

ADVANCED OPTOMETRIC PROCEDURES

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Disclosures

Course Outline

- Allergy testing
- Corneal collagen crosslinking
- Intense pulsed light therapy
- Epithelial debridement for RCE

Allergy testing

- Allergic conjunctivitis
- Diagnostic options
- Impact on treatment
- A comprehensive approach

Allergic conjunctivitis

- Affects up to 40% of Americans
 - Huge economic impact
- Significant burden on sufferers
 - World Allergy Organization: "Allergic conjunctivitis carries same clinical gravity as allergic asthma and allergic rhinitis."
- Underdiagnosed and undertreated
 - "Big Three" of OSD

[Curr Opin Allergy Clin Immunol](#), 2011 Oct;11(5):471-6. doi: 10.1097/ACI.0b013e32834a9676.

Epidemiology of allergic conjunctivitis.

[Rosario N¹](#), [Bielory L.](#)

- "Allergic conjunctivitis is often underdiagnosed and consequently undertreated except when it is severe and the chief complaint of a consultation in a specialty clinic"

The allergy epidemic

- Prevalence of allergy is rising worldwide
 - Nasal, ocular, food, skin
- Several theories, including hygiene hypothesis
 - Decreasing incidence of childhood infections → increase of autoimmune and allergic disease
- “Atopic March”
 - Early intervention

The allergic cascade

- Allergen processed by dendritic cells
- Antigen presented to T-h2 cells
- B-cells activated to plasma cells
- Produce IgE to the allergen
- IgE binds to mast cells
- Re-exposure: mast cells release inflammatory mediators

Allergic conjunctivitis

- Conjunctiva has high concentration of mast cells
- Antigens dissolve directly into tear film
- Dry eye = decreased tear film turnover = increased antigen concentration
- Oral antihistamines dry the eye which may worsen ocular symptoms

Oral vs topical meds

- Conjunctivitis, rhinitis, sinusitis
- Nasal sprays
- Decongestants

Diagnosis

- Patient history
- Physical exam
- Additional testing

Patient history



959 Severity and Frequency Of Allergic Conjunctivitis Symptoms
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Physical exam

- Symptoms may overlap bacterial or viral conjunctivitis
- Commonly misdiagnosed by urgent care

Diagnostic testing

- TearScan IgE
 - Measures ocular IgE levels
 - IgE increases with severity of allergic response

Allergy skin testing

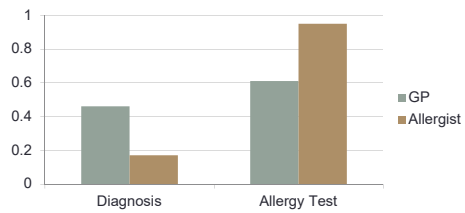
- Historically done in allergists' offices
- More recently in family practice and pediatricians

Diagnostic testing

Ann Allergy Asthma Immunol. 2014 Apr;112(4):322-8.e1. doi: 10.1016/j.anaai.2014.02.006.

Diagnosis and treatment of nasal and ocular allergies: the Allergies, Immunotherapy, and Rhinoconjunctivitis (AIRS) surveys.

Blaiss MS¹, Dykewicz MS², Skoner DP³, Smith LJ⁴, Leatherman R⁵, Craig TJ⁶, Bickory L⁷, Walstein N⁸, Allen-Ramey F⁹.



Allergy skin testing

- Intradermal vs percutaneous
- Determine the presence of allergic response
- Identify specific allergens

Allergy skin testing

- Doctors Allergy Formula, AllerFocus, Allergy Matrix
 - Performed by doctor or technician
 - 58-78 region-specific indoor and outdoor antigens
 - Positive and negative controls
 - Diagnostic test (not lab test, therefore no CLIA waiver)

Allergy skin testing

- Testing takes 10 to 20 minutes
 - Perform same day as exam vs return visit?
 - Consider patient's out of pocket responsibility
 - CPT 95004
 - ~\$5.40 per unit
 - Must stop antihistamines for five days before test

Allergy skin testing

- Positive test: wheal and flare
 - Wheal: Raised, red, itchy bump
 - Flare: Surrounding hyperemia
 - Larger wheal and flare = greater sensitivity
- Must correlate interpretation with history & physical exam
 - Is the antigen in season? Are they currently symptomatic?

Allergy skin testing

- Rare risk of anaphylaxis
 - Doctor must be onsite
 - Epinephrine, Benadryl, and crash cart must be available
- Reports of auditor scrutiny regarding skin tests

Treatment options

- Lifestyle modifications
- Pharmaceuticals
- Immunotherapy

Lifestyle Modifications

- Avoid certain pets
- Remove mold
- Change bedding/pillowcase
- Replace carpet with flooring
- Re-seed lawn and/or avoid mowing
- Move?

Allergy Capitals

Spring 2018

The top five most challenging places to live with spring allergies this year are:

1. McAllen, Texas
2. Louisville, Kentucky
3. Jackson, Mississippi
4. Memphis, Tennessee
5. San Antonio, Texas

Medical therapy

- Typically good compliance (symptoms drive compliance)
 - Targeted skin testing improves compliance
- Can use test results to support medication PA
- Choose time of the year to start/stop therapy

Immunotherapy

- SCIT vs SLIT
- Subcutaneous vs sublingual immunotherapy
 - FDA approval 2014
 - Allergen extract placed under tongue
 - Tablet vs liquid extract
 - Increased resistance over time

Immunotherapy

- SLIT vs traditional therapy for allergic rhinitis
 - Slightly less effective vs steroid nasal spray
 - Superior to antihistamines

Immunotherapy

- SLIT risks
 - Anaphylaxis is rare but possible
 - Beware oral inflammation (thrush, mouth ulcer, recent dental surgery)
 - Patients should have self-injectible epinephrine
 - Avoid with severe asthma or history of eosinophilic esophagitis
 - Give first dose in-office

A Team-Based Approach

- Allergist referrals
 - Airway symptoms
 - Strong positive skin test
 - More than airborne allergens
 - Food, clothing
- Testing those not under an allergist's care
- Competition vs synergistic approach

Corneal Collagen Crosslinking (CXL)

Keratoconus (KCN): A Brief Overview

- Progressive noninflammatory ectasia
- Classic onset in teens, stable by ~40
- Decreasing utilization of penetrating keratoplasty
 - ~15% of KCN patients
- Higher prevalence than once thought
 - 1 in 2000 vs 1 in 400

History of CXL

- Introduced in 2003 in Dresden, Germany
- FDA approval in 2016
 - Avedro's KXL
 - Photrexa
 - Photrexa Viscous

CXL Mechanism of Action

- Collagen fibrils can form strong chemical bonds with adjacent fibrils
 - Happens naturally with aging
 - This may be why KCN stabilizes after middle age
 - Oxidation triggers cross linkage through the release of oxygen free radicals
- Riboflavin is a photosensitizer
- UV light induces oxidation

Riboflavin

- AKA Vitamin B2
- Photosensitizer
- Transfers UV energy to stromal oxygen molecules, creating free radicals
- Also creates a shield to protect the endothelium, lens, and retina

Crosslinking indications

- Age 14 and up
 - Younger is off label
 - Over 40?
- Progressive keratoconus or postsurgical ectasia
- Minimum corneal thickness 400 μm
- Female patients who may become pregnant

Crosslinking protocol

- Epi-on vs Epi-off?
- Only epi-off is FDA approved as of now
- The epithelium is a barrier to the procedure
 - Tight junctions resist absorption of riboflavin
 - Antioxidant enzymes can interfere with mechanism of action

Crosslinking protocol

- Epi-off AKA Transepithelial Crosslinking
 - Considered investigative
 - Published results are mixed
- Why is this being pursued?
 - Easier technique
 - Less patient discomfort
 - Faster recovery
 - Decreased risks
 - Scarring, haze, infectious keratitis

Crosslinking protocol

- Topical anesthesia
- Debride 9mm of epithelium
- Instill riboflavin every 2 minutes for 30 minutes
- Ensure riboflavin saturation in corneal stroma (and present in anterior chamber)
- Verify minimum 400um corneal thickness
- Initiate 30 minute UVA exposure
 - Continue riboflavin q2minutes
- Place bandage CL
- Rx antibiotic and steroid

Crosslinking protocol

- What about epi-on?
 - Disrupt epithelial tight junctions
 - BAK vs EDTA
 - Allows penetration of riboflavin into stroma

Postoperative management

- Immediate follow-up is similar to PRK
- VA may fluctuate for 1-3 months
- Postoperative contact lenses
 - Epithelial thickness returns to normal after 3-6 months
 - For earlier CL wear (~1 month), minimize the interaction between lens and epithelium
 - Scleral, soft, piggyback, hybrid

Financial considerations

- Price of riboflavin formulas
 - Before July 2017: \$595
 - After July 2017: \$2,850

What's next with crosslinking?

- Epi-on studies
 - Improving riboflavin penetration
 - Iontophoresis
- Combined procedures
 - CXL + LASIK in cases of ectasia
 - "Athens Protocol"
 - Adding CXL to routine LASIK
- Using UV light to treat infectious keratitis
- Crosslink the sclera for progressive myopia

The role of optometry

- Epithelial debridement
- Drop instillation
- No laser utilization
- Proper diagnostic equipment

Intense Pulsed Light (IPL) Therapy

Intense Pulsed Light (IPL) Therapy

- Historically used in dermatology as a cosmetic therapy for rosacea and acne
- Targeted telangiectatic vessels associated with facial rosacea
 - Superficial, leaky blood vessels
 - Leak inflammatory mediators
- Patients happened to notice improvement in dry eye symptoms

IPL: What is it?

- Flashes of broad-wavelength light (400-1200nm) are applied by a Xenon lamp to the skin
 - Not a laser treatment
 - Filter limits wavelength to ~500nm
- Heat energy is absorbed by oxyhemoglobin in telangiectatic blood vessels
- Blood vessels are photocoagulated and destroyed
- Targets dermis without affecting epidermis

Effects of IPL on OSD

- Heat melts meibum
- Heat reduces bacterial and parasitic load on lid margin

Patient selection

- MGD
 - Severe/atrophied glands may not respond
- Lid margin telangiectasia

IPL Technique

- Apply cooling gel
- Patch eyes for protection
- Use handpiece to apply treatment to the cheek approaching the lower lid
 - Avoid touching lid margin
- Perform meibomian gland expression
- Prescribe steroid for a few days
- Repeat treatment ~monthly
 - Number of treatments varies (average 4-5)

IPL Outcomes

Invest Ophthalmol Vis Sci. 2015 Feb 12;56(3):1965-70. doi: 10.1167/inv.14-15764.

Prospective trial of intense pulsed light for the treatment of meibomian gland dysfunction.
Craig JP¹, Chen YH¹, Turnbull PR¹.

- Prospective, double-masked, placebo-controlled, paired-eye study
- N=28
- Improved TBUT and symptom scores

IPL risks

- Thinning of skin
 - Caution with excessive treatments
- Photosensitive to sunburn (temporary)
- Ocular damage if not shielded
- Skin blisters, hyperemia, hair loss

Epithelial Debridement for RCE

Recurrent Corneal Erosion (RCE)

- Inadequate epithelial basement membrane adhesions lead to repeat episodes of epithelial defects
- Associated with epithelial basement membrane dystrophy or previous trauma
- Microform versus macroform erosions

RCE treatment

- Relieve pain
 - NSAID, oral analgesics, bandage CL
- Facilitate rapid healing
 - Frequent non-preserved artificial tears
- Prophylactic topical antibiotics

Taking the R out of RCE

- 60% will have persistent symptoms following medical treatment alone
- Treating underlying lid disease decreases frequency of recurrences
- MMP-9 inhibitors (steroids, doxycycline) speed resolution and help to prevent recurrences
- Topical ointments at bedtime
- Bandage contact lenses

Epithelial debridement

- Mechanical removal of loosely adhered epithelium
- Establishes a smooth basement membrane for re-adherence of healthy epithelium
- Typically performed at the slit lamp under topical anesthesia

Debridement technique

- Topical anesthetic in both eyes
- +/- Prophylactic antibiotic
- +/- Lid speculum
- Methylcellulose spear shaped surgical sponge (Weck-cel) vs spatula vs spud

Debridement technique

- Remove loose epithelial debris to the point of tight adherence
- Avoid getting too close to the limbus (stem cells)

Debridement technique

- +/- Diamond burr polish of Bowman's layer
- Removes more abnormal basement membrane
- Aggressive polish may induce postoperative corneal haze

Debridement technique

- +/- Anterior stromal puncture
 - Multiple shallow penetrations are made through the epithelium into the anterior stroma
 - Forms scarring attachments and improves epithelial adhesion
 - Special instruments may be used to prevent corneal perforation
 - May be performed through loose epithelial without debriding
 - Treatment of the visual axis is controversial

Debridement technique

- Cyclopentolate
- Bandage lens
- Prophylactic topical antibiotics
- Topical NSAID

Debridement technique

- +/- Amniotic membrane transplantation
 - Anti-inflammatory and anti-scarring effects
 - Contain tissue inhibitors of MMP-9

Risks and complications

- Corneal scarring or haze
- Infection

Expected outcomes

- Re-epithelialization by three or four days
- Mild corneal haze for 3 to 4 weeks
- Absence of peer reviewed literature with outcomes data
- Diamond burr polishing may improve outcomes over simple debridement
- Simple debridement can successfully convert most patients with macroform erosions to microform