Intense Pulsed Light Therapy in the Optometric Setting

Samantha Myers, OD, FAAO

Kentucky College of Optometry

UNIVERSITY OF PIKEVILLE
KENTUCKY COLLEGE OF OPTOMETRY

Disclosures

- I have no financial disclosures

Course Objectives

- Upon completion of this course, attendants should be able to:
  - Discuss the properties of intense pulsed light (IPL)
  - List the indications for IPL in the optometric setting
  - Discuss the ocular mechanism of IPL
  - Develop a systematic dry eye workup
  - Identify appropriate IPL candidates based on exam findings, Fitzpatrick skin type, contraindications
  - Discuss the steps of an IPL procedure
    - Set up, Toyos DED protocol/settings, clean up, and after-care
  - Review proper IPL scheduling (how many procedures, how often, repeat procedures)

What is Intense Pulsed Light (IPL)?

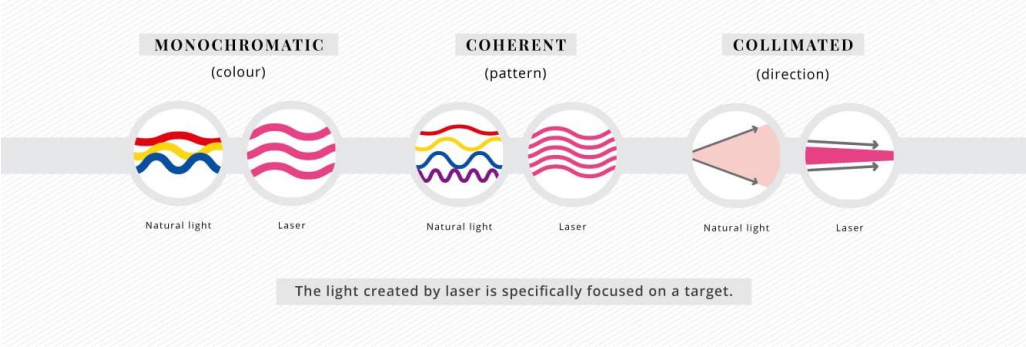
When absorbed in sufficient amounts, light energy can induce changes in the skin

Lasers and intense pulsed light (IPL) devices allow for the delivery of light to the skin in a controlled manner

These devices are useful for achieving desired clinical effects in a variety of dermatologic conditions

What is Intense Pulsed Light (IPL)?

- Not a laser!
- IPL produces high intensity light via bursts of electrical current passing through a xenon gas chamber
  - Light produced is **noncoherent, noncollimated, polychromatic light**

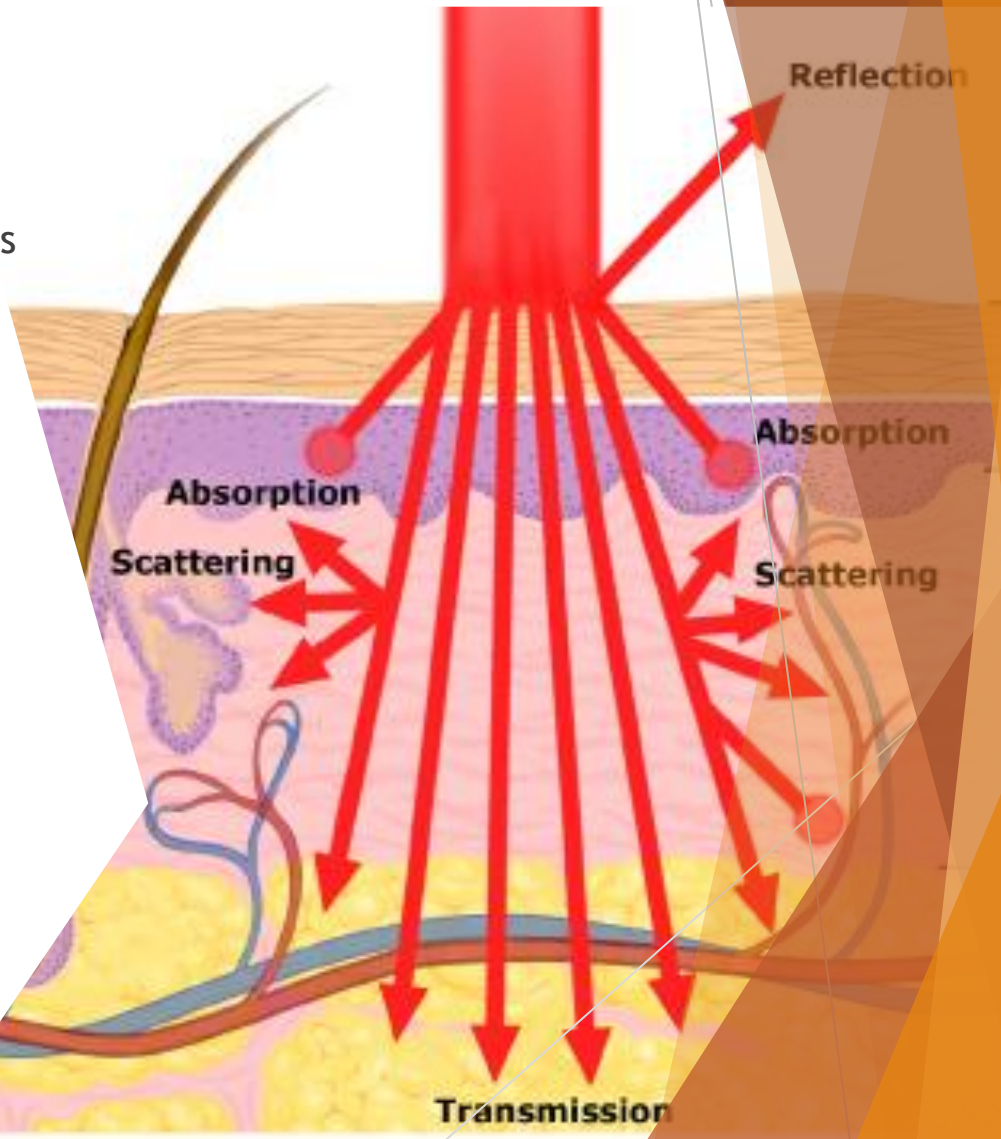


What is Intense Pulsed Light (IPL)?

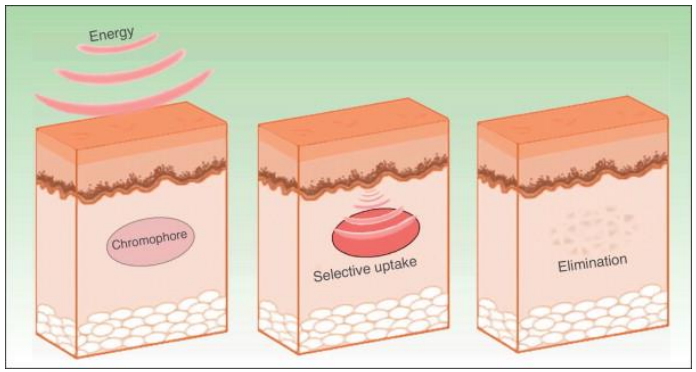
- This light is reflected toward the distal end of the device onto the surface of the skin through a sapphire or quartz crystal
  - Some of this light energy is absorbed by molecules in the skin and converted to thermal energy
  - Internal cooling system protects the epidermis in contact with the crystal

Skin Optics

- **Absorption**
  - Absorption of light is required for light to exert clinical effects on tissue
  - Molecules that absorb light are called **chromophores**
    - Melanin, hemoglobin, water
    - Light absorbed into a target chromophore in the skin is converted to thermal energy, leading to heating and destruction of the chromophore
- Other possibilities
  - Scattering
  - Reflection
  - Transmission



Selective Photothermolysis



- The clinical effects of IPL are based on the principle of **selective photothermolysis**
  - Using light to heat and destroy selective tissue
  - Targets specific chromophores by selecting specific wavelength, fluence, pulse width/sequence that is most likely to be absorbed by that chromophore
  - Spares the surrounding tissue by reducing non-specific, excessive, widespread thermal energy

Therapeutic Parameters

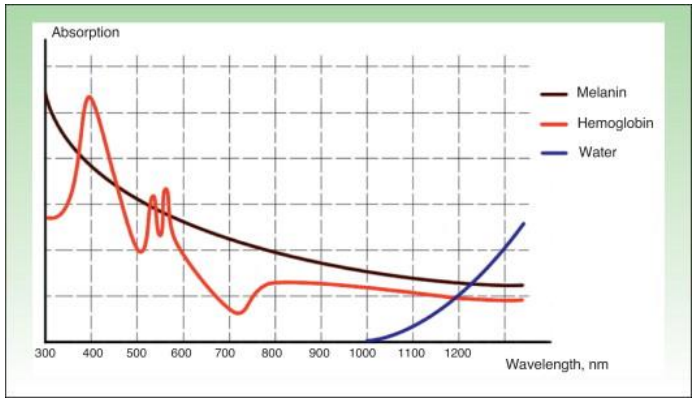
- Wavelength
- Fluence
- Pulse
  - Width/Duration
  - Sequence
  - Delay

Therapeutic Parameters

- Most devices have presets for you based on what you select you are treating! But still important to understand the basics

Wavelength

- Ranges from about 400-1200nm for IPL depending on your system
- Some wavelengths are then filtered out using a filter
  - 2 types of wavelength filters
    - **Cut-off filters**
      - Most common
      - Block all wavelengths below that filter number
      - Typical cut-off filters: 515, 560, 590, 615, 640, 695 and 755
    - Cut-on filters
      - Block all wavelengths except a small range right around that filter number



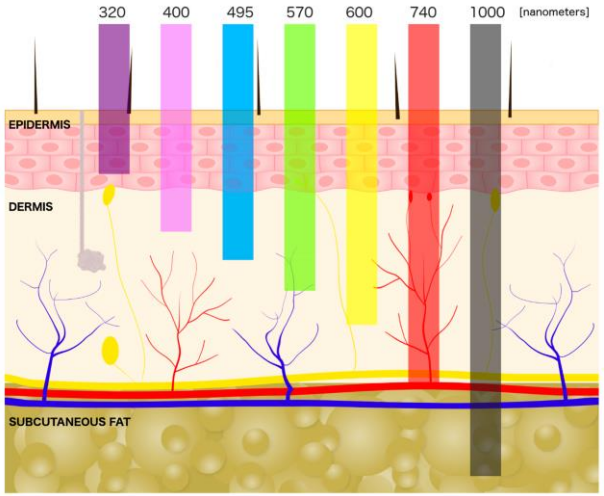
Common chromophore targets in skin

Chromophore	Light absorption range
DNA, RNA, proteins	Ultraviolet
Oxyhemoglobin	Blue-green > yellow >> near infrared
Red tattoo ink	Green
Green tattoo ink	Red
Aminolevulinic acid	Red, blue
Melanin	Ultraviolet > visible light >> near infrared
Black tattoo ink	Visible & near infrared
Deoxyhemoglobin	Near infrared
Sebaceous gland	Near infrared
Fat (adipocytes)	Near infrared
Water	Infrared

Wavelength

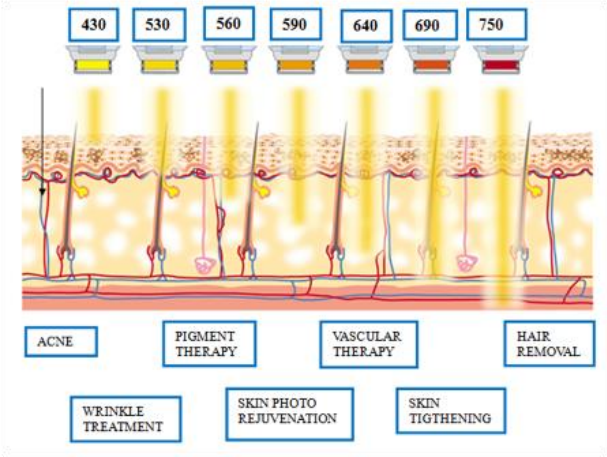
Chromophores absorb light most effectively at certain wavelengths

Wavelength



- Light scattering decreases with increasing wavelength, therefore deeper penetration is generally achieved with longer wavelength

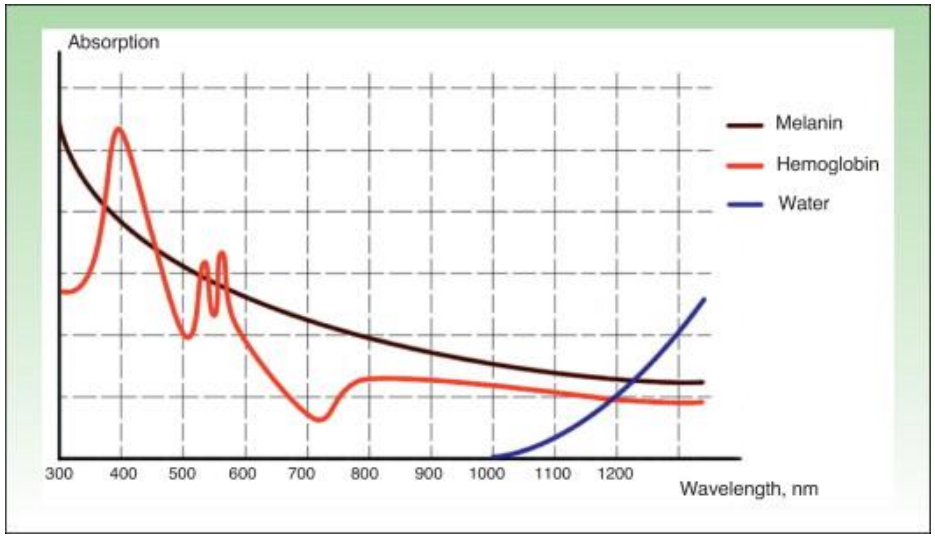
Wavelength



- Choose the right wavelength filter based on the depth of penetration needed and the spectral selectivity of the chromophore being targeted
  - Examples
    - 560nm- superficial lesions in lighter skin
    - 590nm- superficial lesions in darker skin, deeper lesions in all skin types

Wavelength

- Also keep in mind the patient's pigmentation when choosing a wavelength filter
  - The highest absorption of melanin is at lower wavelengths, therefore higher-wavelength filters - which are less absorbed by melanin - offer protection for darker skin types



Fluence

- Fluence is the amount of energy per until area (J/cm^2) that the treated area is exposed to with each pulse or pulse sequence
- Must be sufficient to exert the desired therapeutic effect but should also be at a level that minimizes collateral tissue damage
- Selected based on target tissue and patient's skin color
  - Necessary fluence increases as size and depth of lesion increases
  - MGD→ usually 8 to 20 J/cm^2 used
- May be delivered in a single pulse or spread out over a series of short pulses

Pulse Duration or Pulse Width

- Pulse duration/width is the duration of a pulse of energy
  - Determines how quickly or slowly the energy is absorbed by the target
    - Shorter width = energy absorbed more quickly = tissue reaches a higher temperature
    - Longer width = energy absorbed more slowly = some heat will be lost to surrounding tissue = tissue will not achieve as high of a temperature
  - Usually ranges from 4-20ms

Pulse Duration or Pulse Width

- Pulse duration/width is selected based on thermal relaxation time (TRT) of the targeted chromophore
  - Longer for larger chromophores
  - Longer for more darkly pigmented lesions
- Pulse duration should be equal to or shorter than the target tissue's TRT to confine damage to the targeted tissue and avoid damaging surrounding tissue

Thermal relaxation times

Target	Thermal relaxation time
200 micrometer hair follicle	20 msec
100 micrometer port wine stain blood vessel	5 msec
50 micrometer blood vessel	1 msec
50 micrometer of epidermis	1 msec
7 micrometer erythrocyte	20 microseconds
1 micrometer melanosome	1 microsecond
0.1 micrometer tattoo particle	10 nsec

Pulse Sequence

- Fluence may be all delivered in a single pulse or divided into a short series of pulses
  - Single, double, triple
  - Applying energy in pulse sequences allows better control of the delivered energy, and enables the skin to cool down between sub-pulse
    - Reducing the likelihood of adverse effects to the surrounding epidermis

Pulse Delay

- Pulse delay determines the intervals between the sub-pulses in the sequence
- Allows cooling of the skin between sub-pulses, and help prevent adverse effects by allowing the epidermis to cool down
- Darker skin absorbs more light and heats to a higher temperature
  - Consequently, longer delay times are required to allow the skin to cool when treating darker skin types
- Usually ranges from 5-150ms

IPL Indications/Uses

- Because IPL can be targeted to act on different chromophores to varying degrees, one of the main benefits of IPL is there are a large range of therapeutic possibilities with just 1 device!

IPL Indications/Uses

- Often used in dermatology for treatment of:
  - Vascular lesions
  - Pigmented lesions
  - Unwanted hair
  - Skin damage
    - wrinkles, coarseness, laxity, dyspigmentation

IPL Indications/Uses

- Ocular indications
  - Ocular surface disease
    - Dry eye
    - Meibomian gland dysfunction
    - Ocular Rosacea
    - Chalazia
    - Ocular surface inflammation
    - Demodex

IPL Mechanism

- Proposed ocular mechanisms
  - Ablation of vascular tissue
    - Reduces eyelid telangiectasia
    - Reduces inflammatory mediators which contribute to dry eye
  - Local warming effect
    - Improves expression of meibum
    - Destroys bacteria
    - Reduces demodex load

Archivos de la Sociedad Española de Oftalmología (English Edition)
Volume 94, Issue 7, July 2019, Pages 331-336

Original article

Intense pulsed light therapy: A promising complementary treatment for dry eye disease

Terapia de luz pulsada intensa regulada: un tratamiento complementario prometedor para la enfermedad de ojo seco ☆

L.F. Mejía [a b], J.C. Gil [b], M. Jaramillo [c]

Photomedicine and Laser Surgery
Photomed Laser Surg. 2015 Jan 1; 33(1): 41–46.
doi: 10.1089/pho.2014.3819
PMCID: PMC4298157
PMID: 25594770

Intense Pulsed Light Treatment for Dry Eye Disease Due to Meibomian Gland Dysfunction; A 3-Year Retrospective Study

Rolando Toyos, MD,[1] William McGill, PhD,[2] and Dustin Briscoe, OD[1]

Canadian Journal of Ophthalmology
Volume 51, Issue 4, August 2016, Pages 249-253

Original Article

Outcomes of intense pulsed light therapy for treatment of evaporative dry eye disease

Preeya K. Gupta MD [*], Gargi K. Vora MD [*], Cynthia Matossian MD, FACS [†], Michelle Kim MD [*], Sandra Stinnett DrPH [*]

Video Article

Intense Pulsed Light for the Treatment of Dry Eye Owing to Meibomian Gland Dysfunction

Luca Vigo[1], Giuseppe Giannaccare[2], Stefano Sebastiani[2], Marco Pellegrini[2], Francesco Carones[1]
[1]Carones Ophthalmology Center
[2]Ophthalmology Unit, S.Orsola-Malpighi University Hospital, DIMES, University of Bologna
Correspondence to: Giuseppe Giannaccare at giuseppe.giannaccare@gmail.com

URL: https://www.jove.com/video/57811
DOI: doi:10.3791/57811
Keywords: Medicine, Issue 146, Dry eye, meibomian gland dysfunction, intense pulsed light, noninvasive break-up time, lipid layer thickness, noncontact meibography, tear osmolarity, ocular surface disease index
Date Published: 4/1/2019
Citation: Vigo, L., Giannaccare, G., Sebastiani, S., Pellegrini, M., Carones, F. Intense Pulsed Light for the Treatment of Dry Eye Owing to Meibomian Gland Dysfunction. *J. Vis. Exp.* (146), e57811, doi:10.3791/57811 (2019).

IPL Studies- Improvement in Signs and Symptoms of Dry Eye Disease

IPL Studies- Improvement in Signs and Symptoms of Dry Eye Disease

Intense pulsed light improves signs and symptoms of dry eye disease due to meibomian gland dysfunction: A randomized controlled study

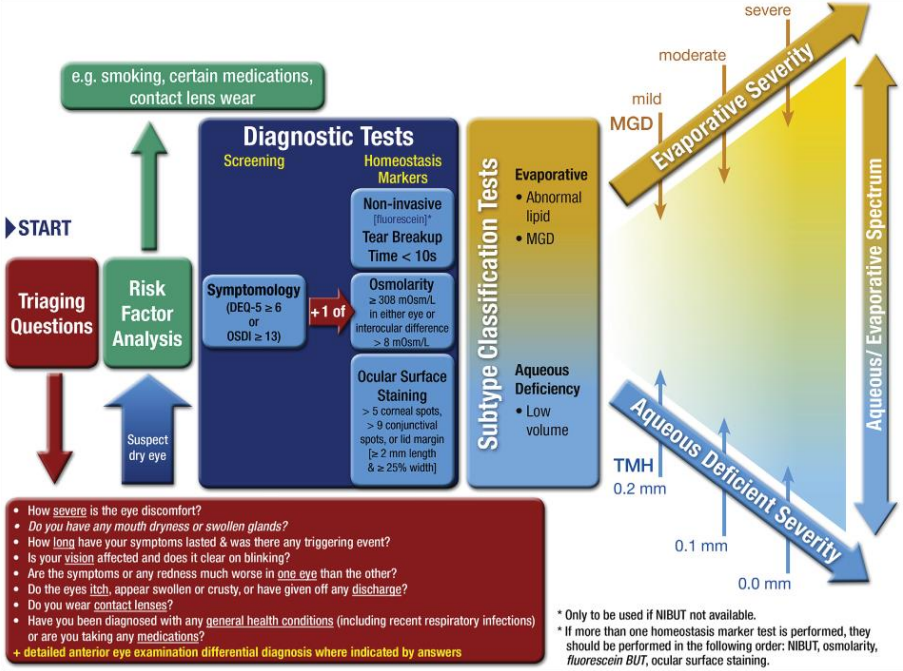
Rolando Toyos, Neel R. Desai, Melissa Toyos, Steven J. Dell

Published: June 23, 2022 • https://doi.org/10.1371/journal.pone.0270268

- Statistically significant improvements in:
  - TBUT
  - Meibum quality
  - Meibomian gland expressability
- Earned Lumenis Optilight FDA approval for dry eye due to MGD

Patient Selection & Work Up

- Obtain a baseline dry eye evaluation based on DEWS II diagnostic algorithm
- In general, work from least to most invasive testing for most accurate results



Patient Selection and Work Up

- Our dry eye workup
  - Detailed history w/ an OSDI
  - Preliminary testing (VA, EOMs, Pupils, CVFs)
  - Lipiview- lipid layer and blink analysis
  - Tear Osmolarity
  - Keratograph- NIKBUT, TMH, redness, meibography
  - Inflammadry
  - Schirmer 1 without anesthetic
  - Comprehensive slit lamp evaluation
    - MGE, vital dyes
  - IOP and undilated view

Ocular Surface Disease Index© (OSDI©)[2]

Ask your patients the following 12 questions, and circle the number in the box that best represents each answer. Then, fill in boxes A, B, C, D, and E according to the instructions beside each.

Have you experienced any of the following *during the last week*?	All of the time	Most of the time	Half of the time	Some of the time	None of the time	N/A
1. Eyes that are sensitive to light?	4	3	2	1	0	
2. Eyes that feel gritty?	4	3	2	1	0	
3. Painful or sore eyes?	4	3	2	1	0	
4. Blurred vision?	4	3	2	1	0	
5. Poor vision?	4	3	2	1	0	

Subtotal score for answers 1 to 5 (A)

Have problems with your eyes limited you in performing any of the following *during the last week*?	All of the time	Most of the time	Half of the time	Some of the time	None of the time	N/A
6. Reading?	4	3	2	1	0	N/A
7. Driving at night?	4	3	2	1	0	N/A
8. Working with a computer or bank machine (ATM)?	4	3	2	1	0	N/A
9. Watching TV?	4	3	2	1	0	N/A

Subtotal score for answers 6 to 9 (B)

Have your eyes felt uncomfortable in any of the following situations *during the last week*?	All of the time	Most of the time	Half of the time	Some of the time	None of the time	N/A
10. Windy conditions?	4	3	2	1	0	N/A
11. Places or areas with low humidity (very dry)?	4	3	2	1	0	N/A
12. Areas that are air conditioned?	4	3	2	1	0	N/A

Subtotal score for answers 10 to 12 (C)

Add subtotals A, B, and C to obtain D
(D = sum of scores for all questions answered) (D)

Total number of questions answered
(do not include questions answered N/A) (E)

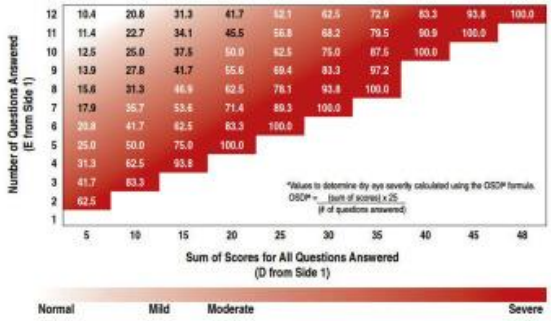
Please turn over the questionnaire to calculate the patient's final OSDI© score.

Evaluating the OSDI© Score[1]

The OSDI© is assessed on a scale of 0 to 100, with higher scores representing greater disability. The index demonstrates sensitivity and specificity in distinguishing between normal subjects and patients with dry eye disease. The OSDI© is a valid and reliable instrument for measuring dry eye disease (normal, mild to moderate, and severe) and effect on vision-related function.

Assessing Your Patient's Dry Eye Disease[1, 2]

Use your answers D and E from side 1 to compare the sum of scores for all questions answered (D) and the number of questions answered (E) with the chart below.* Find where your patient's score would fall. Match the corresponding shade of red to the key below to determine whether your patient's score indicates normal, mild, moderate, or severe dry eye disease.



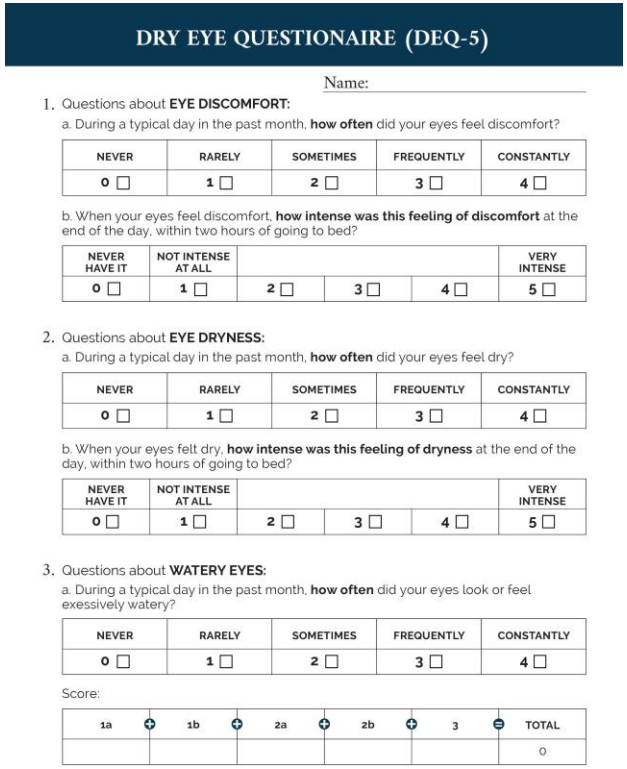
Patient's Name: _____ Date: _____

How long has the patient experienced dry eye disease? _____

Eye Care Professional's Comments: _____

1. Data on file, Allergan, Inc.
2. Schiffman RM, Christianson MD, Jacobsen G, Hirsch JD, Reis BL. Reliability and validity of the Ocular Surface Disease Index. *Arch Ophthalmol.* 2000;118:615-621

Dry Eye Syndrome Questionnaires



DRY EYE QUESTIONAIRE (DEQ-5)

Name:

1. Questions about **EYE DISCOMFORT:**

a. During a typical day in the past month, **how often** did your eyes feel discomfort?

NEVER	RARELY	SOMETIMES	FREQUENTLY	CONSTANTLY
0 ☐	1 ☐	2 ☐	3 ☐	4 ☐

b. When your eyes feel discomfort, **how intense was this feeling of discomfort** at the end of the day, within two hours of going to bed?

NEVER HAVE IT	NOT INTENSE AT ALL				VERY INTENSE
0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

2. Questions about **EYE DRYNESS:**

a. During a typical day in the past month, **how often** did your eyes feel dry?

NEVER	RARELY	SOMETIMES	FREQUENTLY	CONSTANTLY
0 ☐	1 ☐	2 ☐	3 ☐	4 ☐

b. When your eyes felt dry, **how intense was this feeling of dryness** at the end of the day, within two hours of going to bed?

NEVER HAVE IT	NOT INTENSE AT ALL				VERY INTENSE
0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

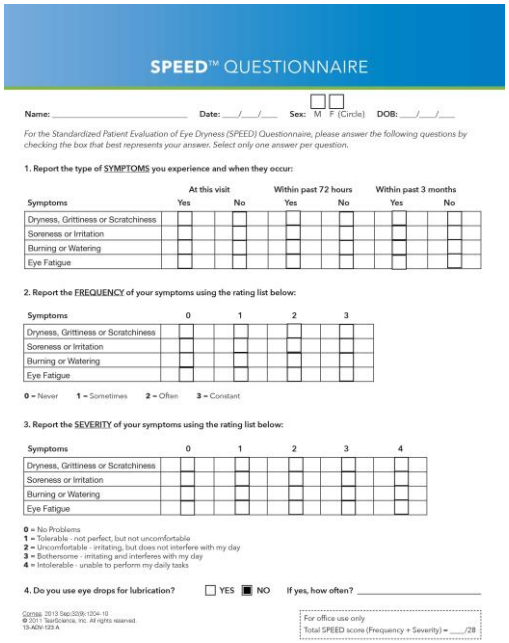
3. Questions about **WATERY EYES:**

a. During a typical day in the past month, **how often** did your eyes look or feel exessively watery?

NEVER	RARELY	SOMETIMES	FREQUENTLY	CONSTANTLY
0 ☐	1 ☐	2 ☐	3 ☐	4 ☐

Score:

1a	⊕	1b	⊕	2a	⊕	2b	⊕	3	⊖	TOTAL
										0



SPEED™ QUESTIONNAIRE

Name: _____ Date: ___/___/___ Sex: M F (Circle) DOB: ___/___/___

For the Standardized Patient Evaluation of Eye Dryness (SPEED) Questionnaire, please answer the following questions by checking the box that best represents your answer. Select only one answer per question.

1. Report the type of SYMPTOMS you experience and when they occur:

Symptoms	At this visit Yes	At this visit No	Within past 72 hours Yes	Within past 72 hours No	Within past 3 months Yes	Within past 3 months No
Dryness, Grittiness or Scratchiness	☐	☐	☐	☐	☐	☐
Soreness or Irritation	☐	☐	☐	☐	☐	☐
Burning or Watering	☐	☐	☐	☐	☐	☐
Eye Fatigue	☐	☐	☐	☐	☐	☐

2. Report the FREQUENCY of your symptoms using the rating list below:

Symptoms	0	1	2	3
Dryness, Grittiness or Scratchiness	☐	☐	☐	☐
Soreness or Irritation	☐	☐	☐	☐
Burning or Watering	☐	☐	☐	☐
Eye Fatigue	☐	☐	☐	☐

0 = Never **1 =** Sometimes **2 =** Often **3 =** Constant

3. Report the SEVERITY of your symptoms using the rating list below:

Symptoms	0	1	2	3	4
Dryness, Grittiness or Scratchiness	☐	☐	☐	☐	☐
Soreness or Irritation	☐	☐	☐	☐	☐
Burning or Watering	☐	☐	☐	☐	☐
Eye Fatigue	☐	☐	☐	☐	☐

0 = No Problems
1 = Tolerable - not perfect, but not uncomfortable
2 = Uncomfortable - irritating, but does not interfere with my day
3 = Bothersome - irritating and interferes with my day
4 = Intolerable - unable to perform my daily tasks

4. Do you use eye drops for lubrication? ☐ YES ■ NO **If yes, how often?** _____

Cornea 2013 Sep;32(9):1204-10

13-ADV-123 A

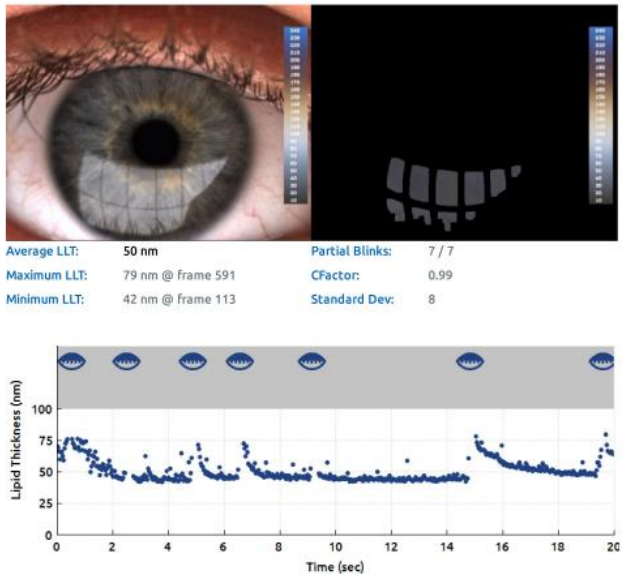
For office use only
Total SPEED score (Frequency + Severity) = ____/28

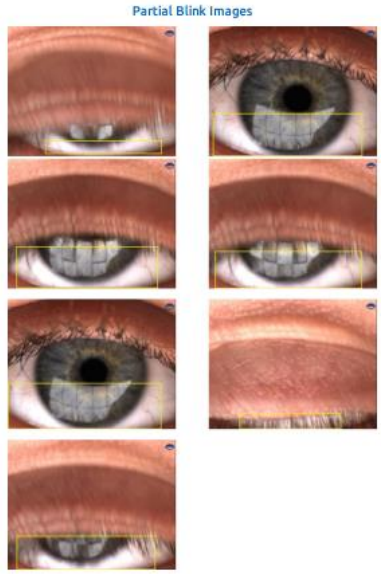
Dry Eye Syndrome Questionnaires

Dry Eye Syndrome Questionnaires

- Why do we need to dry eye syndrome questionnaires?
  - Measurable, repeatable way to measure symptoms and monitor for improvements
  - Tool to show patients the treatment is working
    - Patients often forget how bad their symptoms were!

Lipiview- Lipid Layer and Blink Evaluation





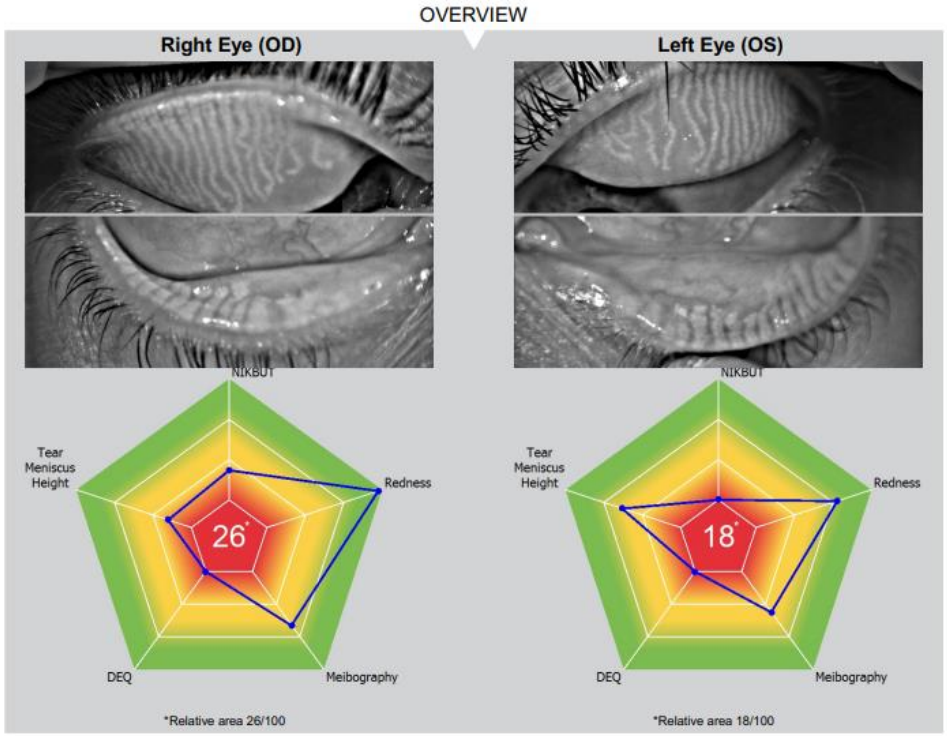
Lipiview- Lipid Layer and Blink Evaluation

- LLT
  - ≤ 60nm = thin and compromised
  - 75nm = marginal
  - ≥ 90nm = adequate and thick
- Blinks
  - Ideally all blinks should be complete
- Alternatives
  - TBUT
  - Assess blinks under SLE

Tear Osmolarity

- Tear Osmolarity
  - Reduced aqueous tear flow or increased evaporation leads to hyperosmotic tears
  - 275-307 mOsm/L = normal
  - >308 mOsm/L or asymmetry between eyes ≥10 = dry eye disease

Keratograph



Keratograph

- Excellent tool for patient education
- Excellent tool to determine candidacy for IPL
  - Meibography
  - NIKBUT
- Alternatives
  - Transillumination of MGs during SLE
  - TBUT w/ NaFl

Inflammadry

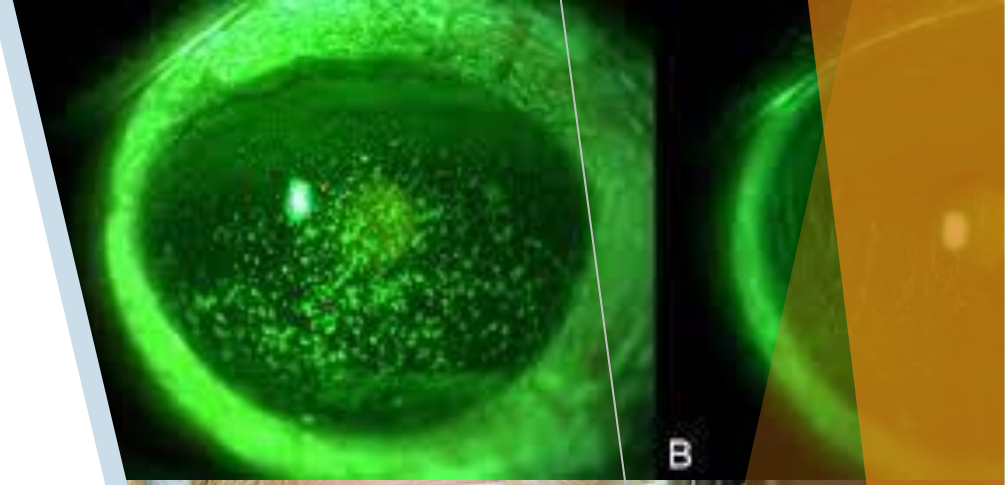
- Rapid result, in-office test that detects elevated levels of MMP-9
- MMP-9 is an inflammatory marker that is consistently elevated in the tears of patients with dry eye disease

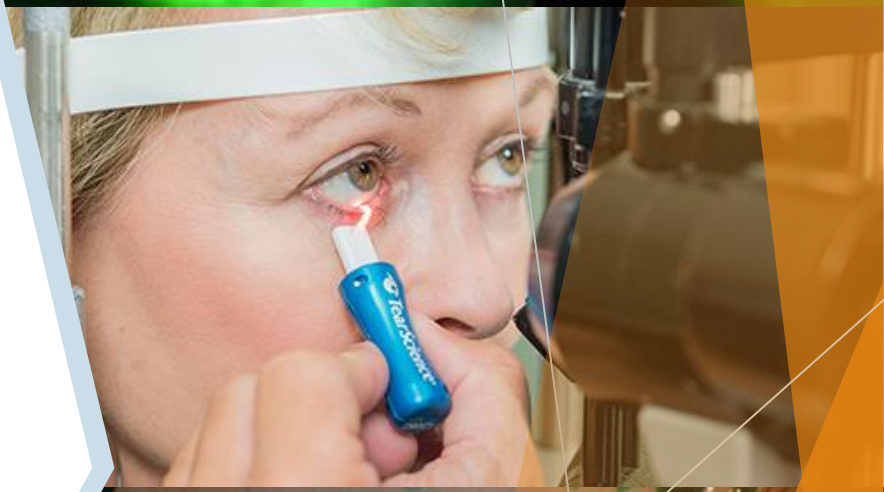
Schirmer Testing

- Schirmer 1
  - Without anesthetic
  - Basal and reflex tearing
  - 5 minutes
  - Results
    - <10mm abnormal
    - <5mm high correlation with autoimmune disease

Comprehensive Slit Lamp Evaluation

- Closely evaluate lids for:
  - MGD
  - Anterior blepharitis / demodex
  - Ocular rosacea (lid telangiectasias)
- Express meibomian glands
  - Meibomian gland evaluator
- Vital dyes
  - Lissamine green
  - Sodium Fluorescein

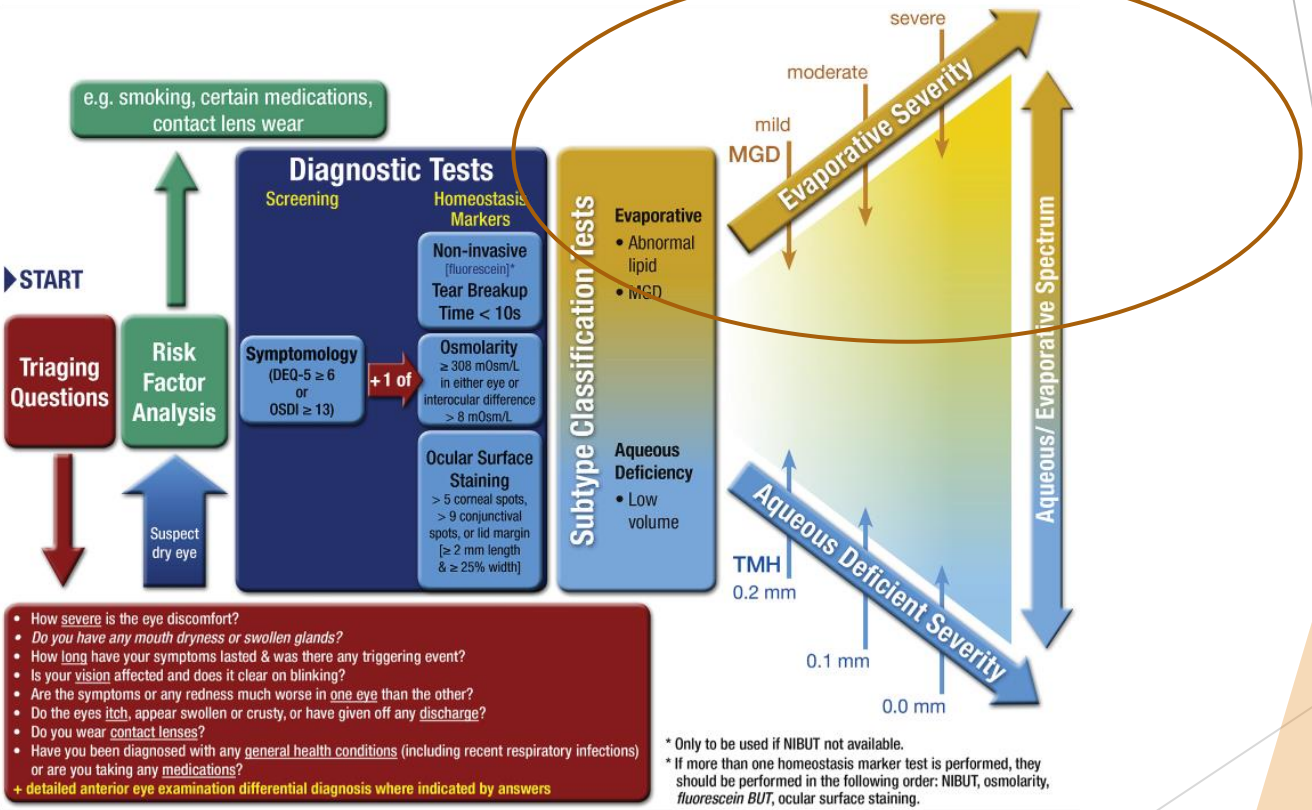


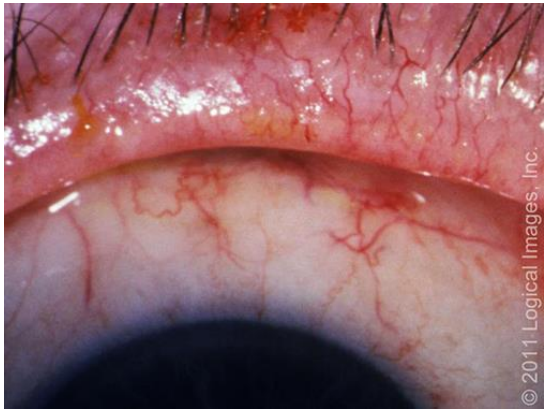


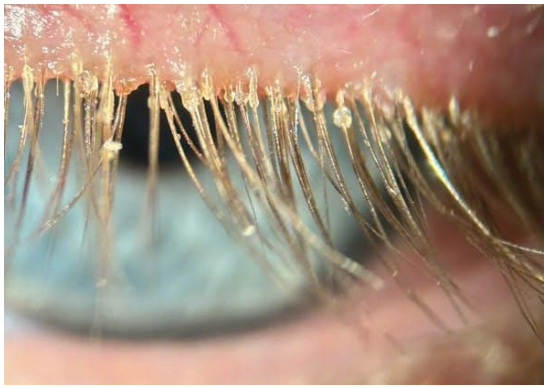
Patient Selection and Work Up

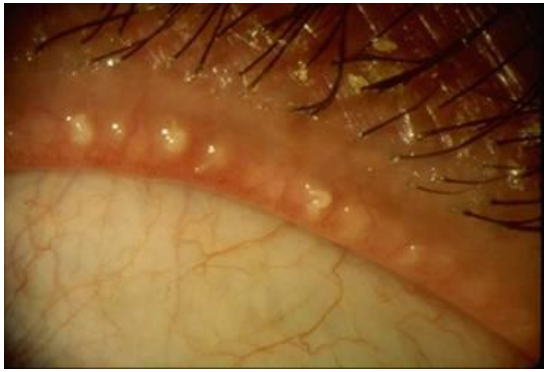
- Modified dry eye workup
  - Detailed history w/ dry eye questionnaire of your choice
  - Preliminary testing (VA, EOMs, Pupils, CVFs)
  - Schirmer 1 without anesthetic
  - Comprehensive slit lamp evaluation
    - Assess blinks
    - Closely evaluate lids
    - Transillumination of MGs
    - MGE
    - Vital dyes
  - IOP and undilated view

Who are the Best IPL Candidates?







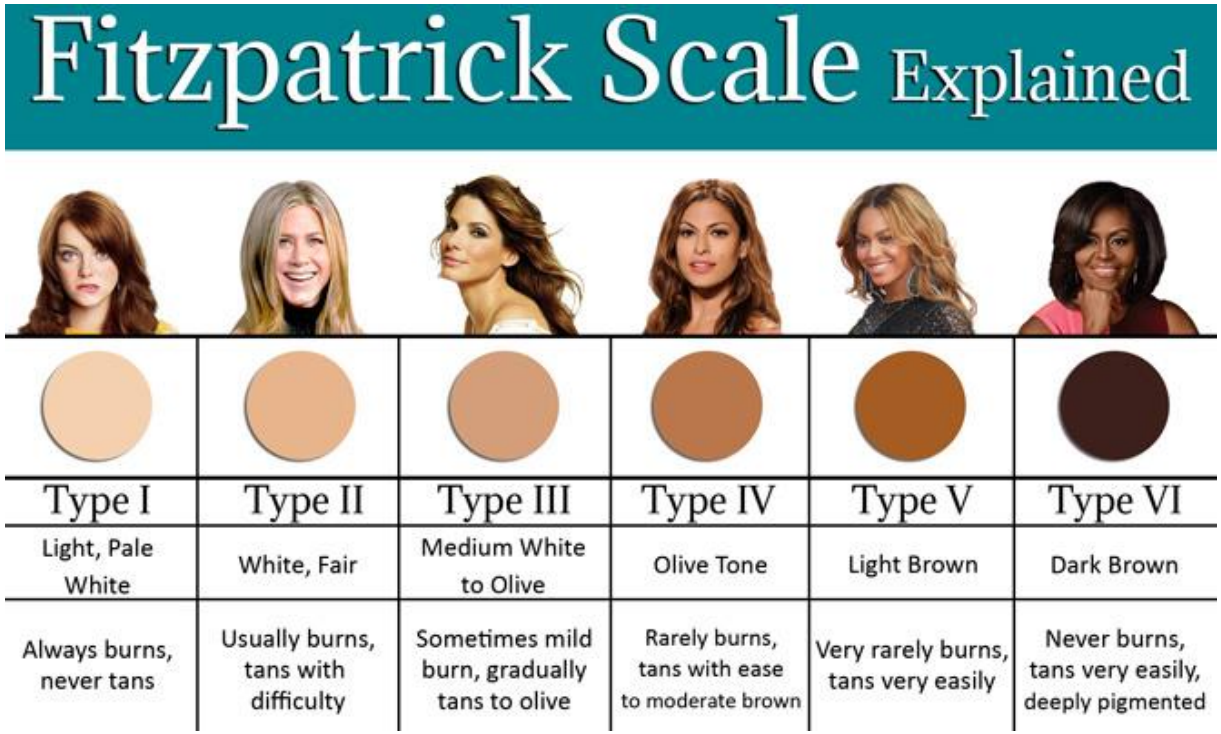


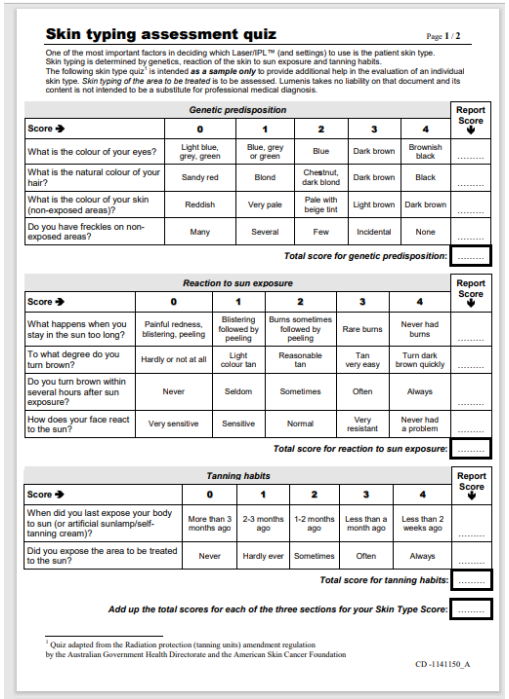
Who are the Best IPL Candidates?

Patient Selection

- Absorption of light is directly related to amount of skin pigmentation
  - Dark complexions or recent light exposure→ more melanin → absorbs more energy
    - Require lower settings
    - Some complexions are too dark for IPL to safely be performed
  - Lighter complexions→ less melanin→ absorbs less energy
    - Require higher settings
- Utilize Fitzpatrick skin type scale and light exposure history/contraindication questionnaire to determine candidacy and settings

Patient Selection- Fitzpatrick Skin Type Scale





Skin typing assessment quiz Page 1 / 2

One of the most important factors in deciding which Laser/IPL™ (and settings) to use is the patient skin type. Skin typing is determined by genetics, reaction of the skin to sun exposure and tanning habits. The following skin type quiz[1] is intended ***as a sample only*** to provide additional help in the evaluation of an individual skin type. *Skin typing of the area to be treated* is to be assessed. Lumenis takes no liability on that document and its content is not intended to be a substitute for professional medical diagnosis.

Genetic predisposition

Score →	0	1	2	3	4	Report Score ↓
What is the colour of your eyes?	Light blue, grey, green	Blue, grey or green	Blue	Dark brown	Brownish black	.....
What is the natural colour of your hair?	Sandy red	Blond	Chestnut, dark blond	Dark brown	Black	.....
What is the colour of your skin (non-exposed areas)?	Reddish	Very pale	Pale with beige tint	Light brown	Dark brown	.....
Do you have freckles on non-exposed areas?	Many	Several	Few	Incidental	None	.....

Total score for genetic predisposition: .....

Reaction to sun exposure

Score →	0	1	2	3	4	Report Score ↓
What happens when you stay in the sun too long?	Painful redness, blistering, peeling	Blistering followed by peeling	Burns sometimes followed by peeling	Rare burns	Never had burns	.....
To what degree do you turn brown?	Hardly or not at all	Light colour tan	Reasonable tan	Tan very easy	Turn dark brown quickly	.....
Do you turn brown within several hours after sun exposure?	Never	Seldom	Sometimes	Often	Always	.....
How does your face react to the sun?	Very sensitive	Sensitive	Normal	Very resistant	Never had a problem	.....

Total score for reaction to sun exposure: .....

Tanning habits

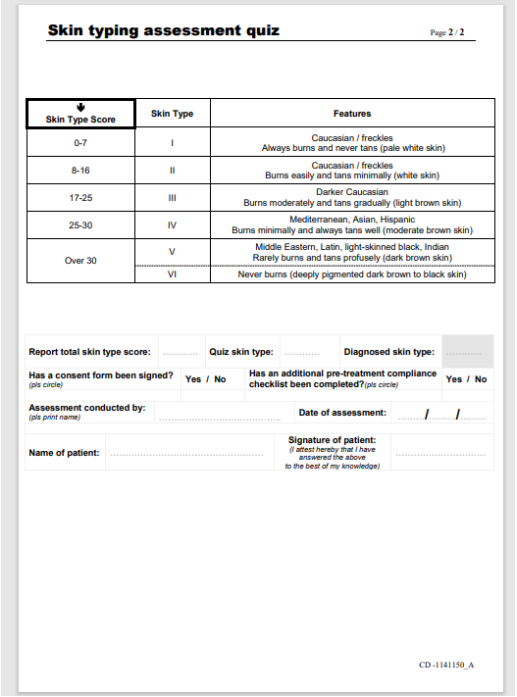
Score →	0	1	2	3	4	Report Score ↓
When did you last expose your body to sun (or artificial sunlamp/self-tanning cream)?	More than 3 months ago	2-3 months ago	1-2 months ago	Less than a month ago	Less than 2 weeks ago	.....
Did you expose the area to be treated to the sun?	Never	Hardly ever	Sometimes	Often	Always	.....

Total score for tanning habits: .....

Add up the total scores for each of the three sections for your Skin Type Score: .....

[1] Quiz adapted from the Radiation protection (tanning units) amendment regulation by the Australian Government Health Directorate and the American Skin Cancer Foundation

CD-1141150_A



Skin typing assessment quiz Page 2 / 2

Skin Type Score ↓	Skin Type	Features
0-7	I	Caucasian / freckles Always burns and never tans (pale white skin)
8-16	II	Caucasian / freckles Burns easily and tans minimally (white skin)
17-25	III	Darker Caucasian Burns moderately and tans gradually (light brown skin)
25-30	IV	Mediterranean, Asian, Hispanic Burns minimally and always tans well (moderate brown skin)
Over 30	V	Middle Eastern, Latin, light-skinned black, Indian Rarely burns and tans profusely (dark brown skin)
	VI	Never burns (deeply pigmented dark brown to black skin)

Report total skin type score: ..... **Quiz skin type:** ..... **Diagnosed skin type:** .....

Has a consent form been signed? *(pls circle)* **Yes / No** **Has an additional pre-treatment compliance checklist been completed?** *(pls circle)* **Yes / No**

Assessment conducted by: *(pls print name)* ..... **Date of assessment:** ... / ... / ...

Name of patient: ..... **Signature of patient:** *(I attest hereby that I have answered the above to the best of my knowledge)* .....

CD-1141150_A

Patient Selection- Fitzpatrick Skin Type Scale

Patient Selection- Contraindications

Fitzpatrick skin type V or higher	Recent significant UV exposure	Allergy to ultrasound gel	Keloid scar tissue former
Skin cancer in the area being treated	Active herpetic infection	Recent skin treatment (resurfacing, chemical peel, botox)	Ocular surgery or eyelid surgery or Neuro-paralysis within 6 months prior to the first treatment
Uncontrolled Systemic Lupus erythematosus and porphyria	Recent radiation therapy	History of seizures or epilepsy	Pregnant or breastfeeding

ORIGINAL ARTICLE

Safety of Combination Laser or Intense Pulsed Light Therapies and Doxycycline for the Treatment of Rosacea

Schilling, Laura M. MD*; Halvorson, Christian R. MD*; Weiss, Robert A. MD*,†; Weiss, Margaret A. MD*,†; Beasley, Karen L. MD*,†

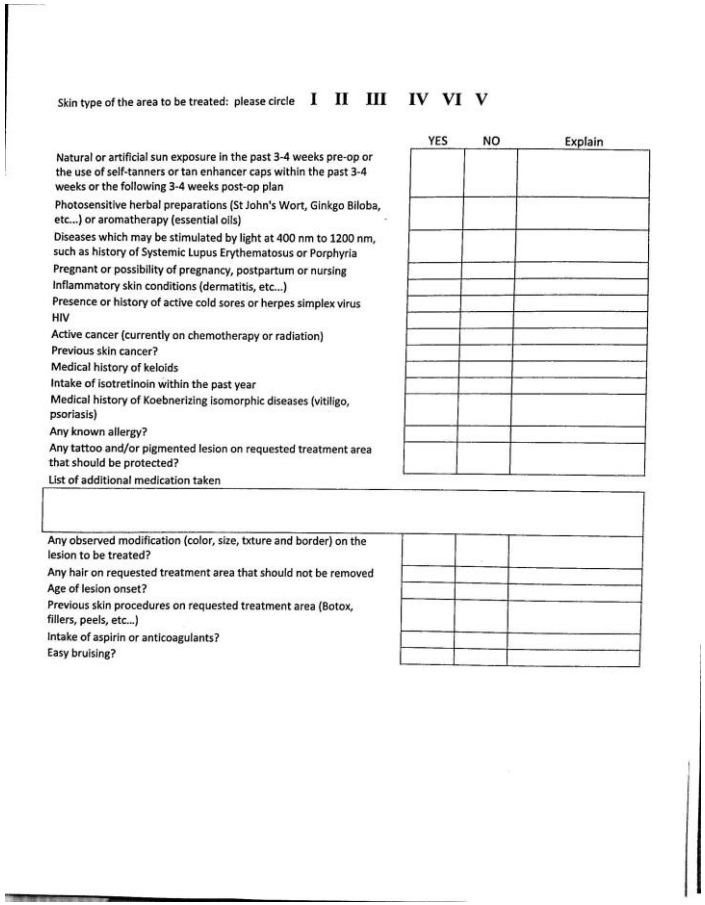
Author Information

Dermatologic Surgery 45(11):p 1401-1405, November 2019. | **DOI:** 10.1097/DSS.0000000000002009

Patient Selection- Contraindications

- Medications
  - Accutane
  - Tetracyclines
  - Retinoid
  - Chemotherapy
  - Anticoagulants

Patient Selection- Light Exposure History and Contraindications Questionnaire



Skin type of the area to be treated: please circle **I II III IV VI V**

	YES	NO	Explain
Natural or artificial sun exposure in the past 3-4 weeks pre-op or the use of self-tanners or tan enhancer caps within the past 3-4 weeks or the following 3-4 weeks post-op plan			
Photosensitive herbal preparations (St John's Wort, Ginkgo Biloba, etc...) or aromatherapy (essential oils)			
Diseases which may be stimulated by light at 400 nm to 1200 nm, such as history of Systemic Lupus Erythematosus or Porphyria			
Pregnant or possibility of pregnancy, postpartum or nursing			
Inflammatory skin conditions (dermatitis, etc...)			
Presence or history of active cold sores or herpes simplex virus			
HIV			
Active cancer (currently on chemotherapy or radiation)			
Previous skin cancer?			
Medical history of keloids			
Intake of isotretinoin within the past year			
Medical history of Koebnerizing isomorphic diseases (vitiligo, psoriasis)			
Any known allergy?			
Any tattoo and/or pigmented lesion on requested treatment area that should be protected?			
List of additional medication taken			
Any observed modification (color, size, txture and border) on the lesion to be treated?			
Any hair on requested treatment area that should not be removed			
Age of lesion onset?			
Previous skin procedures on requested treatment area (Botox, fillers, peels, etc...)			
Intake of aspirin or anticoagulants?			
Easy bruising?			

Procedure- Patient Preparation

- Treated areas should be closely shaven if applicable
- Cleanse face
- Hair net to avoid hairline
- Eye protection
  - Laser grade stickers
  - IPL goggles
  - Laser grade corneal shields
- Examiner eye protection
  - Green goggles

Procedure- Patient Preparation

- Apply a thin layer of clear coupling gel to the area being treated
  - Clear ultrasound gel
  - Typically applied tragus to tragus, nose, and lids for MGD
  - Purpose
    - Maintains appropriate wavelength
    - Protects skin and allows for even treatment
    - Apply enough to see peaks of gel when applicator is lifted off skin

Procedure-Patient Preparation

Procedure-Instrument Options

- Various options
  - Lumenis
  - iProX
  - E-Eye
  - Etc.

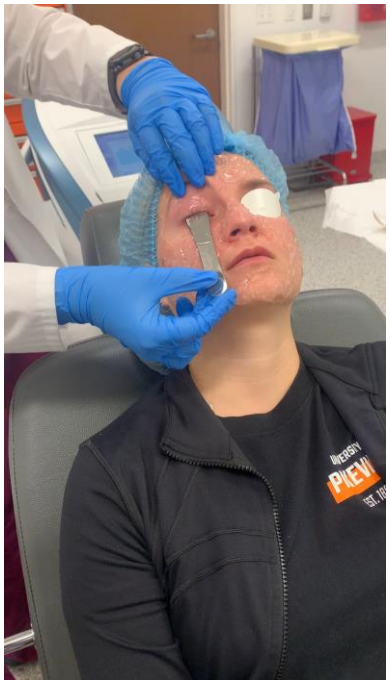
Fitzpatrick Skin Type	Filter (nm)	Fluence (J/cm^2)	Pulse Sequence	Pulse Duration (msec)	Pulse Delay (50msec)
I	590	14-16	Triple	6	50
II	590	12-14	Triple	6	50
III	590	10-12	Triple	6	50
IV	590	10	Triple	6	50

Procedure- Settings for DED (Toyos Protocol)

Procedure- Treatment Protocol for DED (Toyos Protocol)

- Test spot
- Large light guide
  - Tragus to tragus
    - 2 passes
- Small light guide
  - Drop fluence by 1-2 J/cm^2
  - Eyelids (with protective barrier)
    - 1 pass
- Avoid: brows, lashes, orbital rim

Procedure- Treatment Protocol for DED (Toyos Protocol)



Procedure- Treatment Protocol for DED (Toyos Protocol)

Procedure- Other Treatment Options

- Full face rosacea treatment
  - 560nm with Fitzpatrick skin type presets
  - Indications: rosacea, pigmentation, “blending” to avoid stripe of bleached skin across cheekbones from 590
  - Full face treatment using large light guide
    - Cheeks, nose, forehead, jawline, chin
    - Avoid: above the lip, periocular region, eyebrows, hairline
  - 1 pass prior to 590nm Toyos treatment

Procedure- Other Treatment Options

- Chalazia (Dr. Laura Periman)
  - Full face 560nm rosacea treatment, single pass
  - Tragus to tragus 590nm Toyos settings for DED, double pass
  - Toyos setting for DED on eyelids with protective barrier, double pass
    - Stack 3 extra Toyos pulses on top of chalazia

Procedure-Tips and Tricks

- Have a helper (extra set of eyes and hands)
- Should see a thin sliver of gel between skin and light guide
- Keep light flush with skin (avoid tilt)
- 10% overlap between pulses
- Avoid nasolabial folds and upper lid

Procedure- Patient Clean Up

- Remove protective devices
- Remove excess coupling gel
- Cleanse the face
- Apply sooth gel (aloe vera), followed by SPF 30+ lotion
- Instill an artificial tear or redness reliever (brimonidine tartrate .025%)

Post-Procedure Care Instructions

- Avoid significant sun expose
- Regular SPF use during treatment period
- Prophylactic topical steroid pulse after treatment
  - Fluorometholone 0.1% or loteprednol 0.5%
    - BID-TID x 1-2 weeks
- Maintain dry eye regimen

Post-Procedure Patient Education

- Normal side effects
  - Skin may be sensitive after treatment
  - Mild erythema/edema and stinging immediately after treatment
  - Temporary pigmentation changes
    - pigmented lesions may become temporarily darker for up to 14 days after treatment, then become flaky and gradually lighten

Possible Adverse Effects

Unwanted pigmentary changes

Increased risk with greater fluence, greater skin pigmentation, sun exposure before or after treatment against advice

Anterior Uveitis

Especially if proper eye protection not used

Hair loss

Bruising, Burns

IPL Treatment Protocol

- MGD/DED
  - 3-4 total treatments performed 3-4 weeks apart
  - Consider adjunctive gland expression after each treatment or after last treatment
    - Manual or device-assisted
- Chalazia
  - Usually a single treatment
- MGD/DED in the setting of significant rosacea
  - May benefit from more treatments, more frequently
  - Up to 8 treatments every 2 weeks
    - Alternate rosacea full face setting alone and rosacea full face + Toyos DED protocol

IPL Treatment Protocol

- After 2 treatments, may be beneficial to increase fluence by 1-2 J/cm2
- Repeat test spot with increased fluence

IPL Follow Up and Maintenance

- 1 month follow up after final treatment
  - Reassess
    - Dry eye questionnaire
    - Ocular and facial redness
    - Lipid layer thickness
    - Meibography and gland expression
  - Patient still needs maintenance dry eye regimen
    - Adjust as needed

IPL Follow Up and Maintenance

- Maintenance
  - Most will need another set of IPL every 6 to 12 months

Billing/Coding

- CPT Code: 17999
  - Other procedures on the integumentary system
- Typically, not covered by insurance
  - Most charge $200-$500 per treatment
  - “Treatment packages”
    - 3-4 treatments +/- device-assisted expression after last treatment

- Case

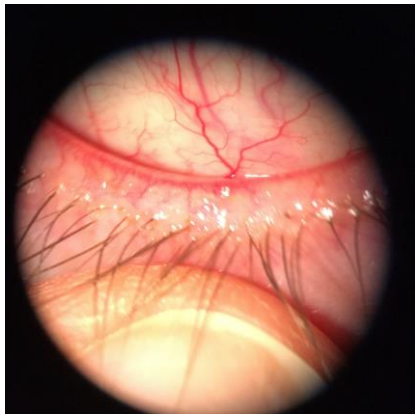
IPL Case: History

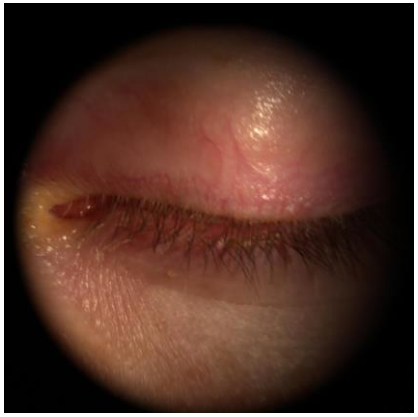
- 25-year-old white male reports for dry eye consultation
  - Chief Complaint/HPI
    - Pt reports severe dry eye OD>OS for 5+ years, worsening since starting medical school this year
    - Pt reports previous eye doctor told him he didn't close his eyes all the way
    - Current treatment: artificial tears TID OU, gel tears QHS OU, moisture chamber goggles QHS
    - OSDI: 27 (Moderate)
  - Medical history
    - No medical conditions
    - No medications
    - No allergies

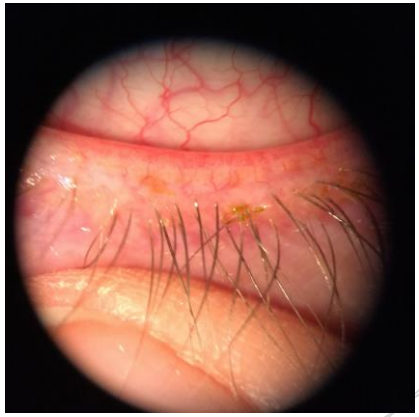
IPL Case: Initial Exam Findings

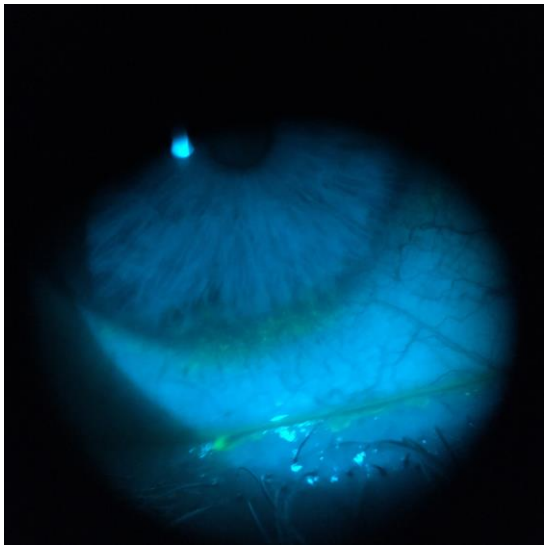
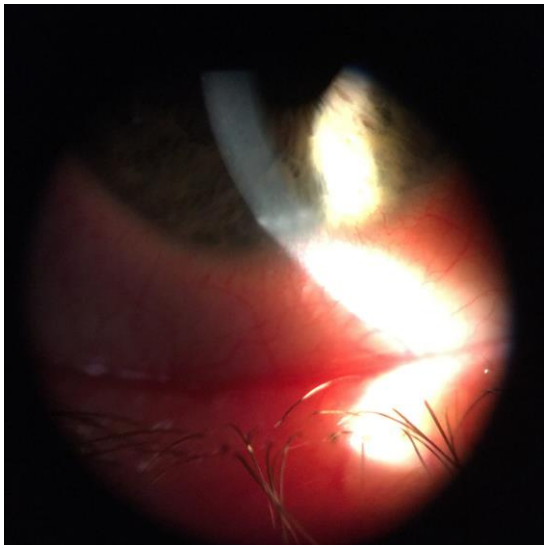
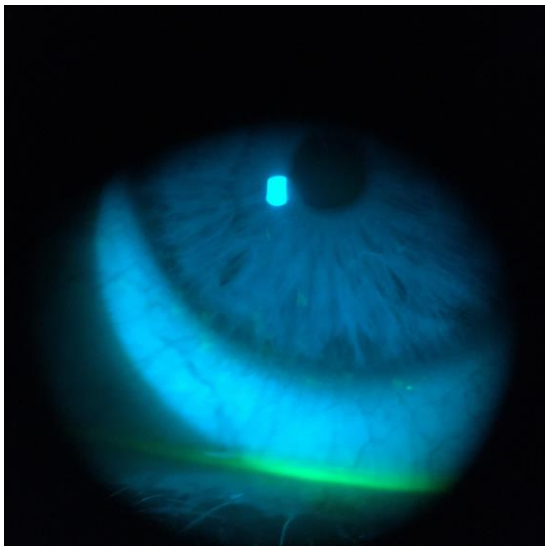
	OD	OS
VAsc	20/15	20/15
Pupils	PERRL (-) APD	PERRL (-) APD
EOMs	Full and smooth	Full and smooth
CVFs	FTFC	FTFC
SLE	See photos	See photos
IOP	9 mmHg	9 mmHg
Undilated view	Unremarkable	Unremarkable

IPL Case: Initial Exam Findings





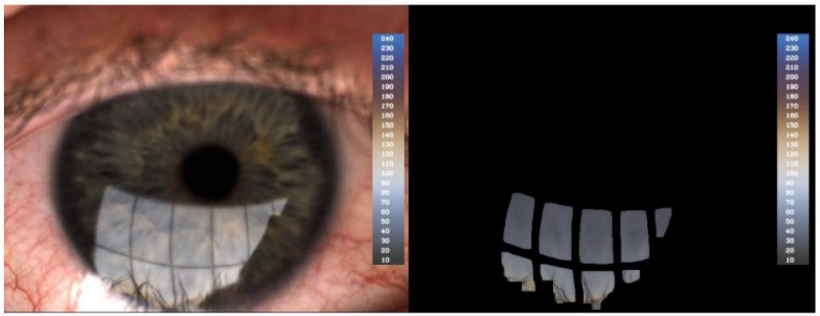


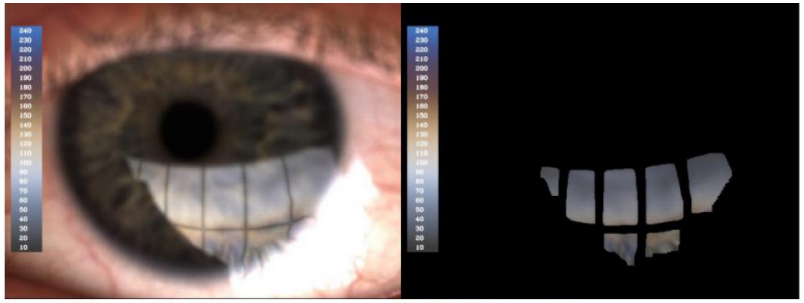
IPL Case: Initial Exam Findings

IPL Case: Initial Exam Findings

- Lipiview



Average LLT:	65 nm	Partial Blinks:	0 / 7
Maximum LLT:	84 nm @ frame 372	CFactor:	0.93
Minimum LLT:	34 nm @ frame 24	Standard Dev:	11



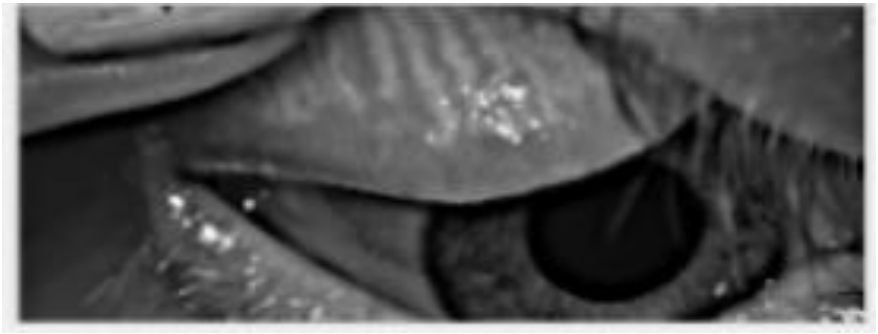
Average LLT:	80 nm	Partial Blinks:	1 / 7
Maximum LLT:	100+ nm @ frame 597	CFactor:	0.96
Minimum LLT:	37 nm @ frame 124	Standard Dev:	17

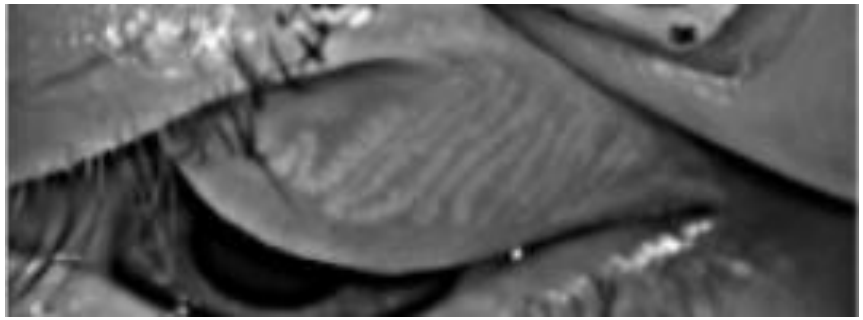
IPL Case: Initial Exam Findings

- Tear Lab
  - OD: 319 mOsms/L
  - OS: 299 mOsms/L
  - Interpretation: High OD and highly asymmetric
- Inflammadry:
  - OD: strong positive
  - OS: positive
- Schirmer 1 (without anesthetic)
  - OD: 30mm
  - OS: 30mm
  - Interpretation: normal OU

IPL Case: Initial Exam Findings

- Meibography





IPL Case: Assessment & Plan

- Assessment
  - Rosacea Conjunctivitis
  - Meibomian gland dysfunction
  - Lagophthalmos with Exposure Keratoconjunctivitis
- Plan
  - Continue artificial tears BID-TID OU, gel tears QHS OU, moisture chamber goggles QHS
  - Start steroid pulse: Pred Acetate TID x 1 week, BID x 1 week, QD x 1 week with plan to transition to restasis or xiidra
  - Start warm compresses
  - Start doxycycline 20mg BID x 2 months
  - 1 month follow up

IPL Case: 1 Month Follow Up

- Chief Complaint/HPI
  - Patient reports minimal improvement in symptoms but has noticed injection has improved
  - Completed steroid pulse
  - OSDI: 25 (Moderate, about stable)
- Exam findings
  - SLE: Improved injection, otherwise stable OU
  - Inflammadry
    - OD: Positive
    - OS: Weak positive
- Assessment/plan
  - Continue current treatment: artificial tears BID-TID OU, gel tears QHS OU, moisture chamber goggles QHS, warm compresses doxycycline 20mg BID for 1 more month
  - Add restasis BID OU

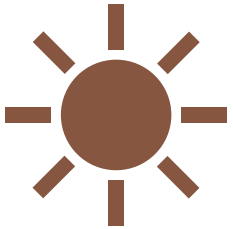
IPL Case: 2 Month Follow Up

- Chief Complaint/HPI
  - Patient reports some improvement in symptoms with addition of restasis
  - Completed doxycycline course
  - OSDI: 18 (Mild, improving)
- Exam findings
  - SLE: Improved injection, otherwise stable OU
- Assessment/plan
  - Continue current treatment: artificial tears BID-TID OU, gel tears QHS OU, moisture chamber goggles QHS, warm compresses, restasis BID OU
  - Recommended IPL series: 3 treatments rosacea and MGD settings, each 3 weeks apart

IPL Case: Treatments

IPL Case: Aftercare

Patient to continue dry eye regimen



Additional treatments between procedures:

SPF use

Limit sun exposure

FML TID x 2 weeks after each procedure

IPL Case: 1 Month Follow Up After 3 Treatments

- Chief Complaint/HPI
  - Patient reports significant improvement in signs/symptoms
  - OSDI: 12 (Normal, improved)
- Exam findings
  - Improved:
    - Injection
    - Lid margin telangiectasia
    - Corneal haze
    - Corneal staining

Conclusions

- IPL is a proven treatment for dry eye disease (DED) secondary to meibomian gland dysfunction
- Developing a systematic dry eye work-up is critical to identity good IPL candidates and to monitor progress
- Having a good understanding of basic IPL properties and the typical protocols used for DED is key to successful treatment while minimizing risks

Questions?

References

All patient photos used with patient permission

- Gade A, Vasile GF, Rubenstein R. Intense Pulsed Light (IPL) Therapy. [Updated 2023 Apr 10]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan
- Hruza, GeorgeMarion, DW. Principles of laser and intense pulsed light for cutaneous lesions. In: UpToDate, Post, TW (Ed), UpToDate, Waltham, MA, 2022
- Jones L, Downie LE, Korb D, Benitez-del-Castillo JM, Dana R, Deng SX, et al. TFOS DEWS II management and therapy report. Ocul Surf 2017 Jul 1;15(3):575–628
- Nelson JD, Craig JP, Akpek EK, Azar DT, Belmonte C, Bron AJ, et al. TFOS DEWS II Introduction. Ocul Surf. 2017 Jul;15(3):269–275
- Periman, Laura, McJunkin, Raquel, Johnson, Kara, Kreuger, Casey. Novel, Non-Invasive Method for Addressing Acute and Chronic Chalazia: A Case Series.
- Sachdeva S. Fitzpatrick skin typing: Applications in dermatology. Indian J Dermatol Venereol Leprol 2009;75:93-96
- Schilling, L. M., Halvorson, C. R., Weiss, R. A., Weiss, M. A., & Beasley, K. L. (2019). Safety of Combination Laser or Intense Pulsed Light Therapies and Doxycycline for the Treatment of Rosacea. Dermatologic surgery : official publication for American Society for Dermatologic Surgery 2019 [et al.], 45(11), 1401–1405.
- Toyos R, McGill W, Briscoe D. Intense pulsed light treatment for dry eye disease due to meibomian gland dysfunction; a 3-year retrospective study. Photomed Laser Surg. 2015 Jan 1;33(1):41–46
- Wat H, Wu DC, Rao J, Goldman MP. Application of intense pulsed light in the treatment of dermatologic disease: a systematic review. Dermatol Surg. 2014 Apr;40(4):359–377. pmid:24495252
- Yan X, Hong J, Jin X, Chen W, Rong B, Feng Y, et al. The efficacy of intense pulsed light combined with meibomian gland expression for the treatment of dry eye disease due to meibomian gland dysfunction: a multicenter, randomized controlled trial. Eye Contact Lens. 2021