Abstract Submission : Entry # 12

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One-sentence objective

We investigated whether sub-lethal micropulse laser photocoagulation can control the molecular dynamics within cells of retinal pigment epithelial (RPE) layer with expression of HSP70 as an index.

Title:
Sub-lethal micropulse laser photocoagulation induces heat shock protein expression in human retinal pigment epithelial cells

Purpose:

Although subthreshold micropulse diode laser photocoagulation reduces macular edema, the details of the action mechanism are unknown. Therefore, we investigated whether sub-lethal laser energy can control the molecular dynamics within cells of retinal pigment epithelial (RPE) layer with expression of heat shock protein (HSP) 70 as an index.

Methods:

First, we constructed a system in which one layer of densely cultured human retinal pigment epithelial cells (ARPE-19) was perpendicularly irradiated by a micropulse diode laser. Next, we applied a laser energy burden to the cell layer that would not cause cell death, and evaluated the HSP 70 expression over time by quantitative PCR and immunocytochemistry.

Results:

The laser irradiation system that we made was able to stably form a sub-lethal photocoagulation-like area in the cultured cell layer. Expression of HSP 70 m-RNA in the cell layer was induced within 30 minutes of laser irradiation, reaching its maximum
after three hours, and compared to an untreated group, rising momentarily three times or more. The amount of HSP 70 mRNA expression depended on the number of laser irradiations. Immunostaining images indicating expression of HSP 70 proteins were detected concentrically around the irradiation site, and persisted for 24 hours after irradiation.

Conclusion:

This report is the first that HSP70 was expressed and upregulated using micropulse laser under sub-lethal condition in cultured RPE cells. Although the therapeutic mechanism of MP laser has not been established yet, HSP70 may be one of trigger and it is also the biological markers for therapeutic laser level in subthreshold micropulse photocoagulation.

Graphics

- Light-Graphics.ppt
Abstract Submission : Entry # 14

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Radboudumc University Medical Center

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Participating university-based clinics are Leiden and Nijmegen (The Netherlands), Oxford (United Kingdom), Cologne (Germany) and Paris (France).

One-sentence objective

The PLACE trial (Photodynamic therapy versus Diode Micropulse Laser treatment in chronic Central serous chorioretinopathy)

Title:

A randomized controlled multicenter trial comparing high-density subthreshold diode micropulse laser to half-dose PDT in chronic central serous chorioretinopathy

Purpose:

Different treatment modalities have been investigated in chronic central serous chorioretinopathy (cCSC), however, no consensus exists on the optimum treatment. Currently, high-density subthreshold diode micropulse laser treatment (HSML) and half dose photodynamic therapy (PDT) are frequently used. A randomized clinical trial was designed for both modalities to evaluate the optimum cCSC treatment.

Methods:

A randomized, controlled open-label multicenter trial comparing the efficacy and safety of half-dose PDT to HSML in patients with cCSC (trial registration: CinicalTrials.gov identifier NCT01797861). A total of 156 patients will be recruited, 78 patients in each treatment arm, with a maximum follow-up duration of 8 months after the first treatment. A complete ophthalmological examination and vision-related quality of life (NEI VFQ-25) and stress questionnaires, will be performed at baseline, 6-8 weeks after first treatment, 6-8 weeks after second treatment (if necessary), and at the final follow-up visit at 7-8 months after first treatment.
Results:

An interim analysis in April 2015 of the study results revealed no reason to discontinue the multicenter trial.

Conclusion:

A randomized multicenter clinical trial is designed to evaluate what is the best frequently used treatment protocol for cCSC: high-density subtreshold diode micropulse laser treatment (HSML) or half dose photodynamic therapy (PDT). In November 2015 probably half of the required 156 patients will be included since the start in January 2014. The study design will be discussed. No final study results are available yet. Interim analysis revealed no reason to discontinue the multicenter trial.

Keywords: Chronic central serous chorioretinopathy, Half-dose photodynamic therapy, High-density subthreshold diode micropulse laser, Prospective, Randomized controlled, Multicenter, Trial, Verteporfin
Abstract Submission : Entry # 15

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One-sentence objective

To assess the thresholds and activated area of the heat shock protein expression after retinal laser therapy at energy levels ranging from conventional photocoagulation to non-damaging phototherapy.

Title:

Heat Shock Protein Expression Following Retinal Laser Therapy

Purpose:

To assess the thresholds and activated area of the heat shock protein (HSP) expression after retinal laser therapy at energy levels ranging from conventional photocoagulation to non-damaging photothermal therapy.

Methods:

Pigmented rabbits have been treated with 577nm PASCAL laser using EndPoint Management (EpM) software and retinal spot size of 200um. Using 20ms pulses, laser power was first titrated to produce barely visible lesions, which was considered 100% energy on EpM scale. Laser exposures were then applied at 120%, 100%, 30%, 25%, 20% and 15% energy. Eyes were fixed 7 hours later, corresponding to peak expression of the HSP70. Immunohistochemistry was performed with histological sections and with whole-mount retinal preparation.

Results:

Exposures at 120% and 100% energy produced light and barely visible burns in acute ophthalmoscopic examination. Exposures at 30% energy and below did not produce any visible damage, even in histological analysis. In whole-mount imaging of RPE, the HSP expression in the 120% and 100% burns appeared as bright rings with the average outer diameter of 311 and 292um, and the inner diameter of 186 and 138 um, respectively. The 30%, 25% and 20% exposures appeared as
bright discs with an average diameter of 176, 145 and 64 um, respectively. There was no visible expression at 15% energy. In cross-section, the HSP expression in the visible burns (100% and 120%) appeared in the RPE surrounding the damage zone, and in the choroid below the retinal damage zone. In the 30% exposures, HSP was expressed only in the RPE.

**Conclusion:**

HSP expression, as a marker of the cellular response to thermal stress, indicates that cells surviving the hyperthermia express HSP around the conventional visible burns, as well as in the middle of the non-damaging spots, with energies ranging from 30% to 20% on EpM scale. Such a narrow therapeutic window of the HSP expression with non-damaging laser settings indicates that careful titration should be performed in each patient, and high density pattern is required to assure clinical efficacy of the non-damaging retinal laser therapy.
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**Title:**
Non-damaging Retinal Photothermal Therapy for Treatment of Chronic Central Serous Retinopathy: one year follow-up

**Purpose:**
To assess safety and clinical efficacy of the non-damaging photothermal therapy of the macula for treatment of the chronic central serous retinopathy (CSR).

**Methods:**
Twenty one eye of 20 patients with persistent CSR (longer than 4 months duration) were treated with the PASCAL Streamline (TMLS, USA) at 577nm wavelength, using 200μm retinal spot sizes. Using EndPoint Management Software the laser power was first titrated for a barely visible burn with 15ms pulses, which was defined as a 100% pulse energy. Treatment was then applied over the area of serous retinal detachment and adjacent non-thickened retina, using 30% pulse energy with spot spacing of 0.25 beam diameter. Changes in ETDRS best corrected visual acuity and central macular thickness were measured over 12 months follow-up.

**Results:**
On average, 532 spots have been applied per treatment. No visible laser marks could be detected either by clinical observation, OCT, FAF or FA. An average, 12 ETDRS letters gain was achieved by 2 months, and it was sustained during the 12 months follow-up. Central macular thickness decreased from 350μm to 297μm, with central maximum thickness reduction...
of -64 μm. On average, 2.2 treatments per year have been applied to manage recurrent fluid or incomplete resolution. Again, no visible damage to the retina after the retreatments could be seen, but visual acuity and resolution of residual fluid improved. In 80% of the patients fluid was completely resolved, in 20% resolution was partial, and there were no non-responders to the treatment.

Conclusion:

Photothermal therapy using PASCAL laser with EndPoint Management software at 30% energy settings was safe, and it improved visual acuity and resolution of subretinal fluid in chronic CSR. Lack of tissue damage allows periodic retreatment without cumulative scaring characteristic to conventional photocoagulation. This technique should be tested in treatment of other macular disorders, and may offer an alternative to conventional laser therapy of the macula and to anti-VEGF pharmacological treatments of macular diseases.
**Abstract Submission : Entry # 17**

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University College London UK  

**One-sentence objective**

We hypothesize that hypoxia in the diabetic retina is caused by additional oxygen consumption arising from inner limb pumps driving the rod dark current—a process that may be interrupted by light-at-n  

**Title:**

Investigating the Arden hypothesis: a pilot investigation of the prevention of dark adaptation as complementary therapy for diabetic retinopathy and macular edema.

**Purpose:**

To determine whether there are domains of hypoxia in diabetic subjects that correlate to loss of retinal function. We hypothesize that the additional oxygen consumption from the inner limb pumps of dark-adapted rods leads to a relative oxygen deficit in the diabetic retina. In support of this hypothesis, the reduced visual sensitivity in diabetic subjects can be overcome by oxygen breathing. We pr  

**Methods:**

1. Using standard and modified microperimetric techniques, we map dark adapted rod sensitivity in the EDTRS zones in patients with non-sight-threatening DME and analyze the changes that occur in areas shown to be thickened by SD-OCT measures.  
2. We record multifocal ERGs to establish the spatial distribution of inner retinal dysfunction and correlate these with microperimetric measurements of psychophysical (photoreceptor) function.  
3. In order to carry out trials, we present a "light mask" as a novel approach to counter the physiological effects of dark adaptation. We demonstrate a comfortable and inexpensive solution that ensures that no matter how the head is positioned, retinal illumina
Results:

1. There is a sensible and systematic relationship between loss of rod sensitivity and increased retinal sensitivity in patients when they breath oxygen. By contrast, oxygen breathing has no effect on retinal sensitivity in control subjects.
2. We correlate the psychophysical changes in photoreceptor function with that of inner retinal function where vasculopathy occurs.
3. Although many patients are prepared to wear devices ("light masks") during sleep, non-contact forms ("glow pillows") can also ensure continuous retinal illumination as an alternative to the light masks. However these require greater electrical power to produce larger amounts of light.

Conclusion:

We have examined changes in visual thresholds with microperimetry and have analyzed how this changes with the oxygen content in the inspired air. We have also examined the relationship between loss of visual sensitivity in regions of localized macular edema and the response to extra oxygen, revealing that early loss of visual function in diabetes is associated with evidence of hypoxia in humans. This is required in view of recent claims that such hypoxic states, found in cat and primate retina, may not be present in the eyes of rodents rendered diabetic with streptozotocin. We have found that the diabetic retina cannot meet the added demands of the “dark current” which is produced by the rod photoreceptors. Small clinical trials have demonstrated that early background diabetic retinopathy and diabetic macular edema improve if patients sleep in dim light that partially light-adapts the rod photoreceptors. We propose light-at-night delivered by a “light mask” as a novel treatment method.
Abstract Submission : Entry # 18

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One-sentence objective

Photocoagulation with a predefined temperature increase within 50 ms at each single irradiation site by means of a fully automatic laser power controlled application method.

Title:

Temperature Controlled Retinal Photocoagulation

Purpose:

An optoacoustic, temperature controlled feedback technique for retinal photocoagulation is presented, which regulates the laser power automatically onto a predefined temperature increase for every single application spot within a total application time of 50 ms. The methods generally allows to apply completely sublethal, lethal subvisible or uniform visible lesions, respectively.

Methods:

Irradiation was performed on rabbits with a modified Nd:YAG-laser (Carl Zeiss Meditec, 532nm). A Nd:YLF-laser (Crystalaser Inc., 523nm, 75ns, 1kHz) simultaneously served to repetitively excite thermoelastic pressure waves. The pressure amplitudes are detected by an ultrasonic transducer embedded in the contact lens and used to calculate the temperature rise. Irradiations for every spot are performed in a three step manner, for calibration, absorption matching and heating to the final temperature, respectively, within 50 ms. The laser power is therefore automatically varied during irradiation. The lesions were examined with a fundus camera.

Results:

We aimed on temperatures of 50, 57, 65 and 82 °C to be achieved at the end of each irradiation period for a retinal spot
diameter of 133 µm. None of the 50°C spots were ophthalmoscopically visible after one hour. About 30% of the 57°C spots were visible after one hour, while the 65 and 82°C spots were all visible and quite uniform in diameter and appearance. For the aim temperature of 50°C, the mean final temperature for 101 irradiation sites was found to be 49.7 °C +/- 3.0 °C. For 57 °C and 91 irradiation spots we measured 56.0 ± 3.4 °C, for 65 °C and 107 irradiations 65.2 ± 4.9 °C, and finally for 82 °C on 40 irradiation sites 88.1 ± 9.9 °C. The corresponding automatically determined heating laser powers were 17.8 ± 5.6 mW, 40.7 ± 17.2 mW, 52.0 ± 14.5 mW and 61.7 ± 10.7 mW for the different aim temperatures, respectively.

Conclusion:

The achieved data are promising for a feedback controlled treatment, which allows to automatically generate preselected sublethal temperature rise for cellular stimulation, or minimal ophthalmoscopically invisible thermal damage, or defined and uniformly visible coagulations. In combination with a patterned application with short exposure times per treatment site, this technique seems to be the ideal method to unburden the ophthalmologist from any manual dosing and allowing a fast and reproducible treatment.
Abstract Submission : Entry # 19

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One-sentence objective

To assess the thresholds and activated area of the heat shock protein expression after retinal laser therapy at energy levels ranging from conventional photocoagulation to non-damaging phototherapy.

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Heat Shock Protein Expression Following Retinal Laser Therapy

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One-sentence objective

Subthreshold micropulse yellow laser with lowest duty cycle can be safely used, in selected cases, for subfoveal neuroretinal detachment due to benign choroidal tumors.

Title:
Subthreshold Micropulse Yellow Laser for Subfoveal Neuroretinal Detachment due to Benign Choroidal Tumors

Purpose:
To report on use of subthreshold micropulse yellow laser (MPYL) in benign choroidal tumors (BCT) complicated with subfoveal neuroretinal detachment (SND).

Methods:
Case series of 10 eyes (10 patients) with BCT localized in the macula or within the posterior pole and complicated with SND. All patients underwent full ophthalmologic evaluation and spectral domain OCT (Spectralis, Heidelberg Engineering, Dossenheim, Germany), fundus autofluorescence (AF) fluorescein angiography (FA) and ICG before and after laser treatment. MPYL treatment was performed with (Iridex IQ 577; Laser System Iridex Corp, CA) using standard parameters (5% duty cycle, 250mWatt, 100 micron diameter) over the whole area of SND and the fovea.

Results:

Eight patients had pigment choroidal nevi and 2 patients had choroidal osteoma. SND resolved in 7 eyes (70 %) and remained unchanged in 3 eyes (30%) after MPYL, on OCT. Mean best corrected visual acuity increased in eyes with resolved SND (74.2+6.8 vs 79.3+3.8 letters ETDRS score, p 1year. Mean number of laser spots was 433+127.

Conclusion:

Subthreshold micropulse laser is a safe treatment in reducing SND in eyes with BCT. MPYL may represent a novel treatment option in selected cases of benign choroidal tumors complicated with SND.
Abstract Submission : Entry # 21

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One-sentence objective

To investigate micropulse contiguous grid laser in the treatment of eyes with DDME involving the fovea that persist following drug treatment

Title:

Micropulse Contiguous Grid Laser for Diffuse Diabetic Macular Edema Resistant to Drug Treatment (DDME)

Purpose:

Purpose;To investigate micropulse contiguous grid laser in the treatment of eyes with DDME involving the fovea that persist following drug treatment, and second, to correlate OCT findings with high contrast acuity visual field (HCAVF) measurements: 1) threshold acuity at fixation (fix VA), 2) best acuity measured at any intercept within 6 degrees of fixation (BA6o), and 3) global macular acuity ( global macular acuity

Methods:

Methods: Retrospective pilot study of sequential eyes treated over all areas of telangiectatic leakage on fluorescein angiography(FA); treatment followed prior pharmaceutical and/or surgery treatment in most all cases. Prior to and at follow-up every 3 months SDOCT, FA, and HCAVF were performed. SDOCT images were analyzed for disruption of photoreceptor
ellipsoid junction (PEJ), external limiting membrane (ELM), outer nuclear layer (ONL), and central and paraxial thickness and central cyst size, disorganization of inner and middle nuclear layers. A self-administered version of the NEI VFQ-25 (iVFQ) was performed at 6 month intervals. Primary outcome was change in HCAVF GMA with secondary ou

Results:

Results: 78 eyes of 57 patients were followed for at least 12 months after micropulse one or more treatments. HCAVF GMA (initial 0.82+0.27logMAR) improved an average of 0.1+/-0.27logMAR with improvements >0.2logMAR in 33% but with 12% worsening>0.2logMAR. Initial HCAVF FixVA, and BA6 were similar to BCVA (0.35+0.23logMAR) but demonstrated no improvement overall (0.00+/-0.16 logMAR) with variable improvement, demonstrating 0.2logMAR in 16%, declined 0.2logMAR in 18%. OCT central thickness (initial 295+160um) demonstrated only an average 6.4 um but highly variable(+146um) improvement, with similar variable changes observed in central or paraxial cyst size (11.9+169.um change). The iVFQ demonstrated a significant improvement in 28% of subjects that correlated best with HCAVF GMA. SDOCT central or paraxial retinal thickness, and foveal or paraxial cyst size were not correlated with local HCAVF scotoma density, whereas disorganization of the inner retinal layers, disruption of PEJ and ELM

Conclusion:

Conclusion: In this study of eyes with diffuse macular edema associated with DR and resistant to pharmaceutical treatment, contiguous micropulse grid laser overall stabilized edema and central vision with improvement in central visual field, but without evidence of lesions or scotomata caused by laser. Cases demonstrated extreme variability in all measures of vision with an intact PEJ, ELM and no ONL thinning or disorganization of the inner retinal layers associated with less corresponding visual field impairment and with improved treatment prognosis whereas central retinal thickness, maximum retinal thickness and foveal or juxtafoveal cyst size were not. It is our belief that CW laser treatment should not be used for treatment of central macular edema associated with DR and that best corrected visual acuity and central retinal thickness should no longer be used to define outcomes of treatment.
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One-sentence objective

To evaluate efficacy of the low energy light therapy in treatment of the age-related macular degeneration (AMD).

Title:

Effectiveness of Low-Energy Light Therapy for the Treatment of Age-Related Macular Degeneration (Dry Form). Results of One-Year Observation.

Purpose:

To evaluate efficacy of the low energy light therapy in treatment of the age-related macular degeneration (AMD).

Methods:

165 patients (288 eyes) with the age from 48 to 86 years old with diagnosis of AMD (dry form) were included in the study. All patients were divided on two groups: the test group (90 patients, 152 eyes) and control group (75 patients, 136 eyes). The effectiveness of the therapy had been estimated by analysis of vision acuity (ETDRS charts) and changes in OCT images and...
in macular pigment optical density (MPOD) which was measured by means of heterochromatic flicker photometry method.

During the year two courses of low energy light therapy had been applied with the 6-months interval for the main group. We used LED-based processor controlled device as a source of light pulses in red, green

Results:

The mean values of MPOD before the treatment were 0.246 for the main group and 0.248 for the control group of patients. Six months later the mean values of MPOD for the same groups were 0.314 and 0.243 respectively. At the end of the first year of observation the difference of MPOD mean values between the test and control groups of patients was 0.149.

According to OCT data the most significant changes were noticed within retinal pigment epithelium (RPE) and choriocapillary layers. At the end of one-year observation the local defects of RPE had been indicated for 4.61% of main group and 26.47% of control group patients. The signs of becoming thinner for the choriocapillary layer had been indicated for 1.32% of test group patients and 13.97% of control group patients.

At the beginning of the study the vision acuity mean value was 68.61 letters for the patients of test group and 64.65 letters for the patients of control group. At the end of a course of therapy the vision acuity mean v

Conclusion:

The low-energy light therapy by means of red, green and infrared light pulses for the patients with dry form of AMD results in increasing of MPOD, arrest the further development of atrophic changes within retinal pigment epithelium (RPE) and choriocapillary layers and provides a vision acuity stabilization.
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One-sentence objective

The visualization of micropulse laser retinal therapy using snapshot hyperspectral imaging is challenging, but maybe a way to continue

Title:

Snapshot Hyperspectral Imaging for Visualization of Micropulse Laser Retinal Therapy

Purpose:

To image previously invisible lesions caused by micropulse laser therapy on retinal tissues of rabbits with a hyperspectral camera

Methods:

An Iridex Iris Medical 810nm micropulse laser was used to lesion in vivo rabbit eyes using a range of power settings. These lesions were then imaged using a Computed Tomographic Imaging Spectrometer (CTIS-II)Generation 2 prototype device from Reichert Technologies, Inc., that was mounted on a FF450 fundus photography camera from Carl Zeiss, Inc. Spectral cube images were then captured using proprietary software.

Results:
Analyses of the optimal wavelength and measurement of grayscale, “brightness”, of the individual pixels of the electronic images were conducted and preliminary results show that some lesions caused by the micropulse laser retinal therapy in rabbit eyes may be visualized but that additional studies should be conducted.

Conclusion:

Long way to go
Abstract Submission : Entry # 24

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One-sentence objective

To explore if laser delivered only to the immediate area of leaking micro aneurysms, as guided by novel computer image guided systems, is efficacious in the treatment of DME.

Title:

Navigated Focal Nondestructive Laser for Diabetic Macular Edema

Purpose:

Recent studies identify tissue effects of laser energy that are independent of its destructive action in the treatment of retinal edema. However, there are a host of parameters that need investigation if we are to optimize the potential benefits for our patients. In the majority of studies so far, laser energy is delivered to a wide area encompassing the entire extent of retinal edema. We now ask

Methods:
Navigated focal nondestructive laser the Navilas Laser System (OD-OS Instruments Teltow, Germany) with a standardized treatment regimen of 70um spot size, 50mW power, and 50msec duration was applied only to fluorescein demonstrable leaking microaneurysms in areas of DME within 2.5 mm of the fovea. Forty eight (48) eyes of 32 patients were examined at day of treatment, and follow-up examinations at 1, 3, 6, and 12 months. Examination included ETDRS VA, OCT determined central macular thickness (CMT), maximum macular thickness (MMT), and total volume (TV), dates of primary and repeat laser, and use and timing of intravitreal agents.

Results:

Eyes with DME have an anatomic and functional response to navigated focal nondestructive laser.

Conclusion:

Navigated focal nondestructive laser needs further investigation as part of the optimization of laser in the treatment of retinal disorders.
Abstract Submission : Entry # 25

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One-sentence objective
To explore the efficacy of computer-guided laser treatment of feeder vessels in the management of neovascular AMD.

Title:
Computer Image Guided Laser to Blood Vessels Feeding Choroidal Neovascularization

Purpose:
Dynamic ICG Angiography has provided a means to identify putative feeder vessels in eyes with choroidal neovascularization. Attempts to apply laser to these feeder vessels in the hope of impeding the exudative process have been thwarted by limitations of laser delivery systems. Computer Image Guided Laser to blood vessels seeming to feed choroidal neovascularization allows these limitations to be

Methods:
Treatment was delivered using the Navilas Laser System (OD-OS Instruments Teltow, Germany) with a standardized
treatment regimen of 100um spot size, 100mW power, and 100msec duration along a 0.5 to 1.0 mm length of vessel at least 0.75 mm away from the fovea. The following data was collected at day of treatment, and follow-up examinations at 1, 3, 6 and 12 months: ETDRS VA, OCT determined central macular thickness (CMT), maximum macular thickness (MMT), and total volume (TV), progression or regression of subretinal fluid(SRF) and pigment epithelium detachment (PED) along with the use and timing of intravitreal pharmaceutical agents.

Results:

Computer Image Guided Laser to blood vessels appearing to feed choroidal neovascularization predictably impedes the progression of disease.

Conclusion:

The advent of Computer Image Guided Laser provides an additional tool to the treatment of wet AMD.
Abstract Submission : Entry #30

Please indicate which person is submitting

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One-sentence objective

To explore potential treatment benefits of micropulse laser in wet AMD in possibly achieving better visual acuity and lowering injection burden to patients.

Title:

Exploring Subthreshold Micropulse Laser for the Treatment of Neovascular Age Related Macular Degeneration (AMD)

Purpose:

Micropulse laser has shown efficacy in the treatment of several retinal diseases presumably by stimulating RPE cells and changing their microenvironment]. The aim of this study is to explore potential treatment benefits of micropulse laser in wet AMD in possibly achieving better visual acuity and lowering injection burden to patients

Methods:
Treatment was delivered with a standardized treatment regimen. The following data was collected at day of treatment, and follow-up examinations at 1, 3, 6 and 12 months: ETDRS VA, OCT determined central macular thickness (CMT), maximum macular thickness (MMT), and total volume (TV), progression or regression of subretinal fluid (SRF) and pigment epithelium detachment (PED) along with the use and timing of intravitreal pharmaceutical agents.

**Results:**

Subthreshold micropulse laser predictably impedes the progression of disease.

**Conclusion:**

The advent of subthreshold micropulse laser provides an additional tool to the treatment of wet AMD.
Abstract Submission : Entry # 33

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One-sentence objective

We hypothesize that hypoxia in the diabetic retina is caused by additional oxygen consumption arising from inner limb pumps driving the rod dark current—a process that may be interrupted by light-at-n

Title:

Investigating the Arden hypothesis: a pilot investigation of the prevention of dark adaptation as complementary therapy for diabetic retinopathy and macular edema.

Purpose:
To determine whether there are domains of hypoxia in diabetic subjects that correlate to loss of retinal function. We hypothesize that the additional oxygen consumption from the inner limb pumps of dark-adapted rods leads to a relative oxygen deficit in the diabetic retina. In support of this hypothesis, the reduced visual sensitivity in diabetic subjects can be overcome by oxygen breathing. We pr

Methods:

1. Using standard and modified microperimetric techniques, we map dark adapted rod sensitivity in the EDTRS zones in patients with non-sight-threatening DME and analyze the changes that occur in areas shown to be thickened by SD-OCT measures.
2. We record multifocal ERGs to establish the spatial distribution of inner retinal dysfunction and correlate these with microperimetric measurements of psychophysical (photoreceptor) function.
3. In order to carry out trials, we present a "light mask" as a novel approach to counter the physiological effects of dark adaptation. We demonstrate a comfortable and inexpensive solution that ensures retinal illumination is maintained at a constant level.

Results:

1. There is a sensible and systematic relationship between loss of rod sensitivity and increased retinal sensitivity in patients when they breath oxygen. By contrast, oxygen breathing has no effect on retinal sensitivity in control subjects.
2. We correlate the psychophysical changes in photoreceptor function with that of inner retinal function where vasculopathy occurs
3. Although many patients are prepared to wear devices ("light masks") during sleep, non-contact forms ("glow pillows") can also ensure continuous retinal illumination as an alternative to the light masks. However these require greater electrical power to produce larger amounts of light.

Conclusion:

We have examined changes in visual thresholds with microperimetry and have analyzed how this changes with the oxygen content in the inspired air. We have also examined the relationship between loss of visual sensitivity in regions of localized DME and the response to extra oxygen, revealing that early loss of visual function in diabetes is associated with evidence of hypoxia in humans. This is required in view of recent claims that such hypoxic states, found in cat and primate retina, may not be present in the eyes of rodents rendered diabetic with streptozotocin. We have found that the diabetic retina cannot meet the added demands of the “dark current” which is produced by the rod photoreceptors. Small clinical trials have demonstrated that early background diabetic retinopathy and DME improve if patients sleep in dim light. We propose light-at-night delivered by a “light mask” as a novel treatment method for those with sight-threatening retinopathy.
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One-sentence objective
To examine the usefulness of retinal function testing as a guide to prophylactic laser treatment of dry age-related macular and inherited retinal degenerations.

Title:
Prompt improvement in retinal function following prophylactic panmacular subthreshold diode micropulse laser (SDM) for age-related and inherited retinal degenerations. A model for functionally guided

Purpose:
To evaluate the usefulness of retinal function testing in eyes undergoing panmacular subthreshold diode micropulse laser (SMD) prophylaxis for chronic progressive retinal disease.

Methods:
The records of all patients undergoing SDM for high-risk age-related macular (AMD) and inherited photoreceptor degenerations (IRD) examined by pattern electroretinography (PERG) and automated microperimetry (AMP) before and after treatment were reviewed.

Results:
86 consecutive eyes of 57 patients with AMD, and 7 consecutive eyes of 7 patients with IRD, evaluated both before and after SDM by PERG, were eligible for study. IRD diagnoses included rod-cone degeneration (3), cone-rod degeneration (3), and
Stargardt’s disease (1 eye). 40 consecutive eyes of 21 patients had AMP concurrent with PERG. SDM treatment consisted of 1800-3000 confluent spots throughout retina circumscribed by the major vascular arcades, including the fovea (“panmacular”). PERG and AMP were performed one week before and between 4 days to 4 weeks after treatment. 92/93 eyes were improved; 85/86 eyes with AMD (P=0.0051, linear mixed model) and 7/7 eyes with IRD (P=0.0107, Wilcoxon-Mann-Whitney test). AMP average thresholds improved (P=0.0439, linear mixed model) but did not correlate with PERG results. Visual acuity was unchanged. There were no adverse treatment effects.

**Conclusion:**

Our findings confirm a role for SDM as prophylactic retinal protective therapy in chronic progressive retinal disease. As an objective, sensitive and reliable measure of macular function, PERG enables (early, preventative) function-guided, rather than (late, therapeutic) image-guided disease management.