# Intense Pulsed Light vs. Low-level Light Therapy

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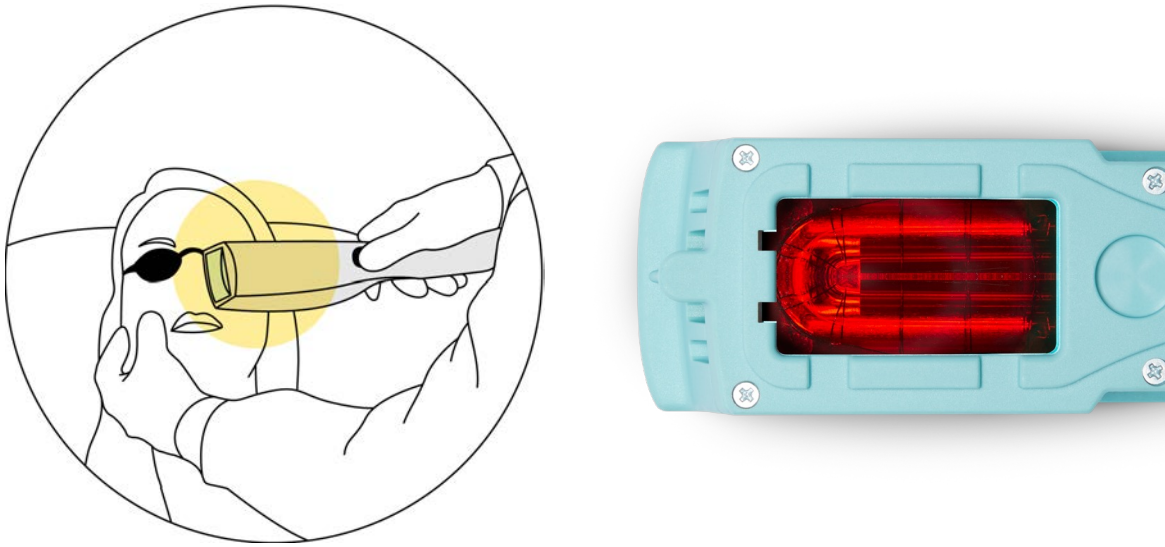
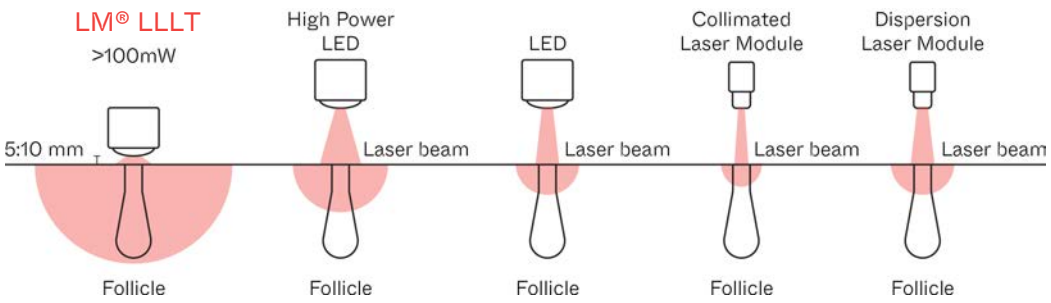
MECHANISMS OF ACTION

1. Blood vessels thrombosis
2. Meibum heating & liquefaction
3. ↑ Anti-inflammatory molecules
4. Metalloproteinases suppression
5. Demodex eradication
6. Photomodulation

NON-COHERENT POLYCHROMATIC LIGHT SOURCE (∧ = 500-1200 NM)





#1 / COCHRANE

114 PATIENTS

3 RCTs 2015-2019

COTE S. ET AL 2020

#2 / GRAEFE'S ARCHIVE

539 PATIENTS

9 RCTs 2015-2019

LENG X. ET AL 2021

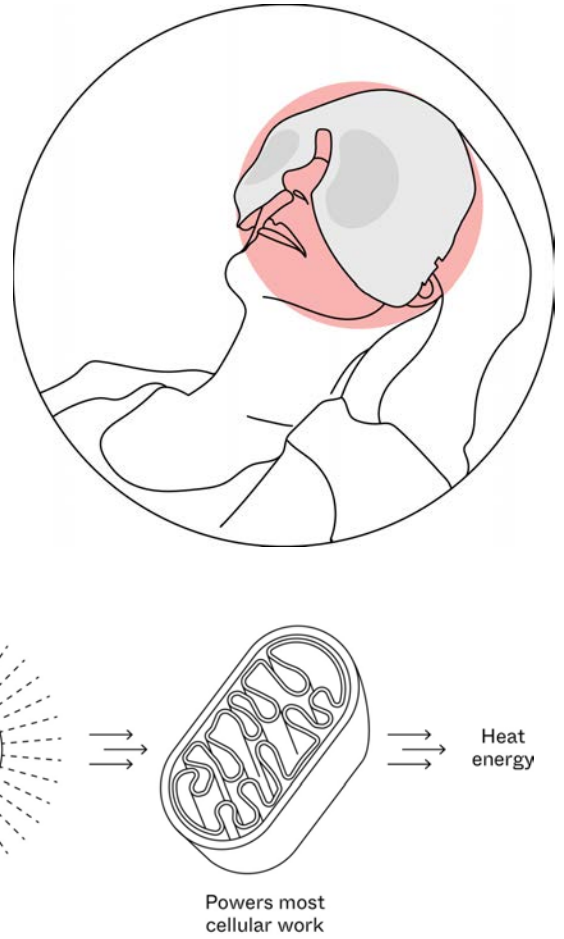
1. IPL with MGX may be an effective & safe treatment to improve TBUT in MGD patients
2. **NOT sufficient** evidence **to confirm improvements** of dry eye symptoms
3. **NOT recommended** to be performed **as** the **only therapy**
4. The **positive effects** of IPL may **decrease within 6 months** after the last session, suggesting a repeatable adjuvant use in combination with other options
5. Due to the limited quantity & quality of the studies, larger, well-designed, strictly blinded, multicenter RCTs are still needed to provide more robust evidence

MECHANISMS OF ACTION

Near-infrared light to elicit **mitochondrial light absorption** & induce **cell photoactivation** with changes in inflammatory protein expression.

Photobiomodulation increases the availability of electrons to Cox, resulting in **enhanced cellular metabolism** and upregulation of **ATP** & **cAMP**.

MONO-CHROMATIC LIGHT SOURCE (DIFFERENT WAVELENGTHS)




 SOURCE: MARKOULLI M, ET AL. PHOTOBIOMODULATION (LOW-LEVEL LIGHT THERAPY) AND DRY EYE DISEASE. CLIN EXP OPTOM. 2021;104(5):561-566.

# Thermography studies recently run have shown upper and lower meibomian glands being simultaneously, directly treated at optimal temperature—i.e., 42°C, through LM® LLLT.

Light Modulation® LLLT triggers endogenous heating to both eyelids, stimulating ATP production and removing blockage from meibomian glands preventing proper functioning—and it does so with zero discomfort for the patient

SOURCE: PULT, H. (2020). LOW-LEVEL LIGHT THERAPY IN THE TREATMENT OF MEIBOMIAN GLAND DYSFUNCTION. INVESTIGATIVE OPHTHALMOLOGY & VISUAL SCIENCE, 61(7), 99-99.

# IPL + LLLT: Dual Stimulation

Evaluating the synergy between the two techniques.

94 eyes / 47 patients suffering from MGD/DED and treated with eye-light®.


> RESULTS / 3 MONTHS AFTER TREATMENT

| | |
|---|---|
| OSDI | Significant reduction in 95.6% of eyes<br>P<0.0001 |
| TBUT | Significant increase in 72.3% of eyes<br>P<0.0001 |
| MBX | Significant increase in 80.8% of eyes<br>P<0.0001 |

**Significant reduction** (P<0.05) in tear fluid levels of IL-1β, IL-17F, & MMP9; MMP9/TIMP1 ratio.

**Positive results** in patients with **chronic** MGD & DED. Clinical & molecular factors changes support the improved symptomatology & **reduced inflammation**.

D'SOUZA S, ET AL. "CLINICAL AND MOLECULAR OUTCOMES AFTER COMBINED IPL THERAPY WITH LLLT IN RECALCITRANT EVAPORATIVE DRY EYE DISEASE WITH MEIBOMIAN GLAND DYSFUNCTION". CORNEA. 2021

40 eyes / 20 patients suffering from Sjögren's Syndrome and treated with eye-light®.


DI MARINO M, ET AL. "COMBINED LOW-LEVEL LIGHT THERAPY AND INTENSE PULSED LIGHT THERAPY FOR THE TREATMENT OF DRY EYE IN PATIENTS WITH SJÖGREN'S SYNDROME". J OPHTHALMOL. 2021



> RESULTS

| | |
|---|---|
| BUT | T0 vs T1, P<0.01 ; T0 vs T3, P<0.0001 |
| Schirmer | Value increased but without significant difference |
| OSDI | T0 vs T1, P=0.0003 ; T0 vs T3, P=0.02 |

**All patients except one** completed the experimental therapeutic protocol **without the need to reintegrate lacrimal substitutes**.

| Measure | T0 | T1 | T3 |
|---|---|---|---|
| BUT (sec) | 3.5 ± 1.65 | 4.5 ± 2 | 5.3 ± 2.7 |
| Schirmer (mm) | 8.6 ± 7.9 | 9.5 ± 10 | 10.38 ± 9.97 |
| OSDI | 50.5 ± 17.5 | 31.46 ± 12.11 | 38.31 ± 19.35 |

T0: baseline
T1: 1 month after IPL+LLT
T3: 3 months after IPL+LLT

Retrospective chart review of 230 patients treated with eye-light® after medical therapy failure (3 centers).


> INCLUSION CRITERIA & RESULTS

| | | INCLUSION CRITERIA |
|---|---|---|
| OSDI | > 33 | |
| TBUT | ≤ 6 sec. | |
| MGD | ≥ 2 | |

> RESULTS

| Measure | n | Pre treatment | Post treatment | |
|---|---|---|---|---|
| OSDI Score | 230 | 42.2±18.8 (6 to 93) | 24.2±15.9 (0 to 75) | P < 0.001 |
| MGD Grade* | 460 | | | P < 0.001 |
| 0 | | | 6 | |
| 1 | | | 34 | |
| 2 | | 9 | 181 | |
| 3 | | 175 | 179 | |
| 4 | | 276 | 60 | |
| TBUT (seconds) | 460 | 4.4±2.1 (0 to 14) | 8.0±3.0 (1 to 17) | P < 0.01 |

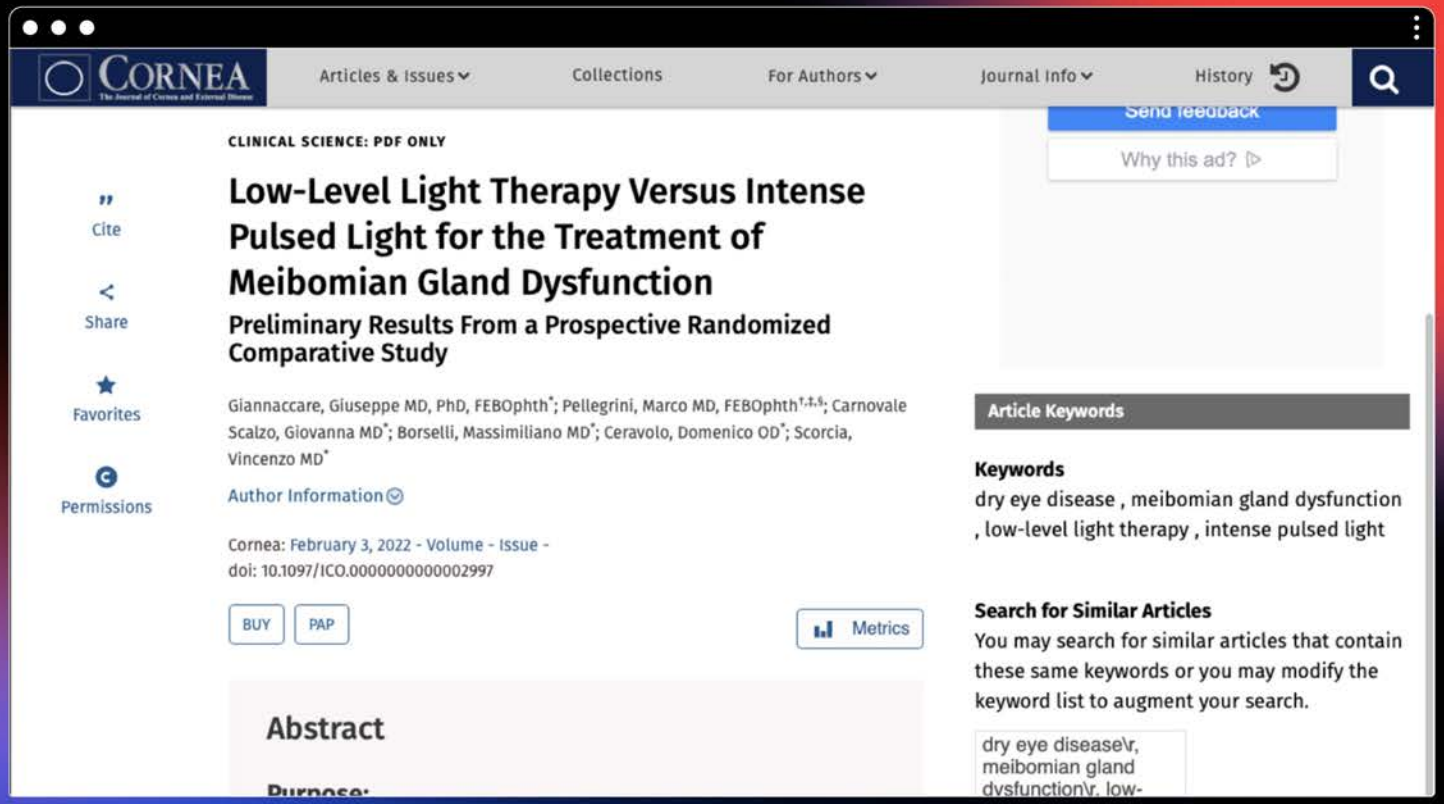


STONECIPHER K, ET AL. "COMBINED LOW LEVEL LIGHT THERAPY AND INTENSE PULSED LIGHT THERAPY FOR THE TREATMENT OF MEIBOMIAN GLAND DYSFUNCTION." CLIN OPHTHALMOL. 2019 11;13:993-999.

# IPL vs. LLLT

## Which technique has the higher impact on DED?

PURPOSE OF THE STUDY
> TO EVALUATE & COMPARE THE SAFETY & EFFICACY OF LLLT VS IPL FOR THE TREATMENT OF MGD



SETTING

## University Hospital of Catanzaro (Italy)

DATE

## September 2020 to June 2021

METHODS

## 1:1 ratio randomization, patients & investigators blinded to allocation

INTENSE PULSED LIGHT
eye-light®

LOW-LEVEL LIGHT THERAPY
my-mask®

| INCLUSION CRITERIA |
|---|
| Age ≥ 18 years |
| Clinical signs & symptoms of MGD |
| Ability to comply with the treatment |

| EXCLUSION CRITERIA |
|---|
| Any ocular surface disease other than MGD or any uncontrolled ocular/systemic disease |
| Previous ocular surgery or eyelid trauma; hypotensive eye drops use; punctal plugs |
| Skin pigmented lesions in the treatment area; pregnancy & breastfeeding |

40 patients were enrolled & randomized to receive LLLT (n = 20) or IPL (n = 20).

There were no significant differences for all baseline parameters between the 2 groups (P>0.05).

**TABLE 1.** Baseline Demographic and Clinical Characteristics of Patients Enrolled in the Study According to the Type of Treatment

| Parameter | LLT | IPL | *P* |
|---|---|---|---|
| Age (yr) | 55.3 ± 17.2 | 60.9 ± 16.0 | 0.401 |
| Sex (M/F) | 14/6 | 8/12 | 0.112 |
| Ethnicity | | | 0.598 |
| European | 18 (90%) | 19 (95%) | |
| Other | 3 (15%) | 1 (5%) | |
| Rosacea | 4 (20%) | 6 (30%) | 0.715 |
| Ocular allergy | 2 (10%) | 1 (5%) | 1.000 |
| Duration of MGD (yr) | 2.4 ± 1.5 | 3.2 ± 1.9 | 0.106 |
| History of MGX | 8 (40%) | 12 (60%) | 0.527 |
| History of MGP | 1 (5%) | 0 (0%) | 1.000 |

Improvement in the **SPEED** score was **significantly greater** in the **LLLT** compared to the IPL group (P = 0.014).

**TABLE 2.** Ocular Surface Parameters in the LLLT Group and IPL Group Before and 2 weeks After the Last Session of Treatment

| Parameter | Group | Before Treatment | After Treatment | *P* |
|---|---|---|---|---|
| SPEED | LLLT | 16.8 ± 4.6 | 6.9 ± 3.2 | **<0.001** |
| | IPL | 16.4 ± 3.2 | 9.7 ± 4.1 | **<0.001** |
| TMH (mm) | LLLT | 0.27 ± 0.12 | 0.33 ± 0.10 | **0.003** |
| | IPL | 0.26 ± 0.11 | 0.25 ± 0.9 | 0.948 |
| NIBUT (s) | LLLT | 5.5 ± 3.3 | 5.4 ± 2.9 | 0.717 |
| | IPL | 6.1 ± 4.4 | 9.4 ± 7.7 | 0.193 |
| Redness score | LLLT | 1.2 ± 0.5 | 1.3 ± 0.6 | 0.527 |
| | IPL | 2.2 ± 3.8 | 1.4 ± 0.4 | 0.569 |
| Meiboscore | LLLT | 1.4 ± 0.7 | 1.4 ± 0.8 | 0.484 |
| | IPL | 1.8 ± 0.7 | 1.5 ± 0.5 | 0.182 |
| MGL (upper eyelid) (%) | LLLT | 73.8 ± 13.0 | 78.3 ± 12.1 | 0.306 |
| | IPL | 75.7 ± 10.0 | 76.0 ± 10.3 | 0.989 |
| MGL (lower eyelid) (%) | LLLT | 73.0 ± 12.3 | 75.6 ± 14.5 | 0.154 |
| | IPL | 75.3 ± 18.9 | 73.5 ± 21.4 | 0.570 |

Numbers in bold indicate values of significance less than 0.05.

Improvement in the **SPEED** score was **significantly greater** in the **LLLT** compared to the IPL group (P = 0.014).

~

**TMH significantly increased** in the **LLLT** group, but not in the IPL group.

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**NIBUT**, **redness score**, **meiboscore**, & **MGL** of the upper & lower eyelids **did not vary** significantly after treatment (all P > 0.05).

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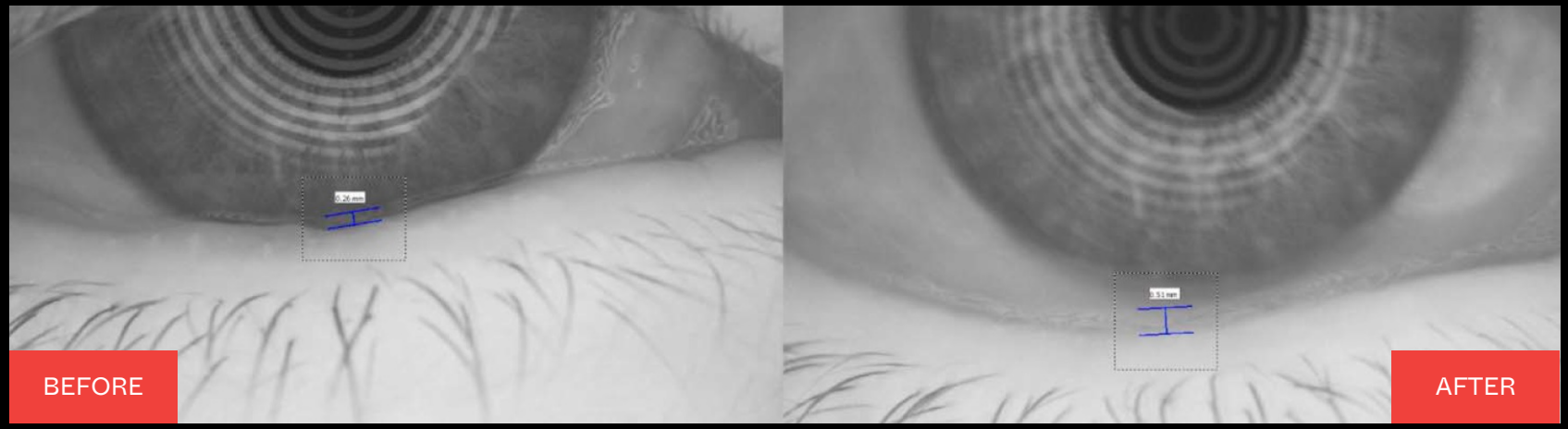
TMH significantly increased in the LLLT group, but not in the IPL group.

# Why?

IPL alone is known to have little effect on tear production.
It has been hypothesized that the **tissue photobiomodulation induced by LLLT** could affect the function of the lacrimal gland.





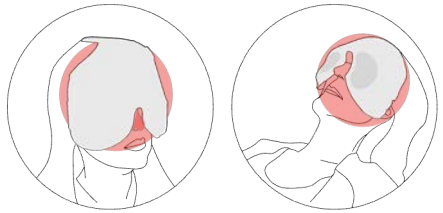
MARTA A, ET AL. “INTENSE PULSED PLUS LOW-LEVEL LIGHT THERAPY IN MEIBOMIAN GLAND DYSFUNCTION”. CLIN OPHTHALMOL. 2021;15:2803–2811.

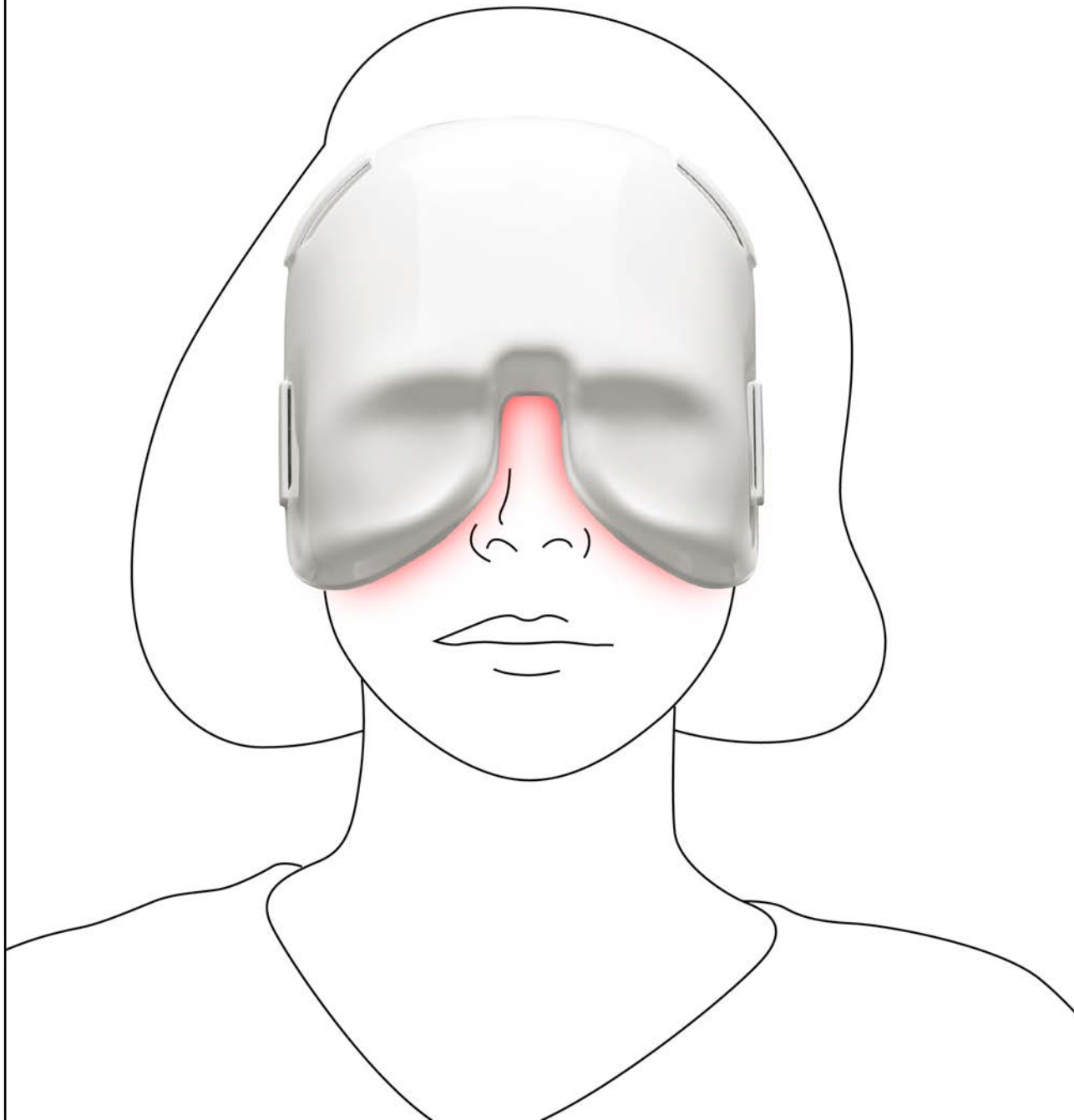
1. IPL & LLLT are both non-invasive, well-tolerated treatments that **reduce DE signs & symptoms when used in combination**.
2. Comparing IPL & **LLLT**, the latter was shown to be **more effective** for DE treatment with **significantly lower** ocular discomfort symptoms & **higher tear production**.
3. LLLT can be **used with success** for DE treatment both **alone & in combination with IPL**.

# Through eye-light® both operators and patients can enjoy the unique benefits of LM® LLLT technology.

eye-light® and LM® LLLT have many benefits:

i. it's fast—a treatment lasts 15'
ii. it's painless
iii. it grants immediate relief to the patient
iv. it's easy and safe for the operator
v. it's plug&play—it doesn't require the operator to be constantly present during the treatment





espansione group

# Thanks for your attention.

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