Practical Treatments for Challenging Anterior Segment Cases

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Text NICHOLASCOLA090 to 22333 to join Live Text Poll

Disclosures

- Allergan Pharmaceuticals Speaker’s Bureau
- Bio-Tissue
- BioDLogics, LLC
- Katena/IOP
- Seed Biotech
- Johnson and Johnson Vision Care, Inc.
- Shire Pharmaceuticals

Live Survey

- Text NICHOLASCOLA090 to 22333 once to join
- Then text A, B, C, D, E to answer
  - Live
  - Immediate
  - Accurate

Clinical Decision Making

- Health care decisions have substantial consequences, and involve important uncertainties and trade-offs
  - Uncertainties may be about diagnosis, accuracy of available diagnostic tests or treatments, history of disease or the effects of treatment in an individual patient or group
- Decision analysis should be broken down into its components, so they can be analyzed individually and then recombine them systematically to help guide your treatment by way of:
  - Development of differential diagnoses
  - Literature based treatment studies
  - Evidence based treatment strategies

Case Study
76 year old Caucasian male

Uncomplicated cataract surgery 3 days prior OS

Woke up with complaint of redness, pain, and decreased VA

BCVA: Hand Motion at 3'

Corneal edema / central folds

Epithelium intact

IOP: 21 mm Hg

3-6+ cell / fibrin in chamber

No view of fundus

Diagnosis and plan?

TASS

Acute, sterile postoperative anterior segment inflammation that develops following anterior segment sx

Monson et al. first used the term TASS in 1992

received greater attention because of a national outbreak in 2005 that affected 112 patients treated at seven sites in six states

linked to endotoxins in Advanced Medical Optics Endosol balanced salt solution (BSS).

Caused by any substance that enters the anterior segment of the eye either during or immediately after surgery, causing toxic damage of the intraocular tissues.

Careful history and exam help differentiate between TASS and endophthalmitis

- intraocular cultures and intravitreal AB must be utilized when interpretation difficult
- Most common clinical symptom is significantly blurred vision
- Most common clinical finding is corneal edema
  - Limbus to limbus
  - Indicative of widespread endothelial damage

Marked anterior segment inflammation

- Hypopyon
- Fibrin from surface of iris onto surface to IOL, to wound and side ports
- Can create significant iris damage
  - Permanently dilated
  - Transillumination
- Damage to TM leading to 2nd Glaucoma
TASS

- Treatment
  - Immediate high dose topical corticosteroid
  - Follow closely
    - Same day
    - Daily
  - IOP monitoring
    - Usually low to start but can rise rapidly
  - Acute trabeculitis
  - PAS development – gonio
  - Specular Microscopy
    - Monitor for permanent endo damage
  - No help to wash out the AC

Elevated IOP

- Epithelial edema often associated with elevated IOP
- Pressure elevation
  - Retained viscoelastic
  - Inflammation
  - Hyphema
  - Ciliary or pupillary block
  - Mechanical angle closure

Elevated IOP

- Treatment
  - Time
  - Ocular hypotensives
  - Wound burp

Cystoid Macular Edema

- Presents 4–12 weeks after uncomplicated surgery with
  - reduced VA
  - ocular inflammation
  - leakage of FL from optic nerve and macula
  - Results from retinal leakage in perifoveal region and accum. of fluid in the outer plexiform layer of the retina
- Major contributing factors
  - intraocular inflammation
  - vitreous traction (wound, iris, or macula)
  - pre-existing microvascular disease
  - yellowish spot in fovea

Cystoid Macular Edema

- Most common cause of decreased vision after cataract surgery
- Incidence?
- Higher risk patients?

Case Study

- What are differentials?
  - Toxic Anterior Segment Syndrome (TASS)
  - Increased IOP
  - CME
  - Corneal abrasion
  - Endophthalmitis
Acute Bacterial Endophthalmitis

- Usually manifests 2-7 days after surgery, most within 6 weeks
- Pain, injection, significant decrease in VA, purulent discharge
- Incidence 1:1000
- Most acute cases due to S.aureus and S.epidermidis
- Key to diagnosis is culturing aqueous and vitreous

Incidence 1:1000
Most acute cases due to S.aureus and S.epidermidis
Key to diagnosis is culturing aqueous and vitreous

Endophthalmitis Vitrectomy Study (EVS)
- Multicenter randomized trial carried out at 24 centers in U.S. (1990-1994)
- Looked at 420 patients with clinical evidence
- To determine the role of immediate PP Vitrectomy
- To determine role of immediate PP Vitrectomy
- Results:
  - No difference in final visual acuity or media clarity with or without use of systemic / IV antibiotics
  - Therefore recommend intravitreal injection of AB


Endophthalmitis Vitrectomy Study (EVS)
- Patients with LP vision or worse with an early vitrectomy did favorably with final VA
- 20/40 or better was achieved 3x more often following PPV than needle tap
- Patients with better than LP VA, do not require a vitrectomy only required tap/biopsy

Endophthalmitis
- Acute Endophthalmitis
- Clinical Appearance
  - Cells in anterior chamber
  - Hypopyon
  - Fibrin
  - Focal corneal edema
  - Eyelid edema
  - Chemosis
  - Hyperemia
  - Vitreal involvement
  - Pain
  - 21% with underlying DM

Case Study
- Spring 2001
- 71 white male 1 day uncomplicated Cataract Post Op evaluation
- Pt reports slept well and in no acute distress
  - No real pain or discomfort but blurry
  - 20/200
- SLE
  - 2-3+ Diffuse limbus to limbus corneal edema
  - 3+ Fibrin in AC emanating from pupil to wound
  - + Hypopyon
  - Pupil mid-dilated
  - Ta 18 mmHg
  - Ant Vitreous – difficult to view but appeared clear
Clinical Features

<table>
<thead>
<tr>
<th>Onset of symptoms</th>
<th>TASS</th>
<th>Infectious</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relatively immediate (12-48 hours)</td>
<td>Somewhat delayed (2-7 days)</td>
<td></td>
</tr>
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</table>

| Pain | Most patients do not experience | >75% of patients have pain |

<table>
<thead>
<tr>
<th>Corneal Edema</th>
<th>TASS</th>
<th>Infectious</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diffuse &quot;limbus-to-limbus&quot;</td>
<td>Focal corneal edema</td>
<td></td>
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<table>
<thead>
<tr>
<th>Anterior Segment Inflammation</th>
<th>TASS</th>
<th>Infectious</th>
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<tbody>
<tr>
<td>Increased cell/flare, hypopyon, marked fibrin reaction</td>
<td>Increased cell/flare, hypopyon, moderate to severe fibrin reaction</td>
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<table>
<thead>
<tr>
<th>Iris/Pupil</th>
<th>TASS</th>
<th>Infectious</th>
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<tr>
<td>Iris atrophy, with dilated, non-reactive pupil</td>
<td>Changes relatively uncommon</td>
<td></td>
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<table>
<thead>
<tr>
<th>Vitreous</th>
<th>TASS</th>
<th>Infectious</th>
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<tbody>
<tr>
<td>Usually clear, rare spillover</td>
<td>Opacified</td>
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Early Visual Impairment
TASS vs Infectious Endophthalmitis

Case Study

- SM, 25 year old Caucasian male
- First time visit to the office
- Medical history unremarkable
- Ocular history: LASIK (May 2011)
- Medication: Fish oil, multi-vitamins, Restasis
Case Study

- Clinical exam
  - Uncorrected VA 20/20 OD, OS
  - Lids/lashes clear
  - Mild lissamine green stain (conjunctiva) OU
  - Reduced TBUT OU
  - Faint SPK

Case Study

- Compliant with Restasis
  - Increased use to 3-4x/daily
  - High-frequency Topical Cyclosporine 0.05% in the Treatment of Severe Dry Eye Refractory to Twice-daily Regimen
  - Dastjerdi MH, Hamrah P, Dana R

Other options

- Amniotic membrane
- Autologous Serum
- Punctal plugs
- Xiidra

Case Study

- Xiidra (lifitegrast ophthalmic solution 5%)
- Mechanism of Action
  - ICAM-1 may be over-expressed in corneal and conjunctival tissues in dry eye disease
  - Lymphocyte function associated antigen 1 (LFA-1) found on surface of T-Cells
  - Integrins can contribute to T-Cell recruitment and migration
  - ICAM-1 and LFA-1 are binding partners
  - Binding leads to T-Cell activation and migration
  - Contributes to release of inflammatory cytokines
  - Lifitegrast binds to LFA-1 and prevents adhesion to ICAM-1

Case Study

- Plan
  - Start patient on Xiidra Q12H OU
  - RTO x 3 weeks for re-evaluation

  Received phone call in ~2 weeks later from patient’s mother

  “Best he has felt in several years”

  Continue Xiidra

Defining Dry Eye

- Dry eye is a disorder of the tear film due to tear deficiency or excessive evaporation, which causes damage to the inter-palpebral ocular surface and is associated with symptoms of ocular discomfort

  - NEL 1995

Defining Dry Eye

- Dry eye is a multi-factorial disease of the tears and ocular surface that results in symptoms of discomfort, visual disturbance, and tear film instability with potential damage to the ocular surface. It is accompanied by increased osmolarity of the tear film and inflammation of the ocular surface

  - Tear Film and Ocular Surface Society, 2007
**Severity Level 1**
- Mild to moderate symptoms and no signs
- Mild to moderate conjunctival signs

**Severity Level 2**
- Moderate to severe symptoms
- Tear film signs
- Mild corneal punctate staining
- Conjunctival staining
- Visual signs

**Severity Level 3**
- Severe symptoms
- Marked corneal punctate staining
- Central corneal staining
- Filamentary keratitis

**Severity Level 4**
- Severe symptoms
- Severe corneal staining, erosions
- Conjunctival scarring


**TFOS DEWS II**
- TFOS DEWS II will update the definition, classification and diagnosis of dry eye disease, critically assess the etiology, mechanism, distribution and global impact of this disorder, and address its management and therapy

- Definition and classification
- Pathophysiology
- Sex differences
- Pain/sensation
- Iatrogenic dry eye (i.e. drug- and surgery-induced)
- Epidemiology
- Tear film
- Diagnosis
- Management & therapy
- Clinical trial design
- Consumer

**Inaugural Dry Eye Summit**
- December 2014
- 30 practitioners from around the country met to see if there was a better way to disseminate information to OD’s

[Link](https://www.dropbox.com/s/8a66zccqyqvdjut/Dry%20eye%20summit%20results.pdf?dl=0)

1. Do your eyes ever feel dry or uncomfortable?
2. Are you bothered by changes in your vision throughout the day?
3. Are you ever bothered by red eyes?
4. Do you ever feel the need to use eye drops?
Case Study

- 17 yo white male, Logan K
  - c/o red, painful, irritated left eye
  - Been going on for almost a month
  - 2 weeks ago went to ER and given Polytrim. Since then no real improvement
  - Wearing Biofinity DW, reports good compliance, no EW, but wearing them today (with the red eye)
  - Vacc: 20/20 OD, 20/30 OS (-4.00 OU)
  - Also had infection on forehead just prior, Dx as “dermatitis or impetigo” which had oral AB
  - He is also a wrestler and routinely has face smeared into mat
  - And after each match usually goes into hot tub to relax muscles, etc., while wearing CLs (May have gone under)
  - Dec 25
Cultured everything
Performed corneal sensitivity
  Was reduced objectively and subjectively OS
Presumptive Dx of Herpes Simplex Keratitis (dendrite and marginal keratitis)
  Started Zirgan 5x/day
  Besivance q2h
  Debride vs no debridement
  Also started on Oral Acyclovir 400mg 5x/day
But had notes in chart saying
  Concerned about Acanthamoeba. Also worried about NTM due to face in mat and possibly even Nocardia. If not improved in next couple of days switch to fortified Amikacin and consider PHMB

**HSV Keratitis – Dendritic Ulcers**
- Most common form of HSV keratitis
  - Dendrite is derivative of “dendron” Greek word for tree
- Linear, branching lesion, swollen epithelial borders, terminal bulbs
- Stains positively w FL along length
  - Rose Bengal or Lissamine Green at epi borders
- Do cultures prior to RB
- Contains live virus
- Central ulceration through basement membrane
  - Ulcerated and not raised as VZV pseudodendrites & healing Epi defects

**HSV Keratitis – Geographic Ulcer**
- Enlarged or expanding dendritic ulcer
- True ulcer that has live virus and extends through basement membrane
- Typically has swollen scalloped epithelial borders
  - Differentiates from smooth borders of neurotrophic ulcer and healing abrasions
  - Wilhelmus et al
    - 22% of all initial infections
    - Assoc w longer duration and topical corticosteroids

**HSV Keratitis – Marginal Ulcer**
- Uncommon and often confused with Staph Marginal disease
- Result of active live virus in close proximity to limbus
- Unique clinical features
  - Epi lesion (perhaps dendrite) with underlying anterior stromal infiltrate and adjacent limbal injection

**HSV Keratitis – Marginal Ulcer**
- Pt extremely symptomatic due to inflammatory nature
- More difficult to treat
  - If inappropriately treat with corticosteroids, will progress centrally with ulceration and subepithelial infiltration (takes on dendrite pattern)
**HSV Keratitis – Marginal Ulcer**

- **Ways to help differentiate**

<table>
<thead>
<tr>
<th>Features</th>
<th>HSV Marginal Ulcer</th>
<th>Staph Marginal Infiltrate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Etiology</strong></td>
<td>Active HSV</td>
<td>Immune response to staph antigen</td>
</tr>
<tr>
<td><strong>Epithelial Defect</strong></td>
<td>Always</td>
<td>Absent (unless late)</td>
</tr>
<tr>
<td><strong>Neovascularization</strong></td>
<td>Often</td>
<td>Never</td>
</tr>
<tr>
<td><strong>Progression</strong></td>
<td>Centrally</td>
<td>Circumferentially</td>
</tr>
<tr>
<td><strong>Blepharitis</strong></td>
<td>Unrelated</td>
<td>Usually</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>Any meridian</td>
<td>Typically 2, 4, 8, 10 O’clock meridians</td>
</tr>
</tbody>
</table>

**HSV Keratitis – Epi Keratitis Management**

- Physical debridement of dendrite w cotton tip applicator with topical or oral Tx:
  - **Topical**
    - Trifluuridine (Viroptic) q2H until epithelium is healed, then qid x 7 days
    - Gancyclovir (Zirgan) 5x daily until epithelium is healed, then tid x 7 days
  - **Oral**
    - Zovirax (acyclovir) 400mg five times daily for 10 days
    - Valtrex (valacyclovir) 500mg three times daily 10 days
    - Famvir (famciclovir) 250mg three times daily 10 days.
  - Prophylaxis with broad spectrum AB prudent, esp when treating large geographic ulcers

**Case Study**

- **JM, 68 year old female**
- **Initial visit April 16, 2014**
- **Presented with complaint of:**
  - Redness, discharge, swelling OD x 2 days
  - Ocular/Medical Hx: Non-contributory
- **Slit lamp exam OD**
  - Chemosis, lid swelling, faint SEI inferior, subconj hemorrhage
- **Slit lamp exam OS**
  - Unremarkable

**Case Study**

- **Initial Diagnosis**
  - Epidemic Keratoconjunctivitis
Viral conjunctivitis caused by adenoviruses 8, 19

- Highly contagious
- Typically unilateral
- No sore throat / fever
- Redness
- Discomfort
- SEI
- Chemosis
- Photophobia

There are no FDA-approved medicines to kill adenoviruses

But, an excellent off-label application of an FDA-approved drug is readily and inexpensive:

- 5% Betadine Sterile Ophthalmic Prep Solution

Decreases the viral load

- Prevents entry into the anterior stroma stopping SEI

Betadine is a topical antimicrobial OTC used to apply and clean wounds or prep for surgery.

**MOA**
- Oxidizes cell constituents
- Iodinates proteins and inactivates them

**Side Effects**
- Severe pain on application
- Irritation
- Pruritic
- Erythema
- Edematous erythema

**Betadine Protocol**
1. By history, rule out any allergy or sensitivity to iodine
2. Instill a drop of 0.5% proparacaine
3. Instill a drop or two of a topical NSAID
4. Instill four to five drops of 5% Betadine onto the eye
5. Ask the patient to gently close the eyes and roll them around to ensure thorough distribution of the Betadine across the ocular surfaces
6. After 1-2 minutes, lavage out the Betadine
7. Instill another drop or two of the NSAID (or even proparacaine if the patient has any discomfort)

Melton-Thomas EKC Betadine Protocol

- Helpful to Tx EKC
- There are no FDA-approved medicines to kill adenoviruses
- But, an excellent off-label application of an FDA-approved drug is readily and inexpensive:
  - 5% Betadine Sterile Ophthalmic Prep Solution
- Decreases the viral load
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Betadine For EKC study / betadineforekc.com

Video courtesy Atlantic Eye Physicians

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Betadine For EKC study / betadineforekc.com

Video courtesy Atlantic Eye Physicians

Trinovanat A. Achaneeyasakul L.O.
Zirgan (0.15% ganciclovir ophthalmic gel)

- Approved 2009 for treatment of acute HSK or dendritic epitheliopathy
- Has been avail in Europe since 1995
- First FDA approval for this class in 3 decades to help treat one of the 60k (29k pts) new cases of HSK each yr
- 1 drop 5x/d (Q3H) until ulcer heals then TID for 7 d
- no toxicity, very quick resolution, very comfortable

Zirgan

- Selectively inhibits synthesis of viral DNA
- Competitive inhibition of viral DNA polymerase
- direct incorporation into DNA primer strand
- SE’s
  - Blurred Vision (60%)
  - Irritation (20%)
  - SPK (5%)
  - Conj Hyperemia (5%)

- Off label Tx of EKC
  - Safety not established below age of 2

Off Label Treatments- Zirgan

- Research presented at ARVO 2001 by Tabarra et al
  - 18 patients with EKC
  - Compared topical ganciclovir to preservative free tears

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<tr>
<th></th>
<th>Recovery Time</th>
<th>Presence of subepithelial opacities</th>
</tr>
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<tbody>
<tr>
<td>Topical ganciclovir 0.15%</td>
<td>7.7 days</td>
<td>22%</td>
</tr>
<tr>
<td>Preservative free tears</td>
<td>18.5 days</td>
<td>77%</td>
</tr>
</tbody>
</table>

Case Study

- Clinical Exam (4/22/14)
  - Patient much more comfortable
  - Minimal injection
  - No photophobia

Case Study

- Pre-Betadine
  - Post-Betadine
SH, 52 year old WF
Was seen 14 months prior with red, irritated right eye

Chief Complaint
- Pain, redness, swelling in left eye x 2 days
- Photophobia, pain radiates into head

VA 20/20 OD, 20/25 OS
Ta 14 mm Hg OD, OS

Impression
Diffuse Anterior Scleritis OS

Plan
- Prednisolone acetate 1% QID OS
- 800 mg ibuprofen QID
- Request labs (CBC, HLA, ANA, ESR)

Follow-up
- 2 weeks
- Condition improving
- Patient comfortable
- Taper steroids, IOP stable
- RTC 2 weeks
Case Study

- Patient returned in 2 days
  - "Film over left eye", VA 20/60 OS
  - Pain, headache, photophobia
  - Left pupil fixed
  - Corneal haze and edema
  - Circumlimbal flush 360
  - Cell, flare, fibrin in chamber, trace hypopyon
  - Limited view of posterior segment
    - Question of vitritis
    - Impression: Uveoscleritis OS
  - Plan: Associated Retinal Consultants

Scleritis

- Can be difficult to diagnose
  - 40% on enucleated biopsy did not have Dx
- Insidious in onset (5-10 days)
- Occurs between 40-60 y.o.
  - Women more
  - Necrotizing mean age 61
- Moderate to severe pain — reason for presentation
  - Exquisite tenderness to globe upon palpitation
  - Radiates to forehead, jaw, temple, sinuses — 66%
  - Pain may be out of proportion with clinical signs
  - Awakens patients at night
    - Exception is RA patient with scleromalacia perforans with no pain
- Mild tearing
- Mild to moderate photophobia
- Redness which has bluish or violaceous tinge
  - Injection and dilatation of deep episcleral blood vessels

Vascular Anatomy

- Sclera itself is avascular
  - Anteriorly fed from deep episcleral plexus
  - Posteriorly by choroidal circulation of long posterior ciliary arteries
- Sclera is supplied with nerves, particularly in the ant seg near muscles.
  - Damage to these nerves in destructive Scleritis is cause of major pain
  - Nerves are also stimulated by distension of the sclera from edema

Diffuse Anterior Scleritis

- Most common form of scleritis – least severe
- Congestion involves the superficial and deep episcleral blood vessels with tortuosity, distortion, and loss of normal radial vascular pattern.
- Small sectoral area of inflammation to entire anterior seg

Retinal Consult

- Same day
  - Confirmed findings
  - No vitreous cells
  - Continue with prednisolone acetate
  - Start prednisone 60 mg/day
  - RTC x 1 week
- Day 7
  - VA improving, pain resolved
  - Hypopyon clear, 1+ cell
  - Taper prednisone 40 mg/day, PF QID
- Lab results: HLA B27 positive

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Nodular Anterior Scleritis

- Nodule(s) is tender and immobile, typically localized to the interpalpebral zone
- Deep red and violaceous scleral lesion
- Interpalpebral area 3-4mm from limbus
- Sclera may become transparent below nodule
- 13.5% inc IOP

Typically does not become necrotic nor extend beyond site of nodule although reports of progression to necrotizing

Necrotizing with Inflammation

- Most destructive
- Most painful, typically awakens patient
- Increases in intensity each day
- Full thickness scleral necrosis with uveal prolapse covered by a thin layer of conjunctival epithelium with associated inflammation
- Area of inflammation extends outward around globe from original site
- 13.5% inc IOP
- Avascular patches hallmark
- Red-free filter
- After inflammation, sclera becomes transparent
- Visible in daylight

Necrotizing with Inflammation

- After circumference of eye is affected leads to:
  - Uveitis
  - Lens changes
  - Glaucoma
  - CRVO
  - Staphylomas if IOP >40mmHg - rare

If defect small collagen will cover
If defect is large or source of stimulus persists, necrotic tissue may need to be excised and grafted
Never graft until disease under control
Temporary gluing may be used in perforated eyes until disease controlled
54% mortality over 10yr

Scleromalacia Perforans

- Characterized by almost total lack of symptoms
- There is a profound degree of scleral loss with uveal protrusion covered by a thin layer of conjunctival epithelium without associated inflammation.
  - Rare
  - Bilateral 90%
  - Elderly RA women
  - Uveitis up to 100%

Yellow to grayish patches that gradually become necrotic and slough leave uvea bare

Scleritis – Associated Diseases

- Scleritis may be the presenting clinical manifestation of a systemic disease in 40-57% patients
  - >30-45% connective tissue or vasculitic disease
  - S-10% have infectious etiology
  - 2% Atopy, rosacea, gout
  - Anterior Scleritis –
    - Diffuse 50% and nod 50%
    - RA most common
    - GPA (Wegener’s)
    - Polyarteritis nodosa
    - SLE
    - Arthritis with inflammatory bowel dis
    - Ankylosing spondylitis

  - Necrotizing w Inflamm 50%
  - GPA (Wegener’s)
  - RA
  - Polyarteritis nodosa
  - Relapsing polyarthritis

  - Necrotizing w/o Inflamm 100%
  - RA
  - GCA
  - Posterior Scleritis 30%
  - RA
  - SLE
  - Psoriatic arthritis
  - GPA (Wegener’s)
  - PAN
  - Polyarteritis
  - Infectious (lyme, tone, K)

  - Underlying dis may not be Dx 2yr

Scleritis – Laboratory Testing

- The testing of scleritis even with the initial presentation requires a thorough diagnostic evaluation to include:
  - CBC – Non specific: infection, tumor, other
  - Urinalysis – kidney / liver dysfunction, metabolic disease
  - Serum chemistries
    - BUN, Creatine, CO2 – Non specific: vasculitis indu renal dis
    - FTA-ABS and RPR – syphilis screening / determination
  - BF -RA
  - ESR – Non specific systemic inflammation
  - ANA – RA, SLE, Collagen Vascular Disease
  - ANCA – GPA (Wegener’s), polyarteritis nodosa
  - P-ANCA C-ANCA

- Chest radiograph – TB, Sarcoid, Wegener’s
**Scleritis – Laboratory Testing**
- Additional testing to consider in appropriate clinical context
  - HLA typing (B27 etc) – HLA related inflam dis, A.S.
  - ELISA – Lyme serology, HIV
  - Sinus Radiography – GPA (Wegener’s)
  - Sacroiliac Radiography – A.S.
  - PPD – TB
  - C-Reactive Protein – Non specific systemic inflam
  - Uric Acid – gout
  - Circulating immune complexes – RA, SLE, Cogans
  - Cryoglobulins – RA, SLE
  - ACE - Sarcoid
  - B Scan ultrasound – post Scleritis suspected
  - Scleral biopsy – infectious dis, FB and rare causes

**Scleritis Treatment – Non infectious**
- Scleritis almost always requires treatment with systemic medications
  - First line is oral NSAID w or w/o topical steroid
    - 100mg Flurbiprofen TID PO
    - 500mg Diflunisal BID PO
    - 400-600mg Ibuprofen QID PO
    - 50mg Indomethacin TID PO
    - 1400-600mg Oxyphenbutazone QD
    - 375-500mg Naproxen TID PO
  - Response within 2-3 weeks
  - Sequential trials
  - Selective COX-2 inhibitor
  - 92% success in diffuse & nodular

**Case Study**

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Infectious Keratitis

- Most sight threatening of interface disorders
  - Rare but potentially devastating
- Incidence:
  - Solomon et al 2003 – 0.03%
  - Moshirfar et al 2007 – 0.31%
  - Llovet et al 2010 – 0.035% (72 eyes of 204,586 from 2002-2008)
- Variety of organisms have been implicated (bacteria and viruses)
  - Staphylococcus
  - Pseudomonas
  - Atypical mycobacteria
  - Fungi
  - Acanthamoeba
  - HSV
  - Adenovirus

Variety of organisms have been implicated (bacteria and viruses)

- Two dense infiltrates caused by Staphylococcus aureus

Infectious Keratitis

- Most common non-viral cause of IK has evolved over time
  - More recently Methicillin-resistant S. aureus has become more common in early postoperative period
  - Due to potential to develop resistance to fluororquinolones

Infectious Keratitis

- Risk factors for IK
  - Blepharitis
  - Dry eye
  - Intraoperative epithelial defects
  - Excessive manipulation
  - Intraoperative contamination
  - Delayed postoperative re-epithelialization
  - Use of topical corticosteroids
  - Patients in health profession

Infectious Keratitis

- IK divided into two groups
  - Early onset (first 2 weeks)
    - Symptoms usually appear 2.7 days +/- 2.2d
    - Staph and strep species
  - Late onset (2 weeks to 3 months)
    - Symptoms will appear 27.4 days +/- 3.6d
    - Non-tuberculosis mycobacteria and fungi

Note the focal infiltrates interspersed within the somewhat diffuse inflammatory reaction. The causative organism was Mycobacterium J. Randleman; R Shah. LASIK Interface Complications: Etiology, Management, and Outcomes. J Ref Surg. 2012;28:575-86.

Infectious Keratitis

- Staphylococcus aureus typically presents within 3-7 d
- Mycobacterial infections from 3wk-4 months
  - Many occur in clusters
    - Mycobacterium chelonae linked to CL used during surgery to mask portion of laser
    - Mycobacterium szulgai linked to ice used to chill BSS on surgical field
  - Acanthamoeba 70 days

Clinical picture of bilateral Mycobacterium chelonae keratitis 5 weeks after laser keratomileusis
Infectious Keratitis

Management
- All
  - Flap lift
  - Culture and scrape
  - Flap bed irrigated w fortified antibiotics

Early onset
- Topical 4th gen FQ alternating q30min with fortified Cefazolin 50mg/ml
- If health care worker substitute cefazolin with vancomycin 50mg/ml
- Besivance Q1-2 hour

Late onset
- Topical 4th gen FQ alternating q30min with Amikacin (beneficial in tx atypical mycobacteria)
- If non-responsive flap amputation may be necessary to facilitate antibiotic penetration

Infectious Keratitis

Prevention
- Infectious lid disease and dry eye treated preoperatively
- Intraoperative, strict adherence to aseptic techniques
  - Lid scrub with povidone-iodine solution
  - Use of different set of instruments and microkeratome blades in cases of bilateral procedure
  - Ensure sterile water being used to clean instruments
- Most resolve with mild to mod loss of VA, but rarely PK required

Conclusion
- When deciding on the correct treatment
- Differential diagnoses
- Literature based treatment studies
- Evidence based treatment strategies

Thank you

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