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Oral Pharmaceuticals in Anterior Segment Disease

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Disclosures:

- Maculogix,
- Sun Pharmaceuticals

Case

- 20 year old male presents with a red painful eye
  - Started that morning when he woke up
  - reports a watery discharge, no itching, and is not a contact lens wearer
- SLE:
  - See attached image with NaFl stain

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Herpes Simplex Virus (HSV) Keratitis: Clinical Features

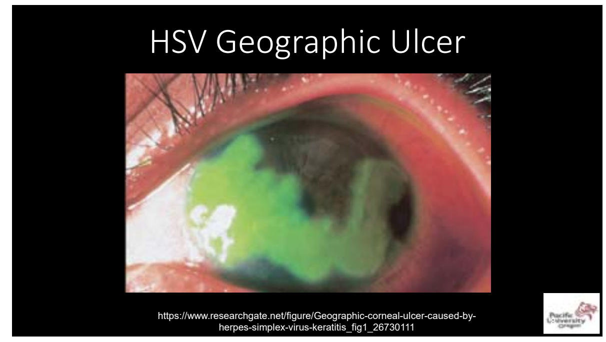
- Characterized by primary outbreak and subsequent reactivation
  - Primary outbreak is typically mild or subclinical (90% of people are asymptomatic)
  - Most clinical ocular infections are manifestations of virus reactivation; ocular involvement occurs in fewer than 5% of primary infections
- After primary infection, the virus becomes latent in the trigeminal ganglion or cornea
  - The majority of ophthalmic HSV cases are unilateral, with recurrences affecting the same eye. Bilateral disease (not necessarily concurrent) occurs in 1-12% of cases and is more common in patients with atopy or other immune abnormalities
- Stress, UV radiation, and hormonal changes can reactivate the virus
- Lesions are common in the immunocompromised (i.e. recent organ transplant or HIV patients)

Herpes Simplex Virus Keratitis

- **Epithelial Keratitis:**
  - Symptoms:
    - Ocular irritation, redness, photophobia, watering, blurred vision
  - Signs:
    - Swollen opaque epithelial cells arranged in a course punctate or stellate pattern
    - Central desquamation results in a dendrite***
      1. Central ulceration
      2. Terminal end bulbs
    - ***Corneal sensation is reduced***

Dendritic Ulcers

HSV Geographic Ulcer



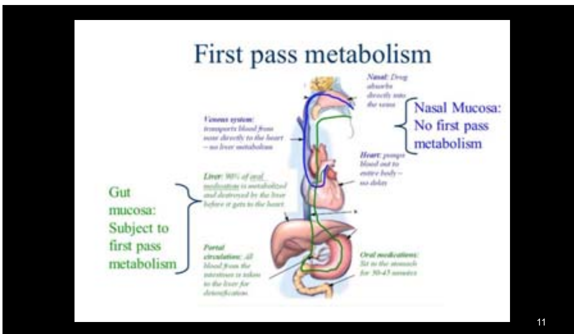
https://www.researchgate.net/figure/Geographic-corneal-ulcer-caused-by-herpes-simplex-virus-keratitis_fig1_26730111

Pediatric HSV Keratitis

- pediatric herpes simplex keratitis has an 80% risk of recurrence, a 75% risk of stromal disease, and a 30% rate of misdiagnosis
- 80% of children with herpes simplex keratitis develop scarring, mostly in the central cornea
  - results in the development of astigmatism
  - 25% of children have more than 2 D of astigmatism, most of which is irregular
- consider pediatric HSV when a patient has unilateral recurrent disease in the anterior segment

Herpes Simplex Virus Keratitis Management

- Topical:
  - Viroptic (trifluridine) q 2h until epi healed then taper down for 10-14 days.
    - Viroptic is toxic to the cornea.
  - Zirgan (ganciclovir) available, use 5 times a day until epi healed then 3 times for a week (US only)



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Anti-Viral Medication

Drug	Mechanism of Action	Bioavailability	Dosing	Side Effects
Acyclovir	Acyclovir interferes with DNA synthesis inhibiting viral replication	10-30% gets absorbed Short ½ life *Metabolized in kidneys	Simplex: 400 mg 5x/day Zoster: 800 mg 5x/day	Overall very safe Nausea, vomiting, headaches, dizziness, confusion
Valacyclovir	Acyclovir pro-drug Equivalent to acyclovir but better for pain management	95% converted to acyclovir* Better bioavailability and longer 1/2 life	Simplex: 500 mg tid Zoster: 1 g tid	Same as acyclovir
Famciclovir	Inhibits DNA chain elongation It is metabolized to penciclovir where it is active 10-20x as long as acyclovir	Superior to acyclovir*	Simplex: 250 mgTID Zoster: 500 mg TID	Same as acyclovir

HSV Stromal Disease

- HSV Stromal disease is an immune-mediated disease
  - Stromal involvement is rarely an initial ocular finding, accounting for fewer than 2% of initial presentations but for 20 – 60% of recurrent corneal disease
- Increased risk of scarring and high risk of poor visual prognosis
- Requires corticosteroids (HEDS: corticosteroid reduced risk of progression by 68%)
  - Without epithelial defect: corticosteroids and prophylactic anti-viral dosage
  - With epithelial defect: active infection anti-viral dosage with judicious corticosteroids

How much to dose steroid?

- HEDS used QID of *prednisolone phosphate*
- Current Recommendations:
  - Mod – severe (especially with neo): 1% Prednisolone or Lotemax QID to 6x/day
  - Want the lowest dose needed to control the inflammation
  - AAO EBM Treatment Guideline 2014
    - Topical steroid for 10 weeks (this is based on HEDS results) with oral antiviral

HSV Epithelial Keratitis

- Treatment Regimen:
  - Viroptic (trifluridine) q 2h until epi healed then taper down for 10-14 days.
  - Oral Valtrex 500 mg 3x/day for 7-10 days
  - Artificial tears
  - L-Lysine 2 grams daily?
    - Proven to "slow down" and retard the growth of the herpes virus and inhibit viral replication
  - Debride the ulcer?
    - Prior to topical antiviral therapy debridement was treatment of choice
    - Generally try to avoid use of sharp instruments and use of cotton swab and anesthetic
- RTC 1 day, 4 days, 7 days

Herpes Simplex Keratitis

- Prophylactic Treatment:
  - Reduces the rate of recurrence of epithelial and stromal keratitis by ≈ 50%
    - Acyclovir 400 mg BID
    - Valtrex 500 mg QD
    - Famvir 250 mg QD
    - L-lysine 1 gram/day:
      - Proven to "slow down" and retard the growth of the herpes virus and inhibit viral replication
    - Frequent debilitating recurrences, bilateral involvement, or HSV infection in a monocular patient

Prophylaxis??

- **Pitfalls to Prophylaxis**:
  - Reduction of recurrence does not persist once drug stopped
  - Resistance????
    - van Velzen, et. al., (2013) demonstrated that long-term ACV prophylaxis predisposes to ACV-refractory disease due to the emergence of corneal ACVR HSV-1.

ORIGINAL CONTRIBUTION

Topical Tetracaine Used for 24 Hours Is Safe and Rated Highly Effective by Patients for the Treatment of Pain Caused by Corneal Abrasions: A Double-blind, Randomized Clinical Trial

Abstract

Pain Management: Oral Analgesics

- Conditions potentially requiring us of oral analgesics:
  - Corneal ulcers
  - Herpes simplex/zoster
  - Post-surgical
  - Trauma
  - Thermal burns

Acetaminophen

- Mechanism of Action is not well understood.
  - Possibly some CNS component
  - Very weak inhibitor of prostaglandin synthesis
- One of the most commonly used analgesics for mild to moderate pain.
  - Equal analgesic properties to ASA unless associated with inflammation, where it is less effective.

Take home: Good for pain; Good for fever;
No effect on inflammation

Consider Combining APAP with NSAID's for Mild to Moderate Pain Relief

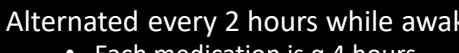
1:00 pm: Two 325mg Tylenol

3:00 pm: Two 200mg Ibuprofen

5:00 pm: Two 325mg Tylenol

7:00 pm: Two 200mg Ibuprofen

Alternated every 2 hours while awake
- Each medication is q 4 hours.



Ibuprofen

- Adult analgesic dose: 200-400mg q4hours
  - Maximum Dosage: 2400 mg/day OTC for pain (approved for 3200 mg/day in arthritis treatment)
- OTC: 200 mg tabs (US) 400 mg and 600 mg (Canada)
- Rx: 300, 400, 600, 800mg tabs
- Peak levels 1-2 hours
- Most renal toxic of all the NSAID's
- Brand Names: Motrin, Advil, and Nuprin

Naproxen Sodium

- OTC: 220 mg (Aleve[R])
- Rx: 550 mg tablets (Anaprox[R] and Crysanal[R])
- Adult Dose:
  - OTC: 1 tablet every 8-12 hours (can use two tablets on first dose)
  - Rx: 550 initial dose, followed by 275 (half tablet) every 6-8 hours.
    - Maximum Dose: 1375mg/day.

Oral Analgesics: Guidelines

- Never exceed maximum recommended dosages:
  - ASA: 4 grams/day
  - Acetaminophen: 4 grams/day (newer data suggest should be closer to 3-3.2 grams/day)
  - Ibuprofen: 2400 mg/day OTC and up to 3200 mg/day prescription (for RA)
  - Naproxen: 1250/day
  - Naproxen sodium: 1375/day
  - Codeine: 360 mg/day

Oral Analgesics: Guidelines

- Make the proper diagnosis first (ie. Don't prescribe without knowing what you are prescribing for!)
- Treat the underlying cause for the pain
- Treat the pain at presentation..don't wait!
- Treat pain continuously over a 24-hour schedule
- Non-prescription drugs should be first choice and tend to be low cost
- Treat patients with the simplest and safest means to aleve pain

Opioids Information

- Drug of first choice for the treatment of **severe** acute pain.
- Block the body's natural protective mechanism for protecting areas in pain – thus never prescribe unless you know the direct cause of the pain.

Opioids Side Effects

- Side Effects are very hard to predict because opioids can cause CNS depression or stimulation.
- CNS Side Effects
  - Dizziness, lightheadedness, sedation, and drowsiness are the most common.
  - Mood elevation (euphoria) and disorientation can occur in some patients.
  - Exacerbated if used in combination with alcohol, depression medications such as tricyclic antidepressants, anticholinergics, antihistamines, anti-seizure medications, or muscle relaxants, etc.
  - Visual symptoms such as blurry vision, miosis, and diplopia can occur.

Opioid Side Effects

Respiratory Side Effects:
- Respiratory Depression
  - Most serious side effect of the opioids
  - Opioids suppress the brainstem respiratory centers
    - Alter tidal volume, respiratory rate, rhythmicity, and responsiveness to CO_2
  - Does not commonly occur at therapeutic doses in healthy patients, but must use caution in patients with pulmonary disease.
- Cardiovascular Side Effects:
  - Peripheral vasodilation can result in orthostatic hypotension, decreased BP, and changes in pulse rate.
- Others Include: Urinary retention, cough suppression, headaches, rashes, itching.

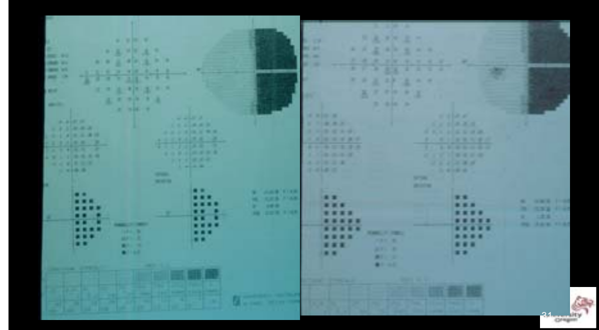
Opioids: Codeine

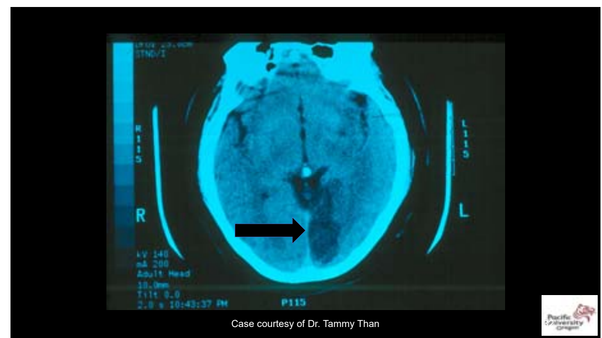
- Analgesic effect occurs within 20 minutes of ingestion and reaches a maximum at 1 – 2 hours.
  - Ceiling effect occurs.
- Usually administered in combination with acetaminophen .
  - Tylenol 1 (222): codeine 8 mg, 300 mg acetaminophen and 15 mg caffeine (Canada)
  - Tylenol 3 = Codeine 30 mg and Acetaminophen 300 mg
    - Dosage: 1-2 tablets every 4 hours.
  - Tylenol 4 = Codeine 60 mg and Acetamenophin 300 mg
    - Dosage: 1 tablet every 4 – 6 hours
  - Also available as generic with 15, 30, or 60 mg of Codeine with 300 mg of Acet. or elixer of 12 mg codeine + 120 mg Acet. per 5 mL.
    - Elixer can be used in children for pain management if >3 years.

Case Example

- 67 YOF
- HA and vision loss x 2 days
- OHx: unremarkable
- LEE: 3 days ago!
- MHx: unremarkable

Case courtesy of Dr. Tammy Than

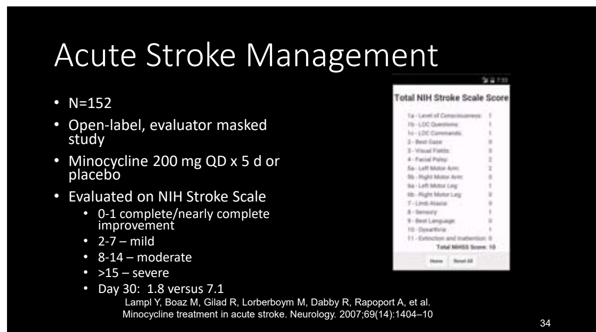




Case courtesy of Dr. Tammy Than

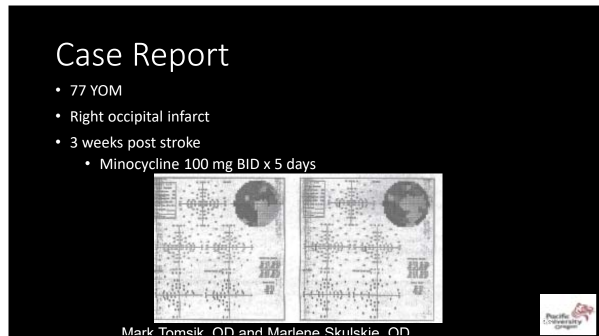
Minocycline?

- Proposed mechanisms
  - Anti-inflammatory
  - Reduction in microglial activation
  - ↓ MMPs
  - Nitric oxide production
  - Inhibition of apoptotic cell death



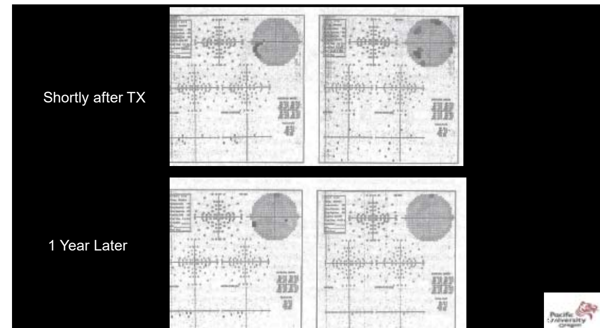
TEST	Admission	Day 7	Day 30	Day 90
NIHSS - Min	7.5	6.5	1.8	1.6
NIHSS – Cont	7.6	8.1	7.3	6.5
mRS – Min	2.8	1.5	1.1	0.9
mRS – Cont	2.0	3.1	2.7	2.1
BI – Min	70.0	85.9	90.6	94.9
BI – Cont	63.9	61.9	68.5	77.6

Minocycline for acute stroke treatment: a systematic review and meta-analysis of randomized clinical trials. J Neurol. 2018 Aug;265(8):1871-1879



Shortly after TX

1 Year Later



Tetracyclines

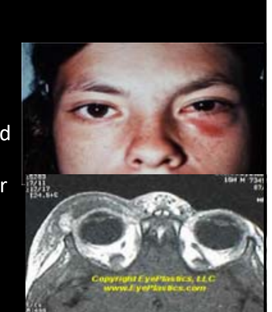
- This group includes:
  - Tetracycline (250mg - 500 mg cap BID-QID) needs to be taken 1 hour before or 2 hours after a meal.
  - Minocycline (100 mg cap BID)
  - **Doxycycline (20mg - 100 mg cap or tab BID)**
    - **In Canada: Apprilon (30 mg doxy + 10 mg slow release doxy)**
- **Rules of Thumb with Doxy:**
  - **Do not take before lying down (>2 hours before)**
  - **Do not take with calcium and avoid antacids**
  - **Do not take with dairy**
  - **Do take with food**
  - **Do educate on sun protection**

Meibomian Gland Dysfunction

- Meibomian gland dysfunction:
  - also referred to as meibomitis and patients experience dry eye problems secondary to increased evaporation of the tears.
  - signs include noticeable capping of the glands and frothing of tear film.
- Standard treatment includes:
  - good lid hygiene with warm compresses and lid scrubs in conjunction with
  - doxycycline 50 mg po BID for 2-3 months

  Alternative treatment:
  - Azythromycin 500 mg/day for 3 days for three- four weeks
    - Recent study used single Z-pak treatment

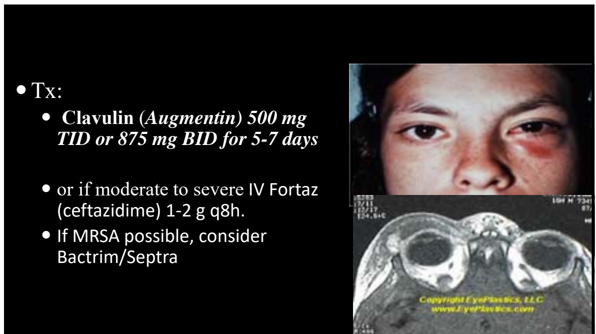
- Infection and inflammation located anterior to the orbital septum and limited to the superficial periorbital tissues and eyelids.
- Usually follows sinus infection or internal hordeolum (possibly trauma)
- Eyelid swelling, redness, ptosis, pain and low grade fever.



Differentiating Orbital vs. Preseptal

FINDING	ORBITAL	PRESEPTAL
Visual Acuity	Decreased	Normal
Proptosis	Marked	Absent
Chemosis and Hyperemia	Marked	Rare/Mild
Pupils	RAPD	Normal
Pain and Motility	Restricted and Painful	Normal
IOP		Normal
Temperature	102 - 104	Normal/mild elevation
HA and Assoc. Symptoms	Common	Absent

Treatment: Orals for Preseptal, Often IV for Orbital



Penicillins: Clavulin (Augmentin)

- **Clavulin (Augmentin) is amoxicillin with potassium clavulanate (clavulanic acid 125 mg).**
- Clavulanate is a B-Lactamase inhibitor which reduces a bacteria's ability to negate the effect of the amoxicillin by inactivating penicillinase (enzyme that inactivates the antibiotic affect).
  - Dicloxacillin can also be used in infections due to penicillinase-producing staph.

Penicillins: Clavulin (Augmentin)

- **Clavulin (Augmentin) is very effective for skin and skin structure infections** such as:
    - dacryocystitis,
    - internal hordeola,
    - pre-septal cellulitis.
  - Treatment of:
    - otitis media,
    - sinusitis,
    - lower respiratory and urinary infections.
  - Given prophylactically to dental surgery patients.

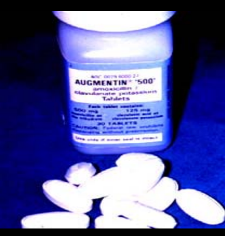
Penicillins: Clavulin (Augmentin)

- It has ***low***:
  - GI upset,
  - allergic reaction and anaphylaxis.
- Serious complications include:
  - anemia,
  - pseudomembranous colitis and
  - Stevens-Johnson syndrome.

Penicillins: Augmentin.

Adults:
- **250 TID, 500 mg tab BID-TID depending on what you are treating** (also available in chewable tablets and suspension)
- or **875 mg q 12hr (bid)**
- 1000 mg XR: q12 hr and not for use in children <16

Peds: <3 mos 30mg/kg/day divided q12hrs using suspension
- >3 mos 45-90mg/kg/day divided q12hrs (otitis media 90mg for 10 days)

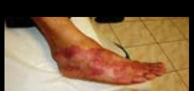


Cephalosporins

- Closely related structurally and functionally to the penicillins,
  - **have the same mode of action,**
  - affected by the same resistance mechanisms.
  - tend to be more resistant to B-lactamases.
- classified as 1st, 2nd, 3rd, 4th and now 5th generation based largely on their bacterial susceptibility patterns and resistance to B-lactamases.
- Typically administered IV or IM, **poor oral absorption**

Side Effects and Contraindications

- Hypersensitivity Reactions are common.
  - Risk of cross sensitivity with PCN's is higher for 1st generation, but often overestimated for later medications.
  - Used to state the cross sensitivity was ~10%, but now believed to be closer to 3%.



Cephalosporins

- 1st generation: **cefadroxil (Duricef)**, **cefazolin (Ancef)**, **cephalexin** (Keflex), and cephalothin
- 2nd generations: **cefaclor** (Ceclor), cefprozil, **cefuroxime (Zinacef)**, cefotetan, cefoxitin
- 3rd generation: cefdinir (Omnicef), cefixime, **cefotaxime (Claforan)**, **ceftazidime (Fortaz)**, ceftibuten, ceftizoxime, **ceftriaxone (Rocephin IM/IV)**.
- 4th generation: cefepime
- Keflex, Ceclor, Omnicef, (all orally administered) are effective against most gram positive pathogens and especially good for skin and soft tissue infections.

Cephalosporins

- **Keflex (cephalexin):**
  - treatment of respiratory, GI, skin and skin structure, and bone infections as well as otitis media
  - Adults: 250-1000 mg every 6 hours
    - **- typical dosing 500 every 6 hours**
  - Children: 25-100 mg/kg/day divided 6-8 hours

Co-Trimoxazole (Bactrim/Septra)

- Combination of trimethoprim and sulfamethoxazole
  - shows greater antimicrobial activity than equivalent quantities of either drug alone.
- Has broader spectrum of action than the sulfa's and is effective in treating:
  - UTIs and respiratory tract infections
  - often considered for treatment of MRSA skin infections

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Co-Trimoxazole (Bactrim/Septra)

- Available:
  - **Bactrim/Septra tablets**:
    - contains 80 mg trimethoprim and 400 mg sulfamethoxazole
    - dosing **2 tablets every 12 hours**
  - **Bactrim DS/Septra DS (Double Strength)**
    - contains 160 mg trimethoprim and 800 mg sulfamethoxazole
    - Dosing **1 tablet every 12 hours**

Epithelial (Anterior) Basement Membrane Dystrophy (EBMD or ABMD)

- Primary features of this "dystrophy" are:
  - abnormal corneal epithelial regeneration and maturation,
  - abnormal basement membrane
- Often considered the most common dystrophy, but may actually be an age-related degeneration.
  - large number of patients with this condition,
  - increasing prevalence with increasing age, and
  - its late onset support a degeneration vs. dystrophy.

Epithelial (Anterior) Basement Membrane Dystrophy (EBMD or ABMD)

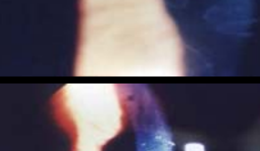
- Not all patients are symptomatic
- Most common symptom is mild FB sensation which is worse in dry weather, wind and air conditioning
- Blurred vision from irregular astigmatism or rapid TBUT
- Pain is usually secondary to a RCE (recurrent corneal erosion) in apprx 10%

Epithelial (Anterior) Basement Membrane Dystrophy (EBMD or ABMD)

- Easy to overlook:
  - typically bilateral though often asymmetric,
  - females>males,
  - often first diagnosed b/w ages of 40-70

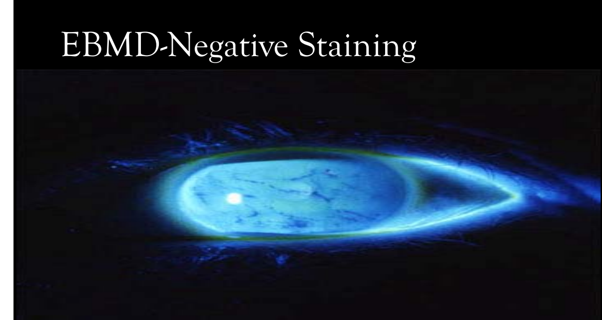
Epithelial (Anterior) Basement Membrane Dystrophy (EBMD or ABMD)

- Most common findings are:
  - chalky patches,
  - intraepithelial microcysts, and
  - fine lines (or any combination) in the central 2/3rd of cornea



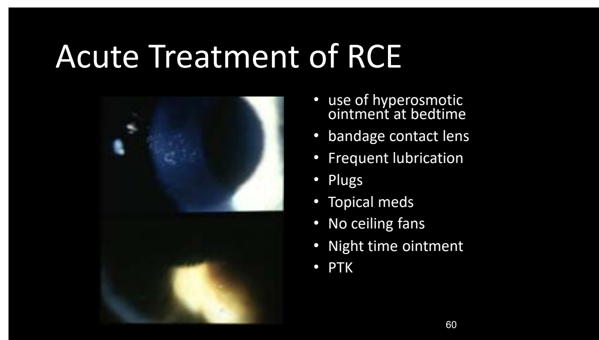
Epithelial (Anterior) Basement Membrane Dystrophy (EBMD or ABMD)

- Often referred to as:
  - maps,
  - dots or
  - fingerprints



Epithelial (Anterior) Basement Membrane Dystrophy (EBMD or ABMD): Treatment

- Typically directed towards preventing RCE
- If RCE's develop:
  - awake with painful eye that improves as day wears on
  - chalky patches/dots in lower 2/3rd of cornea



Recurrent Corneal Erosion: Treatment

- If severe enough to cause vision loss or repeated episodes:
  - oral doxycycline with/without topical corticosteroid
    - Doxy 50 mg bid and FML tid for 4-8 weeks
    - both meds inhibit key metalloproteinases important in disease pathogenesis
  - debridement,
  - Debridement + diamond burr polishing
  - stromal puncture (not commonly done anymore)
  - PTK
  - Latest development: amniotic membrane transplant e.g. Prokera typically after debridement

CORNEAL DEBRIDEMENT

- Soften epithelium
- 1-2 gtt topical anesthetic
- q 15-30 seconds for 2-3 minutes
- Use cotton swab, spatula, spud
- or jewelers forceps
- Remove flaps by pulling edges toward center
- Don't pull directly up or out
- Remove flaps down to tight,
- firm edges.
- Tx abrasion (>50-100%)
  - Recurrence Rate 18%

Pictured: Kimura Platinum Spatula

Diamond Burr Polishing

- Removes abnormal basement membrane
- Provides smooth surface for cells to grow

https://www.katena.com/pterygium-burr-3-5mm-w-chuck-k2-4913

Vo, et al (2014): epithelial debridement with diamond burr polishing was 95% effective after single treatment in preventing recurrence for an average of 32 months follow up time

Amniotic Membrane Transplant

- Amniotic membrane is a biologic tissue with:
  - antiangiogenic,
  - antiscarring,
  - antimicrobial, and
  - anti-inflammatory properties that promotes healing of the ocular surface
- Amniotic membrane grafts have been used for a variety of ocular conditions including:
  - Corneal burns
  - Neurotrophic ulcers
  - Stem cell damage
  - Persistent epithelial defects

Amniotic Membrane Grafts (AMG)

Biotissue- Prokera, Prokera Slim, Prokera Clear, Amniograft, & Amnioguard

IOP Ophthalmics- Ambiodisk

http://www.biotissue.com/products/prokera.aspx

http://www.iopinc.com/store/ambiodisk/

Hordeola

- Acute purulent inflammation
  - Internal occurs due to obstruction of MG
  - External (stye) from infection of the follicle of a cilium and the adjacent glands of Zeiss or Moll
- Painful edema and erythema,

© 2007 by Dipl.-Med. Frank Wiegleb Facharzt fuer Allgemeinmedizin, Siebigerode

Hordeola

- Typically caused by Staph and often associated with blepharitis
- Treatment includes:
  - hot compresses (e.g. Bruder)
  - topical antibiotics (?)
  - possibly systemic antibiotics
    - Augmentin (Clavlulin) 500 mg bid-tid
    - Doxycycline 100 mg bid
    - Keflex 500 mg tid
- Treat concurrent blepharitis

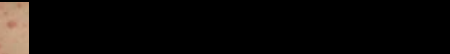
Cephalosporins

- Cefaclor (Ceclor) (2nd generation):
  - Immediate-release: 250 to 500 mg every 8 hours
  - Extended-release: 500 mg every 12 hours

Note: An extended-release tablet dose of 500 mg twice daily is clinically equivalent to an immediate-release capsule dose of 250 mg 3 times daily; an extended-release tablet dose of 500 mg twice daily is **NOT** clinically equivalent to 500 mg 3 times daily of other cefaclor formulations.

Herpes Zoster

1. Primary infection – Chicken pox (Varicella)
   - Usually in children
   - Highly contagious***
   - Very itchy maculopapular rash with vesicles that crust over after ≈ 5 days
   - 96% of people develop by 20 years of age
   - Vaccine now available

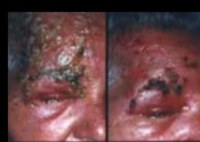


Herpes Zoster

2. Reactivation – Shingles (Herpes Zoster)
    - More often in the elderly and immunosuppressed (AIDS)
        - Systemic work-up if Zoster in someone < 40
    - Can get shingles anywhere on the body
    - Herpes Zoster Ophthalmicus (HZO)
        - Shingles involving the dermatome supplied by the ophthalmic division of the CNV (trigeminal)
            - 15% of zoster cases

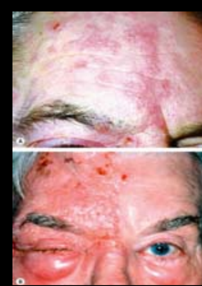
Herpes Zoster

- Symptoms:
    - Generalized malaise, tiredness, fever
    - Headache, tenderness, paresthesias (tingling), and pain on one side of the scalp
        - Will often precede rash
    - Rash on one side of the forehead
    - Red eye
    - Eye pain & light sensitivity



Herpes Zoster

- Signs:
    - Maculopapular rash -> vesicles -> pustules -> crusting on the forehead
    - Respects the midline***
    - Hutchinson sign
        - rash on the tip or side of the nose***
    - Classically does not involve the lower lid
    - Numerous other ocular signs



Herpes Zoster

- Other Eye Complications (Acute):
  - Anterior uveitis (most common ocular manifestation)
  - Acute epithelial keratitis (pseudodendrites)
  - Conjunctivitis
  - Stromal (interstitial) interstitial keratitis
  - Endotheliitis (disciform keratitis)
  - Neurotrophic keratitis

Herpes Zoster

- Associated factors include increasing age, immune deficiency and stress.
- Only people who had natural infection with wild-type VZV or had varicella vaccination can develop herpes zoster.
- Children who get the varicella vaccine appear to have a lower risk of herpes zoster compared with people who were infected with wild-type VZV.

Herpes Zoster

- A person's risk for herpes zoster increases sharply after 50 years of age.
- Almost 1 out of 3 people in the United States will develop herpes zoster during their lifetime.
- A person’s risk of developing post-herpetic neuralgia also increases sharply with age.

Herpes Zoster

- Management includes:
  - oral antivirals:
    - 800mg acyclovir 5x/day
    - valacyclovir (Valtrex) 1g TID,
    - famciclovir (Famvir) 500 mg TID
  - effectiveness of therapy is best started within 72 hours
  - oral steroids (clinical trials show variable results but often prescribed with antiviral to reduce pain)
  - management of pain (capsaicin, tricyclic antidepressants, gabapentin).
  - If ocular complications, consider topical steroids (Pred Forte QID).

Oxervate^R

- August 22nd, 2018 the FDA approved Oxervate for the treatment of neurotrophic keratitis (first ever approved treatment)
- Oxervate^R (cenegermin): recombinant human nerve growth factor
- The safety and efficacy of the topical eye drop was studied in 151 patients with neurotrophic keratitis in two 8-week, randomized, controlled, multi-center, double masked studies. In both studies, patients were given the drops six times daily in the affected eyes for 8 weeks. Across both studies, 70% of patients treated with Oxervate experienced complete corneal healing in 8 weeks compared with 28% of patients who were not treated with the active ingredient, cenegermin

NEW!! Shingrix HZ Vaccine

- Approved in US/Canada as of October 2017
- non-live antigen, to trigger a targeted immune response, with a specifically designed adjuvant to enhance this response and help address the natural age-related decline of the immune system
- Shingrix is 97% effective against shingles for people between the ages of 50 and 69 and 91% effective for people 70 or older.
- It is 91% effective against postherpetic neuralgia for people 50 and older.
- These rates are based on evidence presented to the committee from clinical trials with over 38,000 total participants.

NEW!! Shingrix HZ Vaccine

- recommended for healthy adults aged 50 years and older to prevent shingles and related complications
- recommended for adults who previously received the current shingles vaccine (Zostavax®) to prevent shingles and related complications
- the preferred vaccine for preventing shingles and related complications