Chronic Central Serous Retinopathy: Photothermal Stimulation of the Macula for Treatment of

Program Number: 6345 Poster Board Number: C0122
Presentation Time: 12:00 PM–1:45 PM

Long-term results of laser photocoagulation sparing the papillomacular bundle for peripapillary polypoidal choroidal vasculopathy lesions

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Purpose: To evaluate the safety and effectiveness of laser photocoagulation for indocyanine green angiography (ICGA)-identified peripapillary polypoidal choroidal vasculopathy (PPCV) lesions.

Methods: Twenty-five consecutive PPCV eyes with serous retinal detachments in the macula, which were treated with direct laser photocoagulation, were retrospectively reviewed. No patient had undergone previous treatment for PPCV. All 25 eyes were treated with multicolor red (659 nm) laser photocoagulation. The laser spot was focused on the retinal pigment epithelium underneath the detached retina to spare the papillomacular bundle. Laser photocoagulation targeted the entire ICGA-identified lesion, including both the polypoidal lesions and the branching vascular network.

Results: The mean follow-up period after the first treatment was 43.9 months (range, 12–113 months). The logMAR BCVA was stable or improved by ≥0.3 logMAR in 22 eyes (88.0%). Six cases had recurrent leakage requiring retreatment. Three of 6 cases required photodynamic therapy, resulting in visual acuity loss by ≥0.3 logMAR. The other 3 cases administered some sessions of intravitreal anti-VEGF agents, resulting in visual acuity stability. Nineteen (76.0%) of the 25 studied eyes required no additional treatment during follow-up.

Conclusions: For PPCV, laser photocoagulation was effective in maintaining or improving visual acuity with only a single treatment session over a long period, because laser photocoagulation was administered for all vascular lesions, sparing the papillomacular bundle.

Commercial Relationships: Yukari Shirakata, None; Fumio Shiraga, Alcon Japan (C), Bausch & Lomb Japan (C), Byer (C), Novartis Pharma (C), Santen Pharma (C); Chieko Shiragami, None; Ayana Yamashita, None; Atsushi Fujiwara, None

Program Number: 6346 Poster Board Number: C0123
Presentation Time: 12:00 PM–1:45 PM

Photothermal Stimulation of the Macula for Treatment of Chronic Central Serous Retinopathy

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Purpose: To assess safety and clinical efficacy of the photothermal stimulation of the macula for treatment of the chronic central serous retinopathy (CSR).

Methods: Sixteen eyes of 16 patients with chronic 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 6 months follow-up. Pre- and post-treatment fluorescein angiography (FA) and fundus autofluorescence (FAF) were also assessed.

Results: On average, 332 spots have been applied per treatment. No visible laser marks could be detected either by clinical observation, OCT, FAF or FA. An average, 13 ETDRS letters gain was achieved at 6 months. Central macular thickness decreased from 350μm to 297μm, with central maximum thickness reduction of -64μm. 37% of the patients resolved after one treatment, however 44% required retreatment after 3 months due to recurrent fluid or incomplete fluid resolution and the remaining patients received a second retreatment. Again, no visible damage to the retina after a second treatment could be seen, but visual acuity and resolution of residual fluid improved.

Conclusions: Photothermal stimulation using 577nm PASCAL laser with EndPoint Management GUI was safe and it improved visual acuity and resolution of subretinal fluid in chronic CSR. Lack of tissue damage allows periodic retreatment without cumulative scarring characteristic to conventional photocoagulation. This technique should be tested in larger clinical trials and it may offer an alternative to conventional laser therapy of the macula either alone or in association to anti-VEGF pharmacological treatments.
Purpose: Treatments that reduce drusen may have the potential to limit the progression of age-related macular degeneration (AMD). Here, we evaluated a nanosecond laser in patients with intermediate stages of AMD and investigated the retinal response and mechanism of action in a mouse model of thickened Bruch’s membrane.

Methods: Patients (N=51) with intermediate AMD (bilateral drusen >125μm) received treatment to one eye with a 532nm nanosecond (2RT laser; Ellex Pty Ltd) Q-switched YAG laser. Drusen area in each eye was graded at baseline, 12 and 24 months later. Changes in drusen area in the treated eyes were compared with a natural history AMD cohort (N=58) of similar age range and clinical AMD severity. In order to better understand the mechanism of action, human and mouse retinae were examined to assess the acute effect (1 hour to 7 days) of the laser, while long lasting effects (4 months) were evaluated in aged C57Bl6J and ApoEnull mice. Retinae and RPE were assessed for structural integrity (Nissl; phalloidin, ultrastructure), cell death (TUNEL), glosis (GFAP), and microgliosis (IBA-1). PCR microarrays and qPCR were used to characterise the changes in expression of extracellular matrix genes.

Results: Nanosecond laser treatment reduced drusen area in 35%-40% of eyes following twelve and 24 months (compared to 5-11% of eyes in a natural history cohort; p<0.001). The laser-treated human and mouse eyes exhibited similar acute structural changes such as selective lesions of the RPE and microglial invasion of the lasered area without overt photoreceptor death or retinal injury. Aged control and ApoEnull mice showed a thinning of Bruch’s membrane 4 months after a single laser treatment, that coincided with a change in the RPE expression of select extracellular matrix genes.

Conclusions: Nanosecond laser treatment thins Bruch’s membrane via mechanisms involving altered extracellular matrix turnover. Similar mechanisms may also explain the reduction in drusen area observed in patients with intermediate AMD following nanosecond laser treatment.

Commercial Relationships: Erica L. Fletcher, Ellex Pty Ltd (F); Samuel A. Mills, None; Kirsten Vesyser, None; Ursula Grefether, None; Chi D. Luu, None; Kate Brasington, None; Khin Zaw Aung, None; Malcolm J. Plunkett, Ellex Pty Ltd (E); Robyn H. Guymer, Ellex Pty Ltd (F); Andrew I. Jobling, None

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Clinical Trial: ACTRN12609001056280

Program Number: 6348 Poster Board Number: C0125
Presentation Time: 12:00 PM–1:45 PM

Effect of Selective Retina Therapy (SRT) on the inflammatory microenvironment of the subretinal space

Jost Hilkenkamp, Sofya Bartsch, Erica K. Klettner, Ralf Brinkmann, Johann Roeder, Ophthalmology, University Medical Center Schleswig-Holstein, Kiel, Germany; Medical Laser Center Lübeck, Lübeck, Germany

Purpose: To investigate the effect of Selective Retina Therapy (SRT) as a treatment of early age-related macular degeneration (AMD) on the inflammatory microenvironment of the subretinal space with a focus on key pro-inflammatory and complement system factors.

Methods: Porcine retinal pigment epithelium (RPE)-Bruch-choroid explants maintained in static organ culture in modified Ussing chambers were irradiated with a pulsed Nd:YLF laser (wave length 527 nm, pulse duration 1.7 μs, repetition rate 100 Hz, spot size 200 μm) with 140 and 180 mJ/cm² (below and above ED50-threshold) for 1.7 μs, repetition rate 100 Hz, spot size 200 μm) with 140 and 180 mJ/cm² (below and above ED50-threshold). The irradiated RPE-Bruch-choroid tissue was lysed and the same factors were quantified by Western blot (each factor n = 4-18).

Results: Compared to controls secreted basolateral C3 was reduced (0.45 ± 0.15, p<0.05) while secreted apical CFB was increased (42.11 ± 1.94, p<0.05) 24 hours after SRT with 180 mJ/cm². Basolateral and apical TGF beta 2, TNF alpha at all timepoints, C3, and CFB levels 48 and 96 hours after SRT with 180 mJ/cm² were not altered. Following SRT with 180 mJ/cm², tissue IFN levels quantified by Western blot were reduced (0.64 fold ± 0.26 (p<0.05), all other factors remained unaltered (C3 0.89-fold ± 0.1, TGF b2 0.72-fold ± 0.28, TNF alpha 0.94-fold ± 0.12 (all p<0.05)). Following SRT with 140 mJ/cm² the tissue levels of all factors quantified by Western blot remained unaltered (C3 1.26-fold ± 0.56, TGF b2 1.23-fold ± 0.15, TNF alpha 0.94-fold ± 0.28, IFN 1.37-fold ± 0.75 (all p<0.05)).

Conclusions: Inflammation and complement activation are fundamental components of AMD. The results of this study suggest that SRT does not trigger a pro-inflammatory response of the RPE during wound healing after laser exposure. Consequently, SRT does not seem to trigger AMD progression.

Commercial Relationships: Jost Hilkenkamp, None; Sofya Bartsch, None; Erica K. Klettner, None; Ralf Brinkmann, Medical Laser Center Lübeck, Lübeck, Germany; Johann Roeder, Johann Roeder (P)

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study suggests a trend that ML may actually be counterproductive by enhancing vitreous attachment in the area of treatment. This persistent VMA may worsen DME through tractional and/or hypoxic mechanisms. Further prospective randomized controlled studies are needed to evaluate this trend.

**Commercial Relationships:** Corey Waldman, None; David Ellenberg, None; Philip H. Scharper, None

**Program Number:** 6350 Poster Board Number: C0127
**Presentation Time:** 12:00 PM-1:45 PM
**Accurate Definition of Photocoagulation Intensity by Optical Coherence Tomography (OCT), Microperimetry and Temperature**

Stefan O. Koinzer1, Mark J. Saeger1, Konstantine Purtskhvanidze1, Jan Heckmann1, Kerstin Schlott1,3, Alexander Baade2, Amke Caliebe1, Ralf Brinkmann1,2, Johann Roieder1. 1Ophthalmology, Kiel University, Kiel, Germany; 2Institute of Biomedical Optics, Luebeck University, Luebeck, Germany; 3Medical Laser Center Luebeck, Luebeck, Germany; 4Institute for Medical Informatics and Statistics, Kiel University, Kiel, Germany.

**Purpose:** Clinical laser photocoagulation dosage still relies on immediate ophthalmoscopic visibility, while new imaging techniques would allow more accurate lesion definitions. We demonstrate the high variability of standard ETDRS lesions and suggest objective, OCT-based lesion classes with related mean end temperatures, and we show microperimetric side-effects of the lesions.

**Methods:** We used a universal OCT-based lesion classification that we had developed in a previous study, based on images and retinal peak end temperatures of 504 lesions (100 or 300 μm, 20–50–100–200 ms) from 20 patients. Now we compared 532 nm continuous wave lesions of ETDRS intensity (moderate grey) from 12 patients applied by 4 experienced physicians (300 μm, 20 or 200 ms) in a non-interventional clinical trial. Ophthalmoscopic and OCT characteristics (Heidelberg Spectralis), and microperimetric findings (Nidek MP1) of the lesions were compared over 3 months. Per patient, we imaged 40-60 lesions clinically and 8 lesions microperimetrically (> 6 stimuli/lesion, minimal and mean sensitivities).

**Results:** Lesion variability between patients and physicians measured up to 177% in diameter, or 313% in area. Variability of 20 ms lesions was greater than of 200 ms lesions (both p < 0.001). The majority of 200 ms lesions had strong OCT classes 5 and 6 (end temperatures > 90°C), while the classes of 20 ms lesions were highly variable from 2 to 6 (end temperatures ~ 65 to > 100 °C). 37% (20 ms) or 71% (200 ms) caused absolute scotomas after 1 day, but only 4% or 32% after 3 months. Mean retinal sensitivities were initially reduced by -3 dB (20 ms) or -6 dB (200 ms), but recovered fully (20ms: -2 dB) after 3 months.

**Conclusions:** Lesions aiming at the same ophthalmoscopical endpoint – moderate grey discoloration – are extremely variable, which limits the predictability of the overall clinical treatment effect. The microperimetric damage per lesion is less pronounced than generally believed, even in lesions with obvious photoreceptor scarring. In conventional photocoagulation, 200 ms lesions were more homogeneous, more destructive and caused more pronounced microperimetric damage than 20 ms lesions. Our findings imply that temperature-controlled 20 ms lesions with peak end temperatures around 90 – 100 °C would be safe, effective and microperimetrically innocuous.

**Commercial Relationships:** Stefan O. Koinzer, None; Mark J. Saeger, None; Konstantine Purtskhvanidze, None; Jan Heckmann, None; Kerstin Schlott, None; Alexander Baade, None; Amke Caliebe, None; Ralf Brinkmann, None; Johann Roieder, None

**Program Number:** 6351 Poster Board Number: C0128
**Presentation Time:** 12:00 PM-1:45 PM
**Novel 3-Nanosecond Pulse laser and Diabetic Macular Edema: Changes in Visual Acuity and OCT guided analysis of the FLUID**


**Purpose:** To evaluate the effects of Novel 3-Nanosecond Pulse (2RT) laser in the treatment of non-centre involving Diabetic Macular Edema. A quantitative analysis of intraretinal and subretinal fluid guided by Cirrus optical coherence tomography using standard image analysis software and observing the changes in visual acuity.

**Methods:** A retrospective analysis of 28 patients with diabetic macular edema that had been treated with nanopulse laser. The laser spots (400 microns) were applied in a grid pattern, one burn width apart to the retinal areas with edema at an energy setting that produced minimal reaction. Patients were followed up for 6 months. The main parameters analysed were changes in visual acuity and intraretinal fluid (IRF) and subretinal fluid (SRF) as assessed by Optical Coherence Tomography (OCT) using standard image analysis software.

**Results:** Of the 28 patients (33 eyes) enrolled in the study, the majority were male (78.6%) and the mean age was 59.24 ± 10.55 years. Mean logMAR visual acuity improved from a mean 0.07 logMAR to 0.005 logMAR at 6 months (p > 0.0001). Also, while an initial increase in IRF was seen at 1 month, a significant decrease was achieved in IRF at final follow-up (p > 0.0001). No complications were observed in any of the cases.

**Conclusions:** Retinal rejuvenation therapy (2RT) is safe and effective in the management of non-center involving diabetic macular edema. It is the first report that measured the effects of 2RT laser on intraretinal and subretinal fluid.

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Purpose: To evaluate the alteration of retinal function using multifocal electroretinogram (mERG) over time after microsecond-pulsed selective retinal therapy (SRT) with automatic real-time reflectometry, and to compare the retinal function after both laser treatment modalities of continuous wave laser photocoagulation (CWPC) and SRT.

Methods: SRT and CWPC were applied with 10×10 shots and 1/2 burn-width on the retina at 2 disc diameters inferiorly from optic nerve head, which regarded as visual streak, on right and left eyes of the 20 healthy Chinchilla Bustard rabbits, respectively. mERG was performed before and at day 1, 7 and 30 after both laser treatments. The mean amplitudes and implicit times of N1, P1, N2 from laser-treated hexagon areas were compared among each period. Additionally, fundus color photography, optical coherence tomography (OCT) and fundus fluorescein angiography (FFA) were also carried out. Chorioretinal sections including optic nerve head were obtained at each examination period to observe the anatomical and morphologic changes after both laser treatments.

Results: The mean N1 amplitudes from CWPC lesion were decreased significantly compared to baseline at day 30 (p<0.001); on the other hand, those from SRT lesion showed no difference from baseline (p=0.230). In addition, the mean P1 amplitudes from CWPC were significantly declined from baseline at day 7 and 30 (p<0.001, p=0.001, respectively), while those from SRT were sustained for 30 days after treatment. However, the mean implicit times of N1, P1, N2 and the mean amplitudes of P2 from SRT and CWPC lesions were not changed significantly in comparison with baseline for 30 days. OCT and chorioretinal section findings also revealed the structural preservation on SRT lesion compared to CWPC lesion with atrophic change on whole retinal layer.

Conclusions: These results might suggest that SRT preserved retinal function as well as anatomical structure for 1 month after treatment.

Commercial Relationships: Tae Kwann Park, None; Hoon Dong Kim, None; Jung Woo Han, None; Young-Hoon Ohn, None; Tae Ho Ha, None

Program Number: 6353 Poster Board Number: C0130
Presentation Time: 12:00 PM–1:45 PM
Electroretinographic findings associated with selective retinal therapy (SRT) versus conventional panretinal photocoagulation (PRP) in rabbits

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Purpose: Subvisible selective retinal therapy (SRT) was intended to target the retinal pigment epithelium (RPE) without thermal damage to the adjacent photoreceptors. We evaluated changes in electroretinographic (ERG) findings after SRT compared to panretinal photocoagulation (PRP) in rabbits.

Methods: One eye of twelve chinchilla rabbits was treated with 150 spots of either SRT or conventional laser treatment. Right eyes of six rabbits received SRT(527nm, 20-25µJ, 200um) (SRT group; n = 6) and right eyes of the other six rabbits were treated with PRP(577nm,150mW,200um) (PRP group; n = 6). Fluorescein angiography was performed to demonstrate SRT lesions(Figure1). The operated eyes were investigated with full-field ERG according to ISCEV standards at 1hr and at 3 weeks after treatment. The eyes were enucleated at 3 weeks after that, and hematoxylin and eosin staining was employed to monitor the extent and depth of the laser effects.

Results: At 1 day after treatment, ROD b-wave amplitude was reduced to 64 ± 4 % of baseline in the PRP group compared to baseline and 93 ± 6 % in the SRT group. This reduction was significantly larger in the PRP group than in the SRT group (P <0.05 ; t Test). Similar results were observed for the dark-adapted Combined Response (CR) b-wave amplitude, the reduction in CR b-wave amplitude was significantly larger in the PRP group than in the SRT group. CR a-wave, oscillatory potentials, cone single flash, and 30 Hz flicker responses showed no statistically differences in between-group analyses. At 3 weeks later, the differences were reduced due to recovery in both PRP and SRT groups. Especially b-wave amplitude in SRT group made no difference compared to baseline at 3 weeks. Histology showed selective RPE damage sparing photoreceptor continuity.

Conclusions: SRT in the rabbit eyes induces less functional loss than PRP group in both rod- and cone-mediated retinal function in full-field ERG. Especially SRT group showed no difference compared to baseline. These results suggest that SRT achieves selective targeting of the RPE without the inner and outer retinal damage.

**Results:** No increase in OCT central retinal thickness (CRT) after PRP was found in Group 1 patients (p=0.941 t-Student). Diminished or unchanged CRT was found in Group 2 patients coincident with the reporting of these results (p=0.03 t-Student). Significantly reduced CRT was found in group 3 patients (p=0.014 t-Student). Burns could be partially visualized on biomicroscopy and were confirmed with FAF within one hour from treatment. No peri-treatment laser-associated adverse effects associated with the PRP or macular YW-PL array treatments were found.

**Conclusions:** Yellow 577nm wavelength Pascal® with and without EpM® was found to be safe and effective. Fundus Autofluorescence allows the identification and documentation of areas treated with barely visible or non-visible subthreshold laser.

**Commerical Relationships:** Maria Gil Martinez, None; Salvador Pastor, None; Kenneth Yau, None; Yvonne D’Souza, None; Sajjad Mahmood, None; Stephen Charles, None; George Turner, None; David McLeod, None; David B. Henson, None; Paolo E. Stanga, Allergan plc (C), Allergan plc (F), Bausch & Lomb Inc. (C), Bausch & Lomb Inc. (F), Bausch & Lomb Inc. (R), Bayer AG (C), Bayer AG (R), Novartis AG (C), Novartis AG (R), Optos plc (C), Optos plc (F), Optos plc (R), Thrombogenics Inc. (C), Thrombogenics Inc. (R), Topcon Corp. (C), Topcon Corp. (F), Topcon Corp. (P), Topcon Corp. (R)

**Program Number:** 6355 Poster Board Number: C0132

**Presentation Time:** 12:00 PM–1:45 PM

**F/A and ICG guided, sub-threshold, reduced fluence Focal Laser Photocoagulation Treatment (SRFLPT) in patients with Diabetic Clinically Significant Macular Edema (CSME): Two Year results Georgios Papastergiou, Faysal El-Jabali, Karl Waite, Michael Bennett. Retina Institute of Hawaii, Honolulu, HI

**Purpose:** To assess the long term effectiveness of subthreshold focal laser photocoagulation treatment (SRFLPT) in managing CSME in patients with NIDDM Type 2, by following visual acuity and changes in central retinal volume as measured by OCT.

**Methods:** Two year data were collected from the 142 patients (216 eyes) with ETDRS defined CSME enrolled in our study. ETDRS visual acuity, SD-OCT volume (central 6x6mm), F/A and ICG were obtained at 24 months to follow up on our previously reported results. ICG findings were used again to identify focal leakage from larger retinal microaneurysms and these were then individually treated with direct bare threshold (light blanching) focal laser application. Reduced invisible sub-threshold grid laser photocoagulation was used to treat areas of diffuse capillary leakage determined by F/A findings. The settings of the laser treatment were not changed: spot size of 100μm and a duration of 20ms/sec. Central macular volume was monitored by the Heidelberg SD-OCT.

**Results:** At the end of our 2 year follow-up period, the average total fluence was 2650 ±150 J/cm². 9 patients were lost to follow-up. Visual acuity continued to improve on average 4.6±3.9 ETDRS letters after 24 months (<0.05). Similar to our one–year results, the macular volume improved to 7.6±1.1mm³ from our baseline of 8.6±5.5mm³. 19% of the patients (27) exhibited a gain of more than 10 letters, when 9% (13 eyes) lost 15 or more letters.

**Conclusions:** Our study suggests that clinical improvement of eyes with CSME continues for 24 months when using SRFLPT. Minimizing the total energy used in each session, results in a reduction of the collateral damage and inflammation while still achieving an effective treatment of the macular edema as indicated by our two years results regarding vision and total retinal thickening. However, CSME laser treatment defined by the ETDRS remains still the gold standard. Continued long term follow-up and a larger controlled randomized trial is necessary to better assess the effectiveness of this treatment.

**Commercial Relationships:** Georgios Papastergiou, None; Faysal El-Jabali, None; Karl Waite, None; Michael Bennett, None

**Clinical Trial:** RIH1010

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therapy in the treatment of retinopathy of prematurity. With this in mind, we designed a study to compare morbidity markers between these two treatment groups.

**Methods:** The last ten patients treated with laser therapy and the last ten patients treated with bevacizumab for retinopathy of prematurity at our institution were identified, and their charts were retrospectively analyzed. Patients were excluded if they had received both modalities of treatment. Our morbidity markers included: number of days that ventilator support was required following treatment, length of hospital stay following treatment, and mortality.

**Results:** Our preliminary results indicate that length of hospital stay following therapy was longer in patients receiving laser treatment compared to those receiving intravitreal bevacizumab (80 days versus 61 days). Two patients in the laser group required prolonged ventilator support following treatment compared to no patients in the bevacizumab group. Mortality was found to be equal in both groups.

**Conclusions:** Use of intravitreal bevacizumab for vision threatening retinopathy of prematurity did not result in increased length of hospital stay nor prolonged ventilator support following treatment when compared to traditional laser therapy, and mortality was found to be equal between our two treatment groups.

**Commercial Relationships:** Stephen M. Huddleston, None; Julie Calderwood, None; Mary E. Hoehn, None

**Program Number:** 6358 **Poster Board Number:** C0135

**Presentation Time:** 12:00 PM–1:45 PM

**Adherence to laser therapy in diabetic patients in INDEN, Santo Domingo, Dominican Republic, from April 2012 to April 2013**

*Lyam Ciccone*, 1, 2 *Raúl Padrón*, 1 *Federico Gomez*, 1 *Jaime Soria*, 1 1INDEN, Santo Domingo, Dominican Republic; 2UNIBE, Santo Domingo, Dominican Republic.

**Purpose:** Diabetic retinopathy is a major complication of diabetes mellitus, being the leading cause of blindness in individuals of working age (25-74 years). The cornerstone of the treatment of this complication in advanced stages is the laser photocoagulation.

**Methods:** The main objective of this study was to assess treatment adherence and success rate or condition’s stabilization, along with the clinical-demographical characteristics and state of visual acuity of patients with diabetic retinopathy treated with laser photocoagulation in INDEN hospital’s ophthalmology department, Santo Domingo, DR. from April 2012 - April 2013.

**Results:** Based on a cohort study we evaluated all the patients who were treated with laser photocoagulation in the mentioned period (266 patients), from which a sample of 115 eyes was extracted comprised of those who met the inclusion criteria. These were tabulated in Excel and subsequently analyzed in SPSS. Results show that patients were diagnosed with DM about 16 years prior to the ophthalmological evaluation and treatment accounting for a number of 93 eyes, of which 85% had a proliferative stage. Therapeutic adherence was of 57% with a stabilization percent of 83% in contrast with 43% of the patients with bad adherence (p value: .001). The usage of Triamcinolone of Anti-VEGF along with laser therapy shows a tendency to improve visual acuity in patients with CSME (.70 and .65 respectively to .65 and .65) (p value: .001)

**Conclusions:** Until now, we were not aware of Dominican diabetic patients’ adherence to laser therapy. Results show that these patients have a poor adherence to laser therapy with only 57% completing treatment. Also our patients don’t attend their ophthalmic evaluation until it has being too long since their diagnosis, about 16 years, (85% in proliferative stages). Although visual acuity shows some improvement with usage of laser plus triamcinolone and Anti-VEGF agents, stabilization of the patient’s condition is the general outcome. Shortening laser sessions to 1 or 2 in order to finish treatment earlier, usage of coadjutant treatment (triamcinolone and Anti-VEGF) and early referring of these patients by other specialists such as diabetologists, cardiologists, endocrinologists, etc. could help avoid patients’ poor therapeutic adherence, late attendance and help prevent blindness in developing countries like the Dominican Republic.

**Commercial Relationships:** Lyam Ciccone, None; Rafael E. Valdez, None; Federico Gomez, None; Jaime Soria, None

**Program Number:** 6359 **Poster Board Number:** C0136

**Presentation Time:** 12:00 PM–1:45 PM

**Optical coherence Tomography (OCT) to evaluate treatment of Diabetic macular edema using intravitreal injection of triamcinolone and argon laser treatment soheir M. Mahmoud Ali.** Ophthalmology, Kasr Al Einy hospital Cairo University, Dokki Giza, Egypt.

**Purpose:** To Evaluate the efficacy of intravitreal injection of triamcinolone followed by macular grid argon laser treatment of to reduce retinal thickness and resolving of diabetic macular edema

**Methods:** The study included 60 eyes of D patients having macular edema, diagnosed by OCT to have central foveal thickness more than 350 microns. Exclusion criteria were IOP above 18 mmHg, proliferative diabetic retinopathy, previously operated or laser treated eyes and. Each eye had: 1-Preoperative: Fundus examination, OCT to measure central foveal thickness (CFT), to evaluate stage and type of macular edema, presence of neurosensory detachment, IS/OS segment integrity, IOP and BCVA. 2- intravitreal injection of 2mg in 0.05ml followed up closely for IOP.3- OCT after 21 days of injection. 3- Argon laser was scheduled to eyes where CFT below 250 microns in a C Grid pattern having spot size 100 microns, duration of 200msec and power of 120-200mWatt 4- Eyes with CFT more than 250 mic were subjected to another session of triamcinolone intravitreal injection after 1 month following first injection then measurement of CFT by OCT after 21 days then C Grid pattern laser treatment if CFT was reduced below 250 microns. Results were recorded and statistically analyzed.

**Results:** The study included 60 eyes of 60 NIDD. 35 males and 15 females: 30 eyes had combined diffuse and cystoid macula edema (ME), 14 eyes had only cystoid ME and 16 eyes had only diffuse ME. Mean CFT was +/- 510mic.

72% of eyes having combined diffuse and cystoid ME had CFT below 250 mic after one injection while 20% required a second injection while 8% did not give a significant response so not scheduled for laser tereatment.

64% eyes having cystoid ME had CFT below 250 mic after one injection while 14% required a second injection while 22% did not give a significant response so not scheduled for laser treatment.

84% eyes having diffuse ME had CFT below 250 mic after one injection while 8% required a second injection while 8% did not give a significant response so not scheduled for laser treatment.

85% of resistant cases showed preoperative neurosensory detachment. 15% had elevation of IOP that responded to antiglaucoma treatment.

**Conclusions:** Triamcinolone followed by laser treatment is an efficient method for treating different types of diabetic macular edema in patients of IOP below 18 mmHg.

**Commercial Relationships:** soheir M. Mahmoud Ali. None

**Clinical Trial:** #1082011
The efficacy and safety of 577-nm subthreshold diode micropulse photocoagulation in macular edema


**Purpose:** To assess the efficacy and safety of 577-nm subthreshold diode micropulse (SDM) laser in patients with macular edema by evaluating retinal thickness and autofluorescence.

**Methods:** A retrospective chart review was conducted on all patients who were seen at a university-based retina practice between January 1, 2012 and December 31, 2012 and who had received SDM laser (IQ 577, IRIDEX Corporation, Mountain View, CA) for the treatment of macular edema. Spectral-domain optical coherence tomography (SD-OCT) (Spectralis, Heidelberg Engineering, Heidelberg, Germany), was evaluated for central mean thickness (CMT), total macular volume (TMV), and autofluorescence.

Macular edema was divided into three categories of severity: mild (<350 microns), moderate (350-500 microns) and severe (>500 microns). These values were agreed upon by the investigators according to clinical experience. Patients with follow-up visits of 1, 2 or 3 months and who had not received other treatment in the interim were included.

**Results:** Eighty-eight patients (104 eyes) were identified (37.5% male, 62.5% female, mean age 64.6 years). Concurrent continuous wave photocoagulation comprised 29.8% of treatments. Percent change in CMT at 1 month and 3 months was not significantly different compared to baseline. At 2 months, mean decrease in CMT was 28.34% for the severe edema group (p=0.03). Similarly, in the SDM-only severe subgroup, mean CMT decrease was 26.34% (p=0.03). The mild and moderate groups did not show a significant change in CMT from baseline.

**Conclusions:** Subthreshold diode micropulse photocoagulation using a 577-nm laser is effective in decreasing macular edema in patients with a high degree of baseline edema. The peak effect appears to be 2 months.

**Commercial Relationships:** Sophia Wong, None; Emelene Ramenaden, None; Rashed Alhabshan, None; Lindsay Smithen, None; Jeevan R. Mathura, None

Program Number: 6360 Poster Board Number: C0137

**Presentation Time:** 12:00 PM–1:45 PM

**The efficacy and safety of 577-nm subthreshold diode micropulse photocoagulation in macular edema**

Dafna Goldenberg1, 2, Michaella Goldstein1, 2, Pazit Pianka2, Anat Loewenstein2, 3, Uri Soiberman1, 2. Ophthalmology, Tel Aviv Medical Center, Tel Aviv, Israel; 2Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel; 3Lumenis Ltd, Yokneam, Israel.

**Purpose:** Subthreshold laser treatment of diabetic macular edema (DME) may have less deleterious effects on the photoreceptors than regular continuous wave laser. This study aimed to assess whether subthreshold laser causes a long-term damage to the retinal structures, as demonstrated by SD-OCT, and to evaluate its efficacy in obliterating retinal diabetic microaneurysms.

**Methods:** A retrospective study of eyes that were diagnosed with non-foveal involving DME and underwent subthreshold laser treatment with the Lumenis Novus SRT system. SD-OCT scans of treated retinal areas, performed prior to treatment and approximately 4 months following treatment, were assessed for changes in the continuity of the photoreceptor (PR) layer, the thickness of the PR-retinal pigment epithelium (RPE) layer, the retinal thickness at the treatment sites, and the diameter of the microaneurysms.

**Results:** Nineteen eyes and 31 microaneurysms were included in this study. Following treatment, the continuity of the inner / outer segments junction of the PR was confirmed in all but two cases. The thickness of the PR-RPE layers was 72.32 ± 7.36 μm and 70.97 ± 7.27 μm prior to and following treatment, respectively (p=0.061). The retinal thickness at the treatment sites decreased from 398.65 ± 57.89 μm to 372.74 ± 60.4 μm (p<0.001). The mean axial diameter of the microaneurysms was 87.32 ± 27.45 μm and 6.86 ± 26.12 μm, respectively (p<0.001).

**Conclusions:** In this study, subthreshold laser treatment of retinal diabetic microaneurysms has been shown to be efficacious and safe, as demonstrated by SD-OCT.

A color fundus photograph of the right eye of one of the study’s participants. B Fluorescein angiography (FA) performed two hours following subthreshold laser treatment in the same eye. The studied microaneurysms are circled in this early phase image. C A late phase image from the same FA study. The studied microaneurysms are circled. D Pre-treatment: an infrared scan on the left side of the panel, and an SD-OCT scan on the right. The studied microaneurysms are circled. The PR-RPE layers are depicted within the blue rectangle. The asterisked rectangle is a magnification. E Four months post treatment: the vertical lines mark the former locations of the microaneurysms, which are now undetectable. The PR-RPE layers are within the red rectangle. The asterisk marks a magnified view.

**Commercial Relationships:** Dafna Goldenberg, None; Michaella Goldstein, None; Pazit Pianka, Lumenis Ltd (E); Anat Loewenstein, Lumenis Ltd (C); Uri Soiberman, None

Program Number: 6361 Poster Board Number: C0138

**Presentation Time:** 12:00 PM–1:45 PM

**Preservation of the Photoreceptor Layer following Subthreshold Laser Treatment for Diabetic Macular Edema as Demonstrated by SD-OCT**

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**Purpose:** To assess the efficacy and safety of 577-nm subthreshold diode micropulse (SDM) laser in patients with macular edema by evaluating retinal thickness and autofluorescence.

**Methods:** A retrospective chart review was conducted on all patients who were seen at a university-based retina practice between January 1, 2012 and December 31, 2012 and who had received SDM laser (IQ 577, IRIDEX Corporation, Mountain View, CA) for the treatment of macular edema. Spectral-domain optical coherence tomography (SD-OCT) (Spectralis, Heidelberg Engineering, Heidelberg, Germany), was evaluated for central mean thickness (CMT), total macular volume (TMV), and autofluorescence.

Macular edema was divided into three categories of severity: mild (<350 microns), moderate (350-500 microns) and severe (>500 microns). These values were agreed upon by the investigators according to clinical experience. Patients with follow-up visits of 1, 2 or 3 months and who had not received other treatment in the interim were included.

**Results:** Eighty-eight patients (104 eyes) were identified (37.5% male, 62.5% female, mean age 64.6 years). Concurrent continuous wave photocoagulation comprised 29.8% of treatments. Percent change in CMT at 1 month and 3 months was not significantly different compared to baseline. At 2 months, mean decrease in CMT was 28.34% for the severe edema group (p=0.03). Similarly, in the SDM-only severe subgroup, mean CMT decrease was 26.34% (p=0.03). The mild and moderate groups did not show a significant change in CMT from baseline.

**Conclusions:** Subthreshold diode micropulse photocoagulation using a 577-nm laser is effective in decreasing macular edema in patients with a high degree of baseline edema. The peak effect appears to be 2 months.

**Commercial Relationships:** Sophia Wong, None; Emelene Ramenaden, None; Rashed Alhabshan, None; Lindsay Smithen, None; Jeevan R. Mathura, None

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A histological comparison of micropulse and standard laser treatment in threshold and sub-threshold modes

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**Purpose:** Laser photocoagulation is a common treatment for diabetic macular edema but not without side effects and can damage the neurosensory retina. Sub-threshold micropulse laser produces therapeutic effects without inducing detectable clinical visible changes. However, sub-threshold standard (continuous wave) laser can produce detectable changes in optical coherent topography. We aim to compare the effects of the 577nm (yellow) micropulse laser, 577nm (yellow) standard mode laser and 532nm (green) standard mode laser on the retina by histological examination.

**Methods:** Twelve Dutch-belted rabbits received laser treatment in their left eyes. The 532nm and 577nm laser photocoagulation in standard mode were used in six rabbit eyes. The other six rabbits received sub-threshold 577nm micropulse laser photocoagulation at 5% and 10% duty cycle. Treatment was given at threshold and sub-threshold (approximately 50% of threshold) powers in different areas of the retina. At 1 week and 1 month post-laser photocoagulation, histology of the retinal sections was analyzed and compared.

**Results:** In the treated areas by threshold mode, extensive retinal damage was present with all 4 treatment modalities. In the sub-threshold-treated areas, at 1 week and 1 month post-laser treatment, retinae treated by 532nm laser photocoagulation in standard mode exhibited more retinal morphological changes than the ones treated by 577nm laser in standard mode. Increased extent of retinal fold, retinal pigment epithelium disruption and outer retinal cell death occurred. In general, the overall appearance of the retinae treated with 577nm micropulse laser in both 5% and 10% duty cycles were better preserved when compared with the ones using standard setting with either 577nm or 532nm laser. Most importantly, cellular morphology appeared best preserved in the retinae using the 5% duty cycle, with slight or minimal disruption by histological examination.

**Conclusions:** This study confirmed the clinical findings that no matter what modality is used, if there was a threshold treatment, extensive retinal damage occurs. However, by reducing power to 50% of threshold power, less damage incurred by using the 5% duty cycle micropulse laser.

**Commercial Relationships:** Amy C. Lo, None; Laurence Lau, None; Ian Wong, None; Victor Chong, Quantel Medical (C)

**Support:** Equipment donation by Quantel Medical

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**Poster Board Number:** C0140
**Presentation Time:** 12:00 PM–1:45 PM

Combination therapy with subthreshold diode laser micropulse photocoagulation and intravitreal anti-vascular endothelial growth factor injections for diabetic macular edema


**Purpose:** To determine the anatomical and functional outcomes of intravitreal anti-vascular endothelial growth factor (anti-VEGF) injections combined with supplemental subthreshold diode laser micropulse (SDM) photocoagulation in the treatment of diabetic macular edema (DME).

**Methods:** A retrospective chart review of all patients with subfoveal DME identified by spectral domain optical coherence tomography (SD-OCT) and fluorescein angiogram (FA) who had undergone SDM photocoagulation and/or anti-VEGF injections in the time period between January 2011 to November 2013 was performed. Exclusion criteria included the presence of other concomitant retinal diseases that can lead to subfoveal macular edema, a history of intravitreal steroid injections, or focal photocoagulation in the previous 2 years. Ten patients were identified. Group 1 consisted of 5 patients who had undergone both SDM photocoagulation and anti-VEGF injections. Group 2 consisted of 5 patients matched for age, gender and a diagnosis of subfoveal DME who had undergone anti-VEGF injections only. All records were reviewed for BCVA, fundus photography, FA (presence of macular ischemia and leakage), macula SD-OCT (presence and location of fluid or exudates, central macular thickness (CMT)) and the type (ranibizumab or bevacizumab) and frequency of treatments administered. Statistical analysis was performed using the paired student t-test.

**Results:** Groups 1 and 2 included a total of 10 patients. The average age of Group 1 was 64 years and that of Group 2 was 61 years. Duration of follow-up ranged from 6 to 27 months (average 14.2 months) for Group 1 and 10 to 17 months (average 13.6 months) for Group 2. Average number of injections given per month was 0.35 for Group 1 and 0.86 for Group 2 (p=0.03). Average BCVA improved 0.10 logMAR in Group 1 and 0.20 logMAR in Group 2 (p=0.12). Average CMT improved 97 um in Group 1 and 140 um in Group 2 (p=0.26).

**Conclusions:** The frequency of anti-VEGF injections was significantly reduced in patients who had undergone supplemental SDM photocoagulation without a significant difference in anatomical and functional outcomes. Combination therapy with anti-VEGF injections and SDM photocoagulation may help to reduce the treatment burden for patients with subfoveal DME. This pilot study provides impetus for a larger controlled prospective study.

**Commercial Relationships:** Sumeer Thinda, None; Amar P. Patel, None; Allan A. Hunter, None; Ala Moshiri, None; Lawrence S. Morse, None

**Support:** Research to Prevent Blindness

**Program Number:** 6364
**Poster Board Number:** C0141
**Presentation Time:** 12:00 PM–1:45 PM

Subthreshold Micropulse Diode Laser Photocoagulation (577nm) for Macular Edema secondary to retinal vein occlusion in Korean Patients

Yong Sung You, Dongkyu Lee, San Sung, Hyun-Sab Oh, Soon Hyun Kim, Oh Woong Kwon. Nune Eye Hospital, Seoul, Republic of Korea.

**Purpose:** To assess the efficacy and safety of subthreshold micropulse diode laser photocoagulation for macular edema (ME) secondary to retinal vein occlusion.

**Methods:** Single center, retrospective, nonrandomized interventional case series

Patients : 34 consecutive retinal vein occlusion patients (34 eyes) with clinically significant ME and a central macular thickness (CMT) < 500 micron by optical coherence tomography.

Observation procedures : Subthreshold micropulse diode laser photocoagulation (577 nm) was done with a 15% duty cycle (0.2 sec; 100 micron) at the burn threshold energy. The treated area was monitored on color images for 12 months. Main outcome measures: CMT and best-corrected visual acuity (BCVA) at 1, 3, 6 and 12 months.

**Results:** After 12 months, there was a significant reduction of CMT (P = 0.31, paired t test), but the changes of BCVA was not significant.
The preoperative CMT and BCVA (logarithm of the minimal angle of resolution; logMAR) were 314.29 um and 0.334 respectively, vs 284.91 um and 0.310 at 3 months. Visual acuity was improved or maintained within 0.2 logMAR for 12 months in 90.9% of the patients. No obvious laser scars were detected in any patient.

**Conclusions:** In patients with moderate ME secondary to RVO, subthreshold micropulse diode laser photocoagulation controls ME and maintains visual acuity with minimal retinal damage. These findings prove the efficacy of this method for Korean patients.

**Commercial Relationships:** Yong Sung You, None; Dongkyu Lee, None; San Sung, None; Hyun-Sub Oh, None; Soon Hyun Kim, None; Oh Woong Kwon, None

**Program Number:** 6365 **Poster Board Number:** C0142  
**Presentation Time:** 12:00 PM–1:45 PM

**Laser photocoagulation of peripapillary choroidal neovascular membranes (CNVM)**  
**Suruchi Bhardwaj**1,2, Tamara R. Vrabec2. 1Ophthalmology, Temple University School of Medicine, Philadelphia, PA; 2Ophthalmology, Geisinger Medical Center, Danville, PA.

**Purpose:** The standard of care for subfoveal choroidal neovascularization (CNVM) has evolved from laser photocoagulation to intravitreal anti-VEGF injection. No studies have compared these treatments in peripapillary CNVM, an uncommon extrafoveal variant. These lesions may be more sensitive to laser; favorable results have been reported with only partial ablation of CNVM. We describe our experience with seven eyes managed with laser.

**Methods:** Retrospective case series. Review of seven patient charts with diagnosed peripapillary neovascular membranes in exudative age related macular degeneration.

**Results:** 4 men and 3 women aged 81-89 years followed 4-46 months (mean 18 months) after laser experienced improved final visual acuity (85%), (range 20/30 - CF, mode 20/30) with 1-3 laser treatments.

**Conclusions:** Laser photocoagulation may be considererd as an alternative to chronic anti-VEGF injection in the management of peripapillary CNVM. Further study is warranted.

**Fluorescein Angiography**

**Commercial Relationships:** Suruchi Bhardwaj, None; Tamara R. Vrabec, None

**Program Number:** 6366 **Poster Board Number:** C0143  
**Presentation Time:** 12:00 PM–1:45 PM

**Subthreshold Micropulse Diode Laser Photocoagulation (577nm) for Diabetic Macular Edema in Korean Patients**  
Dongkyu Lee, Hyunseung Kang, Hyoung Eun Kim, Yong Sung You, Soon Hyun Kim, Oh Woong Kwon. Vitreoretinal Center, Nune Eye Hospital, Seoul, Republic of Korea.

**Purpose:** To assess the efficacy and safety of subthreshold micropulse diode laser photocoagulation for diabetic macular edema (ME).

**Methods:** Single center, retrospective, nonrandomized interventional case series

Patients: 39 consecutive diabetic patients (57 eyes) with clinically significant ME and a central macular thickness(CMT) < 500 micron by optical coherence tomography.

Observation procedures: Subthreshold micropulse diode laser photocoagulation (577 nm) was done with a 15% duty cycle (0.2 sec; 100 micron) at the burn threshold energy. The treated area was monitored on color images for 12 months.

Main outcome measures: CMT and best-corrected visual acuity (BCVA) at 1, 3, 6, 12 months.

**Results:** After 1 months, there was a significant reduction of CMT (P < 0.05, paired t test). After 6 months, there was a significant improvement of BCVA (P = 0.19, paired t test).

The preoperative CMT and BCVA (logarithm of the minimal angle of resolution; logMAR) were 330.5 um and 0.351 respectively, vs 321.8 um and 0.328 at 3 months. Visual acuity was improved or maintained within 0.2 logMAR for 12 months in 94.7% of the patients. No obvious laser scars were detected in any patient.

**Conclusions:** In patients with moderate diabetic ME, subthreshold micropulse diode laser photocoagulation controls ME and maintains visual acuity with minimal retinal damage. These findings prove the efficacy of this method for Korean patients.

**Commercial Relationships:** Dongkyu Lee, None; Hyunseung Kang, None; Hyoung Eun Kim, None; Yong Sung You, None; Soon Hyun Kim, None; Oh Woong Kwon, None
Non-Vitrectomized Vitrectomy to Manage Coats’ Disease

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Purpose: To evaluate the therapeutic safety, efficacy and feasibility of treating Coats’ disease with non-vitrectomized vitrectomy.

Methods: 15 patients (15 eyes) diagnosed with Coats’ Disease between December 2012 and October 2013 were included in this study. There were 13 males (86.7%) and 2 females (13.3%) patients, aged from 7 months to 18 years (average 6.7 years). All of the 15 eyes were complicated with shallow retinal detachment. We performed operations with minimal invasions: made two 23G ports 3mm posterior to the limbus of cornea, applied laser directly on the abnormal blood vessels and injected viscoelastics afterwards. 5 eyes were treated combined with intravitreal triamcinolone injection and five with lucentis injection. (Figure 1 A,B,C,D). 2 eyes undertook this surgery after drainage of the subretinal fluid (Figure 2 E,F,G,H).

Results: The follow-up ranged from 2 to 10 months. Visual acuity, intraocular pressure, eye position, slit lamp microscope, indirect ophthalmoscope and color fundus imaging were followed up. At the end of follow-up, 15 eyes had reattached retina, the abnormal blood vessels subsided with laser spots and one eye had an increased intraocular pressure. (Figure 3, 4, 5)

Conclusions: Minimally invasive operations of intraocular photocoagulation combined with intravitreal triamcinolone injection is a safe, efficacious and feasible way to treat Coats’ disease with shallow detachment. Others impact of the technique needs further investigation.

Commercial Relationships: Peiquan Zhao, None
to an occupational laser with monocular macular damage. Two of three patients had a permanent reduction in visual acuity to 20/200 to 20/400 at their last follow up. The development of permanent visual loss was related to location of retinal damage in the central fovea.

In all five eyes at initial presentation, SD-OCT demonstrated outer retinal hyperreflectivity extending from the external limiting membrane (ELM) through the photoreceptor layers (inner segment ellipsoid, ISe, and interdigitation zone, IDZ) to the retinal pigment epithelium (RPE). Focal opacification of Henle’s fiber layer (HFL) was apparent arising from the central outer nuclear layer (ONL). The underlying RPE appeared irregular. In all five affected eyes, the nerve fiber layer and inner nuclear layer were unaffected. Clinically the acute lesions appeared to be flat yellow areas with hypopigmented borders.

Longitudinal SD-OCT examination performed between 4 to 12 months after exposure revealed some restoration of the ONL and ELM. There was irregularity in the ISe and IDZ areas, suggesting permanent damage to photoreceptors. Clinically, there was RPE clumping in the lesion and attenuation at the lesion borders.

**Conclusions:** SD-OCT demonstrates longitudinal changes in the retinal anatomy after inadvertent laser exposure. Damage is most prominent in the photoreceptor layers, but may extend from the outer plexiform layer through Henle’s layer to the RPE. In addition to lasers in laboratory or industrial settings, handheld laser pointers available over the internet may not adhere to the ANSI standards recommended for laser pointers and have potential to produce ocular injury.

**Commercial Relationships:** Gregory D. Lee, None; Caroline R. Baumann, None; David R. Lally, None; Elias Reichel, Alimera (C), Ocular Instruments (F), Regeneron (C), Thrombogenicins (F); Jay S. Duker, None

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**Program Number:** 6369

**Poster Board Number:** C0146

**Presentation Time:** 12:00 PM–1:45 PM

**POFAL Study:** «Protection Oculaire Face aux Agressions Lasers», Phase I

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1Bascom Palmer Eye Institute, U of Miami Miller School of Medicine, Miami, FL; 2Molecular Imaging Research Center / CEA, Fontenay-Aux-Roses, France; 3Vision Institute, Paris, France.

**Purpose:** Risk of laser beam exposure, particularly to lasers “pointers” easily available on open sale or on internet increases every year. Many incidents and accidents have been reported over the last 3 years in France. Side effects from these exposures vary, glare is systematic with a visual disability. Purpose of this study is to try to determine a retinal lesion threshold secondary to such exposures.

**Methods:** A laser emitting at 532nm with a power and duration control system of beam has been developed specifically for this study to achieve the different exposure. A first phase is performed in pigmented rodents to clarify lesion and scar phenomena with different combinations of time-power beam exposure. Powers ranged between 0 to 4.5mW (corresponding to class II and IIIa lasers) and durations between 0 and 0.35 seconds (around mean time of blink reflex =0.25sec). A second phase is performed in non-human primates (NPH) with blink reflex time and powers retained during first phase. Histological analysis of all retinal layers after paraffin embedding and staining was performed to each phase. These analyzes were performed in foveal zone, perifoveal and 10° superior, inferior, nasal and temporal to macula. Several immunoassay analyzes were performed to assess apoptosis and cellular damage (TUNEL, GFAP).

This research was conducted in compliance with ARVO statement for the use of animals in ophthalmic and visual research.

**Results:** A significant linear correlation between energy (power*time) and photoreceptor thickness is found in rodents (r=-0.16, p<0.001). Immunoassay confirm apoptosis and cellular damage of outer layers. Photoreceptors alterations are located only in foveal zone in NHP. Outer layers thickness is statistically lower when exposure power is greater than 1mW. A significant correlation between energy and photoreceptor thickness is also found only in foveal zone (r=-0.51, p=0.01). Immunoassay for apoptosis is also positive in foveal zone when power exposure was greater than 1mW.

**Conclusions:** This study reports systematic tissue damage when power exposure correspond to upper limits of class II lasers (1mW). This is the first in-vivo study analyzing effects of low power laser beam exposure easily available. It provides an anatomical substrate for functional impairment reported in a growing number of incidents and accidents. These initial results are used to guide and adapt research on protection systems for people exposed.

**Commercial Relationships:** Hussam El Chehab, None; Alexis Bemelmans, None; Céline Nouvel-Jaillard, None; Marie-Laure Niepon, None; Jean-Paul G. Renard, None

**Program Number:** 6370

**Poster Board Number:** C0147

**Presentation Time:** 12:00 PM–1:45 PM

**A new laser induced traumatic optic neuropathy model**

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1Bascom Palmer Eye Institute, U of Miami Miller School of Medicine, Miami, FL; 2Tianjin Medical University Eye Institute, Tianjin Medical University Eye Hospital, Tianjin, China; 3Department of Ophthalmology, Shanghai Eye Disease Prevention and Treatment Center, Shanghai, China.

**Purpose:** Current models of traumatic ocular neuropathy rely on blunt force trauma delivered by direct weight contact or compressed air to the eye. These models generate gross generalized damage that can often very severe and not mimic what is observed with humans. We have developed a novel retinal injury animal model using a Nd:YAG laser generating a photodisruptive force above the retina to focus injury of a determined magnitude reliably into the rodent eye which is reproducible, can be followed longitudinally in vivo, is limited to the eye and does not result in mortality, and which more closely mimics the types of retinal injury and structural damage observed with human traumatic optic neuropathy.

**Methods:** A Nd:YAG laser was used to generate a photodisruptive blast injury with 0.4 mJ of energy above the level of the retina and behind the lens in the peripapillary region in Thy-1-ChR2 EYFP murine eyes (n=45). Eyes were imaged using spectral domain optical coherence tomography (SD-OCT) and a confocal scanning laser ophthalmoscope (CLSO) before laser treatment and up to 20 weeks after treatment along with IOP measurements. Mice were sacrificed at various time points and perfused transcardially with paraformaldehyde. Histology of whole mount retina and retinal sections was determined with hematoxylin/eosin (HE) and immunostaining with RGC markers, such as brn3b and thy-1.

**Results:** After one week, the retina ganglion cells (RGCs) were observed to be significantly diminished in number in a wedge shape origination from the circumpapillary region of laser treatment as measured by CSLO (HRT). By 20 weeks, a similar pattern of ganglion cell layer loss was measured using SD-OCT. IOP was not statistically different at all measured time points. Histologically, HE staining demonstrated a significant loss of RGCs and nerve fiber layer, consistent with the imaging results from SD-OCT and CSLO only in laser associated regions. Similarly, immunohistological

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staining for RGC markers confirmed RGC loss in the regions of laser treatment compared to adjacent non-lasered regions of the retina.

**Conclusions:** We developed a new model using a photodisruptive force generated by a Nd:YAG laser to reliably deliver blunt trauma to the retina and cause loss of RGCs and nerve fibers similar to that observed in traumatic optic neuropathy that is amenable to study of neuroprotective strategies in vivo.

**Commercial Relationships:** Mary Tapia, None; Xiaoli Xing, None; Sanja Galeb, None; Andrew Camp, None; Xiaowei Tong, None; Sanjoy K. Bhattacharya, None; Richard K. Lee, None

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