SOPTI Meeting 2020: Abstracts

The 25th National Conference of the Italian Optometric Association (SOPTI) was held in Verona on January 19–20, 2020. The theme of the conference was “Innovative technologies in Optometry and Contact Lenses”, was arranged in 3 sessions: optometry, contact lenses, and ophthalmology. Three keynote speakers were invited during the conference: Prof. Rigmor C. Baraas from the University of South-Eastern Norway in Kongsberg, Prof. Silvia Tavazzi from University of Milano Bicocca and Dr. Iwan Zanchetta, clinical practice Rothrist, Switzerland. The abstracts from accepted posters and free papers are presented here.

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Analysis of sensitivity and specificity of self-report questionnaires on the refractive error

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Abstract

Objective and subjective refraction are considered the gold standard for assessing vision defects. Self-reported questionnaires, which are becoming increasingly popular, could be used as an alternative test to detect refractive errors (Breslin et al., 2014; Cumberland et al., 2016; Ip et al., 2007; Walline et al., 1996). The purpose of this study was to assess the accuracy of two self-questionnaires (Q1 and Q2) in identifying refractive errors. In particular, in the Q1 questionnaire interviewees were required to identify their own refractive error choosing among options specified with the scientific term of the condition (e.g. myopia, hyperopia, astigmatism and presbyopia). In the Q2 questionnaire, options available for the interviewees combined the scientific term of the condition with a descriptive explanation of this.

A multicentre study was carried out in six high street optometric practices in Italy. Two hundred and eight participants (mean age 39.7 ± 17.7 years; 65 percent females) were randomly asked to complete one of two questionnaires before an eye examination. The non-cycloplegic subjective refraction of each participant was determined by an examining optometrist in each centre who was masked to the results of the questionnaire. The spherical equivalent refractive error was used to categorise myopia as ≤ -0.25 D, hyperopia as $\geq +1.00$ D, astigmatism ≤ -1.00 D, and presbyopia with a required addition for near greater or equal $+1.00$ D. For each questionnaire the sensitivity and the specificity were determined comparing the self-reported answers with the classification obtained by the subjective refraction.

Questionnaire 1 showed a sensitivity of 0.82, 0.47, 0.72, and 0.58 for myopia, hyperopia, astigmatism, and presbyopia, respectively. In terms of specificity, Questionnaire 1 showed a value of 0.72, 0.75, 0.59, and 0.97 for myopia, hyperopia, astigmatism, and presbyopia, respectively.

Questionnaire 2 showed a sensitivity of 0.90, 0.75, 0.72, and 0.49 for myopia, hyperopia, astigmatism, and presbyopia, respectively. While in terms of specificity, Questionnaire 2 showed a value of 0.80, 0.80, 0.60, and 0.98 for myopia, hyperopia, astigmatism, and presbyopia, respectively. The ROC curves of the two questionnaires are reported in Figure 1.

Both questionnaires used in the study showed reliable results for identifying myopia (see Figure 1). However, their accuracy in allowing hyperopic, astigmatic, and presbyopic participants to correctly identify their condition was poor. Self-reporting questionnaires in Italian language to identify refractive errors are a good option in case of myopia, but not for other refractive errors, for which only objective and / or subjective refraction should be considered.

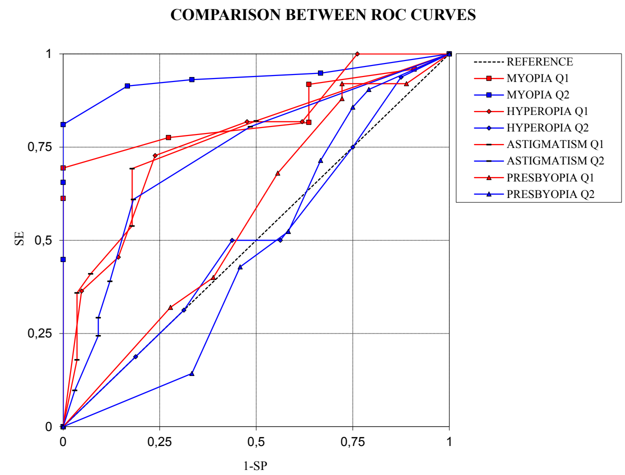

Figure 1: *The ROC curve for each refractive error calculated for Q1(red line) and Q2 (blue line).*

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In-vitro Affinity for Nicotine of Contact Lenses of Different Materials

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Abstract

Nicotine is a toxic compound belonging to the alkaloid family and it is present in high concentrations in the leaves of tobacco plants (*Nicotiana tabacum*). Both smokers and non-smokers are exposed to this chemical because of direct fruition of tobacco derivatives and its presence in the environment as a pollutant (Liu et al., 2018). In clinical contact lens practice, this molecule

can be dangerous because it can adhere to the surface of contact lenses (CLs) (Broich et al., 1980). As for other contaminants, nicotine can have a negative impact on CL properties and ocular health causing infection and inflammation (Panthi & Nichols, 2018; Rabiah et al., 2019). The purpose of this study was to determine the *in-vitro* affinity of CLs to nicotine using UV-VIS spectrophotometry.

Thirteen different materials belonging to 4 out of 5 FDA groups were chosen according to the availability on the market: 1 group I hydrogel CL (Polymacon), 3 group II hydrogel CLs (Nelfilcon A, Omafilcon A, Nesofilcon A), 4 group IV hydrogel CLs (Etafilcon A, Methafilcon A, Filcon IV, Ocufilcon D), and 5 group V silicone hydrogel CLs (Comfilcon A, Delefilcon A, Lotrafilcon A, Lotrafilcon B, Somofilcon A). UV absorbance spectra of each of these CL materials were acquired with a Jasco V-650 spectrophotometer, prior to and after a 10-minute exposure to a 2 mM nicotine solution, followed by a brief rinse in saline solution in order to remove the superficial nicotine. The spectrum of the clean CL was numerically subtracted from the spectra of each CL after the exposure to the nicotine solution. The resulting spectra show a peak centred at about 260 nm, due to the presence of nicotine. The intensity of this peak was then compared to the expected absorbance at the equilibrium (assuming a CL hydration with 0.5 mM nicotine solution), calculated according to the central thickness and percentage of hydration of each CL. The measured/expected ratio provided a relative value which allowed a comparison of nicotine incorporation in the investigated materials.

For each CL, a different measured/expected ratio was found. Group II hydrogel materials showed an absorbance in good agreement with the calculated equilibrium value (range: 0.8-1.0), except for Nesofilcon A, which displayed a ratio of 0.3. On the other hand, Group IV hydrogel materials showed an intensity of the nicotine peak between two and three times higher than the expected equilibrium level (range: 2.1-2.4) and Group V silicone hydrogels showed an opposite result, with a much lower absorbance than expected (0.2-0.4). As far as Group I is concerned, only Polymacon was measured and it showed a ratio of 0.6. In conclusion, despite small differences, similar values were displayed by CLs belonging to the same FDA group: in particular, ionic high-water-content materials (Group IV) presented the highest affinity to nicotine, whereas silicone hydrogels (Group V) showed the lowest. These results suggest that *in-vitro* affinity of CL materials for nicotine depends on their chemical and physical properties.

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Inter and intra-observer reliability in tear meniscus height measurement through a new digital acquisition system

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Abstract

The purpose of this study was to evaluate inter and intra-repeatability of the tear meniscus height (TMH) assessment (Wolffsohn et al., 2017) through a new automatic digital acquisition system.

A set of 153 pictures of lower tear meniscus (76 of ODs and 77 of OSs) were selected from the database of the Research Centre in Optics and Optometry (COMiB) and arranged in a new database. Four observers (2 newly graduated optometrists and 2 optometrists with more than 20 years of clinical experience) measured the TMH of each picture in three different points, centrally and at 30 degrees temporally and nasally (Pena-Verdeal et al., 2016; Yokoi et al., 1999), by the new device named *Dry Eye Report* (CSO, Firenze). Each observer was requested to repeat the overall measurement after 15 days. Central TMH results measured by the 4 observers ranged between 0.09 and 0.86 mm and between 0.08 and 0.54 mm on the OD and OS, respectively. Nasal TMH measurements ranged between 0.08 and 0.86 mm and between 0.04 and 0.74 on the OD and OS, respectively. Temporal TMH measurements were between 0.08 and 0.60 and between 0.06 and 0.61 on the OD and OS, respectively. For the OD, the intraclass correlation coefficient (ICC) (Johnson & Murphy, 2005; Koo & Li, 2016) calculated among the 4 observers resulted 0.94, 0.95 and 0.90 for the central, nasal and temporal measures, respectively. For the OS, the ICC resulted 0.94, 0.95 and 0.90 for the central, nasal and temporal measures, respectively. Intra-observer reliability for pictures of both eyes and the 3 positions of measurement was good for all the observers (all ICCs > 0.79).

The inter-observer reliability in assessing TMH by a new digital device of measurement appeared extremely good in terms of ICCs for both eyes and either centrally, nasally or temporally. The intra-observer reliability appeared extremely good, also. More experienced clinicians did not show better ICC values.

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Corneal topography in assessing Extended Depth of Focus CL centration

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Abstract

The study was carried out to evaluate accuracy and inter- and intra-observer reliability of the centration assessment of an extended depth of focus (EDOF) soft contact lens (CL) developed by Brian Holden Vision Institute for myopia control, by corneal topography.

Thirty-three myopic volunteers (25 females) age range 18.6–27.9 years (mean ± *SD*; 22.7 ± 2.0 years) were recruited among the students of Milano-Bicocca University (Milan, Italy). All measurements were performed at the Research Centre in Optics and Optometry (COMiB) of the same university. EDOF CLs (Mylo, Mark'ennovy, Spain) were fitted in both eyes of each participant except for two of them because only one eye met all inclusion criteria. For any EDOF CL, a videokeratography over the CL (Osiris-T, CSO, Italy) and a slit lamp (SL) digital picture (HR-Elite, CSO, Italy) were taken in a randomised sequence. For the SL images, the Phoenix software was used to assess the position (coordinates x and y) of the EDOF CL centre respect to the centre of the pupil in a Cartesian plane. For the videokeratoscophic acquisitions, the position of the EDOF CL centre in respect to the centre of the pupil was detected using a qualitative procedure directly from the topographic map (tangential algorithm), by two different observers (one newly graduated optometrist and one optometrist with more than 20 years of clinical experience) and repeated twice in two different sessions with a 15 days delay.

Accuracy of the topographic assessment in determining coordinates of the EDOF CL centre with respect to SL assessment was good. No significant difference was found in the left eyes, whereas in the right eyes a less temporally decentred position of the CLs was detected (paired t-test, $p < 0.05$). Nevertheless, this difference appeared clinically negligible (0.14 ± 0.22 mm). The difference between the 2 observers in assessing CLs centration by topographic map was not significant for horizontal coordinates of both eyes, but a significant difference was found for vertical axes (paired t-test, $p < 0.05$). The intra-class correlation coefficient (ICC) was calculated for each coordinate (x, y) and for each eye amongst the two measures achieved in CL centration assessment by the topographic procedure by each observer. ICCs were very good (between 0.64 and 0.88) in each observer, except for the horizontal decentration value relative to the right eye, which for the observer with less experience dropped to 0.58.

In conclusion, assessing CL centration by performing topography over an EDOF soft CL appeared to be an accurate method. Intra and inter-observer reliability of the measurement were good.

A feasible way to quantitatively measure the sensory eye dominance

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Abstract

This study investigates the possibility of developing a sensory eye dominance test on a continuous scale, based on performance rather than on the subject's introspective response. Determining sensory eye dominance (SED) is important in some optometric interventions influenced by the integration of information coming from the two eyes (Evans, 2007). Several studies have found inconsistencies between traditional dominance measurements (Mapp et al., 2003; Walls, 1951). SED seems to vary according to the type of test and its conditions, such as the distance and the eccentricity of the stimulus (Khan & Crawford, 2001). These inconsistencies may result from tests that are dichotomous and based on the patient's subjective impressions. Some scientific research uses SED tests based on ocular balance indexes, currently not used in the clinical context due mainly to the required administration times (Bossi et al., 2018).

Thirteen observers participated in the experiment. Stimuli presentation and data analysis were performed using Psychopy and other scientific Python modules (Peirce & MacAskill, 2018). A dichoptic stimulus previously used by Reynaud & Hess (Reynaud & Hess, 2017) in order to produce a Pulfrich effect (Pulfrich, 1922) that allows the illusory three-dimensional perception of a cylinder that rotates clockwise or counterclockwise, was modulated in terms of ocular disparity and contrast. The stimuli were fused through two prismatic lenses mounted on a stereoscope prototype built in our laboratory. The observers were asked to report the perceived direction of rotation. In this way, psychometric curves were obtained for the proportion of clockwise responses related to ocular disparity and contrast difference between the two stimuli. Furthermore, three traditional dominance tests were conducted on each subject: the red filter, positive lens (sensory) and pointing (motor) test.

Firstly, we assessed the repeatability of our test on three subjects from our sample who carried out the measurements two times with one week between measurements, showing similar results within their trials. From the psychometric curves, we estimated the balance point between eyes in terms of the ocular disparity which produced an inversion of perceived rotation. We found that it was significantly different between observers whose results were consistently right ($N = 4$), left ($N = 4$) or ambiguous dominant for the combination of traditional tests [$F(2,10) = 6.196$, $p = 0.017$], and estimated that the information from the dominant eye could be processed on average 8.2 ± 5.8 ms faster than that of the other eye. Observers with a dominant left eye showed more marked differences in processing times (6.8 ± 2.0 ms) than people with a dominant right eye (1.5 ± 0.9 ms). The subjects that do not show a clear dominance had no differences in processing times between the eyes (1.2 ± 1.7 ms). These results are consistent with the literature (Read & Cumming, 2005) and underline the need to distinguish the peripheral from the hemispherical SED (Jasper & Raney, 1937; Rombouts et al., 1996). We are currently resolving this critical issue in order to develop a new SED quantitative test for use in clinical practice.

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Italian optometry in an European framework, between history and function

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Abstract

Ophthalmic optics and optometry together are a unitary field, both historically and functionally. Even now, European associations (European Council of Optometry and Optics ECOO and European Academy of Optometry and Optics EAOO) represent both professions. Nevertheless, there are differences in functions, but the common ground of optical aids for vision function remain. *Ante litteram* opticians started to prepare eyeglasses in the XIII century in Italy. The year 1286 is used as a symbolic date for the first eyeglasses (Ilardi, 2007) even if the real date is probably earlier (Cappa, 2004). There is evidence that eyeglasses for myopia were specifically selected, sold and used already in the XV century in Italy (Ilardi, 2007). So, the specific practice of optics spans over 7 centuries. In Italy, one traditional "optician" dates back to 1856 and is still active in the same place, and another one which is still active dates back to 1802 (Raffaele Sacco). These are both in Naples. It must be highlighted that eyeglasses, even during the XIX century, found opposition by medical professionals. Antonio Scarpa (1826), an Italian eye surgeon famous in Europe, wrote a short textbook to promote visual hygiene, and against "lasciviousness" in order to prevent myopia. The same book warns about the use of concave eyeglasses, but considers convex lenses "less harmful". This radically different approach – opposing opticians and oculists – shines light on different styles of thought at the time: for physicians the goal was to remove eye defect (i.e. to cure); instead, for opticians the goal was to correct and re-establish visual function. Looking back from actuality, both approaches seem incomplete: use of corrective lenses without evaluating causes or applying a treatment without real knowledge of causes. The "opticians' approach" has shown efficacy, and refractive correction with lenses remains the preferred and scientifically based option. The "cure" of refractive errors is still is being studied. Activity of opticians as a regulated profession can be traced far back in local guilds, like the one of *Christalleri* in Venice, in the XIII century (De Lotto, 1956). In 1928 a law was introduced which regulates the practice of opticians in the unified Italy. This law still applies and gives opticians the license to refract for "simple defects of myopia and presbyopia". This poses the role of opticians under Category 2 of WCO, not to be confused with the "dispensing optician" of English-speaking countries. In 1969-70 advanced education in optometry started, for licensed opticians only, both in Milan and Vinci/Florence (the latter Institute is still active as IRSOO). Many educational projects on optometry followed, none fully establish a standard. In 2001 a three-year university program in "optics and optometry" was started (as a specific Physics degree, within the Science School) in Milan and rapidly other universities followed. In 2018, Italian optics and optometry associations developed a two-level registration, for *optician* and *optometrist-optician*, based on the different education, competencies and qualifications of the two (Registro TiOpto). Most of the current practices in Italy are independent. Generally speaking, all optometrists are also licensed as opticians, but not all opticians are qualified as optometrists, respectively in a ratio of about 4:1 (opticians to optometrists).

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Contact lens use, what to do to get a severe microbial keratitis

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Abstract

Inappropriate use of contact lenses is the most common cause of severe ocular microbial keratitis. Severe microbial keratitis can reduce visual function. In Italy there have been no studies into the incidence of microbial keratitis in contact lens wear. The purpose of this study was to investigate habits of contact lens wearers in relation to severe microbial keratitis and describe associated risk factors.

A total of 49 subjects with severe microbial keratitis responded to a survey between November 2018 and May 2019. All subjects were in ophthalmological hospital for pharmacological treatment after diagnosis of severe microbial keratitis associated with contact lens use, and all were disposable soft contact lens wearers. The survey was retested on 22 subjects one month after the first test. The participants were aged from 16 to 67 years (mean 37 years), 74% were female. No rubbing of the lens after use was reported for 98% of the sample. 83% reported that they had not visited an eye specialist to have contact lenses fitted. Water exposure (tap water, swimming pool, shower) was reported for 72% of the sample. 55% reported waiting longer than 1 month before replacing the contact lens case. 49% slept with contact lens in the eyes almost 1 or 2 night a week. 49% reported waiting longer than the recommended time before changing their contact lenses.

Risk factors associated with severe microbial keratitis were reported. It is necessary to educate contact lens wearers to establish safe habits.

Corneal densitometry changes after orthokeratology treatment

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Abstract

Densitometry is a measure of transmission of light. Orthokeratology is an effective treatment for myopia control. It has been established that it is a reversible modelling of corneal epithelium. Actually, there is no study of corneal densitometry after orthokeratology treatment over short and long period. The aim of this study is to analyse the densitometry of the sublayers of human corneas that have undergone orthokeratology treatment for two years.

Scheimpflug images of 70 eyes of 36 subjects, aged from 9 to 15 years, that underwent orthokeratology treatment for myopia control have been collected for this retrospective study, before and after two years of orthokeratology. The images have been processed through MATLAB scripts. The central vertex and the external edge of the cornea were identified and the optical density for each sublayer within the 3 central mm was measured. The data thus obtained have been analysed with the Shapiro Wilk and *T*-test (Wilcoxon signed-rank test), in order to assess the statistical significance. The values related to the right eyes of the sample have been analysed. The densitometric values in GSU (Grey Scale Unit) before the orthokeratology treatment and after two years of continuous wear highlighted a difference from 18.1 $\pm$ 1.04 to 18.7 $\pm$ 1,4 ($Mdn = 18.0$, CI 95%, $W = 81$, $p = 0.02$) for the epithelium-Bowman complex, from 10.7 $\pm$ 0.8 to 11.2 $\pm$ 0.8 (CI 95%, $t = 3.63$, $M = -0.51$, $p = 0.00$) for the stroma, and from 5.1 $\pm$ 0.6 to 5.0 $\pm$ 0.7 (CI 95%, $t = 0.92$, $M = 0.12$, $p = 0.37$) for the endothelium.

The difference in densitometric values for the primary corneal layers of normal subjects, measured before and after two years of orthokeratology treatment, turned out to be statistically significant for the epithelium and the stroma. However, these differences are not considered clinically significant, as the measured variations of refractive index are minimal. Currently, the minimal normal values of the density variation occurring physiologically or by wearing other kinds of contact lenses cannot be determined because of the characteristics of the assessed sample.

Corneal densitometry differences between two Scheimpflug camera

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Abstract

Densitometry is a measure of transmission of light. Measurements of corneal densitometry are useful to observe effects of contact lenses, ocular treatments, or surgical intervention. The Scheimpflug camera is a principle of photography, which when applied with a specific device can visualize and make further analysis on the anterior segment of the eye. The purpose of this study was to compare measurements of corneal densitometry taken with two commercially available Scheimpflug camera devices.

A total of 66 images of 24 normal eyes of 12 subjects were analysed with Sirius (CSO, Italy) and Pentacam (Oculus, Germany). Subjects were aged from 20 to 22 years, 64% were female. GSU (Grey Scale Unit) index for principal corneal sublayers were extrapolated. GSU from Pentacam images were extrapolated using proprietary software, GSU from Sirius images were extrapolated by a bespoke algorithm based on Matlab. For the anterior sublayers of the cornea (120 μm for Pentacam, Epithelium-Bowman for Sirius) a statistically significant difference was found between the two devices ($p < 0.001$ Wilcoxon signed-rank test; mean and standard deviations values of 16.80 $\pm$ 0.66 GSU for Pentacam and 17.55 $\pm$ 0.70 GSU for Sirius; 95% range of difference from 0.76 to 1.07). A statistically significant difference was also found between the two devices for the posterior sublayers of the cornea (over 120 μm for Pentacam, stroma for Sirius) ($p = 0.02$ Wilcoxon signed-rank test; mean and standard deviations values of 10.50 $\pm$ 0.48 GSU for Pentacam and 10.62 $\pm$ 0.56 GSU for Sirius; 95% range of difference from 0.01 to 0.21)

GSU values for each device were reported for the principal sublayers of the cornea. Statistical differences for each sublayer were found, but our data suggests a difference of 1 GSU unit as maximum difference. It is not possible to consider the clinical significance of these differences due to a lack of normal values reported in scientific literature for the two instruments.

Is it possible to predict the ocular aberrometry variations with bitoric soft contact lenses in irregular astigmatism?

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Abstract

Corneal surface irregularity can introduce high order aberrations often not correctable with spectacles. New generation soft contact lenses with bitoric design may be useful in correcting higher-order aberrations. The bitoric design is characterized by both the anterior and posterior surfaces being toric, and their principal advantages is almost normal thickness. The disadvantage is that more chair-time is required for trialling the lenses and calculating the final parameters compared with other lenses. A better predictability of objective effectiveness would be useful in cutting down on time consuming procedures.

The purpose of this study was to analyse the effects on coma and astigmatism aberrations of bitoric soft contact lenses in subjects with irregular astigmatism and to assess the measurement differences of aberrations by using an aberrometer and a topographer.

A retrospective study was performed on a selection of 22 subjects with irregular astigmatism divided into 14 right eyes and 15 left eyes for a total of 29 examined eyes. Each eye had BCVA with spectacles lower (better) than 0.3 logMAR. Each eye was fitted with soft bitoric contact lens (TDK, TSlac, Italy). Aberrations index, from Osiris (CSO, Italy), for astigmatism, coma, and spherical aberration, for a pupil diameter of 4 mm, were extrapolated with and without the contact lens fitted. Indexes were compared with ANOVA to evaluate the effect of the contact lens on aberrations.

In the comparison between before and after contact lens application the statistical analysis did not reveal any significant difference in predictability of changes in aberrations, although the means of single aberrations showed a decrease of vertical

coma in both samples (right eyes and left eyes).

The study does not show any predictability of objective efficacy, compared to high order aberrations, of bitoric soft contact lenses in subjects with irregular astigmatism. Evaluation of efficacy with trial lenses and comparison with subjective variations are necessary to assess the efficacy of bitoric contact lens fitting in general irregular astigmatism.

Imaging cone-to-RPE connections in the living human retina

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Abstract

Multimodal adaptive optics scanning light ophthalmoscopy (m-AOSLO) allows for high resolution in-vivo imaging of the human retina. The m-AOSLO instrument in Kongsberg currently allows for the following modes of imaging: in-vivo reflectance confocal, split-detector and dark-field imaging (Pedersen et al., 2020; Scoles et al., 2013; Scoles et al., 2014). Thus, resolving individual photoreceptor cells (1–2 μm in size) and individual retinal pigment epithelial cells. It is non-invasive and allows monitoring in the authentic anatomical setting of the living human eye. The retinal pigment epithelium (RPE) is essential for appropriate development of the human retina, through promoting photoreceptor development and differentiation. RPE cell maturation is thought to play a critical role in defining foveal specialization and shape. Results from an ongoing study on the relationship between foveal shape obtained from OCT imaging and cone and RPE cell density profiles of healthy adults will be presented and discussed.

References

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