Optometric Potpourri

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Disclosures

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

Definition

Potpourri
- A miscellaneous collection, a mixture of things

Urgency vs. Emergency?
Ocular Emergency

- Immediate threats to the visual system that can lead to permanent loss of visual function if left untreated

Levels of Urgency

- Immediate: within one to two hours
- Urgent: within 24 hours
- Semi-urgent: within a week
- Routine: within three to six months

Ocular Emergency?

- Chemical Burn?
- Loss of vision?
- Flashes/Floaters?
- Itching?
- Redness?
- Tearing?
- Discharge?

Chemical Burn

- Level of Urgency
  - URGENT!!
  - True Ocular Emergency

Chemical Injuries of the Cornea

- Acid - low pH
- Alkali - high pH
- Irritant - neutral pH
- Surfactants – detergents – neither acid or alkali
  - Cationic, anionic, nonionic
  - BAK
  - Liquid dishwashing detergent

Modifying factors

- Duration of contact
- Solution pH
- Solution quantity
- Solution penetrability
### Acid Burns
- Intact corneal epithelium affords moderate protection against penetration of dilute or weak acids
  - Little damage seen unless pH < 2.5
  - Acids bind to corneal proteins and act as chemical barrier
  - Severe damage if epithelium removed
- Cause protein coagulation in corneal epithelium
  - Also acts as barrier
  - Ground glass appearance
- Usually non-progressive and superficial
  - Hydrofluoric acid is exception
  - Fluoride ion penetrates stroma
  - Acts as alkali
- Low pH
  - Sulfuric acid
  - Sulfurous acid
  - Hydrochloric acid
  - Nitric acid
  - Acetic acid
  - Chromic acid
  - Hydrofluoric acid
- Rates of penetration
  - Sulfuric Acid - slowest
  - Hydrochloric acid - fastest
  - Sulfurous acid – faster
  - Hydrofluoric acid - fastest

### Alkali Burns
- Substances that have basic (high) pH
- More severe than acid burns
  - As pH rises, emulsification of lipids in cell membranes occur
  - Destroying barriers to penetration facilitating deeper penetration to anterior segment
- Injurious effect on stroma involves:
  - Rapid destruction of corneal mucoproteins
  - Resultant stromal haze
  - Increasing as the pH is raised above 11.5
  - Penetrate more rapidly than acids
  - Detectable levels in anterior chamber in seconds to minutes

### Treatment - Irrigation
- Irrigation
  - Tetracaine
  - Lid speculum
  - Physiological saline
  - Tap water
- Instruct patient to irrigate with any type of water they have access to
  - Eye wash
  - Sink
  - Garden hose
  - Shower

- Must neutralize pH first
  - Goal 7.0 to 7.2
  - Check every 15-30 minutes
  - pH testing OU, even if claims only one eye affected
  - Trapped particles will cause pH change after initial normalization
  - Special attention to fornix

### 3 most common
- Calcium Hydroxide Ca(OH)₂ (Lime)
  - Found in plaster
- Sodium hydroxide NaOH (Lye)
  - Found in drain cleaners
- Ammonium hydroxide NH₃ (ammonia)
  - Found in household cleaners
- Potassium hydroxide KOH (Caustic Potash)
- Magnesium hydroxide Mg(OH)₂
  - Fireworks - Combined chemical and thermal injury

** most common
* most serious - penetrates immediately into anterior segment structures
Grade I
- Involves corneal epithelium only
- Cornea remains clear
  - Epithelium denuded
- Prognosis: Excellent for full recovery of normal corneal appearance and function

Grade II
- Cornea is hazy, but anterior segment structures are visible
- Prognosis: Good
  - Concerns:
    - Persistent epithelial dysfunction
    - Conjunctivalization
    - Haze
    - Neovascularization

Grade III
- Stromal haze limits visualization of iris and lens
- Prognosis: Guarded
  - Surgery needed for visual rehabilitation

Grade IV
- Complete loss of corneal epithelium
- Loss of proximal conjunctival epithelium
- Opaque cornea
  - No view of iris or pupil
  - Ischemic necrosis of proximal conjunctiva and sclera
- Prognosis: Extremely poor
  - High risk for sterile ulceration and corneal melt

Tools of the Trade

Favorite Instrument
What Can We Identify?
- Macular Holes
- Macular Degeneration
- Cystoid Macular Edema
- Diabetic Macular Edema
- Central Serous Retinopathy
- Retinal Nerve Fiber Layer (Glaucoma)
- Anterior Segment?

Optical Coherence Tomography
- Essential tool for non-invasive analysis of retinal tissue for diagnosis and management of retinal disease and glaucoma
- First reported in 1991 by Huang et al
- Provides micron-scale cross sectional images of retina and choroid
- Analogous to B-scan ultrasonography but uses light waves instead of sound waves
  - Near infrared light waves (800nm) prevents the need for contact with the globe
- Resolution far exceeds that which can be achieved with ultrasound, computed tomography, or MRI
- Great for patient education
- Allows for quantification and comparison to norms
- Can monitor progression or resolution of disease

Optical Coherence Tomography
- Time domain 1996-2002
  - Compares a reflected beam of light to a beam of light from a reference center
  - 400 A-scans/ sec & 1 B-scan/1.6 sec
  - Resolution 10um
- Spectral Domain
  - Measures difference in wavelength between light from a fixed reference that returns to tissue
  - 27,000 A-scans/sec and 512 B-scans
  - Resolution 5um
- Spectral Domain provides more detailed images and more data with improved speed and accuracy

Normal
- First interface encountered is between the transparent vitreous and reflective NFL
- Deepest layer identified is RPE and choriocapillairs
- Between the two is neuro-sensory retina

Macular Holes
- Stage 1
  - Consists of a foveal detachment either with or without a full thickness defect
  - Patients report sudden onset metamorphopsia
- Stage 2
  - Associated with a full thickness defect that can be small or large and can appear slightly eccentric

Macular Holes
- Stage 3
  - Demonstrate larger, complete foveal defect greater than 400um in diameter
- Stage 4
  - Full thickness hole with complete PVD
Cystoid Macular Edema

- Causes
  - Medication side effects
  - Trauma/injury
  - Diabetes
  - AMD
  - Cataract surgery

Most common cause of decreased vision after cataract surgery
Usually 4-12 weeks after cataract surgery
Incidence?
Higher risk patients?

81 year old AA female
Medical history: HTN
Ocular history: unremarkable
Uncomplicated cataract surgery
Uncorrected VA @ 3 months: 20/20 OD, OS

Returned two months later
  - BCVA 20/30 OD, 20/60 OS

Case Study
**Case History**
- 57 year old white female c/o decreased vision OD for a few weeks
- Medical Hx: Thyroid disease (Synthroid)
- Ocular Hx: DES/Lid Margin disease (Restasis)
- BCVA: 20/40 OD, 20/20 OS
- Differentials?
- What questions do we need to ask?

**Central Serous Retinopathy**
- Localized detachment of sensory retina from underlying pigment epithelium

**Retinal Nerve Fiber Layer (Glaucoma)**
- collects impulses that start with the rods and cones
- carries neural impulses to the optic disc
- lack of function causes loss of visual acuity or scotoma
- lack of function causes the loss of vision in glaucoma patients
**Anterior Segment Capabilities**
- Can measure corneal thickness
- Can evaluate depth of FB

**OCT**
- Allows us to manage diseases
  - Monitor progression
  - Monitor improvement

**“These Are a Few of My Favorite Things”**

**Disposable Spray Caps**
- Convert standard ophthalmic drop bottle to spray bottle
- 12/pack
- $19.95
- Sigma Pharmaceuticals

**New Therapies in Ocular Surface Disease**

**Case Studies**
Sandra, 75 years old
Medical Hx:
- HTN, Osteoporosis
Ocular History
- Successful cataract surgery 2012 OU
- Longstanding dry eye syndrome
Medications
- Lotrel
- Fosamax
- Restasis
- FreshKote as needed

Keratoconjunctivitis Sicca

Ophthalmic Exam
- Decreased TBUT
- Dense and diffuse SPK
- Patient very photophobic

Options?

Autologous Serum Eye Drops
- Benefits
- Clinical Indications

Sutureless Amniotic Membranes
- Anatomy
- Options
- Case Studies

Options?
**What is the amniotic membrane**

- Innermost layer of the placents
- Thin but tough transparent pair of membranes, which hold a developing embryo (and later fetus) until shortly before birth.

The primary function of the amniotic membrane is to protect the fetus from injury.

1. Anti-inflammatory
2. Anti-scarring
3. Anti-angiogenic

**Mechanisms of Action**

- Promotes Epithelialization
- Suppresses Inflammation
- Inhibits Scarring
- Inhibits Angiogenesis
- Neurotrophic Factors
- Anti-Microbial Agent

All without the harmful side effects found in topical and oral medications

**Indications**

- Acute Chemical/Thermal Burns
- Recurrent Corneal Erosions
- Neurotrophic Defects / Persistent Corneal Epithelial Defects
- Filamentary Keratitis
- Vernal Keratoconjunctivitis
- Recalcitrant Dry Eye
- Microbial Keratitis
- Nodular Degeneration
- PRK

**Recurrent Corneal Erosion**

- Chronic relapsing disease of corneal epithelium
- Characterized by disturbance of epithelial basement membrane
  - Defective adhesions
  - Recurrent breakdown of corneal epithelium
    - Redness, photophobia, tearing
    - Usually at night or upon awakening
    - May be related to REM during sleep
- Matrix metalloproteinase (MMP)
  - Name for group of enzymes that break down the structure of the extracellular matrix (collagenase)
- Elevated levels of MMP-9 and MMP-2 have been observed in tears of patients with RCE

**Recurrent Corneal Erosions**

Courtesy of Ramamurthi et al.
Recalcitrant Dry Eye

**Pathophysiology**
- Elevated Pro-inflammatory cytokines
- Elevated levels of MMP

**AM Mech of Action**
- Promotes Epithelialization
- Suppresses Inflammation
- Inhibits Scarring
- Inhibits Angiogenesis
- Neurotrophic Factors
- Anti-Microbial Agent

**Clinical findings**
- Tear film instability
- Ocular inflammation
- Pro-inflammatory cytokines are upregulated
- Elevated levels of MMP noted

Sutureless amniotic membranes contain anti-inflammatory mediators, growth factors and cytokines
- Help restore a healthy and non-inflamed ocular surface
- Maintain a stable tear film

**Procurement**
- Membranes are procured and processed according to standards established by American Association of Tissue Banks (AATB) and FDA
- All recovered under full informed consent
  - From Caesarean vs. vaginal
  - A thorough medical and social history of donor is obtained. Screened for:
    - HIV-1
    - HIV-2
    - HIV type 1 Nucleic Acid Test
    - HTLV-1
    - HTLV-2
    - Syphilis RPR
    - CMV
    - Hep B Core antibody
    - Hep B surface antigen
    - Hep C Antibody
    - Hep C Virus Nucleic Acid test

An absolute guarantee of tissue safety is not possible. Allograft has the potential to transmit infections disease to the recipient and the patient should be made aware
- Keep track of tissue used and lot numbers
- All data on file in regard to testing for the tissue
- Do Not use:
  - Areas with active or latent infection
  - Disorder that would create unacceptable risk of post op complications
  - Not to be used in eyes with GLC drainage devices or blebs

**Available Sutureless Membranes**

Optix International LLC
9125 Gordon Bernard Circle
Bartlett, TN 38133

Ambio-Disk
7080 19th Street, Suite 212
Miami, FL 33170

ProKera
1-800-396-8844
7000 SW 97th Avenue
Suite 212, Miami, FL 33173

Skye™ OculoMatrix
3629 Manhattan Beach Blvd.
Redondo Beach, CA 90278

3184-B Airway Avenue
Costa Mesa, CA 92626

www.biologics.com
www.prokerainfo.com
www.biotissue.com
www.seedbiotech.net/

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www.biologics.com
www.prokerainfo.com
www.biotissue.com
www.seedbiotech.net/
Cryopreserved Amniotic Membranes

Prokera

Product Specifications

<table>
<thead>
<tr>
<th>Outer Ring Diameter</th>
<th>Inner Ring Diameter</th>
<th>Device Height</th>
<th>Tissue Thickness</th>
<th>Ring Description</th>
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</thead>
<tbody>
<tr>
<td>21.6 mm</td>
<td>17.9 mm</td>
<td>0.7 mm</td>
<td>Single Layer</td>
<td>Ring &amp; Elastomeric Band System (polycarbonate)</td>
</tr>
<tr>
<td>21.6 mm</td>
<td>15.5 mm</td>
<td>1.1 mm</td>
<td>Single Layer</td>
<td>Dual Ring System (polycarbonate)</td>
</tr>
<tr>
<td>21.6 mm</td>
<td>15.5 mm</td>
<td>1.1 mm</td>
<td>Multiple Layers</td>
<td>Dual Ring System (polycarbonate)</td>
</tr>
</tbody>
</table>

Prokera

- Cryopreserved
- Store in refrigerator x 3 months 1° C to 10° C (33.8° F to 50°F)
- Store in freezer
  - 1 year between -49° C to 0° C (-56.2° F to 32° F)
  - 2 years between -85° C to -50° C (-121° F to -58° F)
- Shelf life is 2 years from date of manufacturer
- Allow to thaw to room temperature unopened for 5-10 min
- Open inner pouch and remove using blunt forceps
- Rinse with saline to reduce stinging sensation
- Do not leave in eye longer than 30 days
All stored at room temperature
Shelf life typically 2-5 years
Do not need to be rehydrated
All require the use of BCL
Dehydrated Membranes

- **Ambio Disk**
  - Ambio 2 (35μ)
  - 9 or 15 mm
  - Ambio 5 (100μ)
  - Comes with a Kontur Precision Spherical CL
    - 8.9 bc
    - 16mm*, 18mm or 20mm

- **BioDOptix**
  - Two Disc Sizes
    - 12mm or 15mm
  - BCL of choice
  - Careful with sizing
  - 40-60um thick membrane

- **Dehydrated Membranes**

- **AlphaPatch**
  - 1.5cm x 2cm
  - 2cm x 3cm
  - 2cm x 6cm
  - 4cm x 4cm
  - 4cm x 8cm
  - 12 mm disc
  - Thought to maintain growth and healing factors
  - Not disrupted as may be the case in other dehydrated membranes
  - Used currently in wound care
  - Extending into ophthalmic setting

- **Dehydrated Membranes**

- **Arl**
  - 8 mm disc
  - 10 mm disc
  - 15 mm disc
  - 2 cm x 3 cm ellipse
  - 3 cm x 5 cm ellipse
  - 3 cm x 7 cm ellipse

- **VisiDisc**
  - 10 mm disc
  - VisiDisc Thin (45 microns)
  - VisiDisc Thick (200 microns)

Dehydrated Membranes

Complete the donor and recipient information form and return immediately

Case Study- CM

- 62 year old female with DES x 7 years

Medical history significant for:
  - HTN, hyperlipidemia, anxiety, PTSD, arthritis, osteoporosis, anemia, hypothyroidism, GERD

Ocular history significant for:
  - Ocular surface disease

Medications:
  - Synthroid, Elavil, Prilosec, Seroquil, Zocor, Atenolol, Klonopin, Neurontin

Clinical exam
  - Decreased TBUT OU
  - Lissamine green and NaFl stain

Unable to continue Restasis
Decided on amniotic membrane
Case Study

WR, 50 year old male

Initial visit August 2011

Presented with c/o foreign body/irritation OD

Medical Hx: HTN, hyperlipidemia

Ocular Hx: Unremarkable

Clinical Exam (September 2012)

- BCVA 20/20 OD, OS
- Slit lamp exam
  - Blepharitis/Meibomitis
- DFE
  - Unremarkable

Clinical Exam (July 2013)

- Presents with c/o symptoms of RCE OD
  - Cornea clear OD/OS
  - Treatment: Start Muro 128 ointment QHS OD

Case Study- CM

- Clinical exam
  - Removed ring at 1 week
  - Improved corneal appearance
  - Patient reported improved comfort

- Continue artificial tears
- Long term options reviewed

Recurrent Corneal Erosion

WR, 50 year old male

Initial visit August 2011

Presented with c/o foreign body/irritation OD

Medical Hx: HTN, hyperlipidemia

Ocular Hx: Unremarkable

Clinical Exam (August 2013)

- Patient more symptomatic
- Change treatment course
Case Study

Clinical Exam (August 2013)
- Patient more symptomatic
- Change treatment course
  - Debrided cornea OD
  - BCL x 2 months
  - Add Azasite BID
- Less symptomatic until January 2014

Clinical Exam (March 2014)
- New Plan

Clinical Exam (April 2014)
- Doxycycline 20 mg BID x 2 months
- Lotemax gel TID OD x 1 month

Debrided cornea
ProKera Slim AM inserted
**Autologous Serum**

- Use first described in 1984 by Fox et al (for keratoconjunctivitis sicca)


- DEWS / ITF - Severity Level 3 Treatment

- Unpreserved, non-antigenic

- Utilizes patient's own blood serum

- Blood is drawn and serum is spun down and mixed with artificial tears / 0.9% sodium chloride

- Doesn't contain red blood cells and clot factors

**Concerns:**

- Costly - $150-300 time, 2-4x/year
  - Typically not covered by insurance

- Inconvenient - Requires blood donation from patient

- Need to store frozen for up to three months at −20°C

- Keep away from light to avoid degradation of Vitamin A

- Possible risk of infection

- Cornea and systemic

**Potential complications**

- Immunoglobulin deposits

- Corneal infiltrates

- Conjunctivitis

- Decreased corneal sensitivity

**Compounding Pharmacy**

Physician’s Compounding Pharmacy
1900 S. Telegraph Road, Suite 102
Bloomfield Hills, MI 48302
Phone: 248-758-9100
Fax: 248-758-1831

**Newer Technologies**
Anterior Segment Therapies

Product Design
- Disease-specific, tailored drug release and plug persistence

Procedure
- Easy to insert, familiar procedure to physicians
- Non-invasive
- Absorbable – no need for removal
- Allows for visualization by the patient and the physician

Sustained Release Dexamethasone

Value Proposition - Strong steroid, soft delivery
- 1x administration replaces 4x/day dosing over 4-week period
- Plug tailors release with tapered administration for 30 days
- 7% of the drop equivalent dose; no IOP spikes observed in Phase 2

Plug characteristics
- Easy to insert
- Comfortable for the patient
- Absorbable – no need for removal

Status
- Phase 3 trials complete for post-op inflammation and pain
- Topline results reported for Phase 2 trial for allergic conjunctivitis

Sustained Release Dexamethasone Plug Insertion and Visualization

New Technologies and Ideas are Great

Most of the time…..

Thank you

Please feel free to contact us:

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