“FOLLOW THE FLASHING LIGHTS”

USING INTENSE PULSE LIGHT TREATMENT TO GET THE OCULAR SURFACE BACK ON TRACK

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Pacific University College of Optometry
Meet Dr. Doll and Disclosures

- Dr. Doll coordinates Pacific dry eye solutions, Pacific University College of optometry's Ocular surface Dryness Center of excellence
- Dr. Doll has been a consultant AND/or speaker for the following companies:
  - Allergan
  - Alcon
  - BioTissue
  - Novarits
  - Johnson and Johnson
  - Sun

Dr. Doll only supports diagnostics and therapeutics that work! There is no bias in this presentation.

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The DEWS I report (2007) set the stage for the re-invention in the way we think of “dry eye.”

DEWS I taught us: “Dry eye is a multifactorial 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.”
The latest updated definition of dry eye as of July 2017:

“Dry eye is a multifactorial disease of the ocular surface characterized by a loss of homeostasis of the tear film, and accompanied by ocular symptoms, in which tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities play etiological roles.”
What does this Mean?

Even when you take care of the underlying cause, the patient may still require help, because:

1. Homeostasis is altered - the GPS is broken
2. Inflammation is at play - the radiator is broken
3. Neurosensory abnormalities persist - all the “idiot lights” are on
The Vicious Round-About

- Once the patient enters, they have a hard time escaping
- Luckily there are escape routes, you just have to know where they are
<table>
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<th><strong>2007- Long Drive</strong></th>
<th><strong>2020- Short Cuts</strong></th>
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<td><strong>Treatments</strong></td>
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<tr>
<td>• Restasis (cyclosporine 0.05%), topical steroids</td>
<td>• Xiidra (lifitegrast 5%), Cequa (cyclosporine 0.09), Restasis (cyclosporine 0.05%), Klarity-C (cyclosporine 0.1%)</td>
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<td>• Hand meibomian gland expression</td>
<td>• LipiFlow, iLux, TearCare, Meiboflow, RadioFrequency, intraductal probing</td>
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<td>• Artificial tears</td>
<td>• Autologous serum, Amniotic Membranes/drops</td>
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<td>• Vitamin A</td>
<td>• Omega-3 Fatty Acids + GLA</td>
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<td>• Hot compresses</td>
<td>• Intense Pulse Light (IPL)</td>
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<td>• Baby Shampoo lid scrubs</td>
<td>• BlephaEx, tea-tree oil/ hypochlorous acid lid scrubs, eyelid debridement</td>
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<td>• Oral Doxycycline</td>
<td>• Doxycycline, Azasite</td>
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<td>• True Tear Neuro-stimulation</td>
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Modern Ocular Surface Treatment Routes

- **Topical Pharmaceuticals:** Xiidra (lifitegrast 5%) Cyclosporines (Restasis 0.05%, Cequa 0.09%, Klarity-C 0.1%), topical steroids
- **Oral Pharmaceuticals:** Docycycline, Azithromycin, Azasite
- **Biological Materials:** Autologous serum, Amniotic Membranes/drops
- **Nutraceuticals:** Omega-3 Fatty Acids +GLA, Vitamin A
- **MGD Mechanical:** LipiFlow, Meiboflow, Radio Frequency, hand expression, intra-ductal probing, hand meibomian expression, eyelid debridement
- **Blepharitis Treatments:** tea-tree oil/ hypochlorous acid lid scrubs, BlephEx/Lid Pro
- **Neuro-stimulation:** True Tear
- **Intense Pulse Light (IPL)**
Intense Pulse Light (IPL) Background

- Light energy delivered to skin tissue in the visible spectrum (580 nm) to near infrared (1200 nm)
  - *We use mostly wavelengths in the 500s and 600s*

- **NOT considered a LASER**
Where have We Travelled Safely Before?

- Historically used to treat skin conditions by dermatology, including rosacea, port wine stain and seborrheic keratosis
- Can also be used for hair removal
- A happy side-effect of decrease dry eye symptoms in those with concurrent MGD/rosacea was noted (thank you Dr. Toyos!)
Rosacea Connection

• Eyelid changes are found in up to 90% of patients with rosacea, including meibomian gland dysfunction
• 50% have blepharitis

• Higher frequency of lid margin telangiectasia, rounding of the posterior lid margin, notching of the lid margin, orifices retroplacement, eyelash loss, trichiasis, and anterior blepharitis compared to control participants
Proposed Mechanism of Action #1

■ Energy from IPL is absorbed by chromophores in abnormal telangectatic vasculature along eyelid margin, which raise the blood vessel temperature high enough to cause its coagulation, leading to its destruction and replacement by fibrous granulation tissue.

■ IPL closes abnormal vasculature, and decreases the ability of inflammatory mediator delivery.

■ Cuts off the roadways to the “Inflammatory Delivery Trucks” going to the lid margins
Roadways to Inflammatory Cells = Telangiectasia
Proposed Mechanism of Action #2

- IPL decreases Demodex (and associated bacterial) load along the lid margin
- The pigmented exoskeleton of Demodex contains chromophore that absorbs IPL energy.
- Histologic analysis has demonstrated that IPL treatment induces coagulation and necrosis of Demodex mites!!
- No more “Inflammatory hitchhikers”
Proposed Mechanism of Action #3

- IPL decreased overactive epithelial skin-cell turn-over
- This turn-over is common in rosacea and other skin condition
- Decrease build-up of the excessive debris over meibomian gland orifices
- Decreased “Inflammatory Littering”
Proposed Mechanism of Action #4

- IPL decreases inflammation via direct action on inflammatory mediators.
- Increase in the levels of anti-inflammatory: IL-10, TGF-β.
- Decreases pro-inflammatory: IL-6, TNF-α.
- Shows reduced MMPs as a result - tissue is not being remolded/ broken down.
- Reduced unnecessary “Construction/ deconstruction zones.”
Proposed Mechanism of Action #5

- Heat from IPL softens meibum secretions temporarily.
- We know that meibum completely liquefies with surface heat applied at >114°F for 4 minutes.
- This heat is not likely from the skin temperature alone, as studies demonstrate that the equipment itself does not reach higher than 45°C/113°F and skin temperatures do not increase >1°C.
- The result is likely from a combination of skin and internal small blood vessel increase in temperature (45°C–70°C/113-158°F), which could warm the lid.
- Recall that heat and pressure are needed to fully express glands, so IPL is recommended in conjunction with gland expression.

CAUTION
Pressure relief device located in this area.
IPL Evidence-Based Support Improvements
(Thank You to Dr. Laura Periman!)

- **Osmolarity**: Dell (2017), Toyos/Briscoe (2016)
- **Meibography**: Rong 2017, Jiang (2016)
- **Inflammatory markers** (IL-6, IL-17A, PGE2): Liu (2017)
- **LLT**: Craig (2015)
- **Lid Margin**: Jiang (2016), Toyos (2015)
IPL OSD Treatment Candidates

- Ocular or facial rosacea
- Telangiectasia of lid margin
- Hx of *Demodex* blepharitis
Fitzpatrick Skin Typing

- All patients will need to fill-out a questionnaire at every visit to determine type of skin, This will determine IPL setting.

- Questionnaire includes questions about:
  - Genetic disposition
  - Sun exposure
  - Tanning habits

- Darker skinned individuals (> Fitzpatrick V) are NOT candidates, due to risk of skin depigmentation.
Fitzpatrick Scale

Pigmentary phenotype (Fitzpatrick scale)

Epidermal Melanin

UV phenotype
UV sensitive, Burn rather than tan
UV resistant, Tan; never burn

Cancer risk
### Fitzpatrick Skin Type Descriptions

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<th>Type</th>
<th>Descriptions</th>
<th>Example</th>
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<tr>
<td>Type I</td>
<td>Highly sensitive, always burns, never tans</td>
<td>Red hair with freckles</td>
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<tr>
<td>Type II</td>
<td>Very sun sensitive, burns easily, tans minimally</td>
<td>Fair skinned, fair haired Caucasians</td>
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<tr>
<td>Type III</td>
<td>Sun sensitive skin, sometimes burns, slowly tans to light brown</td>
<td>Darker Caucasians</td>
</tr>
<tr>
<td>Type IV</td>
<td>Minimally sun sensitive, burns minimally, always tans to moderate brown</td>
<td>Mediterranean type Caucasians, some Hispanics/Asians</td>
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<tr>
<td>Type V</td>
<td>Sun insensitive skin, rarely burns, tans well</td>
<td>Some Hispanics/Asians some Blacks</td>
</tr>
<tr>
<td>Type VI</td>
<td>Sun insensitive, never burns, deeply pigmented</td>
<td>Darker Blacks</td>
</tr>
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</table>
Contraindications

- Fitzpatrick Skin Type $\geq V$, due to risk of discoloration/depigmentation
- Patients with recent intense sun exposure
- Recent tanning (real, booth, spray, bottle)
- Active Herpes Infection
- Never over the top of:
  - *Sun burn/ skin burn*
  - *Active open wound*
  - *Wanted facial hair*
  - *Tattoos (including “permanent make-up”)*
Preparation

- Pull hair back (band or cap)
- Remove all make-up
- Place corneal protection (either IPL sticker shields or laser-grade metallic shields),
- Cover treated area with clear ultrasound gel
- Doctor wears filters
- Patient given a “stress ball” to help with sensation, along with “verbal anesthesia”
Preparation Video
Toyos Settings

- 20-30 pulses total
- Sized 8 mm x 15 mm at 590nm (14-16 J/cm²)
  - Applied on a band of skin that extends from tragus to tragus (coronal axis) and on the cheeks from the maxillary process of the zygomatic bone up to the inferior orbital rim below the lower eyelids (longitudinal axis).
  - “W- Pattern” under the eyes.
IPL Settings
The Periman Protocol

1. Skin treatments for rosacea:
   560/590/640nm filter, single pulse
   - Intensity and number of pulses determined by Fitzpatrick Skin Type

2. Toyos Settings:
   590nm filter, triple pulse
   - 20-30 pulses in a “W- Pattern” under the eyes.
Periman Protocol Continued:

3. **Periman Eyelids**: 590nm filter, triple pulse
   \[12 \text{ j/cm}^2(6\text{ms on, 40ms off})\]
   
   - Always with laser grade metallic shields, smaller light guide
   
   - 6 pulses per eyelid, for a total of 24 pulses

(4. **Aesthetic Clean-Up**: Small Light Guide, Single pulse, uses aesthetic setting for small angiomas and nasal angle telangiectasias, could include use of 640nm filter)
Periman Lids
How many times?

- 3-5 consecutive treatments
- Spaced approximately 2-4 weeks apart

- Like all dry eye therapy will likely require re-treatment anywhere from 6 months to 2 years

- Recommend trying BEFORE gland expression, as gland secretions improve with IPL over treatment length, with the exception of “candle wax” secretions
Back to Work Clean and Calm

- Can use OTC Lumify 1gtt OU, BUT it does have BAK
- Alternative is to mix 1gtt Alphagan P with 1 vial of NPAT
- Mix 1gtt of either into sunscreen and apply to the treated face
Protect the Results

- SPF worn daily with no sun trips for a week
- Avoid behaviors that could dilate blood vessels for 48hrs
  - *Intense Exercise*
  - *Hot tubs/ saunas*
  - *Spicy food*
  - *Excess caffeine and alcohol*
- Avoid harsh skin products that contain retinol, glycolic acid, or harsh abrasives for 48 hrs
Potential Bumps in the Road

Most common side effects are
- Light pinkening of the skin, similar in appearance to a mild sun-burn (recall no UV rays!)
- Mild swelling or edema
- Temporary darkening of dark spots/freckles

More severe side effects could include:
- Permanent discoloration
- Burns
Rare Complication

- A rare complication secondary to *Demodex* infestation can occur
- A hypersensitivity reaction to excessive deceased *Demodex* mites
- This reaction is transient and can be well controlled with topical steroids.
Skin Treatments

- IPL can also be used to lighten darker areas of skin pigmentation
- Documented to increase fibroblast production of skin collagen
- Estheticians in the state of Oregon can get certifications (non-doctors), so with proper training.
- Check with own state to determine whether you can perform non-ocular procedures.
- Requires a different filters
- Keep in mind these results, like any skin treatment are temporary and usually require re-treatments
IPL Units

- M22™ Optima™ by Lumenis
- EYE-LIGHT® by Topcon- no gel option
- E-Eye (only in Australia/Europe right now)
Patient Cases

- Been Everywhere: the patient who has tried everything
- New Driver: the new dry eye diagnosis
- Back on the Road: surgical co-management patient.
Been Everywhere

- 62 yowf female
- History of probable autoimmune
- CC was recent flare of autoimmune worsening ocular surface dryness
- Was best managed for inflammatory dry eye and MGD with
  - Lifitegrast 5% BID
  - LipiFlow every 6 to 12 months
  - Home therapy with TTO based lids scrubs, OM-3/GLA
Been Everywhere IPL

- Referred to first doctor in Portland to have IPL
- 4 rounds of Toyos Settings, one optional photo-facial
- Resulted in cessation of ocular dryness symptoms. Less redness and irritation of lid margins. Lowering of MMP-9 InflammaDry findings
- Currently undergoing annual repeat with Periman Protocol to keep inflammation under control
New Driver

- 63 year old white female, retired
- Chief concern of fluctuating vision and burning/dryness
- Medical History of Rosacea and Fibromyalgia
  - On Gabapentin
- Only using NPAT 6x daily
  - Tried LipiFlow x 5 years ago and liked it, but reports it wore off about 2-3 years ago and was “too busy “to come in for re-treat
  - Does not want to use eyedrops that sting or cost too much
New Driver with Rosacea
New Driver Treatment

- IPL treatment x 3
  - 1 Toyos
  - 2 Periman
  - 1 LipiFlow Treatment
Skin Changes to Watch

- Telangiectasia gets more patchy
- Less redness

- Freckles can become more pronounced
New Driver Outcomes

- Each IPL treatment resulted in a one hour increase between having to take artificial tears went from 1gtt every 2-3 hours to 1gtt every 5-6 hours
- LipiFlow treatment lead to over 10 clear secreting glands- no turbid glands
- Patient reports improvement in facial appearance with less redness and compliments from water-aerobics group (where she can’t wear make-up) and even updated Facebook Profile picture with no filter!
New Driver Staying on Track

- Patient is now on Zocular lids scrubs nightly, Refresh Relieva/Thera Tears NPAT every 5-6 hours
- Recommended anti-inflammatory control with cyclosporine or lifitegrast, but currently “thinking about it,” but would be happy to repeat series again
70 yo white female, originally presented as a referral for blepharitis and cracked upper eyelid

Due to severe dermatochalasis

Had been treated with in-office 50% TTO, followed by home TTO lid scrubs

Also diagnosed with MGD
Back on the Road
Prep for Surgery- 6 months later

- After a 2 month trip to Europe and a blepharoplasty surgical consult
- New goal was to insure patient had the best surgical experience, by decreasing inflammation in the eyelids
- 3 rounds of Toyos IPL Settings, spaced 1 month apart
- Resulted in all glands secreting clear

- Bilateral upper blepharoplasty 1.25 months after last IPL round
Back on the Road Post- Surgery

- Reported excellent healing and satisfaction with surgical results, minimal scarring, and increased visual field
- SPEED Q was still below 10
- Had stopped TTO lids scrubs (unsure if she could use with healing scars), with mild cylindrical dandruff returning
- Prescribed patient restart TTO lids scrubs at night, along with a lid seal sleep mask and gel drop
Back on the Road: Staying On-Track

- Recall will be 6 months after blepharoplasty
- Repeat IPL treatments annually
- Continue TTO based lid scrubs every other night
- Lifitegrast BID (patient is also looking into cyclosporine 0.09% for cost comparison)
Cruising

- IPL is an anti-inflammatory treatment that improves the health of the entire ocular surface
- Helpful for patients with telangiectasia of lid margins, peri-ocular and facial skin
- IPL can be implemented as a first line therapy or added to an advanced ocular disease patient’s regimen
- Consider IPL for pre-surgical patients, particularly lid surgeries