

Antibacterial Drugs

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How Would You Treat This?



Normal Bacterial Flora

- Normal Host-Organism Relationships
 - Skin
 - External ocular surface
 - Nasal mucosal tissue
 - Oral cavity
 - Gastrointestinal pathway
 - Colon, rectal pathway
 - Vaginal tissue
- Abnormal Host-Organism Relationship
 - Infection

Infection

Mechanisms:

- Release of toxins or antigens (direct)
- Generation of inflammation or tissue invasion (indirect)
- Secondary to noninfectious diseases that reduce natural defenses (indirect)
- May result from change in normal flora

Principles of Antimicrobial Treatment

- Antibiotic – produced by other microorganisms to suppress growth of other microorganisms
- Antimicrobial agent – synthesized in laboratory
- Terms interchangeable today

Principles of Antimicrobial Treatment

- Bactericidal agent: cells killed
- Bacteriostatic agent: no growth of new cells but existing cells not killed
- Both effective chemotherapeutic agents
- Both rely to some degree on host defenses to eliminate infection
- Same drug may have both properties depending the concentration of drug, organism involved and targeted location for treatment
- Choice of bactericidal vs. bacteriostatic agent may depend on status of host and specific site of infection
 - i.e. must use bactericidal agent for CSF d/t lack of host defenses

Principles of Antimicrobial Treatment

- MIC – minimal inhibitory concentration
- Organism considered susceptible if MIC is $\frac{1}{4}$ or less of the readily obtainable peak plasma concentration of drug
- MBC – minimum bactericidal concentration to kill 99.9% of microbial cells

Principles of Antimicrobial Treatment

- Choice of bactericidal vs. bacteriostatic agent may depend on status of host and specific site of infection
- Example if infection in CSF, bactericidal agent must be used. No host defenses.

Drug Selection Factors for Patients

- Identification of organism
- Antimicrobial susceptibility of organism
- Ideally from laboratory culture and drug sensitivity testing
- However, empirical treatment most of time today
- Bactericidal vs. bacteriostatic agent
- Bacterial resistance

Drug Selection Factors for Patients

- Host status
 - Allergy history
 - Age factors
 - Pharmacokinetic factors
 - Renal function
 - Hepatic function
 - Pregnancy status
 - Genetic or metabolic abnormalities
 - Anatomical site of infection
 - Host defenses, white blood cell function

Host Factors

- Allergy history - seasonal, drug, atopy
- Age – adult, elderly, pediatric patients
- Pharmacokinetic – amount of drug that reaches extravascular tissue and fluids
 - Concentration gradient between plasma and target tissue

Host Factors

- Pharmacokinetic – amount of drug that reaches extravascular tissue and fluids
 - Concentration gradient between plasma and target tissue
 - Degree of drug binding to plasma and tissue proteins
 - Molecular size
 - Degree of ionization and lipid solubility
 - Rate of elimination or metabolism

Host Factors

- Renal function
 - Renal filtration or secretion status
 - Changes with age
 - Dosage adjustments estimated based on age, body size, or creatinine concentrations
- Hepatic function
 - If drugs metabolized in the liver, may need to reduce dosage if impaired hepatic function

Host Factors

- Always know your patient's gastrointestinal, hepatic and renal status prior to prescribing any oral antibiotic.
- Previous medical history plus have there been any problems in the past with a particular drug.

Host Factors

- Pregnancy, nursing mothers
 - Potential teratogenic and toxic effects
 - Examples
 - Aminoglycosides - eighth nerve damage
 - Chloramphenicol - gray baby syndrome
 - Erythromycin - cholestatic hepatitis
 - Sulfonamides - hemolysis in newborn with glucose-6-phosphate dehydrogenase deficiency
 - Tetracyclines - limb abnormalities, dental staining
 - Trimethoprim - altered folate metabolism
 - Fluoroquinolones – bone development problems

Host Factors

- Genetic or metabolic factors
- Anatomical site of infection – foreign body sites, abscesses, blockage of ducts more difficult for drug to penetrate
- Most antimicrobial agents readily enter most body tissues and compartments except for CSF, brain, eye, and prostate gland
- Host defenses – critical white blood cell between 500-1,000 mature polymorphonuclear cells/mm³

Adverse Effects of Antimicrobial Drugs

- Hypersensitivity reactions
- Toxicity
- Potential interactions with other drugs
- Teratogenic issues
- Overgrowth of other microbial organisms
- Superinfection

Adverse Effects of Antimicrobial Drugs

- Superinfection or overgrowth of other microbial organisms always a risk with oral antibiotics.
- However, you still must treat with most appropriate agent unless a documented equal alternative exists.

Bacterial Resistance

- General mechanisms
 - Mutational events, single step chromosomal changes in origin
 - Plasmids - transmissible, extrachromosomal piece of DNA
 - Resistance conferring plasmids have been identified for virtually all bacteria
 - Resistance may be present in form of genes or transposons which can be transferred to plasmids or be incorporated into chromosomes
 - Chromosomal genes coding for resistance can also be transferred in the reverse direction

Bacterial Resistance

- Antimicrobial agents are a major selective factor for both types of resistance
- Destroy susceptible bacteria
- Permit proliferation of intrinsically resistant bacteria or those that have acquired extrachromosomal resistance

Bacterial Resistance

- Specific mechanisms
 - Development of altered receptors or enzymes that interact with the drug (production of altered penicillin binding proteins)
 - Decrease in concentration of drug that reaches the receptors by altered rates of entry or removal of drug (aminoglycosides may have decreased ribosomal binding due to decreased diffusion through cell wall)

Bacterial Resistance

- Enhanced destruction or inactivation of drug (B-lactamases which catalyze the hydrolysis of penicillins)
- Synthesis of resistant metabolic pathways (trimethoprim resistance in *Streptococcus* due to production of thymidine nucleotides by alternative pathway)
- Failure to metabolize the drug (anaerobic bacteria may not metabolize drug metronidazole to active metabolites)

General Treatment Principles

- Establish accurate clinical diagnosis (laboratory if needed)
- Destruction or removal of invading organism with minimal adverse effects
- Alleviation of symptoms (may require augmentation of antimicrobial therapy)
- Pharmacological agent efficacy varies with type and anatomical location of organism
- Route of administration, dosage regimen, and length of time for treatment all important
- Avoid tapering oral antibiotic agents and emphasize to patients the importance of taking the complete treatment regimen.

General Treatment Principles

- When treating systemic infection, usually best not to use same drug twice within a short period of time to improve drug efficacy and avoid resistance issues.
- This principle differs from typical topical antibiotic practices. Reason is the higher drug concentrations available for topical agents.

Routes of Administration

- Topical - achieve high concentrations of drug directly at infection site
- Oral - achieve peak serum concentrations 1-2 hours after administration
 - Indications for use of oral agents
 - Topical agents inappropriate
 - Topical agents ineffective
 - Emergency care
- IM - peak plasma concentration reached ½-1 hour after injection
- IV - peak plasma concentration reached 20-30 minutes after infusion

Combination Therapy

- If needed, combine drugs with different mechanisms of action
- Goal is to achieve synergism
- Definitions –
 - Indifferent - combination equals efficacy of sum of separate entities
 - Synergistic - combined efficacy greater than sum of separate entities
 - Antagonistic - combined efficacy less than sum of separate entities

Principles of Antimicrobial Treatment: The Bottom Line

- Bactericidal agent: cells killed
- Bacteriostatic agent: no growth of new cells but existing cells not killed
- Both effective chemotherapeutic agents
- Both rely to some degree on host defenses to eliminate infection
- Same drug may have both properties depending the concentration of drug, organism involved and targeted location for treatment
- Choice of bactericidal vs. bacteriostatic agent may depend on status of host and specific site of infection
 - i.e. must use bactericidal agent for CSF d/t lack of host defenses

Antimicrobial Drug Classes

- Inhibit bacterial cell wall synthesis
- Increase cell membrane permeability
- Inhibit bacterial protein synthesis at the ribosomal level
- Affect bacterial tetrahydrofolate cofactor system (intermediary metabolism)
- Inhibit bacterial DNA replication (inhibit DNA gyrase, topoisomerase)

Antimicrobial Drug Classes

- | | |
|--|--|
| <ul style="list-style-type: none"> • Inhibit bacterial cell wall synthesis <ul style="list-style-type: none"> • <i>Penicillins</i> • <i>Cephalosporins</i> • Vancomycin • Bacitracin • Increase cell membrane permeability <ul style="list-style-type: none"> • Polymyxin B • Gramicidin • Inhibit bacterial DNA replication <ul style="list-style-type: none"> • Fluoroquinolones | <ul style="list-style-type: none"> • Inhibit bacterial protein synthesis at the ribosomal level <ul style="list-style-type: none"> • Aminoglycosides • <i>Tetracyclines</i> • Chloramphenicol • Clindamycin • <i>Macrolides</i> • Affect bacterial tetrahydrofolate cofactor system <ul style="list-style-type: none"> • <i>Sulfonamides</i> • <i>Trimethoprim</i> • Pyrimethamine |
|--|--|

Most Useful Antibiotics for Eye Care

- **Amoxicillin with clavulanate potassium (Augmentin)**
 - Typical dosage 1-1.5 gm per day in split doses for 10 days
- **Cephalosporin**
 - Typical dosage 1-1.5 gm per day in split doses for 10 days
 - First generation: Gram positive coverage
 - Cephalexin (Keflex)
 - Second generation: Expanding Gram negative coverage
 - Cefaclor (Ceclor)
 - Third generation: Increased Gram negative, decreased Gram positive
 - Ceftriaxone (Rocephin): injectable only
- **Sulfamethoxazole and Trimethoprim (Bactrim)**
 - Typical dosage 800mg sulfmethoxazole/160mg trimethoprim every 12 hours
- **Fluoroquinolone**
 - Levofloxacin (Levaquin)
 - Typical dosage 500mg to 750mg daily

Drugs Inhibiting Bacterial Cell Wall Synthesis

- **Penicillins**
- **Cephalosporins**
- Vancomycin
- Bacitracin

Penicillins

- Bactericidal
- Inhibits cell wall synthesis by inhibiting the terminal step in the formation of the peptidoglycan wall
- Interferes in the peptide bond formation needed for the cross linking of the polysaccharride chains
- Most effective on active bacteria, minimal effect on resting bacteria

Penicillins

- 1st generation – efficacy against Gram positive organisms
 - Penicillin G
 - Penicillin V
- Gram negative efficacy increases in 2nd, 3rd generations
 - Ampicillin
 - Amoxicillin
 - **Amoxicillin with clavulanate potassium**
 - Carbenicillin – efficacy against *Pseudomonas aeruginosa*
- 3rd generation – little efficacy against Gram positive organisms

Penicillins

- Resistance
- Primarily due to destruction of drug by B-lactamase or penicillinase enzymes
- Penicillins that were originally resistant to penicillinase (commonly produced by *Staphylococcal* bacteria)
 - Methicillin
 - Dicloxacillin
- Methicillin Resistant *Staphylococcus Aureus* (MRSA)
- MRSA – may be cross resistant to other drugs including the cephalosporins, aminoglycosides and erythromycin

Penicillins

- When treating adult patients with penicillins or cephalosporins, need an agent with efficacy against penicillinase (B-lactamase) producing *Staphylococcus aureus*.
- For pediatric patients, need an agent with efficacy against *Streptococcus pneumoniae* and *Haemophilus influenzae*.
- Usually best to use penicillins or cephalosporins with extended spectrum activity to achieve the above goals.

Penicillins

- Extended spectrum of activity agents
 - Amoxicillin with clavulanate potassium (Augmentin)
 - Most useful penicillin for ocular disease

Penicillins

- Typical dosage 1-1.5 gm per day in split doses for 10 days
- Adverse effects include:
 - Hypersensitivity
 - Hyperkalemia if large doses of potassium salt form of penicillin
 - Alteration of normal flora bacteria
 - Superinfection
- Contraindications
 - Allergy to any penicillin
 - Crossover sensitivity with cephalosporins common

Cephalosporins

- Bactericidal
- Same mechanism as penicillins
- Also bind to enzymes associated with cell membrane resulting in complex series of reactions which may alter bacterial permeability, inhibit protein synthesis, and cause the bacteria to release autolysins

Cephalosporins

- 1st generation agents: efficacy against most Gram positive organisms
 - Cefazolin
 - **Cephalexin**
 - Cefadroxil
- 2nd generation agents: expanded efficacy against many Gram negative organisms
 - Cefaclor
 - Cefuroxime
- 3rd generation agents: declining Gram positive spectrum but increased Gram negative efficacy
 - Ceftriaxone
 - Ceftazidime

Cephalosporins

- Most useful extended spectrum activity agents
 - Cephalexin (Keflex, Kef-Tabs)
 - Cefadroxil (Duracef)
 - Cefaclor (Ceclor)
 - Ceftriaxone (Rocephin) **

** Not available as oral agent, injectable only

Cephalosporins

- Resistance
- Susceptible to B-lactamases, each drug has variable response
- May be effective against penicillinase producing *Staphylococcus aureus*, particularly cefadroxil
- Gram negative bacteria may produce B-lactamases that do inactivate the drugs

Cephalosporins

- Adverse effects
 - Hypersensitivity
 - Alteration of normal flora bacteria
 - Vitamin K deficiency
 - Nephrotoxicity – if aminoglycoside and cephalosporin administered concomitantly
 - Superinfection
- Contraindications
 - Allergy to cephalosporins, possible crossover sensitivity with penicillins
 - Hemophilia

Clinical Case Examples

- Internal hordeolum
- Preseptal cellulitis
- Lid abscess
- Impetigo
- Hyperacute conjunctivitis
- Corneal ulcer
- Phlyctenular keratoconjunctivitis
- Dacryocystitis
- Canaliculitis
- Orbital fracture

Case Presentation

- 66 year old female complaining of a painful, swollen left eyelid.
 - Started four days ago and has gotten worse.
 - Noticed a sticky discharge today.
 - Reports that she "doesn't feel right" but no specific symptoms or fever.
- POH: mild cataracts, media = vision
- PMH: Type 2 DM, HTN
- Meds: Metformin, Norvasc
- Allergies: sulfa drugs

Case Presentation

- Visual Acuity with correction
 - OD 20/40+1 PH 20/25
 - OS 20/60 PH 20/40
- PERRL, no APD
- EOMs full OU
- VF FTFC OU
- External examination: swollen left upper eyelid, feels firm, slightly warm and tender to palpation
- Goldmann Applanation Tonometry @2:45 PM
 - OD 14, OS 13
- SLE per slides
- DFE unremarkable



Preseptal Cellulitis

- Limited to pretarsal space
- Always check for fever
- Consider IV meds if febrile
- Appropriate oral agents include:
 - Augmentin (amoxicillin / clavulanate potassium)
 - 875mg PO BID
 - Ceclor (cefaclor)
 - 750mg PO BID
 - Bactrim DS (160 mg trimethoprim / 800 mg sulfamethoxazole)
 - 1 tab PO BID
 - Levaquin (levofloxacin)
 - 750mg PO QD
 - Avelox (moxifloxacin)
 - 400mg PO QD

Case Presentation: 12/1

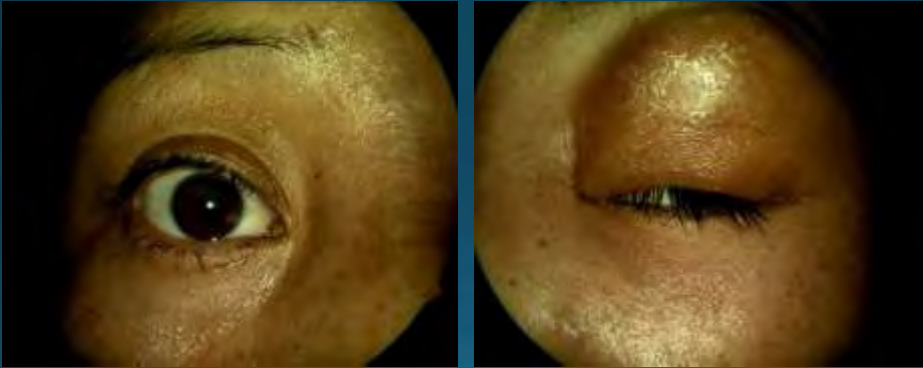
- 27 year old Hispanic female
- HPI:
 - Developed "pimple" on left upper eyelid 1 week ago.
 - Pt reports she squeezed it but failed to express anything.
 - The swelling subsequently worsened and she sought care from outside provider yesterday, rx'd Azithromycin 250 mg PO daily.
 - Pt reports swelling has increased drastically since last night

Exam Findings

- Distance visual acuity
 - OD 20/20-
 - OS 20/20-
- PERRL, (-) APD
- Extraocular motilities: full and smooth OU
- Anterior segment exam as follows



Assessment and Plan?

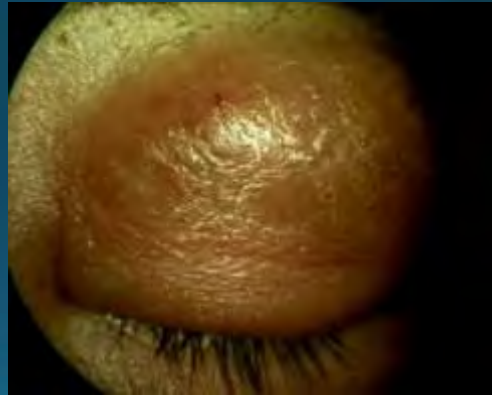


Assessment and Plan

- Assessment:
 - Preseptal cellulitis left eye
- Plan:
 - D/C Azithromycin
 - Administer Ceftriaxone 1 gm IV prior to discharge
 - Rx Augmentin 875 mg PO Q12H x 10 days
 - Start hot compresses x 10 to 15 minutes 6 times per day
 - RTC 24 hours

Follow up: 12/2

- Minimal improvement in symptoms
- Clinical exam similar to yesterday, with increased tautness of upper eyelid
- Recommend stab incision and drainage



Assessment and Plan

- Assessment:
 - Preseptal cellulitis left eye s/p incision and drainage
- Plan:
 - Continue Augmentin 875 mg PO Q12H x 10 days
 - Continue hot compresses x 10 to 15 minutes 6 times per day
 - RTC 3 days



12/1



12/2



12/5



12/19

Case Presentation: 1/14



- 53 year old Hispanic male
- Referred from Emergency Room to, "evaluate the patient who has a lump to his epicanthal area"
- Ocular History: unremarkable
- Medical History: acute proctitis, dx'd 1/6, currently taking Cipro 500mg PO q12h

Assessment and Plan

- Left dacryocystitis
- Rx Augmentin 875/125 mg PO BID
- Rx hot compresses x 10 minutes QID
- RTC 4 days



Follow up: 1/18



Plan:

Continue Augmentin 875/125 PO BID

Continue hot compresses



1/14



1/18



1/21



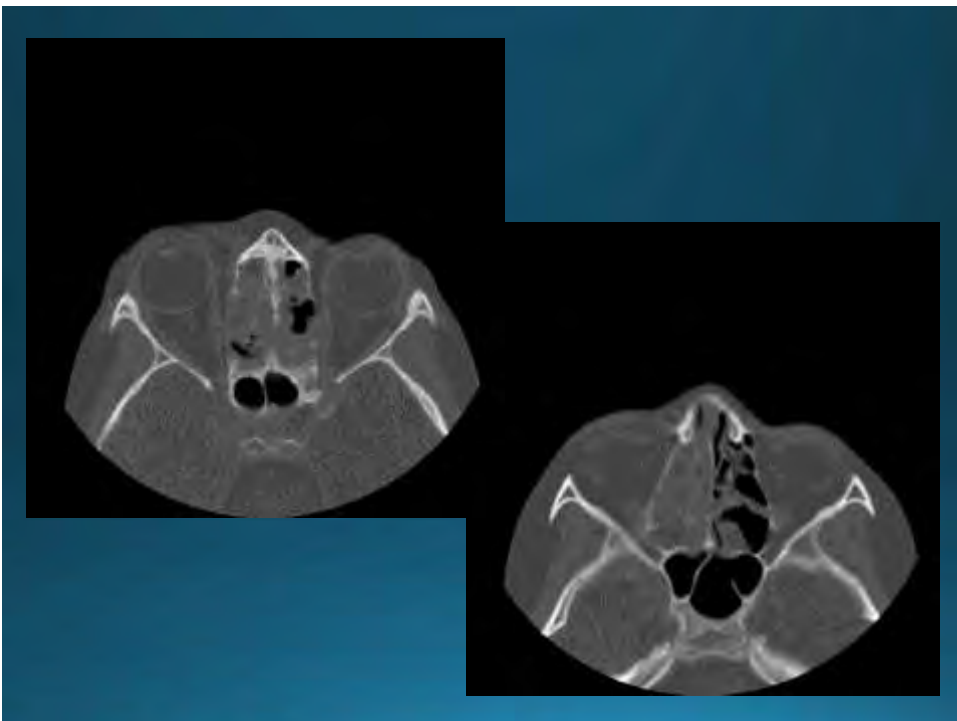
1/28

Case Presentation

- 10 year old male presents to the Emergency Room complaining that "my face is swollen, I don't feel well"
 - Parent reports "puffiness" around right eye x 1 week
 - No discharge noted
 - Child has been complaining of headaches and says that he doesn't feel well
- Diagnosed with sinusitis in ER and sent to eye care provider for consultation
- POH unremarkable
- PMH unremarkable, up to date with vaccinations
- Meds: none
- Allergies: none

Exam Findings

- UCVA OD 20/20, OS 20/20
- PERRL, no APD
- EOMs full motilities OU
- CVF FTFC OU
- External periocular edema with eyelid involvement right side, pain upon percussion right side
- Oral temperature 103 F
- Goldmann Applanation Tonometry:
 - OD 15, OS 15 @ 1:15 PM
- SLE as per slides
- DFE unremarkable



Now what would you do?

- Release the patient on Vigamox TID right eye and hot compresses
- Release the patient on cefaclor 500 mg PO q12h
- Admit the patient and start IV ceftriaxone

36 year old female presented to Emergency Room complaining of red, swollen painful right eye
Ocular history unremarkable
Medical history positive for heroin and cocaine abuse



Preseptal vs. Orbital Cellulitis

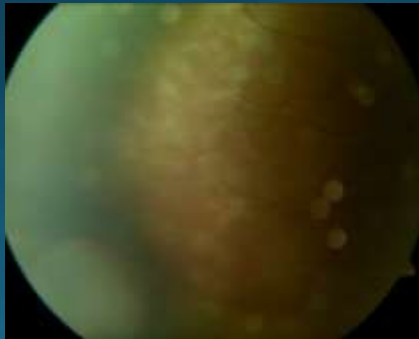


Key Points

- Any cellulitis must be managed aggressively
- If suspect orbital cellulitis, need CT scan, blood cultures and IV antibiotics STAT
- Good first choice antibiotic is ceftriaxone (Rocephin)
- Ocular signs of orbital cellulitis include pupillary abnormalities, extraocular muscle motility restrictions, conjunctival congestion, optic nerve edema

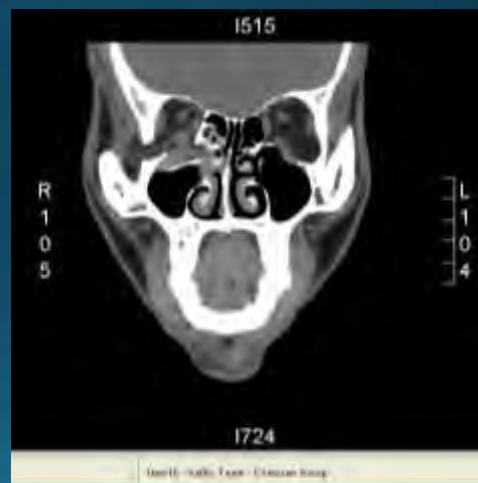
Case Presentation

- 22 year old male referred from Emergency Room after being punched in right eye
- Visual acuity:
 - OD 20/50 PH 20/30
 - OS 20/20
- Extra-ocular motilities:
 - OD superior restriction, limited all other fields of gaze
 - OS full
- Goldmann Applanation Tonometry @ 11:00 AM
 - OD 16 mmHg
 - OS 15 mmHg
- Examination as follows





Management?



Orbital Fracture Management

Further treatment based on imaging results

- Medial Orbit: Observe and consider surgical repair if medial rectus entrapment
- Orbital Apex: Difficult to manage & controversial
- Orbital Roof: Neurosurgical consult
- Zygomatic: Observe vs. surgery
- Orbital Floor:
 - Systemic Antibiotics
 - Nasal Decongestants
 - Ice Compresses

S/P Orbital Floor Repair



Case Presentation

- 45 year old female presents to Emergency Room due to pain and swelling of lower right eyelid x 24 hours
- Pertinent Ocular History: was punched in left eye 1 year ago, was never examined by a doctor
- Pertinent Medical History: hospitalized 2 weeks ago for "intestinal bleeding"
- Allergies: sulfa and codeine

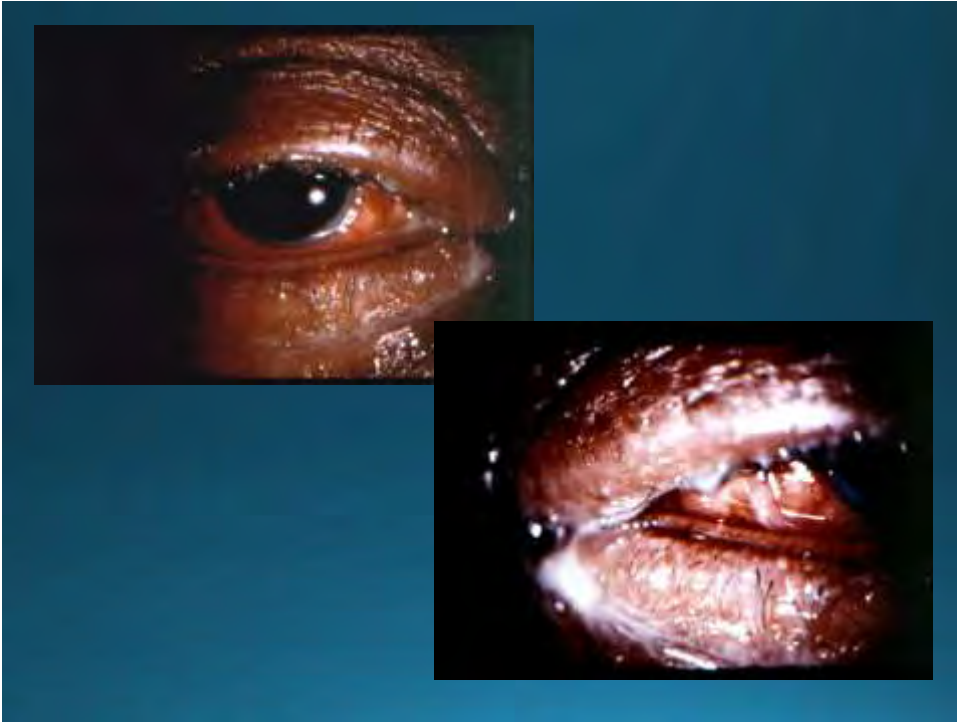
Exam Findings

- Distance Visual Acuity (without correction):
 - OD 20/40+ PH 20/30
 - OS 20/70+ PH 20/30
- Extraocular motilities full OU
- PERRL, MG(-)
- Confrontations: FTFC OD/OS
- Slit lamp exam as follows
- Goldmann Applanation Tonometry @ 3:40 PM
 - OD 15mmHg
 - OS 15 mmHg



Assessment and Plan

- Multiple external hordeolum lower right eyelid
- Rx Cephalexin 500 mg PO TID x 7 days
- Hot compresses x 10 minutes a minimum of 6 times per day



Case Presentation: 12/19

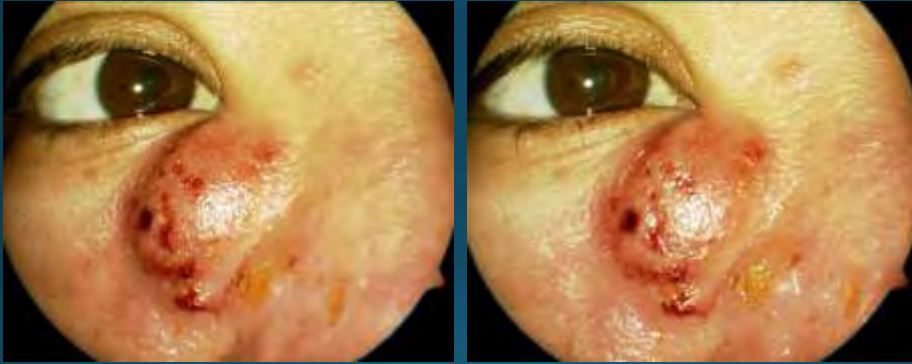
- Referred by Urgent Care Clinic: "37 year old woman with swelling on the medial corner of the right eye"
- Pt reports symptoms began 4 days ago, woke up with red swollen lesion that has progressively become larger and more painful
- Pt reports using warm salt water compresses with no relief
- Pt reports bleeding after attempting to express lesion

History

- Medical History: (+) acne vulgaris
 - Minocycline 100mg PO BID (Rx'd 2.5 months ago)
 - Clindamycin phosphate topical lotion to affected areas BID
- Ocular History:
 - Last eye exam 4 years ago
 - Decreased vision left eye since birth

Examination

- Distance Visual Acuity: without correction
 - OD 20/40 PH 20/30
 - OS 20/400 PH 20/100
- Extraocular motilities: full and smooth OU
- PERRL, (+) APD OS
- External examination as follows

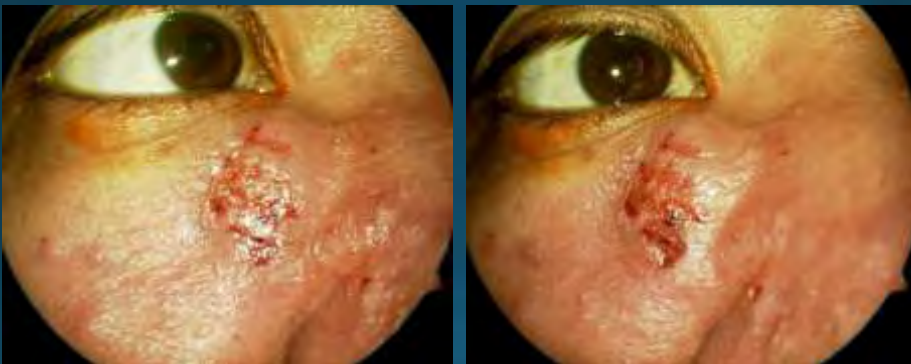


Assessment and Plan

- Right dacryocystitis
- Rx Augmentin 875mg PO BID x 10 days
- Hot compresses x 10 minutes QID
- RTC 3 days

Follow Up: 12/22

- Pt reports improvement in swelling and pain
- Distance Visual Acuity: without correction
 - OD 20/40+ PH 20/25+
 - OS 20/80 PH 20/60
- PERRL, (+) APD OS
- External examination as follows

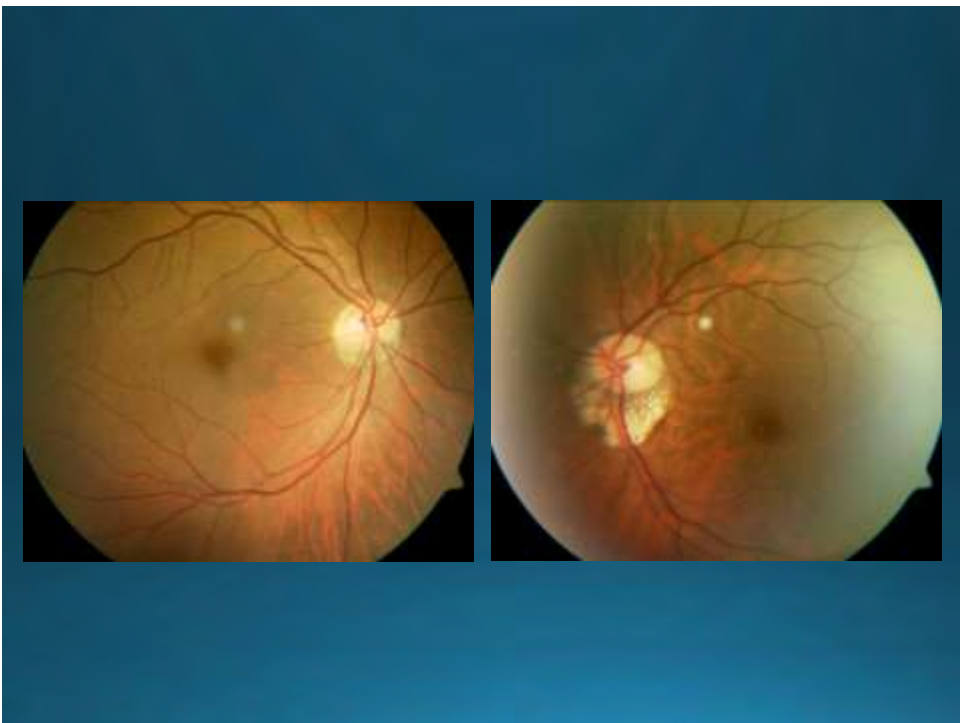


Assessment and Plan

- Resolving right dacryocystitis
- Continue Augmentin 875mg PO BID
- Continue hot compresses x 10 minutes QID
- RTC 1 week

Follow up: 12/29

- Pt reports continued improvement
- Distance Visual Acuity: without correction
 - OD 20/40+ PH 20/25+
 - OS 20/80 PH 20/60
- Extraocular motilities: full and smooth OU
- Confrontation visual fields: FTFC OD/OS
- PERRL, (+) APD OS
- Manifest Refraction:
 - OD -1.75-2.25x015 20/20
 - OS -7.50-2.50x140 20/30+
- External examination as follows
- Goldmann Applanation Tonometry @ 10:50 AM
 - OD 13 mmHg
 - OS 14 mmHg
- Dilated fundus exam as follows



Assessment and Plan

- Resolving right dacryocystitis
 - Continue Augmentin 875mg PO BID until course completed
 - Continue hot compresses x 10 minutes QID until resolution
- Tilted discs with optic nerve coloboma OS
 - Disc photos today
 - RTC 1 month for 30-2 visual field
- Compound myopic astigmatism OS >> OD with mild refractive amblyopia OS
 - Advised pt of importance of protective eye wear
 - Spectacle rx written, recommend polycarbonate lenses

Drugs Inhibiting Bacterial Protein Synthesis

- Aminoglycosides
- **Tetracyclines**
- **Macrolides**
- Chloramphenicol
- Clindamycin

Tetracyclines

- Bactericidal or bacteriostatic
- Inhibit bacterial protein synthesis by binding to 30S subunit of ribosomes
- Block the attachment of aminoacyl-tRNA to the receptor site on the messenger RNA ribosome complex
- Gain entry into the bacterial cells by an energy dependent process

Tetracyclines

- Three groups of drugs ranging from short to long acting
- Most useful drugs:
 - Tetracycline - short acting
 - Doxycycline - long acting
 - Minocycline - long acting
- Some tetracyclines are incompletely absorbed in fasting state
- Doxycycline and minocycline absorbed more completely

Tetracyclines

- Efficacy against Gram positive, Gram negative, aerobic and anaerobic bacteria
- Effective against *Chlamydia*, *Rickettsia*, *Mycoplasma*, spirochetes and some protozoa
- However, broad resistance has limited the clinical usage of these agents
- Appear to have some anti-inflammatory properties
- Inhibits collagenase activity
- Metalloproteinase-9 inhibitor

Tetracyclines

- Resistance and development of newer drugs has limited usage
- Mechanism found in both Gram positive and negative bacteria is plasmid mediated resulting in decreased intracellular accumulation of drug and increased transport of the drug out of the bacterial cell
- Another mechanism is alteration of outer membrane proteins resulting from mutations in chromosomal genes

Tetracyclines

- Tetracyclines - anti-inflammatory effects, collagenase inhibitor, metalloproteinase-9 inhibitor
- Typical Dosages
 - Tetracycline 250 mg qid (duration depends on clinical entity being treated, always take on empty stomach, many foods interfere with absorption, particularly dairy products)
 - Doxycycline (Vibramycin) 50-100 mg bid (duration depends on clinical entity being treated, absorption more tolerant of other foods)
 - Minocycline (Cleeravue-M) 50-100 mg bid (duration depends on clinical entity being treated)

Tetracyclines

- Some antibiotic agents can interfere with oral birth control agents, particularly tetracycline.
- Actual breast cancer risk with tetracycline or doxycycline still uncertain. Keep up with literature in this area.
- Optic disc edema and pseudotumor cerebri have been reported as adverse events with tetracycline agents but are not common. However, monitor and be suspicious of patients reporting headaches while being treated with these agents.
- Tetracyclines (including doxycycline, minocycline) not effective against many common bacteria due to bacterial resistance issues. In eye care, drugs mainly utilized for their apparent anti-inflammatory effects and treatment of *Chlamydia trachomatis*.
- When treating acne rosacea (inflammation), important to taper tetracycline agent over several months.

Tetracyclines

- No evidence that tapering tetracycline agent is effective for treatment of meibomian gland dysfunction in posterior blepharitis. Abnormal fatty acid metabolism is the primary problem, not inflammation. However, may need to treat for several months.
- Should not taper tetracycline agents when treating active infection, such as *Chlamydia trachomatis*. Patient should complete the recommended regimen.

Tetracyclines

- Adverse effects include:
 - Binding to bone and teeth
 - Gastrointestinal tract upset
 - Hepatic and renal dysfunction
 - Vaginal candidiasis
 - Vertigo (minocycline)
 - Photosensitivity
- Contraindications
 - Hypersensitivity
 - Known intolerance to drugs
 - Pregnant or breast feeding mothers
 - Children 8 years of age or less
 - ?? Increased risk for breast cancer

Treatment Options



Case Presentation

- 24 year old male complaining of pain and tearing left eye after being poked in the eye at a concert 2 weeks ago
 - Reports pain improves and worsens
- POH: unremarkable
- PMH: unremarkable
- Medications: none
- Allergies: none

Case Presentation

- Uncorrected Visual Acuity:
 - OD 20/20
 - OS 20/70, PH NI
- PERRL, MG(-)
- Slit lamp exam:



Treatment?

Case Presentation

- Patient healed well with bandage contact lens and Vigamox QID until re-epithelialized.
- Muro 128 5% soln initiated after re-epithelialization x 2 months.
- Patient returned 3 months later with another erosion. Now what?

Tetracyclines

- Efficacy against Gram positive, Gram negative, aerobic and anaerobic bacteria
- Effective against *Chlamydia*, *Rickettsia*, *Mycoplasma*, spirochetes and some protozoa
- However, broad resistance has limited the clinical usage of these agents
- **Appear to have anti-inflammatory properties**
- **Inhibits collagenase activity**
- **Metalloproteinase-9 inhibitor**

Recurrent Corneal Erosion

- Doxycycline 50 mg PO BID x 2 months
- Topical steroid (FML) TID x 1 month



Wang L, Tsang H, Coroneo M. Treatment of recurrent corneal erosion syndrome using the combination of oral doxycycline and topical corticosteroid. Clin Experiment Ophthalmol. 2008 Jan-Feb;36(1):8-12.

Dursun D, Kim MC, Solomon A, Pflugfelder SC. Treatment of recalcitrant recurrent corneal erosions with inhibitors of matrix metalloproteinase-9, doxycycline and corticosteroids. Am J Ophthalmol. 2001 Jul;132(1):8-13.

Case Presentation: 10/6

- 43 year old White Female
- Complaining of redness, soreness and light sensitivity OS x 1 day
- Pertinent Medical History: Last Comprehensive Eye Examination 8/30
 - Branch retinal vein occlusion OS, attributed to anticardiolipin Ab (2007)
 - Lattice degeneration OU
 - Myopia
- Pertinent Medical History:
 - Anticardiolipin Ab, discovered following 2 miscarriages

Exam Findings: 10/6

- Distance Visual Acuity: with correction
 - OD 20/25
 - OS 20/25
- Pupils: ERRL (5-3), (-)APD
- Slit Lamp Examination:
 - OD unremarkable
 - OS grade 2 hyperemia, perilimbal injection, grade 4 cells and flare with inflammatory membrane forming over pupillary margin
- Goldmann Applanation Tonometry @ 11:41 AM
 - OD 13 mm Hg
 - OS 10 mm Hg
- Dilated Fundus Examination: stable from previous exam

Additional History ?

Additional History

- Pt admits several systemic symptoms that have been attributed to anxiety by PCP
- July:
 - Became extremely fatigued for no apparent reason
- August:
 - Developed episodes of dizziness and feelings as if she were in a “fog” that would last up to 30 minutes
 - Developed chest palpitations and muscle spasms on the left side of the neck
 - Tingling in her fingers, toes and left arm
 - Periods of time when back of left leg looks slightly swollen (to her only) and the left side of her groin feels sore
- PCP ordered lab work that was deemed to be non-contributory other than high B-6, low B-12 and a “false positive” for Lyme disease
- PCP referred her to a cardiologist for evaluation which was unremarkable

Assessment and Plan

- Severe non-granulomatous anterior uveitis OS
- Rx prednisolone acetate 1% q2h OS
- Rx cyclopentolate 1% TID OS
- Requested patient to obtain copies of all blood work results to date
- RTC 6 days for follow up and lab work review

Exam Findings: 10/19

- Improved symptoms
- OS now has rare cell
- Goldmann Applanation Tonometry @ 1:59 PM
 - OD 11 mm Hg
 - OS 12 mm Hg
- Phone consult with new (yet to be seen) PCP:
 - Reviewed symptoms and lab work, agrees to initiate treatment
 - Appointment moved up from next month to tomorrow

Assessment and Plan

- Resolving anterior uveitis associated with Lyme Disease
- Taper prednisolone acetate 1% to QID x 1 week, then TID OS
- D/C cyclopentolate 1%
- Rx doxycycline 100 mg PO BID x 28 days
- RTC 2 weeks

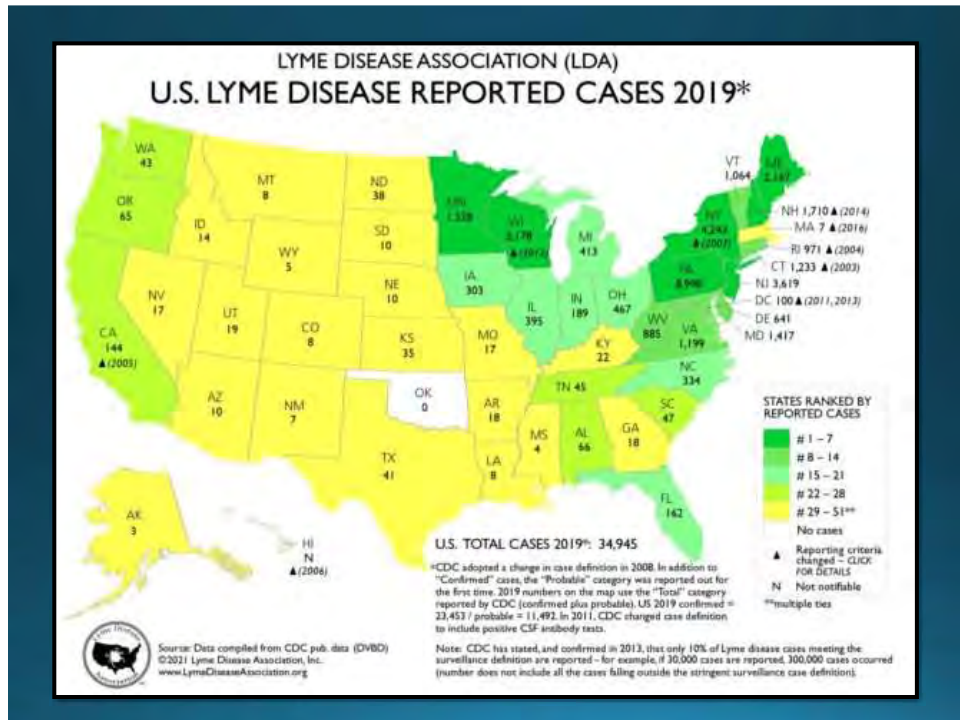
Exam Findings: 11/2

- Pt asymptomatic
- Distance Visual Acuity: with correction
 - OD 20/25
 - OS 20/30+2
- Anterior chamber deep and quiet OU
- Goldmann Applanation Tonometry @ 10:10 AM
 - 15 mm Hg
 - 15 mm Hg

Assessment and Plan

- Taper prednisolone acetate 1% BID x 1 week, QD x 1 week, D/C.
- Continue doxycycline 100 mg PO BID
- RTC 3 weeks

- Pt returned 11/23, pt asymptomatic, anterior chamber quiet



Ocular Presentation

- Stage 1 (3-30 days after tick bite): bull's eye skin rash
 - Ocular Findings: conjunctivitis, uveitis

Ocular Presentation

- Stage 2 (weeks to months later): joint pain (60%), neurologic problems such as cranial neuropathies, neuritis or meningitis (15%), and cardiac (5%)
 - Ocular Findings: cranial nerve palsies (VII most common), papilledema, optic neuritis
- Late Stage 2 (and 3): stromal keratitis, anterior/posterior uveitis, episcleritis, symblepharon, chorioretinitis, vasculitis, exudative retinal detachment, branch artery occlusion, orbital myositis.

Ocular Presentation

- Stage 3: chronic arthritis, psychiatric, and peripheral neuropathy
 - Ocular Findings: same as Stage 2

Lyme Disease Diagnosis

- 52% of patients with chronic disease are negative by ELISA but positive by Western blot¹
- Although the CDC requires 5 of 10 bands for IgG surveillance purposes, 2 of 5 bands have specificity of 93-96% and a sensitivity of 100%²
- 56% of patients with Lyme disease test negative using the two-tiered testing system recommended by the CDC³

1. Donta ST. Issues in the Diagnosis and Treatment of Lyme Disease. *The Open Neurology Journal*. 2012;6:140-145. doi:10.2174/1874205X01206010140.
2. Engstrom SM, Shoop E, Johnson RC. Immunoblot interpretation criteria for serodiagnosis of early Lyme disease. *J Clin Microbiol*. 1995 Feb;33(2):419-27.
3. Stricker RB, Johnson L. Let's tackle the testing. *BMJ : British Medical Journal*. 2007;335(7628):1008. doi:10.1136/bmj.39394.676227.BE.

Treatment

- Oral antibiotics for 2-3 weeks:
 - Tetracycline 500 mg PO QID
 - Doxycycline 100 mg PO BID
 - Phenoxymethyl penicillin 500 mg PO QID
 - Amoxicillin 500 mg PO QID
 - Erythromycin 400 mg PO QID (children, pregnant, tetracycline or penicillin allergy)

Treatment

- Later stages need 30 days of treatment with oral antibiotics
- Severe disease (meningitis, carditis) requires parenteral therapy (14 to 21 days)
 - Intravenous penicillin G 3-4 million units q4h
 - Intravenous ceftriaxone 2 g/d in divided doses

Case Presentation: 3/10

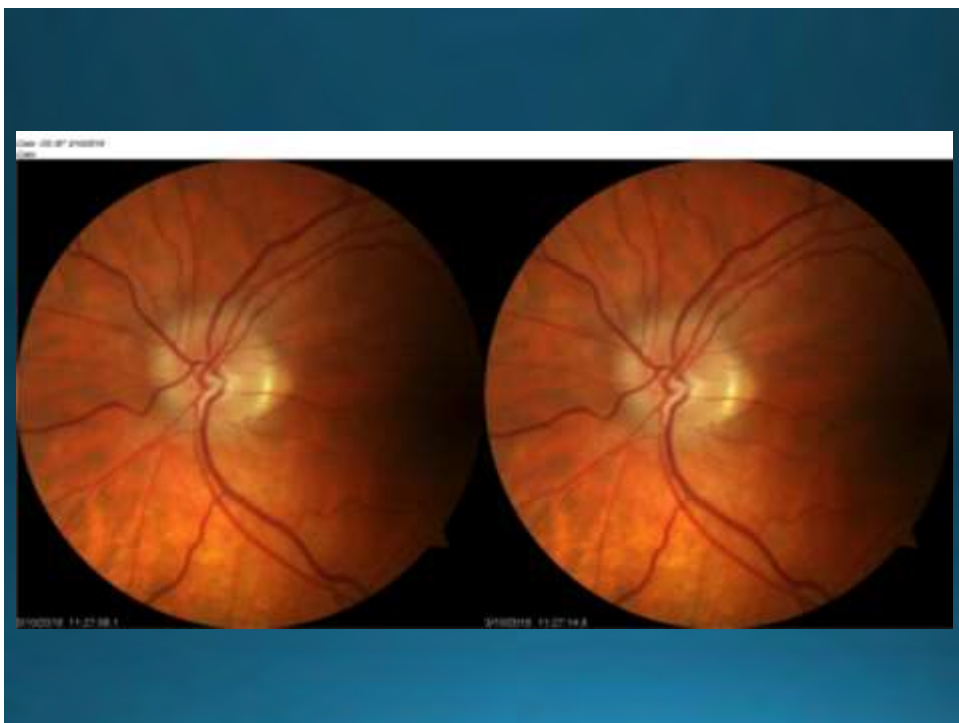
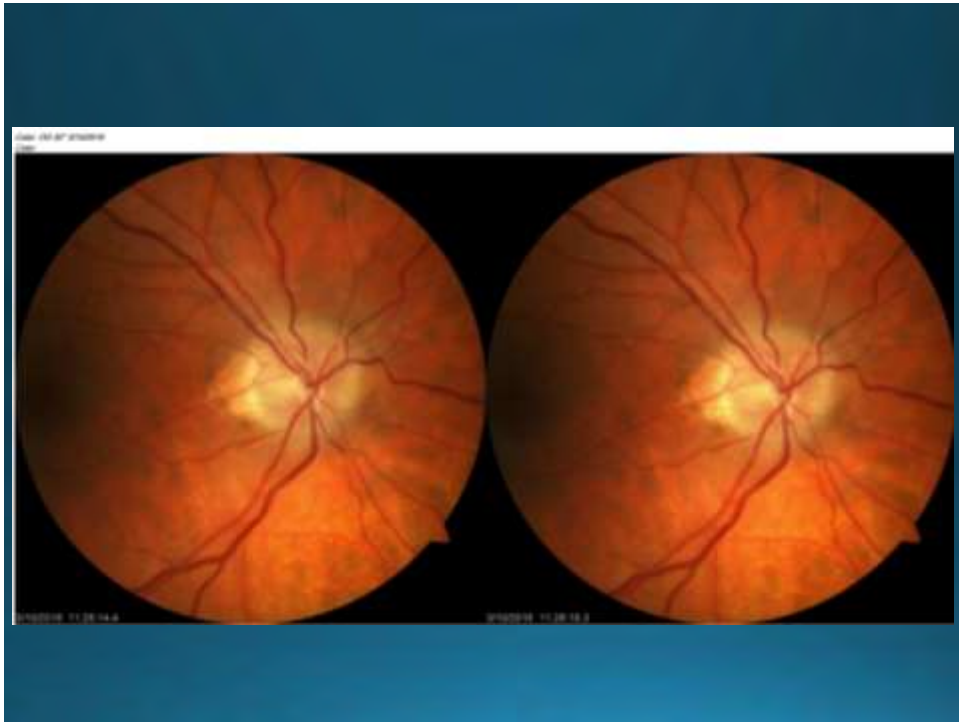
- 44 year old white male
- Chief Complaint: increased blur when reading
- Pertinent Ocular History:
 - LEE approximately 3 weeks ago
 - Was told he had severe sun damage and that he needed prescription sun glasses
 - Prior history unremarkable
- Medical History:
 - Rosacea
 - Medications: doxycycline 50 mg PO QD

Case Presentation: Exam Findings

- Distance Visual Acuity: without correction
 - OD 20/30
 - OS 20/40
- Manifest Refraction:
 - OD +0.75-0.50x100 20/20
 - OS +1.00-0.50x080 20/20
- PERRL (5-3), (-)APD
- Extraocular motility: full OU
- Confrontation Visual Field: FTFC OD/OS

Case Presentation: Exam Findings

- Slit Lamp Examination:
 - Nasal pinguecula OU
 - Otherwise unremarkable
- Goldmann Applanation Tonometry @ 10:33 AM
 - OD 16 mm Hg
 - OS 16 mm Hg
- Dilated Fundus Exam: as follows



Assessment and Plan?

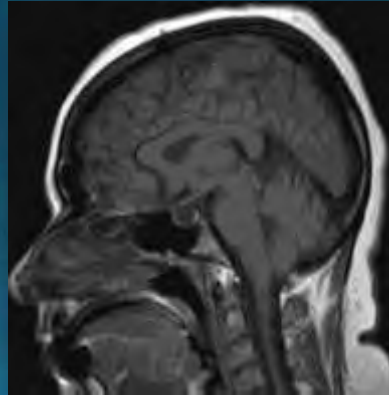


Assessment and Plan

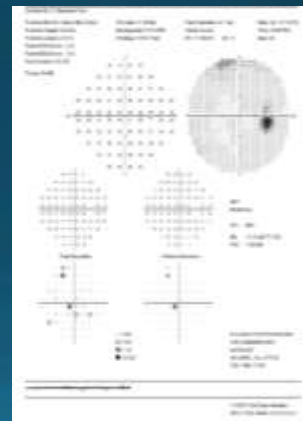
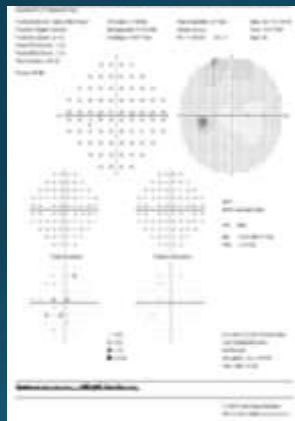
- Bilateral disc edema
- Rule out doxycycline induced intracranial hypertension
- Discontinue doxycycline
- Order blood work: CBC with differential, metabolic panel, ESR, CRP, Lyme Ab, Lyme Western Blot, FTA-ABS, RPR, quantiferon gold-TB
- Order MRI of brain and orbits with / without contrast
- RTC for 30-2 visual field

3/18 MRI of Brain and Orbits

- An empty sella is present
- No other abnormalities



4/12 Follow Up: Visual Field



Doxycycline Induced Intracranial Hypertension

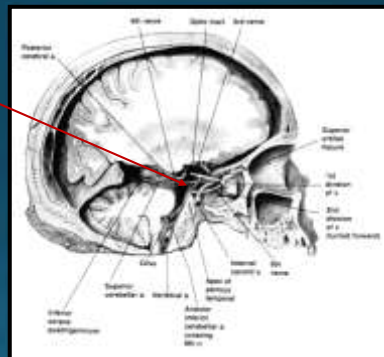
- Increased intracranial pressure associated with drugs including tetracycline, minocycline and doxycycline
- Proposed mechanism: Drug affects cyclic adenosine monophosphate at the arachnoid granulations which interferes with the energy dependent absorption
- Time to develop intracranial hypertension is unknown
 - In largest review of intracranial hypertension induced by minocycline, time of onset ranged from 2 weeks to 1 year
- Raised intracranial pressure persists for 2 to 5 weeks after discontinuing tetracycline

Chiu AM, Chuenkongkaew WL, Cornblath WT, Trobe JD, Digre KB, Dotan SA, Musson KH, Eggenberger ER. Minocycline treatment and pseudotumor cerebri syndrome. Am J Ophthalmol.1998;126:116–121.

Intracranial Hypertension: Signs and Symptoms

- Asymptomatic
- Headaches (99%)
- Transient vision loss
- Diplopia
- Tinnitus
- Nausea
- Papilledema
- No spontaneous venous pulsation
- Visual field defects
- Normal to decreased visual acuity, color vision and contrast sensitivity

Dorello's canal



Medication Induced Intracranial Hypertension

- Vitamin A toxicity
- Tetracycline
- Oral contraceptives
- Nalidixic acid
- Lithium
- Growth hormone
- Tamoxifen
- Sulfa drugs

Macrolides

- Bactericidal or bacteriostatic
- Inhibit bacterial protein synthesis by binding to 50S subunit of ribosomes
- Low toxicity since they do not bind to mammalian ribosomes

Macrolides

- Erythromycin
- **Azithromycin**
- Clarithromycin

Macrolides

- Efficacy against Gram positive cocci, Gram positive bacilli, *Neisseria*, *Mycoplasma*, *Treponema*, *Rickettsia*, and *Chlamydia*
- Some activity against *Haemophilus influenzae*
- Azithromycin bactericidal against most organisms
- Erythromycin bacteriostatic for most organisms, bactericidal for *Streptococcus pneumoniae*
- Azithromycin or erythromycin may be reasonable alternatives when not able to utilize a penicillin or cephalosporin due to allergy, recent treatment with an agent, poor result in past, etc.

Macrolides

- Erythromycin – only free base active, gastric acids inactivates the erythromycin base so tablets are enteric coated, ester versions also help overcome problem (ethylsuccinate most widely used). [Erythromycin E.E.S.]
- **Azithromycin** – rapidly absorbed and widely distributed throughout the body, extended half-life makes once a day dosing possible
- Clarithromycin – half life twice as long as erythromycin so dose only twice per day, more gastrointestinal upset with this agent

Macrolides

- Resistance
 - Plasmid mechanisms
- Adverse effects include:
 - Gastrointestinal irritation
 - Hypersensitivity reactions
 - Headache, dizziness, fatigue (azithromycin, clarithromycin)
 - Cholestatic hepatitis (estolate preparation of erythromycin)
 - Prolongs half-life of theophylline, may lead to theophylline toxicity

Macrolides

- Contrindications
 - Hypersensitivity
 - Known intolerance to the drugs
 - Pregnancy (clarithromycin)
 - Drug interaction issues particularly erythromycin

Macrolides

- Erythromycin is the antibiotic agent with the highest risk of interacting with other oral medications. If not certain, check PDR, PubMed, MedlinePlus, etc. prior to prescribing.
- Example - Fexofenadine taken concurrently with erythromycin may lead to a toxic reaction in susceptible patients.

Macrolides

- Erythromycin may also be contraindicated if patient taking any of the following drugs.
 - Anticoagulant agents
 - Digoxin
 - Statin agents
 - Dilantin
 - Theophylline

Macrolides

- Macrolides - both G+ & G- activity with efficacy against *Chlamydia trachomatis*
 - Azithromycin (Zithromax) – for *Chlamydia trachomatis* 1,000 mg qd x 1 day, repeat regular dosage if not successful
 - Azithromycin - regular dosage 500 mg x1 day, then 250 mg x 4 days
 - Erythromycin – typical dosage 400 mg qid (duration depends on clinical entity being treated)

Clinical Case Examples

- Inclusion conjunctivitis
- Posterior blepharitis
- Acne rosacea
- Recurrent corneal erosion

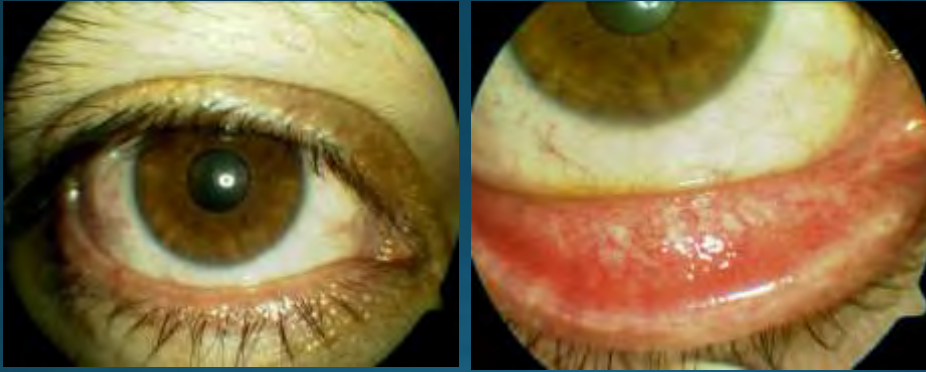
How would you treat this?



*28 year old Hispanic male
Complains of red, irritated right eye x 7
months*



5 days later...



Chlamydia trachomatis

- Gram negative bacteria
- Obligate intracellular pathogen
- Three strains of *C. trachomatis*
 - Trachoma (serotypes A, B, Ba or C)
 - Trachoma
 - Urethritis (serotypes D through K)
 - Inclusion conjunctivitis
 - Lymphogranuloma venereum (serotypes L1, 2 and 3)
 - Conjunctival granulomas
 - Interstitial keratitis

Treatment

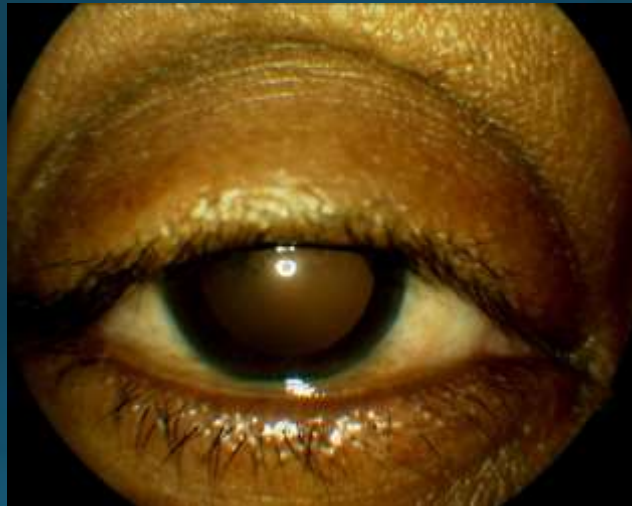
- Azithromycin (Zithromax)
 - 1 gram PO in single dose, or 500 mg PO on day 1, followed by 250 mg qd for 2 to 5 days
 - Pregnancy category B
- Tetracycline (Sumycin)
 - 250-500 mg PO qid for 3-6 weeks
 - Pregnancy category D

Case Presentation

- 47 year old female
- Presents complaining of right eye pain and painful swelling on right side of face
 - Started two weeks ago and has steadily gotten worse
 - No other symptoms
- Ocular History: unremarkable
- Medical History: unremarkable
- Medications: daily multivitamin
- Allergies: none

Exam Findings

- Distance Visual Acuity: without correction
 - OD 20/30 PH 20/20-2
 - OS 20/20
- PERRL (4-3), (-)APD
- Extraocular Motility full OU
- Confrontation visual fields FTFC OD/OS
- External: markedly swollen and tender preauricular node right side with some surrounding edema
- Slit lamp exam as follows
- Goldmann Applanation Tonometry @ 2:53 PM
 - OD 17 mm Hg
 - OS 17 mm Hg
- Dilated fundus examination non-contributory







Assessment and Plan

- Parinaud's Oculoglandular Syndrome
 - Order blood work: B. henselae IgG and IgM with reflex to titer
 - Rx azithromycin 500 mg PO on day 1, followed by 250 mg QD x 5 days

Key Points: Parinaud's Oculoglandular Syndrome

- Differential diagnosis
 - Cat scratch disease (Bartonella henselae)
 - Sarcoidosis
 - Tuberculosis
 - Lymphogranuloma venereum
 - Syphilis
- Management
 - If history of cats, typically treat as cat scratch disease
 - Otherwise need workup and treat accordingly

Drugs Inhibiting Intermediary Metabolism

- **Sulfonamides**
- **Trimethoprim**
- Pyrimethamine

Sulfonamides

- Bacteriostatic
- Inhibit the bacterial synthesis of folic acid
- Structural analogs of PABA, competitively inhibit the first step in synthesis of folic acid
- Broad resistance has led to replacement of these agents by other antimicrobial drugs

Sulfonamides

- Resistance
 - Reduced cellular uptake of drug, chromosomal or plasmid mechanism
 - Altered dihydropteroate synthetase
 - Production of increased amounts of para-aminobenzoic acid

Sulfonamides

- Adverse effects include:
 - Anorexia, nausea, vomiting, diarrhea
 - Blood dyscrasias (anemia)
 - High levels of bilirubin in infants born to mothers taking the drug, also excreted in breast milk
 - Hypersensitivity
 - Stevens-Johnson syndrome
 - Transient myopia

Sulfonamides

- Contraindications
 - Hypersensitivity
 - Known intolerance to drug
 - Contraindicated in pregnancy and infants under 2 months old
 - Documented blood dyscrasias

Trimethoprim

- Bacteriostatic
- Blocks the formation of thymidine by binding to bacterial dihydrofolate reductase
- Prevents the conversion of dihydrofolate to tetrahydrofolate
- Trimethoprim binds competitively and inhibits the enzyme in bacterial and mammalian cells

Trimethoprim

- Trimethoprim efficacious for most Gram positive and negative organisms, not effective against *Pseudomonas aeruginosa*
- Trimethoprim well absorbed from the GI tract
- Used for treatment of toxoplasmosis in combination with sulfonamides
- Sulfamethoxazole and Trimethoprim (Bactrim) typical dosage for bacterial infection 800 mg of sulfamethoxazole and 160 mg of trimethoprim q12h, duration dependent on clinical entity

Trimethoprim

- Resistance
- Primary mechanism (chromosomal mutation or plasmid) related to cell permeability changes and from the presence of an altered dihydrofolate reductase
- Mutation to thymine dependence
- Overproduction of dihydrofolate reductase also possible

Trimethoprim

- Adverse effects include:
 - Nausea, vomiting, diarrhea
 - Rarely a rash
 - Hemotological toxicity is uncommon, neutropenia can occur (HIV patients)
 - Increase in creatinine concentrations possible
 - Headache, depression, hallucinations
 - Hypersensitivity
- Contraindications
 - Hypersensitivity
 - Documented megaloblastic anemia due to folate deficiency

Case Presentation

- 10 year old Hispanic female complaining of decreased vision OD x 3 weeks
- Diagnosed with conjunctivitis by pediatrician and treated with Naphcon-A QID
- The patient was referred after there was no improvement for 2 weeks

History

- Developmental: full term baby with a birth weight of 5.6 pounds
- She was born in Central America and came to the United States in 2003
- Medical: positive PPD in February 2003, (10x10mm, Bellevue Hospital, New York)
 - Her chest x-ray was negative
 - Underwent Isoniazid (INH) therapy for 9 months
- Ocular: unremarkable
- Family Medical and Ocular History: unremarkable

Ocular Examination

- Visual Acuity:
 - OD 20/60
 - OS 20/25
- Pupils: unequal with the right pupil round at 6mm and unreactive to light, left pupil round at 5mm and briskly reactive to light. (-) APD.
- Slit lamp exam OD:
 - bulbar conjunctival injection
 - Mutton fat keratic precipitates
 - Grade 4+ anterior chamber reaction with plasmoid aqueous,
 - 360 degree posterior synechiae of the iris
 - Cells in the anterior vitreous.
- The anterior segment of the left eye was unremarkable.
- Goldmann Applanation Tonometry at 10:12 AM:
 - OD 10 mm Hg
 - OS 10 mm Hg
- Dilated fundus exam of the right eye revealed no additional information due to the posterior synechiae and hazy media. Dilated fundus exam of the left eye was completely unremarkable.

Assessment and Plan?

Assessment and Plan

- Tentatively diagnosed with granulomatous anterior uveitis OD
- Rx Pred Forte every 15 minutes and Homatropine 5% twice a day in the right eye.
- Patient and her mother were instructed to return to the clinic in 24 hours.
- More history? Systemic work-up?

Work-up

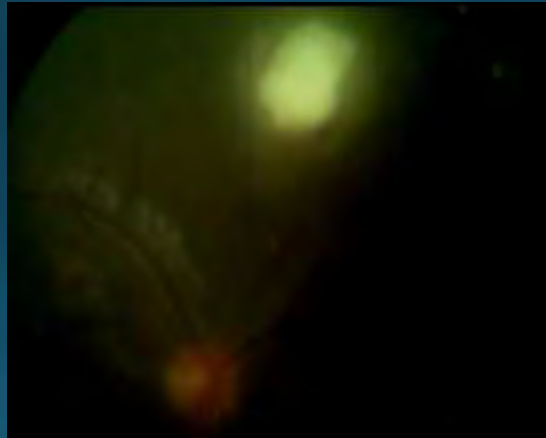
- Upon further questioning, the mother reports that the patient often complained of joint pain, especially in her hands and feet, upon awakening.
- Tests ordered:
 - chest x-ray
 - Blood work:
 - Complete blood count
 - Erythrocyte sedimentation rate
 - Anti-nuclear antibody
 - Syphilis IgG enzyme immunoassay with the rapid plasma reagin test
 - Lyme antibody titre
 - Rheumatoid factor
 - TORCH

Follow up



- Chest x-ray was negative
- Blood work was remarkable for:
 - increased hematocrit (44.5, ref. 33-43),
 - increased platelet count (458, ref. 130-400),
 - positive *T. Gondii* IgG antibody (358.7, ref. ≥ 10.0 positive).
 - Negative *T. Gondii* IgM antibody (0.2, ref. < 0.90 negative).

How would you treat this?



August 14th

Toxoplasmosis gondii

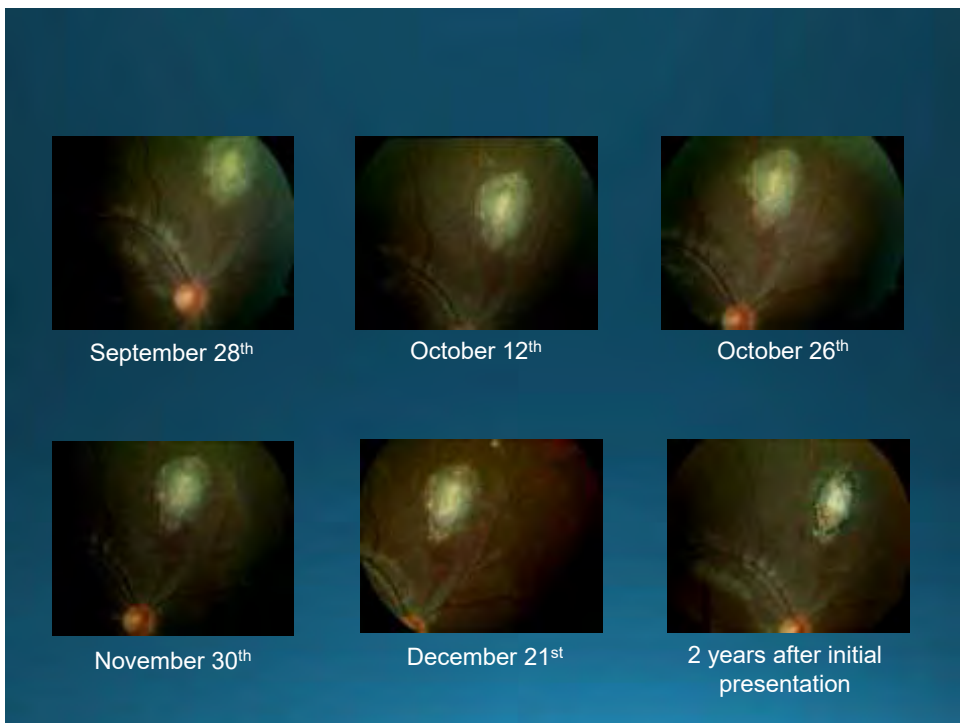
- Obligate intracellular parasite that finds host in mammals and birds
- Humans may become infected when they ingest the parasite's eggs or cysts
- Once infected the parasite may be passed across the placenta from a pregnant mother to her fetus resulting in a congenital form of the disease
- The classic clinical finding of ocular toxoplasmosis is a focal chorioretinitis with overlying vitritis

Traditional Treatment

- Pyrimethamine (Daraprim)
 - 75 mg PO qd or 50 mg PO bid loading dose, followed by 25 mg PO bid
 - Pregnancy category C
- Sulfadiazine (Microsulfon)
 - 2-4 g PO single loading dose, followed by 1 g PO qid
 - Pregnancy category C
- Prednisone (Deltasone, Meticorten, Orasone)
 - 60-100 mg per day PO for 1-2 weeks; then, taper over 2-3 weeks
 - Pregnancy category C

Alternative Treatment

- Trimethoprim and sulfamethoxazole (Bactrim DS)
 - 1 DS tab contains 800 mg of sulfamethoxazole and 160 mg of trimethoprim
 - 1 DS tab PO bid for first 2 weeks; then 1 regular tab PO bid for next 3-4 weeks
 - Widely accepted as an effective treatment and has the benefit of less systemic side effects compared to sulfadiazine
 - Consider adding folinic acid supplement for long courses
 - Oral corticosteroids may be used in conjunction with Bactrim



Case Presentation

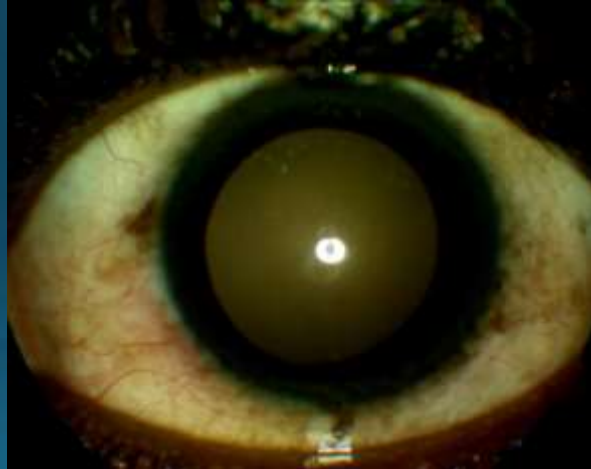
- 47 year old male referred from primary care provider for “sudden decreased vision of left eye for 4 days”
- Patient reports he woke up 4 days ago with a red left eye and blurry vision
- POH: patient reports similar episode 10 years ago, for which he was successfully treated by his PCP with eye drops
- PMH: unremarkable
- Patient just moved to United States from Nigeria one month ago

Exam Findings

- Uncorrected visual acuity:
 - OD 20/20-
 - OS 20/80 PH NI
- Manifest Refraction
 - OD plano 20/20
 - OS -1.00 sph 20/70+
- Confrontation visual field: FTFC OD/OS
- Pupils: right pupil (4mm) round and reactive to light, left pupil (5mm) round and sluggishly reactive to light, (-)APD
- Extraocular motility: full OD/OS

Slit Lamp Exam

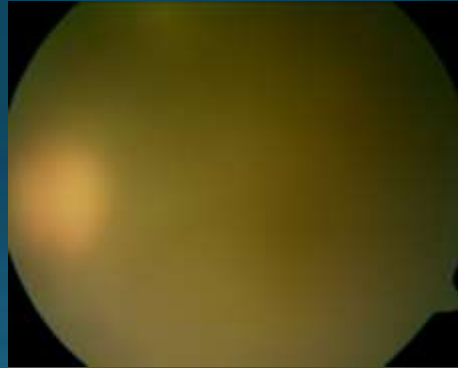
- Keratic precipitates OS
- Small Koeppe nodule forming at 9:00 OS
- Anterior chamber OS: grade 4+ cells and trace flare
- GAT @ 2:10 pm:
 - OD 15 mmHg
 - OS 13 mmHg



Dilated Fundus Exam



Small chorioretinal scar



Five active chorioretinal lesions in linear pattern superior to disc, lesions increase in size as move away from disc

Assessment and Plan?

Assessment and Plan?

- Presumed toxoplasmosis with multiple active chorioretinal lesions OS
 - Order PPD and blood work: toxoplasmosis IgG and IgM, ACE, HIV
 - Rx Pyrimethamine 50 mg PO BID
 - Rx Sulfadiazine 2 g PO single loading dose, then 1 g PO QID
 - Rx 5 mg folinic acid PO Q3D (~2 times per week)
 - Rx Homatropine 5% oph soln TID OS
 - RTC 3 days

Follow up: 3 days later

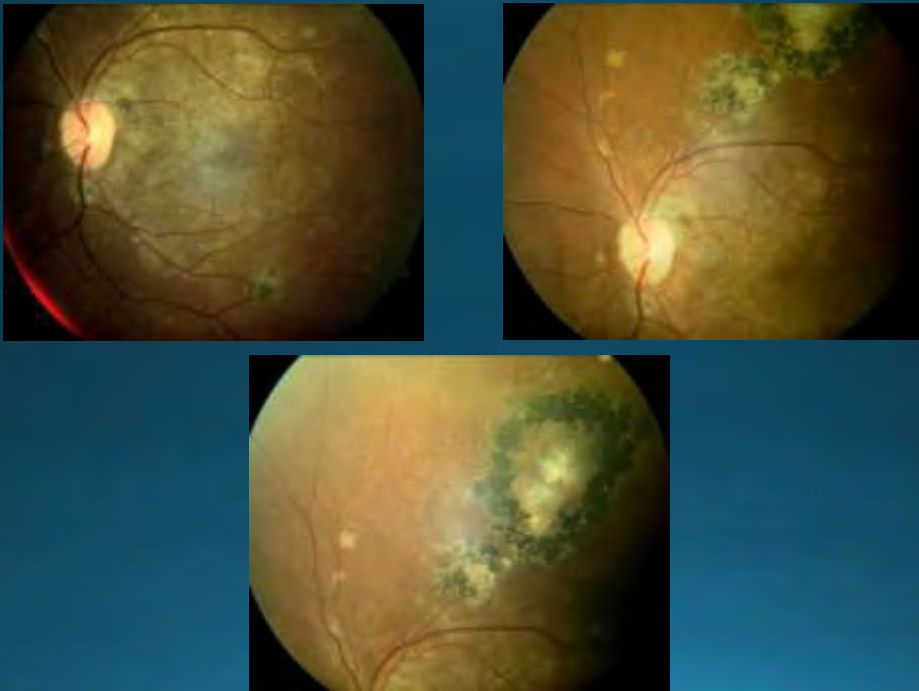
- Patient reports subjective improvement in visual acuity
- Clinical findings, including visual acuity, unchanged from last exam
- Review of lab work:
 - Toxoplasmosis IgG: 82.9 (≥ 10 positive)
 - Toxoplasmosis IgM: 0.2 (< 0.9 negative)
 - ACE: 52 (8-52)
 - HIV: negative
- PPD negative

Assessment and Plan

- Toxoplasmosis chorioretinitis OS
- Continue present medications
- RTC 2 weeks

Follow Up

- Patient remained on medications x 2 months
- Visual acuity improved left eye to 20/25+
- Fundus exam at 2 month exam as follows



Case Presentation: Cause and Effect, or Coincidence?

- 32 year old male
- POH: told he had a “scar” in his left eye 15 years ago
- PMH: schizophrenia
- Best corrected visual acuity:
 - OD -1.75-1.25x170 20/20
 - OS -1.25-0.75x180 CF @ 8 feet
- PERRL, (-) APD
- Confrontations: FTFC OD/OS
- Extra-ocular motilities full OU
- Anterior segment unremarkable
- Goldmann Applanation Tonometry @ 5:00 PM:
 - OD 18 mm Hg
 - OS 18 mm Hg
- Dilated fundus exam as follows



Toxoplasmosis: Interesting Thoughts

- Mothers infected at time of delivery were found to be 53% more likely to self injure during next 14 months
- 2011 American Journal of Psychiatry: increased risk of schizophrenia after delivery
- 2012 American Psychiatric Association: schizophrenic patients infected with toxoplasmosis were more likely to attempt suicide
- Why???

Pedersen MG, Mortensen PB, Norgaard-Pedersen B, Postolache TT. Arch Gen Psychiatry. 2012;():1-8. doi:10.1001/archgenpsychiatry.2012.668

Toxoplasmosis: New Thoughts

- Toxoplasmosis produces enzyme with tyrosine hydroxylase and phenylalanine hydroxylase activity
- This alters production of dopamine
 - Schizophrenia is linked to dopamine dysregulation
 - Makes infected mice less fearful of cats
- Any thoughts on this?

Clinical Examples: Summary

Clinical Case Examples – typical initial treatments

- Internal hordeolum – Augmentin or cephalexin
- Preseptal cellulitis – Augmentin or Bactrim
- Lid abscess - Augmentin, or Bactrim
- Impetigo – Augmentin or amoxicillin
- Dacryocystitis – Augmentin
- Canaliculitis – cephalexin
- Dacryoadenitis – Augmentin or cephalexin
- Orbital fracture – Augmentin or Bactrim

Clinical Examples: Summary

- Inclusion conjunctivitis - azithromycin
- Posterior blepharitis – doxycycline or minocycline
- Recurrent corneal erosion - doxycycline
- Toxoplasmosis – Bactrim
- Hyperacute bacterial conjunctivitis (nongonococcal) – cephalexin

Questions?

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