

NCC 'Beyond 2020' Paper Abstracts
Free paper sessions
Sunday, March 15, 2020 09:30 – 10:45
Netherlands, Veldhoven, de Koningshof,
Diezezaal

Organization Section: NCC/ BCLA

Moderator: Byki Huntjens

Paper Number: 1

Presentation time: 09:30-09:37

Intra- and Inter-Visit Repeatability of a Contemporary Corneoscleral Topographer

Langis Michaud, Gabriella Courey, Marie-Michele Dupuis, Patrick Simard

Purpose: To determine the intra- and inter-visit repeatability of the Eaglet Eye Profilometer (EEP).

Method: The data from a prospective, non-randomized control study imaging 28 eyes (14 participants) using the EEP was analyzed. Four measurements were taken per eye at 2 min intervals. The last 3 measurements were merged together to create a composite eye. Measurements were taken after applying sodium fluorescein using carboxymethylcellulose sodium non-preserved artificial tears. Only images with a quality of 100% were accepted. Baseline assessment (V1) was repeated at a second visit (V2) (72hrs from V1). The data extracted was: corneal astigmatism (AST) and axis (AX), sagittal (SAG) height (360° (S360), temporal (TS) and nasal (NS)) and max/min SAG values and their axis, all at 13 and 15mm chords. A one-way repeated measures ANOVA was used to measure intra-visit repeatability. A paired t-test was performed to evaluate inter-visit repeatability at both chords, which was validated using the Wilcoxon test.

Results: The mean age of the 14 subjects who completed the study (5M, 9F) was 23.93±1.385 years. Within the same visit, no statistically significant difference was found for all values. There was no statistically significant difference when comparing the first measurement to the composite eye. Therefore, the composite image was used to compare inter-visit

repeatability at each chord. Between each visit, the only measurements presenting a statistically significant difference were TS ($p=0.0005$) at 13mm, NS at 13mm ($p<0.001$) and 15mm ($p=0.001$) and minSAG at 15mm ($p=0.0224$, signed rank $p=0.0166$). Post-hoc analysis revealed that none of these values were affected by gender (M vs F) or eye (OD or OS).

Conclusions: The results of this study demonstrate that the vast majority of measurements generated from the EEP present repeatable results within the same visit and between visits. Clinically, this is important data to assess corneoscleral shape and improve the efficacy and outcomes of scleral lens fits, saving chair time for both the clinician and the patient.

Research funding received: None

Paper Number: 2

Presentation time: 09:37-09:44

Calculation of ocular axial length from keratometry and refraction data in a myopic paediatric population

Philip Morgan, Paul Chamberlain

Purpose: Myopia management seeks to slow ocular growth to reduce the risks of myopia-associated pathological ocular changes, but few eyecare practitioners have routine access to dedicated biometry instrumentation. This study explored the estimation of ocular axial length from measures of keratometry and refraction.

Method: For a large prospective study into the performance of a dual focus one-day soft contact lens (MiSight 1 day, CooperVision, Inc), 144 subjects (8-12 years) without previous contact lens wear were fitted with either a dual focus or a standard soft contact lens and followed for three years. Radius of curvature of the anterior cornea (k, mm) and axial length (A, mm) were determined with an IOL Master biometer (Carl Zeiss Meditec) and cycloplegic and non-cycloplegic spherical equivalent refractive error (S, D) was evaluated with a WAM-5500 (Grand Seiko). A linear mixed model was

constructed to evaluate the potential for calculating 1/A from 1/k and S.

Results: The model found that 1/A could be predicted with the formula: $1/A = (0.22273/k) + (0.00070*S) + 0.01368$ with both 1/k (F = 1636, p < 0.0001) and S (F = 1334, p < 0.0001) as significant factors. The coefficient of determination, r-squared, was 0.83. Reorganisation of this equation gives: $A = 1/(0.01368 + 0.00070 S + 0.22273/k)$ with 95% confidence limits of +/- 0.73mm (+/- 3.0%). A similar relationship was found with non-cycloplegic refraction.

Conclusions: For eyecare practitioners wishing to estimate absolute ocular axial length of their patients, using keratometry and refractive error provides better agreement to a biometer than employing refractive error alone. This approach is able to categorise patients into risk groups based on the overall level of myopia but is not as precise as using a dedicated biometer for assessing small changes in axial length over time.

Research funding received: Study sponsored by Cooper Vision

Paper Number: 3

Presentation time: 09:44-09:51

Qualitative research to understand patient experience during the contact lens teach and aftercare, and how to optimise the experience to help retain patients

Amanda Bogers, Ben Terrell

Purpose: It is important to understand the experience a patient new to contact lenses (CLs) is going through during CL application and removal training (teach) and how to optimise the teach before, during and after to help maintain retention at this early stage of their CL journey. The CL aftercare is an important appointment to review current lens suitability and maintaining eye health. It is crucial to understand what factors influence the patients experience of the teach and aftercare in order to help retain patients.

Method: Qualitative research was conducted with four group discussions of 90 minutes, held in the UK in May 2019. A total of 30 participants, 12 men and 18 women aged between 22 and 45 years, both new and experienced wearers were split in groups of seven and eight to discuss their experiences.

Results: All participants showed a mix of emotions ranging from excitement to anxiety before the teach. For three out of four participants the teach felt scripted and rushed. Staff seemed uninterested and eager to finish, and for many, the teach was conducted by inexperienced staff in an inappropriate location. Only a quarter of participants had positive experiences. Almost half of wearers felt that the aftercare had benefits for the first couple of appointments but became repetitive and obligation in order to receive more lenses. These feelings caused a move to other opticians. However, over half of wearers had positive feelings and welcomed the opportunity to have their eye health checked and stay up to date.

Conclusions: These insights show that the teach is an emotional journey. The aftercare is seen as a nuisance especially by experienced wearers. There are opportunities to optimise and tailor both the teach and aftercare to help support successful lens wear and maintain retention, benefitting both wearer and practice.

Research funding received: Study sponsored by Cooper Vision

Paper Number: 4

Presentation time: 09:51-09:58

Efficacy of software-based fitting in orthokeratology

Ron Beerten, Walter Wolterinck, Elien Janssen

Purpose: Some markets fit orthokeratology (OK) using trial contact lenses (CLs). This can make the procedure complicated; more experience is needed, it can be time consuming and there is a risk of cross infection with trial lenses. In

western markets, most OK CLs are fitted empirically with digital software, calculating the unique CLs based on topography and subjective refraction. This study was to analyse the overall success of digital OK fitting and the quantity of lens exchanges needed to reach success.

Method: The database of the MyProcornea lens fitting platform was analysed for fits between January 2015 and July 2017 (www.myprocornea.com). Data from eyes fitted with DreamLite OK (DOK) CLs using the fitting software were analysed at least 2 years after the initial fit. DreamLite standard and DreamLite TRX (toric) were included; the CL is licensed for fitting up to -5.00DS. DOK is a yearly replacement system; two reorders with a yearly interval was considered a successful fit. The amount of lens exchanges per eye, when needed, within 3 months of the initial fit to reach a satisfactory outcome, were also analysed.

Results: With 1000 eyes fitted with MyProcornea software, there was an overall success rate of 70% i.e. still wearing DOK after 2 years. The success rate was highest for the Rx group -1.50DS to -2.50DS (77%); lowest was for Rx group -3.50 to -5.00 (66%). With higher powers, first fit success rate decreased; -3.50 to -5.00DS needed one lens exchange (2 lenses total) in the first 3 months, whereas 25 % of eyes between -0.50 to -2.50DS required a lens exchange lens for satisfactory outcome.

Conclusions: This study confirmed that digital, empirical fitting of OK is successful and effective with DreamLite and the MyProcornea software for the range -0.50 to -5.00DS.

Research funding received: N/A

Paper Number: 5

Presentation time: 09:58-10:05

Comparison of horizontal corneal diameter measurements using the Aladdin biometer and Medmont E300 corneal topographer

Byki Huntjens, Kristina Mihić, Chris C. Hull

Purpose: Superiority in corneal diameter,

white-to-white (WTW) distance, measurements using objective imaging devices over subjective face-to-face measurements by eye care practitioners (ECP) have been reported previously. The primary aim of this study was to compare manual and automated corneal diameter measurements using 2 different objective imaging devices. A secondary aim was to compare results obtained by an experienced ECP and novice user.

Method: The WTW distance was measured in one eye selected at random from 71 participants (males n=15, females n=56) using the automated software v1.6.2 of the Aladdin biometer (Topcon, Tokyo, Japan) and manual ruler and circumference methods within the Medmont E300 topographer software v6.2.6 (Medmont International Pty Ltd., Victoria, Australia). The mean age of the participants was 20.9 years \pm 2.1 (SD) ranging 19 to 27 years and none had any history of ocular disease. Both examiners, independently measured WTW on three different occasions for both techniques on the Medmont.

Results: The ECP recorded a mean corneal diameter of 11.87 mm \pm 0.37 (SD) with the Aladdin, while the Medmont measured 11.91 \pm 0.37 mm using the ruler and 11.90 \pm 0.36 mm using the circle ($F(69) = 1.677$; $p = 0.19$). The Intraclass Correlation Coefficients (ICC) of 3 repeated measures was 0.993 (ruler) and 0.930 (circle). Compared to the ECP, this was reduced in the novice user (0.968 and 0.955, respectively) with increased variability ($p = 0.051$). The coefficient of inter-rater repeatability improved using the circumference method (0.937) versus the ruler (0.914).

Conclusions: There were no statistically nor clinically significant differences between the WTW measurements using the Aladdin or Medmont; therefore these can be used interchangeably. However, when analysing Medmont images, the ruler method was more reliable compared to the circle. Additionally, we report increased variation in repeated measures

by the novice user, indicating that some training may be necessary.

Research funding received: Study funded by City, University of London and No7 Contact lenses

Paper Number: 6

Presentation time: 10:05-10:12

Agreement in anterior eye measurements between the Aladdin biometer and Medmont E300 topographer

Kristina Mihic, Chris C. Hull, Byki Huntjens

Purpose: The aim of this study was to assess the agreement of anterior corneal parameters and pupil diameter and offset measured with the Medmont E300 corneal topographer and the Aladdin optical biometer.

Method: Three consecutive readings were obtained from 71 healthy participants with a mean age of 20.9 ± 2.1 years (mean \pm SD) using the Medmont topographer (Medmont International Pty Ltd., Victoria, Australia). Central corneal curvature in the flat (Kf) and steep (Ks) meridians, magnitude of corneal astigmatism (CA), corneal eccentricity, photopic pupil size, and pupil decentration were compared to the average of 3 internal readings from the Aladdin (Topcon, Tokyo, Japan).

Results: Mean difference in Kf and Ks was 0.006mm and 0.012mm respectively demonstrating good agreement. The 95% Limits of Agreement (LoA) for Kf and Ks were -0.07 to $+0.06$ mm and -0.06 to $+0.08$ mm respectively. For CA, the mean difference was 0.11D with LoA from -0.42 to $+0.64$ D. The mean corneal eccentricity was 0.17 ± 0.38 using the Aladdin and 0.55 ± 0.11 using the Medmont, which was statistically significantly different ($p < 0.0005$). The mean-difference plot showed a relationship between eccentricity and difference. The mean photopic pupil diameter was not significantly different between the Aladdin (3.53 ± 0.57 mm) and the Medmont (3.57 ± 0.71 mm; $p = 0.58$). The difference between instruments in horizontal pupil offset was 0.00 ± 0.09 mm

($p = 0.70$), and vertically 0.05 ± 0.15 mm ($p = 0.005$).

Conclusions: We report high levels of agreement between the Aladdin and the Medmont device with clinically insignificant mean differences for Kf, Ks, CA, pupil size and offset. Both instruments showed significant differences in the eccentricity towards the periphery, despite nearly identical radii of curvature measurements. Due to the observed bias for eccentricity, it is not appropriate to use these two instruments interchangeably for peripheral corneal topography.

Research funding received: Study funded by City, University of London and No7 Contact lenses

Paper Number: 7

Presentation time: 10:12-10:19

Characterizing the surface properties of daily disposable contact lens materials

Lakshman Subbaraman, Bob Tucker, Ethan Leveillee, Erich Bauman

Purpose: Using surface chemistry, a daily disposable silicone hydrogel (SiHy) contact lens with unique surface properties (verofilcon A) was developed. This novel lens material with "SMARTSURFACE" technology should provide a more wetttable surface than other SiHy lens materials. This study used an in vitro model to characterize the aqueous film stability of this lens and compared with other commercial contact lenses.

Method: To determine the water break up time (WBUT) on contact lenses under fully hydrated conditions, the iDDrOP method was employed. To eliminate the influence of packaging solution additives, the lens was soaked overnight in a phosphate buffered saline solution (PBS), the iDDrOP instrument trough was filled with PBS, and the lens sample was submerged. The lens was then raised out of the fluid at a controlled rate. Videos of the fluid draining from the lens surface were then recorded. The WBUT was defined as the time when the first area of

fluid reached zero. Each lens was submerged between recordings to ensure the lens was fully rewetted. Each experimental group had 10 lenses, and three measurements per lens were conducted, resulting in 30 total measurements per group.

Results: The average WBUT on verofilcon A was 30±6 seconds longer, whereas on etafilcon A, somofilcon A, and stenfilcon A WBUT was found to be 7±3 sec, 6±3.5 sec, and 5±2.6 sec, respectively. Based upon Student's t-test, the WBUT of verofilcon A was statistically greater than the other lenses ($p < 0.05$).

Conclusions: Surface modification techniques can create novel, highly wettable surface gels on silicone hydrogel core materials. The SMARTSURFACE process on verofilcon A contact lenses demonstrated a more stable aqueous film compared to other products, as demonstrated with a longer WBUT.

Research funding received: Study sponsored by Alcon

Paper Number: 8

Presentation time: 10:19-10:26

Clinical performance of senofilcon A with and without a photochromic additive

John Buch, David Ruston, John Meyler, Jessica Cannon

Purpose: The purpose of this study was to validate the clinical performance of senofilcon A with a photochromic additive (Test) against a similar lens without the additive (Control).

Method: Two similar studies were combined in the analysis. Both studies were prospective, bilateral, partial-subject masked, daily-wear reusable, dispensing, and had the same eligibility criteria and the same study lens parameters. The dispensing periods were 2 weeks each in a randomized ABB or BAA design, resulting in a 6-week study per subject. Follow-up visits occurred at 2, 4, and 6 weeks after dispensing with safety measures collected at each visit. Preferences were asked at the 4-week follow-up, and overall

subjective responses were collected at the 6-week follow-up.

Results: A total of 229 cohort subjects age 32.4 +/- 7.89 were included in the analysis. There were no physiological differences found between the Test and Control lenses at any visit, and the physical fit of all study lenses were judged acceptable. Preferences for the Test lens were statistically superior for all outdoor and indoor items, including overall preference outdoors (5.61 +/- 1.23), overall preference indoors (4.20 +/- 0.98), and overall preference while using computer screens and digital devices (3.39 +/- 0.71). Overall vision (6.3 +/- 1.1) and comfort (3.3 +/- 1.4) of the Test lens was statistically superior to the Control lens after six weeks of wear.

Conclusions: The senofilcon A lens with a photochromic additive performed just as well as the same lens without the additive in all safety measures, and exceeded the Control lens in all efficacy measures that included lens preferences and other important subjective measures for both the activated and inactivated states of the Test lens. The patient can expect benefits from the Test lens both outdoors and indoors.

Research funding received: Study sponsored by Johnson & Johnson

Paper Number: 9

Presentation time: 10:26-10:33

The effects of a senofilcon A contact lens with and without a photochromic additive on positive dysphotopsia across age

John Buch, David Ruston, John Meyler, Billy Hammond, Lisa Renzi-Hammond, Jessica Cannon

Purpose: The purpose was to assess the visual effects of wearing an activated and an inactivated photochromic lens (Test), with direct comparisons to a non-photochromic lens (Control), in terms of their ability to reduce positive dysphotopsia (halos, starbursts). Attention is given to the influence of age.

Method: Two age groups (13-39, 40-65) were recruited in a 2:1 ratio at a single investigational site. Subjects were randomly fit with a photochromic lens on one eye and a non-photochromic lens on the other. Testing occurred without and with photochromic activation by use of a violet activator (390 nm, half-bandwidth 30 nm). The extent of dysphotopsia was measured using an aperture (~4 mm) that created a bright point source of light 38 inches from the plane of the eye. Between the point source and subject, a centering precision caliper was used to measure lateral spread of halos and starbursts.

Results: A total of 54 subjects completed as cohort (younger group: n=35 age 28.0 +/- 6.28, older group: n=19 age 47.6 +/- 5.93). The photochromic lens produced smaller halo diameters than the Control lens, both activated (48% on average) and inactivated (18% on average), and age strata was a significant factor ($p < 0.001$) with the older group showing a greater reduction. The photochromic lens produced smaller starburst diameters than the Control lens, both activated (42% on average) and inactivated (22% on average), and age strata was a significant factor ($p = 0.001$) with the older group showing a greater reduction.

Conclusions: The senofilcon A lens with photochromic additive reduced the extent of positive dysphotopsia compared to the same lens without the additive, regardless if the lens was activated or not. The visual benefit was greatest with the older population.

Research funding received: Study sponsored by Johnson & Johnson

Paper Number: 10

Presentation time: 10:33-10:40

Comparison of variation in phoria patterns after wearing two contact lenses of different optical design

Juliette Papin

Purpose: In cases of accommodation or vergence anomalies, spectacles or contact lens designs can be recommended in non-

presbyopes for their potential effect on accommodation and phorias. A multiple aspheric curve design lens (CADZO) (Biofinity® Energys, comfilcon A, CooperVision Inc.) has been shown to help reduce the accommodative strain and reduce visual eye fatigue when using digital devices. The objective of this study was to evaluate the effect of CADZO on phorias compared to a centre-distance multifocal design (CAMF) (Biofinity® Multifocal, comfilcon A, CooperVision Inc.). Visual quality and visual fatigue has also been evaluated.

Method: This was a single centre, randomised, double-masked, cross-over study comparing variation in phoria patterns after wearing CADZO and CAMF (Add +2.00D) for two weeks. Subjects aged between 19–38 years old had visual acuity and phorias measured and these were compared to baseline. Six subjects were CL wearers, there was an adaptation period for the others. There was a one-week washout period day before assessment with the second contact lens design.

Results: Twenty-five subjects (22.36±3.40 years) were enrolled; mean spherical equivalent was +0.06D±1.69. In all subjects, an increase of exophoria with CAMF (Baseline -1.40Δ, CAMF: -3.16 Δ; $p = 0.0455$) was observed. The mean phorias with CADZO did not change from baseline (Baseline: -1.40Δ, CADZO: -1.40Δ $p = 0.5694$). In esophoric subjects, a reduction in phoria with CAMF compared to baseline (Baseline: 4.32, CAMF: -0.18; $p = 0.0080$) was observed. There was no significant reduction in esophoria with the other design (Baseline: 4.32Δ, CADZO: 2.18Δ, $p = 0.0646$).

Conclusions: The results show that Biofinity Multifocal lowered esophoria values, while Biofinity Energys had little impact on phoria measurement.

Research funding received: N/A

End of session