



TIME TO POWER-UP!
USING ENERGY-BASED THERAPIES IN OPTOMETRIC PRACTICE

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1

FINANCIAL DISCLOSURES

I have no financial disclosures



2

'DRY EYE' COLLECTIVELY DESCRIBES ALL ETIOLOGIES OF DRY EYE DISEASE

Category	Specific Causes	Details
Age & Gender	Aging (50+), Female sex, Menopause	Tear production decreases with age; hormonal fluctuations increase risk
Medical Conditions	Sjogren syndrome, Diabetes, Thyroid disease, Lupus, Rheumatoid arthritis	Autoimmune disorders attack tear-producing glands
Medications	Antihistamines, Antidepressants, Blood pressure drugs, Cold/allergy meds	Side effects reduce tear production
Lifestyle & Environment	High-intensity digital device use, Windy/dry/smoky environments, Sleep under a ceiling fan, sedentary	Reduced blinking and tear evaporation increase risk
Ocular Factors	Meibomian gland dysfunction, Contact lens wear, LASIK, Lacrimal gland dysfunction	Disrupts tear film composition and/or tear film production

McCann P, Kuvshin Z, Lopez G, Malik S, Qureshi R, Li T. Interventions for Dry Eye: An Overview of Systematic Reviews. *JAMA Ophthalmol*. 2024 Jun 1;142(1):98-114. doi: 10.1001/jamaophthol.2023.5751. PMID: 38127364. PMCID: PMC11619798.

3



LOVE YOUR EYELIDS

Disorders of the facial area and eyelid are frequently encountered in clinical practice

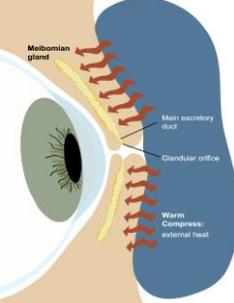
- Meibomian gland dysfunction
- Evaporative dry eye disease
- Hordeolum and chalazion
- Blepharitis
- Ectropion
- Ptosis
- Eyelid laxity
- Facial and ocular rosacea

Benita-Del-Castillo JM. How to promote and preserve eyelid health. *Opt Vis*. 2012 Oct; 25. PMID: 23118519. PMCID: PMC3484726.

4

TRADITIONAL DRY EYE THERAPIES

- The role of home-based eyelid hygiene is to effectively remove inflammatory debris and enhance expression of meibum through eyelid warming and massage
- Previous studies have determined that eyelid hygiene has a significant effect on meibomian gland dysfunction by comparative analyses between baseline and follow-up periods, or between treatments
- In a recent study, the maximum efficacy of eyelid hygiene was continuously increased up to 6 months and maintained for 4 months after stopping eyelid hygiene procedures (washing the eyelid margin with commercial eyelid scrub products after warm compression for 5-10 minutes)
- Only 40% of patients with meibomian gland dysfunction were compliant, even though face-to-face education regarding eyelid hygiene was provided at every visit during the study



Ahn H, Kim BK, Kim J, J YX, Jun J, Kim TL, Lee HC, Seo KY. How Long to Continue Eyelid Hygiene to Treat Meibomian Gland Dysfunction? *Clin Adv*. 2022 Jun 20;11(1):579. doi: 10.3390/clin11020529. PMID: 35159962. PMCID: PMC92317031.

5

INTERVENTIONAL DRY EYE (ENERGY-BASED THERAPIES AS A PRIMARY OPTION)

Device-based therapies that offer effective alternatives to traditional dry eye disease treatment protocols

- Intense Pulsed Light (IPL)
- Low-Level Light Therapy (LLLT)
- Radiofrequency Thermal Therapy (RF)
- Thermo-Mechanical Action (DMA)
- Dynamic Muscle Stimulation (DMS)



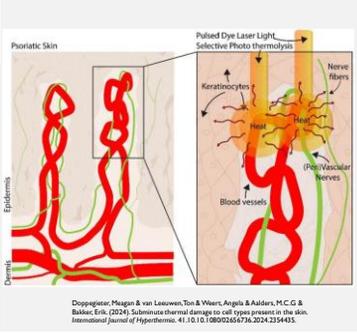
This more proactive approach can reduce symptoms and decrease the dependency on eye drops

6

INTENSE PULSED LIGHT

- Intense pulsed light (IPL) is created by a biostimulation device that uses a high-performance flash lamp to produce a non-coherent light output of large wavelength
- The basic principle of IPL therapy is selective photothermolysis
- IPL energy is directed to the skin and absorbed by chromophores such as melanin, hemoglobin and water, with the development of heat, thus inducing blood vessel coagulation and destruction

Tahirovic B, Waddan M, Arisa R, Friele F, Uthman TP. Intense pulsed light treatment in meibomian gland dysfunction: A concise review. *Opt Soc Am*. 2020; Oct 16:4181-4184. doi: 10.1016/j.jcoo.2020.06.002. Epub 2020 Jul 3. PMID: 32429037



7

INTENSE PULSED LIGHT DEVICES

Epi-C Plus Essilor Instruments	iProElite MDelite	OptiLIGHT Lumenis	Envision Immode

8

REGULATORY STATUS

- Medical-grade IPL devices are FDA-regulated instruments designed to treat diseases
- These devices must meet rigorous safety, efficacy, and, for electronic equipment, IEC 60601-1 standards to ensure patient safety
- Most IPL devices used by optometrists are FDA-cleared for aesthetic indications like skin rejuvenation, hair removal, and removal of pigmented or vascular lesions
- Prior to 2021, all IPL devices used to treat meibomian gland dysfunction and dry eye disease were used "off-label", likely based on clinical studies and independent practice
- The FDA granted De Novo authorization for the management of dry eye disease to the Lumenis Stellar M22 device in April 2021
- De Novo authorization is used for low-to-moderate risk devices with no predicate

9

LOW-LEVEL LIGHT THERAPY

Photobiomodulation is a process by which absorption of red or near infrared light energy produces a series of physiological effects at the cellular level

- First goal of light application is to modulate cellular bioenergetics to increase energy production
- Second goal is to reduce inflammation
- Additional functionalities include:
 - Thermal softening of meibum
 - Stimulates fibroblasts and thus increases production of collagen and elastin
 - Promotes the expression of genes associated with tissue regeneration and repair

Park, Yul & Kim, Hoon & Kim, Sehwon & Cho, Kyong. (2022). Effect of low-level light therapy in patients with dry eyes: prospective, randomized, observational trial. *Scientific Reports*, 12, 10.1038/s41598-022-07427-6.

Couturaud V, Le Fur M, Pellester M, Granotier F. Reverse skin aging signs by red light photobiomodulation. *Skin Res Technol*. 2023 Jul;29(7):1339-1. doi: 10.1111/srt.13391. PMID: 37522497; PMCID: PMC10311288.

10

LOW-LEVEL LIGHT THERAPY DEVICES

InfinityPro MDelite	Epi-C Plus Essilor Instruments	Valeda Alcon

11

REGULATORY STATUS

- Medical-grade LLLT biostimulation devices are FDA-regulated instruments designed to treat diseases
- These devices must meet rigorous safety, efficacy, and, for electronic equipment, IEC 60601-1 standards to ensure patient safety
- Most LLLT devices used by optometrists are FDA-cleared for aesthetic indications like skin rejuvenation, hair removal, and removal of pigmented or vascular lesions
- Prior to November 2024, all medical-grade LLLT devices used by optometrists to treat ocular and adnexal disease were used "off-label"
- The FDA granted De Novo authorization for the treatment of macular degeneration to the Valeda Light Delivery System in November 2024

12



"IT'S NEVER TOO SOON TO START LOVING YOUR EYELIDS"

13



PEDIATRIC MEIBOMIAN GLAND ATROPHY

Patients experience moderate-to-severe gland atrophy as the final end product of chronic inflammatory eyelid disease

In a United States-based population of children, a recent study found 42% had some evidence of meibomian gland atrophy despite having no symptoms of dry eye disease

Cupta PK, Stevens MA, Kozhaya N, Priestley Y. Prevalence of Meibomian Gland Atrophy in a Pediatric Population. *Cornea*. 2018 Apr;37(4):491-493. doi: 10.1097/ICO.0000000000001476. PMID: 29264952. PMCID: PMC5941629.

14

RADIOFREQUENCY THERMAL THERAPY

Radiofrequency thermal therapy is a non-invasive, in-office procedure that is designed to deliver heat therapy to the skin and its associated structures

Heating the inner layer of the skin increases the temperature of the oil inside the meibomian glands, a recommended therapy in treating meibomian gland dysfunction

The aesthetic effects of radiofrequency therapy are based on a mild heating of the skin's underlying network of collagen and elastin fibers to stimulate new collagen and elastin production

Photo courtesy of Ki Hargis, O.D.

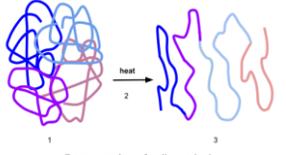


15

EYELID SKIN TIGHTENING

Neocollagenesis and Skin Remodeling

- Goal of treatment is to "Get A Better Blink"
- Denaturation of collagen occurs when heat therapy destroys all the collagen heat-labile intramolecular crosslinks leading to an "unwinding" and change in structure from a highly-ordered crystalline form to a randomly distributed and gel-like shape
- The 3D structure of the biomolecule is changed and the function as a catalyst for biological reactions is lost
- The presence of denatured proteins implies a potential disruption in cell activity, usually damages the cell, and puts the cell at risk of early death
- Immune system responds to thermal injury and produces new and better collagen that results in tighter skin



Denaturation of collagen by heat

Alman P,Baroni C, Mata F,Quarica Morita P An innovative temperature-controlling handpiece for face and body skin laxity and tightening treatment with radiofrequency Skin Res Technol. 2023 Jun;29(6):1385- doi: 10.1111/itr.13385 PMID: 37337641;PMCID: PMC10246499.

16

RADIOFREQUENCY THERAPY DEVICES

iProElite MDeLite



OptiPLUS Lumenis



Envision Inmode



17

REGULATORY STATUS

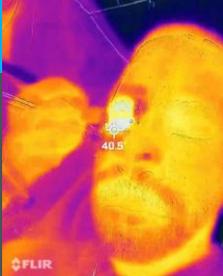
- Medical-grade radiofrequency devices are FDA-regulated instruments designed to treat diseases
- These devices must meet rigorous safety, efficacy, and, for electronic equipment, IEC 60601-1 standards to ensure patient safety
- Most RF devices used by optometrists are FDA-cleared for general use around the eyes and aesthetic indications like skin rejuvenation, hair removal, and removal of pigmented or vascular lesions
- Prior to November 2023, all medical-grade RF devices used by optometrists to treat ocular and adnexal disease were used "off-label"
- The OptiPLUS received FDA clearance for use in patient with goals of improving blood circulation and stimulating collagen production for ophthalmic use in 2023

18

MEIBUM LIPODOMICS

STUDY OF PATHWAYS AND NETWORKS OF CELLULAR LIPIDS IN BIOLOGICAL SYSTEMS

- Meibum is not a solid at low temperatures, but exists as a gel phase that is 20% disordered; conversely, it is not a liquid at higher temperatures, but exists in a liquid-crystalline phase that is about 80% disordered
- "Melting" should not be used to describe the meibum fluidity changes seen in meibomian gland dysfunction since melting is associated with a phase change from solid to liquid
- In vitro and in vivo studies demonstrate that the temperatures required to increase the fluidity of obstructive secretions range from 32°C to 45°C in mild-to-moderate disease
- 40°C is required for maximum lipid disorder and effective liquefaction in normal patients and 41.5°C is required for patients with severe disease
- It should be noted that heating the meibum just 2.5°C disorders the meibum 66% and sub-optimal temperatures are still effective at disordering the lipids



FLIR

Eyelid temperature measured during radiofrequency thermal therapy with FLIR One Pro thermal camera

19

THERMO-MECHANICAL ACTION DEVICE

- Tixel I by Tixel
- Addresses meibomian gland dysfunction with targeted heat therapy
- Goal of the treatment is to restore meibomian gland function and improve dry eye disease signs and symptoms
- 2-3-minute treatment time
- The Tixel i received FDA-clearance for use in patients with evaporative dry eye disease from meibomian gland dysfunction in November 2024



20

EYELID MALPOSITION

Although symptoms are important, a careful examination of the eyelids is required to determine any eyelid malposition and prescribe treatment

- Lower eyelid position
- Eyelid retraction test
- Eyelid laxity evaluation
- Lagophthalmos evaluation
- Floppy eyelid evaluation

Horizontal eyelid laxity is the primary cause of eyelid malposition and horizontal eyelid tightening can eliminate the laxity



"Snap back test"

21

LACRIMAL PUMP MECHANISM

Tears flow along the upper and lower margins of the eyelids and enter the upper and lower canaliculi by capillary action and suction

With each blink, the orbicularis muscle squeezes the puncta and canaliculi together and it also contracts and expands the lacrimal sac, thereby creating negative pressure which sucks the tears from the canaliculus into the sac

When the eyes open, the muscles relax, the lacrimal sac collapses, and a positive pressure is created which forces tears down into the nasolacrimal duct



Failure of the lacrimal pump mechanism results in tears pooling in the conjunctival sulcus until they spill over the eyelid after the blink

22

DYNAMIC MUSCLE STIMULATION DEVICE

- OptiLIFT by Lumenis
- Addresses lower eyelid laxity and impaired blinking by using pulses of energy that produce regular contractions of the muscles in the eyelids
- Goal is to restore muscle tone and improve blinking quality
- The OptiLIFT received FDA clearance for use in patients with lower eyelid laxity and impaired blinking in 2025
- Application of the OptiLIFT for use in patients with evaporative dry eye disease from meibomian gland dysfunction is considered "off-label"



23

CONCLUSION

- Expand your delivery of optometric services into energy-based therapies when treating patients with ocular and adnexal disease
- Restore eyelid structure and function in ways that cannot be done with eye drops, eyelid hygiene procedures, or blinking exercises
- Minimize your patient's daily burden of disease by offering to reduce or eliminate the burden



24