Perifoveal Capillary Perfusion Pressure and Wall Shear Stress Estimated by a Computational Model Based on Adaptive Optics Scanning Laser Ophthalmoscopy (AOSLO)

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**Purpose:** To estimate capillary perfusion pressure (CPP) and wall shear stress (WSS) in the perifoveal capillaries through advanced computational analysis of AOSLO images from diabetic and non-diabetic individuals.

**Methods:** AOSLO multiply scattered light imaging of perifoveal capillary networks was performed for eyes of diabetic and non-diabetic subjects. Standard deviation perfusion maps were generated from 50-frame videos (30 frames/sec, 2°×2° area) and montaged to form 5°×5° images. After Frangi filtering, image thresholding and manual editing by trained graders, a binary mask was generated to construct 3-D geometrical models with arteriolar inlets and venular outlets identified by registration to a 100° color fundus photograph. Mean arterial pressure, IOP and the geometry of the network were utilized in a computational model to estimate CPP (with respect to the venular outlet pressure) and WSS. On average, >600,000 data points were sampled across each vascular network.

**Results:** 3 non-diabetic eyes (2 subjects) and 2 eyes of 1 subject with mild NPDR (DM duration 19 yrs) had mean±SD age of 33±4 yrs, and 2 were male. Mean estimated CPP was 18.5±11.6 mmHg and WSS was 6.0±5.3 Pa. In the 3 non-diabetic eyes, distribution of data points within the 1st, 2nd, 3rd & 4th quartiles of the average distribution were 21.7, 22.4, 22.2, 33.7% for CPP, and 22.7, 21.9, 27.0, 28.3% for WSS. In the 2 diabetic eyes the values were 24.6, 30.5, 34.0, 10.8% for CPP, and 22.7, 21.9, 27.0, 28.3% for WSS. In the 2 diabetic eyes the vessel binary mask after image segmentation. d. CPP map using reconstructed 3D vessel network. e. WSS map for a subset of the vessels in Fig. 1d. Arrows indicate stress direction and color indicates magnitude.

**Commercial Relationships:** None.


**Program Number:** 5665
**Poster Board Number:** C0052
**Presentation Time:** 8:30 AM–10:15 AM

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Methods: Irradiation was performed on rabbits with a new Nd:YVO₄-laser system (Zeiss Visulas Series Prototype, 532 nm). A Nd:YLF-laser (Crystalaser, 523 nm, 75 ns, 1 kHz) simultaneously served to excite thermoelastic pressure waves. The pressure is detected by an ultrasonic transducer embedded in the contact lens and is used to calculate the temperature rise. Irradiations are performed with predefined exposure times. The laser power is automatically varied during irradiation in order to achieve a preset peak temperature at the end of the laser exposure. The lesions sizes were examined on color fundus images acquired with a fundus camera one hour after irradiation.

Results: In the first series lesions were created with a calculated retinal spot diameter of 133 μm with an overall irradiation time of 150 ms/spot and a preset peak temperature of 65 °C. With the implemented algorithm, a mean peak temperature of 67 °C with a standard deviation of 4.2 °C was achieved. The variability of automatically chosen laser power of 47 +/- 11 mW shows that the method takes the individual variations of light transmission and absorption into account. The mean lesion diameter was determined to be 149 +/- 17 μm. The results with an overall irradiation time of 50 ms were even more accurate within +/- 2 °C from different set temperatures and will be presented in detail on the conference as well.

Conclusions: The achieved data are promising for a feedback controlled treatment, which allows to automatically generate preselected sublethal temperature rise, or minimal ophthalmoscopically invisible thermal damage, or defined and uniformly visible coagulations. This technique seems to be the ideal method to unburden the ophthalmologist from any manual dosing and allowing a fast and reproducible treatment also in a patterned modus.

Commercial Relationships: Ralf Brinkmann, None; O. Koinzer, None; Stefan Ralf Brinkmann, None; allowing a fast and reproducible treatment also in a patterned modus.

Presentation Time: 8:30 AM–10:15 AM

Photobiomodulation (phototherapy) of retinal tissue in Stargardt disease

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Purpose: To analyse functional data in 36 patients affected by Stargardt Disease with mutations in the ABCA4 gene after photobiomodulation with mnemosline (Model MNEMOSLINE, made by KALOS, EC CERTIFICATE No°1419/MDD, TELEA ELECTR. ENG. SRL, Sandrigo (VI)-ITALY) in genetic analysed patients.

Methods: Polycentric prospective study (Bologna, Milano, Rome-ITALY) in genetic analysed patients. 36 patients, average age 20.2±1.3 sd (12 enrolled in Bologna, 12 in Milan and 12 in Rome) with Fishman I Stargardt disease classification (Arch. Ophthal. 1999). We evaluated best corrected visual acuity (BCVA), reading speed (w/min), microperimetry (MP-1), pattern electroretinography (PERG). Exams were repeated at start up time, at 1,2,3 months. Mnemosline was used for 10 minutes, 2 times a day, 5 days per week for 3 months.

Red LED 650 nm pulsed light has the better penetrative capacity in tissue without termal increase, activating chromophore (cytochrome c oxidase) response, improving ATP (Amat et al, 2006).

Results: BCVA ranged between 0.6-1.0 logMAR, using ETDRS charts. ETDRS letters went from 34 to 37,67. From 100% to 113.3%
percentage variation of PERG (Anova statistic) Retinal sensitivity (MP-1) measured in dB grewed from 10.68 to 12.29. W/min growed from 65.67 to 84.

Conclusions: LED pulsed light 650 nm may have beneficial effects in Stargardt disease upregulating mitochondrial cytochrome c oxidase in the retinal tissue. More extensive trials are request.

Commercial Relationships: Sergio Zaccaria Scalinci, None; Francesco Milone, None; Mariangela Maginicho, None; Caterina Bert, None; Paolo G. Limoli, None; Enzo M. Vingolo, None; Daniela Domanico, None; Lucia Scorrillo, None

Program Number: 5669 Poster Board Number: C0056
Presentation Time: 8:30 AM–10:15 AM
Partial Periferic Photocoagulation (PPP) avoiding equator retina to treat proliferative diabetic retinopathy
Mario J. Saravia, Mariana Ingolotti, Matias Portela, Juan Pablo Fernandez, Bernardo A. Schlaen. Oftalmologia, Hospital Universitario Austral, Tigre, Argentina.

Purpose: To assess if PPP, a new laser treatment technique to treat patients with PDR with indication of PRP (with or without indication of vitrectomy), reduces progression and avoids ablative scars in equatorial retina.

Methods: Twenty four eyes from 18 diabetic patients (25-72 y.o.) with proliferative retinopathy with indication of PRP and naif of laser treatment, were treated with PPP. Eyes with less than 100 shots were considered naif.

PPP is a modification of PRP, an intense laser treatment aiming burns to an area restricted between ora serrata and a line situated on the anterior edge of vortex veins. Laser treatment were delivered during a pars plana vitrectomy PPV (14 cases) when it was indicated by directed ophthalmoscopy (10) when it was not. In every case treatment required more than 1000 and less than 2000 shots of a 23G endoprobe or indirect ophthalmoscope beam from a Ophthalas 532 Eyelit Alcon. Treated eyes where classified according to a severity scale to assess if they progressed 2 or more levels on severity. This was the primary endpoint. They were followed for 50 to 6 mos. Vitreous hemorrhages, diabetic macular edema, retinal detachment, and subfoveal were assessed as secondary endpoints as signs of progression.

Results: None of the 24 eyes progressed on the severity scale at follow up. Two patients had had vitreous hemorrhage that required PPV (one treated through IO laser and one by endolaser). There were no cases of retinal detachment, nor rheaisis.

Conclusions: All treated eyes did not progress on severity scale with PPP. Most of them regress on scale to a lower level. This is suggestive of effectiveness of this modification of the classic laser treatment. Antiangiogenic therapy for diabetic macular edema showed in clinical trials revascularization of capillary drop out areas at the equator, so a conservative approach seems to be more logic than PRP. Panoramic angiography demonstrate that extreme perifera is the first and the most ischemic area in diabetes, and so more angiogenic. Most of patients treated with PRP do not show scars at the extreme perifery, and instead have intense scars at equator. Some progress on severity anyway. Partial Periferic Photocoagulation (PPP) preserves retina between temporal arcades and vortex veins line. The weakness of this serie is that in cases of PPV laser, surgery could bias the results. But PPV and no PPV eyes showed no difference.

Commercial Relationships: Mario J. Saravia, None; Mariana Ingolotti, None; Matías Portela, None; Juan Pablo Fernandez, None; Bernardo A. Schlaen, None

Program Number: 5670 Poster Board Number: C0057
Presentation Time: 8:30 AM–10:15 AM
RESPONSE OF THE RETINAL PIGMENTED EPITHELIUM TO RETINAL REGENERATION THERAPY (2RT) LASER, IN VITRO AND IN VIVO

Purpose: The purpose of this study was to delineate the effects of the retinal regeneration therapy (2RT) laser to the retinal pigmented epitheliun (RPE), both in vitro and in vivo, concentrating on levels of ablation, and induction of proliferation and potential protective factors from surviving cells.

Methods: In vitro studies, primary cultures of rat RPE cells grown on glass coverslips were subjected to laser irradiation at a range of energy settings from 0.3mJ to 1.8mJ. Some cells were fixed immediately and some returned to culture for varying times up to 7 days before being fixed, for immunocytochemical analysis of normal cell markers (α-tubulin, RPE65, ZO-1), markers of cell stress (nestin, αB-crystallin, heat shock proteins), indicators of proliferation (cyclin D1, PCNA) or growth factor expression (FGF-2, CTNF, VEGF). In other cases cells were subjected to time-lapse videomicroscopy (VDM) for up to a week, to assess their physical reaction. For in vivo studies, anaesthetised adult Dark Agouti rats were exposed to retinal laser irradiation at the same energy range as used for in vitro studies. At different times after treatment RPE whole-mounts were analysed by immunohistochemistry as outlined for the in vitro studies.

Results: RPE cells in vitro and in vivo were ablated in a manner linearly-dependent upon laser energy delivered; at the extremes, 1.8mJ killed 100% of cells within the lasered zone and 0.3mJ only killed approximately 25% of cells. Cells surrounding the kill zones produced significant levels of stress proteins (nestin, αB-crystallin, heat shock proteins) and growth factors (FGF-2, CTNF, VEGF) within 24 hours of treatment; cellular proliferation markers were also detected, from 24-72 hours post-laser. Effects were dependent upon energy levels used: the greater the energy level, the greater the relative amount of detectable factor produced by surrounding cells. VDM demonstrated cells proliferating back into the ablated zones within 1-3 days post-laser, in vitro.

Conclusions: The findings demonstrate that RPE cells surrounding 2RT laser ablation sites actively respond to injury by producing a range of protein factors which likely have autocrine and paracrine effects. Thus, the 2RT laser not only avoids causing significant collateral damage to photoreceptors, but it can also induce expression of potentially protective factors.

Commercial Relationships: John P. Wood, None; Glyn Chidlow, None; Marzieh Tahnasebi, None; Malcolm Plunkett, None; Robert J. Casson, None

Program Number: 5671 Poster Board Number: C0058
Presentation Time: 8:30 AM–10:15 AM
Retinal pigment epithelium (RPE) response to selective retina therapy (SRT) in mouse eyes
Tae Kwann Park, Hoon Dong Kim, Ralf Brinkmann, Young-Hoon Ohn. Ophthalmology, Soonchunhyang Univ Hospital, Bucheon-si, Korea (the Republic of); Medical Laser Center Lubeck GmbH, Lubeck, Germany.

Purpose: This study was designed to evaluate selective retina therapy (SRT)-RPE tissue reaction after SRT with 1.7 micro-second pulsed laser controlled by an automatic feedback reflectometry to avoid extended thermomechanical tissue damage.

Methods: Ten shots of SRT were performed in the right eyes of C57BL/6J mice using a Q-switched Nd:YLF laser system. SRT-
treated mice received IP injection of 5-ethyl-2'-deoxyuridine (EdU) in PBS. The mice were sacrificed at 3 hours to 14 days after treatment. Infrared (IR) and fluorescein angiographic (FA) images were taken with a confocal scanning laser ophthalmoscope (Heidelberg Retina Angiograph 2; Heidelberg Engineering, Heidelberg, Germany). The whole mount and transverse sections were analyzed with In situ cell death detection kit, POD (Roche, Germany), Click-it® Assay Kits (Life Technologies, Carlsbad, CA) for RPE cell proliferation, immunofluorescence (IF) staining with various antibodies. The changes of RPE cell numbers within 200 μm diameter centered at SRT site were counted at 3 hours to 14 days (n=5 at each time point). Untreated and conventional laser-treated mice were compared as negative and positive control.

Results: SRT sites were not detected with IR image but clearly detected with FA. At the SRT-treated area of the retinochoroidal tissue, only RPE cells were specifically detected with TUNEL (+) labeling. EdU (+) RPE cells were detected from 1 day after treatment, increased to 7 days and remained to 14 days. With whole mount sections, breakdown of cell-cell and expansion of RPE cells were detected by β-catenin IF staining. The number of RPE cells at SRT sites was gradually decreased to 12 hours (75.6% of baseline) and recovered to 14 days (93.4% of baseline). Up-regulated expression of Otx2 transcription factor was observed in the RPE cells located at SRT site.

Conclusions: SRT induced RPE cell death without photoreceptor cell damage. SRT-treated RPE areas were recovered with expansion and proliferation of the surrounding RPE cells.

Commercial Relationships: Tae Kwann Park, None; Hoon Dong Kim, None; Ralf Brinkmann, None; Young-Hoon Ohn, None

Support: The Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education, Science and Technology [Grant 2013R1A1A2009899], The Soochunhyang University Research Fund [Grant 20130627]

Program Number: 5672 Poster Board Number: C0059
Presentation Time: 8:30 AM–10:15 AM

Long Term Results of Prophylactic Laser For Fundal Coloboma
Ravi Bypareddy, Koushik Tripathy, Yog Raj Sharma, Rohan Chawla, Subodh Kumar singh, Pradeep Venkatesh, rajpal vohra, Babulal Kumawat, hushan wadekar: ophthalmology, all india institute of medical sciences, New Delhi, India.

Purpose: The role of prophylactic laser in fundal coloboma (FC) to prevent development of retinal detachment(RD) is controversial. The authors aim is to describe the long term results of such procedure.

Methods: Hospital records of FC cases, following up at Retina clinic of an Indian tertiary eye care centre were analysed. All FC cases had received three to four rows of contiguous laser spots at coloboma margin including the anterior margin, and sparing the macula.

Results: 407 eyes of 260 patients were analyzed. Mean age (± SD) was 20.9 (± 13.2) years, ranging from 5-62 years. 28 patients (10.7%) had unilateral FC. Follow up period ranged from 1-17 years, mean (±SD) being 5.1 (±3.8) years. According to Ida Mann’s classification, 163 eyes (40%) had type 1, 153 eyes had type 2 (38%), 77 eyes had type 3 (19%), and 14 eyes (3%) had type 5 coloboma. Only 2 eyes (0.5%) developed RD (one with type 5 and another with type 2 coloboma) which underwent successful vitreoretinal surgery. There was no significant difference (p=0.4) in mean pre-laser best corrected visual acuity (BCVA) (LogMAR 1.23 ± 0.57) and mean BCVA at final follow up (LogMAR 1.24 ± 0.57).

Conclusions: Prophylactic laser of FC has shown encouraging results in preventing RD in our clinical practice. It can help to maintain BCVA in these cases in long term. We recommend prophylactic laser to all FC cases presenting after 4 years of age.
Non-damaging Photothermal Therapy for Treatment of Chronic Central Serous Chorioretinopathy: One year follow-up

Daniel Lavinsky¹, Daniel V. Palanker², ³Ophthalmology, UFRGS, Porto Alegre, Brazil; ³Ophthalmology/ HEPL, Stanford University, Stanford, CA.

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

Methods: Nineteen eyes of 18 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. Pre- and post-treatment fluorescein angiography (FA) and fundus autofluorescence (FAF) were also assessed.

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 271µm, with central maximum thickness reduction of -79µm. 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 79% of the patients fluid was completely resolved, in 21% resolution was partial, and there were no non-responders to the treatment.

Conclusions: 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 could be combined to anti-VEGF pharmacological treatments of macular diseases.

Commercial Relationships: Daniel Lavinsky, TMLS (C); Daniel V. Palanker, TMLS (C), TMLS (P)

Clinical Trial: NCT01975103

Photothermal Therapy for Diabetic Macular Edema: Initial Clinical Experience

María Gil Martínez³, SERENA SALVATORE¹,², SALVADOR Pastor-Idoate³, Yvonne D’Souza, Sajjad Mahmood, Stephen Charles, George Turner, David B. Henson¹, Paolo E. Stanga².

¹Manchester Royal Eye Hospital and Manchester Academic Health Science Centre; ²Manchester Vision Regeneration (MVR) Lab at NIHR/Wellcome Trust Manchester CCF, Manchester, United Kingdom; ³Manchester Vision Regeneration (MVR) Lab at NIHR/Wellcome Trust Manchester CCF, Manchester, United Kingdom.

Purpose: To investigate the morphologic features and clinical efficacy of Barely Visible and Subvisible “Subthreshold” 577-nm Photothermal Therapy in Diabetic Macular Edema (DME) and propose new treatment parameters.

Methods: Retrospective review. Ten eyes with newly diagnosed DME were treated with the 577-nm (yellow) wavelength PASCAL® Streamline® laser and assessed before and after treatment using Fourier-Domain (FD-OCT) and Swept-Source Optical Coherence Tomography (SS-OCT), Fundus Autofluorescence (FAF) and Fundus-related Perimetry (FrP). Proprietary Endpoint Management Software® (EpM®) was used to obtain uniform sub-threshold treatment spots within the treatment array. Laser power was first titrated for a Barely Visible 10ms 100µm retinal spot size which was defined as 100% pulse energy and which would become the “Landmark” spots to facilitate visualisation of treated areas. Treatment was applied over areas of retinal thickening as per FD-OCT maps, using either 40% or 70% pulse energy (Barely Visible or Subvisible “Subthreshold” spots) with an inter-spot spacing of 0.75 or 1 spot diameter. Best-corrected Visual Acuity (BCVA) and changes in Retinal Thickness (RT) were measured over a 6 months follow-up. Pre-treatment and post-treatment FAF and FrP Retinal Sensitivity were also assessed. The two-tailed Student’s t-test was used for statistical analysis.

Results: On average, 662 (309-1060) spots have been applied per eye to cover the areas of retinal thickening. No Subvisible “Subthreshold” laser spots could be detected on immediate post-treatment slitlamp examination. FD-OCT showed the Landmark but not the Barely Visible nor the Subvisible “Subthreshold” spots. However, they were visible on FAF and some of them progressively disappeared over time. There was a statistically significant reduction in RT (15%) on FD-OCT at 2 months compared with baseline in eyes treated with EpM® at 40% (p<0.02). BCVA and Retinal Sensitivity didn’t show any statistically significant improvement in either group.

Conclusions: This is the first report on the safety and clinical effectiveness of Barely Visible and Subvisible “Subthreshold” 577-nm PASCAL® laser® with EpM® in DME. This technology may effectively reduce edema within treated areas with no enlargement nor coalescence of retinal treatment spots over 6 months. These new treatment parameters seem to be safe and effective.
Program Number: 5676 Poster Board Number: C0063
Presentation Time: 8:30 AM–10:15 AM
Safety and Efficacy of Selective Retina Therapy (SRT) for the Treatment of Diabetic Macular Edema (DME): A Pilot Study.
Young Jung Roh1, Young Gun Park1, Jae Ryun Kim1, Seungbum Kang1, Eric Seifert1, Dirk Theisen-Kunde2, Ralf Brinkmann3.
1Department of Ophthalmology and Visual Science, Catholic University of Korea, Seoul, Korea (the Republic of); 2Medical Laser Center Lübeck GmbH, Lübeck, Germany.
Purpose: SRT stimulates retinal pigment epithelium (RPE) cell migration and proliferation into irradiated areas using 1.7μs laser pulses, improving metabolism at diseased areas. RPE cells are selectively damaged without affecting the neural retina, photoreceptors or choroid. This is a prospective, interventioninal, single center, single arm, open label clinical study to evaluate the efficacy and safety of SRT in eyes with clinically significant DME.
Methods: Twenty-three eyes of 21 consecutive patients (mean age 63.3 years [48-77 years], 7 male) with clinically significant DME were treated with SRT and followed for 6 months with evaluations at 1 week, 1, 3 and 6 months. 86.9% had received prior DME treatment, including intravitreal anti-VEGF, subtenon triamcinolone and conventional laser. Evaluations included: Fundus fluorescein angiography, reflectometry, optical coherence tomography and macular sensitivity using micropertometry within central 10° field. Key outcome measures included: Proportion of eyes gaining ETDRS letters in BCVA from baseline, mean changes in BCVA, central macular thickness (CMT), maximum macular thickness (MMT) and macular sensitivity and incidence of adverse events over the follow-up period. Patients who met retreatment eligibility criteria could be retreated after a period of 2 months.
Results: Seventeen eyes (16 patients) completed 6 months follow up. Mean BCVA improved from 67.7±11.1 letters at baseline to 73.7±11.9 at 6 months. The proportion of eyes gaining ≥5, ≥10 and ≥15 letters were 41.2%, 17.6% and 11.8% respectively. Two eyes lost ≥5 letters, but neither had considerable deterioration in OCT findings or macular sensitivity. Nine eyes (53%) showed >5% decrease in MMT compared to baseline at 6 months. Macular thickness decreased from 482.06±96.56 μm to 465.06±101.45 (p=0.183) and mean macular sensitivity increased from 21.16±2.9 to 22.38±3.0 db (p=0.019). Retreatment occurred in 12 eyes. No treatment-related adverse events were reported.
Conclusions: BCVA gains and improved macular sensitivity have demonstrated that SRT, using reflectometric dosimetry, can be an effective treatment for clinically significant DME. The safety profile was acceptable and consistent with previous reports. The absence of collateral damage in the neural retina and choroid and selective effect on the RPE, sparing the photoreceptors makes SRT particularly suitable for treatment of DME.
Commercial Relationships: Young Jung Roh, lutronic (F);
Young Gun Park, lutronic (F); Jae Ryun Kim, None; Seungbum Kang, None; Eric Seifert, None; Dirk Theisen-Kunde, None; Ralf Brinkmann, SRT (P)
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Program Number: 5677 Poster Board Number: C0064
Presentation Time: 8:30 AM–10:15 AM
Initial validation of navigated 577 nm laser with navigated microsecond pulsing in DME patients
Ahmed Al Marzouqi. Ophthalmology, Augenklinik LMU, Munich, Germany.
Purpose: To evaluate and compare the safety, usability and retinal effects of the recently introduced 577 nm yellow navigated laser with/without navigated microsecond pulsing (MSP) versus 532 nm green navigated laser.
Methods: An initial case series of 14 eyes of 12 consecutive patients having center-involving DME. Nine eyes were treated with Navilas 532 nm (5 eyes) and 577 nm (4 eyes) continuous wave (CW) laser photoacogulation to a barely visible effect. Five additional eyes were treated with OCT-guided 577 nm navigated microsecond pulsing therapy (confluent pattern, 100 micron, 100 μs pulses, 5% duty cycle, 100 μs envelope pulse duration, titration with CW to barely visible effect, power values doubled/ switch to MSP). Micropertmetry analysis of retinal sensitivity was conducted on individual effect locations following registration with Navilas treatment documentation.
Results: Required laser power settings for a barely visible effect were 98 (±9.25) mW for 532nm and 84 (±19.86) mW for 577 nm. Effect boundaries appeared slightly more defined with 577 nm. Mean power setting for microsecond pulsing was 170 (±32.84) mW after doubling. At 5% duty cycle no visible effects could be observed. Retinal sensitivity changes were 2.8±2.7 with 532 nm, -0.5±2.43 with 577 nm and 0.05±4.0 with 577 nm MSP. No adverse effects were observed.
Conclusions: All navigated laser modalities could safely and easily be applied in a standard clinical setting. Navigated yellow 577 nm laser required less laser power to create a barely visible effect than 532 nm laser and appears less detrimental to retinal function. Navigated microsecond pulsed laser does not produce visible effects and does not appear to affect retinal function at 5% duty cycle. Therefore it represents a tissue friendly option in the management of retinal disease warranting further investigation into its efficacy.
Commercial Relationships: Ahmed Al Marzouqi, None
Purpose: To determine the effect of combination therapy with SDM laser without a significant difference in visual outcomes.

Commercial Relationships: Eric G. Feinstein, None; Randee C. Miller, None; Chandan Yashraj, None; Rama Jager, None; Harit Bhatt, None; Veeral Sheth, None

Program Number: 5679 Poster Board Number: C0066
Presentation Time: 8:30 AM–10:15 AM

Effect of focal laser photocoagulation in eyes with early or moderate non-proliferative diabetic retinopathy

Seonghun Jeong, Jungil Han, Young Ju Lew, Saemi Park.
Ophthalmology, Kim’s eye hospital, Seoul, Korea (the Republic of).

Purpose: To report the effect of focal laser photocoagulation in change of hard exudates and rates of progression in eyes with early or moderate non-proliferative diabetic retinopathy

Methods: We retrospectively reviewed the medical records of 60 eyes of 33 patients who were diagnosed with early to moderate non-proliferative diabetic retinopathy between January, 2006, and December, 2012. The patients were separated into 2 groups: treated with focal laser photocoagulation group (group A) and without laser photocoagulation (group B). Best corrected visual acuity measurements were reviewed at baseline and annually for five years. Fundus photographs were reviewed at baseline and follow-up periods. Optical coherent tomography measurements were checked when macular edema developed or suspected.

Results: The mean follow-up period was 51.4 months. Thirty-eight eyes of 20 patients received focal laser photocoagulation. The grades of hard exudates decreased significantly between baseline and at final visit in treated eyes (P<0.05), but not in control eyes (p=0.206). The cumulative probability of progression of retinopathy at 5 years was 29% (group A), 18% (group B). But, the Kaplan-Meier survival curves showed no significant difference in progression between the eyes in group A and group B. (p=0.420).

Conclusions: Focal laser photocoagulation reduced hard exudates in eyes with early to moderate non-proliferative diabetic retinopathy. However, this focal laser photocoagulation was not able to decelerate the progression of diabetic retinopathy.

Commercial Relationships: Seonghun Jeong, None; Jungil Han, None; Young Ju Lew, None; Saemi Park, None

Program Number: 5680 Poster Board Number: C0067
Presentation Time: 8:30 AM–10:15 AM

SDM laser photocoagulation and anti-VEGF therapy for diabetic macular edema


Purpose: To determine the effect of combination therapy with intravitreal anti-vascular endothelial growth factor (anti-VEGF) injections and subthreshold diode micropulse (SDM) laser photocoagulation on visual outcomes and the anti-VEGF treatment burden in patients with diabetic macular edema (DME).

Methods: A retrospective chart review was performed of all patients with subfoveal DME identified by spectral domain optical coherence tomography (SD-OCT) and fluorescein angiogram (FA) who had undergone SDM laser and/or anti-VEGF injections in the time period between January 2011 to June 2014. Exclusion criteria included the presence of other concomitant retinal diseases that can lead to subfoveal macular edema, a history of intravitreal corticosteroid injections, or conventional laser in the previous 2 years. Twenty patients were identified. Group 1 consisted of 10 patients who had undergone both SDM laser and anti-VEGF injections. Group 2 consisted of 10 patients matched for age, gender and a diagnosis of subfoveal DME who had undergone anti-VEGF monotherapy. All records were reviewed for BCVA, fundus photography, FA, macula SD-OCT, and the type and frequency of treatments administered. Statistical analysis was performed using the paired student t-test.

Results: Groups 1 and 2 included a total of 20 patients. The average age of Group 1 was 65 years and that of Group 2 was 62 years. Duration of follow-up ranged from 6 to 18 months (average 9.6 months, median 8 months) for Group 1 and 6 to 29 months (average 13.1 months, median 12 months) for Group 2. Average number of injections given per month was 0.27 for Group 1 and 0.67 for Group 2 (p=0.004). The average initial CMT was 315.5um for Group 1 and 419.2um for Group 2 (p=0.03). Average CMT improvement was 39um in Group 1 and 117um in Group 2 (p=0.04). There was no significant difference in the average final CMT between the two groups. BCVA improved 0.05 logMAR in Group 1 and 0.08 logMAR in Group 2 (p=0.27).

Conclusions: The frequency of anti-VEGF injections was significantly reduced in patients who had undergone combination therapy with SDM laser without a significant difference in visual outcomes.

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

Support: Supported in part by an unrestricted grant from Research to Prevent Blindness New York, NY to the University of California Davis Eye Center.

Program Number: 5681 Poster Board Number: C0068
Presentation Time: 8:30 AM–10:15 AM

Subthreshold micropulse laser treatment for chronic central serous chorioretinopathy with persistent subretinal fluid

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Purpose: To evaluate the treatment outcome of 577nm subthreshold micropulse laser (SML) treatment for chronic central serous chorioretinopathy (CSC) with persistent subretinal fluid (SRF).

Methods: This retrospective study included 38 eyes of 33 consecutive patients who were treated with a 577nm SML (Supra Scan, Quantel Medical) for chronic CSC with persistent SRF. Patients with any prior treatment within the last 3 months were excluded. A confluent SML treatment was performed at the leakage sites detected by fluorescein and indocyanine green angiography. Examinations before and after SML treatment included best corrected visual acuity (BCVA) and spectral domain optical coherence tomography (SDOCT).

Results: 20 eyes received one SML treatment, 18 eyes 2 treatments and 8 eyes 3 treatments. Mean follow-up after the first SML treatment was 5.5 months (1-11 months). At the last follow-up, in 9 eyes (24%) the SRF had dissolved completely and in 18 eyes (47%) the SRF was reduced. Eleven eyes (29%) showed no improvement. The central retinal thickness (CRT) decreased significantly after treatment (mean CRT before SML: 393±140 μm, after SML: 289±80 μm, p<0.01) and BCVA showed a significant increase (p=0.05). No laser scars were detected after treatment. In the subgroup of PDT therapy resistant patients (n=21) with one or more half dose PDT treatments in the past, in 3 eyes (14%) the SRF had dissolved completely and in 12 eyes (57%) the SRF was reduced. Six eyes (29%) showed no improvement. The CRT decreased significantly after treatment (mean CRT before SML: 393±140 μm, after SML: 289±80 μm, p<0.01) and BCVA showed a significant increase (p=0.05). No laser scars were detected after treatment.
**Purpose:** The effectiveness of focal laser photocoagulation for diabetic macular edema (DME) is highly variable. Few studies to date have addressed parameters predictive of treatment success. We evaluated the effectiveness of focal laser for DME in a county hospital setting to identify patient and treatment factors that correlated with successful outcomes.

**Methods:** Resident-performed focal laser for DME at Parkland Memorial Hospital (Dallas, TX) from 1/13 to 9/14 were retrospectively reviewed. Patient demographics, hemoglobin A1c (HbA1c), prior treatments, fluorescein angiography, visual acuity, central subfield thickness (CST) and maximum subfield thickness (MST) on OCT were analyzed. The primary end points were visual acuity and retinal thickness 1 month after treatment. This study received IRB approval from University of Texas Southwestern Medical Center.

**Results:** 32 eyes treated by 7 physicians were reviewed. The average patient age was 58.4 years. 66.7% were male. The largest ethnicity was Hispanic (47.8%). Average HbA1c at the time of procedure was 7.8%. At 1 month, visual acuity improved from 20/65 pre-treatment (logMAR 0.514 to 20/50 (logMAR 0.392). Average CST and MST improved from 334.2 μm and 436.3 μm to 328.2 μm and 422.25 μm, respectively. HbA1c, prior laser treatments, intravitreal injections, or the availability of fluorescein angiography did not affect treatment success (P=0.3 for CST and MST). Patients with pre-treatment CST <400 μm had better results than those >400 μm (-7.8 μm vs. +102.3 μm, p<0.0001). Treatments targeting less than 5 micro-aneurysms had better success (MST change of -33.1 μm vs. +4 m, p<0.0001). The best results were obtained with 80-100 mW of power delivered over 0.1 s with MST change of -25.4 μm compared with +77.0 μm in those >100 mW (p<0.05).

**Conclusions:** Focal lasers for DME performed on a mostly Hispanic cohort by resident physicians were able to improve visual acuity and decrease retinal thickness. Availability of fluorescein angiography, glycemic control, and prior treatments had no significant impact on outcomes. Selecting patients with CST <400 μm, less than 5 micro-aneurysms in the area of swelling, and using laser power between 80 - 100 mW were associated with greater success. These findings serve as a guideline to patient selection and treatment parameters in diabetic laser treatments but should be validated in different cohorts.

**Commercial Relationships:** Xihui Lin, Kevin Bubel, None; Richard Winslow, None

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**Clinical usefulness of preoperative anterior chamber flare as predictor for PVR in patients with rhegmatogenous retinal detachment**

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**Purpose:** Preoperative aqueous laser flare measurements are thought to have a predictive value in the development of proliferative vitreoretinopathy (PVR) in patients undergoing surgery for a retinal detachment. In this study we tested if preoperative aqueous flare is a useful screening tool to decide whether a patient should receive a possible preventive therapy.

**Methods:** Two hundred consecutive patients with a primary retinal detachment were asked to participate and gave written informed consent. Exclusion criteria were active uveitis, active uveitis, proliferative diabetic retinopathy, diabetic macular edema, exudative age-related macular degeneration, and retinal vein occlusion. In both eyes aqueous flare was measured preoperatively using a Kowa FM-500 Laser Flare Meter (Kowa Company Ltd, Tokyo,Japan) 15 minutes after instillation of 0.5% tropicamide. From each eye an average of five measurements expressed in photounits per millisecond (pc/ms) was taken. Extent of retinal detachment, number of horseshoe tears, presence of curled edges during surgery, type of surgery and medication history were recorded. All patients were evaluated at least six months after surgery to determine if they underwent additional surgery due to PVR redetachment. Median flare values were compared using the Mann-Whitney U test. Sensitivity and specificity at different cut-off values were determined with a ROC analysis.

**Results:** The median preoperative flare value of patients who developed PVR (mdn = 18.4 pc/ms, n=10) and patients that did not (mdn = 9.35 pc/ms, n=92) differed significantly, p=0.007. The area under the ROC curve was 0.76 (95% CI 0.62; 0.89). A cut-off value of 10pc/ms leads to acceptable sensitivity (80%) of this measurement. However, it yields a very low specificity (50%). If the cut-off value is raised to 15pc/ms (specificity 80%) the sensitivity decreases to only 60%.

**Conclusions:** Although median flare values seem to differ between groups, preoperative flare has low sensitivity and specificity as predictor for PVR in patients with a primary rhegmatogenous retinal detachment. Therefore it has limited clinical usefulness as a screening tool for preventive therapy.

**Commercial Relationships:** Verena C. Mulder, None; Elon H. van Dijk, None; Jan C. van Meurs, None

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Both groups showed that BCVA (log MAR) improved significantly at 1 month after therapy, however, there was no statistically significant differences of BCVA improvement in group comparison. Both groups showed that SRF and PED were partially or completely resolved, however, no statistically significant difference of resolution period was found between the groups. No patient experienced adverse events in group I, and 1 patient developed choroidal neovascularization (CNV) after treatment at the area of previous laser treatment in group II. Two patients were recurred in group I and none in group II.

Conclusions: Both PDT and direct focal laser photocoagulation are considered to be beneficial treatment in patients with chronic CSC. Focal laser photocoagulation before PDT is a good treatment option in a aspect of cost-effectiveness and convenience.

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Evaluation of 577nm multispot vs 532nm single-spot panretinal photocoagulation for diabetic retinopathy: a clinical trial

Purpose: Several laser equipments have been developed for treatment of diabetic retinopathy (DR), differing in laser wavelength and pattern of spots. The purpose of this study is to evaluate and compare patient tolerance, treatment parameters, safety and anatomical/functional outcomes in patients with DR who underwent panretinal photocoagulation (PRP) with 577nm multispot laser (Supra Scan®, Quantel Medical) versus 532nm single-spot laser (Pascal®, Topcon).

Methods: Our group designed a single-center, randomized clinical trial involving 30 eyes, including individuals with proliferative DR without previous treatment. Eyes with ocular comorbidities or previous intravitreal injection or vitrectomy were excluded. After recruitment best corrected visual acuity (Snellen), OCT, fluorescein angiography and retinography were performed. Patients were then submitted to PRP, either using 577nm multispot laser with 10-20ms exposure time (group 1) or 532nm single-spot laser with 100ms exposure time (group 2). Those exams will be repeated at 6 months and 1 year after PRP conclusion. The main outcome is regression of neovessels at 1 year and secondary outcomes are laser parameters, spots characteristics, number of sessions and patient tolerance (a subjective scale of pain and photophobia, ranging from 0 _no discomfort_ to 10 _extreme discomfort_).

Results: So far 23 patients have been recruited, 2 were excluded and 14 have completed treatment, 7 in each group. Patients included in group I had mean mean visual acuity of 0,5±0,2; mean maximum power used in treatment was 528,57±197,1mJ, producing 2407,7±148,1 spots in 2,7±0,8 sessions. In the first, second and third sessions, mean pain was 3,1±2,3, 4,0±3,2 and 4,2±3,0; and mean photophobia was 3,4±3,3, 4,7±4,5 and 3,7±4,3, respectively. In group 2, mean visual acuity was 0,6±0,7; mean maximum power was 386,4±158,0 mJ with 1224,7±154,2 spots produced in 3,1±0,4 sessions. Mean pain was respectively 3,9±1,7, 5,1±2,9 and 5,9±2,5 in the first, second and third sessions respectively; and mean photophobia was 4,1±1,2, 6,3±2,1 and 6,1±2,5.

Conclusions: Preliminary results of this study show that 577 nm multispot laser, when compared to 532nm single-spot, requires a similar number of sessions for completing PRP and is better tolerated by patients. Follow up data will be used to compare effectiveness and anatomical outcomes between the two groups.

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Laser flare photometry: a useful tool for monitoring children with juvenile idiopathic arthritis (JIA)-associated uveitis
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Purpose: To evaluate laser flare photometry values for monitoring children with JIA-associated uveitis.

Methods: Retrospective chart review. We analyzed children with JIA-associated uveitis followed between 2000 and 2014 at La pitê Salpêtrière Hospital (Paris France). We defined two groups of patients characterized by the decrease of flare values one month after treatment intensification (more 50% flare decrease in group 1 and less 50% flare decrease in group 2). Complications enumerated at baseline and during follow up (at 5 years and at last visit) were compared in each group and in overall population.

Results: Fifty four children (99 eyes) were included in this study (mean follow up 8.2 years +/-4.5 ). Ten eyes were excluded from the analysis because the initial flare value was inferior to 12 ph/ms. Complications of uveitis were present in 68 eyes (76%) at baseline and in 76 eyes (85%) at last visit. Flare values one month after treatment intensification decreased of more than 50% in 59 eyes (66%) (group 1) and of less than 50% in 30 eyes (33%) (group 2). Group 1 children developed significantly less complications as compared to group 2 children at 5 years (p=0.03), band keratopathy (p=0.003), cataract surgery (p=0.003), glaucoma (p=0.003) trabeculectomy (p=0.004), macular oedema (p=0.001), papillary edema (p=0.02) and at last visit (p=0.004), band keratopathy (p=0.004), cataract surgery (p=0.02), trabeculectomy (p=0.006), papillary edema (p=0.02). They also kept a better visual acuity (p<0.0001 at both 5 years and last visit) and required less systemic immunosuppressive treatments (sixth treatment line at last visit p=0.01). Flare photometry values were significantly different between the 2 groups at both 5 years (p=0.002) and last visit (p=0.0001).

Conclusions: Decrease of laser flare photometry values one month after treatment intensification is a good predictive value of complications and low visual acuity over long-term follow-up in children with JIA-associated uveitis.

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