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Cataract

Quantification of functional intermediate and near range of acuity reserve of a Diffractive Trifocal Intraocular Lens – A Worldwide Pooled-analysis of prospective clinical investigations

Presenting author: Ruth Lapid-Gortzak, Netherlands

Session name: Multifocal + Toric
Date and time: 09 October 2021, 08:00 - 09:30
Presentation time: 08:00 - 08:06
Location: Hall 13 / Elicium Ballroom

Purpose:
AUC metric is a useful tool to understand acuity reserve to changing visual demands as a function of optical defocus and distance. To quantify the functional range of intermediate and near visual acuity reserve of the trifocal intraocular lens (IOL), AcrySof IQ PanOptix IOL Model (TFNT00) in the largest cohort of subjects from different ethnicities.

Setting:
A pooled-analysis of six prospective, controlled, multicenter clinical trials conducted in Australia, Japan, Korea, India, Germany, Netherlands, Italy, France, Spain, Denmark, USA, Brazil, Chile and Colombia evaluating the 3 to 6 months postoperative visual outcomes of subjects bilaterally implanted with the TFNT00 IOL.

Methods:
Descriptive summaries and graphical presentations of photopic binocular defocus curve results overlaid with the visual acuity demand for a target size equivalent to 0.1 LogMAR (20/25) are plotted as a function of defocus to quantify the useful functional range of vision for physiologically relevant acuity demands. An area under the curve (AUC) metric was used to estimate the useful functional range of acuity reserve between 1m (1D) and 33 cm (3.0D).

Results:
Across studies, the average age of the study subjects (n=551) was approximately 63 years and two thirds female. The mean Defocus curve VA from 0.00D to -3.00D ranged from 0.0 to 0.1 logMAR. The TFNT00 IOL provided 20/25 or better distance corrected VA from 40 to 60 cm. TFNT00 has ~2–3 lines of functional acuity reserve in the near range (-2.0 to -3.0D)

Conclusions:
Acuity reserve analysis via AUC represents a novel methodology for interpreting defocus curves in terms of functional visual performance. This method demonstrated that the defocus curve of the TFNT00 IOL observed in patients from different ethnicities and geographies around the World provides sufficient acuity reserve to easily function in visual tasks in the near to intermediate distance range.

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Comparison of refractive and visual outcomes of three presbyopia-correcting intraocular lenses

Presenting author: Tiago Ferreira, Portugal

Session name: Multifocal + Toric
Date and time: 09 October 2021, 08:00 - 09:30
Presentation time: 08:06 - 08:12
Location: Hall 13 / Elicium Ballroom

Purpose:
To evaluate and compare the clinical outcomes after cataract surgery with implantation of three different types of trifocal diffractive intraocular lenses (IOLs).

Setting:
Hospital da Luz Lisboa, Lisbon, Portugal

Methods:
Randomized comparative clinical trial enrolling 180 eyes of 90 patients undergoing bilateral phacoemulsification cataract surgery with implantation of one of these trifocal IOLs: Tecnis Synergy (Johnson & Johnson Vision) (Synergy group, 30 patients), Acrysof IQ PanOptix (Alcon) (PanOptix group, 30 patients), and POD F (PhysIOL) (Finevision group, 30 patients). The clinical outcomes in terms of distance, intermediate and near visual acuity, refraction, defocus curve, photic phenomena and spectacle independence were evaluated during a 3-month follow-up.

Results:
Postoperative monocular uncorrected intermediate visual acuity (UIVA) was significantly worse in the Finevision compared to Synergy group (0.05±0.09 vs. 0.09±0.10, p=0.026). Postoperative binocular distance-corrected intermediate (DCIVA) and near visual acuity (DCNVA) was 0.00 logMAR or better in most of cases (Synergy/PanOptix/Finevision: DCIVA 80/83.3/73.3%, DCNVA 83.3/83.3/76.7%). Significant differences between groups were found in the visual acuity for the vergence demands of -0.50, -1.00, -2.00, -3.50 and -4.00 D ($p \leq 0.045$). No significant differences among groups were found either in different disturbing visual symptoms ($p \geq 0.129$). 96% of patients in all groups did not require the use of spectacles at any distance after surgery.

Conclusions:
The three trifocal IOLs evaluated provide an effective visual rehabilitation with minimal incidence of photic phenomena. A trend to obtain a wider range of functional focus was observed with the Tecnis Synergy IOL.

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Preliminary evaluation of the effect of a novel visual training program in patients implanted with trifocal diffractive intraocular lenses: a blinded randomized placebo-controlled clinical trial

Presenting author: David Pablo Piñero Llorens, Spain

Session name: Multifocal + Toric
Date and time: 09 October 2021, 08:00 - 09:30
Presentation time: 08:12 - 08:18
Location: Hall 13 / Elicium Ballroom

Purpose:
To evaluate the potential benefit on visual performance of a novel visual training program based on the use of Gabor patches in patients undergoing bilateral cataract surgery with implantation of a trifocal diffractive intraocular lens (IOL).

Setting:
Vithas Medimar International Hospital, Alicante, Spain

Methods:
This study analyzes the outcomes of the first 20 patients (43-78 years) of a blinded placebo-controlled clinical trial evaluating the effect of a 3-week visual training initiated 1 week after implantation of a diffractive trifocal IOL (PanOptix from Alcon or RayOne from Rayner). Patients were randomly assigned to two groups: treatment group (TG, 10 patients) that used a videogame based on Gabor patches (Optitrain, Proconsi), and placebo group (PG, 10 patients) using a videogame without specific stimuli for improving the visual performance (Fun Kid Racing, Uptodown). Visual acuity (VA), and distance (CSV-1000) and near contrast sensitivity (CS) changes were compared.

Results:
No significant differences among groups were found in baseline VA and CS data ($p \geq 0.06$). After the training period, a trend to better VA and higher CS values were found in TG, but differences only reached statistical significance for near CS (Optopad test) for 1.5 cycles/degree (1.66±0.26 vs. 1.45±0.16, $p=0.048$), and distance CS for 3 (2.02±0.14 vs. 1.84±0.13, $p=0.010$), 6 (2.05±0.15 vs. 1.78±0.18, $p=0.004$), and 12 cycles/degree (1.82±0.22 vs. 1.57±0.14, $p=0.010$). Likewise, a significant improvement was only found in TG in near CS (Optopad) for 1.5 ($p=0.010$) and 3.0 cycle/degree ($p=0.020$), and distance CS for 6.0 and 12 cycles/degree.

Conclusions:
A 3-week visual training based on the use of Gabor patches in the immediate postoperative period after bilateral implantation of trifocal IOLs seems to be beneficial for improving the visual performance achieved with the implant. These preliminary outcomes will be confirmed when the recruitment and follow-up of all patients from the current clinical trial is finished.

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Binocular defocus curves with different multifocal IOLs: SimVisGekko simulations vs clinical data in implanted patients

Presenting author: Xoana Barcala, Spain

Session name: **Multifocal + Toric**
Date and time: **09 October 2021, 08:00 - 09:30**
Presentation time: **08:18 - 08:24**
Location: **Hall 13 / Elicium Ballroom**

Purpose:
SimVisGekko (2EyesVision, Madrid) is a binocular visual simulator that allows to experience vision with different presbyopic corrections before surgery. Commercial Multifocal intraocular lenses (M-IOLs) were programmed in SimVisGekko using published on bench optical quality data. Defocus visual acuity curves (DFVA) obtained in healthy presbyopic patients through SimVisGekko simulated IOLs were compared to DFVA curves reported in the literature in patients implanted with those M-IOLs.

Setting:
Visual Optics and Biophotonics Laboratory (Viobio Lab), Instituto de Optica, Spanish National Research Council (IO-CSIC)

Methods:
Commercial M-IOL designs were programmed in the SimVisGekko using on bench optical quality published reports: FineVision_PODF (PhysIOL), AcrySofIQ_PanOptix (Alcon), TECNIS_Symfony (AbbottMedicalOptics). Binocular DF logMAR VA curves (-4.50 to +1.50 D, 0.50 steps) were measured through SimVisGekko-simulated M-IOLs binocularly on 10 healthy presbyopes. DFVA curves from patients implanted with FineVision (n=15), PanOptix (n=15) and Symfony (n=20) IOLs were compiled from scientific literature (Ribeiro et al.2020; Gil et al.2020) and compared with the simulations. Comparisons were made on average data in terms of absolute VA at Far(0.00)/Intermediate(1.50)/Near(3.00), DFVA curve shape similarity metrics (cross-correlation), and Root Mean Square (RMS) DFVA curve differences.

Results:
LogMAR VA at Far were -0.02±0.1/-0.01±0.05/-0.06±0.13 with the SimVisGekko-simulated M-IOLs and -0.01/-0.01/-0.07 in real patients with FineVision/PanOptix/Symfony. Differences in logMAR VA between real M-IOLs and simulations were -0.07/-0.03/-0.04 at Intermediate and -0.02/0.01/0.02 at Near for the three M-IOLs. DFVA shape similarity metrics were 0.96/0.94/0.99. RMS DFVA curve differences were 0.04/0.04/0.03 logMAR for the three MIOLs (equivalent to 1-2 letters of difference). SimVisGekko-simulated and real MIOL curves were strikingly similar. The higher differences (0.10 logMAR) occurred in the positive side of the DFVA curve and could be associated with some residual accommodation.

Conclusions:
We demonstrated that commercially available M-IOLs can be programmed in SimVisGekko using publicly available data. The excellent match of through-focus visual performance (both absolute and relative values) between test presbyopic subjects with SimVisGekko-simulated lenses and real patients implanted with the corresponding M-IOLs suggests that SimVisGekko is a reliable simulator to capture the real vision through the FineVision, PanOptix and Symfony IOLs, as well as the differences in performance across designs.

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Combined diffractive-EDOF optics compared to diffractive trifocal : which added value ?

Presenting author: ANAS-ALEXIS BENYOUSSEF, France

Session name: Multifocal + Toric
Date and time: 09 October 2021, 08:00 - 09:30
Presentation time: 08:30 - 08:36
Location: Hall 13 / Elicium Ballroom

Purpose:
To evaluate and compare the performance of one diffractive trifocal intraocular lens (IOL) and one diffractive bifocal with extended depth of focus (EDOF) IOL.

Setting:
Ophthalmology Department, University Hospital of Brest Morvan, Brest, France

Methods:
Patients with binocularly implanted IOLs of two different designs (Physiol FineVision HP® [FV HP] and Johnson and Johnson Synergy® [SY]) were evaluated 1 month after surgery. There were 15 patients in each group. The primary outcome was reading speed at different contrast and luminance levels (Salzburg reading desk). The secondary outcomes were uncorrected and corrected visual acuity (distance at 4 m, intermediate at 70 cm, and near at 40 cm), defocus curve, quality of vision, halometry, and aberrometry Ray-tracing.

Results:
Fifteen subjects by group were successfully recruited. One month postoperatively, The Synergy® IOL had better reading speed at both high (+38,1 words per minute, p=0,028) and low contrast (+57,2 words per minute, p=0,007) than the Finevision HP® IOL. There were no statistically significant between-group differences in the spherical equivalent, UDVA, UIVA, UNVA, CDVA, CIVA, CNVA, and aberrometry. The defocus curve of the IOL SY is continuous with smooth progression and a wider intermediate viewing range versus the triple-peak appearance of the IOL FV HP. The mean halometric reading angle was 1.2° with no statistically significant difference between the two groups.

Conclusions:
The depth of field provided by IOL Synergy® results in a statistically significant improvement in reading performance compared to Fine Vision HP®. Both lenses provided excellent distance, intermediate, and near vision. The two implants are concerned by photic phenomena including halos in accordance with their diffractive dimension.

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Premium monovision versus bilateral myopic monovision, hybrid monovision and bilateral trifocal implantation: a comparative study.

Presenting author: Georgios Labiris, Greece

Session name: Multifocal + Toric
Date and time: 09 October 2021, 08:00 - 09:30
Presentation time: 08:36 - 08:42
Location: Hall 13 / Elicium Ballroom

Purpose:
To compare the efficacy of premium monovision (hybrid bifocal intraocular lens - IOL in the dominant and diffractive trifocal IOL in the recessive eye), against bilateral myopic monovision, hybrid monovision (monofocal IOL in the dominant and diffractive trifocal IOL in the recessive eye) and bilateral trifocal implantation.

Setting:
Department of Ophthalmology, University Hospital of Alexandroupolis, Alexandroupolis, Greece

Methods:
This was a prospective, comparative study. Cataract patients populated 4 study groups: Monovision Group (MoG), Multifocal Lens Group (MfG), Hybrid Monovision Group (HmG) and Premium Monovision Group (PmG). Binocular Uncorrected Distance Visual Acuity (bUD-VA), Binocular Uncorrected Reading Acuity and Critical Print Size at 60cm (bUI-RA, bUI-CPS) and 40cm (bUN-RA, bUN-CPS), contrast sensitivity, subjective satisfaction, dysphotopsia symptoms and spectacle independence were evaluated 6 months following the second eye operation. A mathematical model was constructed, which calculated the relative efficacy of each surgical intervention based on the total Visual Function Index-14 (VF-14) score as a function of each measured clinical parameter score.

Results:
120 participants were recruited and populated equally the study groups. Significant improvement of preoperative bUD-VA was observed in all study groups. No significant differences could be detected in postoperative bUD-VA and bUI-RA ($p = 0.24$) among study groups, while significant differences were noticed in bUI-CPS ($p = 0.04$), bUN-RA ($p = 0.02$) and bUN-CPS ($p = 0.01$). Dysphotopic phenomena (glare and shadows) were significantly more in the MfG arm followed by the PmG group ($p = 0.04$ & $p = 0.02$, respectively), while satisfaction and spectacle independence rates were significantly better in PmG group. PmG presented the best relative efficacy.

Conclusions:
All surgical techniques present satisfactory outcomes. Premium monovision seems to demonstrate the best relative efficacy.

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Analysis of the retinal image quality in eyes implanted with multifocal, EDOF and accommodative intraocular lenses: study of the PSF Strehl ratio by pyramidal aberrometry

Presenting author: Jorge L. Alio, Spain

Session name: Multifocal + Toric
Date and time: 09 October 2021, 08:00 - 09:30
Presentation time: 08:42 - 08:48
Location: Hall 13 / Elicium Ballroom

Purpose:
To study and compare the clinical optical image quality following implantation with different premium IOLs, by the analysis of the point spread function (PSF) Strehl ratio using a Pyramidal WaveFront based sensor (PWS) aberrometer.

Setting:
Vissum Miranza, Alicante, Spain.

Methods:
This study included 194 eyes implanted with: A) 19 AcrySof SA60AT (control group); B) 19 Miniwell; C) 24 LENTIS Mplus LS-313 MF30; D) 33 LENTIS Mplus LS-313 MF15; E) 17 AkkoLens Lumina; F) 31 AT LISA tri 839MP; G) 20 Precizon Presbyopic; H) 20 AcrySof IQ PanOptix; I) 11 Tecnis Eyhance. Main outcome measures were PSF Strehl ratio, PSF Strehl ratio excluding second order aberrations (PSFw2), total root-mean-square (RMS), low and high order aberrations RMS.

Results:
AT LISA Tri had the highest significant PSFw2 Strehl ratio at both 3- and 4-mm pupil size (0.52±0.14 and 0.31±0.1), followed by SA60AT (0.41±0.11 and 0.28±0.07) and PanOptix (0.4±0.07 and 0.26±0.04). AT LISA Tri was found to provide a significant better retinal image quality than PanOptix at both 3.00 mm ($p<.0001$) and 4.00 mm ($p=.004$). MPlus MF15 was found to be significantly better than MPlus MF30 at both 3.00 mm ($p<.0001$) and 4.00 mm ($p=.002$). Total RMS, LOA RMS, HOA RMS, PSF Strehl Ratio and PSFw2 varied significantly between the studied groups ($p<0.001$).

Conclusions:
Clinical image quality parameters differed significantly according to the technology of the implanted lens. AT LISA Tri, SA60AT and PanOptix showed the highest values of retinal image quality, while the lowest PSFw2 Strehl ratio was showed by Miniwell, MPlus MF30 and Precizon Presbyopic.

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Comparison of visual outcomes after implantation of two diffractive trifocal toric intraocular lenses

Presenting author: ANAS-ALEXIS BENYOUSSEF, France

Session name: Multifocal + Toric
Date and time: 09 October 2021, 08:00 - 09:30
Presentation time: 09:00 - 09:06
Location: Hall 13 / Elicium Ballroom

Purpose:
To compare the performance of two diffractive trifocal toric intraocular lens designs in terms of refractive and visual acuity outcomes at different distances, rotation stability, different contrast VA and quality of vision.

Setting:
University Hospital, Ophthalmology department, Brest, France

Methods:
In this prospective, multicenter, double blind, superiority study, 30 patients undergoing cataract surgery were randomized to receive one of two trifocal toric IOLs (PanOptix®, ALCON and Fine Vision PodF®, PHYSIOL). Outcomes analyzed 6+/- 2 weeks after surgery included binocular visual acuities at different distances, both uncorrected and corrected, astigmatism (by vector analysis), stability rotational (by measurement on photographs), defocus curve, quality of vision (with the SRD). The subjective quality of life and the patient satisfaction were also assessed, with by the NEI-RQL 42 questionnaire.

Results:
The VA assessment seems in favor of PanOptix®toric for intermediate vision at 60 cm. Mean spherical equivalent was 0.24D +/-0.15D for PanOptix®toric and 0.0D +/- 0.40D for FineVision®toric. A percentage of successful astigmatism correction of 55% for PanOptix®toric and 60% for FineVision®toric is observed. Binocular defocus curves showed a plateau between 0.0D and -2.5D. The implants both appear stable at 1 month (< 3°). The reading speed is comparable between the 2 implants. Satisfaction is high, with a majority carrying out their activity's spectacle-free and we find halo-type glare as the main photic phenomena in both groups

Conclusions:
Toric version of multifocal IOLs is crucial to achieve emmetropia, required for optimized results. The 2 evaluated diffractive models confirm the interest of correcting corneal astigmatism starting at -0.75D with excellent outcome obtained with both. The slight difference found in this study for intermediate vision (60 cm) seems to be explained by a different optical concept between the 2 implants. The correction of astigmatism appears satisfactory, in particular due to the stability of the implant, and the quality of vision does not seem to be affected despite acceptable halos at night frequently described.

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Rotational Stability, Visual Performance, and Surgeon Satisfaction of Tecnis Toric II (Model ZCU) intraocular lens

Presenting author: Daniel Chang, United States

Session name: Multifocal + Toric
Date and time: 09 October 2021, 08:00 - 09:30
Presentation time: 09:06 - 09:12
Location: Hall 13 / Elicium Ballroom

Purpose:
Rotational stability, visual performance, and surgeon satisfaction with the Tecnis Toric II Intraocular Lens (IOL) was evaluated. An objective photographic method was used to determine postoperative rotational stability by measuring the IOL axis of orientation at the end of the surgery and at subsequent postoperative visits.

Setting:
Post-market, prospective, multi-center, single-arm study in seven sites in the United States (U.S).

Methods:
Patients with pre-existing corneal astigmatism ≥ 1.00 diopter (D) in one or both eyes were implanted with Tecnis Toric II models ZCU 1.50 D to 6.00 D. Lens rotation relative to the intraoperative position was measured at the 1-day, 1-week, and 3-month visits by two independent, masked analysts using custom image analysis software. A 3-item questionnaire assessing surgeon satisfaction with overall outcomes, rotational stability, and UDVA for each implanted eye was administered. Absolute IOL rotation, uncorrected distance vision (UDVA), postoperative astigmatism, and surgeon satisfaction data from 145 eyes at 1-week and 85 eyes from 3-months are presented.

Results:
The percentage of eyes with ≤ 5° of absolute rotation was 99.3% at 1 week and 100% at 3-months. The mean absolute rotation was 0.81°±0.93° at 1 week and 0.86°±0.64° at 3 months. Mean uncorrected distance visual acuity was 0.03±0.14 logMAR (20/21) at 1 week and -0.01±0.10 logMAR (20/20) and 3 months. Mean absolute postoperative refractive cylinder was 0.23 D±0.29 D at 1 week and 0.18 D±0.25 D at 3 months. At 3 months, surgeons were very satisfied or satisfied with overall outcomes, rotational stability, and uncorrected distance vision in 99.1%, 99.1%, and 98.1% of implanted eyes, respectively.

Conclusions:
Interim analysis show that all eyes implanted with the Tecnis Toric II IOL demonstrated excellent rotational stability, excellent uncorrected distance vision, and minimal residual astigmatism.

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Toric intraocular lens power calculation in keratoconus

Presenting author: Ehud Assia, Israel

Session name: **Multifocal + Toric**
Date and time: **09 October 2021, 08:00 - 09:30**
Presentation time: **09:12 - 09:18**
Location: **Hall 13 / Elicium Ballroom**

Purpose:
Intraocular lens (IOL) power calculation in cataract patients with keratoconus is challenging due to inaccurate evaluation of the corneal power and atypical ocular biometry parameters. Post-operative refraction tends to result in a hyperopic error with common IOL calculation formulae. The Barrett True-K formula for keratoconus offers a new approach for IOL power calculation utilizing the measured values or a predicted value of the posterior corneal power. The aim of this study was to compare IOL power calculation accuracy between various formulae in patients with keratoconus.

Setting:
Ein Tal Eye Center, Tel Aviv, Israel and The Lions Eye Institute, Nedlands, Western Australia, Australia.

Methods:
The study included cataract patients presenting with stable keratoconus and relatively regular astigmatism in the central cornea. Visual acuity and subjective refraction were examined 1 month after cataract removal and a toric IOL implantation. The error in predicted refraction and IOL power calculation accuracy within a range of 0.5 to 2.0 diopters were compared between different IOL calculation formulae, including Barrett True-K formula for keratoconus, calculated with either measured or predicted posterior corneal astigmatism, Barrett Universal II formula, Kane formula, Kane formula for keratoconus, SRK/T, Haigis, Holladay I and Hoffer Q.

Results:
Thirty-two eyes of 23 subjects with keratoconus had cataract surgery with a toric lens. Visual acuity improved in all cases after surgery and the subjective refraction improved from -5.14 ± 5.85 D to -0.03 ± 0.80 D (p=0.001). A hyperopic mean error in predicted refraction was found with most formulae, except for the Barrett True-K formula (-0.05 ± 0.09 D). The lowest mean absolute error in predicted refraction was achieved with the True-K formula for keratoconus (0.34 D) followed by Kane formula for keratoconus (0.49 D) and SRK/T (0.56 D). The True-K formula prediction error within 0.5 D was 87.5%.

Conclusions:
Cataract surgery with a toric IOL implantation is safe and effective in patients with stable keratoconus and central regular corneal astigmatism. Keratoconus specific formulae are necessary to avoid postoperative hyperopic refractive surprise. The new Barrett True-K formula for keratoconus improves IOL power selection by incorporating the posterior corneal parameters into the IOL power calculation.

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Refractive and Visual Outcome of Misaligned Toric Intraocular Lens After Operative Realignment

Presenting author: Mehdi Shajari, Germany

Session name: Multifocal + Toric
Date and time: 09 October 2021, 08:00 - 09:30
Presentation time: 09:18 - 09:24
Location: Hall 13 / Elicium Ballroom

Purpose:
The study was performed to evaluate the refractive and visual outcome of patients with misaligned toric intraocular lenses (IOLs) after operative realignment, with and without back-calculation of the toric axis after implantation of the IOL

Setting:
University Hospital Frankfurt, Germany

Methods:
This is a retrospective case series of 39 patients who underwent a second operation to realign a misaligned toric IOL from August 2013 to December 2019 at the Department of Ophthalmology, Goethe University, Frankfurt, Germany. Ideal toric axis was calculated using the back-calculator astigmatismfix.com

Results:
The toric IOLs showed a postoperative misalignment of 25.69 ± 26.06°. Postrotational, uncorrected distance visual acuity (UDVA) improved from 0.39 ± 0.29 logMAR to 0.27 ± 0.18 logMAR. Refractive outcome showed a reduction of residual sphere and cylinder. The postoperative UDVA when performing alignment to the preoperative calculated axis (51%) was 0.24 ± 0.16 logMAR with a cylinder of 0.90 ± 0.90 diopter (D). In the group with alignment to a back-calculated axis (49%), the UDVA was 0.32 ± 0.20 logMAR with a cylinder of 0.76 ± 0.72 D.

Conclusions:
Realignment of misaligned toric IOLs improves visual acuity and reduces residual refractive errors. Especially for high cylinder power IOLs, better refractive outcome can be seen when performing a back-calculation before realignment.

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Real-World Outcomes of a Novel Wavefront-Shaping Presbyopia-Correcting Intraocular Lens Implanted in Spanish Clinics

Presenting author: Miguel Teus, Spain

Session name: **EDOF**
Date and time: **09 October 2021, 13:15 - 14:45**
Presentation time: **13:15 - 13:21**
Location: **Auditorium**

Purpose:
To report Real World visual outcomes with the ACRYSOF IQ Vivity and ACRYSOF IQ Vivity Toric Extended Vision IOL models DFT015, DFT315, DFT415, and DFT515

Setting:
Multicenter, ambispective registry study conducted in Europe, the UK and Australia evaluating the performance of bilaterally implanted ACRYSOF Vivity and ACRYSOF Vivity Toric IOL in a real world setting through routine clinical practice

Methods:
This is a sub-analysis of subjects enrolled from Spanish sites to date. After a minimum of 3 months post-op follow up per local clinical practice standards, subjects implanted with the AcrySof IQ Vivity and Vivity Toric IOL in both eyes underwent visual performance assessments of visual acuity at distance, intermediate (66 cm) and near (40 cm) distances. Subject satisfaction and spectacle independence recorded via validated questionnaires and patient reports of visual disturbances are reported. We present the first interim analysis of outcomes observed at the enrollment visit.

Results:
To date, 129 subjects are enrolled globally, with 69 subjects enrolled in Spanish sites. Mean UCDVA was 0.016 ± 0.080 logMAR (20/20 Snellen), mean UCIVA was 0.112 ± 0.119 logMAR (~ 20/25 Snellen) and mean UCNVA was 0.251 ± 0.159 logMAR (~20/32 Snellen). 94.1% fairly/very satisfied and 70.6% report no difficulty in seeing the prices of goods when shopping. The % of subjects reporting never/rarely needing to wear eyeglasses to see up close 63.3%, or at arm's length 88.3% or far away 94.1% . None halos 85.3%, glare 91.2% or starbursts 91.2%. There are no unanticipated AEs to date.

Conclusions:
This first assessment of patients bilaterally implanted in Spain with the ACRYSOF IQ Vivity and ACRYSOF IQ Vivity Toric Extended Vision IOL evaluated in regular clinical settings suggests very good visual outcomes, high levels of vision patient satisfaction with low needs to wearing spectacles for intermediate and distance activities and also experiencing mild to none visual disturbances. The study is ongoing and additional data may be included in the paper

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Clinical outcome and everyday performance of ZEISS AT LARA 829, a next generation Extended Depth of Focus (EDoF) IOL after its bilateral implantation at three months postoperative

Presenting author: Thomas Kohnen, Germany

Session name: EDOF
Date and time: 09 October 2021, 13:15 - 14:45
Presentation time: 13:21 - 13:27
Location: Auditorium

Purpose:
To evaluate the visual performance after bilateral implantation of an extended depth of focus intraocular lens (IOL) with a Smooth Microphase (SMP)-Technologie for less light scattering.

Setting:
Department of Ophthalmology, Goethe University, Frankfurt, Germany.

Methods:
Twenty patients (40 eyes) who received bilateral implantation of the AT LARA 829MP (Carl Zeiss Meditec, Oberkochen, Germany) pre-enrolment. Exclusion criteria were previous ocular surgeries excluding cataract surgery and refractive lens exchange and ocular pathologies or corneal abnormalities. 3 months postoperative examination included manifest refraction; monocular and binocular uncorrected (UCVA) and distance-corrected (DCVA) visual acuity in 4 m, 80 cm, 60cm and 40 cm; slit-lamp examination. 3 months postoperatively monocular and binocular defocus testing, binocular contrast sensitivity (CS) under photopic and mesopic conditions, and a questionnaire on subjective quality of vision, optical phenomena, and spectacle independence were performed.

Results:
Binocular UDVA was -0.01±0.09logMAR in 4m, 0.04±0.13logMAR in 80cm, 0.23±0.15logMAR in 60cm and 0.25±0.13logMAR in 40cm distance. Binocular defocus curve shows a visual acuity of -0.02logMAR to 0.22logMAR between 0.00 D (far) and -2.00D (50cm). CS under photopic and mesopic conditions without and with glare was 1.29 logCS, 0.80 logCS, 0.75 logCS, respectively. 70% of patients need glasses for intermediate and/or reading distance after surgery depending on their daily demands. Despite some optical phenomena, 75% of patients would choose the same IOL again and 70% also recommend it to others.

Conclusions:
Visual performance of AT LARA IOL showed good uncorrected binocular VA at far and 80cm distance (<0.05logMAR) and acceptable VA at 60cm and near distance (<0.3logMAR). 70% of patients need glasses for intermediate and/or near daily activities. Over 70% patients were very satisfied despite some optical phenomena.

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Results of an extended depth of focus intraocular lens implantation in the second eye of patients implanted previously with a monofocal intraocular lens in the first eye

Presenting author: Guy Kleinmann, Israel

Session name: EDOF
Date and time: 09 October 2021, 13:15 - 14:45
Presentation time: 13:27 - 13:33
Location: Auditorium

Purpose:
To investigate the visual results and patient satisfaction after unilateral implantation of extended depth of focus intraocular lens implantation (EDOF IOL) in the second eye of patients implanted previously with a monofocal IOL in the first eye, and to compare the results to patients implanted bilaterally with either EDOF or monofocal IOLs.

Setting:
Private, outpatient center.

Methods:
Medical records and self-reported questionnaires from consecutive patients who were implanted with monofocal and EDOF IOLs in the first eye and second eye respectively (group A), bilateral EDOF IOLs (group B), and bilateral monofocal IOLs targeted for distance (group C), were compared retrospectively for visual outcome, spectacle independence, patient satisfaction, and subjective photic phenomena.

Results:
The patients in group A (18 eyes of 18 patients) had better distance uncorrected visual acuity compared with group B (72 eyes of 36 patients), or group C (44 eyes of 22 patients), $p = 0.043$, and $p = 0.002$, respectively, similar intermediate uncorrected visual acuity to group B, and a tendency towards better near uncorrected visual acuity compared with group C ($p = 0.052$). There was no difference in complaints of haloes and/or glare between the groups.

Conclusions:
Patients, previously implanted with a monofocal IOL in one eye who are interested in improving their spectacle independence, can be considered for EDOF IOL implantation in the second eye and can expect similar results to those implanted bilaterally with EDOF IOLs and better results than patients implanted bilaterally with monofocal IOLs.

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Cataract

Subjective and objective assessment of visual disturbances in patients implanted with three different presbyopia correcting IOLs

Presenting author: MERCÈ GUARRO, Spain

Session name: EDOF
Date and time: 09 October 2021, 13:15 - 14:45
Presentation time: 13:33 - 13:39
Location: Auditorium

Purpose:
To describe and compare the patient satisfaction (McAllinden test) and halometry (Light Distortion Analyser; LDA) of patients implanted bilaterally with three different presbyopia correcting IOLs (PC-IOLs). A non-diffractive PC IOL (Vivity) and two diffraction based models: ATLara (Zeiss) and Symfony (J&J) and a control monofocal IOL (AcrySof IQ, Alcon).

Setting:
Vallès Ophthalmolgoy Research. Barcelona. None of the other authors has a financial or proprietary interest in any material or method mentioned. This research is supported by an IIT Grant (IIT#52863693) from Alcon.

Methods:
Prospective Randomized Controlled Trial with 3 study groups Vivity(n=14), ATLara(n=12), Symfony(n=9) and a control group(n=13). Three months follow-up. Patients were implanted bilaterally with the same IOL model. All surgeries were performed by the same surgeon and functional examinations by two experienced optometrists. Visual disturbances were assessed subjectively (McAllinden) test and psychophysically (LDA). LDA is a device that uses multiple LEDs to characterize size of the visual disturbances through the Light Disturbance Index (LDI, ratio of the area of points missed and the total area explored) and Best fit Cicle, (BFC circle that best first the distortion area).

Results:
Results shown for Vivity; AT.Lara; Symfony and monofocal. McAllinden test: patients reporting "never" perceiving: • Glare: 86%; 82%; 88% 92% • Halos: 93%; 55%; 63%; 82% • Starburst: 71%; 45%; 50%; 69% Binocular LDA results: - LDI (%): 9.04; 18.03; 15.00; 11.02 - BFCr (mm): 24.15; 33.99; 30.96; 26.11

Conclusions:
Results of both subjective and psychophysical methods show that patients implanted with the non-diffractive PC-IOL Vivity present similar visual disturbances than those implanted with a monofocal IOL. Patients implanted with the other diffraction based PC-IOLs included in this study present higher perception of halos and starburst. The study is designed to include 20 patients per group. At the moment of the submission of this abstract recruitment is still ongoing. Results will be updated before the congress including a more detailed statistical analysis.

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Visual acuity, wavefront aberration and defocus curves with enhanced monofocal and monofocal aspheric intraocular lens: A prospective, randomised study.

Presenting author: Mayank Nanavaty, United Kingdom

Session name: **EDOF**
Date and time: **09 October 2021, 13:15 - 14:45**
Presentation time: **13:45 - 13:51**
Location: **Auditorium**

Purpose:
To compare uniocular and binocular uncorrected and corrected distance and intermediate visual acuity, wavefront aberrations and defocus curves at 1 and 3 months in a prospective, randomised comparative study comparing Tecnis Eyhance® (Johnson & Johnson vision, USA) or RayOne® (Rayner intraocular lenses ltd., United Kingdom) intraocular lenses (IOLs).

Setting:
Brighton & Sussex University Hospitals NHS trust, Brighton, United Kingdom.

Methods:
In this study 50 patients (100 eyes) were recruited (ClinicalTrials.gov Identifier: NCT04175951). Patents were examined at 1- and 3-months post-surgery after bilateral sequential or surgeries on both eyes within 2 weeks. The primary outcomes were LogMAR unaided distance (UCDVA) and intermediate visual acuity (UIVA) at 60cm (uniocular and binocular). Secondary outcomes were corrected distance (CDVA) and distance corrected intermediate visual acuity (DCIVA) at 60cm (uniocular and binocular), manifest refraction, spherical (Z40) and vertical coma (Z3-1) aberrations (total, internal eye and corneal) using iTrace® aberrometer, defocus focus curves, Catquest 9SF questionnaire, glare and halos questionnaire on 1-4 Likert scale.

Results:
Uniocular UCDVA (p=0.02), UIVA (p=0.02) and binocular UIVA (p<0.01) and uniocular (p=0.01) & binocular (p<0.01) DCIVA were better with Eyhance® at 3 months. For total and internal eye, Eyhance® showed less positive Z40 compared to RayOne® (more negative Z40). At 1 month, only uniocular defocus curve was significantly broader with Eyhance® group at -1.0D & -2D. Whereas, at 3 months both uniocular and binocular defocus curves were significantly broader with Eyhance® between -0.5D and -3.0D. Mean Rasch scores improved in both groups (Eyhance®:2.04±1.34 to 2.91±0.81 and RayOne®:1.61±1.35 to 2.97±0.16) at 3 months. Refraction, Z3-1, glare and halos were not different.

Conclusions:
Eyhance® provides better uniocular and binocular UCDVA, UIVA and DCIVA. There is no difference in CDVA, glare or halos. Due to the difference in the optical principles, Eyhance® give low positive Z40 compared to higher negative Z40 with RayOne®.

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Refractive and Visual Outcomes of a New Extended Depth of Focus (EDOF) Intraocular Lens

Presenting author: Gilles Lesieur, France

Session name: EDOF
Date and time: 09 October 2021, 13:15 - 14:45
Presentation time: 13:51 - 13:57
Location: Auditorium

Purpose:
To assess the refractive and visual outcomes after implantation of a new refractive/extended depth of focus (EDOF) intraocular lens (IOL).

Setting:
Centre Ophtalmologique IRIDIS, Albi, France

Methods:
Retrospective study of 20 patients (20 eyes), who underwent implantation of a Lucidis (Swiss Advanced Vision, SAV-IOL SA, Neuchâtel, Switzerland) IOL during cataract surgery. Best-corrected and uncorrected near and distance visual acuities, monocular defocus curve from +2 to -4 (step size 0.50), 25% contrast corrected distance visual acuity, were collected at 1 month and 3 months postoperatively. Clinical outcomes, mesopic pupil diameter, and adverse event were also collected at 3 months postoperatively.

Results:
The first analysis shows a good defocus curve with correction of far and intermediate vision for all the patients and possibility of near vision without spectacles for unnegligible part of the patients. All postoperative data and statistical analysis have not yet been collected, and will be available at the time of the congress.

Conclusions:
The Lucidis EDOF IOL showed good refractive and visual performance for distance, intermediate and near visions. The monocular defocus curve demonstrated two pics at 0.00 and between -1 and -2 with good visual acuities, while maintaining correct acuities in low contrast. We confidently recommend the use of this lens, which is also available in a toric version, and makes it possible to meet the new needs of patients without inducing photic phenomena. The stability of toric version will be analyzed in the future.

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Spanish Site Outcomes of a Novel Wavefront-Shaping Presbyopia-Correcting Intraocular Lens – A Real World Registry Study

Presenting author: Montserrat Garcia-Gonzalez, Spain

Session name: EDOF
Date and time: 09 October 2021, 13:15 - 14:45
Presentation time: 13:57 - 14:03
Location: Auditorium

Purpose:
To report the Real World visual and subjective outcomes observed in routine clinical practice at the Clínica Rementería with the ACRYSOF IQ Vivity and ACRYSOF IQ Vivity Toric Extended Vision IOL models DFT015, DFT315, DFT415, and DFT515.

Setting:
Clínica Rementería, Madrid, Spain

Methods:
This is a sub-analysis of 19 subjects enrolled to date in our clinic and evaluated using local clinical practice standards. After a minimum of 3 months and up to 6 months post-op follow up, subjects implanted with the AcrySof IQ Vivity and Vivity Toric IOL underwent visual acuity assessments at a range of functional distances in addition to subjective vision satisfaction and spectacle independence with validated Patient Reported Outcome Measures questionnaires and patient reports of visual disturbances. We present the first interim analysis of outcomes observed at the enrollment visit.

Results:
The mean ± standard deviation photopic binocular visual acuity (in logMAR) UDVA was -0.011 ± 0.041, UIVA (66cm) was 0.100 ± 0.086 and UNVA (40cm) was 0.208 ± 0.143 with 94.7% of subjects presenting UDVA ≥20/20. 94.7% subjects reported never/rarely needing to wear eyeglasses to see at arm's length and far away and 57.9% to see up close. Also, the majority report no difficulty with their sight in their everyday life and are fairly/very satisfied with their sight; none halos, glare or starbursts were reported by 78.9%, 94.7% and 94.7% respectively. There are no unanticipated adverse effects to date.

Conclusions:
This interim analysis at our site level subjects bilaterally implanted with the ACRYSOF IQ Vivity and ACRYSOF IQ Vivity Toric Extended Vision IOL suggests very good distance, intermediate and near visual outcomes with high levels of vision patient satisfaction with low needs to wearing spectacles for intermediate and distance activities and also experiencing low to none photic visual disturbances. The study is ongoing and additional data may be included at the meeting.

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Near and distance stereoacuity of Low-Add Bifocal Intraocular Lenses and Mini-Monovision Pseudophakia

Presenting author: Muhammad Biadsy, Israel

Session name: EDOF
Date and time: 09 October 2021, 13:15 - 14:45
Presentation time: 14:03 - 14:09
Location: Auditorium

Purpose:
To evaluate and compare the stereopsis in patients following cataract surgery with bilateral low-add bifocal intra-ocular lens (IOL) implantation and monofocal IOL with mini-monovision.

Setting:
Retrospective cohort study

Methods:
Consecutive patients underwent bilateral cataract extraction surgery and implantation of either bilateral Lentis comfort (Oculentis GmbH, Berlin, Germany) IOL (group A) or monofocal IOLs using mini-monovision (group B). Patients were recalled for assessment at 3 to 80 months postoperatively. The primary outcome measure were distance Randot and near Titmus stereopsis. The secondary outcomes were visual acuity, contrast sensitivity and reading performance. The study comprised 86 patients (172 eyes). The mean age of the patients was 69.40 years ± 10.00 (SD). Group A comprised 47 patients (94 eyes) and group B comprised 39 patients (78 eyes).

Results:
11(29.7%) of group-A achieved excellent distance stereopsis (<60arcsec) vs. 2(5.13%) of group-B(P = 0.0037). 15(31.9%%) of group-A achieved unrecognized distance stereopsis (>400arcsec) vs. 28(71.80%) of group B(P = 0.0002). Good near stereopsis (>100 arcsec) was present in 41(87.23%) of group-A and 27(69.23%) of group-B(P = 0.0423). The mean distance stereopsis was 147.89+120.50 arsec. for group-A and 207.5+141.02 arsec for group-B(P = 0.0429). The mean near stereopsis was 81.06+77.52 arsec. for group-A and 124.47+143.65 arsec for group-B(P = 0.0705). The mean postoperative UCDVA, UCIVA and UCNVA: 0.05±0.2, 0.03±0.11 and 0.18±0.15 for Group-A and 0.09±0.09(P=0.2829), 0.10±0.12(P=0.0045) and 0.25±0.16(P = 0.0260) for group-B.

Conclusions:
Better near and distance stereoacuity were observed in patients implanted with Lentis comfort IOL compared with mini-monovision pseudophakia. Both Groups A and B showed excellent distance and intermediate and good near uncorrected visual acuity at all distances.

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Evaluation of a novel non-diffractive extended depth-of-focus hydrophobic intraocular lens.

Presenting author: Robert Hoerster, Germany

Session name: **EDOF**
Date and time: **09 October 2021, 13:15 - 14:45**
Presentation time: **14:15 - 14:21**
Location: **Auditorium**

Purpose:
Extended depth-of-focus (EDOF) intraocular lenses (IOL) aim to achieve spectacle independent visual acuity from distant to intermediate range, simultaneously causing as few photic phenomena (halos, starbursts, glare) as possible. Several EDOF IOLs use a diffractive optical design, which may lead to unwanted photic phenomena. We here evaluated a novel hydrophobic refractive / non-diffractive EDOF IOL design.

Setting:
MVZ ADTC Moenchengladbach-Erkelenz, Ostpromenade 41, 41812 Erkelenz, Germany, Center of Ophthalmology, University of Cologne, Kerpener Strasse 62, 50924 Cologne, Germany.

Methods:
In this comparative retrospective case series we implanted 82 eyes with an EDOF IOL (LuxSmartTM, Bausch & Lomb GmbH, Berlin, Germany) and 84 eyes with monofocal aspheric IOL: 54 eyes with a clear IOL (Polylens® AS 61, Polytech Domilens, Roßdorf, Germany), 30 eyes with a yellow IOL (iSert® 251, Hoya Surgical Optics GmbH, Frankfurt, Germany). All patients received surgery on both eyes. We compared corrected (CDVA) and uncorrected (UDVA) distant and uncorrected intermediate (UIVA) visual acuity, defocus curves and report of photic phenomena six weeks postoperatively. All visual acuity values are given in logMAR.

Results:
CDVA and UDVA were comparable in EDOF versus yellow and clear monofocal IOLs. CDVA: 0.003yellow, 0.009clear, 0.05EDOF; P>0.99 EDOF vs. yellow, P>0.99 EDOF vs. clear. UDVA: 0.07yellow, 0.07clear, 0.14EDOF; P=0.545 EDOF vs. yellow, P=0.491 EDOF vs. clear. UIVA was higher in EDOF versus yellow and clear monofocal IOLs. UIVA: 0.32 yellow, 0.32 clear, 0.15EDOF; P=0.035 EDOF vs. yellow, P=0.002 EDOF vs. clear. The defocus curve of the EDOF IOLs showed a VA at 0.0 dioptres (dpt) of 0.02, at -1.5 dpt of 0.21 and at -2.5 dpt of 0.5. Patients reported mild glare with both IOL types (P=0.701).

Conclusions:
In these early postoperative results this novel refractive EDOF IOL achieved high UDVA values with a shallow decrease and broader defocus curve and significantly higher UIVA compared to monofocal aspheric IOLs. Photic phenomena were reported by comparable numbers of patients in both IOL groups and comprised only mild glare, no starbursts and no halos. Further evaluation at 3 and 6 months results will be performed to exclude early postoperative irregularity of the eye.

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Multicentric clinical comparison of extended depth of focus (EDOF) and monofocal IOLs

Presenting author: Pavel Stodulka, Czech Republic

Session name: EDOF
Date and time: 09 October 2021, 13:15 - 14:45
Presentation time: 14:21 - 14:27
Location: Auditorium

Purpose:
To compare clinical results of bilateral implantation of two IOLs of the same material and overall design but one with EDOF (Isopure 1.2.3., Physiol) and the other with monofocal (Micropure 1.2.3., Physiol) optic.

Setting:
Gemini Eye Clinic, Zlin, Czech Republic Miranza IOA Madrid, Spain Asian Eye Institute, Philippines Augentagesklinik Rheine, Germany University Eye Clinic, Heidelberg, Germany Augen-Zentrum Nordwest, Germany Vienna Institute for Research in Ocular Surgery (VIROS), Austria Smile Eyes Augen + Laserzentrum, Leipzig, Germany Institute of Eye Surgery, UPMC Whitfield Hospital, Waterford, Ireland

Methods:
Ongoing prospective, multicenter, randomised, controlled, single-blind post-market clinical follow-up study. Randomized patients underwent routine cataract surgery with bilateral implantation of either EDOF (Isopure 1.2.3) or a monofocal (Micropure 1.2.3) IOL. Follow-up examinations included: Uncorrected Distance Visual Acuity (UDVA), Corrected Distance Visual Acuity (CDVA), Uncorrected (UIVA) and Distance Corrected Intermediate Visual Acuity (DCIVA) at 80 & 66cm. Distance-corrected defocus curves were recorded between -2.5D and +1.5D in 0.5 D steps, except for ±0.25 D in order to test for intermediate behaviour of the IOL. Contrast sensitivity was performed along with patient reported outcomes (QoV, PRSIQ, CatQuest). All visual acuities in logMAR.

Results:
Interim results at 4-6M postoperative for EDOF (16/47 eyes) and monofocal IOL (8/32 eyes) show mean refractive outcomes (MRSE) 0.18±0.43D and 0.06±0.39D respectively. Monocular mean corrected visual acuities: a) EDOF CDVA 0.01±0.14, DCIVA (80cm) 0.11±0.16, DCIVA (66cm) 0.17±0.16; b) Monofocal CDVA −0.03±0.05, DCIVA (80cm) 0.24±0.10 , DCIVA (66cm) 0.22±0.07. Monocular mean uncorrected visual acuities: a) EDOF UDVA 0.17±0.17, UIVA (80cm) 0.15±0.18, UIVA (66cm) 0.15±0.19; b) Monofocal UDVA 0.05±0.09, UIVA (80cm) 0.21±0.19, UIVA (66cm) 0.25±0.18. Defocus curve follows the expected course allowing for far and intermediate vision. Contrast Sensitivity curve also follows the expected course.

Conclusions:
Visual acuities of Isopure EDOF IOL shows slightly superior intermediate vision at 80 and 66cm compared to monofocal Micropure IOL at 4-6 months. However, both show very good far and intermediate visual functions. Isopure EDOF IOL improve the intermediate vision required for many daily tasks. Data of more eyes will be presented soon.

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Comparison of Visual Performance between Monofocal and Extended Depth-of-Focus Intraocular Lenses of the Same Material and Basic Design

Presenting author: Hirotaka Tanabe, Japan

Session name: EDOF
Date and time: 09 October 2021, 13:15 - 14:45
Presentation time: 14:27 - 14:33
Location: Auditorium

Purpose:
To compare the visual performance of a monocal intraocular lens (IOL) (ZCB00V) and an extended depth-of-focus (EDOF) IOL (ZXR00V) of the same material and basic design.

Setting:
Department of Ophthalmology, Tsukazaki Hospital, Himeji, Hyogo, Japan

Methods:
We retrospectively evaluated postoperative parameters at 10 weeks after the last surgery in cataract patients who underwent bilateral ZCB00V or ZXR00V implantation from February 21, 2013, to November 19, 2020, with the right and left lenses implanted within 3 months of each other.

Results:
The study enrolled 1584 eyes of 792 patients. The monofocal group comprised 1374 eyes of 687 patients (73.0 ± 7.4 years; female/male, 415/272), and the EDOF group comprised 210 eyes of 105 patients (67.8 ± 6.9 years; female/male, 39/66). Corrected near visual acuity, contrast sensitivity (1.0/0.7 degrees), and contrast sensitivity with glare (0.7 degrees) were significantly better in the monofocal group ($p<0.00068$, Wald test). Uncorrected intermediate visual acuity, uncorrected near visual acuity, and near spectacle independence were significantly better in the EDOF group ($p<0.00068$, Wald test).

Conclusions:
The two IOL groups had different characteristics in terms of uncorrected intermediate visual acuity, uncorrected/corrected near visual acuity, contrast sensitivity, contrast sensitivity with glare and near spectacle independence.

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Evaluation of different IOL calculation methods for cataract after corneal refractive surgery

Presenting author: ANAS-ALEXIS BENYOUSSEF, France

Session name: **EDOF**
Date and time: **09 October 2021, 13:15 - 14:45**
Presentation time: **14:33 - 14:39**
Location: **Auditorium**

Purpose:
The predictability of calculating intraocular lenses after refractive surgery is a real challenge. Currently, it is necessary to use different formulas in particular those available online from ASCRS , in order to achieve target of emmetropia. This goal is crucial because these patients want to maintain or recover spectacle independence, which invite to discuss multifocal or EDOF implants.

Setting:
CHRU BREST

Methods:
Prospective observational study bringing together patients who underwent : radial keratotomy (20) , LASIK (9), PRK (5). They benefited from a bilateral EDOF TRIUMF ® (Physiol-BVI) trifocal-EDOF implantation calculated as an average of the various existing formulas : Barrett TK, Haigis Suite, ASCRS calculator, K-1. The intervention is carried out according to the usual standards by a single operator. 3-month results are analyzed to assess the method that can minimize the refractive error after the different corneal refractive procedures.

Results:
In patients having benefited from KR, we noted an average refraction of -0.63D [-2.25; +1.00].The patients who underwent lasik surgery had a mean refraction of -0.35D [-1.25; 0.00] and in the PRK group, this was -0.30D [-1.00; 0.00]. In the KR group, 2 methods stand out: the Barrett TK (ASCRS) (MEA: 0.51) and the Haigis suite (MEA: 0.90). 75% of patients were satisfied and recommend this surgery. 90% of patients have distance glasses independence and 50% of patients need near glasses intermittently. 80% of patients declare that they have no more halos or optical aberration.(confirmed by I-tracey).

Conclusions:
The use of multifocal implants in this context has demonstrated its interest by its tolerance to refractive error with, however, the need for intermittent glasses for near vision. It is necessary to average the different methods using the online site. Patients undergoing refractive surgery have great demands on their visual quality and on maintaining their independence from glasses. Obtaining emmetropia in this context is one of the major challenges currently in ophthalmology. However, we must not forget to inform patients of the complex issues involved in this type of surgery.

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Two-Year Multinational Evaluation of a New Aspheric Hydrophobic Monofocal Intraocular Lens

Presenting author: Rudy Nuijts, Netherlands

Session name: Monofocal + PCO
Date and time: 10 October 2021, 08:00 - 09:30
Presentation time: 08:00 - 08:06
Location: Hall 13 / Elicium Ballroom

Purpose:
To report the visual acuity, refractive, and safety outcomes of the Clareon® (Alcon Vision LLC) aspheric, hydrophobic, monofocal, intraocular lens (IOL) 2 years after implantation,

Setting:
Conducted at study centers in Australia (n = 3), France (n = 2), Germany (n = 2), Italy (n = 2), the Netherlands (n = 2), Spain (n = 5), and the United Kingdom (n = 3).

Methods:
This is a prospective, multinational, single-arm trial assessing the long-term (3-year) safety and effectiveness of the Clareon® IOL implanted bilaterally in adults (≥ 22 years of age) who required bilateral cataract extraction (www.clinicaltrials.gov identifier: NCT03316885). Subjects are attending 12 study visits (9 post-implantation) over approximately 36 months. The primary study objectives are to demonstrate the long-term (3-year) visual acuity and adverse event (AE) outcomes of the Clareon IOL, and the one-year visual acuity and AE outcomes compared to historical safety and performance endpoint rates as reported in EN ISO 11979-7:2014. We present the 2 year interim results.

Results:
245 subjects were enrolled; 215 were implanted. At 2 years, postoperative mean corrected distance visual acuity (CDVA) was 0.03 logMAR in first and second eyes, and >96% of eyes had CDVA 20/25 or better. Mean manifest refractive spherical equivalent was within target (emmetropia) by 1-week and maintained at 0.06 D in first and second eyes at 2 years. There were no unanticipated AEs. Clinically significant posterior capsule opacification (PCO) was reported for 3 first (1.4%) and 5 second (2.4%) eyes, and clinically significant PCO requiring Nd:YAG laser capsulotomy was reported for 3 first (1.4%) and 5 second (2.4%) eyes.

Conclusions:
The 2-year visual outcomes were excellent and had stable refractive results. There were no unanticipated AEs, and very low rates of PCO and Nd:YAG capsulotomies were observed.

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Effectiveness and Safety of the Clareon Monofocal Intraocular Lens: Outcomes From a 12-Month Multicenter Study

Presenting author: William Maxwell, United States

Session name: Monofocal + PCO
Date and time: 10 October 2021, 08:00 - 09:30
Presentation time: 08:06 - 08:12
Location: Hall 13 / Elicium Ballroom

Purpose:
This registration study assessed effectiveness and safety of the novel Clareon intraocular lens (IOL; model SY60WF; Alcon Vision LLC).

Setting:
Sixteen clinical sites in the United States

Methods:
This was a prospective, single-arm, unmasked clinical trial in subjects requiring cataract surgery. Subjects were adults ≥22 years old. Following phacoemulsification, 350 subjects received the Clareon IOL unilaterally; 342 completed the study. Monocular corrected distance visual acuity (CDVA) and uncorrected distance visual acuity (UDVA) were evaluated. The primary effectiveness endpoint was the percentage of subjects with CDVA ≥0.3 logMAR at Month 12. Safety was assessed by monitoring adverse events (AEs). Visual acuity and safety outcomes were compared with historical safety and performance endpoint (SPE) rates.

Results:
At 12-months, 99.7% of subjects achieved monocular CDVA ≤0.3 logMAR; 99.7% and 86.8% achieved monocular CDVA of ≤0.34 (20/40 or better) and ≤0.04 logMAR (20/20 or better), respectively. Over 95% of subjects achieved mean monocular UDVA ≤0.3 logMAR; 97.1% and 57.6% achieved monocular CDVA of ≤0.34 and ≤0.04 logMAR, respectively. Mean monocular CDVA and UDVA were −0.052 and 0.043 logMAR, respectively. AEs were within SPE limits. The most common nonserious ocular AE was posterior capsule opacification (5.4%). Serious AEs were less than1% and none were assessed as related to the device. There were no observations of glistenings at 12 months.

Conclusions:
Results of this study support the effectiveness and safety of the Clareon IOL. Visual acuity outcomes with the Clareon IOL exceeded the SPE rates for monocular CDVA, and AEs were within the limit of historic SPE rates.

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Could anatomical changes occurring with cataract surgery have a clinically significant effect on effective intraocular lens position?

Presenting author: david pablo pinero llorens, Spain

Session name: Monofocal + PCO
Date and time: 10 October 2021, 08:00 - 09:30
Presentation time: 08:12 - 08:18
Location: Hall 13 / Elicium Ballroom

Purpose:
The purpose of the current study was to optimize the calculation of effective lens position (ELP) of two different monofocal intraocular lenses (IOLs) using the measurements obtained with an optical biometer in terms of the position of the IOL and potential ocular globe changes after cataract surgery. For such purpose, an optical low-coherence interferometry system (OLCI) was used that has been previously validated for its use in pseudophakic eyes.

Setting:
This study was conducted at the Ophthalmology Department of the Marina Baixa Hospital (Villajoyosa, Alicante, Spain).

Methods:
Prospective, descriptive, single-center study involving 472 eyes of 280 subjects (mean age 73.5 years) undergoing cataract surgery that were divided into two groups according to the IOL implanted: group 1330 eyes with AcrySof IQ SN60WF (Alcon), and group 2142 eyes with Akreos MI60L (Bausch & Lomb). Refractive and biometric changes were evaluated during a period of 6-month follow-up with an optical biometer (considering potential measurement artifacts). Comparison of ELP estimated with the SRK-T formula (ELP SRK-T) and ELP calculated considering clinical real data was made (ELP AXL-corrected clinical).

Results:
Besides significant changes in refraction, a significant increase in anterior chamber depth (ACD) ($p < 0.001$) and a significant reduction in the axial length (AXL) ($p < 0.001$) were detected. Mean 1-month postoperative AXL change was - 0.08 ± 0.06 and - 0.10 ± 0.11 mm in groups 1 and 2, respectively ($p = 0.001$), with no changes afterward. Mean difference between ELP SRK-T and ELP AXL-corrected clinical was 0.17±0.39 and -0.23±0.43mm in groups 1 and 2, respectively ($p < 0.001$). A strong and statistically significant correlation of these differences with the prediction refractive error was found in both groups.

Conclusions:
In conclusion, potential anatomical changes occurring after cataract surgery can explain the level of refractive predictability obtained using the vergence formula SRK-T, which supports the hypothesis that these anatomical changes are real and not only due to an artifact from optical biometers. New approaches for estimating ELP with better predictions of the position of the IOL and AXL changes with surgery should be considered to optimize IOL power calculations. A new approach for ELP estimation is provided for the SRK-T formula for two different types of monofocal IOLs that should be validated in future prospective trials.

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Comparing the effective lens position and refractive outcome of a novel rhexis-fixated lens to established lens designs

Presenting author: Wolfgang J. Mayer, Germany

Session name: Monofocal + PCO
Date and time: 10 October 2021, 08:00 - 09:30
Presentation time: 08:18 - 08:24
Location: Hall 13 / Elicium Ballroom

Purpose:
To evaluate differences in effective lens position (ELP) based on the lens design. Intraocular lenses (IOLs) with plate-haptic, c-loop haptic, and a rhexis-fixated lens were compared.

Setting:
1 Department of Ophthalmology, Ludwig-Maximilians-University, Munich, Germany 2 Department of Ophthalmology, Goethe-University, Frankfurt am Main, Germany 3 Nordblick Eye Clinic, Kiel, Germany

Methods:
The study included patients having age-related cataract surgery with implantation of either a plate-haptic, c-loop haptic, or a novel rhexis-fixated IOL. Biometry and refraction measurements were conducted preoperatively and 3 months postoperatively. Lens constant optimization was performed.

Results:
Seventy eyes of 56 subjects were included. ELP for rhexis-fixated IOL was shortest (4.29±0.24 mm), followed by c-loop haptic (4.41±0.42 mm) and plate-haptic (4.51±0.26 mm) IOL. Difference in ELP was significant between rhexis-fixated IOL and both plate-haptic (P=.001) and c-loop haptic IOL (P=.000). ACD adjustment based on lens design showed a significant effect on refraction and IOL power predictions for all formulas and lenses (P<.05). For the rhexis-fixated IOL the differences in refraction ranged from -0.039D (Hill-RBF) to -0.096 D (Haigis). The other 2 lenses showed mean differences in refraction between +0.046 D (Hill-RBF) and +0.097 D (Haigis).

Conclusions:
The difference in IOL fixation and its resulting position in the capsular bag have a significant effect on the effective lens position and consequently a significant effect on the prediction of postoperative refraction.

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Cataract

Comparative analysis of the visual performance achieved after cataract surgery with implantation of a standard monofocal or a monofocal intraocular lens with modified optical profile: a randomized clinical trial

Presenting author: Oege Goslings, Netherlands

Session name: Monofocal + PCO
Date and time: 10 October 2021, 08:00 - 09:30
Presentation time: 08:30 - 08:36
Location: Hall 13 / Elicium Ballroom

Purpose:
To evaluate and compare the visual performance achieved after cataract surgery with implantation of a standard monofocal and a monofocal intraocular lens with modified optical profile

Setting:
Department of Ophthalmology, Elisabeth-TweeSteden Hospital, Tilburg, the Netherlands1, Department of Optics, Pharmacology and Anatomy. University of Alicante, Alicante, Spain2

Methods:
Prospective comparative randomised clinical trial enrolling a total of 90 eyes of 45 patients with ages ranging from 54 to 87 years old. All eyes underwent successful bilateral cataract surgery with implantation of one of two different types of monofocal IOLs: Vivinex iSert© IOL (Hoya) (48 eyes, 24 patients) and Tecnis Eyhance© IOL (Johnson & Johnson Vision) (42 eyes, 21 patients). Distance and intermediate visual acuity, refraction and patient-reported (Catquest-9SF questionnaire) outcomes were evaluated during a 3-month follow-up.

Results:
A total of 91.7% and 81.9% of eyes had a postoperative spherical equivalent within ±0.50 D in Eyhance and Vivinex IOL groups, respectively. No statistically significant differences were found between IOL groups in postoperative logMAR binocular UDVA (Eyhance -0.02±0.07 vs. Vivinex -0.01±0.11, p=0.845) and CDVA (Eyhance -0.07±0.09 vs. Vivinex -0.08±0.06, p=0.897). In contrast, significantly better binocular uncorrected (UIVA) (0.10±0.09 vs. 0.20±0.12, p=0.023) and distance-corrected intermediate visual acuity (DCIVA) was found in the Eyhance group (0.14±0.12 vs. 0.24±0.08, p=0.009). Rasch calibrated Catquest mean score was slightly better in the Eyhance group, but was not statistical significant (-3.41±0.75 vs. -3.08±0.79, p=0.191).

Conclusions:
The monofocal intraocular lens with modified optical profile Tecnis Eyhance provides an enhanced intermediate visual function compared to a standard monofocal IOL while maintaining an excellent distance vision.

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Cataract

Repeatability and reproducibility of post-operative refraction in patients with Eyhance monofocal intraocular lens

Presenting author: Andreea Fisus, Austria

Session name: Monofocal + PCO
Date and time: 10 October 2021, 08:00 - 09:30
Presentation time: 08:36 - 08:42
Location: Hall 13 / Elicium Ballroom

Purpose:
Aim of this study is to determine the comparability and repeatability of different refraction methods in patients implanted with Eyhance (Johnson & Johnson) lens and compare the results with a known monofocal lens (ZCB00, Johnson & Johnson).

Setting:
Vienna Institute for Research in Ocular Surgery, Hanusch Hospital, Vienna, Austria

Methods:
This is a prospective study that included patients with Eyhance implanted in one eye and ZCB00 in the fellow eye. Autorefraction measurements were performed with 4 autorefractometers, each patient measured three times with each device. Two independent observers perform subjective refraction and were masked to the autorefraction outcome.

Results:
25 patients out of 50 completed the study. The mean SE for the study group was -0.39 ± 1.06 for Topcon, -0.11 ± 0.61 for NIDEK, 0.14 ± 0.57 for Zeiss and -0.14 ± 0.54 for Tomey . The mean difference in SE between autorefractometers and subjective refraction was -0.07 ± 0.53 for Topcon, -0.04 ± 0.38 for NIDEK, 0.30 ± 0.47 for Zeiss, 0.00 ± 0.55 for Tomey . The coefficient of repeatability for spherical and cylinder dioptre was 0.30 and 0.13 for Topcon, 0.17 and 0.14 for NIDEK, 0.26 and 0.50 for Zeiss, 0.31 and 0.45 for Tomey.

Conclusions:
A good refractive outcome was obtained for both lenses. The differences between the autorefractometers and subjective refraction were small.

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Cataract

The effect of pre-operative keratometric astigmatism on uncorrected distance visual acuity after cataract surgery

Presenting author: Allan Nghiem, United Kingdom

Session name: Monofocal + PCO
Date and time: 10 October 2021, 08:00 - 09:30
Presentation time: 08:42 - 08:48
Location: Hall 13 / Elicium Ballroom

Purpose:
To determine the relationship between pre-operative keratometric corneal astigmatism and post-operative uncorrected distance visual acuity (UDVA) in cataract surgery using standard monofocal intraocular lenses (IOLs).

Setting:
Moorfields Eye Centre at Croydon University Hospital, London, UK

Methods:
An analysis was conducted on 11857 consecutive cataract procedures in a single ophthalmology unit in London, UK in a 6-year period between 1 April 2014 to 1 April 2020. Pre-operative keratometry data and post-operative visual acuity data were analysed. Patients with both pre-operative keratometry data, post-operative UDVA recorded and with a predicted post-operative refractive outcome of between -0.5D and +0.5D were included in the analysis. Patients with pre-operative keratometric astigmatism of 2.0D or more were excluded as these patients had toric IOL implanted.

Results:
9934 participants met the inclusion criteria. 23.8% of patients had corneal astigmatism of less than 0.5D, 60.7% less than 1.0D and 9.2% of patients had corneal astigmatism of 2.0D or more. Of all the patients with pre-operative corneal astigmatism of less than 0.5D, 39.2% achieved UDVA of 6/6 or better and 85.9% achieved 6/12 or better. The percentage of patients achieving post-operative 6/6 UDVA, decreased with higher pre-operative keratometric astigmatism with rates of 32.5%, 23.3% and 16.8% for patients with astigmatism of 0.5-1D, 1-1.5D and 1.5-2D respectively.

Conclusions:
Lower levels of pre-operative keratometric astigmatism are related to higher levels of UDVA. These figures can be useful to allow for better-informed pre-operative decisions regarding surgery, expectations for post-operative UDVA and expectations of achieving spectacle-independence for distance and to inform decisions about surgical approaches to reduce or offset corneal astigmatism.

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Cataract

Intraindividual correlation of crystalline lens decentration and tilt with postoperative intraocular lens (IOL) decentration and tilt with a new hydrophobic acrylic IOL with modified c-loop haptics

Presenting author: Daniel Schartmüller, Austria

Session name: Monofocal + PCO
Date and time: 10 October 2021, 08:00 - 09:30
Presentation time: 08:48 - 08:54
Location: Hall 13 / Elicium Ballroom

Purpose:
To assess the influence of preoperative crystalline lens characteristics on the development of postoperative intraocular lens decentration and tilt up to 6 months postoperatively.

Setting:
Medical University of Vienna

Methods:
130 eyes of 68 patients with mono- or bilateral age related cataract received an aspheric hydrophobic Rayner RAO800C IOL with an overall diameter of 12.5mm and a capsular bag contact of 119 degree. Preoperative biometry was performed with an IOL Master 700. Preoperative crystalline lens decentration and tilt and postoperative pseudophakic lens tilt after 1 week (1w) and 4-7 months (6m) were assessed using an anterior segment SS-OCT Casia 2. Influencing factors on postoperative decentration and tilt such as axial length (AXL) were assessed.

Results:
Mean difference in decentration of the preoperative crystalline lens and the IOL after 1w was 0.18±0.10mm. Mean difference in IOL decentration from 1w to 6m was 0.08±0.07mm. The mean difference in tilt of the preoperative crystalline lens and the IOL after 1w was 1.11±0.84 degrees. Mean difference in IOL tilt from 1w to 6m was 0.66±0.58 degrees. Axial length was negatively correlated with the difference in tilt from preoperatively to 1w ($r=-0.26;p<0.01$) but not from 1w to 6m ($r=-0.04;p=0.65$). Preoperative crystalline lens tilt and decentration were positively correlated with IOL tilt and decentration after 6m ($r=0.87;p<0.01$ and $r=0.36;p<0.01$, respectively).

Conclusions:
Intraindividual postoperative IOL tilt was highly correlated with preoperative crystalline lens tilt. The IOL was less prone to preoperative lens decentration but still correlated. Capsular bag shrinkage after 1w only had a minor effect on overall decentration and tilt. Higher values of tilt were found in short eyes.

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Cataract

Nd:YAG capsulotomy rates at 5 years after cataract surgery: a multivariate analysis from a real-world evidence study in Spain

Presenting author: Derek O'Boyle, Spain

Session name: Monofocal + PCO
Date and time: 10 October 2021, 08:00 - 09:30
Presentation time: 09:00 - 09:06
Location: Hall 13 / Elicium Ballroom

Purpose:
Posterior Capsule Opacification (PCO) is understood to be a multifactorial complication affected by several factors such as age, ocular comorbidities and IOL material and design. If untreated, PCO can result in reduced visual acuity, impaired contrast sensitivity and glare disability. Nd:YAG laser capsulotomies are performed to treat the condition, resulting in additional burden to patients and health care systems. The aim of this study is to assess the long term impact of IOL choice and other PCO related factors on subsequent Nd:YAG capsulotomy rates, from a Spanish hospital perspective.

Setting:
This study is a retrospective cohort analysis of anonymised electronic medical records of cataract patients from two large Spanish regional hospitals of the Ribera Salud group in the Torrevieja-Vinalopó healthcare area, who are main providers of ophthalmic procedures in the Alicante region.

Methods:
De-identified electronic healthcare records for 9,545 patients aged 65+ years who underwent cataract surgery during the period Jan 2007 – Dec 2017 from two large regional hospitals in Spain, were retrospectively analysed. 3,955 eyes were followed more than 5 years. At 5 years, Nd:YAG incidence proportions (95% CI) and adjusted odds ratios were calculated through multivariate logistic regression. Variables included in the multivariate analysis included: IOL implanted at the time of surgery, age, gender and related co-pathologies.

Results:
At 5 years post-surgery, Nd:YAG incidence was significantly lower for AcrySof compared to the other models: 8.8% (CI 6.0 %-11.6%) for AcrySof, 44.3% (CI 42.4 %-46.2%) for Zeiss Asphina, 47.4% (CI 44.1 %-50.6%) for AJL, 44.0% (CI 33.4 %-54.7%) for IOL Tech. Adjusted odds for Nd:YAG capsulotomy were significantly higher for other IOLs compared with AcrySof (OR's = 9.54, 8.35, 8.02 for AJL LLASY60, Zeiss Asphina and IOL Tech Stabibag respectively ($p < 0.001$). Age at index (per 1 year increase OR: 0.98) and female gender (OR: 1.41) were also significantly associated ($p < 0.001$) with Nd:YAG capsulotomy.

Conclusions:
This study generated robust real-world evidence confirming the relationship between the IOL implanted at the time of cataract surgery and the incidence of Nd:YAG capsulotomy to treat PCO. After adjusting for factors associated with PCO, the results indicate that AcrySof IOLs have significantly lower Nd:YAG treatment rates compared to the other IOLs implanted at the study site during the 5 years follow-up after cataract surgery. Future research may be warranted to investigate the consequences of lens choice for patient quality of life and overall healthcare costs.

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Cataract

Posterior capsule opacification with two hydrophobic acrylic intraocular lenses: Vivinex XY1 vs Acrysof SN60WF 3-year results of a randomized trial

Presenting author: Christina Leydolt, Austria

Session name: Monofocal + PCO
Date and time: 10 October 2021, 08:00 - 09:30
Presentation time: 09:06 - 09:12
Location: Hall 13 / Elicium Ballroom

Purpose:
To compare the incidence and intensity of posterior capsule opacification (PCO) and Nd:YAG capsulotomy rates between two similar open-loop single-piece hydrophobic acrylic intraocular lenses (IOLs) but differences in the proprietary material characteristics and the design features over a period of 3 years.

Setting:
Department of Ophthalmology, Medical University Vienna

Methods:
Eighty patients (160 eyes) had bilateral cataract surgery in both eyes and received a Vivinex XY1 IOL in one eye and an Acrysof SN60WF IOL in the other eye. Follow-up examinations were performed three years after surgery. Digital retroillumination images were taken of each eye. The amount of posterior capsule opacification (score: 0 – 10) was assessed subjectively at the slit-lamp and objectively using automated image analysis software (AQUA).

Results:
The objective PCO score of the Vininex XY1 IOLs was 0.9 ± 0.8 compared to the PCO score of 1.4 ± 1.1 for the Acrysof SN60WF IOLs ($p < 0.001$). 11.4 % of patients had a neodymium:yttrium-aluminium-garnet (Nd:YAG) capsulotomy in the Vininex XY1 eye, and 18.6% had a capsulotomy in the Acrysof SN60WF eye ($p = 0.001$) three years postoperatively.

Conclusions:
The new hydrophobic acrylic Vininex XY1 IOL showed significantly lower PCO and YAG rates compared to the Acrysof SN60WF IOL. The interaction of various factors such as hydrophobic material, smooth optic surface and sharp posterior optic edge is the major key for PCO prevention.

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Incidence of YAG laser capsulotomies and their complications in a large French population sample

Presenting author: Antoine Brezin, France

Session name: Monofocal + PCO
Date and time: 10 October 2021, 08:00 - 09:30
Presentation time: 09:12 - 09:18
Location: Hall 13 / Elicium Ballroom

Purpose:
To assess the incidence of YAG laser capsulotomies in the French population and the main demographic characteristics of the patients. To report their complications 3, 6, 9 and 12 months after the procedures.

Setting:
The French National Health Data System was used to extract data from the "Échantillon Généraliste des Bénéficiaires" (EGB), a 1/97th sample of the French population. The number of capsulotomies performed between January 1st, 2014 and December 31st, 2017 was recorded as well as their complications within the following year.

Methods:
Non-interventional cohort study based on ≥ 18-year-old subjects. Codes processed by the National Health Data System were used to record the number of capsulotomies performed within the study period. To assess the complications related to the procedures, patients with a history of the following pre-existing conditions were excluded from the analyses: ocular hypertension or glaucoma, as well as all vitreoretinal diseases. Codes related to ocular hypertension or glaucoma, macular edema, retinal detachments were subsequently recorded. A Kaplan-Meier analysis based on the complications detected every 3 months during the year following the capsulotomies was performed.

Results:
10 774 capsulotomies were performed for 8425 patients. Their number increased from 2312 in 2014, to 3141 in 2017 (+35.9%). Based on these data, we extrapolated that 253.103 capsulotomies were performed in France in 2017. The mean patient-age was 75.1 ± 10.2 years, 85.9% of patients were ≥ 65 years old and the M/F sex-ratio was 0.55. The capsulotomies were performed within 1- and 2-years following cataract surgery in respectively 9.8% and 23.2% of cases. In the year following the capsulotomies, the incidence of glaucoma/ocular hypertension, macular edema and retinal detachments was 9.6%, 6.4% and 0.4% respectively.

Conclusions:
Ours is the first big data study regarding YAG laser capsulotomies in France. Based on our findings, we estimate that capsulotomies are performed in approximately 30% of pseudophakic patients. Moreover, the extrapolation of our data to the global French population suggests that more than 30.103 French patients are treated each year for capsulotomy-related complications. Our analyses show that these complications occur mostly within 6 months after the procedure.

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Peripheral posterior capsule opacification can regain morphological characteristics of the human lens

Presenting author: Justin Christopher D'Antin, Spain

Session name: Monofocal + PCO
Date and time: 10 October 2021, 08:00 - 09:30
Presentation time: 09:18 - 09:24
Location: Hall 13 / Elicium Ballroom

Purpose:
The mechanisms involved in the development of posterior capsule opacification (PCO) are not fully understood. Thus, we compared in vivo developed PCO with the lens and PCO formed in tissue culture with focus on the periphery of the lens capsule to evaluate the morphological changes that occur in the short term and the potential long term implications.

Setting:
Experimental Research Lab, Centro de Oftalmologia Barraquer, Barcelona

Methods:
We studied 3 human tissue groups: Cultured lens capsules after mock cataract surgery (n=6, 30 days), lens capsules from donors that had previously undergone cataract surgery (IOL capsules) (n=12) and intact lenses (n=6). All samples were analyzed with a darkfield, both frontally and in cross sections. Afterwards, they were stained with Vimentin, alpha Smooth Muscle Actin, Picro Sirius Red (for collagen) and Paired box protein (Pax6).

Results:
We found that cultured capsules and less developed IOL capsules consisted mainly of monolayers of mesenchymal cells, while more developed IOL capsules, contained lens epithelial cells (LECs), globular cells and lens fiber cells. Many IOL capsule samples expressed collagen I and III in areas where cells were in contact with the IOL. Pax6 had a similar dispersed distribution in less developed IOL capsules and cultured capsules, while more developed IOL capsules and intact lenses, concentrated Pax6 in LECs at the equatorial lens bow. The relative opacity of the samples did not align with the degree of fiber cell organization.

Conclusions:
The similarities between cultured capsules and less developed IOL capsules indicate that our in vitro developed PCO is comparable to early in vivo developed PCO. The similar morphology of more developed IOL capsules and intact lenses seems to indicate an attempt at lens regeneration.

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Cataract

Evaluating changes in aqueous prostaglandins and cytokine profiles in femtosecond laser-assisted cataract surgery with increased capsulotomy energy.

Presenting author: Hon Shing Ong, Singapore

Session name: FLACS + CS compl + Special
Date and time: 10 October 2021, 13:15 - 14:45
Presentation time: 13:15 - 13:21
Location: Hall 11

Purpose:
Ophthalmic viscoelastic devices (OVDs) have been shown to aid the insertion of mechanical pupil expanders and are used in viscomydriasis. In our previous study, we found that higher femtosecond laser energy levels are required to create capsulotomies in eyes filled with OVDs. This study evaluated the changes in aqueous prostaglandin E2 (PGE2) and cytokine levels in femtosecond laser-assisted cataract surgery (FLACS) with increased capsulotomy energy, and the effects of non-steroidal anti-inflammatory drugs (NSAIDs) on these aqueous profiles.

Setting:
This study was conducted in the Singapore National Eye Centre, a tertiary ophthalmic hospital.

Methods:
83 patients who underwent FLACS (LDV Z8, Ziemer Ophthalmic Systems, Switzerland) were randomly divided into 4 groups. Group 1 (n=20): 90% capsulotomy energy with no preoperative non-steroidal anti-inflammatory (NSAIDs); Group 2 (n=21): 90% capsulotomy energy with preoperative topical NSAIDs; Group 3 (n=22): 150% capsulotomy energy with preoperative topical NSAIDs; Group 4 (n=20) conventional phacoemulsification without preoperative NSAIDs. Aqueous humour was collected immediately after laser and after phacoemulsification, and the levels of prostaglandin E2 (PGE2) and cytokines determined.

Results:
After phacoemulsification, PGE2 levels increased in all groups. PGE2 and cytokine (IL-6, IFN-γ, IL-8) levels were significantly lower in Group 4 (non-laser) compared the laser groups even with preoperative NSAIDs (p=0.01). PGE2 levels were significantly higher immediately after laser in Group 1 compared to Groups 2 and 3 (p=0.04). Increase in capsulotomy energy from 90% to 150% did not significantly increase PGE2 and cytokine levels when preoperative NSAIDs were applied (Group 2 vs Group 3).

Conclusions:
The beneficial effects of preoperative topical NSAIDs on aqueous PGE2 and cytokine profiles described in this study is clinically important. When an increase in capsulotomy energy is clinically required (e.g. in the presence of OVDs or corneal opacities), surge in PGE2 and cytokine levels is similar with energy increases of 90% to 150%, when preoperative NSAIDs are administered.

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Cataract

Intraoperative complications using a low-energy femtosecond laser in cataract surgery: results from a real-world high-volume setting

Presenting author: Julia Riemey, Germany

Session name: FLACS + CS compl + Special
Date and time: 10 October 2021, 13:15 - 14:45
Presentation time: 13:21 - 13:27
Location: Hall 11

Purpose:
To report data on intraoperative complications of cataract surgery using a low-energy femtosecond laser.

Setting:
Retrospective, consecutive case series, high-volume, single-centre setting.

Methods:
We retrospectively reviewed medical records of patients who underwent femtosecond laser assisted cataract surgery (FLACS) using FEMTO LDV Z8 between August 2015 and December 2019, performed by two experienced high-volume surgeons. The first 20 surgeries of each surgeon were excluded. We reviewed surgery reports with special attention to the occurrence of intraoperative complications, including but not limited to capsular complications. An intraoperative complication existed when surgery report was marked “completed with complications”. In those cases, we collected further detailed data regarding the nature and extent of the complication, patient demographics, additional ocular diagnoses, ocular biometry and the primary surgical outcome.

Results:
A total of 1,806 eyes of 1,131 patients, 903 left and 903 right eyes, were included to this study. 0.28% (5 eyes) had an intraoperative complication, of which all were of capsular nature. Three eyes (0.17%) had a tear of the anterior and 2 (0.11%) of the posterior capsule. In all cases, an intraocular lens (IOL) could be successfully implanted with no further complications. In anterior capsule tear cases the IOL was implanted in the capsular bag and in the remaining a sulcus fixation was applied.

Conclusions:
Results of our current study show a very low intraoperative complication rate of only 0.28% in a high-volume real-world setting. Anterior capsular tears do not appear to be a common complication of FLACS using a low-energy laser device.

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Femtosecond laser-assisted paediatric cataract surgery using low-energy laser: a large case series

Presenting author: Irina Trifanenkova, Russian Federation

Session name: FLACS + CS compl + Special
Date and time: 10 October 2021, 13:15 - 14:45
Presentation time: 13:27 - 13:33
Location: Hall 11

Purpose:
To evaluate safety and postoperative visual outcomes of femtosecond laser- assisted cataract surgery in a paediatric population.

Setting:
Retrospective, consecutive case series, single-centre setting (Kaluga branch of the S. Fyodorov Eye Microsurgery Federal State Institution, Russia).

Methods:
51 eyes of 33 paediatric patients with a mean age of 3.22 years (ranging from 2 months to 13 years), each diagnosed with a cataract (49 congenital, 1 traumatic and 1 complicated), underwent a femtosecond laser-assisted cataract surgery, using the mobile and compact FEMTO LDV Z8 low-energy femtosecond laser (Ziemer Ophthalmic Systems, Switzerland). Anterior laser capsulotomy, phaco-aspiration and intra-ocular lens implantation (IOL), were performed in all eyes. Both intraoperative and long-term postoperative complications, along with long-term monocular uncorrected distance (UDVA) and best-corrected visual acuity (BCVA), were assessed during average follow-up period of 32.96 months (ranging from 14 to 69 months).

Results:
Intraoperative anterior capsule tears occurred in 3 eyes. In each case however, they did not extend posteriorly and the IOLs were placed in the bags without further complications. One day after surgery, 4 eyes presented with a transient exudative reaction, which all resolved spontaneously. Four eyes developed posterior capsule opacification (PCO) and were subsequently treated with Nd-YAG laser capsulotomy. At last patients' follow-up 73.91% of eyes scored a BCVA of 20/60, or better, whilst 45.65% 20/40, or better. Overall, 88.00% of eyes achieved an improvement in Snellen lines as compared to the baseline ($p < 0.001$).

Conclusions:
In this paediatric case series, the low-energy femtosecond laser offered the benefits of achieving safe anterior capsulotomy (despite high elasticity of the lens capsule observed in paediatric population), low number of intra- and post-operative complications, as well as significant improvement in BCVA. Further studies are required to investigate the potential impact of posterior laser capsulotomy on the development of PCO and the need for subsequent Nd-YAG laser treatment. Nevertheless, femtosecond laser-assisted cataract surgery in paediatric population is a safe and effective technique offering considerable benefits to the patients.

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Cataract

I-OCT Assisted Evaluation of 1000 Versus 400 Microns Incision Depth for Capsulotomy in Eyes Undergoing FLACS for Intumescent Cataract

Presenting author: Siddharth Duggal, India

Session name: FLACS + CS compl + Special
Date and time: 10 October 2021, 13:15 - 14:45
Presentation time: 13:33 - 13:39
Location: Hall 11

Purpose:
To compare the safety, efficacy and feasibility of 1000 microns versus 400 microns incision depth for capsulotomy in eyes undergoing Femtosecond Laser Assisted Cataract Surgery (FLACS) for Intumescent Cataracts

Setting:
Phaco-Refractive Department, Nethradhama Super Speciality Hospital, Jayanagar, Bengaluru

Methods:
This prospective, interventional, randomised, comparative study included 50 eyes (50 patients) diagnosed with Intumescent cataract for whom only capsulotomy using FLACS was planned. Two groups (n=25 eyes in each) were created, Group 1 and 2 wherein 400µm and 1000µm incision depth for capsulotomy respectively. In both groups capsulotomy of 5.2 mm, pulse energy of 4µJ, with horizontal and vertical spot spacing of 5 and 15µm respectively was made. Intraoperative OCT was used to assess completeness of capsulotomy as free floating nature or presence of capsular adhesions if any. At 3 months, Endothelial cell density was compared between both groups.

Results:
In Group 1, 9 out of 25 eyes (36%) were free floating that is removed only with OVD while 16/25 required additional manipulation with micro forceps whereas in Group 2, 21 out of 25 eyes (84%) were free floating which corroborated with IOCT findings. Three eyes had capsulorrhexis runoff in Group 1 while one had similar run off in Group 2 none resulting in PCR. Adhesions more than 4 clock hours was seen in 6 eyes in group 1 while none in group 2. Post op ECD difference was not found to be significant in either groups p value >0.05.

Conclusions:
Capsulotomy using 1000 microns incision offers advantage of having greater safety compared to 400 microns incision depth however still requires caution in managing Intumescent Cataracts.

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Cataract

Visual acuity outcomes using Femtosecond-Laser aided Astigmatism Management

Presenting author: Tim Schultz, Germany

Session name: FLACS + CS compl + Special
Date and time: 10 October 2021, 13:15 - 14:45
Presentation time: 13:45 - 13:51
Location: Hall 11

Purpose:
Clinical study to evaluate post-operative visual outcomes for patients undergoing cataract surgery with the femtosecond-laser assisted cataract surgery platform

Setting:
University Eye Hospital Bochum in Bochum, Germany

Methods:
A prospective, single-arm study was performed on 57 eyes who had undergone cataract surgery with the assistance of the CATALYS Precision Laser System with cOS 6.0. The measured outcomes were the visual acuity changes between preoperative and 4 weeks postoperative and the Iris registration success rate. At the 1 month postoperative visit 49 eyes had been completed

Results:
Statistically significant changes ($p<0.0001$) in LogMar UCDVA and LogMar BCDVA from preoperative to 1-month postoperative were observed. Mean changes in LogMar UCDVA and LogMar BCDVA were 0.44 (>4 lines of improvement from preoperative) and 0.23 (>2 lines of improvement from preoperative) respectively. 65% of eyes had UCDVA of 20/40 or better at 1-month postoperative compared with 16% eyes preoperatively. 74% of eyes had BCDVA of 20/20 or better at 1-month postoperative compared with 30% eyes preoperatively. Most eyes (98%) had BCDVA of 20/32 or better 1month postoperatively. Iris registration success rate and overall satisfaction with workflow were both 98.2%

Conclusions:
This Clinical study demonstrated that the use of the CATALYS Precision Laser System with cOS 6.0 in patients undergoing cataract surgery, provides good visual acuity results and satisfactory clinical performance.

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Cataract

One-year results of Arcuate Keratotomy in patients with astigmatism up to 3 diopters using low pulse energy Femtosecond Laser

Presenting author: Luca Schwarzenbacher, Austria

Session name: FLACS + CS compl + Special
Date and time: 10 October 2021, 13:15 - 14:45
Presentation time: 13:57 - 14:03
Location: Hall 11

Purpose:
To evaluate the efficacy of low pulse Femtosecond Laser guided Arcuate Keratotomy: A 1 year follow up

Setting:
Department of Ophthalmology, Medical University of Vienna

Methods:
In this prospective study, 43 eyes with age-related cataract and regular corneal astigmatism between 1.0 and 3.0 diopters (dpt) were enrolled. Femtosecond Laser Arcuate Keratotomy (Femto-AK) was performed with a low pulse energy Femtosecond Laser (LDV Z8; Ziemer) prior to laser-assisted anterior capsulotomy and lens fragmentation. Castrop Nomogram (modified by P.Hoffman) was used to calculate corneal arc length. Follow ups were conducted 1 month, 3 months and 1 year postoperatively. Anterior corneal topography was measured with Atlas (Zeiss), Pentacam (Oculus) and an anterior segment OCT (Tomey) for total tomography including posterior corneal curvature. Difference Vector (DV) was calculated.

Results:
43 eyes from 25 (58%) female and 18 (42%) male patients were included. Mean UCDVA was 0.04±0.60 (logMAR) after one month and 0.03±0.60 after three months and -0.01.0±0.72 after one year, respectively. Mean preoperative astigmatism value was 1.62±0.49 dpt. Postoperative residual astigmatism of 0.64±0.35 dpt after 1 month, 0.65±0.34 dpt after three months and 0.67±0.39 dpt after one year was observed. DVs were 0.59, 0.60 and 0.68 dpt after 1 month, 3 months and 1 year, respectively.

Conclusions:
The astigmatic effect of low pulse energy femtosecond-assisted arcuate keratotomy was maintained from 1 month to 1 year in eyes with astigmatism up to 3 diopters. Vector analysis showed a tendency towards undercorrection of corneal astigmatism over a 1-year follow-up period, especially in with-the-rule astigmatism.

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Cataract

Safety and efficacy of implantation of the FEMTIS Lens using the LENSAR™ Laser System - a series of 693 eyes

Presenting author: Detlef Holland, Germany

Session name: FLACS + CS compl + Special
Date and time: 10 October 2021, 13:15 - 14:45
Presentation time: 14:03 - 14:09
Location: Hall 11

Purpose:
Since the introduction of the FEMTIS Lens (TELEON Surgical BV, The Netherlands) over 700 lenses of this new IOL model were implanted in the nordBlick Augenklinik Bellevue. The lens has a special haptic system, which allows the lens to be enclaved into the capsulotomy. Studies showed that the new design shows better rotational stability and better performance regarding tilt and decentration compared with standard capsular bag IOLs. In new technologies safety is always important and therefore intra- and postoperative complications should be analyzed also in the normal clinical setting apart from clinical trials.

Setting:
nordBLICK Augenklinik Bellevue Eye Hospital, Augenzentrum. ONE, Kiel, Germany

Methods:
The retrospective Study includes 693 eyes that underwent femtosecond laser assisted cataract surgery (FLACS) in cataract. (Mean age 73±8years.) Surgeries were performed by a single surgeon. Femtosecond laser assisted capsulotomy and lens fragmentation were performed using the LENSAR™ femtosecond Laser System. Capsulotomy was prepared with a diameter of 4.8 mm and was centered at the pupil center. Retrospectively the operation reports where controlled for intraoperative complications. Also the clinical data where searched regarding secondary intervention of the patients due to postoperative lens related complications like iris capture.

Results:
No intraoperative complications occurred related to IOL design; particularly no tears of the capsulotomy or rupture of the posterior capsule. In 5 eyes one of the main haptics positioned inside the capsular bag was damaged but the lens could be centered without problems. In three cases the IOL was injected upside down which made a turning of the IOL necessary Postoperatively seven cases of iris capture occurred within the first week. In these cases a surgical intervention was necessary. No iris capture was seen later postoperatively. No other lens related postoperative complications like e.g. iris chafing or glaucoma were documented.

Conclusions:
The implantation of the FEMTIS lens was found to be safe and effective. After a flat learning curve, the implantation is fast and free of complications. Especially no PCR or capsule tear where noticed. If miotic drugs are used, potential but rarely seen early postoperative complication of an iris capture disappeared. Signs of secondary glaucoma due to the lens design was not found in this analysis too. The advantages of this IOL design like better centration, high rotation stability and less tilt compared to normal capsular bag IOL are not diminished at all to lens design related complications.

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Anterior Segment Optical Coherence Tomography can identify retained lens fragments otherwise missed by conventional slit lamp examination

Presenting author: Haseeb Akram, United Kingdom

Session name: FLACS + CS compl + Special
Date and time: 10 October 2021, 13:15 - 14:45
Presentation time: 14:15 - 14:21
Location: Hall 11

Purpose:
To report a case of pseudophakic bullous keratopathy in which clinical examination failed to identify a lens fragment which was subsequently diagnosed using anterior segment optical coherence tomography (AS-OCT)

Setting:
Southend University NHS Hospital, UK

Methods:
A retrospective chart analysis was performed of an 80-year-old male following routine cataract surgery, with no intraoperative complications. 8 weeks postoperatively the patient was referred to the corneal service with non-clearing corneal oedema, and visual acuity of counting fingers. Slit lamp examination demonstrated pseudophakic bullous keratopathy and an intraocular pressure of 28 mmHg. No retained fragment was evident on gonioscopy.

Results:
A scan was acquired using the Heidelberg SPECTRALIS® Anterior Segment OCT module in the corneal setting, single line, standard 11mm scan, rotated at 90 degrees vertical with a 20-degree field of view capturing 1024 A-Scan using 815nm wavelength infrared light. This revealed a retained lens fragment in the inferior angle, which was subsequently washed out 2 days later.

Conclusions:
Retained lens fragment after routine cataract surgery is an uncommon but unfortunate complication and should be suspected in any patient with significant corneal oedema with no history of endothelial disease, especially when the eye is hypertensive. Conventional examination and gonioscopy is insufficient to rule out retained lens fragments when the view is hindered by corneal oedema in some cases. Anterior segment OCT is mandated in all newly presenting cases of pseudophakic bullous keratopathy to exclude retained lens matter not evident on conventional clinical examination alone.

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Implantation of a trifocal intraocular lens in high myopic eyes with nasal-inferior staphyloma

Presenting author: Carlos Lisa, Spain

Session name: **FLACS + CS compl + Special**
Date and time: **10 October 2021, 13:15 - 14:45**
Presentation time: **14:21 - 14:27**
Location: **Hall 11**

Purpose:
To assess visual outcomes in high myopic eyes with nasal-inferior staphyloma implanted with a pseudophakic trifocal intraocular lens (IOL).

Setting:
Fernandez-Vega Ophthalmological Institute, Oviedo, Spain

Methods:
We retrospectively analyzed the visual outcomes of 50 eyes of 45 patients who had cataract surgery after AT LISA trifocal IOL implantation. 25 eyes diagnosed with posterior staphyloma (nasal-inferior, type IV and V) and, 25 eyes as long eyes. Uncorrected distance visual acuity (UDVA) and corrected distance visual acuity (CDVA) values were used to assess efficacy and safety of the surgery. Refraction and defocus curves were also evaluated at 6-months.

Results:
No intra and post-operative problems occurred during the 6-months of follow-up. After the surgery, the mean Snellen decimal UDVA ranged from 0.50 to 1.00, and CDVA from 0.60 to 1.00 for both groups. CDVA was 0.91 and 0.74 for the long-eye and staphyloma groups, respectively. Efficacy and safety indexes were 1.22 and 1.32 for the long-eye, and 1.26 and 1.43 for the staphyloma group, respectively. All eyes of both groups showed a postoperative spherical equivalent within 1.00D. The long-eye group showed the highest percentage of spherical equivalent between -0.13D and +0.13D and the staphyloma group between -0.51D and -0.14D.

Conclusions:
The outcomes of the present study show that a trifocal IOL provides good visual acuity in high myopic eyes, being worse for nasal-inferior staphyloma eyes. The degree of tilt of the macular plane is related with the expected visual acuity.

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IOL Implantation with "Flattened Flanged Intrascleral Fixation Technique" in patients with Ectopia Lentis

Presenting author: Fikret Ucar, Turkey

Session name: FLACS + CS compl + Special
Date and time: 10 October 2021, 13:15 - 14:45
Presentation time: 14:27 - 14:33
Location: Hall 11

Purpose:
To evaluate the efficacy and results of the intrascleral intraocular lens fixation (IOL) technique applied to manage lens dislocation in patients diagnosed with ectopia lentis.

Setting:
Konyagoz Eye Hospital

Methods:
Patients who had undergone phacoemulsification and scleral fixation due to ectopia lentis in our clinic were included in the study. After capsulorhexis, iris hooks were attached to the anterior capsule at the dialysis area and a capsular tension ring was placed to manage zonular dialysis. Capsular bag and posterior capsule integrity were preserved during phacoemulsification. Both haptics were left out of the capsular bag and implanted into the sclera with the flattened flanged scleral fixation technique that we described previously. Both haptics were externalized by matching with the direction of zonular weakness. IOL optic was placed in the capsular bag.

Results:
Twenty-four eyes of 18 patients were included in the study. The mean age was 35.65 ± 9.84 (18-55). The mean follow-up time was 20.50 ± 9.88 months. The postoperative best corrected visual acuity (BCVA) was 0.92 ± 0.13 (Snellen chart). The mean postoperative astigmatism was 0.72 ± 0.75 D. No major intraoperative complications were observed. In the postoperative period, IOL decentralization, tilt, suture exposure, hypotonia, choroidal effusion, cystoid macular edema, and retinal detachment were not observed in any patient. Transient intraocular pressure (IOP) elevation was observed in 1 patient and posterior capsule opacification (PCO) was observed in 2 patients.

Conclusions:
Ectopia lentis is often associated with zonular weakness, which makes lens extraction and IOL implantation challenging. Therefore, an appropriate surgical method is required to ensure optimum stability for the IOL and minimize the risk of complications such as retinal detachment or glaucoma. In these patients, IOL implantation, using the flattened flanged scleral fixation method, without Cionni capsular tension ring, provides good visual outcomes and IOL stability with no serious complications.

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Cataract Surgery following posterior chamber phakic IOL Implantation

Presenting author: Omid Kermani, Germany

Session name: **FLACS + CS compl + Special**
Date and time: **10 October 2021, 13:15 - 14:45**
Presentation time: **14:33 - 14:39**
Location: **Hall 11**

Purpose:
Cataract after implantation of a posterior chamber phakic IOL (pIOL) can be caused by age, high myopia, iridectomy or by relative contact between the implant and crystalline lens, or a combination of these causes. The presentation is about to outline the surgical technique and review the results of pIOL explantation, phacoemulsification and IOL implantation in a single step cataract surgical procedure.

Setting:
Augenklinik am Neumarkt - Private Clinic

Methods:
All patients included, received the pIOL at our clinic within the past 25 years. 43 eyes of 29 patients were reviewed. 23 eyes developed nuclear sclerosis. In 20 eyes anterior subcapsular opacities were noted. The mean age at time of pIOL implantation was 42 years compared to 33 years mean age of our pIOL patient population. Mean age was 49 years (45 to 61 years) at time of cataract surgery. The spherical equivalent (SEQ) before pIOL implantation was -9.5D±1.5D (+5.0D to -24.0D). More than 75% of patients with cataract had myopia of ≥-7,5D.

Results:
Mean SEQ was -0.65D post pIOL implantation and -0.54D post cataract surgery. Explantation of pIOL and cataract surgery with premium IOL implantation was performed through the same incision (2,5mm). No case lost BCVA from cataract surgery. The mean UCVA post pIOL implantation was 1.0 (0,0 Log MAR), decreased to 0.4 (0,4 Log MAR) before cataract surgery and improved to 0.8 (0,1 Log MAR) following pIOL explantation, phacoemulsification and IOL implantation. There were no relevant intraoperative complications. Laser retinopexy (horseshoe foramina) had to be performed in three eyes. Two eyes were treated with Bevacizumab because of myopic maculopathy.

Conclusions:
High age at time of implantation (>40 Years) and high myopia (>-7,5D) were found to be predisposing for early cataract formation in pIOL patients. Cataract surgery with pIOL explantation and phacoemulsification with IOL implantation is a safe and effective single step procedure. The procedure should be performed by experienced surgeons because of high ametropia of the affected eyes and the high expectations of patients with regard to refractive outcomes.

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Predictive accuracy of the Optiwave Refractive Analysis (ORA) intraoperative aberrometry device for the new Clareon monofocal IOL

Presenting author: Lindsay Spekreijse, Netherlands

Session name: **CS equipment**
Date and time: **10 October 2021, 16:45 - 18:15**
Presentation time: **16:45 - 16:51**
Location: **Hall 11**

Purpose:
To evaluate refractive outcomes for the Clareon® monofocal IOL in terms of achieved target refraction for the ORA® Intraoperative Wavefront Aberrometry device (Alcon Laboratories, Inc.) and preoperative noncontact biometry.

Setting:
University Eye Clinic Maastricht, Maastricht University Medical Center+, the Netherlands.

Methods:
Prospective observational clinical trial. Patients with bilateral age-related cataracts undergoing phacoemulsification, either by delayed sequential surgery or on the same day, were included in the study. Exclusion criteria were an increased risk of refractive surprise or complicated surgery. Implanted IOL power was based on noncontact optical biometry data using the Barrett Universal II formula (BU-II), optimized for the Clareon®IOL. Postoperative subjective refraction was measured four to six weeks after surgery. Catquest-9SF questionnaires were completed preoperatively and three months after surgery.

Results:
One hundred eyes (51 patients) were included. The percentage of eyes within 1.0D, 0.75D, 0.50D and 0.25D of target for ORA vs. BU-II were 84%, 72%, 57% and 21% vs. 97%, 88%, 77% and 53%, respectively. Mean absolute prediction error was significantly higher for ORA vs. preoperative biometry($P<0.001$). After global optimization, the prediction accuracy of ORA improved significantly ($P<0.001$). Catquest-9SF questionnaires showed improved levels of ability at three months after surgery ($P<0.001$).

Conclusions:
This study showed lower percentages of eyes within target refraction for ORA (prior to lens constant optimization) compared to the BU-II formula when implanting the Clareon®IOL. However, prediction accuracy of ORA improved significantly after global optimization. Therefore, further intraoperative measurements, postoperative measurements, and optimization are needed to improve the ORA prediction for this IOL.

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Demystifying "Artificial Intelligence" (AI) for Intraocular Lens (IOL) Calculation

Presenting author: Paul-Rolf Preußner, Germany

Session name: CS equipment
Date and time: 10 October 2021, 16:45 - 18:15
Presentation time: 16:51 - 16:57
Location: Hall 11

Purpose:
To find out what can be gained with AI methods beyond physical calculation, and what cannot

Setting:
University Eye Hospital Mainz, Germany

Methods:
In 6004 eyes the predicted refraction differences between SRK/T, Hoffer Q, Holladay I and Haigis formulas, Hill RBF algorithm and OKULIX raytracing are compared graphically in pseudocolors as function of axial eye length and corneal radius. Further, RBF and raytracing are compared to a simple 2-dimension linear interpolation algorithm (LINEAR) the same way.

Results:
The difference pattern of each of the formulas to RBF is characteristic for each formula and very similar to the difference pattern of that formula to raytracing. RBF and raytracing do not show a specific difference pattern. The difference pattern between LINEAR and RBF or LINEAR and raytracing is very faint. The overall prediction error differences between RBF and raytracing are very similar and slightly better than LINEAR. RBF, raytracing and LINEAR are slightly better than the formulas. All prediction error differences are statistically significant, but clinically not very relevant.

Conclusions:
The shape of the IOL power as function of the input variables is very smooth. Therefore, even a simple approach (e.g. linear interpolation) is not much worse than higher-order interpolations such as radial basis functions. Beyond this mathematically straight-forward approach, hidden artificial intelligence is not required.

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Agreement of the Aladdin, AL-Scan, Argos, IOLMaster 700, Lenstar LS 900 and OA-2000 optical biometers

Presenting author: Robert Montés-Micó, Spain

Session name: CS equipment
Date and time: 10 October 2021, 16:45 - 18:15
Presentation time: 16:57 - 17:03
Location: Hall 11

Purpose:
To evaluate the agreement between various biometric parameters using six optical-biometers based on different optical technologies

Setting:
University of Valencia, Spain

Methods:
In this study 150 eyes of 150 patients were measured with the Aladdin, AL-Scan, Argos with Alcon image guidance, IOLMaster 700, Lenstar LS 900 and OA-2000 optical biometers. Keratometry (K1 and K2), J0 and J45 vectors, central corneal thickness (CCT), anterior chamber depth (ACD), lens thickness (LT), axial length (AL), white-to-white (WTW) and pupil size (PS) were measured with each device by the same examiner. The agreement between the biometers was assessed by applying a Bland–Altman analysis. The average difference, the confidence interval (CI) of the average difference at 95%, and 95% limits of agreement (LoA) were also ascertained.

Results:
We found statistically significant differences between biometers for all parameters evaluated ($p<0.001$) varying as a function of the parameter analyzed. The LoA-width of some comparisons for K1 and almost all for K2 were >0.50 D. A similar pattern was found for J0/J45. For CCT, quite a lot comparisons showed LoA-width values of >25µm. LoA-width for ACD ranged from 0.366 to 0.175 mm and for LT was about 0.2 mm. AL showed a highest LoA-width of 0.225 mm. The LoA-width for WTW was, in most cases, about ⍰0.50 mm. The LoA-width for PS ranged from 1.578 to 3.541 mm.

Conclusions:
The outcomes found by the six biometers showed statistically significant differences between most ocular parameters. Depending on the specific parameter and its use, the biometers may still be interchangeable since the clinical impact may be negligible.

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Repeatability of OCT-based versus Scheimpflug- and reflectometry-based keratometry in patients with hyperosmolar and normal tears

Presenting author: Bjoern Gjerdrum, Norway

Session name: CS equipment
Date and time: 10 October 2021, 16:45 - 18:15
Presentation time: 17:03 - 17:09
Location: Hall 11

Purpose:
To compare the repeatability of keratometry between different instruments in patients with hyperosmolar tear film and a control group.

Setting:
Private Eye clinic, Haugesund

Methods:
Subjects with tear-film osmolarity of 316 mOsm/L or more in either eye or 308 m/Osm/L or lower in both eyes were assigned to the hyperosmolar and the control group, respectively. The test eye was the eye with higher osmolarity in the hyperosmolar group and randomly chosen in the control group. The repeatability of keratometry was compared between a reflectometry device (Haag-Streit Lenstar 900), a Scheimpflug device (Oculus Pentacam HR) and two optical coherence tomography (OCT) devices (Tomey Casia SS-1000 and Heidelberg Anterion), based on two measurements from each device.

Results:
The study included 94 subjects. Both OCT devices had higher mean differences of average SimK vs the Lenstar in both groups, though all differences in means were below 0.07 D. The Casia had the highest mean vector difference of SimK astigmatism in the control group (differences below 0.11 D). These differences of the instruments were statistically significant (p=0.02), except for the Anterion in the control group. With all subjects, the coefficient of repeatability varied from 0.1 to 0.3 for average SimK (highest for both OCT devices) and from 0.4 to 0.7 for SimK astigmatism (highest for the Casia).

Conclusions:
Both OCT devices show more variability in average SimK and the Casia more variability in SimK astigmatism compared to the Lenstar and the Pentacam. However, the results suggested that repeatability was not influenced by osmolarity.

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Comparison of US & fluidic parameters between a torsional phaco handpiece with an integrated pression sensor and a torsional classical handpiece

Presenting author: Pascal Rozot, France

Session name: CS equipment
Date and time: 10 October 2021, 16:45 - 18:15
Presentation time: 17:15 - 17:21
Location: Hall 11

Purpose:
To compare the ultrasonic parameters (cumulated dissipated energy CDE, torsion and longitudinal time & amplitudes) and fluidics (estimated liquid, total time of aspiration) of the new phaco handpiece Sentry and a classical phaco handpiece on the Centurion phaco machine

Setting:
Clinique Juge, Marseille, France

Methods:
Prospective non-randomized study - 1 phaco with Sentry handpieces (group 1) in 1 operative room (OR), 1 phaco with classical torsional handpieces (group 2) in the second OR - 6 weeks duration. 109 consecutive eyes with no operative complication: Sentry 43 eyes, classical 66 eyes. Complete operative data were collected after each phaco procedures on the Centurion machine. Statistical analysis: T-test at 2 branches /different variances; Fischer's exact test.

Results:
The 2 groups were comparable in terms of age, sex, axial length and cataract nuclear grading (1X to 4X). Total surgery time showed no statistical difference. The mean number of Sentry function activations was 3,23 +/- 3,3. Significant statistical differences was found 1° for CDE between group 1 (9,41 +/- 4,94) and group 2 (12,73 +/- 6,87), p<0,004; 2° for total US time: 53,8 +/- 16,8sec vs 63,7 +/- 23,7sec (p<0,01) and for all torsional parameters; 3° for the estimated BSS total volume: 43+/- 9 cc vs 47+/-11 cc.

Conclusions:
Permitting lower operative IOP, less surge and higher levels of aspiration this study demonstrated less ultrasound power (-25%) and less fluids (-8%) used with a torsional phaco handpiece with an integrated pression sensor compared to a conventional torsional handpiece, giving more safety to phaco procedures, especially in cases of high myopia, zonular fragility and IFIS syndromes.

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Aerosol generation through phacoemulsification

Presenting author: Hanbin Lee, United Kingdom

Session name: CS equipment
Date and time: 10 October 2021, 16:45 - 18:15
Presentation time: 17:21 - 17:27
Location: Hall 11

Purpose:
To evaluate whether phacoemulsification is an aerosolgenerating procedure in an ex vivo experimental model.

Setting:
Sussex Eye Hospital, Brighton, United Kingdom

Methods:
In this ex-vivo study on 15 porcine eyes, an optical particle counter was used to measure particles of 10 µm and less using the cumulative mode. The 2 parts of the study were to: (1) assess the efficacy of the particle counter in the theater environment where there are dynamic changes in temperature and humidity; and (2) to measure aerosol generation with 3 phacoemulsification settings: (i) continuous power with 80% longitudinal (5 eyes); (ii) continuous power with 100% torsional (5 eyes); and (iii) continuous power with 80% longitudinal with application of hydroxypropyl methylcellulose (HPMC) on the ocular surface (5 eyes).

Results:
Maximum aerosols were captured when the counter faced the aerosol source. There was no significant difference in aerosol generation of all sizes during each phacoemulsification setting with torsional, longitudinal, and longitudinal with HPMC ($P > .01$). Combining data of all 3 phacoemulsification settings (150 measurements from 15 eyes), there was no significant difference comparing prephacoemulsification and during phacoemulsification for aerosols of 5 µm or less (1455 vs 1363.85, $P = .60$), more than 5 to 10mm (1.5 vs 1.03, $P = .43$), and of 10 µm or less (1209 vs 1131.55, $P = .60$).

Conclusions:
Phacoemulsification did not generate aerosols of 10 mm or less with continuous power using 80% longitudinal, 100% torsional, and 80% longitudinal setting with HPMC on the surface.

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Surgically induced astigmatism in phacoemulsification and nanolaser photofragmentation cataract surgery

Presenting author: Gangolf Sauder, Germany

Session name: **CS equipment**
Date and time: **10 October 2021, 16:45 - 18:15**
Presentation time: **17:27 - 17:33**
Location: **Hall 11**

Purpose:
Paracentesis and phaco incision are critical steps in cataract surgery. If not correctly placed and orientated lead to a more difficult procedure and a greater tissue stress resulting in wound burn or opacification. This will reduce the self-sealing effect hindering a healing process that even in the best of cases will never regain original strength. An indirect method to assess this negative result is the surgically induced astigmatism (SIA). The aim of the study was to compare the SIA following two procedures that differed in only the use of either phacoemulsification and photofragmentation.

Setting:
Charlottenklinik for Ophthalmology in Stuttgart, Germany

Methods:
This retrospective single-center single-surgeon study enrolled 800 consecutive eyes that underwent a standardized uneventful phacoemulsification cataract surgery and 400 consecutive eyes that underwent the same surgical procedure but with NanoLaser photofragmentation instead of phacoemulsification. The main incision was positioned on the axis of astigmatism or at 90o when astigmatism was not present. Sample size was determined to detect a difference of .05D (standard deviation =.25D) with a type-I-error (alfa) of .05 and a type-II-error (beta) of .10. The degree and main axis of astigmatism was measured with keratometry prior to and between one to three months after surgery.

Results:
The two groups did not present statistically significant differences in age and sex. The SIA ranged from 0 to .75D and the Chi-squared test comparing the frequencies of each level was highly statistically significant (p<.001). The mean astigmatism for the group of eyes that underwent phacoemulsification was 0.43±0.17 (median = 0.25; 95% C.I.: 0.43 to 0.45) and for the photofragmentation group was 0.36±0.15 (median= 0.50; 95% C.I.: 0.43 to 0.45). The distributions in the two groups differed significantly (two-tailed independent samples Mann–Whitney U = 118400.5, P < 0.001).

Conclusions:
The damage induced by placing surgical instruments in a tight passage is due to two types of energy: mechanical and thermal. The former is the result of changing the orientation of the instrument and thus deforming the tunnel. The latter is due to two factors: heat created by friction (sleeve/instrument and sleeve/tissue) and phaco/laser energy lost. The two procedures differed in only the amount of energy lost within the corneal tunnel: lasers conducted by fiber optic losses zero energy. In conclusion, Nanolaser photofragmentation cataract surgery produced less SIA, indicating that it is a less traumatic technique.

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An experimental analysis of recommended incision sizes of 13 different intraocular lens injector models

Presenting author: Maximilian Friedrich, Germany

Session name: CS equipment
Date and time: 10 October 2021, 16:45 - 18:15
Presentation time: 17:33 - 17:39
Location: Hall 11

Purpose:
Clear cornea incisions that have the manufacturers recommended size often enlarge during cataract surgery because of the insertion of an Intraocular lens (IOL) injector. The goal of this study was to determine the specific preoperative incision size (IS) for each injector which leads to the smallest postoperative IS while having a small intraoperative incision enlargement (IE) and compare it to the manufacturer's instructions for use.

Setting:
The David J Apple International Laboratory for Ocular Pathology, University of Heidelberg, Heidelberg, Germany.

Methods:
The study included 126 porcine eyes prepared with four different sized clear corneal incisions. The sizes depended on the recommended incision size of the examined injector model. The incision size was measured right before and after IOL injector insertion with an incision gauge set ranging up to three millimetres. An IOL injector was inserted with the into-the-bag implantation technique in each incision. To determine significant differences of postoperative IS and intraoperative IE depending on preoperative IS a Games-Howell post-hoc test was concluded.

Results:
In total 13 injector models from 6 manufacturers were investigated. 5 out of 13 injector models had a specific recommendation for into-the-bag implantation technique. The other 8 injectors either only had a recommendation for another technique or none. There was intraoperative IE in 86.8% of the incisions with a mean IE of 0.26 ±0.18 mm. IE was often significantly larger in small IS compared to larger IS concerning an injector model ($P<0.05$). Five injector models had a significant smaller recommended incision size than the smallest reasonable incision size found in this study with an average difference of 0.3 mm ($P<0.05$).

Conclusions:
Every IOL injector producing company should at least give a recommended incision size preferably for every common implantation technique. The recommended incision sizes should be validated by an independent laboratory to prevent needlessly small incisions associated with a more challenging surgery procedure. Future studies should evaluate the outcome of a high IE versus a large preoperative IS.

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Experimental evaluation of intraocular lens injector systems: a Miyake-Apple view based study

Presenting author: Lu Zhang, Germany

Session name: CS equipment
Date and time: 10 October 2021, 16:45 - 18:15
Presentation time: 17:45 - 17:51
Location: Hall 11

Purpose:
To compare four intraocular lens (IOL) injector systems in human cadaver eyes with Miyake-Apple technique.

Setting:
David J Apple Center for Vision Research, Department of Ophthalmology, University Hospital Heidelberg, Heidelberg, Germany.

Methods:
In 20 human cadaver eyes, +20.0 diopter IOLs were implanted with the following injector systems: iTec (iT), Monarch ⅢD (M), Bluemixs 180 (B) and CT Lucia (CT). Corneal incision sizes were measured before and after implantation with a incision gauge set. Resistance force of each injector system was evaluated on a scale from 1 to 5, with 1 being the smallest force and 5 being the strongest force. IOL delivery performance were determined based on Miyake-Apple view videos.

Results:
The incision enlargements were 0.48 ± 0.04mm (iTec), 0.25 ± 0.05mm (Monarch ⅢD), 0.58 ± 0.04mm (Bluemixs 180), 0.58 ± 0.05mm (CT Lucia). Scores on resistrance force were: 5 (iT), 3 (M), 4(B), 4 (CT). Except for 4 cases (80%) of “kissing haptic” were observed in injector iTgroup, no other advent events were observed during IOL implantation.

Conclusions:
It is important to choose the appropriate incision size instead of pursuing only “smaller incision”. All injector systems except for iTec provided predictable IOL delivery .

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Cataract

Video Analysis of Optic-Haptic-Interaction during IOL implantation with different hydrophobic acrylic IOLS

Presenting author: Weijia Yan, Germany

Session name: CS equipment
Date and time: 10 October 2021, 16:45 - 18:15
Presentation time: 17:51 - 17:57
Location: Hall 11

Purpose:
To compare the optic-haptic interaction of different hydrophobic acrylic IOLs after using three preloaded injectors.

Setting:
International Vision Correction Research Centre (IVCRC), Department of Ophthalmology, University of Heidelberg, Heidelberg, Germany and Borkenstein & Borkenstein Private Practice at the Clinic of the Kreuzschwestern, Graz, Austria.

Methods:
In this clinical study, we included a total of 231 eyes that underwent phacoemulsification and lens implantation procedures. We measured the characteristics of three preloaded injectors (multiSertTM [injector A], TECNIS Simplicity [injector B], and TECNIS iTec [injector C]). The analysis included IOL insertion, haptic–optic interaction, and the time of IOL delivery.

Results:
The incidence of unfolding problems with the leading haptic of injector A, B and C was 6%, 2% and 5%, and for problems with the trailing haptic, it was 0, 2% and 3%. Haptic-optic adhesion occurred in 2% of cases for injector A, 44% for injector B, and 52% for injector C (P< .05). The fastest delivery into the capsular bag was for injector A (mean19.96 ± 6.47 [SD] seconds). IOL power, we found, did not correlate with either the implantation time or haptic-optic adhesion.

Conclusions:
We found nearly the same rate of behaving unfolding problems for leading and trailing haptics in three injectors. And in some injectors, we have up to 52% haptic-optic adhesions. FINANCIAL DISCLOSURE: G. U. Auffarth reports lecture fees and research grant from Johnson & Johnson and Hoya

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New design of a foldable IOL with winged haptics for scleral fixation – Early experience

Presenting author: HEMANTH REDDY VANGA, India

Session name: **CS equipment**
Date and time: **10 October 2021, 16:45 - 18:15**
Presentation time: **17:57 - 18:03**
Location: **Hall 11**

Purpose:
To report early experience with a new design of foldable IOL with winged haptics for scleral fixation

Setting:
Nethradhama Super Speciality Eye Hospital, Bangalore, India

Methods:
The new foldable IOL is hydrophilic, with a 6.5 mm optic and an overall diameter of 13mm. The haptics are wing shaped with two central holes to allow passage of a 6-0 prolene suture & two peripheral holes to guide the orientation. The edges of the optic and haptics are rounded with a posterior offset of 5 degrees to prevent rubbing of the IOL against the iris. The IOL can be injected using a front-loading cartridge through a 2.8mm incision

Results:
10 eyes of 10 patients (mean age 65 years) underwent scleral fixation with new foldable IOL design using a modified 4- flanged technique. Main indications were aphakia due to PCR, ZD, subluxated/dislocated IOL. All surgeries were uneventful with no incidence of breakage of suture or slipping of flange from optic holes, while insertion of IOL, using the injector. Except for one eye, which required flange burial due to exposure, no post-op issues were encountered in remaining 9 eyes. IOL position as seen on clinical photography and UBM remained stable and well centered throughout mean follow up of 6 months

Conclusions:
Early experience suggests that the new foldable IOL design could be a safe & feasible option to manage aphakia, however, needs further experience and long-term data

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Nanosecond Laser Cataract Surgery with Soft-Shell technique: Effect on Endothelial Cell Loss

Presenting author: Lutz Blomberg, Germany

Session name: CS equipment
Date and time: 10 October 2021, 16:45 - 18:15
Presentation time: 18:03 - 18:09
Location: Hall 11

Purpose:
The primary aim of this single-center two surgeon retrospective cross-sectional study was to compare endothelial cell loss following NanoLaser cataract surgery with and without the integration of the Soft-Shell technique (a dispersive ophthalmic viscoelastic device (OVD) against the corneal endothelium forming a more persistent protective layer with a high viscosity cohesive OVD posteriorly). Secondary objectives were to evaluate the effect of laser energy and follow-up time on variations of the endothelial cell density, coefficient of variance, and central corneal thickness.

Setting:
Hildesheim-Alfeld-Bockenem Eye Center, Hildesheim, Germany

Methods:
Digital records of all patients who underwent NanoLaser cataract surgery, where nanosecond laser photofragmentation was performed instead of phacoemulsification, during a three-year period were reviewed. Surgical procedures were performed by two surgeons (LB and KN) using a standardized cataract extraction procedure, the former also integrated the Soft-Shell technique. Patients with one baseline and at least one follow-up automated non-contact EM-3000 Specular Microscopy (Tomey, Nagoya, Japan), with endothelial cell density (ECD), rate of polymegethism represented by coefficient of variance (COV) and pachymetry, were enrolled. were recorded. Intraoperative total laser energy was obtained for surgical notes.

Results:
Overall, 55 eyes of 36 patients were enrolled. The two groups: NanoLaser + soft shell (NLSS) and NanoLaser only (NL). Spherical outcome and surgically induced astigmatism on average for each surgeon. Comparison of the modification of ECD, coefficient of variance and central corneal thickness between the two groups did not yield statistically significant differences with an average endothelial cell loss after adequate training was 201±175 for NLSS and 271±201 for NL. The number of cells lost due to surgery was calculated by using linear regression analysis: 46±88 cells for NLSS and 155±87 cells for NL (p=.002).

Conclusions:
While ECD is measured centrally, there are two main sites of cell loss: peripherally due to incisions and direct/indirect contact during instrument manipulation/use. The NanoLaser induced zero energy dispersion in the corneal tunnel and the only damage is induced by instrument movement/friction. Centrally, the Soft-Shell technique significantly reduces the propagation of compression trauma due to fluidics, lens fragmentation, and fragment movements, as well as instrument movement. In conclusion, with NanoLaser with the Soft-Shell technique spares even more endothelial cells than NanoLaser alone.

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Intraocular lens opacification after endothelial keratoplasty: a retrospective cohort monocentric study.

Presenting author: Natalia Lorenzana-Blanco, Spain

Session name: IOL dislo+opac Spec Cases
Date and time: 11 October 2021, 09:45 - 11:15
Presentation time: 09:45 - 09:51
Location: Auditorium

Purpose:
To calculate the specific risk of opacification of different types of intraocular lenses (IOLs) in patients undergoing endothelial keratoplasty (EK) and to determine whether there are differences even if they are made of the same acrylic material.

Setting:
Fundación Jiménez Díaz University Hospital, Madrid (Spain).

Methods:
Retrospective descriptive observational cohort study of all consecutive patients with endothelial dysfunction who underwent EK at our center from June 2009 to October 2020 with a median follow-up of 854 days (range: 384-1570). Patients who underwent EK prior to cataract surgery or with media opacity that made monitoring difficult where excluded. A descriptive, univariate and multivariate statistical analysis of the sample was carried out using the statistical software package SPSS (SPSS Inc., USA). Survival analysis was performed using Kaplan–Meier method.

Results:
Three-hundred-seventy-two eyes of 308 patients were included in the study, 130 males and 178 females, with a mean age of 73 years (range: 65-80). The opacification percentages in the different groups of lenses according to the optic material were: 32.77% in the hydrophilic, 0.78% in the hydrophobic, 0% in the hydrophobic / hydrophilic and 6.45% in the subgroup of eyes were IOL model was not available. IOL Models that showed higher opacification rates were: Akreos Adapt and MI60P AO from Bausch & Lomb (17/68 = 25%) and CT Asphina 409M from Zeiss (22/44 = 50%). Global opacification rate was 12.90%.

Conclusions:
The specific risk of opacification after EK is different for each type of IOL even if they are made of the same acrylic material and it must be calculated for each one to be able to discuss prognosis more precisely with our patients.

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The optical function of IOLs in different opacification patterns: a metrology analysis of 67 explants

Presenting author: Grzegorz Labuz, Germany

Session name: IOL dislo+opac Spec Cases
Date and time: 11 October 2021, 09:45 - 11:15
Presentation time: 09:51 - 09:57
Location: Auditorium

Purpose:
Intraocular lens (IOL) opacification is one of the leading causes of IOL exchange in Europe, which is related to either primary or secondary calcification. This late postoperative complication has often been studied using imaging techniques that identify distinct morphological patterns. In this study, we used optical metrology to determine how the type of opacification would have compromised the IOLs' function prior to explanation.

Setting:
David J. Apple Center for Vision Research, Department of Ophthalmology, University of Heidelberg, Germany.

Methods:
Of 67 explanted IOLs, we identified 28 with homogeneous calcification, 21 with localized calcification, and 18 subluxated lenses without calcification that served as controls. We used the modulation transfer function (MTF) cut-off (0.43 at 100 lp/mm) to define decreased optical quality, following the manufacturers' guidelines for IOL testing. Light scattering was evaluated in vitro using a clinical device.

Results:
Only one control IOL demonstrated a decreased MTF compared to four and 15 in the homogeneous and localized groups, respectively. The MTF-derived metrics did not differ between the homogeneous and control IOLs (P=0.99), but both showed better performance than those with localized pacification (P=0.001). The median straylight parameter in the homogeneous pattern was 181.8 (108.5 to 244.1) deg2/sr, but in the localized group, it was less, and that was 69.8 (17.7 to 250.8) deg2/sr (P=0.02). Both opacification patterns yielded a significant straylight increase compared to the controls (P=0.001).

Conclusions:
We demonstrated that optical quality differs between the two types of opacification. The centrally-localized pattern showed a significant MTF reduction, indicating a larger potential to affect patients' visual acuity. Although localized calcification demonstrated lower straylight than found in the homogeneous form, both conditions may cause severe glare phenomena.

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Estimating the visual impairment from intraocular lens opacification using anterior segment optical coherence tomography

Presenting author: Timur M. Yildirim, Germany

Session name: IOL dislo+opac Spec Cases
Date and time: 11 October 2021, 09:45 - 11:15
Presentation time: 09:57 - 10:03
Location: Auditorium

Purpose:
Estimating the impact of ocular pathologies on the visual quality can be challenging, especially with regard to making therapeutic decisions. The purpose of this study was to visualize and objectively evaluate the influence of localized intraocular lens (IOL) opacification on patient's visual impairment.

Setting:
The David J Apple International Laboratory for Ocular Pathology, Department of Ophthalmology, Heidelberg University Hospital, Heidelberg, Germany

Methods:
High-resolution optical coherence tomography (OCT) cross-section images were obtained of 44 IOL explants using an anterior segment (AS-) OCT device (Heidelberg Engineering, Heidelberg, Germany). In 24 cases, IOL exchange was due to centrally localized opacification. As a control group, 20 IOLs, explanted because of IOL (sub-) luxation were included. Image analysis was performed to find a threshold area value representing a metric for the amount of opacification. Light scattering of all lenses was quantified using a c-quant straylight meter (Oculus, Wezlar, Germany). Correlation between the amount of opacification and straylight was calculated and a simple linear regression model was derived.

Results:
Different patterns of IOL opacification were visualized using a clinical high-resolution OCT device with an in vitro IOL holder. Image analysis showed a mean threshold area of 6.7 ±3.3 % and 2.0 ±0.8 %, and a mean straylight value of 95.1 ±75.6 deg2/sr and 5.0 ±3.4 deg2/sr for the opacified and clear group, respectively. Straylight correlated statistically significant with the threshold area, with a correlation coefficient of $R2=0.80$, $P < 0.001$.

Conclusions:
This novel high-resolution OCT imaging technique can be used to study IOL pathologies. The amount of opacification correlated well with the straylight parameter. AS-OCT imaging might be a useful tool to predicting a patient's visual impairment and aid clinicians to objectify patients' complaints.

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Material analysis of posterior surface silicone intraocular lens opacification in association with asteroid hyalosis

Presenting author: Lizaveta Chychko, Germany

Session name: IOL dislo+opac Spec Cases
Date and time: 11 October 2021, 09:45 - 11:15
Presentation time: 10:03 - 10:09
Location: Auditorium

Purpose:
To analyse and describe the posterior surface opacification of explanted silicone intraocular lenses (IOLs) with clinicopathologic correlation to asteroid hyalosis.

Setting:
The David J. Apple International Laboratory for Ocular Pathology, Department of Ophthalmology, University of Heidelberg, Germany.

Methods:
Ten explanted silicone IOLs underwent laboratory analyses, including light microscopy, histological staining with alizarin red, scanning electron microscopy (SEM) and energy dispersive X-Ray spectroscopy for elemental composition (EDX). Related clinical data were obtained in each case, including gender, age at IOL implantation, dates of implantation and explantation, as well as history of neodymium-dopped yttrium aluminum garnet (Nd:YAG) laser treatments or other opacification removal attempts. High-resolution optical coherence tomography (OCT) images were obtained in-vitro with an anterior segment OCT device (Anterion, Heidelberg Engineering, Heidelberg, Germany).

Results:
In all of the ten analysed silicone IOLs explanted localized posterior opacification was confirmed. SEM and EDX analyses showed that the deposits composed of calcium phosphate and calcification was located at the posterior optic surface of the silicone IOLs. In eight cases, IOL polishing using Nd:YAG laser had been attempted unsuccessfully, prior to IOL exchange. The data of a clinical case shows that this type of IOL opacity predominantly led to subjective symptoms of glare and increase in straylight.

Conclusions:
Silicone IOLs can develop posterior surface calcification in eyes with asteroid hyalosis. There are techniques of cleaning the IOL surface but in some cases IOL explantation has to be performed. The awareness of this association should be taken into consideration.

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Histopathological findings of specimens in the Dead Bag Syndrome

Presenting author: Liliana Werner, United States

Session name: IOL dislo+opac Spec Cases
Date and time: 11 October 2021, 09:45 - 11:15
Presentation time: 10:21 - 10:27
Location: Auditorium

Purpose:
A “dead bag syndrome” has been recently described, in which the capsular bag appears to be clear many years after surgery, becoming diaphanous and floppy, and unable to support the intraocular lens (IOL) within it. The aim of this study was to describe histopathological findings of this syndrome.

Setting:
Intermountain Ocular Research Center, John A. Moran Eye Center, University of Utah

Methods:
Six capsular bags suspected to be from dead bag syndrome cases (mean patient age 65.7 years +/- 5.85 years) were removed due to in-the-bag dislocation of the posterior chamber IOL. The specimens were fixed in formalin and submitted to histopathological examination. The capsular bags were processed, sectioned, and stained with hematoxylin/eosin, and Masson’s trichrome stains. The associated explanted IOLs for five specimens were also examined microscopically.

Results:
Histopathologic examination of the six capsular bags showed capsular thinning and/or splitting. Lens epithelial cells (LECs) were completely absent on one specimen while the other specimens had rare LECs on the inner surface of the anterior capsule. Three of the five explanted IOLs were three-piece silicone lenses while the other IOLs were single-piece hydrophobic acrylic lenses. One IOL optic showed a small amount of granular pigment deposition, but the optics of the other three lenses were unremarkable.

Conclusions:
In this syndrome, there appears to be an absence of secondary proliferation of LECs, as well as fibrotic changes. The capsule shows some signs of degradation, such as thinning and/or splitting. Zonular weakness appears to be an associated finding, with in-the-bag IOL dislocation. Further studies are necessary to ascertain the etiology of this condition.

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Prospective Results after the sutureless intrascleral fixation of a one-piece hydrophilic, foldable intraocular lens

Presenting author: Claudette Abela-Formanek, Austria

Session name: IOL dislo+opac Spec Cases
Date and time: 11 October 2021, 09:45 - 11:15
Presentation time: 10:27 - 10:33
Location: Auditorium

Purpose:
To evaluate the surgical and postoperative outcome after the sutureless scleral fixation (SSF) of a foldable intraocular lens, the Carlevale IOL (Soleko).

Setting:
Department of Ophthalmology, Medical University of Vienna, Austria

Methods:
Thirty eyes of 30 patients with aphakia (2 eyes), dislocated IOL or subluxated lens (28 eyes) who underwent SSF of a one-piece hydrophilic-acrylic Carlevale lens were prospectively included. Pre-, and post-operative refraction, endothelial cell count, complications during and after surgery were documented. The intraocular lens tilt and decentration were evaluated using an anterior segment OCT (Casia). Surgery was performed by one surgeon. The patients underwent 23 gauge vitrectomy, IOL explantation and implantation of the anchor shaped haptics under 2 intrascleral pockets at the 0° axis.

Results:
Mean BCVA was 0.42 ± 0.26 pre-operatively and 0.68 ± 0.34 Snellen 3-months postoperatively. The predictive error spherical equivalent was -0.06 D (-1.64 - +1.37 dpt.); the intraocular lens tilt was 6.97° ± 2.57° (4.4°-13.3°). Decentration was 0.40 mm ± 0.21mm. Surgically induced Astigmatism was 0.84 dpt ± 0.59 dpt.. The mean corneal endothelial cell density decreased from 1,848 to 1,743 cells/mm2 at 3 months. Cystoid macular edema and vitreous hemorrhage occurred each in 1 patient; one case with retinal detachment was successfully reattached, 2 cases of haptic exposure are under observation. Reverse pupillary block and lens dislocation were not observed.

Conclusions:
SSF using the Carlevale Lens represents a reproducible, minimally invasive surgical technique with good postoperative results increasing the armamentarium available for secondary lens implantation in the absence of the capsular bag.

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Clinical Outcomes of Scleral Fixation Techniques of Intraocular Lenses - Sutured Versus Flanges

Presenting author: Guy Kleinmann, Israel

Session name: IOL dislo+opac Spec Cases
Date and time: 11 October 2021, 09:45 - 11:15
Presentation time: 10:33 - 10:39
Location: Auditorium

Purpose:
To compare the results, safety and efficacy of these two scleral fixation techniques

Setting:
Kaplan Medical Center, Rehovot, Israel, and Edith Wolfson Medical Center, Holon, Israel

Methods:
A retrospective case series of IOL fixation surgeries performed at Kaplan Medical Center and at Edith Wolfson Medical Center using one of two techniques: sutured scleral fixation (group A) or flanged scleral fixation (group B), during 2008-2021, by experienced surgeons. Patients were evaluated for visual acuity, refraction, operation time, and complications.

Results:
One-hundred and sixteen patients were included in the study (A: 76, B: 40) Baseline patients' characteristics were similar. Post-operative corrected distance visual acuity (CDVA) was similar between groups (A: 0.3, B: 0.4 LogMAR (P=0.9)). Post- operative complications were similar, except for higher anterior chamber cell reaction in group A (59.2% vs 29.4%, p=0.03). Group B had significantly higher rate of additional procedures performed during surgery (72.5% vs. 31.5%, p<0.001), whilst surgery time was similar (p=0.22). A multivariate analysis showed that group B remained significantly associated with reduced surgical time (OR = 0.09, 95% CI= 3.7 to 32.1, P = 0.014).

Conclusions:
'Flange technique' for IOL fixation is non inferior to the known sutured IOL fixation technique, with same visual results and complication rates, and reduced surgical time.

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SPIDER IOL surgical technique – 9 years of experience

Presenting author: Natália Ferreira, Portugal

Session name: IOL dislo+opac Spec Cases
Date and time: 11 October 2021, 09:45 - 11:15
Presentation time: 10:45 - 10:51
Location: Auditorium

Purpose:
To describe a surgical technique for management of cases with inadequate or capsular support absence, named by the authors as "Spider IOL technique". This includes a combined pars plana vitrectomy with knotless zigzag transscleral suture fixation of foldable, 4 haptics, acrylic hydrophobic from Bausch&Lomb Akreos Adapt ®AO IOL, by small incision implantation. To determine population characteristics, evaluate anatomical and functional results and complications.

Setting:
Natália Ferreira Department of Ophthalmology, Centro Hospitalar Universitário do Porto, Largo do Prof. Abel Salazar, 4099-001 Porto, Portugal Rui Carvalho Hospital Pedro Hispano - Unidade Local de Saúde de Matosinhos Rua Dr. Eduardo Torres / 4464-513 Senhora da Hora

Methods:
Retrospective, consecutive, case-series analysis of 121 eyes of 111 patients, submitted to Spider IOL technique, by 2 surgeons, between October 2011 and December 2020, with minimum follow-up of 2 months. Indications were in-the-bag IOL-capsule-complex dislocation (IOLCCD), complicated cataract surgery (CCS), long-time surgical aphakia (SA), corneal endothelium decompensation (CED), lens dislocation (LD), IOL dislocation (IOLD) and complications related to previous scleral fixated IOL (SFIOL). Demographic data, pre-operative phakic state, predisposing factors (pseudoexfoliation, glaucoma, high myopia, trauma and previous surgery), additional procedures and complications were recorded. Main anatomical and functional outcome measures (best corrected visual acuity improvement, postoperative refractive cylinder) were analyzed.

Results:
121 eyes from 111 patients, 56.8% male, mean age of 75.6 years were included, with mean follow-up of 13 months (range 2-80). Most frequent causes for Spider IOL technique were: IOLCCD (55.4%), LD (13.2%), IOLD (11.6%) and CCS (10.8%). In IOLCCD group, 43.3% had AA-IOL rescued and repositioned with scleral-fixation and 56.7% had IOL exchanged to new AA-IOL. Mean BCVA improvement was 31,0 letters. Postoperative mean cylinder was 0,993. Main postoperative complications were: IOP elevation (n=19), glaucoma surgery need (n=6), cystoid macular edema (n=8), endothelial decompensation (n=1), retinal detachment (n=1). No corneal-wound leakage, recurrent intraocular bleeding, endophthalmitis, AA-IOL-dislocation occurred postoperatively.

Conclusions:
IOL Spider technique led to significant improvement in visual acuity, being a safe, predictable and efficient procedure. This procedure, combined advantages of small incision surgery (low induced astigmatism), of one piece four haptics IOL design (adequate centration and stabilization) and of knotless suture fixation (no suture related complication reported). Optimal anatomical and functional outcomes were observed. Incidence of postoperative complications were very low and related with previous predisposing factors, as glaucoma worsening.

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Comparison of 2 techniques for sutureless intrascleral IOL fixation

Presenting author: Adrian Reumueller, Austria

Session name: IOL dislo+opac Spec Cases
Date and time: 11 October 2021, 09:45 - 11:15
Presentation time: 10:51 - 10:57
Location: Auditorium

Purpose:
To compare the outcome of the transconjuctival double needle flanged technique described by Yamane versus the intrascleral Scharioth technique in eyes with absent capsular support

Setting:
Retrospective, single-surgeon, cohort study in a university hospital.

Methods:
Thirty-six consecutive patients operated between 10/2018 and 01/2020 who underwent sutureless intrascleral IOL fixation (SIS) were included. 21 eyes received the Yamane technique (YT) and 15 eyes the Scharioth technique (ST). The records were searched for indication of surgery, intra- and postoperative complications and visual acuity over a period of 3-6 months. Lens tilt and decentration were measured with the anterior segment OCT data (Casia 2, Tomey, Japan).

Results:
Spontaneous IOL dislocation (61.1%) and complicated cataract surgery (16.7%) were the main indications for surgery. PEX was diagnosed in 36%. Surgical technique was altered intra-operatively in 3 cases due to haptic associated complications. There were no severe intra- or postoperative complications. Optic-iris capture was observed in 3/21 eyes in YT and 2/15 in the ST group. Mean IOL tilt was 3.7° (ST) and 7.5° (YT)(p=0.16). Mean IOL decentration was 1.2 mm (ST) and 0.82 mm (YT) (p=0.65). Visual acuity (Snellen) improved from 0.49 (ST) and 0.48 (YT) to 0.59(ST) and 0.61(YT).

Conclusions:
ST and YT are equally feasible options for SIS. The haptic length and material are crucial factors often determining the success of surgery. Iris capture was common in both techniques suggesting that the sclerotomies for haptic placement should be at least 2-2.5 mm from the limbus.

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Influence of combined phacovitrectomy without tamponade on intraocular lens displacement and postoperative refraction

Presenting author: Maximilian Gabriel, Austria

Session name: IOL dislo+opac Spec Cases
Date and time: 11 October 2021, 09:45 - 11:15
Presentation time: 10:57 - 11:03
Location: Auditorium

Purpose:
To investigate if phacovitrectomy without air or gas tamponade causes intraocular lens (IOL) displacement or refractive changes and to correlate surgically induced macular thickness change with postoperative refractive error.

Setting:
Prospective, bilateral comparison.

Methods:
This prospective bilateral comparison study included 40 eyes of 20 patients. Inclusion criteria were combined phacovitrectomy in one eye and cataract surgery in the contralateral eye. Both eyes received angulated single-piece hydrophobic IOLs. Postoperative anterior chamber depth (ACD) was compared between both groups 1-5 hours, 1 day and 8 weeks after surgery using the paired t-test or the Wilcoxon signed-rank test. Postoperative refraction was compared after 8 weeks using Holladay I, HofferQ, SRK/T and Haigis formulae. Pearson's coefficient was used to describe the correlation between surgically induced macular thickness change and postoperative refractive error.

Results:
There were no intergroup differences in ACD (8 weeks: 0.02 mm absolute difference, SD 0.22, range -0.36 – 0.65, p = 0.401), mean absolute refractive error (8 weeks: Holladay I p = 0.452; HofferQ p = 0.475; SRK/T p = 0.498; Haigis p = 0.869) or percentages within the 0.5D and 1.0D range at any time point. All formulae were optimized separately for the phacovitrectomy and the cataract group. In both groups the correlation of macular thickness change and refractive error was low (cataract group r2 = -0.13, p = 0.579; phacovitrectomy group r2 = -0.10, p = 0.678).

Conclusions:
Combined phacovitrectomy without air or gas tamponade caused neither IOL displacement nor refractive shifts compared to phacoemulsification alone. Surgically induced macular thickness change had no significant influence on postoperative refraction. All four IOL formulae showed comparable postoperative refractive outcomes.

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Intraocular Lens stabilisation with the fixOflex intracapsular ring

Presenting author: Ioannis Pallikaris, Greece

Session name: **IOL dislo+opac Spec Cases**
Date and time: **11 October 2021, 09:45 - 11:15**
Presentation time: **11:03 - 11:09**
Location: **Auditorium**

Purpose:
The fix-O-flex (EYE-PCR B.V) intracapsular ring is implanted in the capsule prior to the intraocular lens to facilitate its centration while maintaining the anatomical shape of the peripheral capsule. We report on the clinical outcomes in a cohort of 96 patients from an ongoing clinical study with follow up data up to 12 months.

Setting:
Elnour Eye Center, Alexandria, Egypt and University of Crete, Heraklion Greece

Methods:
The fix-O-flex ring has an external diameter of 9.8 mm and a thickness of 1.7mm and is implanted via a 2.2mm injector. It has an internal grove to receive the IOL's haptics and additional features to secure the optic of the IOL concentrically with the ring. Ninety-six (96) patients were randomly recruited and received the ring in combination with a Tecnis (ZCB00) (Johnson And Johnson New Brunswick, NJ) IOL. Follow up intervals included one day, one week, one month, three months, six and twelve months postoperatively.

Results:
Mean Best Spectacle corrected Visual Acuity after 1 week was 0.8 (SD 0.21) and remained stable up to 1 year follow up (no statistically significant difference was observed for any postoperative interval in comparison to 1 week postoperatively). Similarly, refraction (SE) was stabilized after 1 week at the mean value of -0.91D (SD 1.25). Mean time for ring implantation was 1 min and 17 sec (SD 0.31 min). In 6 patients (6.18%) the ring required additional manipulations for centration after injection. Mild PCO was reported in 2 cases in the 12-month follow up period. No serious adverse events were observed.

Conclusions:
The Fix-o-flex ring provides an open capsule space for IOL implantation. Biometry and refraction were stable postoperatively. Implantation was fast and safe. Intraoperative complications involved the position of the ring and the IOL after implantation and were controlled by surgical manipulations.

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Long term Results for Eyes Treated with a Schlemm's Canal Microstent as a Standalone Procedure for Glaucoma

Presenting author: Antonio Maria Fea, Italy

Session name: Glaucoma
Date and time: 11 October 2021, 11:30 - 13:00
Presentation time: 11:30 - 11:36
Location: Hall 9

Purpose:
To characterize long-term (up to 5 years) reductions in intraocular pressure (IOP) and IOP-lowering medication use following standalone implantation of a Schlemm's canal microstent (Hydrus Microstent, Ivantis, Irvine, CA) in clinical practice. The study population consists of eyes with a diagnosis of primary open angle glaucoma and no prior incisional glaucoma surgery. All patient data was extracted from the SPECTRUM global registry of over 2900 Hydrus Microstent procedures.

Setting:
The study population consisted of patients with a glaucoma diagnosis drawn from 34 clinical sites located in 15 countries in Europe, Asia, Australia, South and Central America, and Canada.

Methods:
Eligibility criteria for inclusion in this analysis included age >18 years, diagnosis of primary open-angle glaucoma (POAG), no prior history of incisional glaucoma surgery, standalone microstent implantation without cataract surgery, and a minimum of 3 months postoperative follow-up with no missing primary outcome data. A deidentified data set was analyzed. Changes in IOP and the use of IOP-lowering medications were compared from baseline at each postoperative time point using paired t-tests. Safety analysis included characterization of adverse events and need for additional surgical procedures. 406 eyes from 353 subjects met inclusion criteria.

Results:
Mean (SD) IOP at baseline was 20.2 (6.1) mmHg. Follow up mean IOP ranged from 14.6 (3.9) mmHg at 48 months to 16.6 (4.4) mmHg at 3 months, representing IOP reductions ranging from 3.5-5.8 mmHg ($p<0.0001$ at all visits). Mean medication use was 2.5 (1.2) at baseline and were reduced through 60 months, ranging from 1.2-1.6 medications per eye ($p=0.005$) at all visits. The most frequent adverse events were IOP elevations >10 mmHg above baseline (4.2%) and peripheral anterior synechiae (3.7%). Incisional glaucoma surgeries were performed in 11.8% of eyes through 60 months.

Conclusions:
Standalone microstent implantation in eyes with POAG in clinical, non-trial setting produces significant and lasting reductions in both IOP and the need for IOP-lowering medications, with an excellent safety profile and low rate of failure requiring additional surgery. This procedure should be considered in patients with POAG who require long-term moderate reductions in IOP reduction, medication, or both.

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Five-Year Outcomes of Trabecular Micro-Bypass Stents (iStent inject) Implanted with or without cataract surgery

Presenting author: Fritz H Hengerer, Germany

Session name: Glaucoma
Date and time: 11 October 2021, 11:30 - 13:00
Presentation time: 11:42 - 11:48
Location: Hall 9

Purpose:
As Germany was one of the first countries to have commercial availability of the iStent inject trabecular micro-bypass, datasets from German surgeons are some of the longest-running and most informative in the world to-date. The present study evaluated five-year efficacy and safety following iStent inject implantation in glaucomatous eyes with varying disease severities and surgical histories. Stent implantation was performed either with phacoemulsification or as a standalone procedure. The completion of both types of procedures by the same surgeon in the same clinical setting enables validation of the long-term intraocular pressure (IOP)-/medication-lowering potential of the stents, independent from cataract extraction

Setting:
Large academic ophthalmology center in Heidelberg, Germany.

Methods:
This prospective single-surgeon consecutive case series evaluates iStent inject implanted in 125 eyes either with cataract surgery (Combined) or as a standalone procedure (Standalone), with all but 3 eyes (98%) reaching 60 months (60M) of follow-up. All eyes had successful implantation of 2 iStent inject stents. Open-angle glaucoma (OAG) was the principal diagnosis, with other glaucoma sub-types included. Outcomes were analyzed for the overall cohort as well as for the two subgroups (Combined and Standalone). Outcomes through 60M included IOP, medication burden, and safety parameters.

Results:
Preoperatively, mean IOP in the overall cohort (n=125) was 23.5±6.2mmHg on 2.68 mean medications; this reduced to 13.9±2.2mmHg on 0.77 mean medications at 60M (41% and 71% reductions, respectively; $p<0.001$ for both). All but 1 eye (>99%) were on medications preoperatively, but by 60M, nearly half (46%) were medication-free. In Combined eyes (n=81), mean IOP decreased from 22.6mmHg to 13.6mmHg (40% reduction, $p<0.001$), and medications from 2.52 to 0.78 (69% reduction, $p<0.001$). In Standalone eyes, mean IOP reduced from 25.3mmHg to 14.6mmHg (42% reduction, $p<0.001$) and medications from 2.98 to 0.74 (75% reduction, $p<0.001$). Safety outcomes were highly favorable.

Conclusions:
iStent inject implantation resulted in significant reductions in IOP and medication burden, with treatment effects enduring consistently through 5 years. Outcomes were similar in Combined and Standalone eyes, validating the long-term effect of the stents apart from cataract extraction. Although the cohort had relatively high medication burden preoperatively, nearly half of eyes were medication-free by five years, while mean IOP decreased by nearly 10mmHg. Importantly, results were gathered prospectively in consecutive patients from the surgeon's clinical practice, making the data relevant to surgeons and patients in both Combined and Standalone settings.

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Minimally invasive glaucoma surgery with three generations trabecular micro-bypass implants in combination with cataract surgery for glaucoma: results after 1 year.

Presenting author: Lotte Scheres, Netherlands

Session name: Glaucoma
Date and time: 11 October 2021, 11:30 - 13:00
Presentation time: 11:48 - 11:54
Location: Hall 9

Purpose:
To determine and compare the efficacy and safety of combined cataract surgery with three generations trabecular micro-bypass implants: iStent®, iStent inject®, and iStent Inject W® (Glaukos Corporation, Laguna Hills, CA, USA).

Setting:
Single-center prospective interventional study.

Methods:
All consecutive trabecular micro-bypass stent implantations in combination with cataract surgery at the University Eye Clinic in Maastricht between June 2017 and November 2020 were studied prospectively. Patients underwent standard phacoemulsification with implantation of an intraocular lens, under sub-Tenon's anaesthesia. The stents were implanted under direct gonioscopic guidance via an ab-interno approach into the trabecular meshwork. In the iStent group one stent was implanted, and two stents were implanted in the iStent inject and iStent inject W groups. Main outcome measures were IOP levels, IOP-lowering medication use and safety.

Results:
Two hundred forty-nine eyes were included, the majority diagnosed with advanced or severe glaucoma (66%), based on mean deviation on the visual field. At baseline, mean±SD IOP was 16.9±4.9mmHg, 56% of the eyes was on three or more medications , 7% was medication-free. At 6 months postoperative, mean IOP of the iStent, iStent inject and the iStent inject W groups was 12.9±2.4, 12.7±2.9 and 11.7±2.4mmHg, respectively. After one year, overall mean IOP was decreased to 13.2±3.3 mmHg, 31% was medication-free. The most commonly observed adverse event was mild hyphema, usually resolving within the first postoperative week.

Conclusions:
Trabecular micro-bypass stent implantation in combination with cataract surgery is safe and effective in lowering the IOP and reducing the number of IOP-lowering medications.

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Baerveldt Valve and Aurolab Aqueous Drainage Implant (AADI) surgical results: 18 months comparison

Presenting author: Juan Carlos Izquierdo, Peru

Session name: Glaucoma
Date and time: 11 October 2021, 11:30 - 13:00
Presentation time: 12:00 - 12:06
Location: Hall 9

Purpose:
To compare the surgical results of the Baerveldt valve implant and the Aurolab Aqueous Drainage Implant (AADI) over a period of 18 months.

Setting:
Instituto de Ojos Oftalmosalud. Lima, Perú

Methods:
Retrospective study in which a total of 74 patients were evaluated, of which 40 patients (45 eyes) underwent Baerveldt valve implant surgery and 34 patients (40 eyes) underwent Aurolab Aqueous drainage implant valve. (AADI) with an 18-month follow-up after surgery. Follow-up controls were carried out at 1 day, 1 month, 3 months, 6 months, 12 months and 18 months.

Results:
Significant reduction of intraocular pressure in both groups. In AADI, decreased from 31.4 +- 10.1 to 12.3 +- 3.6 mmHg. at 18 months of follow-up, while with the Baerveldt valve, decreased from 26.7 +- 10.4 to 12.8 +-3.1 mmHg. The effect in reducing the number of drugs was significantly greater in the AADI group (4.2 +-0.8 at baseline to 1.7 +-1.3 at 18 months) compared with Baerveldt (3.3 +-0.6 at baseline to 1.9 +-1 at 18 months) ($p < 0.001$). The most frequent complication was choroidal detachment in both groups, this being more frequent in AADI group (22.5%) than Baerveldt group (6.7%).

Conclusions:
Both procedures are effective in reducing intraocular pressure, however there was a greater reduction in hypotensive drugs in patients with AADI and the rate of complications was higher in AADI, which resolved without the need for a second surgical intervention. No financial disclosure of the author.

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PreserFlo Microshunt - the better trabeculectomy? Two- year results with a new microshunt in surgical glaucoma therapy

Presenting author: Jan Werth, Germany

Session name: Glaucoma
Date and time: 11 October 2021, 11:30 - 13:00
Presentation time: 12:06 - 12:12
Location: Hall 9

Purpose:
The PreserFlo Microshunt (Santen) is a new glaucoma implant for lowering intraocular pressure via a subtenonal drainage. In contrast to the known methods of minimally invasive glaucoma surgery the microshunt has to be implanted from an external approach. We present our 2-year results on the effectiveness of intraocular pressure reduction, safety and rate of complications as well as postoperative treatment and need of second surgery in patients open angle glaucoma.

Setting:
In this prospective 24-month data analysis, the safety and effectiveness from Preserflo Microshunt implantation.

Methods:
The Preserflo Microshunt was implanted in 130 eyes of 96 patients as a stand-alone procedure. We monitored the intraocular pressure, the number of postoperative medication as well as visual acuity, visual field defects and endothelial cell loss. Regular monitoring of the filter zone by swept-source-OCT was also performed.

Results:
All eyes showed a significant reduction in pressure during the postoperative observation period. The mean medicated baseline intraocular pressure was 28.3 mmHg. Postoperatively the intraocular pressure was 9.6 mmHg on average after 12 month and 12,8 mmHg after 2 years. The number of medications decreased from 2.66 to 0.06 at year 1 and 0.2 after 2 years. Needling and revision rate depends strongly to the used concentration of MMC (0,02% to 0,04%). With a modified surgical technic and the routine use of 0,04% MMC the needling rate was less than 10% and the revision rate less than 5 %.

Conclusions:
After two years, the PreserFlo MicroShunt shows a very effective and lasting intraocular pressure reduction. The number of complications was significantly lower compared to published data for trabeculectomy. If the IOP lowering effect prolongs over a longer period and the safety data are as good as today the PreserFlo Microshunt could be a alternative surgery in cases of open angle glaucoma.

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Prolene Gonioscopy-assisted transluminal trabeculectomy alone or combined with cataract extraction: 5-year outcomes

Presenting author: Huri Sabur, Turkey

Session name: Glaucoma
Date and time: 11 October 2021, 11:30 - 13:00
Presentation time: 12:12 - 12:18
Location: Hall 9

Purpose:
To evaluate the success, safety, and complication rates of gonioscopy-assisted transluminal trabeculotomy (GATT) alone or combined with cataract extraction

Setting:
Department of Ophthalmology, Uludag University Faculty of Medicine, Bursa, Turkey

Methods:
This retrospective study included 65 eyes of 65 patients who underwent GATT using 5/0 prolene suture to treat open-angle glaucoma. The GATT surgery was performed alone or combined with phacoemulsification. The data on age; preoperative and final visual acuity; intraocular pressure (IOP) preoperatively and 1st week, 1st month, 3rd months, and every 6th months postoperatively; the number of anti-glaucoma medications used preoperatively and postoperatively; and postoperative complications were recorded. Surgical success was determined as IOP <21 or ≥ 20% reduction from baseline without further glaucoma surgery

Results:
The preoperative mean IOP was 34.2 ± 10.6 mmHg. The preoperative mean number of anti-glaucoma medications was 3.4 ± 0.6. In all postoperative follow-ups, IOP was significantly lower than preoperative values (p=0.00). While the mean preoperative visual acuity was logMAR 1.57 ± 1.2, the mean postoperative visual acuity was logMAR 0.39 ± 0.38 (p <0.05). The mean number of anti-glaucoma medications was reduced to 0.3± 0.7 (p=0.00). All eyes had the IOP of ≤21mmHg in 87.6% (1yr), 83.1% (2 and 3yr), and 76.9% (5yr). Surgical outcomes were similar between patients who underwent GATT alone or combined with cataract extraction (p>0.05).

Conclusions:
GATT procedure is a safe and successful method of lowering the IOP with a high safety profile. Performing GATT in the same session with cataract extraction does not reduce the efficacy of GATT

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The Effect of Trabelcular Micro-Bypass Stent Implantation Combined With Cataract Surgery Using Hydrophilic Versus Hydrophobic Intra-ocular Lenses on Intra-ocular Pressure in Patients With Glaucoma: Real-life 1 Year follow-up

Presenting author: Fadi Haddad, United Kingdom

Session name: Glaucoma
Date and time: 11 October 2021, 11:30 - 13:00
Presentation time: 12:18 - 12:24
Location: Hall 9

Purpose:
To compare the effect of iStent-Inject combined with cataract using different lens materials (hydrophobic versus hydrophilic) on intra-ocular pressure in patients with glaucoma

Setting:
27 eyes of 27 patients which underwent standard phacoemulsification and intra-ocular lens implantation (either hydrophilic or hydrophobic) combined with 2 iStent inject implantation by one surgeon. All cases were uneventful

Methods:
A longitudinal prospective real-life study including 27 patients who underwent iStent inject (Glaukos, San Clemente, USA) with hydrophobic (n=15) (HOYA iSert250 preloaded IOL system, Hoya Medical, Singapore) or hydrophilic (n=12) (RayOne, Rayner intraocular lenses limited, UK) IOL implantation. Age, baseline visual acuity and 24-2 SITA-Fast mean deviation and pattern standard deviation were comparable in both groups. Complete success (5≤IOP≤18 mmHg, no antiglaucoma medications, no complications),and qualified success (5≤IOP≤18 mmHg, with antiglaucoma medications, no complications) were recorded. 2-tailed t-test was performed to compare IOP and medication classes

Results:
The IOPs were 18.5±3.50, 14.50±2.62, 11.60±3.29, 13.91±2.84 and 12.08±2.43 for the hydrophilic IOLs and 19.20±5.20, 14.40±4.39, 13.56±3.71, 14.00±2.90 and 13.38±3.12 for the hydrophobic IOLs at baseline,1,3,6 and 12 months post-operatively, respectively. The medication classes were 2.83±1.95, 1.82±1.40, 0.8±0.84, 1.25±1.36 and 1.25±1.29 for the hydrophilic IOLs and 2.33±1.29, 1.80±1.47, 1.80±1.14, 1.73±1.53 and 1.79±1.76 for the hydrophobic IOLs at baseline, 1,3,6 and 12 months post-operatively, respectively. Complete success was achieved in 25% of hydrophilic IOLs and 20% of hydrophobic IOLs at 12 months while qualified success in 75% and 60%, respectively. 1 eye receiving hydrophobic IOL underwent a trabeculectomy.

Conclusions:
No evidence of statistically significant outcome alteration related to IOL structure has been shown in our study. Long term results need to be reported

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A European Study of the Efficacy and Safety of a Supraciliary Glaucoma Drainage Device in Patients with Open Angle Glaucoma

Presenting author: Julián García-Feijoó, France

Session name: Glaucoma
Date and time: 11 October 2021, 11:30 - 13:00
Presentation time: 12:30 - 12:36
Location: Hall 9

Purpose:
To describe the safety and efficacy profile of a novel, supraciliary, micro-invasive glaucoma surgery (MIGS) drainage system, MINIject (iSTAR Medical, Wavre, Belgium), in European patients with medically-uncontrolled open-angle glaucoma.

Setting:
The trial was carried out as a prospective, multi-centre, interventional, single-arm study in 8 sites across 3 countries in Europe (STAR-II).

Methods:
A 5mm-long supraciliary device was successfully implanted in 29 eyes in a stand-alone, ab-interno procedure. The device is made of biocompatible STAR® material which is soft and flexible silicone in a micro-porous network design. The primary endpoint is the success rate 6 months after surgery, greater than 60%. Success is defined as diurnal intraocular pressure (IOP) ≤ 21mmHg and more than 5mmHg with a minimum 20% reduction from baseline, with or without glaucoma medication. Washout was not performed in this study. Here preliminary results up to 18 months are reported.

Results:
Baseline mean diurnal IOP was 24.6±3.8mmHg using 2.9±1.2 IOP-lowering medications. At 6-month follow-up, 75.9% of patients reached success, meeting the primary endpoint. At 18-months post-implantation, the success rate in 27 patients was 88.9%. Mean diurnal IOP was reduced by 9.5mmHg (38.5%) from baseline to 14.7±5.4mmHg at 18 months. Furthermore, mean medication use was 1.4±1.3, a mean reduction of 1.4 medications (51.4%) compared with baseline. IOP ≤18 mmHg was achieved in 77.8% of patients. Serious adverse events related to the device included: IOP increase (5 patients), and eye pain, corneal erosion, and chorioretinal folds (1 patient each), all of which resolved.

Conclusions:
This supraciliary MIGS device implanted in a standalone procedure was shown to be a powerful treatment option to reduce IOP by 38.5% 18 months post-implantation while decreasing the need for medication in patients with open-angle glaucoma. The minimally invasive delivery of MIGS represents a safety advantage compared with other surgical treatment options that use an ab-externo approach and/or require a bleb. This study confirms the potential efficacy of using a MIGS implant standalone in the supraciliary space to reduce IOP. Long-term results up to 24 months are awaited. ClinicalTrials.gov: NCT03624361

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5-Year Efficacy and Safety of iTrack Ab-interno Canaloplasty as a Standalone Procedure and Combined with Cataract Surgery in Primary Open-Angle Glaucoma

Presenting author: Norbert Koerber, Germany

Session name: Glaucoma
Date and time: 11 October 2021, 11:30 - 13:00
Presentation time: 12:36 - 12:42
Location: Hall 9

Purpose:
To evaluate the long-term effectiveness of iTrack (Nova Eye Medical Inc., Fremont, USA) ab-interno canaloplasty in reducing intraocular pressure (IOP) and glaucoma medications in patients with primary open-angle glaucoma (POAG).

Setting:
Augencentrum Köln-Porz, Köln, Germany

Methods:
In this retrospective monocentric consecutive case series, 27 eyes of 22 patients, with a mean age of 77.3 ± 5.8 years were treated with ab-interno canaloplasty (iTrack microcatheter) performed as a standalone procedure or combined with cataract surgery and followed for up to 5 years following the procedure. The iTrack was used to circumferentially intubate and viscodilate Schlemm's canal over 360 degrees. Primary efficacy endpoints included intraocular pressure (IOP) and number of glaucoma medications at 12, 24, 36, 48 and 60 months after surgery.

Results:
Mean IOP was statistically significantly reduced from 19.8±5.2mmHg at baseline to 14.4±3.3mmHg at the 60-month follow-up ($p<0.001$). The number of glaucoma medications was statistically significantly reduced from 1.92±1.00 at baseline to 0.89±0.83 at the 48-month follow-up; there was no statistically significant difference between the mean number of medications at baseline and the 60-month follow-up (1.21±0.97; $p=0.277$). At 60 months, the mean percentage reduction in IOP was 30.9±19.9% and 57.1% of eyes were on 1 medication or less. No serious complications were recorded.

Conclusions:
iTrack ab interno canaloplasty performed as a standalone procedure or in combination with cataract surgery significantly reduced IOP in patients with POAG up to 5 years after the procedure. Patients also experienced a statistically significant reduction in medication dependency at the 4-year follow-up, but that reduction started to recede between the 4-year and 5-year follow-up.

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One-Year Outcomes of Preserflo MicroShunt in Pseudoexfoliation Glaucoma.

Presenting author: Matthias Nobl, Germany

Session name: Glaucoma
Date and time: 11 October 2021, 11:30 - 13:00
Presentation time: 12:42 - 12:48
Location: Hall 9

Purpose:
To compare the safety and efficacy of Preserflo MicroShunt (microshunt) implantation augmented with Mitomycin C in patients with pseudoexfoliation glaucoma (PEXG) and primary open-angle glaucoma (POAG).

Setting:
This was an investigator initiated, retrospective, interventional study conducted at a single, tertiary ophthalmology centre in Munich, Germany.

Methods:
46 eyes of 41 patients with PEXG (20 eyes) and POAG (26 eyes) underwent microshunt implantation. Definition of surgical success was missing of intraocular pressure (IOP) outside the range of 5 to 17mmHg and missing of IOP reduction lower than 20% on two consecutive visits each, missing of surgical revisions or reoperations and no loss of light perception. Outcome was rated as complete success if achieved without medication, otherwise as qualified success. Furthermore, postoperative complications and interventions were compared between the two groups.

Results:
Demographics were similar, except for older age in the PEXG group (70.9±8.6 versus 77.6±8; p=0.02). Mean IOP dropped from 21.5±5.8mmHg (PEXG) and 18.2±4.5mmHg (POAG) to 12.8±3.0mmHg (p<0.0001) and 12.9±4.2mmHg (p<0.0001), respectively, at one year. Mean number of medications were reduced from 2.8±1.3 to 0.3±0.8 for PEXG patients (p<0.0001) and from 2.7±1.3 to 0.3±0.8 for POAG patients (p<0.0001). At one year 75.0% of PEXG patients achieved complete success and 80.0% qualified success. In the POAG group rates were 73.1% and 76.9%, respectively. Postoperative complications were comparable, except for higher rates of hypotony (p=0.04) and choroidal detachment (p=0.03) in the PEXG group.

Conclusions:
Microshunt implantation demonstrated similar efficacy and safety results in PEXG and POAG eyes at a follow-up of 12 months.

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Transscleral cyclophotomodulation in patients with glaucoma after vitreoretinal surgery - own results

Presenting author: Ewa Mrukwa-Kominek, Poland

Session name: Glaucoma
Date and time: 11 October 2021, 11:30 - 13:00
Presentation time: 12:48 - 12:54
Location: Hall 9

Purpose:
The aim of this study was to present the use of transscleral cyclophotomodulation in patients with glaucoma, and to assess the efficacy and safety of this intervention in patients with secondary glaucoma after posterior vitrectomy. Currently, the method of intraocular pressure (IOP) lowering is selected based on its effectiveness and patient's safety. Minimally invasive glaucoma therapies are therefore becoming increasingly popular including cyclophotocoagulation with the Cyclo G6 micropulse laser (IRIDEX, Mountain View, California, USA).

Setting:
Department of Ophthalmology, School of Medicine in Katowice, Medical University of Silesia, Poland
Department of Ophthalmology, Professor K. Gibinski University Hospital Center, Medical University of Silesia, Poland

Methods:
From September 2019 through September 2020, Cyclo-G6 micropulse laser cyclophotocoagulation was performed in patients who had previously undergone posterior vitrectomy. The analysis comprised 5 women and 3 men (aged 36-95 years) with secondary glaucoma. MP-TLT was performed under local and periocular anesthesia, using the Cyclo G6 laser. After the procedure, the patients continued their anti-glaucoma treatment, which was individually tailored depending on follow-up IOP evaluations. The following parameters were assessed prior to surgery and during the follow-up: best corrected distance visual acuity, IOP, the number of active substances in the eyedrops used and postoperative complications.

Results:
During the observation period, the number of active substances in the eyedrops used and visual acuity were at a similar level as before the surgery. However, IOP decreased compared to pre-treatment and was within the normal range. The pre-surgery mean IOP was 27.5±6.85 mmHg decreasing to 19.25±5.55 mmHg after 1 week, 17.75±3.37 mmHg after 1 month and 14.83±2.93 mmHg after 3 months. No adverse effects were seen, except slight procedure-related inflammation of the anterior segment. No additional treatments were required to lower the IOP.

Conclusions:
Our results indicate that cyclophotocoagulation with the Cyclo G6 micropulse laser is an effective and safe method to decrease intraocular pressure, also in patients with secondary glaucoma developed after posterior vitrectomy. Hence, anti-glaucoma surgery can be delayed. There are no publications on the use of the Cyclo G6 laser for the treatment of glaucoma in eyes after posterior vitrectomy while numerous articles deal with the problem of high post-vitrectomy IOP as well as its treatment