The Latest in Advancements and Technology in Ocular Disease

Mile Brujic, OD, FAAO

Disclosure

- Dr. Brujic has the following relevant financial relationships: Apellis (consultant, speakers bureau), ABB Optical (received meeting support), Abbvie (consultant), Alcon (consultant, speakers bureau), Art Optical (received meeting support), Bausch + Lomb Health (consultant, speakers bureau), Contamac (received meeting support), CooperVision (received meeting support), CSEye (consultant), Dompe (consultant), Dopavision (consultant), Glaukos (consultant), Johnson & Johnson Vision Care (received meeting support), Lentechs (received research support), MDElite (consultant), Nordic Pharma (consultant), Orasis (consultant, speakers bureau), Radius XR (consultant), Sun Pharma (speakers bureau), Tangible Science (received meeting support), Tarsus (consultant, speakers bureau), Viatris (consultant, speakers bureau), Visionix (consultant), Walman Optical (received meeting support).
- These relationships have been mitigated and will not influence the content of this presentation

No AMD
-No drusen or <10 small drusen (<63um) without pigment abnormalities

Early AMD
-Approximately >9 small drusen or <15 intermediate drusen (63-124um) or pigment abnormalities associated with AMD

Intermediate AMD
-Approximately >14 intermediate drusen or any large drusen (>124um)

Advanced AMD
-Geographic atrophy with involvement of the macular center or non-central GA atleast 350um in size

ForeseeHome

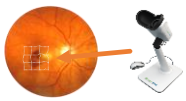
Uses **Preferential Hyperacuity Perimetry (PHP)**

Proven efficacy with level 1 evidence

Real-World Remote Patient Monitoring Model

Preferential Hyperacuity Perimetry test for detecting visual abnormalities

1. Patient's Home
2. My Clinic
3. Monitoring Center

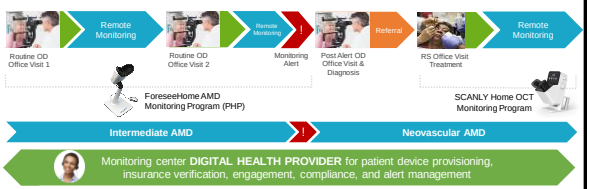


Preferential Hyperacuity Perimetry (PHP) identifies visual distortions caused by, but not limited to, conversion from dry to wet AMD

ForeseeHome (Notal Vision) uses PHP test on a home-based device performed by the patient

Digital healthcare services for AMD patients

Dedicated remote monitoring programs with advanced, AI-based technologies support Optometrist diagnosis of acute nAMD conversion and monitoring of chronic therapy between office visits



SCANLY Home OCT Device

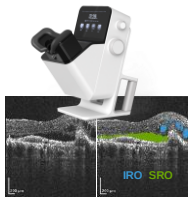
EASY-TO-USE PATIENT SELF-OPERATED CONNECTED DEVICE

Key Features

- Portable device: size 14"x11"x14" (WxDxH), weight <16 lbs.
- Patient self-setup and self-operation
- Automatic data transmission via built-in wireless connection
- AI-enabled estimation of hypo-reflective spaces

Imaging System Specifications

- Spectral-domain optical coherence tomography (SD-OCT)
- Scan area: 10 x 10 degree (3mm x 3mm)
- High density volume scan with up to 88 B-scans and 34 µm spacing
- Self-imaging time < 1 minute per eye[1]



1. https://clinicaltrials.gov/study/NCT04907409

IRO: Intra-retinal hypo-reflective spaces | **SRO**: Sub-retinal hypo-reflective spaces

DID YOU KNOW?

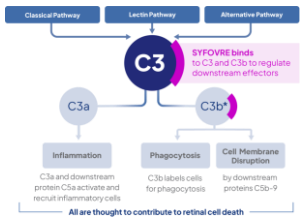
- ~1M people are affected by GA in the US
- Vision loss from GA can occur before lesions reach the fovea
- The median time to foveal encroachment in GA patients was just 2.5 years

SYFOVRE (pegcetacoplan injection) APPROVED ON FEB 17, 2023

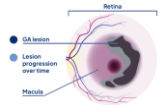
INDICATION: SYFOVRE™ (pegcetacoplan injection) is indicated for the treatment of geographic atrophy (GA) secondary to age-related macular degeneration (AMD).

INTRAVITREAL INJECTION given monthly or every other month (EoM); Based upon doctor's discretion

Mechanism of Action:
Targeting C3 within the Complement Cascade



RESULTS:
Monthly and EoM



Trial 1

After 2 years, compared to those who did not receive SYFOVRE, **SYFOVRE slowed lesion growth by**

- **22%** when taken monthly (n=202)
- **18%** when taken every other month (n=205)

Trial 2

After 2 years, compared to those who did not receive SYFOVRE, **SYFOVRE slowed lesion growth by**

- **18%** when taken monthly (n=201)
- **17%** when taken every other month (n=201)

GATHER1
GATHER2

The Efficacy of Avacincaptad Pegol in Geographic Atrophy:
GATHER1 and GATHER2 Results

Arshad M Khanani, MD, MA[1]; Sunil S Patel, MD, PhD[2]; Giovanni Staurenghi, MD[3]; Ramin Tadayoni, MD, PhD[4]; Carl J Danzig, MD[5]; David R Lally, MD[6]; Anat Loewenstein, MD[7]; David S Boyer, MD[8]; Carl D Regillo, MD[9]; Tien P Wong, MD[10]; Glenn J Jaffe, MD[11]; Justin Tang, PhD[12]; Liansheng Zhu, PhD[12]; Hersh Patel, OD[12]; Julie Clark, MD[12]

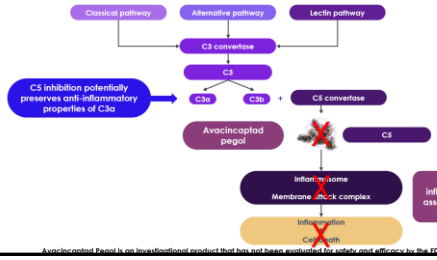
[1]Sierra Eye Associates, Reno, NV, USA; [2]University of Nevada, Reno School of Medicine, Reno, NV, USA; [3]West Texas Retina Consultants, Abilene, TX, USA; [4]Eye Clinic, Department of Biomedical and Clinical Sciences "Luigi Sacco," University of Milan, Milan, Italy; [5]Université de Paris, Ophthalmology Department, AP-HP, Hôpital Lariboisière, Paris, France; [6]Rand Eye Institute, Deerfield Beach, FL, USA; [7]Florida Atlantic University, Charles E. Schmidt School of Medicine, Boca Raton, FL, USA; [8]New England Retina Consultants, Springfield, MA, USA; [9]Division of Ophthalmology, Tel Aviv Sourasky Medical Center, Tel Aviv University, Tel Aviv, Israel; [10]Retina Vitreous Associates Medical Group, Los Angeles, CA, USA; [11]Wills Eye Hospital, Philadelphia, PA, USA; [12]Retina Consultants of Texas; Retina Consultants of America; Blanton Eye Institute, Houston Methodist Hospital, Houston, TX, USA; [13]Department of Ophthalmology, Duke University, Durham, NC, USA; [14]Iveric Bio, Parsippany, NJ, USA

The Retina Society 55th Annual Scientific Meeting, Pasadena, CA
November 2 – 5, 2022

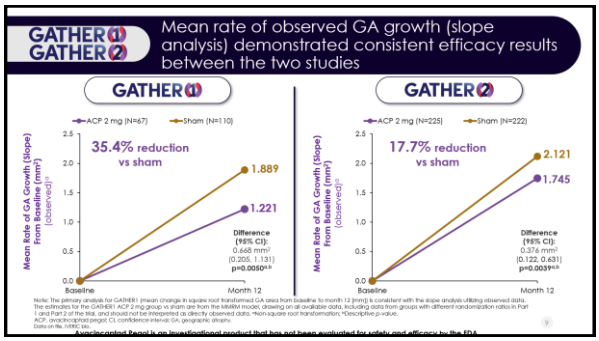
MED-2200207

Avacincaptad Pegol is an investigational product that has not been evaluated for safety and efficacy by the FDA

Avacincaptad pegol is a pegylated RNA aptamer designed to be a specific inhibitor of complement C5



Avacincaptad Pegol is an investigational product that has not been evaluated for safety and efficacy by the FDA

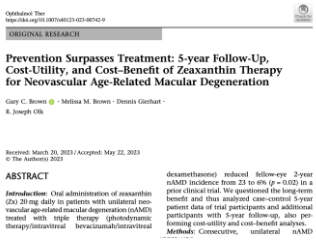


Avacincaptad pegol (IZERVAY) is approved for the treatment of geographic atrophy secondary to age-related macular

- Efficacy and safety of IZERVAY were evaluated in 2 phase 3, randomized, multi-center, doublemasked, sham-controlled clinical trials
  - Izervay safety profile was consistent, with a high rate of patient retention
  - Izervay demonstrated significant reductions in ga growth in just 12 months

1.IZERVAY™ (avacincaptad pegol intravitreal solution) Prescribing Information. IVERIC bio, Inc., Parsippany, NJ 07054.

New Data on Zeaxanthin



Ophthalmol Ther
https://doi.org/10.1007/s40123-023-00742-9

ORIGINAL RESEARCH

Prevention Surpasses Treatment: 5-year Follow-Up, Cost-Utility, and Cost–Benefit of Zeaxanthin Therapy for Neovascular Age-Related Macular Degeneration

Gary C. Brown · Melissa M. Brown · Dennis Gierhart · R. Joseph Oik

Received: March 20, 2023 / Accepted: May 22, 2023
© The Author(s) 2023

ABSTRACT

Introduction: Oral administration of zeaxanthin (Zx) 20 mg daily in patients with unilateral neovascular age-related macular degeneration (nAMD) treated with triple therapy (photodynamic therapy/intravitreal bevacizumab/intravitreal dexamethasone) reduced fellow-eye 2-year nAMD incidence from 23 to 6% ($p = 0.02$) in a prior clinical trial. We questioned the long-term benefit and thus analyzed case–control 5-year patient data of trial participants and additional participants with 5-year follow-up, also performing cost-utility and cost–benefit analyses.

Methods: Consecutive, unilateral nAMD

-Group randomized to 20mg of Zeaxanthin (ZX) per day + AREDS 2 vs just AREDS 2
-Paitents developing nAMD in the non-affected eye in that time period
  -22% of ZX
  -48% of non-ZX

iCare HOME2 and HOME
Measurement guidance before the measurement

iCare HOME2

Smart light guide enables **active positioning guidance** for the patient. The light rings help find the correct measurement distance.

- Solid red light means the device is not level and cannot take a measurement
- Visible **blue light ring** indicates that the probe is too far from the eye
- When the patient sees a symmetrical green light ring, the device is positioned in correct angle

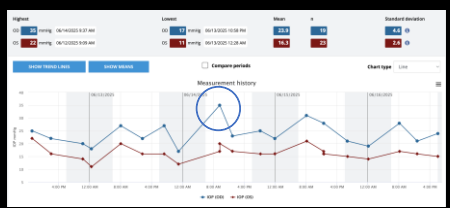
iCare HOME

Probe base light to help level the tonometer

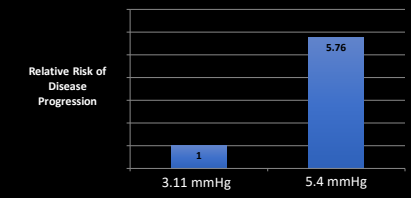
- Solid red light means the device is not level and cannot take a measurement
- When the patient sees a symmetrical green light ring, the device is level and centered

OS IOP measuring higher in office

OD IOP has slowly been increasing



Self-Monitoring – Diurnal Range



Arsani S, Zeimer R, Wilensky J, et al. Large diurnal fluctuations in intraocular pressure are an independent risk factor in patients with glaucoma. *J Glaucoma*. 2000;9:134-142.

Ocular Perfusion Pressure (OPP)

OPP = **2/3([DBP + 1/3(SBP – DBP)] – IOP)**

Simplified clinical equation:

DPP = DP - IOP

Wearable Devices for VF

Radiusxr
Virtual Vision
Olleyes
M&S Technologies

Study on Effect of Nutrition on Computer Symptoms

- 360 participants
- Randomized to 4 groups that utilized 1 of four nutritional formulations for 90 days
- Measurements were taken at baseline, 45 days later and 90 days later
  - 1 – Placebo
  - 2 - 6 mg Lutein, 1.2mg Zeaxanthin, 75mg chrysanthemum extract, 75mg goji berry extract, 100mg black current extract
  - 3 - 10 mg Lutein, 2 mg Zeaxanthin, 125mg chrysanthemum extract, 125mg goji berry extract, 167mg black current extract
  - 4 – 14 mg Lutein, 2.8 mg Zeaxanthin, 175mg chrysanthemum extract, 175mg goji berry extract, 233mg black current extract

Results

- 1 - Improved eye fatigue symptoms
- 2 - Improved visuognosis persistence
- 3 - Improved Schirmer test
- 4 - Improved macular pigment optical density (MPOD)

AZR-MD-001

- **Mechanism of action**: Contains selenium sulfide, a keratolytic agent also found in some anti-dandruff shampoos.
- **Safety/efficacy:**
  - An interim data analysis from a double-masked, vehicle-controlled trial presented at ARVO 2021 found a significantly greater change in OSDI score of at least 4.5 units in the group receiving 1.0% AZR concentration (85.7%) vs vehicle group (22.2%, *P*=.03)
    - Change from baseline in Meibomian Gland Score was also significantly higher with 1.0% AZR vs control (*P*=.03)

Gupta PK et al. Clin Ophthalmol. 2021;15:4399-4404. https://www.ajosjournals.org/article.aspx?articleid=2774724. https://clinicaltrials.gov/ct2/show/NCT03652051?term=azr-md-001&draw=2&rank=4

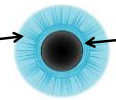
100% Perfluorohexyloctane

- **Mechanism of action**: Sole ingredient is perfluorohexyloctane, which covers the tear film to limit aqueous evaporation and penetrates meibomian glands, reportedly dissolving altered meibum
- **Safety/efficacy**:
  - Results of the phase 3 double-masked GOBI study presented at the 2022 ASCRS annual meeting showed that adults with MGD-related DED in the treatment group vs placebo group had significantly improved total corneal fluorescein staining (2.0 vs -1.0) and visual analog scale dryness score (-27.4 vs -19.7), *P*<.001 for both) on Day 57.
    - Blurred vision was the only adverse event more likely in treated subjects (3.0% vs 0.3%).
  - Topline data of the phase 3 MOJAVE trial announced in 2021 also included significant change on these efficacy outcomes versus control on day 57 (*P*<.001 for both)

Tauber J et al. Cornea. 2021;40(9):1132-1140. https://ascrs.confex.com/ascrs/22am/meetingapp.cgi/Paper/81754. https://ir.bauschhealth.com/news-releases/2021/09-30-2021-115908870

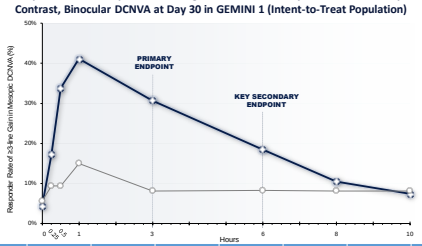
MOAs of Different Miotics In Development For Presbyopia

Iris Dilator Muscle Inhibition
0.75% phentolamine
0.1% brimonidine



Iris Sphincter Muscle Activation
- 0.4% pilocarpine
- 1.25% pilocarpine
- Low-dose pilocarpine
- 2% pilocarpine
- 2% aceclidine
- 2.75% carbachol + 0.1% brimonidine

Proportion of Participants Achieving 3-Lines or More Improvement in Mesopic, High Contrast, Binocular DCNVA at Day 30 in GEMINI 1 (Intent-to-Treat Population)



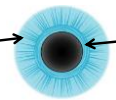
Mesopic illumination was defined as 10-11 lux, measured at the target

Timepoint	Hour 0	Hour 0.25	Hour 0.5	Hour 1	Hour 3	Hour 6	Hour 8	Hour 10
VUITY (%)	4.3	17.7	34.8	41.6	30.7	18.4	10.6	7.5
Vehicle (%)	5.9	9.8	9.8	15.7	8.1	8.8	8.5	8.6
Difference (95% CI)	-1.5 (-6.4, 3.3)	7.9 (0.3, 15.5)	25.0 (16.2, 33.8)	25.9 (16.4, 35.5)	22.5 (14.3, 30.8)	9.7 (2.3, 17.0)	2.1 (-4.4, 8.5)	-1.1 (-7.1, 5.0)

VUITY™ [package insert]. North Chicago, IL: Allergan, an AbbVie Company, USA

MOAs of Different Miotics In Development For Presbyopia

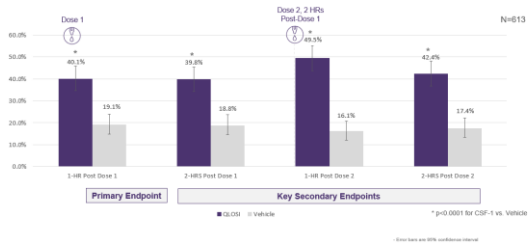
Iris Dilator Muscle Inhibition
0.75% phentolamine
0.1% brimonidine



Iris Sphincter Muscle Activation
- 0.4% pilocarpine
- 1.25% pilocarpine
- Low-dose pilocarpine
- 2% pilocarpine
- 2% aceclidine
- 2.75% carbachol + 0.1% brimonidine

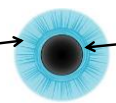
QLOSI™ ACHIEVED ALL PRIMARY & KEY SECONDARY ENDPOINTS

POOLED DAY 8 – PROPORTION OF PARTICIPANTS ACHIEVING ≥ 3-LINE IMPROVEMENT DCNVA, AND NO LOSS OF 1-LINE OR MORE IN DISTANCE VISUAL ACUITY (STUDY EYE)



MOAs of Different Miotics In Development For Presbyopia

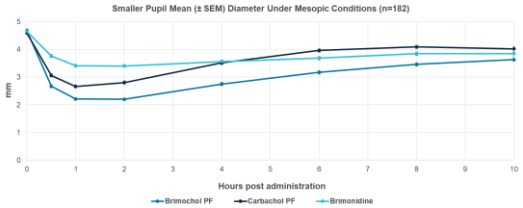
Iris Dilator Muscle Inhibition
0.75% phentolamine
0.1% brimonidine



Iris Sphincter Muscle Activation
- 0.4% pilocarpine
- 1.25% pilocarpine
- Low-dose pilocarpine
- 2% pilocarpine
- 2% aceclidine
- 2.75% carbachol + 0.1% brimonidine

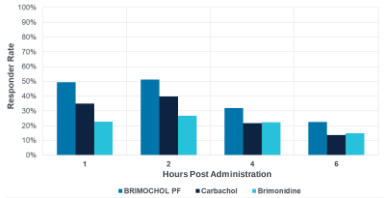
BRIMOCHOL™ PF Significantly Superior to Carbachol & Brimonidine in Pupil Diameter Reduction: 30mins to Hour 10

- All Differences Between BRIMOCHOL™ PF and Monotherapies Highly Significant (p<0.001) at All Timepoints
- Gradual offset of BRIMOCHOL™ PF miosis balances near vision improvement with minimizing night-time vision risks



US FDA Primary Endpoint Met at Hours 1, 2, 4, and 6

Primary for US FDA: Proportion of Subjects with a ≥15 ETDRS Letter Gain from Pre-dose Baseline in BUCNVA without a ≥5 ETDRS Letter Loss in BUCDVA under Mesopic Conditions (n=182)



P-values	Hr1	Hr2	Hr4	Hr6
vs. Carbachol	<0.001	0.008	0.012	0.006
vs. Brimonidine	<0.001	<0.001	0.022	0.039

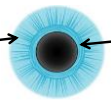
BRIMOCHOL™ PF superior to Carbachol and Brimonidine at multiple timepoints – 1,2,4 and 6 hours

BRIMOCHOL™ PF has higher peak efficacy and longer duration than only marketed product

BRIMOCHOL™ PF is being evaluated against vehicle as part of ongoing Phase 3 Program – evaluating 8+ hour performance

MOAs of Different Miotics In Development For Presbyopia

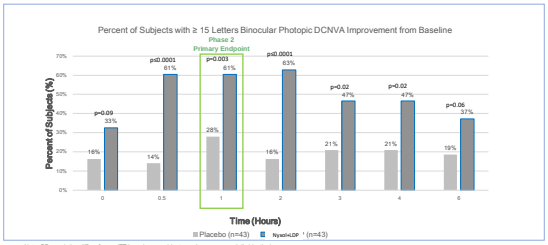
Iris Dilator Muscle Inhibition
0.75% phentolamine
0.1% brimonidine



Iris Sphincter Muscle Activation
- 0.4% pilocarpine
- 1.25% pilocarpine
- Low-dose pilocarpine
- 2% pilocarpine
- 2% aceclidine
- 2.75% carbachol + 0.1% brimonidine

Met Primary & Secondary Endpoints

61% Patients had ≥ 15 Letter Near Gain with Fast Onset & Durable Responses

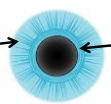


Note: ITP population differs from mITT by only one subject; results were essentially identical.

Source: VEGA-1 TLR Table 14.2.1.2 Percent of Subjects with Improvement From Baseline in Photopic DCNVA by Time Point (ITP Population), 15 letters is 3 lines.

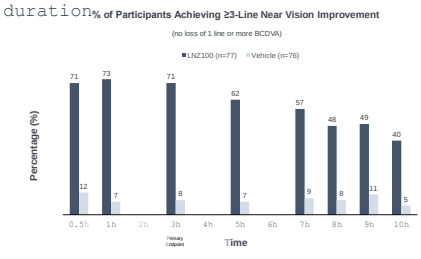
MOAs of Different Miotics In Development For Presbyopia

Iris Dilator Muscle Inhibition
0.75% phentolamine
0.1% brimonidine



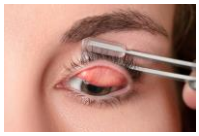
Iris Sphincter Muscle Activation
- 0.4% pilocarpine
- 1.25% pilocarpine
- Low-dose pilocarpine
- 2% pilocarpine
- 2% aceclidine
- 2.75% carbachol + 0.1% brimonidine

LNZ100 achieved rapid onset and 10 hours duration



CLARITY 2, day 1 results; full analysis set. Near visual acuity was assessed at 40cm using Monocular BCDVA (best-corrected distance visual acuity)

Meiverter





Effectiveness of a Singular Ocular Rinse via Irrigating Eyelid Retractor to Reduce MMP-9 in Patients with Dry Eye Disease

Nandini Venkateswaran, MD ABO
Natasha Mayer, BSc

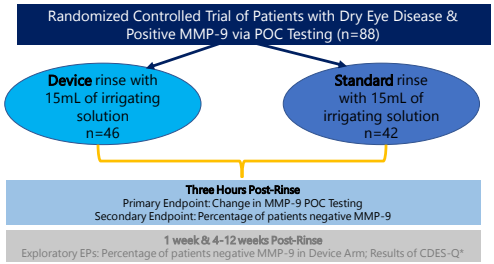
ASCRS 2023 San Diego, California

Objective

Eye rinsing has been an effective method to reduce Matrix Metalloproteinase-9 (MMP-9), a hallmark of surface inflammation

A **single** ocular rinse assisted via **irrigating eyelid retractor** effect on MMP-9

Study Design



Eligibility Criteria

Inclusion Criteria	Exclusion Criteria
• ≥18 years of age with dry eye complaints • Positive MMP-9 via Point-of-care testing	• Anti-inflammatory medication usage • Artificial tear or topical ocular medication usage within the past 14 days • Intraocular surgery within the past 6 months • Contact lens wear within past 12 hours • Contraindication to MMP-9 POC testing • Acute allergic or infectious conjunctivitis • History of SJS or cicatricial conjunctival disease • Severe dry eye preventing wetting of the POC testing

Irrigating Eyelid Retractor

Fixed to a syringe, the retractor has 5 ports which aim fluid at the palpebral conjunctiva, bulbar conjunctiva and conjunctival fornix.

www.nature.com/scientificreports

scientific reports

OPEN **Assessment of reliability and validity of the 5-scale grading system of the point-of-care immunoassay for tear matrix metalloproteinase-9**

Minjoong Kim, Ja Young Oh, Seon Ha Bae, Seung Hyeun Lee, Won Jun Lee, Yeoun Sook Chun & Kyoung Won Kim

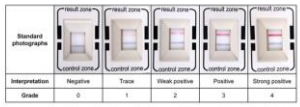
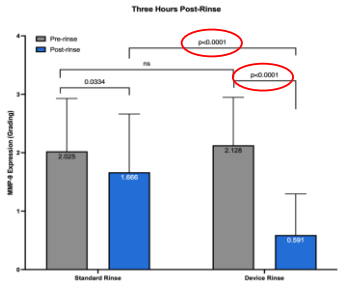


Figure 4. Standard photographs for 5-scale grades ranged from 0 to 4 along to the color density of the red band in the readout window of the point-of-care matrix metalloproteinase (MMP)-9 immunoassay.

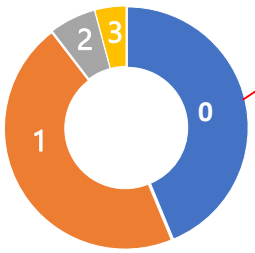
Results—Primary Endpoint



Paired t-test: decreased MMP-9 expression in both standard and device groups with greater attenuation in the device rinse group.

Two-way ANOVA: decreased MMP-9 expression in device group compared to standard ($p < 0.0001$).

Results—Secondary Endpoint



44% of patients converted to negative

Conclusion

A novel irrigating eyelid retractor rinse of the ocular surface statistically reduces MMP-9 levels compared to baseline and is superior to a standard eye rinse.

Use of an irrigating eyelid retractor may be a therapeutic avenue for those patients with dry eye disease.

Further work on the durability of these findings is ongoing.

RASP Inhibitors

- www.aldeyra.com
- Aldehyde is a product of metabolism
- Normally rapidly broken down
- With inflammation, is produced in quantities that are difficult to breakdown efficiently
- RASP – Reactive aldehyde species
- Reproxalap – Is a RASP inhibitor

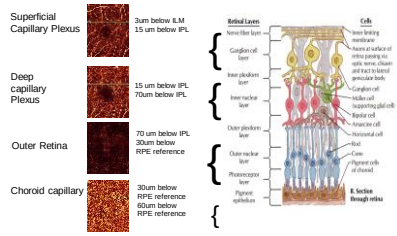
No AMD
-No drusen or <10 small drusen (<63um) without pigment abnormalities

Early AMD
-Approximately >9 small drusen or <15 intermediate drusen (63-124um) or pigment abnormalities associated with AMD

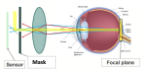
Intermediate AMD
-Approximately >14 intermediate drusen or any large drusen (>124um)

Advanced AMD
-Geographic atrophy with involvement of the macular center or non-central GA atleast 350um in size

Visualize Retinal Vasculature

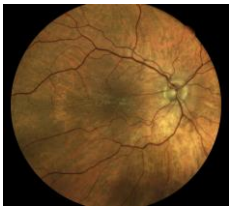


TrueColor Confocality

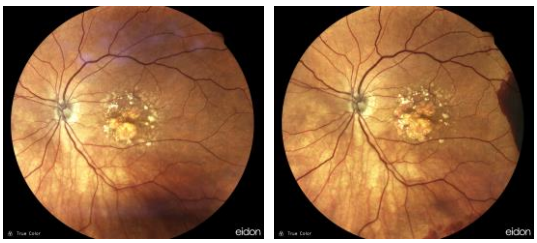


Confocal systems employ a very **thin beam** of light to scan the retina, and a **mask** that blocks the light reflected by layers that are far from the focal plane.

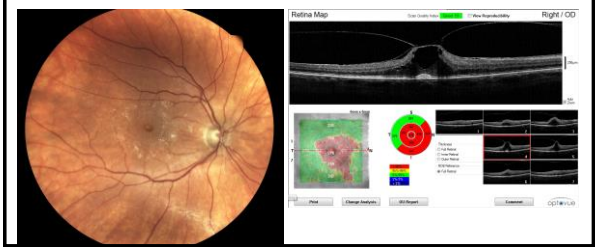
Differently from other Confocal systems that use monochromatic lasers, EIDON uses **white LED** illumination, thus providing **TrueColor images**.



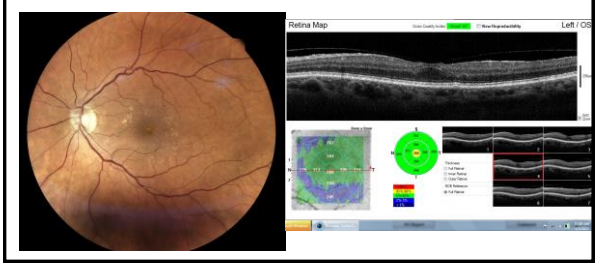
New Standards for Detecting Change

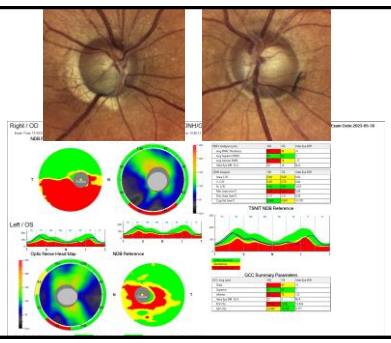


Macular findings

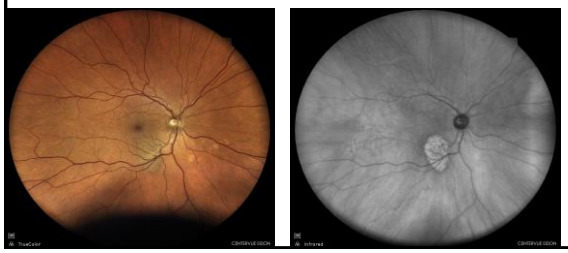


Macular findings

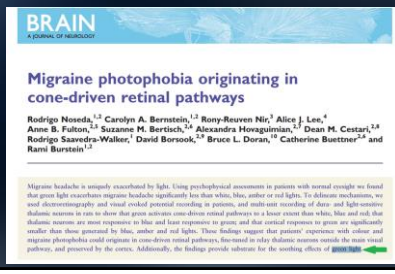




Choroidal Nevus



Severe Headache & Migraine Sufferers: Breakthrough *Burstein et al*

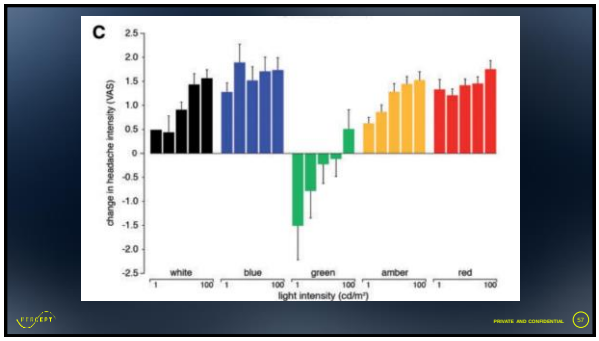


BRAIN
A JOURNAL OF NEUROLOGY

Migraine photophobia originating in cone-driven retinal pathways

Rodrigo Noseda,[1,2] Carolyn A. Bernstein,[1,2] Rony-Reuven Nir,[3] Alice J. Lee,[4] Anne B. Fulton,[2,5] Suzanne M. Bertisch,[2,6] Alexandra Hovaguimian,[2,7] Dean M. Cestari,[2,8] Rodrigo Saavedra-Walker,[1] David Borsook,[2,9] Bruce L. Doran,[10] Catherine Buettner[2,8] and Rami Burstein[1,2]

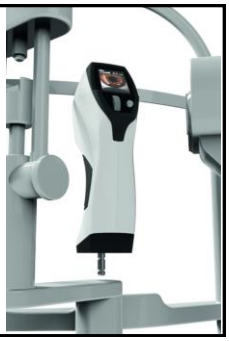
Migraine headache is uniquely exacerbated by light. Using psychophysical assessments in patients with normal eyesight we found that green light exacerbates migraine headache significantly less than white, blue, amber or red lights. To delineate mechanisms, we used electroretinography and visual evoked potential recording in patients, and multi-unit recording of dorsal- and light-sensitive thalamic neurons in rats to show that green activates cone-driven retinal pathways to a lesser extent than white, blue and red; that thalamic neurons are most responsive to blue and least responsive to green; and that cortical responses to green are significantly smaller than those generated by blue, amber and red lights. These findings suggest that patients' experience with colour and migraine photophobia could originate in cone-driven retinal pathways, fine-tuned in relay thalamic neurons outside the main visual pathway, and preserved by the cortex. Additionally, the findings provide substrate for the soothing effects of green light



Corneal Esthesiometer

- Objectively assesses corneal sensitivity
- Five stimulus levels ranging from 1 mbar to 10 mbar
- NCT 250 to 300mbar
- Device is 4mm from the patient's ocular surface

https://esthesiometer-brill.com/



Proparacaine Challenge Test

1) Assess comfort of patient at time of visit (0 to 10)
2) Place drop of proparacaine in eyes
3) Assess comfort of patient about 90 seconds after drop instillation

Artificial intelligence (AI)

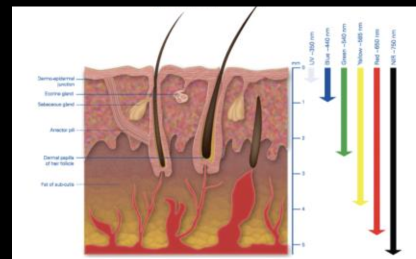
a. Current and potential roles for AI in disease detection and management
b. Role in documentation
c. Understanding the power of AI
   i. Documentation assistant
   ii. Letters to other providers
   iii. Verbalizing findings to AI

Electromagnetic Radiation

- The power of light
- Ultraviolet range (<400nm)
  - UVA 315-400nm
  - UVB 280-315nm
  - UVC <280nm
- Visible spectrum (400-700nm)
- Infrared spectrum (>700nm)

1) Caerwyn Ash, Michael Dubec, Kelvin Donne, Tim Bashford. Effect of wavelength and beam width on penetration in light-tissue interaction using computational methods. Lasers Med Sci. 2017 Nov;32(8):1909-1918.
2) Antero Salminen, Kai Kaarniranta, Anu Kauppinen. Photoaging: UV radiation-induced inflammation and immunosuppression accelerate the aging process in the skin. Inflamm Res. 2022 Jun 24;71(7-8):817–831.
3) Pinar Avci et al. Low-level laser (light) therapy (LLLT) in skin: stimulating, healing, restoring. Semin Cutan Med Surg. 2013 Mar;32(1):41–52.

Light Penetration Into the Skin



1) Caerwyn Ash, Michael Dubec, Kelvin Donne, Tim Bashford. Effect of wavelength and beam width on penetration in light-tissue interaction using computational methods. Lasers Med Sci. 2017 Nov;32(8):1909-1918.

Low Level Light Therapy

- Cytochrome C oxidase (CCO) is an enzyme located in the mitochondria of cells
- Acts as a chromophore for red and near infrared light
- Absorption of this light energy by CCO enhances enzymatic activity, mitochondrial respiration, and adenosine triphosphate (ATP) production
- Can alter transcription properties within the cell

1) Pinar Avci et al. Low-level laser (light) therapy (LLLT) in skin: stimulating, healing, restoring. Semin Cutan Med Surg. 2013 Mar;32(1):41–52

Low Level Light Therapy

- Increases pro-collagen, collagen, basic fibroblastic growth factors (bFGF) and proliferation of fibroblasts
- Tissue inhibitor of metalloproteinases (TIMPs) are elevated in tissues treated with LLLT
  - Likely protect newly produced collagen from proteolytic degradation of matrix metalloproteinases (MMPs)

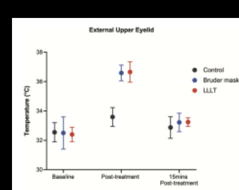
1) Pinar Avci et al. Low-level laser (light) therapy (LLLT) in skin: stimulating, healing, restoring. Semin Cutan Med Surg. 2013 Mar;32(1):41–52

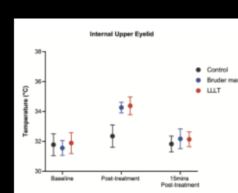
Low Level Light Therapy and the Eyes

- LLLT and eyelid temperature
- Three groups:15 minute treatment, sham, heat mask
- External and internal upper and lower eyelid temperature
- Thermal camera used to measure temperature
- Increased temperature in both treatment arms in all 4 measurements

1) Antoinette Antwi, Augustine N Nti, Eric R Ritchey. Thermal effect on eyelid and tear film after low-level light therapy and warm compress. Clin Exp Optom. 2024 Apr;107(3):267-273.

Low Level Light Therapy and the Eyes





1) Antoinette Antwi, Augustine N Nti, Eric R Ritchey. Thermal effect on eyelid and tear film after low-level light therapy and warm compress. Clin Exp Optom. 2024 Apr;107(3):267-273.

Low Level Light Therapy and the Eyes

- Thirty patients had three LLLT treatments separated by 1 week
- Examined at baseline and 4 weeks later
- Improvements demonstrated in non-invasive tear film break up time, tear meniscus height, tear film lipid layer thickness, Schirmer's test and ocular surface disease index score
- Study didn't have a control arm

1) *Antoinette Antwi, Alexander W Schill, Rachel Redfern, Eric R Ritchey. Effect of low-level light therapy in individuals with dry eye disease. Ophthalmic Physiol Opt. 2024 Aug 2.*

Low Level Light Therapy and the Eyes

- Forty patients randomized to LLLT treatments twice a week for 3 weeks or sham treatment
- Examined at baseline and 4 weeks later
- Corneal staining improvement
- Conjunctival staining improvement
- Schirmer's test improvement

1) Yuli Park, Hoon Kim, Sehwan Kim, Kyong Jin Cho. Effect of low-level light therapy in patients with dry eye: a prospective, randomized, observer-masked trial. Sci Rep. 2022 Mar 4;12(1):3575.

Low Level Light Therapy Surgery

- Patients scheduled to undergo cataract surgery
- Treatment arm had LLLT 7 days before surgery and 7 days after surgery
- Outcomes measured 30 days after surgery
- Treated patients had lower OSDI and higher TBUT

1) *Giuseppe Giannaccare et al. Outcomes of low-level light therapy before and after cataract surgery for the prophylaxis of postoperative dry eye: a prospective randomised double-masked controlled clinical trial. Br J Ophthalmol. 2024 Jul 23;108(8):1172-1176.*

Low Level Light Therapy for Chalazion

- Retrospective study
- 26 eyes of 22 patients with a previous history of failed chalazion treatment
- Underwent single 15 min LLLT session
- 46% of eyes demonstrated resolution
- For those who didn't achieve resolution, they received a second 15 min LLLT session
- After second treatment, 92% of eyes demonstrated resolution of chalazia

1) *Karl Stonecipher, Richard Potvin. Low level light therapy for the treatment of recalcitrant chalazia: a sample case summary. Clin Ophthalmol. 2019 Sep 5:13:1727-1733.*

Low Level Light Therapy for Chalazion Treatment

Mile Brujic, OD, FAAO
Premier Vision Group, Bowling Green, OH

BACKGROUND

Chalazion is a condition that if unresolved with warm compresses, will often times require incision and curettage. Patients and clinicians are seeking out alternatives to surgical treatment for recalcitrant chalazion.

Low level light therapy (LLLT) has provided a unique opportunity to enhance metabolism in the skin and underlying tissue. Electromagnetic radiation penetration into the tissue is largely based on its wavelength. In the visible spectrum, the longer wavelengths have a deeper tissue penetration. Near infrared penetrates even deeper.[1]

Cytochrome C oxidase (CCO) is an enzyme located in the mitochondria of cells that acts as a chromophore for red and near- infrared light. Absorption of this light enhances enzymatic activity, mitochondrial respiration, and adenosine triphosphate (ATP) production. LLLT has been shown to increase production of pro-collagen, collagen, basic fibroblast growth factors (bFGF) and proliferation of fibroblasts.[2] Additionally, LLLT has been shown to increase external and internal eyelid temperatures.[3,4] These properties have increased LLLT utilization in dry eye and meibomian gland dysfunction which has led to interest in the technology for its potential role for chalazion treatment.

There is very little in the peer reviewed literature on LLLT for chalazion treatment. In a single study, there was a face mask LLLT utilized for treatment of patients with recalcitrant chalazia. Twenty six eyes of twenty two patients were studied. After two treatments, 92% of chalazia were resolved.[5]

In this case series, we treated four patients with chalazia with The InfinityPro by MDElite. Patients were treated with three 15 min sessions. During each treatment session, patients were 6 to 8 inches from the LLLT light emitting diode (LED) panels. They were exposed to a combination of blue (415nm +/- 15nm) red (630nm +/- 15nm) and infrared (835nm +/- 15nm) radiation. The energy output of the light was 45 J/cm².

CASE DESCRIPTION

Four patients of various ages with recalcitrant chalazia were exposed to three 15 minute LLLT sessions. After 30 days, all chalazia were resolved.

Case 1

A 12 year old male had a history of a recalcitrant chalazion on his left lower eyelid. He has been applying warm compresses to his eyelids several times a day for the last two weeks. The chalazion has come and gone for the last three months (Figure 1). There was grade 3 collarettes at the base of the lashes OU.

We prescribed lotilaner 0.25% to use 1 gtt bid OU for 6 weeks to treat the demodex blepharitis. The patient performed his first LLLT session the day of the office visit, the second session 4 days later and the third session 3 days later. Four days later he was seen in the office for a follow up and the chalazion was almost completely resolved (Figure 2). The patient was seen six weeks later with complete resolution of both the chalazion and blepharitis.

Figure 1

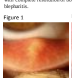
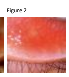


Figure 2



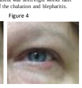
Case 2

A 58 year old female with a history of hordeolum and multiple chalazion removal surgeries came in with a chalazion on her left lower lid. She had concurrent blepharitis and ocular rosacea. She was using an antibiotic/steroid combination drop qid OS and heat applied to the eyelid twice a day (Figure 3).

We prescribed lotilaner 0.25% to use 1 gtt bid OU for 6 weeks to treat the demodex blepharitis. The patient performed the first LLLT session the day of the visit, the second session three days later and the third session four days later. Fourteen days after the last treatment session, she was seen in the office for a follow up and the chalazion was almost completely resolved (Figure 4). The patient was seen eight weeks later with complete resolution of the chalazion and blepharitis.

Figure 3

Figure 4



Case 3

A 67 year old female presents with a large chalazion on her left upper eyelid for the last week. She is currently using artificial tears and heat twice a day. She hasn't noticed any improvement (figure 5). She has a concurrent demodex blepharitis.

We prescribed lotilaner 0.25% to use 1 gtt bid OU for 6 weeks to treat the demodex blepharitis. The patient performed the first LLLT session the day of the visit, the second session seven days later and the third session four days later. Fourteen days after the last LLLT session she was seen in the office for a follow up and the chalazion was almost completely resolved (Figure 6). Four weeks later she was seen for a follow up with complete resolution of the chalazion and blepharitis.

Case 4

A 40 year old female presents with a modest chalazion on her left upper eyelid for the last three weeks. She currently isn't doing anything to manage it.

Figure 5

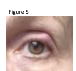
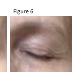


Figure 6



The patient performed the first LLLT session the day of the visit, the second session four days later and the third session six days later. One month later she was seen in the office for a follow up and the chalazion was completely resolved.

CONCLUSION

Low level light therapy seems to be a promising alternative to surgical incision and curettage of chalazia. This case series provides evidence to support consideration for an alternative to surgical removal of chalazia. Further research and clinical experience will continue to elucidate the LLLT as a viable option for treating chalazia.

REFERENCES

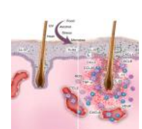
1) Caerwyn Ash, Michael Dubec, Kelvin Donne, Tim Bashford. Effect of wavelength and beam width on penetration in light-tissue interaction using computational methods. Lasers Med Sci. 2017 Nov;32(8):1909-1918.
2) Pinar Avci et al. Low-level laser (light) therapy (LLLT) in skin: stimulating, healing, restoring. Semin Cutan Med Surg. 2013 Mar;32(1):41–52.
3) Antoinette Antwi, Augustine N Nti, Eric R Ritchey. Thermal effect on eyelid and tear film after low-level light therapy and warm compress. Clin Exp Optom. 2024 Apr;107(3):267-273.
4) Antoinette Antwi, Alexander W Schill, Rachel Redfern, Eric R Ritchey. Effect of low-level light therapy in individuals with dry eye disease. Ophthalmic Physiol Opt. 2024 Aug 2.
5) Karl Stonecipher, Richard Potvin. Low level light therapy for the treatment of recalcitrant chalazia: a sample case summary. Clin Ophthalmol. 2019 Sep 5:13:1727-1733.

SPECIAL THANK YOU

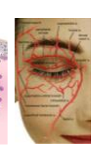
To MDElite for providing support for this poster

Dry eye due to MGD is an inflammatory disease

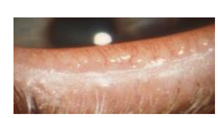
MGD is often a skin gland disease



abnormal blood vessels release pro inflammatory agents



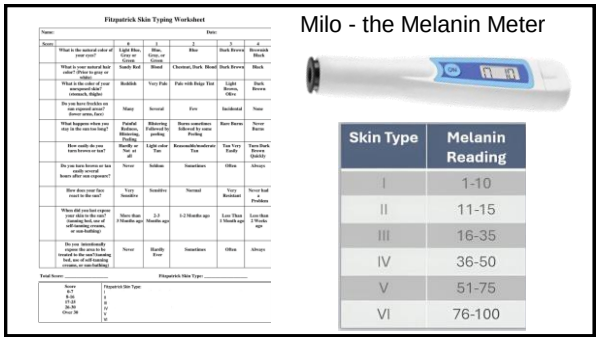
These inflammatory agents propagate to the eyelids via the orbital vasculature

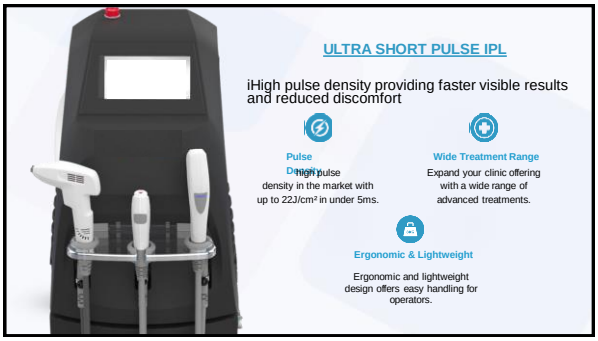


Source: Gerber et al, *J Invest Dem Sym Proc* 2011

Intense Pulsed Light

1. Warms Meibum
2. Emits Energy that absorbed by chromophores in hemoglobin and closes abnormal vessels in the eyelid margin and adjacent conjunctiva. Prevents release of inflammatory factors by the vessels
3. Reduces inflammatory factors in tears (interleukin 17A. Interleukin-6, prostaglandin E2) (up-regulates expression of anti-inflammatory agents while downregulating pro-inflammatory argents)
4. Activates fibroblasts and enhance collagen production
5. Reduce inflammatory or neurogenic pain
6. Reduction in bacterial load and demodex to reduce inflammation





Acoltremon ophthalmic solution 0.003%

- Primary target: Corneal TRPM8 cold-sensing ion channels on trigeminal sensory nerves. Acoltremon, acts as a TRPM8 agonist.
- Cellular effect: Activates TRPM8 channels, allowing Na^{+}/Ca^{2+} influx, depolarizing the neuron and generating action potentials.
- Neural pathway: This activates trigeminal signaling, which in turn increases basal tear production via reflex lacrimation. (The label notes the exact mechanism in DED is not fully defined, but animal and human data support this pathway.)

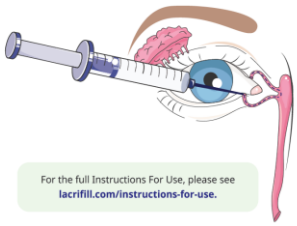
Lacrifill (Nordic Pharma)

- Cross-linked hyaluronic acid gel that allows patient's eyes to be bathed in their own natural tears
- Customized for each individual patient
- Provides a full fill of the canalicular system
- Lasts for 6 months
- In-office procedure reimbursed through existing CPT code (68761)

Procedure

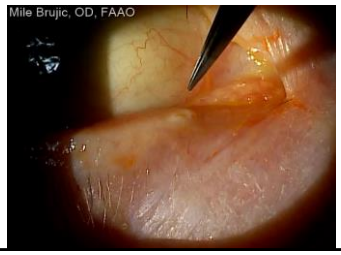
Instructions for Use

1. LACRIFILL comes in a pre-filled injector with enough gel to treat the lower and upper canaliculi.
2. The cannula tip is placed in the punctum and the LACRIFILL gel is inserted.
3. The gel flows through the punctum into the lacrimal sac.
4. If you see the gel extruding from the upper punctum, you know that both the upper and lower puncta have been blocked.



For the full Instructions For Use, please see **lacrifill.com/instructions-for-use.**

Punctal Dilation



Introducing Gel Into Canalicula