

Symposium: Customized ablation in surgical management of irregular astigmatism

113-01

Irregular astigmatism: definition, classification, topographic, wavefront and clinical presentation

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Purpose: A comprehensive review of the concept of irregular astigmatism, various definitions and indices used in the literature, classification systems, topographical presentations, and common clinical correlates.

Methods: Review of literature and clinical representative cases of irregular astigmatism, including classifications, statistical indices and correlates between corneal topography, wavefront aberrometry and clinical presentations.

Results: Classification systems and statistical indices are useful in describing irregular astigmatism. Study of correlations between corneal topography, wavefront aberrometry and clinical presentations are helpful to identify disease etiology and treatment plan.

Conclusion: Irregular astigmatism can be described and classified through statistical indices which together with corneal topography and wavefront sensing provides the best tool in the diagnosis and management.

113-02

Requirements of the laser delivery technology for treatment of irregular astigmatism

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Purpose: To introduce and discuss the technology required for treatment of irregular astigmatism.

Methods: A special emphasis will be put on a platform-free reasoning in the pursue of the ideal refractive solutions by discussing different hardware solutions from various manufacturers, together with the corresponding software solutions. Many of the possible sources of errors in the data acquisition, or in any other step in the treatment chain will be identified and debated.

Results: Ablation pattern for treatment of irregular astigmatism addresses the peculiarities and irregularity of the astigmatism itself. Being unique and specific for each treated problematic eye, the correct choice of various parameters will ensure the best refractive results, as well as avoid less favourable outcomes by identifying and decreasing the errors.

Conclusion: Participants will be able to apply the newly acquired knowledge in order to recognise the requirements and limitations of the existing technology for treatment of irregular astigmatism and make the right decision in order to pursue the best possible refractive outcomes.

113-03

Problems and solutions with correct registration

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Purpose: To present the latest technology developments in tracking and registering the wavefront during custom ablation.

Methods: Current tracking and registering methods and devices will be critically reviewed. Latest developments as regards limbal vessels recognition and tracking will be presented.

Results: Limbal vessels recognition and tracking proved effective in an experimental series of human eyes for registration purposes.

Conclusion: Limbal vessels recognition for registration purposes may be a very effective way for allowing perfect match between the measured wavefront and its reference position during the ablation.

113-04

Surgeon's contribution to ablation registration

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Purpose: To develop a surgical technique that would increase accuracy of ablation registration in customized laser refractive surgery.

Methods: Dynamics of the procedure was analyzed and available literature on the subject has been reviewed in order to identify possible sources of registration error.

Results: A technique that consists of series of systematic steps aiming to minimize cyclotorsional errors and lateral shift has been developed. It consists of marking of a reference axis and ablation center as well as manual bulbus fixation during the treatment. It is applied during relevant preoperative examinations, upon definition of ablation center and axis and throughout the treatment.

Conclusion: Application of this technique should decrease the possibility of registration errors that can diminish the effect of customized ablation, when treating irregular astigmatism.

113-06

CRS-Master topography based treatment of irregular astigmatism

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Purpose: Irregular astigmatism may be induced by failed laser refractive surgery, by keratoplasty, by trauma laser and result in loss in visual acuity that cannot be corrected with spectacles. We report here our results from using the latest generation topography based ablation system for treatment of irregular astigmatism.

Methods: Since August 2005, 15 eyes with irregular astigmatism were treated with a Zeiss-Meditec MEL-80 excimer laser was used. Ablation profiles were calculated using CRS software based on ATLAS topographic images. Treatments were performed as PRK, LASIK or re-LASIK procedures. Outcome was evaluated by subjective impression, visual acuity and by topographic analysis (ray-tracing analyses).

Results: Only two eyes have 3 months post-operative follow-up at the time of abstract submission. In one eye, uncorrected and corrected visual acuity has improved considerably. In the other eye uncorrected visual acuity has improved while corrected visual acuity is unchanged. In both cases corneal topography is more regular.

Conclusion: Topography assisted excimer laser ablation may improve uncorrected and spectacle corrected visual acuity in subjects with irregular astigmatism. Analysis of larger patient groups over longer time is necessary to more precisely define which eyes can benefit from this type of laser ablation.

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113-07

Wavefront guided custom ablation in symptomatic eyes – LADARVision system

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Purpose: To evaluate the clinical results of wavefront-guided customized treatment of eyes with myopia and/or astigmatism, and clinically significant visual symptoms related to the presence of higher order aberrations.

Methods: Thirty-four consecutive eyes from 24 patients underwent wavefront-guided custom ablation to correct low and high order aberrations, using the commercial LADARVision platform. Eyes were followed-up from 3 to 12 months after treatment. Uncorrected (UCVA) and best spectacle-corrected visual acuity (BSCVA), manifest refractive spherocylindrical error (MRSE), wavefront measurement of high order aberrations and subjective visual symptoms report were the parameters used to assess the treatment.

Results: All treated eyes had an improvement in UCVA. Sixteen eyes gained one BSCVA line, 18 eyes gained two lines, none revealed any loss. MRSE was slightly hyperopic in all eyes (from +0.12 to +1.50 D). All the eyes showed a reduction in preexisting high order aberrations, ranging between 3 and 64%. Subjectively, all patients noticed a consistent reduction in their preexisting visual symptoms.

Conclusion: Wavefront-guided custom ablation proved effective in reducing high order aberrations and related visual symptoms in this series of eyes. A longer follow-up on a larger series is necessary to assess the accuracy of the algorithm in the correction of defocus, which resulted slightly overcorrected in this study.

113-08

C-CAP and CustomVue in treatment of irregular astigmatism – VISX system

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Purpose: To examine the safety and efficacy of treating post-refractive surgery irregular astigmatism using the VISX's C-CAP and CustomVue methods.

Methods: Case examples will be used to illustrate the utility of these two methods in treating irregular astigmatism. Entrance criteria for C-CAP include prior refractive surgery, topographic decentration and increased coma on WavePrint, loss of BSCVA and subjective symptoms with BSCVA (but resolves with RGP).

Entrance criteria for CustomVue include all of the above except topographically it either demonstrates small optical zone or no defined patterns of irregular astigmatism and WavePrint shows increased HOA. Pre and postop parameters measured include uncorrected and BSCVA and subjective symptoms (grade 1–3), RGP-corrected vision and symptoms, refraction, topography and WavePrint aberrometry.

Results: In this small series, C-CAP showed moderate efficacy in correcting decentered ablation. CustomVue shows moderate success in correcting irregular astigmatism and small optical zone cases as long as WavePrint can capture preop image. All patients treated demonstrated improvement in clinical symptomatology, BSCVA, and improvement in topography and WavePrint.

Conclusion: C-CAP is useful in treating decentered treatment. CustomVue can correct mild to moderate irregular astigmatism. The capture rate of WavePrint aberrometry is often the bottle-neck step of a successful CustomVue treatment for irregular astigmatism.

113-09

Topography guided customized treatments in visually disturbing irregular astigmatism – iVis system

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Purpose: To evaluate efficacy, safety, predictability and stability of customized topographic transepithelial PRK in eyes with irregular astigmatism due to different causes.

Methods: Thirty-two eyes had transepithelial PRK with the new Ires (Ligi Technologie Medicali S.p.A.) ultrafast excimer laser. The ablation profile, calculated by Cipta Custom Ablation software (Ligi), was based on topographic data (Orbscan, Orbtex) and pupil dynamic (DPA-Pmetrics, Ligi). Data on uncorrected (UCVA) and best-corrected (BCVA) visual acuity, predictability, stability of refraction, contrast sensitivity (CSV-1000 Vector Vision) and any complications were analysed. Refractive astigmatism was analysed.

Results: We observed improvement of UCVA and BCVA in all cases. Targeted induced astigmatism was 4.6 and surgically induced astigmatism 4. Quality of vision also improved in all cases.

We did not observe any complications and haze after PRK treatment performed in this study.

Conclusion: Transepithelial customized PRK in irregular astigmatism realized by means of a 1000 Hz flying-spot excimer laser provides stable and predictable results.