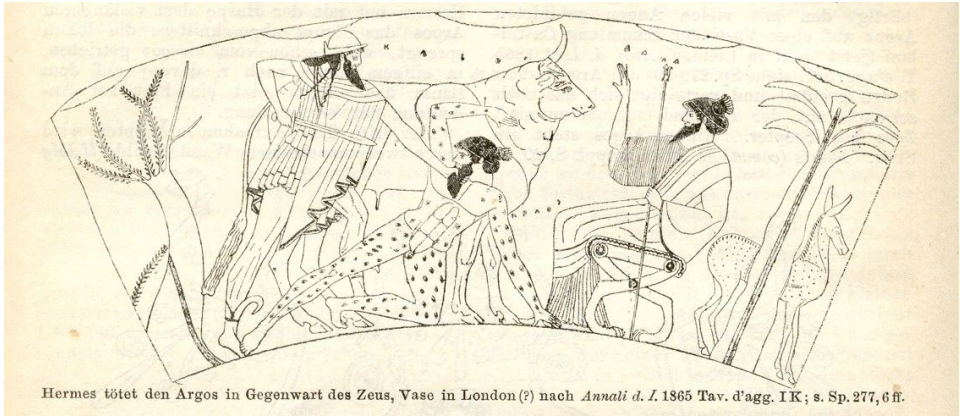

Outpatient Optho HPI

Vision loss left eye - noted vision blurring in left eye, next day she had pain over her left eye, vision worsened- grey and cloudy. Vision became black shadows.

Vision Loss OS - Rapidly progressive

Pain with infraduction OS - feels tight and painful

Denies temple pain, scalp tenderness, jaw claudication, or diplopia before the vision loss happened

Denies weakness arms/legs

No symptom change with hot shower / overheating

Case 1: Ophthalmology

Base eye exam		Right	Left
Visual acuity		20/20	HM
Tonometry	*Pressure*	22	20
Pupils	*Afferent pupillary defect*	None	Trace
Extraocular Movement		Full	Full
Visual Fields	*Restrictions*	None	Central vision spared
Color	*Ishihara*	14/14	0/14

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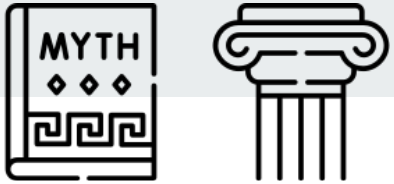

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Slit Lamp	Right	Left
External	Normal	Normal
Lids/Lashes	Normal	Normal
Conjunctiva/Sclera	Normal	Normal
Cornea	Clear	Clear
Anterior Chamber	Normal	Normal
Iris	Pharm dilated	Pharm dilated
Lens	Trace cataract	Trace cataract
Anterior Vitreous	Normal	Normal

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Iris	Pharm dilated	Pharm dilated
Lens	Trace cataract	Trace cataract
Anterior Vitreous	Normal	Normal

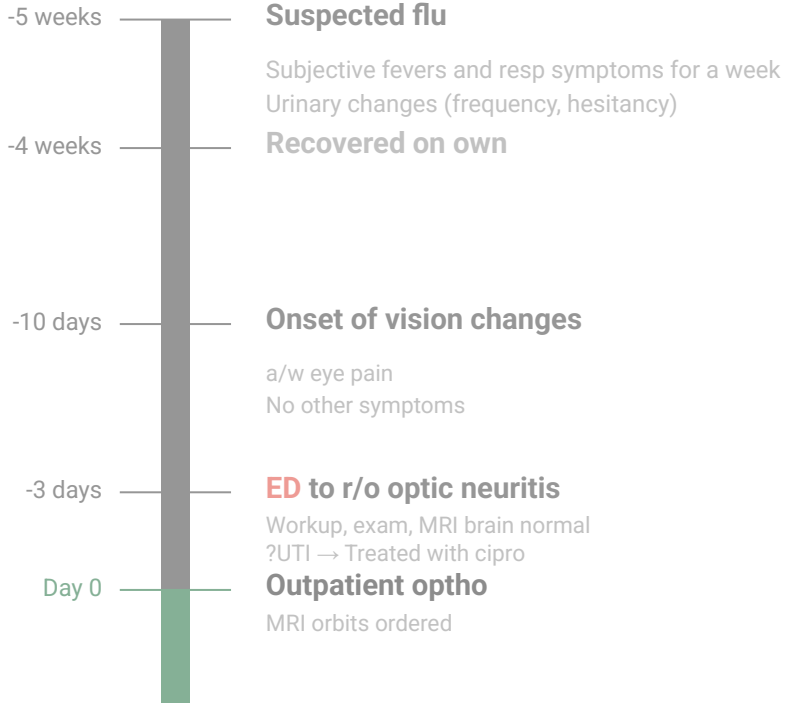
Fundus Exam	Right	Left
Disc	Small nerve	Diffuse edema & elevation, no hemes
Cup-to-Disc ratio	Normal	Normal
Macula	Normal	Normal
Vessels	Normal	Normal
Periphery	Normal	Normal

Case 1: HPI

A **50 y/o F** with PMH including obesity, OSA, migraines p/w **acute, painful left vision loss** x10d

Exam, in english	Right	Left
Visual Field Test	WNL	Generalized depression
Retinal nerve fiber layer	WNL	Significantly thickened ⇒ suggests swelling
Ganglion Cell Complex	Normal ⇒ Suggests retina is normal	
Optic nerve	WNL	Thickened, with subretinal fluid ⇒ suggests swelling
Fundus	WNL	Diffuse edema

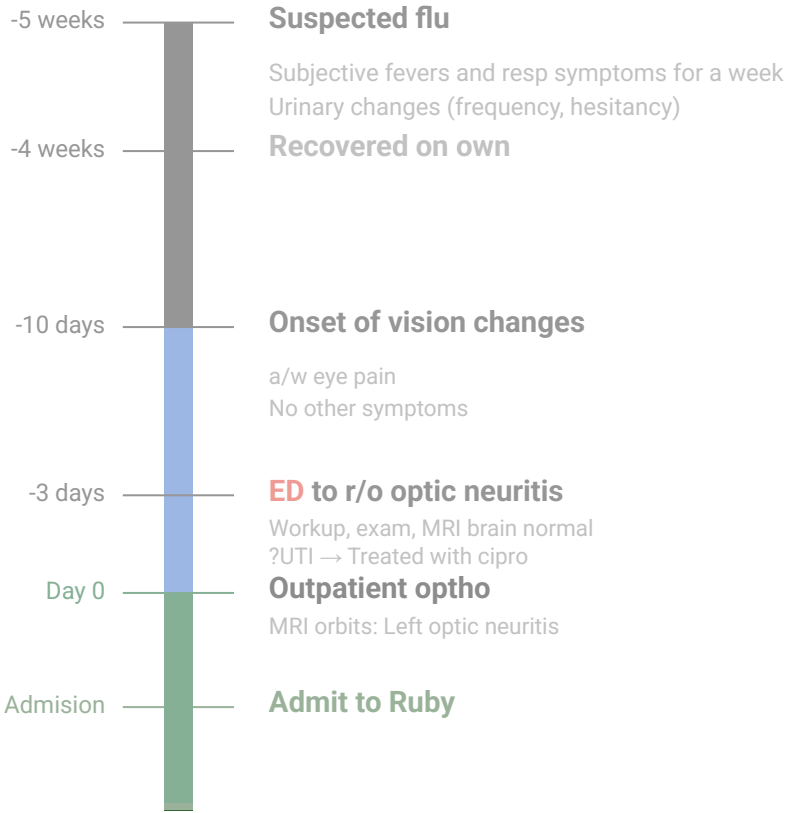
Ordered stat MRI orbits for concern of optic neuritis



Case 1: HPI

A **50 y/o F** with PMH including obesity, OSA, migraines p/w **acute, painful left vision loss** x10d

- Ordered stat MRI orbits for concern of optic neuritis
  - Left long segment enhancement consistent with optic neuritis
- Sent to ED



Case 1: Social History, Exposures, Risk Factors

Geographic & Travel	• Lives 20 mins away from Uniontown with two sons (in their 20s) • **Wooded area** but not outside much • Over the summer, went on **Caribbean cruise** ○ No fun off boat excursions, but did eat meat at beach side restaurant in Turks and Caicos
Occupational	• Works helping people with intellectual disabilities • Formerly worked in **correctional facilities** years ago
Substance & needles	• Social EtOH, vapes tobacco, no drugs • No unprofessional piercings or tattoos
Animals	• **Three dogs**, son has **indoor cat**
Sexual	• Sexually active with men in the past five years, but no partners in past year • No known STI history, but **doesn't recall any prior testing**
Infectious	• No prior hx of major infections, no hx of recurrent UTIs

Case 1: Physical exam

BP	143/76	**Pulse**	65	**SpO2**	94 %
Temp	36.5 °C (97.7 °F)	**RR**	18	**BMI**	**39 kg/m²**
General	Alert and oriented, NAD				
HEENT	NCAT; trachea appears midline, **decreased left eye visual acuity**				
Resp	Normal respiratory effort, symmetric chest rise				
CV	RRR; extremities perfused				
GI	Non-distended; no TTP				
Extremities	No clubbing, cyanosis, or edema				
Neuro/MSK	Moves extremities				
Psych	Normal mood; appropriate affect				

Case 1: Neuroimaging

MRI brain W/WO (one year ago)

Scattered foci of T2/FLAIR hyperintensity (w/o contrast enhancement) in the supratentorial brain

- This is nonspecific and can be seen with chronic migraines
- DDx include multiple sclerosis, Lyme disease, or vasculitis

MRI brain W/WO (Now)
No changes

MRI orbits
Ill-defined **T2** hyperintensity w/ **marked enhancement** of the **intraorbital, canalicular & anterior prechiasmatic left optic nerve**, as well as mild fat stranding around left intraorbital optic nerve, **c/w left optic neuritis**

MRI Cervical & Thoracic spine

- No evidence for demyelinating process of the cervical spine
- 6 mm cerebellar tonsillar ectopia with mild mass effect upon the left dorsal midbrain and no evidence for syrinx

Case 1: Summary

A **50 y/o F** with PMH including obesity, OSA, migraines p/w **acute, painful left vision loss** x10d

Imaging suggestive of optic neuritis, but unable to obtain an LP

Geographic, Travel, & work	• Lives in **wooded area** but not outside much • Over the summer, to **Turks and Caicos**, did eat meat at beach side restaurant in • Formerly worked in **correctional facilities**
Animals	• **Three dogs**, son has **indoor cat**
Sexual	• No prior STI testing

Exam, in english	Right	Left
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Ill-defined **T2** hyperintensity w/ **marked enhancement** of the intraorbital, canalicular & anterior prechiasmatic **left optic nerve**, as well as mild fat stranding around left intraorbital optic nerve, c/w **left optic neuritis**

MRI brain & spine W/WO
Normal aside from chronic cerebellar tonsillar ectopia

Case 1: Workup

Nobody would do an LP because of the chronic cerebellar tonsillar ectopia

Others	Result
ANA	Neg
ACE	Neg
Lysozyme	Neg
MOG	...
AQP4	...
NMO	...
SPEP	Neg

ID Workup	Result
TPAb	
Lyme	
QuantGold	
Toxo	
RMSF	
Bartonella	

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Lyme	Neg
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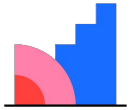
Toxo	**Pos**
RMSF	Neg
Bartonella	Neg

Case 1: Does toxoplasmosis do this?

There is no disagreement about the patient's diagnosis (**isolated unilateral optic neuritis**) but the **etiology** of the optic neuritis is still not certain

[Q1.1] Is this toxo?

[Q1.2] How common is a positive IgG?

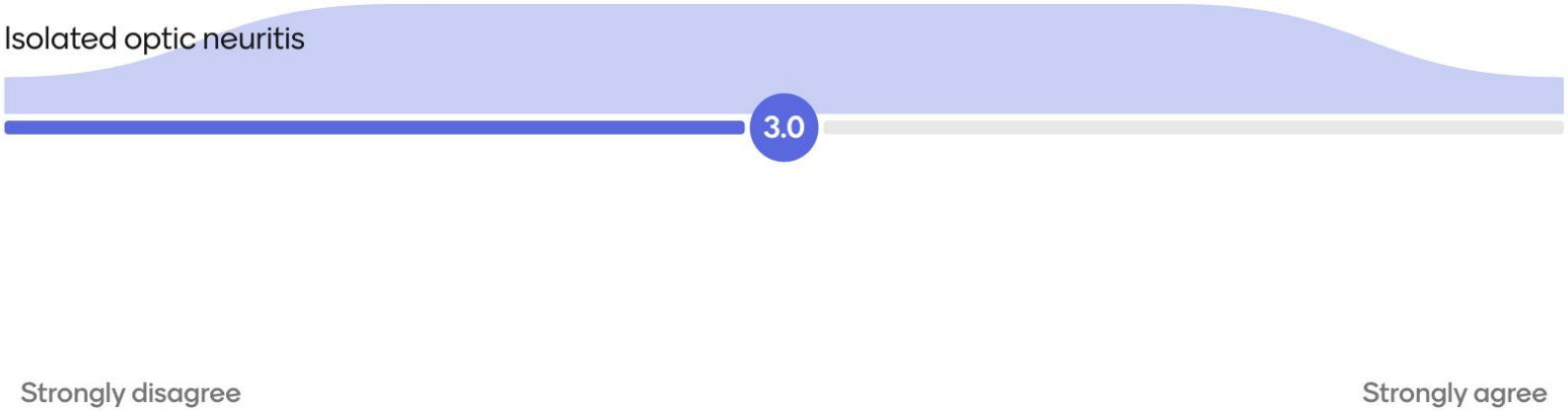


Mentimeter

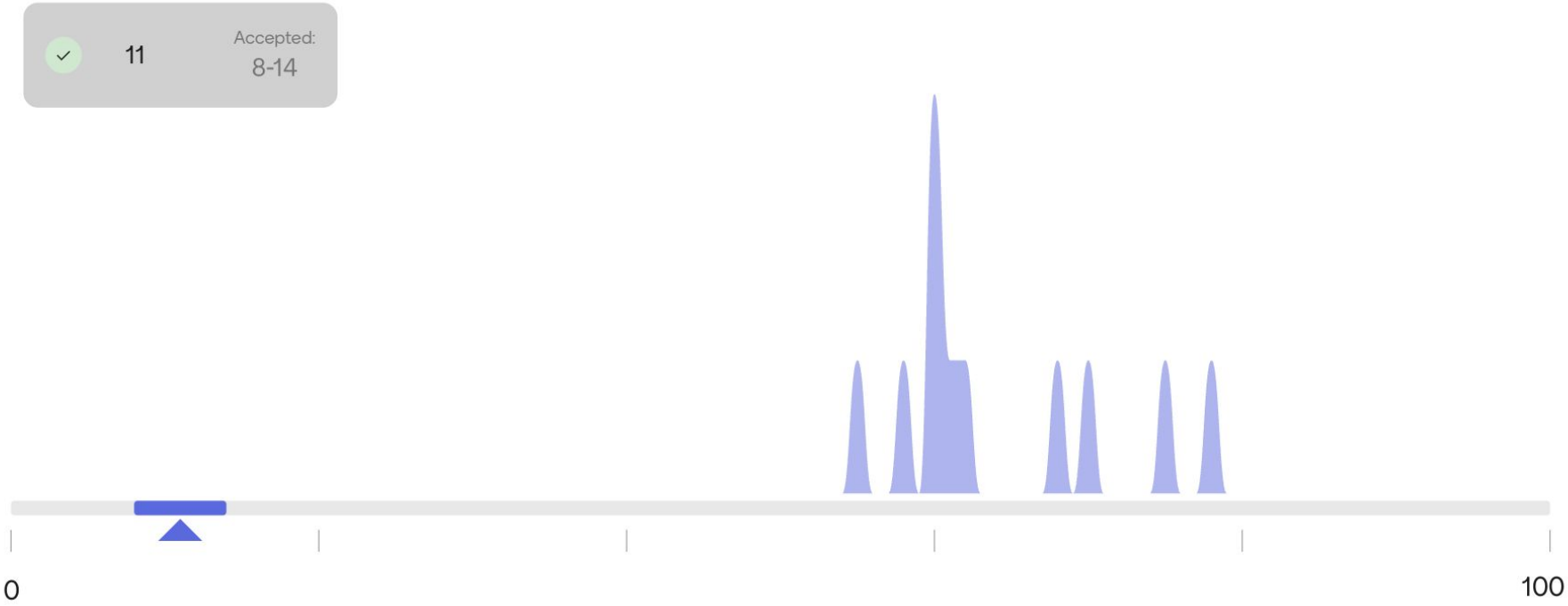
Is isolated optic neuritis c/w toxo

What is the base rate of positive toxo antibodies?

[Q1.1] Does toxoplasmosis cause this?



[Q1.2] How common is Toxoplasma IgG?



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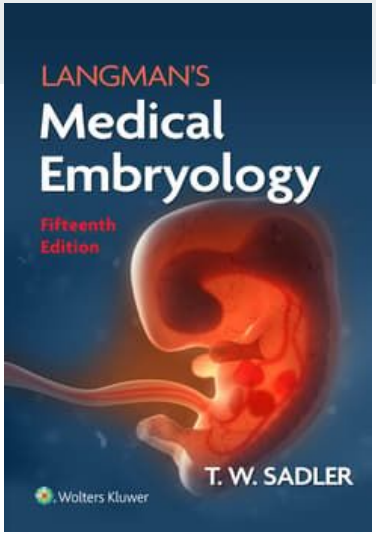
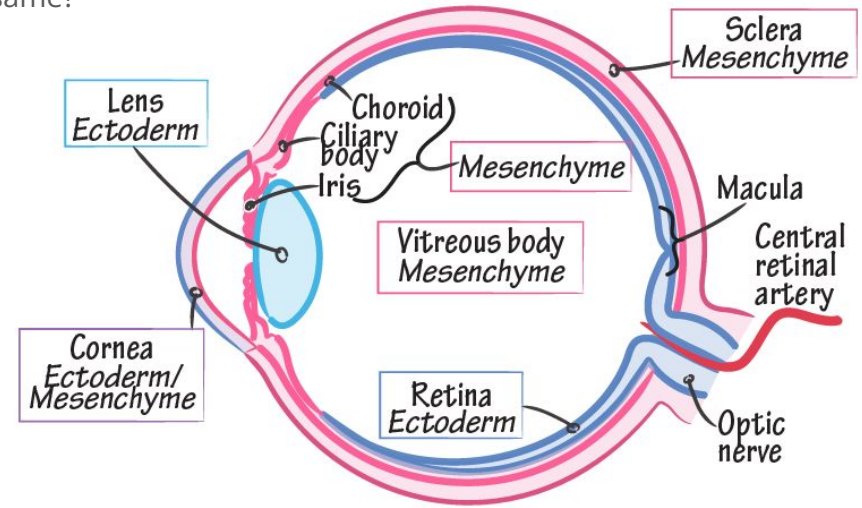


There is no disagreement about the patient's diagnosis (**isolated unilateral optic neuritis**) but the **etiology** of the optic neuritis is still not certain

- **No retinal involvement** or uveitis on exam
  - But isn't the **retina** and **optic nerve** kinda the same?



Case 1: Does toxoplasmosis do this?

There is no disagreement about the patient's diagnosis (**isolated unilateral optic neuritis**) but the **etiology** of the optic neuritis is still not certain

- **No retinal involvement** or uveitis on exam
- There are still some pending tests

Travel	Ate some meat at beachside restaurant in Turks and Caicos
Animals	Son has **indoor cat**

Workupc	Result
Toxo	**Pos**
MOG	...
AQP4	...
NMO	Neg

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There is no disagreement about the patient's diagnosis (**isolated unilateral optic neuritis**) but the **etiology** of the optic neuritis is still not certain

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- **One in 10** have **positive IgG** (NHANES)

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- There are still some pending tests
- **One in 10** have **positive IgG** (NHANES)
    - But she was **IgM positive**

Travel	Ate some meat at beachside restaurant in Turks and Caicos
Animals	Son has **indoor cat**

Workup	Result
Toxo	**IgM**
MOG	...
AQP4	...
NMO	Neg

Case 1: Hospital course

- Toxoplasma IgM (>160), IgG negative
- Started on Bactrim (3.5 DS q12h, high BMI)
    - Patient did not enjoy the Bactrim experience®, but took it

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- Toxoplasma IgM (>160), IgG negative
- Started on Bactrim (3.5 DS q12h, high BMI)
  - Patient did not enjoy the Bactrim experience®, but took it
- **MOG antibody** would later come back at **1:160**
  - Lost to neurology follow up

Case #2

Case 2: HPI

A **77y/o F** with PMH including psoriatic arthritis (on Humira & MTX), CKD, HFpEF, Afib, ?ILD p/w **sudden onset R monocular vision loss**

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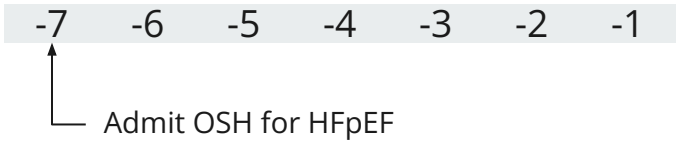
- Admitted to OSH with dyspnea, got diuresis
  - No preceding infectious issues per EMR (or by HPI)
  - Pulmonary was worried about ILD



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- Admitted to OSH with dyspnea, got diuresis
- Felt feverish on hospital day 8 (call it “day 0”)
  - Collected BCx & resp workup → BCx negative
  - No antibiotics given

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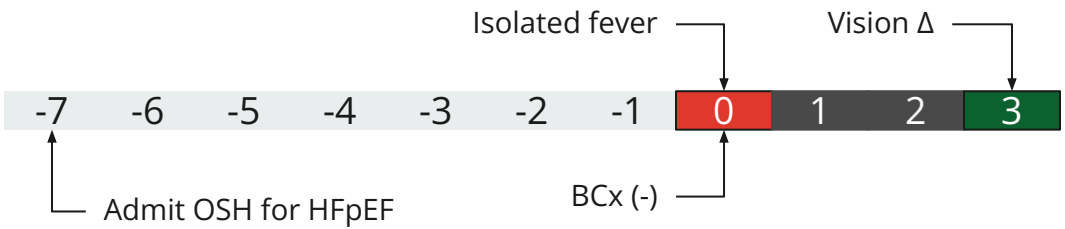
- Admitted to OSH with dyspnea, got diuresis
- Felt feverish on hospital (“day 0”)
- **Vision changes** 48 - 72h later
  - Floaters → decreased acuity
  - A/W bifrontal headaches, photophobia, & pain w/ EOM



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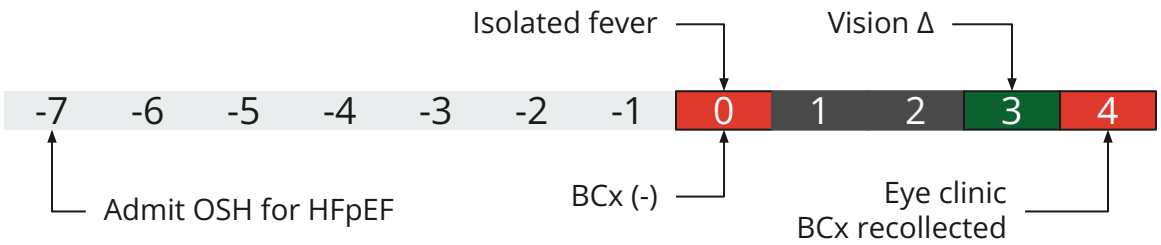
- Admitted to OSH with dyspnea, got diuresis
- Felt feverish on hospital (“day 0”)
- **Vision changes** 48 - 72h later (floaters → bad vision), HA, pain w/ EOM
- OSH arranges for next day eye clinic → discharges so she can go to appt
    - Ophthalmology does their exam → Admit to Ruby
    - Collected BCx again



Case 2: Ophthalmology clinic

A **77y/o F** with PMH including psoriatic arthritis (on Humira & MTX), CKD, HFpEF, Afib, ?ILD p/w **sudden onset R monocular vision loss**

HPI: States she was over at OSH for test, noticed the vision changes when she was doing a coughing test

Base eye exam	Right	Left
Visual acuity	Light perception	20/20
Tonometry	15	16
Visual fields defects	Central spared	None
Slit lamp	**Right**	**Left**
Conjunctiva/Sclera	Normal	Normal
Cornea	Normal	Normal
Anterior chamber	Normal	Normal
Iris	Normal	Normal
Vitreous	PVD, VH	Normal

PVD = Posterior vitreous detachment
VH = Vitreous hemorrhage

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A&P: Hemorrhagic PVD OD

- dense VH OD appreciated on OPTOS today -- no view posteriorly
- recommend pt started ASAP on broad spectrum ABX
- needs CBC, blood cultures, r/o toxo, infectious/inflammatory work-up
- consider PPV/vitreous biopsy/IV ABX if no improvement

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Iris	Normal	Normal
Vitreous	PVD, VH	Normal

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Case 1: Social history, exposures, & risk factors

Geographic & Travel	Lives in central WV. No recent travel but when she was working did travel to **Japan & Germany** quite a few times
Occupational	Retired. Main hobbies is **gardening**
Environmental exposures	Definitely has some dirt & soil exposures from the garden. Doesn't recall any injuries. **Tick bites** in the past, but none recently
Animals	**Seven cats**, all but one is an indoor cat

Case 2: Labs

ID Workup	Result
TPAb	Neg
Lyme	**Pos**
QuantGold	Neg
Toxo	**IgG**

Seen by ID in the past and s/p Tx

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MRI orbits
mild uveal scleral thickening and **enhancement involving the right ocular globe** with mild retrobulbar episcleral fat stranding and edema. Mild **preseptal periorbital edema** around the right orbit. Optic nerve normal

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Blood cultures
No growth

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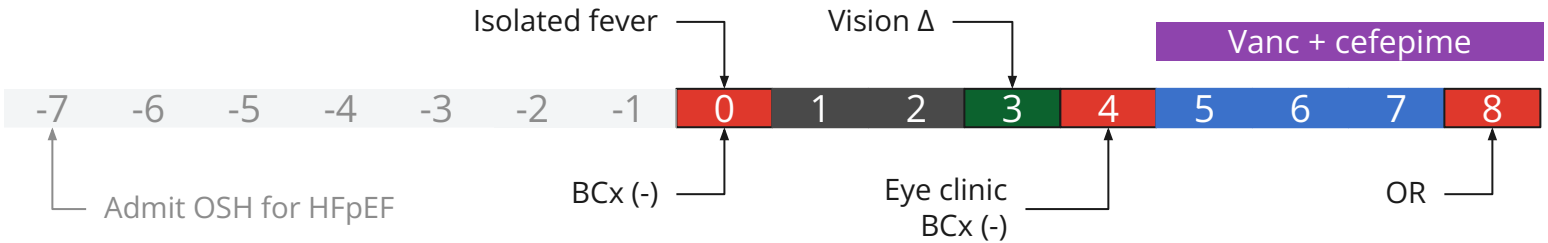
- Felt feverish on hospital (“day 0”)
- **Vision changes** 48 - 72h later (floaters → bad vision), HA, pain w/ EOM
- Admit to Ruby the next day → (BCx negative again)
  - Started on **vanco** & **cefepime**
- Goes to OR for **pars plana vitrectomy**, vitreous **biopsy**, vitreal **injections**
  - Operative report concerning for **fungal/herpetic infiltration** of the retina



Case 2: Summary

A **77y/o F** with PMH including psoriatic arthritis (on Humira & MTX), CKD, HFpEF, Afib, ?ILD p/w **R monocular vision loss** two days **after self resolving fever**.

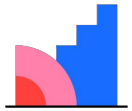
- Blood cultures (x2 on separate dates) are negative
- MRI orbits show inflammation & some preseptal/periorbital enhancement
- Not a ton of improvement on vanc & cefepime

 # Right hemorrhagic PVD (posterior vitreous detachment)
 # Endophthalmitis - the initial concern
 # Fungal/herpetic retinitis? Concern after OR

 # Immunocompromise
 # Psoriatic arthritis - On Humira
 # CKD3a - In case we want to use nephrotoxins

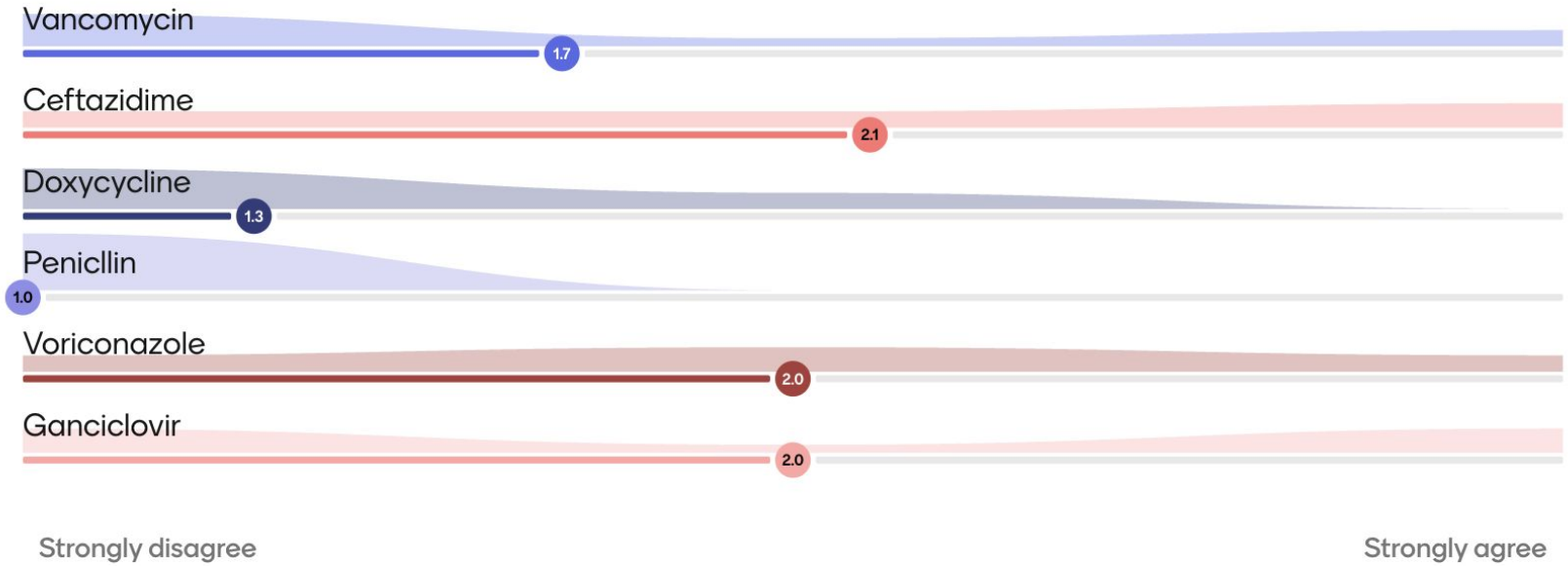
 # ANA positive 1:160
 # Hx of Lyme - Treated
 # Toxo IgG positive

[Q2.1] Empiric recs?



Mentimeter

[Q2.1] Empiric recommendations?



Case 2: Hospital course

Initial recs:

- Continue **vanco**
- Continue **ceftazidime**
- If worried about mold, **start vori**

From the eye	
Routine Cx	G/S (-)
Fungal Cx	…
CMV PCR	…
HSV PCR	…
VZV PCR	…
Toxo PCR	…

s/p vitreal injections

1. Vancomycin
2. Voriconazole
3. Foscarnet
4. Ganciclovir
5. Dexamethasone

Case 2: Hospital course

Initial recs:

- Continue **vanco**
- Continue **ceftazidime**
- If worried about mold, **start vori**

Next day: ophtho worried about missing viral coverage and want IV Cytovene

- We don't want to kill the kidneys (CKD3a)
- We make them pick between vanco & ganciclovir
- They pick IV **ganciclovir**

From the eye	
Routine Cx	NG
Fungal Cx	…
CMV PCR	…
HSV PCR	…
VZV PCR	…
Toxo PCR	…

s/p vitreal injections

1. Vancomycin
2. Voriconazole
3. Foscarnet
4. Ganciclovir
5. Dexamethasone

Case 2: Hospital course

Systemic treatment:

- IV **ceftazidime**
- IV **vanco** → IV **ganciclovir**
- PO **vori**

From the eye	
Routine Cx	NG
Fungal Cx	…
CMV PCR	…
HSV PCR	…
VZV PCR	…
Toxo PCR	…

s/p vitreal injections

1. Vancomycin
2. Voriconazole
3. Foscarnet
4. Ganciclovir
5. Dexamethasone

Case 2: Hospital course

Initial systemic treatment:

- IV **ceftazidime**
- IV **vanco** → IV **ganciclovir**
- PO **vori**

Post op day 2: VITREOUS FLUID
1+ Rare Staphylococcus aureus

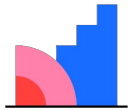
- **Stop everything, start zyvox**
- How long to treat?
  - "Uncomplicated" bacteremia
  - Four weeks (with negative BCx?)

From the eye	
Routine Cx	(+)
Fungal Cx	...
CMV PCR	...
HSV PCR	...
VZV PCR	...
Toxo PCR	...

s/p vitreal injections

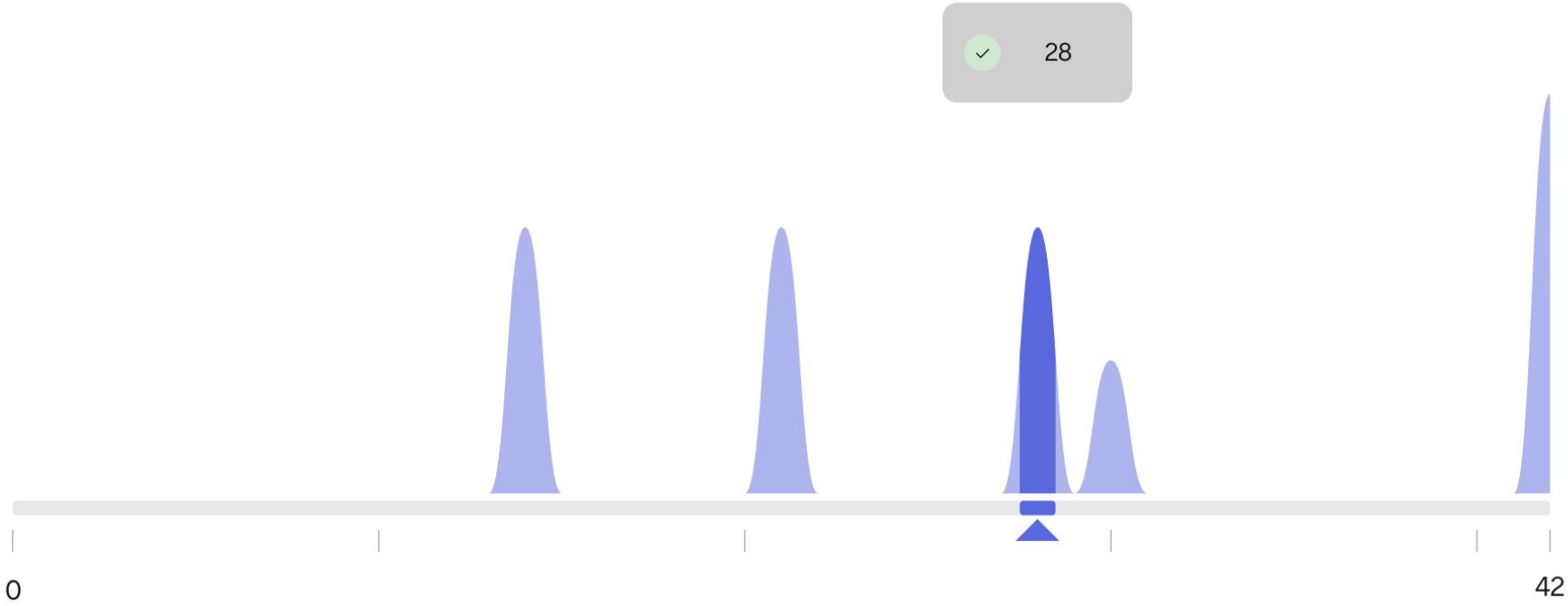
1. Vancomycin
2. Voriconazole
3. Foscarnet
4. Ganciclovir
5. Dexamethasone

[Q2.2] How long to treat?



Mentimeter

[Q.2] How many days to treat the *S. aureus*?



Case 2: COpAT course

Systemic treatment:

- PO **linezolid** for 4 weeks
- Responds well with improving vision

From the eye	
Routine Cx	**MSSA**
Fungal Cx	NG
CMV PCR	Neg
HSV PCR	Neg
VZV PCR	Neg
Toxo PCR	Neg

s/p vitreal injections

1. Vancomycin (x2)
2. Voriconazole (x2)
3. Foscarnet
4. Ganciclovir (x2)
5. Dexamethasone

Case 2: COpAT course

Systemic treatment:

- PO **linezolid** for 4 weeks
- Responds well with improving vision

Post op day 7: VITREOUS FLUID
<5 cfu Candida parapsilosis

- They sent 4 total cultures
  - Routine: MSSA (only)
  - Fungal #1: No growth
  - Fungal #2: C parapsilosis
  - Anaerobic: No growth

From the eye	
Routine Cx	**MSSA**
Fungal Cx	**(+)**?
CMV PCR	Neg
HSV PCR	Neg
VZV PCR	Neg
Toxo PCR	Neg

s/p vitreal injections

1. **Vancomycin** (x2)
2. **Voriconazole** (x2)
3. Foscarnet
4. Ganciclovir (x2)
5. Dexamethasone

Case 2: Inconsistent beliefs?

There are some drug-drug interactions with vori, so I was inclined to say "*environmental contamination*" and **getting better** on monotherapy, so just **ignore the candida**. **But…**

Routine: on day 2
1+ MSSA

Fungal #1: Final
No growth

Anaerobic: Final
No growth

Fungal #2: on day 7
<5 cfu C parapsilosis

s/p vitreal injections

1. **Vancomycin** (x2)
2. **Voriconazole** (x2)
3. Foscarnet
4. Ganciclovir (x2)
5. Dexamethasone

Case 2: Inconsistent beliefs?

There are some drug-drug interactions with vori, so I was inclined to say "*environmental contamination*" and **getting better** on monotherapy, so just **ignore the candida**. **But…**

- I also say "*intravitreal injections are the mainstay*" and the patient got two doses of voriconazole
- I don't have any data to say endogenous can not be polymicrobial

Routine: on day 2
1+ MSSA

Fungal #1: Final
No growth

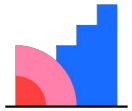
Anaerobic: Final
No growth

Fungal #2: on day 7
<5 cfu C parapsilosis

s/p vitreal injections

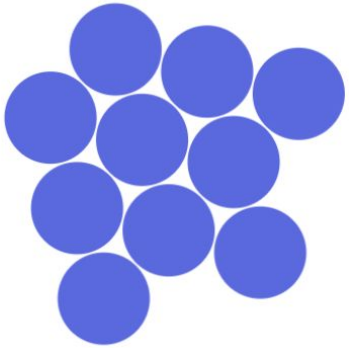
1. **Vancomycin** (x2)
2. **Voriconazole** (x2)
3. Foscarnet
4. Ganciclovir (x2)
5. Dexamethasone

[Q2.3] Do we treat the *C parapsilosis*?



Mentimeter

[Q2.3] Do we treat the *Candida parapsilosis*?



10 Yes

0 No

1 Maybe?

Case 2: COpAT course

Systemic treatment:

- PO **linezolid** for 4 weeks
- Responds well with improving vision

Post op day 7: VITREOUS FLUID
<5 cfu Candida parapsilosis

- **Ignored the Candida**
- She **did fine** on linezolid monotherapy

From the eye	
Routine Cx	**MSSA**
Fungal Cx	**(+)**?
CMV PCR	Neg
HSV PCR	Neg
VZV PCR	Neg
Toxo PCR	Neg

s/p vitreal injections

1. **Vancomycin** (x2)
2. **Voriconazole** (x2)
3. Foscarnet
4. Ganciclovir (x2)
5. Dexamethasone

Case #3

Case 3: HPI

A **73 y/o F** with PMH including metastatic breast cancer (on Keytruda) p/w **vision loss**

Case 3: HPI

A **73 y/o F** with PMH including metastatic breast cancer (on Keytruda) p/w **vision loss**

- Presets to optho clinic for blurry vision, pain, photophobia

Case 3: HPI

A **73 y/o F** with PMH including metastatic breast cancer (on Keytruda) p/w **vision loss**

- Presets to optho clinic for blurry vision, pain, photophobia

Background
Following with derm for a **rash**

- Ongoing for **5 months**
- Only thing that has helped has been **PO steroids**

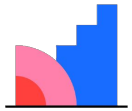
3 months ago:

- Had **bilateral lens replacements** for cataracts
- Was started on pembrolizumab (PDL1 inhibitor) for cancer around this time

Case 3: Eye exam

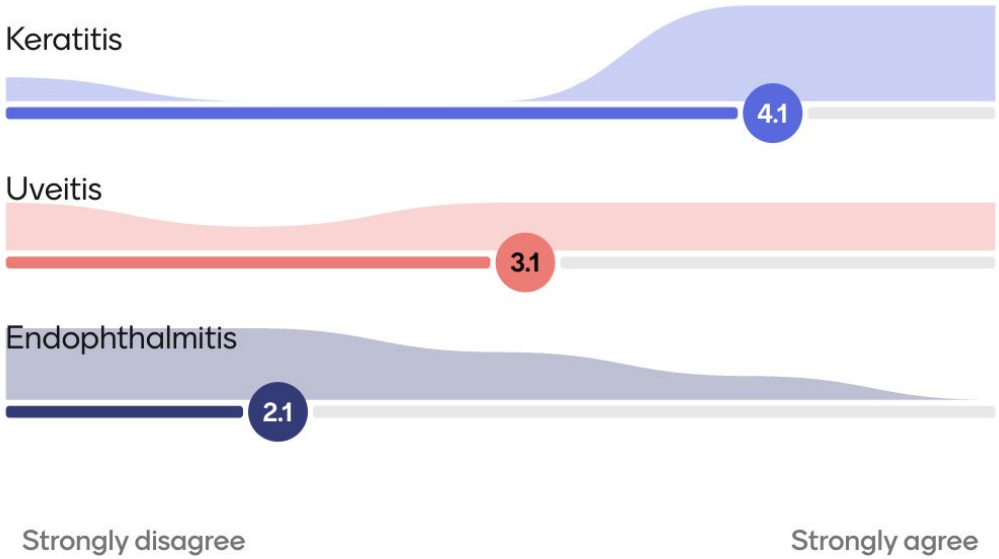
Exam (day 0)	Right	Left
Visual acuity	20/100	20/70
Ocular pressure	13	24
Conjunctiva/Sclera	Normal	Normal
Cornea	**epithelial irregularities**	temporal **corneal infiltrate** w/ **3 KPs**
Anterior Chamber	Normal	**3+ cells**
Lens	PCIOL	PCIOL
Vitreous	Normal	**Syneresis, no cell**
Fundus exam	Normal	Normal

[Q3.1]
What kind of “-itis” does she have?



Mentimeter

[Q3.1] What kind of "-itis" does she have?



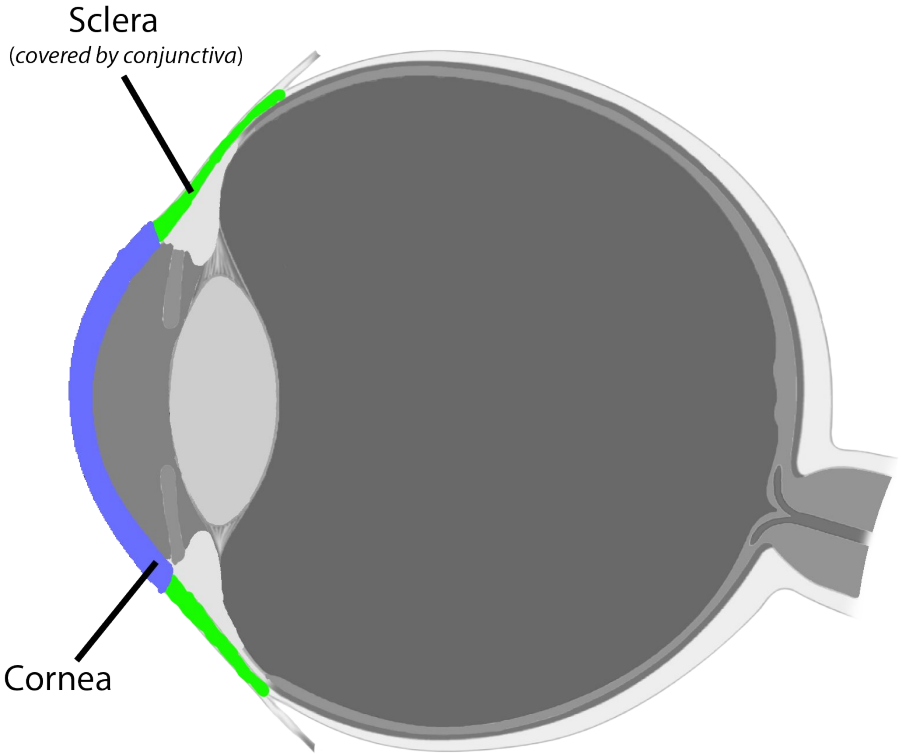
Exam (day 0)	Left
Visual acuity	20/70
Ocular pressure	24
Conjunctiva/Sclera	Normal
Cornea	temporal **corneal infiltrate** w/ **3 KPs**
Anterior Chamber	**3+ cells**
Lens	PCIOL
Vitreous	**Syneresis, no cell**
Fundus exam	Normal

Refresher on eye anatomy & disease

Conjunctivitis

Conjunctivitis is infection of the **conjunctiva**, the membrane covering the **sclera** (white of the eye)

Called **keratoconjunctivitis** if it involves the cornea too

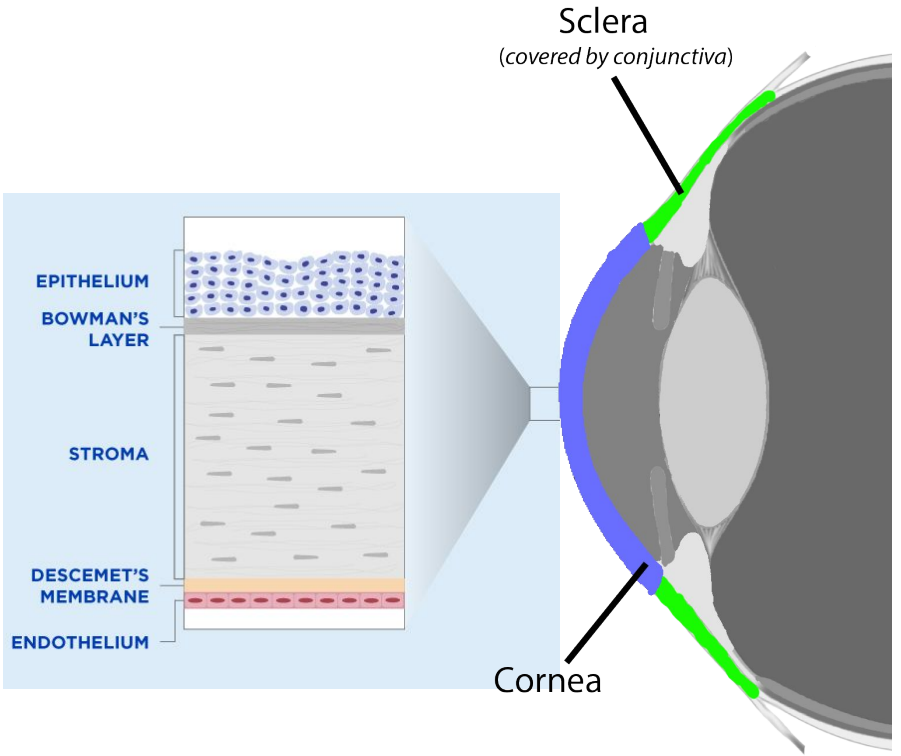


Keratitis

Infection of the **cornea** is **keratitis**

Layers of the cornea:

- **Epithelium**: The protective barrier
  - This needs to be disrupted in order to have “deep” infections
  - Most common site of infection, but if limited to epithelium may not be severe
- **Bowman’s layer**: acellular layer
  - Prone to scarring (e.g. in HSV)
  - Generally need trauma to pass this layer
- **Stroma**: Thick layer that provides structure to the cornea
  - This is where severe infections are (fungal, Acanthamoeba, HSV, severe bacterial)



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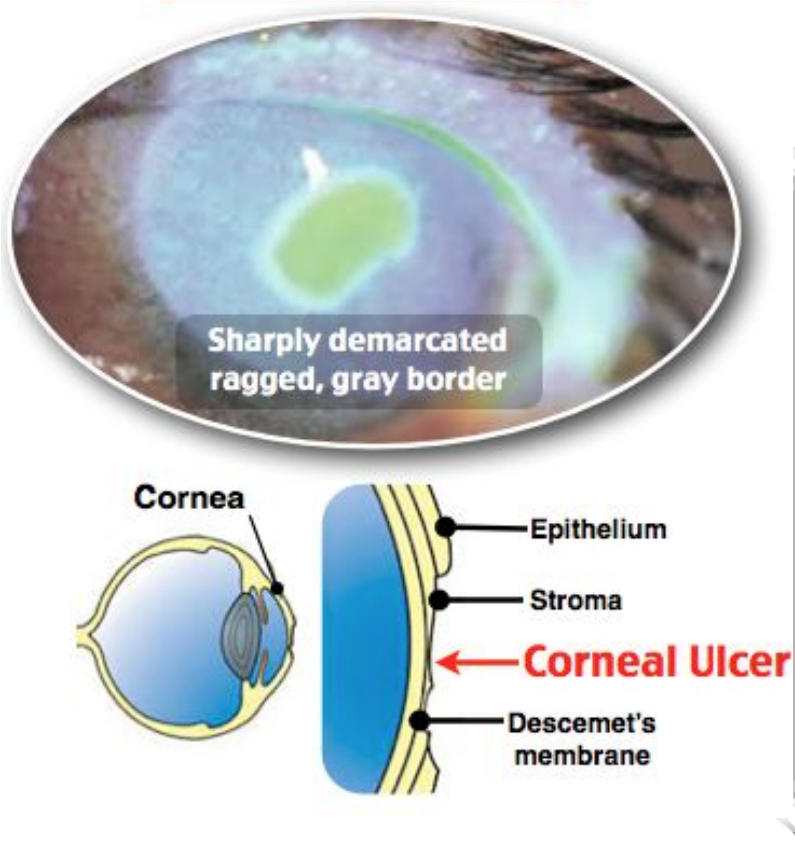
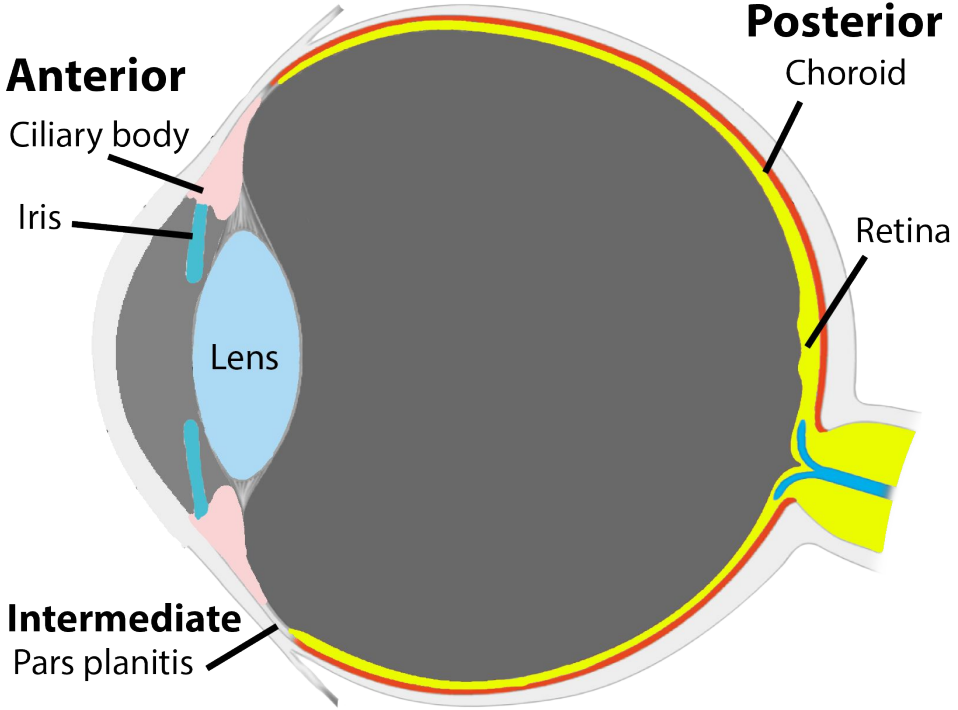


Uveitis

Uveitis is inflammation of **uvea** (iris, ciliary body, choroid) --or-- **retina**



Uveitis

Uveitis is inflammation of **uvea** (iris, ciliary body, choroid) --or-- **retina**

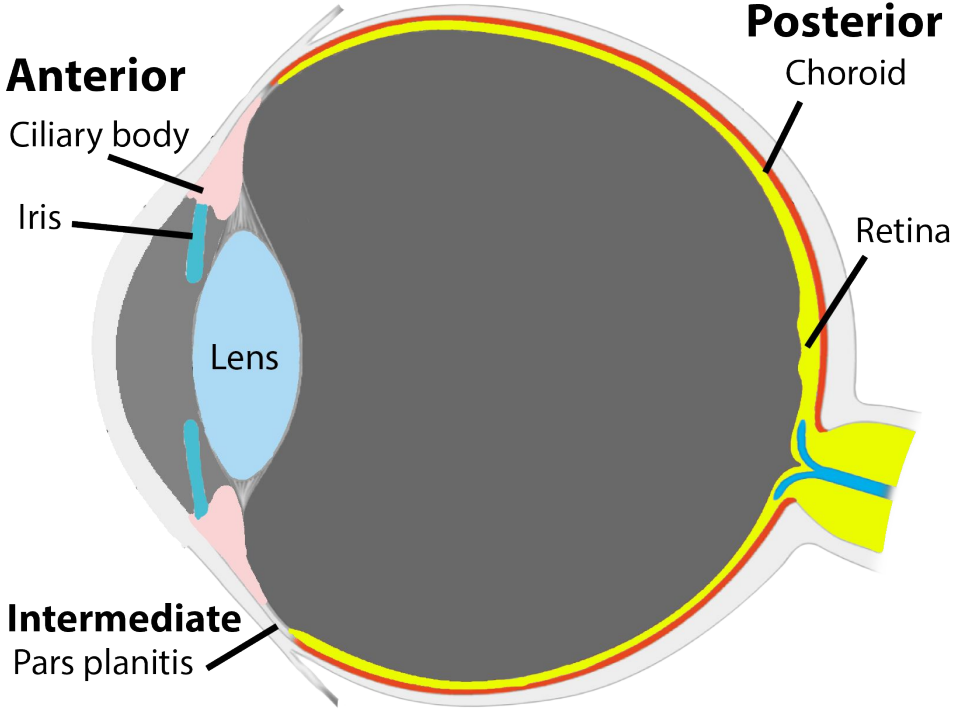
Divided into categories by where the most **amount of inflammation is**:

Anterior uveitis
ir*itis*, irido*cyclitis*

Intermediate uveitis
pars plan*itis*

Posterior uveitis
choroid*itis*, retin*itis*, chorioretin*itis*

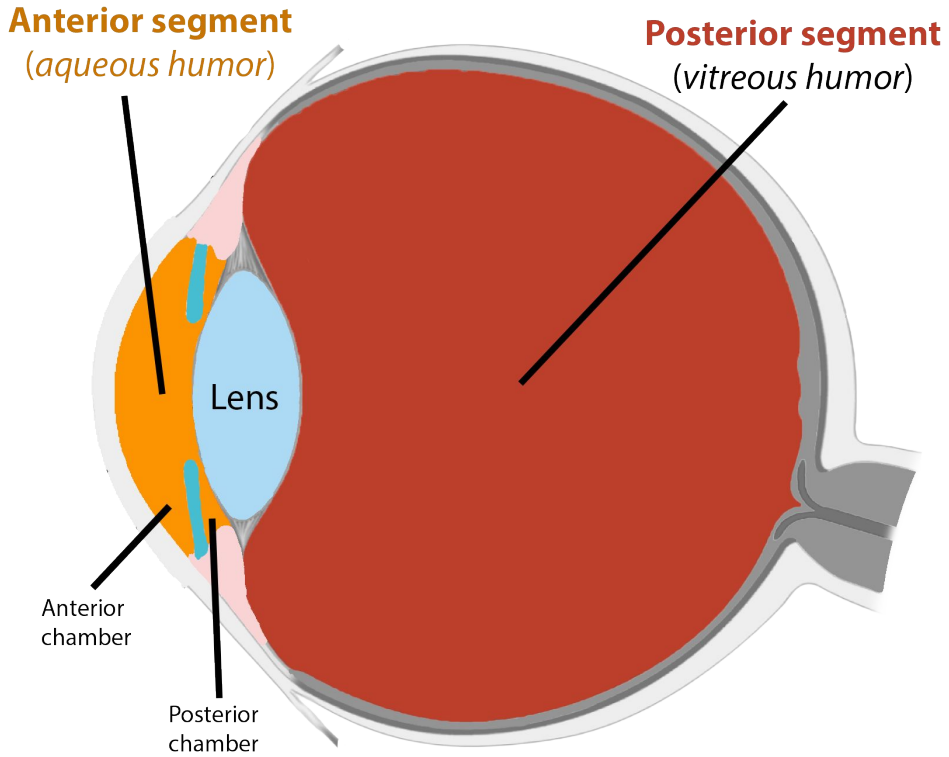
Panuveitis
Everything!



Segments of the eye

Segments are **separated by the lens**

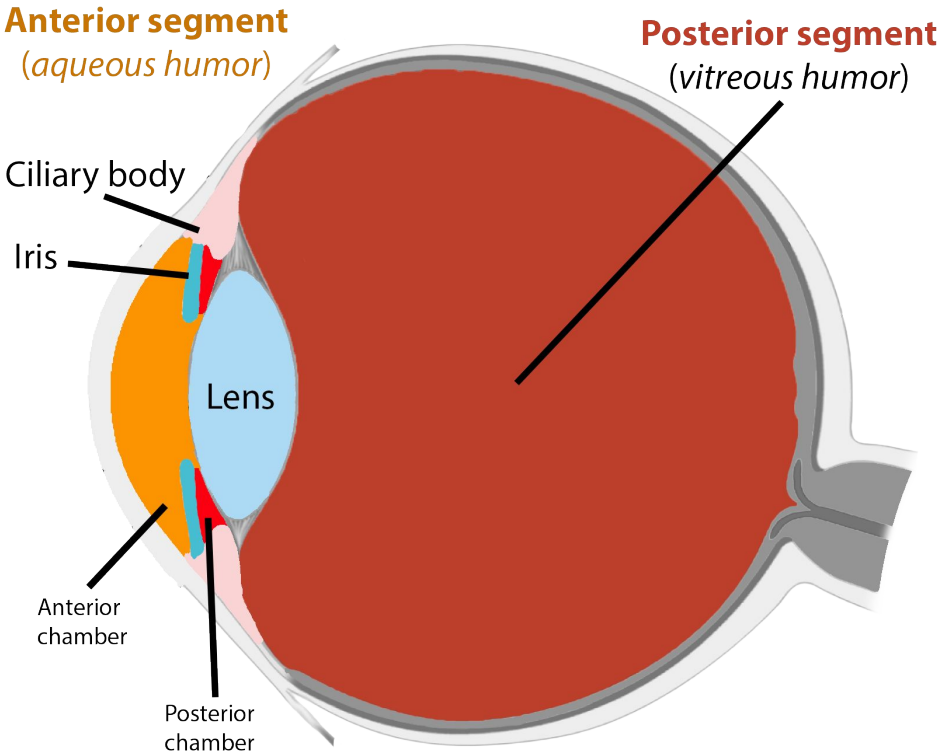
- **Anterior segment** = aqueous humor
- **Posterior segment** = vitreous humor



Segments of the eye vs chambers of the eye

Chambers =/= segments

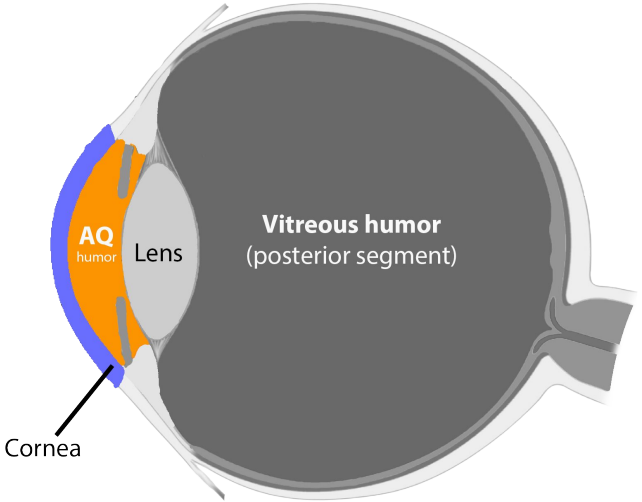
- **Anterior segment** = aqueous humor
  - Anterior chamber
  - Posterior chamber
- **Posterior segment** = vitreous humor



Question:

What kind of “-itis” does she have?

Exam (day 0)	Right	Left
Conjunctiva/Sclera	Normal	Normal
Cornea	**epithelial irregularities**	temporal **corneal infiltrate** w/ **3 KPs**
Anterior Chamber	Normal	**3+ cells**
Lens	PCIOL	PCIOL
Vitreous	Normal	**Syneresis, no cell**



Case 3: HPI

A **73 y/o F** with PMH including metastatic breast cancer (on Keytruda), rash on PO steroids, bilateral lens replacement (-3 mo) p/w **vision loss**

Optho A&P
 # Corneal infiltrate, possible keratitis (OS)
 # Dense anterior chamber reaction (OS)

Exam (day 0)	Right (OD)	Left (OS)
Visual acuity	20/100	20/70
IOP	13	24
Sclera	Normal	Normal
Cornea	**epithelial irregularities**	temporal **corneal infiltrate** w/ **3 KPs**
Ant Chamber	Normal	**3+ cells**
Lens	PCIOL	PCIOL
Vitreous	Normal	**Syneresis, no cell**
Fundus exam	Normal	Normal

No posterior chamber reaction

Case 3: HPI

A **73 y/o F** with PMH including metastatic breast cancer (on Keytruda), rash on PO steroids, bilateral lens replacement (-3 mo) p/w **vision loss**

Optho A&P
 # Corneal infiltrate, possible keratitis (OS)
 # Dense anterior chamber reaction (OS)
- Concern for an **infectious process** (given immunocompromise + keratitis) but also notes **Keytruda** can cause uveitis

Exam (day 0)	Right (OD)	Left (OS)
Visual acuity	20/100	20/70
IOP	13	24
Sclera	Normal	Normal
Cornea	**epithelial irregularities**	temporal **corneal infiltrate** w/ **3 KPs**
Ant Chamber	Normal	**3+ cells**
Lens	PCIOL	PCIOL
Vitreous	Normal	**Syneresis, no cell**
Fundus exam	Normal	Normal

No posterior chamber reaction

Case 3: HPI

A **73 y/o F** with PMH including metastatic breast cancer (on Keytruda), rash on PO steroids, bilateral lens replacement (-3 mo) p/w **vision loss**

Optho A&P
 # Corneal infiltrate, possible keratitis (OS)
 # Dense anterior chamber reaction (OS)

- Concern for an **infectious process** (given immunocompromise + keratitis) but also notes **Keytruda** can cause uveitis
- Did not culture L cornea because did not want to *create* epithelial defect
- Start **tobra** & **vanco drops**

No posterior chamber reaction

Exam (day 0)	Right (OD)	Left (OS)
Visual acuity	20/100	20/70
IOP	13	24
Sclera	Normal	Normal
Cornea	**epithelial irregularities**	temporal **corneal infiltrate** w/ **3 KPs**
Ant Chamber	Normal	**3+ cells**
Lens	PCIOL	PCIOL
Vitreous	Normal	**Syneresis, no cell**
Fundus exam	Normal	Normal

Case 3: HPI

A **73 y/o F** with PMH including metastatic breast cancer (on Keytruda), rash on PO steroids, bilateral lens replacement (-3 mo) p/w **vision loss**

- Day 0: Keratitis OS, dense ant chamber reaction → Vanc & tobra gtts
- Day 19: **Vision worsening**

Was 3 KPs on day 0

Exam (day 19)	Right (OD)	Left (OS)
Visual acuity	20/200	20/80
Sclera	Normal	Injection
Cornea	**epithelial irregularities**	temporal **corneal infiltrate** w/ **20 KPs**
Ant Chamber	Normal	**2+ cells**
Iris	Normal	Normal
Lens	PCIOL	Inflammatory debris
Vitreous	Normal	**Syneresis, no cell**

Case 3: HPI

A **73 y/o F** with PMH including metastatic breast cancer (on Keytruda), rash on PO steroids, bilateral lens replacement (-3 mo) p/w **vision loss**

- Day 0: Keratitis OS, dense ant chamber reaction → Vanc & tobra gtts
- Day 19: **Vision worsening** → corneal culture

Optho A&P
 # Corneal infiltrate, possible keratitis (OS)
 # Dense anterior chamber reaction (OS)
- More worried of **infectious process**, more keratic precipitates on cornea
- Does **Cx of L cornea**
- Continue tobra & vanco drops

Exam (day 19)	Right (OD)	Left (OS)
Visual acuity	20/200	20/80
Sclera	Normal	Injection
Cornea	**epithelial irregularities**	temporal **corneal infiltrate** w/ **20 KPs**
Ant Chamber	Normal	**2+ cells**
Iris	Normal	Normal
Lens	PCIOL	Inflammatory debris
Vitreous	Normal	**Syneresis, no cell**

Was 3 KPs on day 0

Case 3: HPI

A **73 y/o F** with PMH including metastatic breast cancer (on Keytruda), rash on PO steroids, bilateral lens replacement (-3 mo) p/w **vision loss**

- Day 0: Keratitis OS, dense ant chamber reaction → Vanc & tobra gtts
- Day 19: **Vision worsening** → corneal culture
  - Culture grows **mycobacterium abscessus**
  - Optho asks patient to **pause PO steroids** → **Rash worsens**

Case 3: HPI

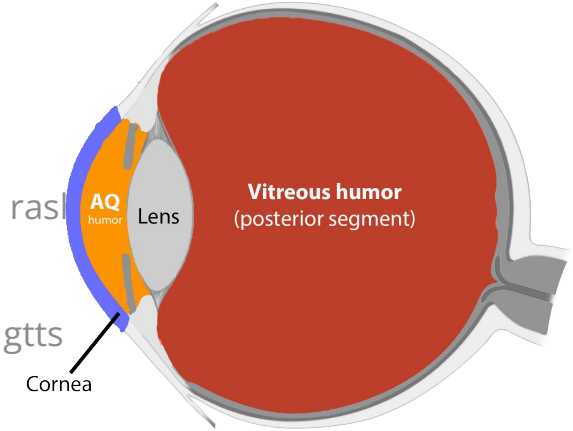
A **73 y/o F** with PMH including metastatic breast cancer (on Keytruda), rash on PO steroids, bilateral lens replacement (-3 mo) p/w **vision loss**

- Day 0: Keratitis OS, dense ant chamber reaction → Vanc & tobra gtts
- Day 19: **Vision worsening** → corneal culture
  - Culture grows **mycobacterium abscessus**
  - Optho asks patient to **pause PO steroids** → **Rash worsens**
- Day 33: Dermatology is concerned for **SJS/TEN** from the Keytruda
  - Skin biopsy **confirms SJS**
  - Admitted directly to Ruby

Case 3: HPI

A **73 y/o F** with PMH including metastatic breast cancer (on Keytruda), rash
bilateral lens replacement (-3 mo) p/w **vision loss**

- Day 0: Keratitis OS, dense ant chamber reaction → Vanc & tobra gtts
- Day 19: **Vision worsening** → corneal culture
  - Culture grows **mycobacterium abscessus**
  - Optho asks patient to **pause PO steroids** → **Rash worsens**
- Day 33: **SJS/TEN** from the Keytruda
  - Skin biopsy **confirms SJS**
  - Admitted directly to Ruby



Exam (day 33)	Left (OS)
Visual acuity	**HM**
Sclera	4+ Injection
Cornea	temporal **corneal infiltrate** w/ **KPs**
Ant Chamber	**2+ cells**
Iris	Normal
Lens	PCIOL
Vitreous	**Dense vitritis**

Case 3: Summary

A **73 y/o F** with PMH including metastatic breast cancer (on Keytruda for 4 mo), lens replacement (-4 mo), current SJS p/w **left eye vision loss** x 1 month

 # Keratitis, left eye (OS)
- M abscesses on corneal Cx

 # Anterior chamber-itits (OS)
- Later vitreous involvement

 # C/F panuveitis

 # SJS / TENS (from immunotherapy)

 # B/L lens replacement
- 3 months before keratitis

 # Hx systemic steroid use (for rash)

Exam (day 33)	**Left (OS)**
Visual acuity	HM
Sclera	4+ Injection
Cornea	temporal **corneal infiltrate** w/ **KPs**
Ant Chamber	**2+ cells**
Iris	Normal
Lens	PCIOL
Vitreous	**Dense vitritis**

Ongoing since start of vision issues

Maybe from stopping steroids (vs progression of infection)

- -30 days: Post op eye exam was normal
- Day 0: Keratitis OS, dense ant chamber reaction
  - Rx Vanc & tobra gtts
- Day 19: **Vision worse** → corneal Cx
- ~Day 23: Cx grows ***M abscessus***
  - Optho **holds PO steroids** → Rash worsens
  - Posterior involvement begins
- Day 33: **SJS** (Bx confirmed) → Admit to Ruby

Case 3: Summary

A **73 y/o F** with PMH including metastatic breast cancer (on Keytruda for 4 mo), lens replacement (-4 mo), current SJS p/w **left eye vision loss** x 1 month

 # Keratitis, left eye (OS)
- M abscesses on corneal Cx

 # Anterior chamber-itits (OS)
- Later vitreous involvement

 # C/F panuveitis

 # SJS / TENS (from immunotherapy)

 # B/L lens replacement
- 3 months before keratitis

 # Hx systemic steroid use (for rash)

Exam (day 33)	**Left (OS)**
Visual acuity	HM
Sclera	4+ Injection
Cornea	temporal **corneal infiltrate** w/ **KPs**
Ant Chamber	**2+ cells**
Iris	Normal
Lens	PCIOL
Vitreous	**Dense vitritis**

Antimicrobial exposures

- **Cephalosporins** (same time as starting Keytruda)
  - Could this cause SJS?
- **Fluoroquinolone** gtts (as part of post op care)
  - Moxi & ofloxacin
- **Erythromycin ointment** (basically the whole time)
- **Vanco** & **tobramycin** gtts (past 33 days)
- **PO doxycycline** (past 7 days)

[Q3.2]
Is this ocular SJS or ocular NTM?

Skip

Mentimeter

Case 3: Susceptibilities

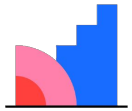
Corneal swab: *M abscessus*		
Doxycycline	≥16	Resist
Ciprofloxacin	≥8	Resist
Moxifloxacin	≥8	Resist
TMP/SMX	4 /76	Resist
Imipenem	8	Intermed
Cefoxitin	32	Intermed
Clofazimine	0.06	
Tigecycline	0.06	
Amikacin	8	Suscept
Linezolid	8	Suscept
Clarithromycin	?	**Pend**

Clarithromycin susceptibility to follow
No T28 substitution or deletion in erm(41) gene was detected

Antimicrobial exposures

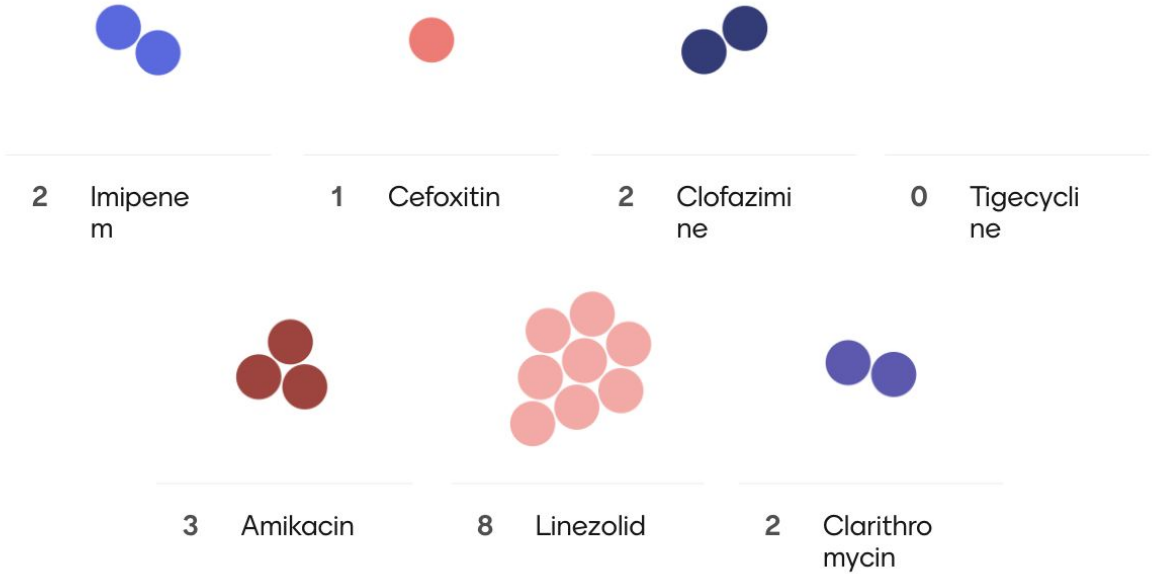
- **Cephalosporins** (same time as starting Keytruda)
  - Could this cause SJS?
- **Fluoroquinolone** gtts (as part of post op care)
  - Moxi & ofloxacin
- **Erythromycin ointment** (basically the whole time)
- **Vanco** & **tobramycin** gtts (past 33 days)
- **PO doxycycline** (past 7 days)

[Q3.3]
If needing to do systemic therapy, what would you trust?



Mentimeter

[Q3.3] Which systemic antimicrobials would you pick (& that get in the eye)?



2 Imipenem

1 Cefoxitin

2 Clofazimine

0 Tigecycline

3 Amikacin

8 Linezolid

2 Clarithromycin

Corneal swab: *M abscessus*		
Doxycycline	≥16	Resist
Ciprofloxacin	≥8	Resist
Moxifloxacin	≥8	Resist
TMP/SMX	4 /76	Resist
Imipenem	8	Intermed
Cefoxitin	32	Intermed
Clofazimine	0.06	
Tigecycline	0.06	
Amikacin	8	Suscept
Linezolid	8	Suscept
Clarithromycin	?	**Pend**

Clarithromycin susceptibility to follow
No T28 substitution or deletion in erm(41) gene was detected

Case 3: Susceptibilities

Corneal swab: *M abscessus*		
Doxycycline	≥16	Resist
Ciprofloxacin	≥8	Resist
Moxifloxacin	≥8	Resist
TMP/SMX	4 /76	Resist
Imipenem	8	Intermed
Cefoxitin	32	Intermed
Clofazimine	0.06	
Tigecycline	0.06	
Amikacin	8	Suscept
Linezolid	8	Suscept
Clarithromycin	**?**	**Pend**

Clarithromycin susceptibility to follow
No T28 substitution or deletion in erm(41) gene was detected

Week 4: ID recs

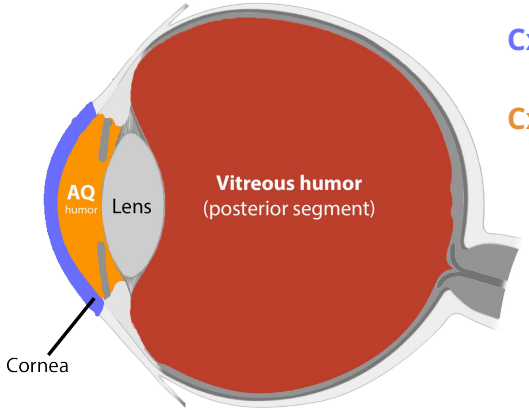
We get the susceptibilities back and say

- Corneal Cx **could be environmental contamination**
  - E.g. from the eye drops used post op
- **No good systemic options**; need careful risk benefits discussion before months/years of Tx
- **Sign off**: No systemic therapy, please do topicals
  - Call back if any growth on aqueous chamber/vitreous cultures

Case 3: Infectious course

- -3 months: Bilateral lens replacement
  - -30 days: Post op eye exam was normal
- Day 0: **Keratitis** OS, **ant chamber** rxn
  - Rx Vanc & tobra gtts
- w2d5: **corneal Cx**: ***M abscessus***
  - By exam, vitreous involvement begins during this time period
- w4d6: **Ant chamber Cx**: ***M abscessus***
  - Injected amikacin

Week 4, day 6 (left eye)
Optho does **paracentesis of anterior chamber** w/ injection of amikacin
- Cultures will eventually grow M abscessus



Key for the timeline
Cx = corneal Cx
Cx = anterior chamber Cx
NTM = M abscessus

Do you do systemic therapy now?

Case 3: Infectious course

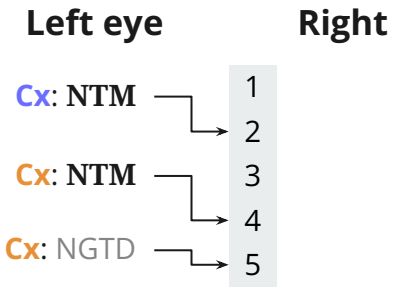
Week 4, day 6 (left eye)
Optho does **paracentesis of anterior chamber** w/ injection of amikacin

- Cultures will eventually grow M abscessus

Week 5, day 5 (left eye)
Paracentesis of anterior chamber

- No injections
- Cultures had no growth

Key for the timeline
Cx = corneal Cx
Cx = anterior chamber Cx
NTM = M abscessus
NGTD = No growth



Case 3: Infectious course

Key for the timeline
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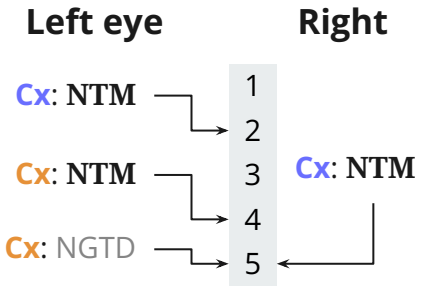
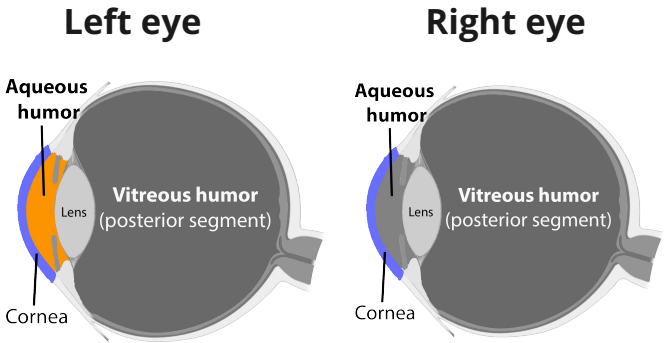


Week 4, day 6 (left eye)
Optho does **paracentesis of anterior chamber** w/ injection of amikacin
- Cultures will eventually grow M abscessus

Week 5, day 5 (left eye)
Paracentesis of anterior chamber
- No injections
- Cultures had no growth

Week 5, day 4 (right eye)
Corneal swab of the right eye (seemingly uninvolved)
- Corneal Cx: M abscessus



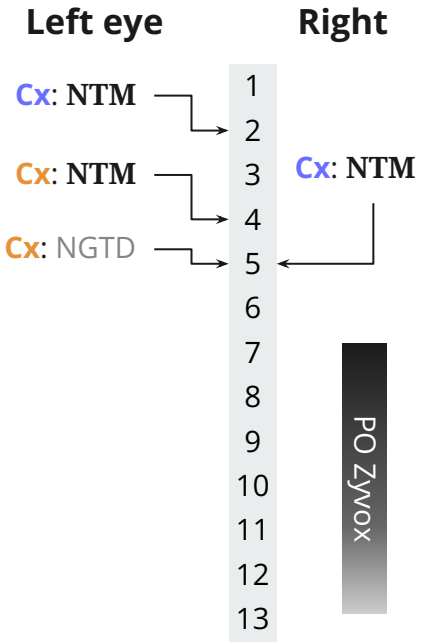
Case 3: Infectious course

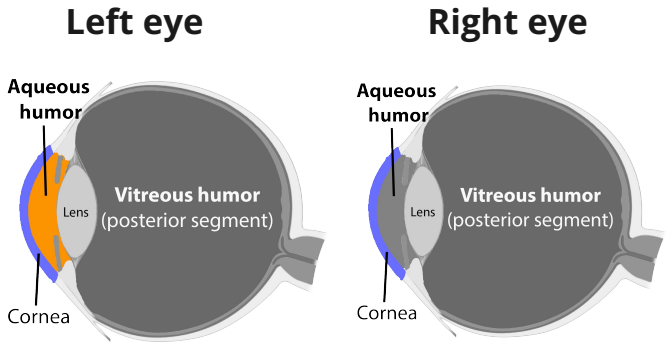
Week 7, day 2

Optho is planning or removal of the left lens, so when patient is seen in ID clinic:

- Start **PO linezolid**
  - Plan for 6 weeks
- Continue with amikacin & linezolid gtts

Key for the timeline
Cx = corneal Cx
Cx = anterior chamber Cx
NTM = M abscessus
NGTD = No growth



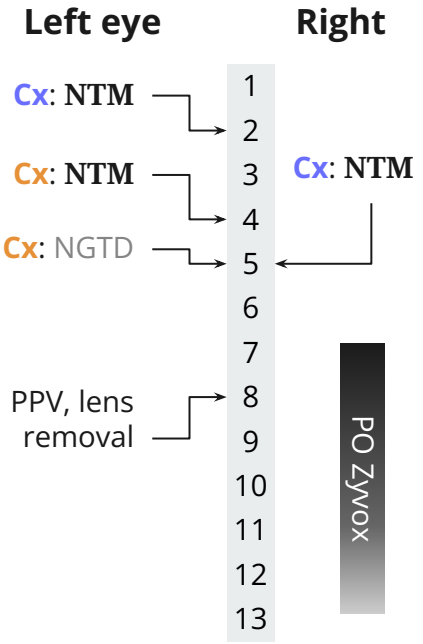


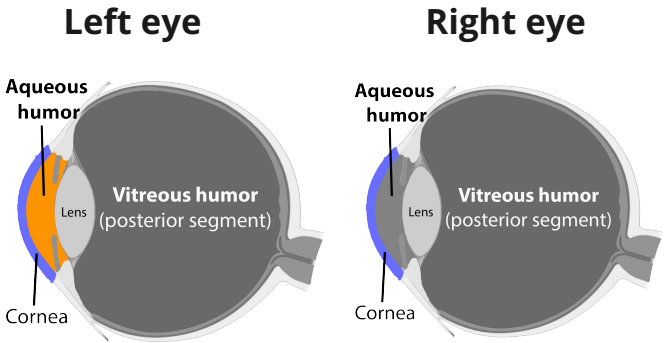
Case 3: Infectious course

Week 8
NAME OF PROCEDURES: left eye
1. Pars plana vitrectomy
2. Vitreous biopsy & injection of intravitreal amikacin
3. Removal of Intraocular implant

Lens Cx: TBD
Vitreous Cx: TBD

Key for the timeline
Cx = corneal Cx
Cx = anterior chamber Cx
Cx = vitreous Cx
NTM = M abscessus
NGTD = No growth





Case 3: Infectious course

Week 8
NAME OF PROCEDURES: left eye
1. Pars plana vitrectomy
2. Vitreous biopsy & injection of intravitreal amikacin
3. Removal of Intraocular implant

Lens Cx: No growth..?
Vitreous Cx: **M abscessus**

Key for the timeline
Cx = corneal Cx
Cx = anterior chamber Cx
Cx = vitreous Cx
NTM = M abscessus
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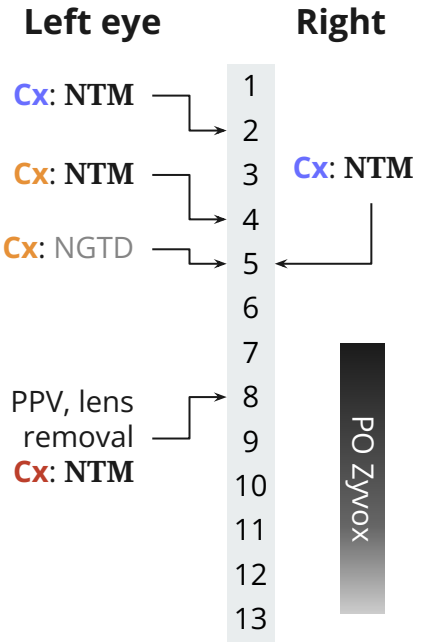
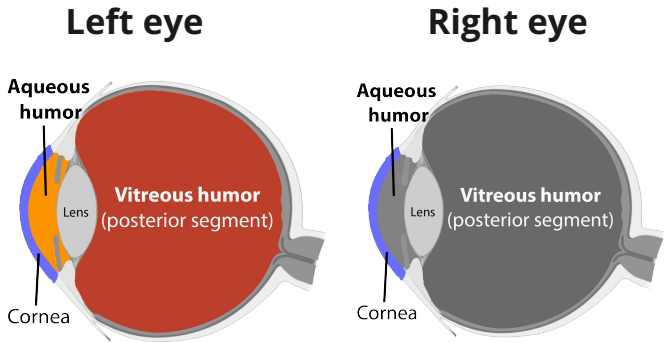


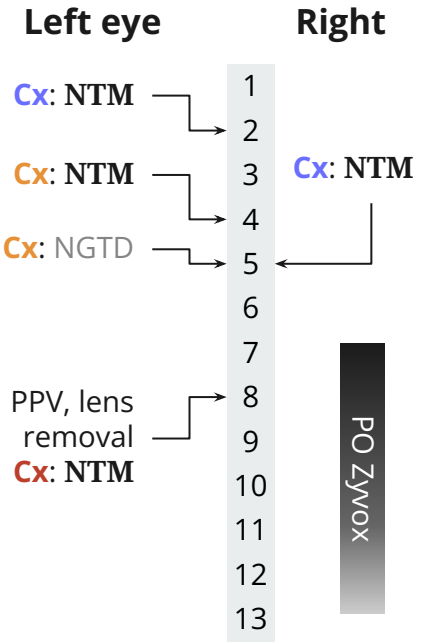


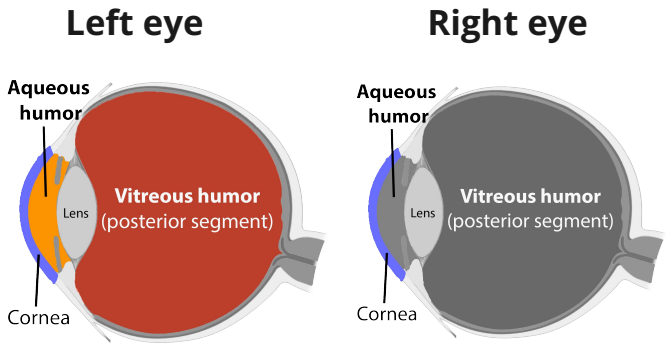
Case 3: Infectious course

Week 13, day 5

Admitted to OSH with acute on chronic anemia. *Hemodynamically stable* but…

Key for the timeline
Cx = corneal Cx
Cx = anterior chamber Cx
Cx = vitreous Cx
NTM = M abscessus
NGTD = No growth





Case 3: Infectious course

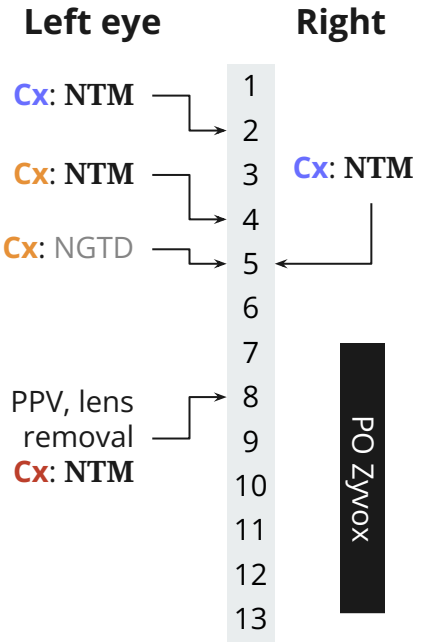
Week 13, day 5

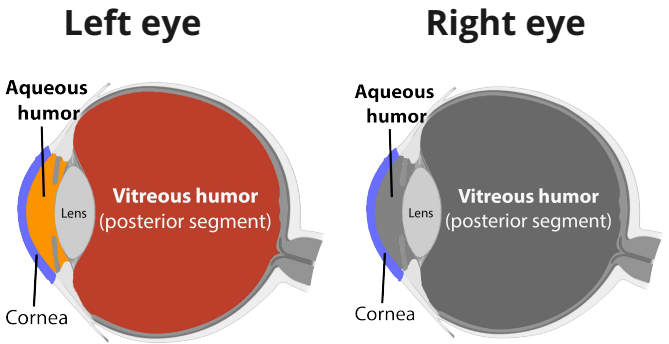
Admitted to OSH with acute on chronic anemia. *Hemodynamically stable* but…

- Platelets 77
- **Lactate 5.7**

PO **linezolid stopped** (two days short of the six week mark)

Key for the timeline
Cx = corneal Cx
Cx = anterior chamber Cx
Cx = vitreous Cx
NTM = M abscessus
NGTD = No growth





Case 3: Infectious course

Week 17

Bilateral corneal cultures are negative!

Key for the timeline
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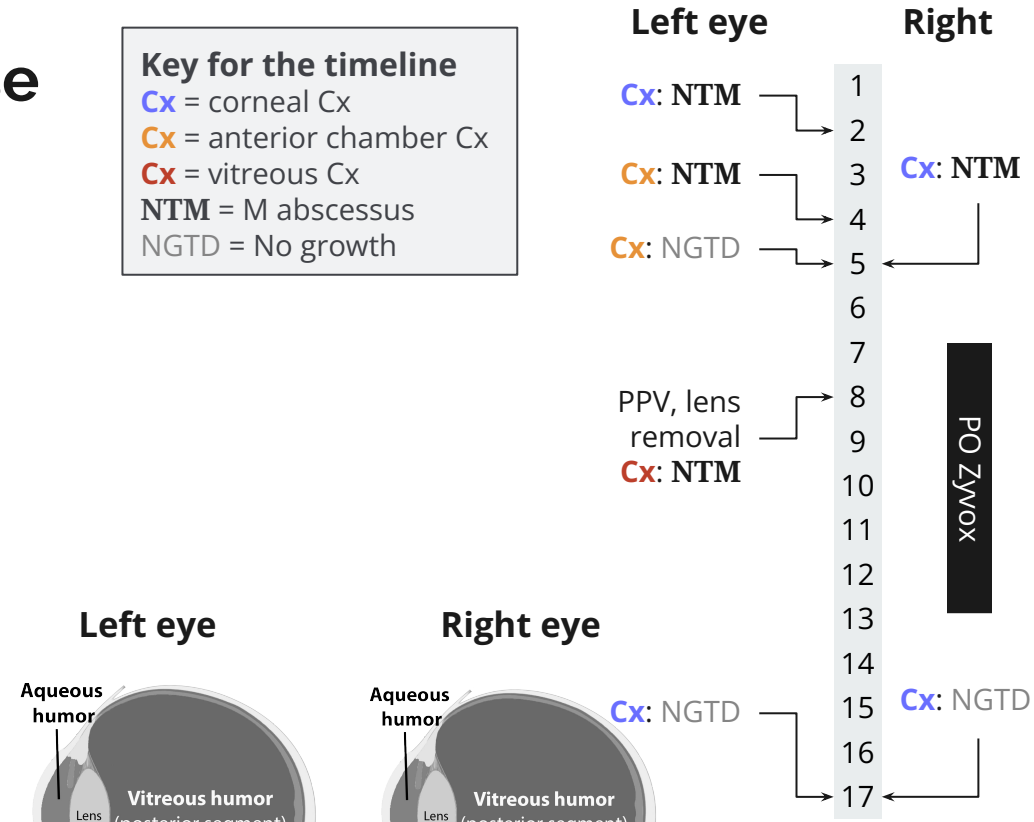
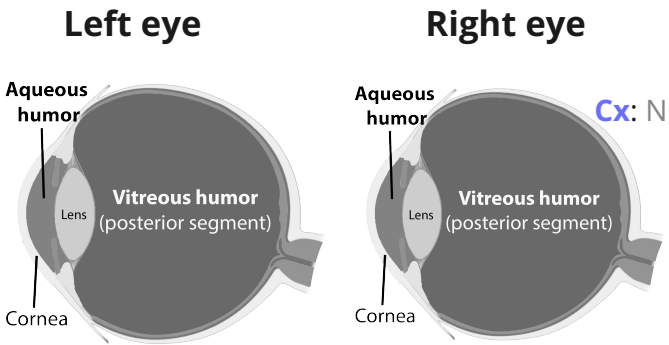
Cx = anterior chamber Cx
Cx = vitreous Cx
NTM = M abscessus
NGTD = No growth





Case 3: Infectious course

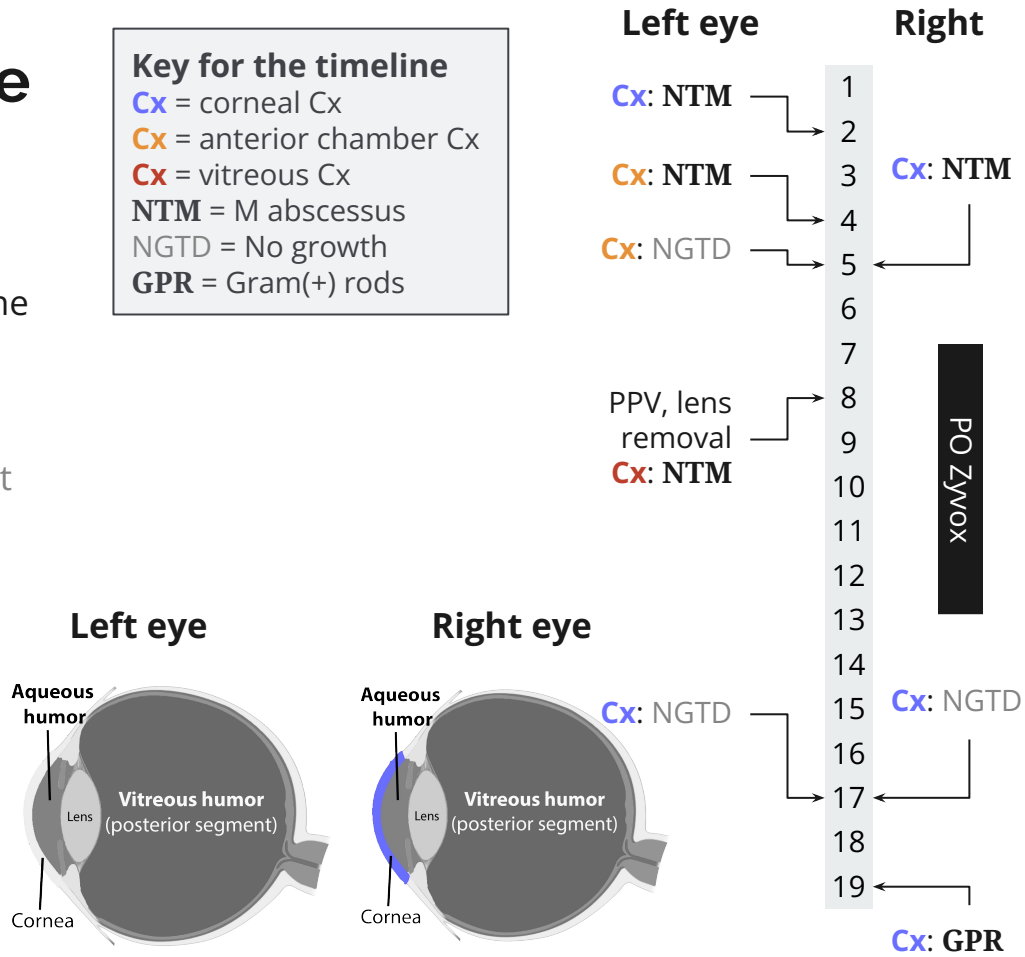
Week 19

Corneal cultures obtained **last week** from the **right eye** showed up as positive (while preparing these slides)

- **Gram positive rods** only (worry about *propionibacterium acnes* or *Corynebacterium*)

Addendum
Acid fast bacilli on AFB (but smear neg)

Key for the timeline
Cx = corneal Cx
Cx = anterior chamber Cx
Cx = vitreous Cx
NTM = M abscessus
NGTD = No growth
GPR = Gram(+) rods



Discussion

Links to articles discussed here

Ocular NTM

- Recognize major **causes** & **risk factors** of **NTM keratitis** and **endophthalmitis**
- Identify **clinical patterns & characteristic exam findings** and understand when to pursue scraping or other diagnostic steps
- Outline **medical and surgical treatment approaches**, including indications for escalation
- Appreciate **expected outcomes** and the reasons these infections are challenging to manage, including insights from reported outbreak

NTM Keratitis

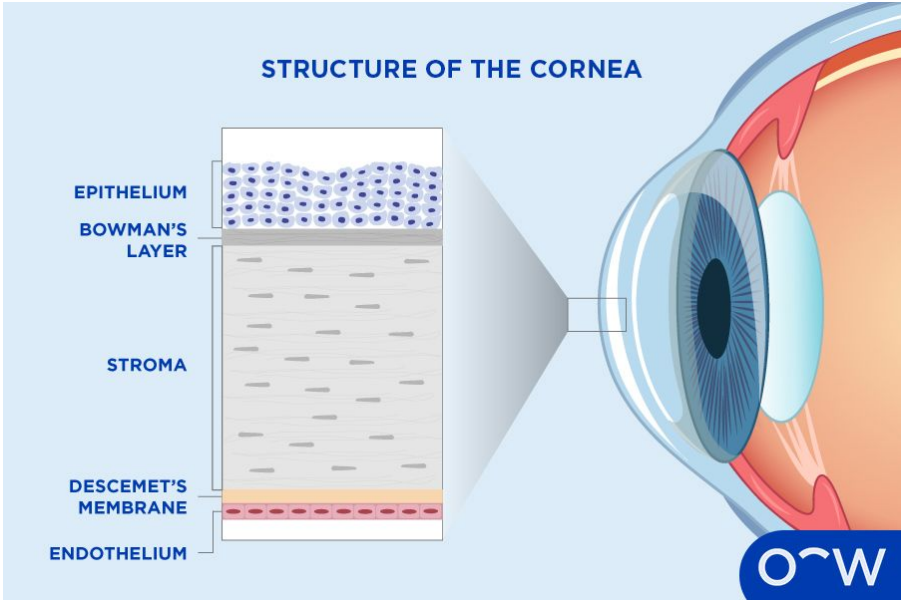
- Most commonly caused by the **rapid growers** [3]
  - *M fortuitum* or *M abscessus* account for **84% of cases** [2]

NTM Keratitis

- Most commonly caused by the **rapid growers** [3]

Risk factors [3]

Anything that disrupts the **corneal epithelium**



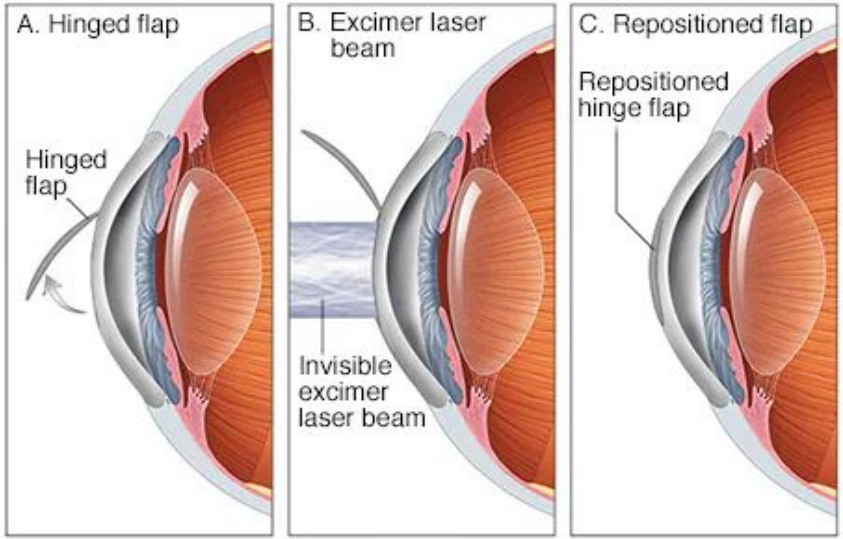
NTM Keratitis

- Most commonly caused by the **rapid growers** [3]

Risk factors [3]

Anything that disrupts the **corneal epithelium**

LASIK (47%)
- Which makes sense as you cut the cornea



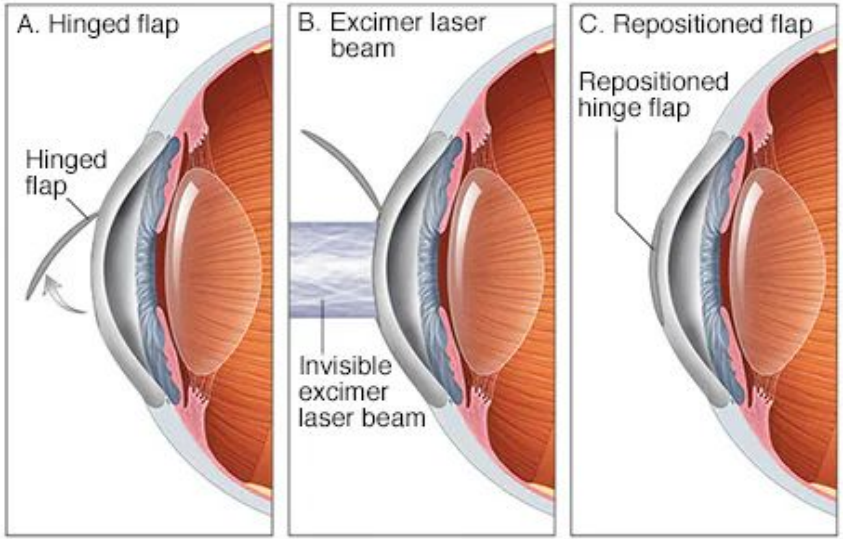
NTM Keratitis

- Most commonly caused by the **rapid growers** [3]

Risk factors [3]

Anything that disrupts the **corneal epithelium**

LASIK (47%)
- Which makes sense as you cut the cornea
- **Almost half of *infectious keratitis*** after LASIK is from NTM



NTM Keratitis

- Most commonly caused by the **rapid growers** [3]

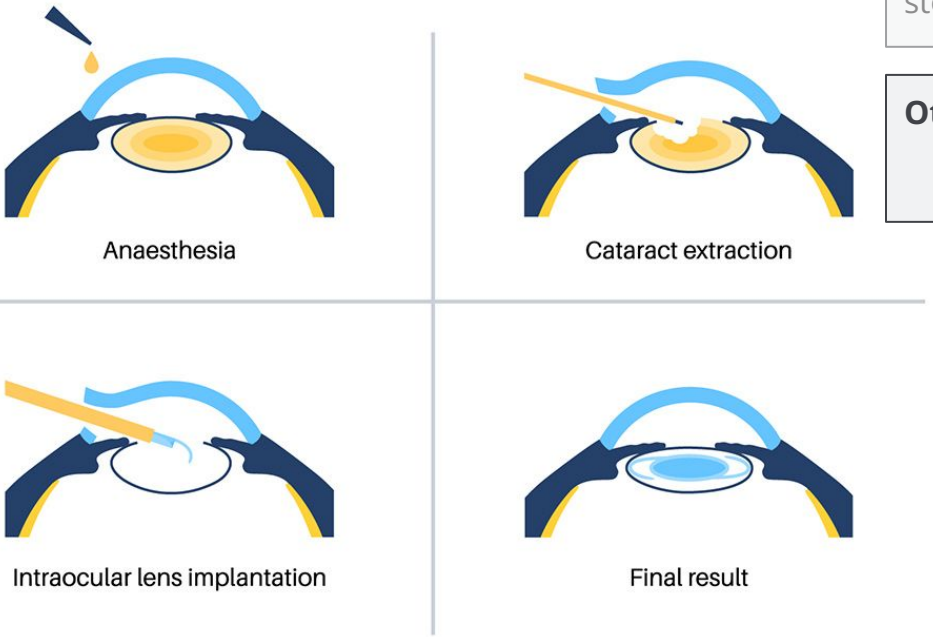
Risk factors [3]

Anything that disrupts the **corneal epithelium**

LASIK (47%)
Outbreaks in Brazil, USA, and Japan to **improper sterilization** [2]

NTM Keratitis

- Most commonly caused by the **rapid growers** [3]



Risk factors [3]

Anything that disrupts the **corneal epithelium**

LASIK (47%)
Outbreaks in Brazil, USA, and Japan to improper sterilization [2]

Other ocular surgery (22%)
- Cataract surgery (8.8%)
- Penetrating keratoplasty (9.5%)

NTM Keratitis

- Most commonly caused by the **rapid growers** [3]

Risk factors [3]

Anything that disrupts the **corneal epithelium**

LASIK (47%)
Outbreaks in Brazil, USA, and Japan to improper sterilization [2]

Other ocular surgery (22%)
- Cataract surgery (8.8%)
- Penetrating keratoplasty (9.5%)

Non-surgical
- Trauma (14.8%)
- Foreign body (17.6%)
- Contact lens (6.4%)

NTM Keratitis

- Most commonly caused by the **rapid growers** [3]
- Risk factors: Anything that disrupts the corneal epithelium
    - Up to **one in three** may have **no apparent epithelial defect**

NTM Keratitis [2]

- Most commonly caused by the **rapid growers** [3]
- Risk factors: Anything that disrupts the corneal epithelium
- Clinical course depends on risk factor

Ocular surgery (69%) [3]
- LASIK (47%)

More indolent
- Avg **3.4 weeks**
- Can be up to 14 weeks

Non-surgical trauma (~30%) [3]

More abrupt
- Days to weeks

NTM Keratitis [2]

- Most commonly caused by the **rapid growers** [3]
- Risk factors: Anything that disrupts the corneal epithelium
- Clinical course depends on risk factor

Ocular surgery (69%) [3]
- LASIK (47%)

More indolent
- Avg **3.4 weeks**
- Can be up to 14 weeks

Often **deeper inflammation**

Non-surgical trauma (~30%) [3]

More abrupt
- Days to weeks

More **superficial inflammation**

NTM Keratitis [2]

- Most commonly caused by the **rapid growers** [3]
- Risk factors: Anything that disrupts the corneal epithelium
- Clinical course depends on risk factor
- Corneal infiltrates with radiating projections (“**cracked windshield**” appearance) is suggestive

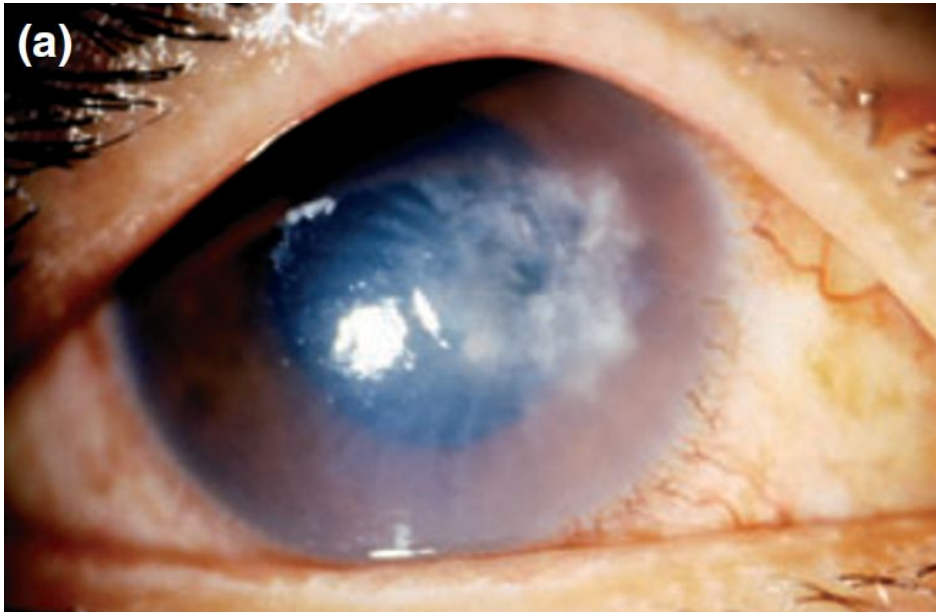


Figure 1a of Chu et al [2] showing paracentral stromal infiltrates with radiating projections mimicking a cracked windshield

NTM Keratitis [2]

- Most commonly caused by the **rapid growers** [3]
- Risk factors: Anything that disrupts the corneal epithelium
- Clinical course depends on risk factor
- Infiltrates with radiating projections (“**cracked windshield**” appearance)
- May be mistaken for **HSV** or ***Acanthamoeba*** as it also causes **crystalline keratopathy**
    - Can also look fungal [3]

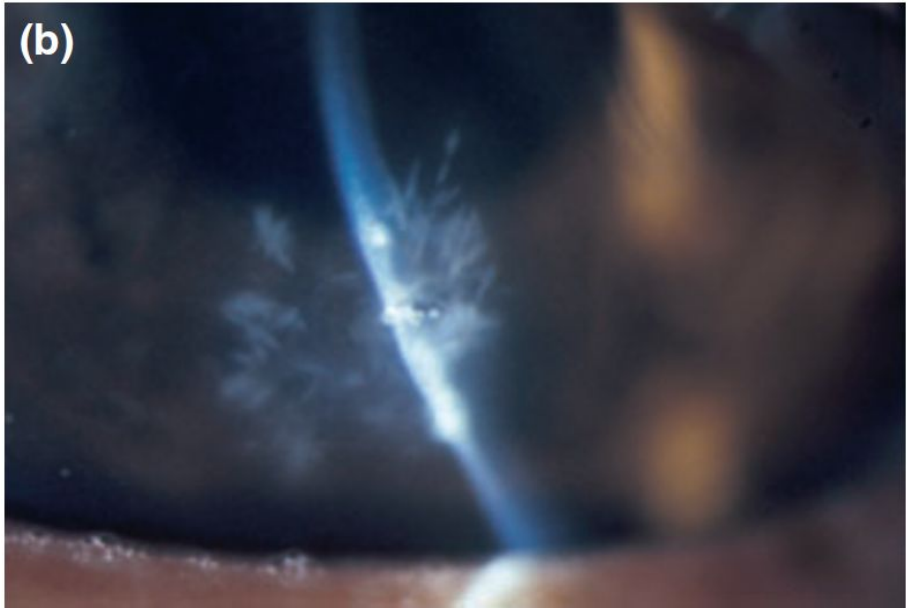


Figure 1b of Chu et al [2] showing infectious crystalline keratopathy characterized by white, crystalline, refractile, branching stromal infiltrates

NTM Keratitis [2]

- Most commonly caused by the **rapid growers** [3]
- Risk factors: Anything that disrupts the corneal epithelium
- Clinical course depends on risk factor
- Look for “cracked windshield” or crystalline keratopathy
- Diagnosis requires **corneal scraping**

Week 4: ID recs
Corneal Cx could be **environmental contamination**

NTM Keratitis [2]

- Most commonly caused by the **rapid growers** [3]
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- Clinical course depends on risk factor
- Look for “cracked windshield” or crystalline keratopathy
- Diagnosis requires **corneal scraping**

Week 4: ID recs
Corneal Cx could be **environmental contamination**

Corneal swab --vs-- scraping
You’re *allowed* to E-swab whatever you want (it’s a free country), but just because you *can* do something doesn’t mean it’s a *good idea*

NTM Keratitis [2]

- Most commonly caused by the **rapid growers** [3]
- Risk factors: Anything that disrupts the corneal epithelium
- Clinical course depends on risk factor
- Look for “cracked windshield” or crystalline keratopathy
- Diagnosis requires **corneal scraping**

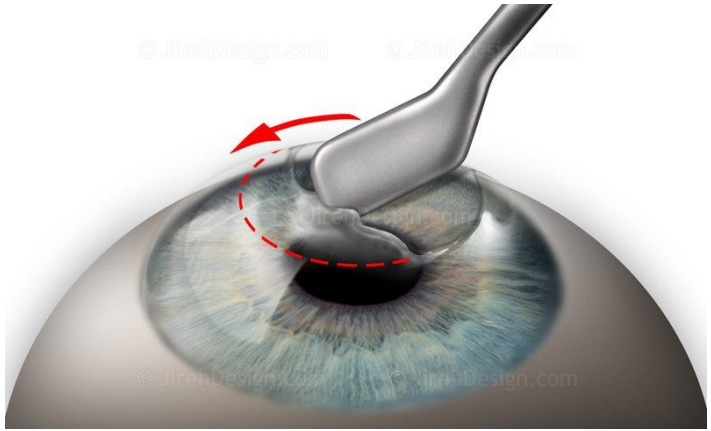
Optho A&P
 # Corneal infiltrate, possible keratitis (OS)
 # Dense anterior chamber reaction (OS)
...

- Did not culture L cornea because **did not want to *create* epithelial defect**
- Start **tobra** & **vanco drops**

Corneal swab --vs-- scraping

To perform a corneal scraping [7] (per the internet)

1. Instill **topical anesthetic** and align the patient in slit lamp (for magnification)
2. Use a **spatula**, **spud** or **swab**
3. Scrape the ulcer **at its base** and at the leading **edge of the infiltrate**

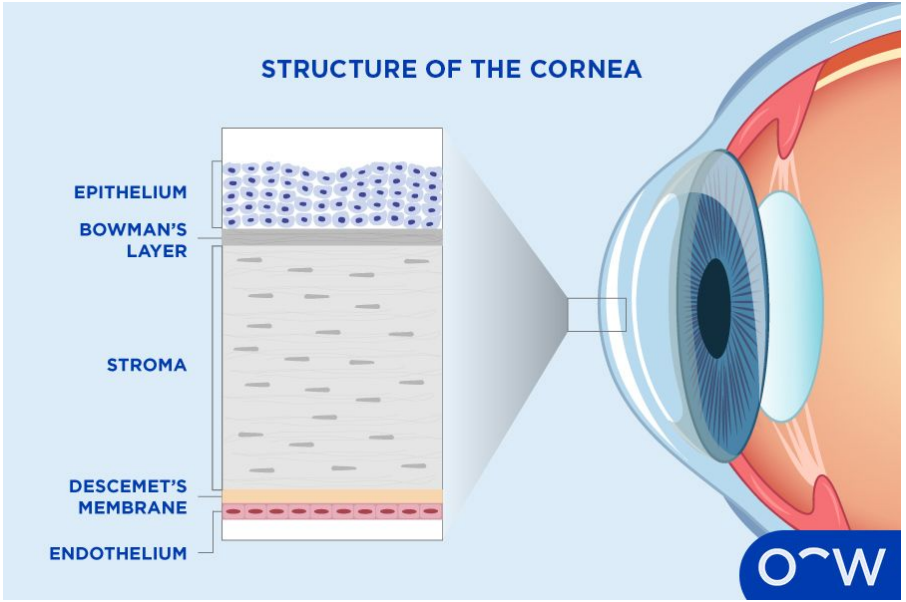


Treatment: NTM Keratitis [2]

- Requires antibiotics +/- aggressive surgical management
  - **45% managed medically** [3]
  - Half get local antibiotics, **half get systemic** [citation 3, table 4 has details]
- Progression despite topical antibiotics is followed by surgery in most cases

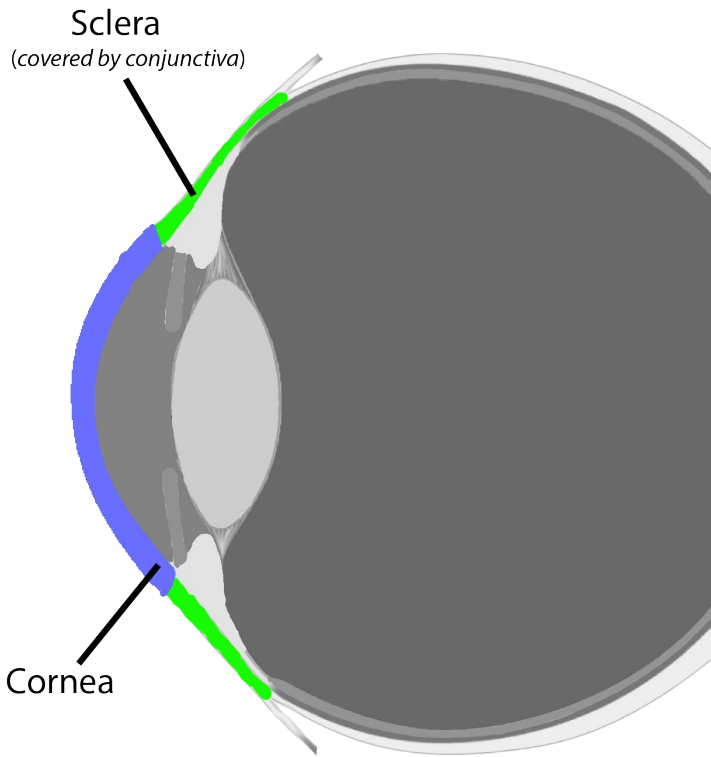
Treatment: NTM Keratitis [2]

- Requires antibiotics +/- aggressive surgical management
  - Progression despite topical antibiotics is followed by surgery in most cases
- **Lamellar keratectomy**: Removal of infected corneal stroma
  - Flap amputation often needed for LASIK



Treatment: NTM Keratitis [2]

- Requires antibiotics +/- aggressive surgical management
  - Progression despite topical antibiotics is followed by surgery in most cases
- **Lamellar keratectomy**: Removal of infected corneal stroma
  - Flap amputation often needed for LASIK
- Advanced cases can **progress to corneoscleral junction** and result in **endophthalmitis**



Prognosis: NTM Keratitis [2]

Historically had a bad prognosis, but **getting better**

- In 2004, 50% of post-LASIK NTM had at least moderate vision loss
- More recent studies have **82%** **have visual acuity of 20/40 or better**

Prognosis: NTM Keratitis [3]

Historically had a bad prognosis, but **getting better**

- In 2004, 50% of post-LASIK NTM had at least moderate vision loss
- More recent studies have **82% have visual acuity of 20/40 or better**

Still, **NTM is much more challenging to manage** compared to other types of infectious keratitis

- One in four required **more than one surgery**
- A 2015 systematic review [3] found one in five **legally blind**

NTM endophthalmitis

- Recognize major **causes** & **risk factors** of **NTM keratitis** and **endophthalmitis**
- Identify **clinical patterns & characteristic exam findings** and understand when to pursue scraping or other diagnostic steps
- Outline **medical and surgical treatment approaches**, including indications for escalation
- Appreciate **expected outcomes** and the reasons these infections are challenging to manage, including insights from reported outbreak

NTM endophthalmitis [6]

- Incidence is **quite low** (unlike infectious keratitis post-LASIK)
  - <1% of culture positive endophthalmitis cases in one review [4]
- In one 2015 systematic review of 379 patients [3] with ocular NTM infections
  - 290 had keratitis (77%)
  - 44 had endophthalmitis (12%)
- Clinical presentation [3]
  - **59%** had **anterior chamber** reaction with hypopyon
  - **31%** had **vitreous** inflammatory reaction
  - **6.3%** had granulomatous **keratic precipitates** on the cornea

NTM endophthalmitis [6]

Exogenous

Commonly **after procedures** (76%) [3]

- Cataract surgery with IOL (49%)
- 70% involved some kind of implant (IOL, corneal grafts, tubes)

NTM endophthalmitis [6]

Exogenous	Endogenous
Commonly **after procedures** (76%) [3] ● Cataract surgery with IOL (49%) ● 70% involved some kind of implant (IOL, corneal grafts, tubes)	**Uncommon** (12% in one review [6], n=14) ● Heavy immunosuppression (transplant, HIV); uncommon in immunocompetent ● ~30% had disseminated NTM [3][6]

NTM endophthalmitis [6]

Exogenous	Endogenous
Commonly **after procedures** (76%) [3] ● Cataract surgery with IOL (49%) ● 70% involved some kind of implant (IOL, corneal grafts, tubes)	**Uncommon** (12% in one review [6], n=14) ● Heavy immunosuppression (transplant, HIV); uncommon in immunocompetent ● ~30% had disseminated NTM [3][6]

More commonly the **rapid growers**

- *M abscessus* (65%)
- *M fortuitum* (25%)

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Endogenous

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More commonly the **slow growers** (93%)

- Most common: *M avium* (35%)
- Only one was rapid grower (*M chelonae*)

Outbreaks! NTM endophthalmitis [5]

Iatrogenic NTM infection can be **devastating**, highlighted by a 2018 cases series of **9 patients** with ***M abscessus*** after cataract surgery

- Averaged **10.6 intravitreal injections**
  - All had at least one additional surgery
- All received 3-6 months of **systemic antibiotics**
  - Mostly prolonged clarithromycin
  - Also got 10 days of amikacin & tigecycline

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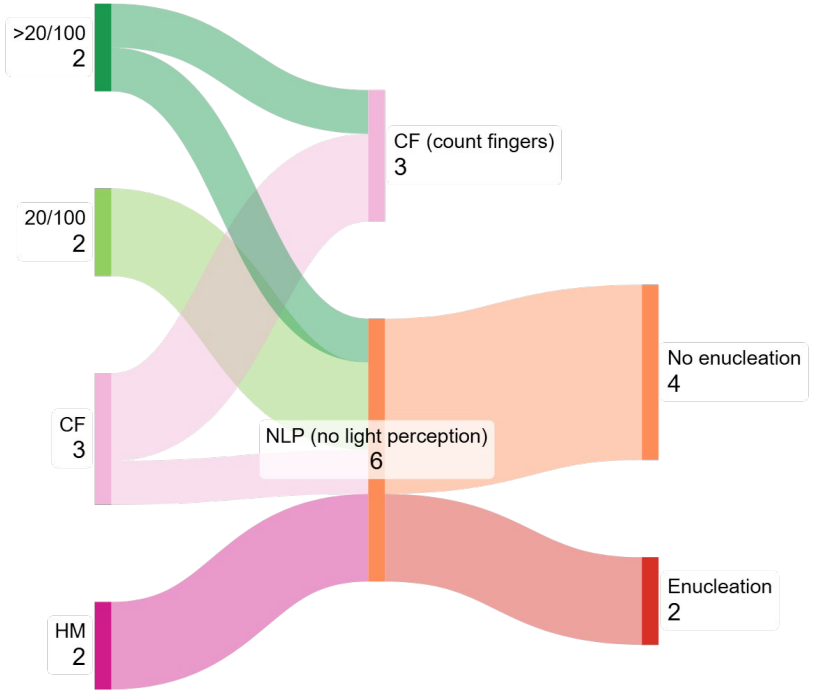
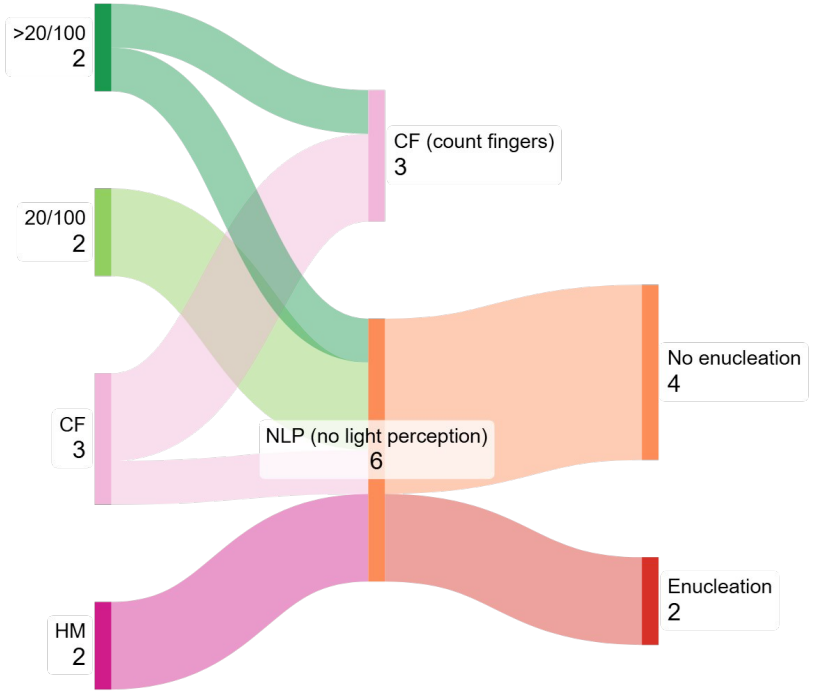
Nobody got better :(



Outbreaks! NTM endophthalmitis [5]

Iatrogenic NTM infection can be **devastating**, highlighted by a 2018 cases series of **9 patients** with ***M abscessus*** after cataract surgery

- All cases were from the same clinic
- They cultured they eye drops (no growth)
- Suspected it was related to their autoclave
    - But clinic changed autoclave before they could Cx



NTM endophthalmitis [3]

Treatment

- Everyone gets antibiotics
  - 50% had combo therapy
- **86%** treated **surgically**
- **No significant correlation** between PPV and visual outcomes
  - Likely because outcomes are miserable

NTM endophthalmitis

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Prognosis

...it's **not good**

- 79% were worse than 20/200 [6]
- 77% were <20/40 [3]
- 68% were ≤20/400 [4]
- 2/3rd had no light perception [5]

Anywhere **1/3 - 1/5 will lose the eye** [3-6]

Learning points & take aways

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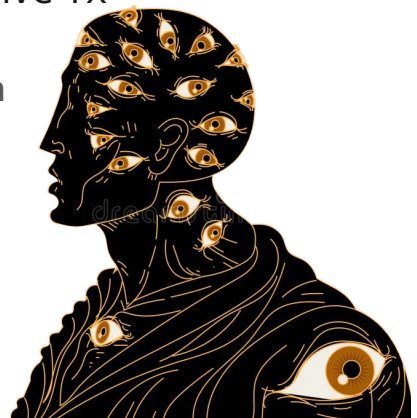
- NTM ocular infections are mostly caused by **rapid-growing NTM**, often **after ocular surgery** or trauma
- **Keratitis** may present with indolent or abrupt courses
  - **Can mimic** HSV, fungi, or acanthamoeba
  - Look for "**cracked windshield**" pattern
- Management often requires **prolonged antibiotics** + **surgical interventions**
- **NTM endophthalmitis** carries a **grave prognosis** despite aggressive Tx
  - Keratitis outcomes are better
  - Endophthalmitis remains associated with severe vision → **enucleation**
- **Delayed diagnosis** is the norm
  - Steroids make it worse!



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