American Society of Cataract and Refractive Surgery

6-10, May, 2016
New Orleans, Louisiana
Ernest N. Morial Convention Center

Course 09-304
Room 225-227

“Best Management of Cataract Surgery In Complicated Eyes With Shallow ACD and Narrow Angle”

Senior Instructor:
George Beiko MD

Instructor:
Barbara Kusa MD
Richard Lindstrom MD
Samuel Masket MD
Matteo Piovella MD

Monday, May 9, 2016
1.00 PM – 2.30 PM
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lens Surgery in Patients at Risk for Narrow-Angle Glaucoma: Three Years Follow Up</td>
<td>3</td>
</tr>
<tr>
<td>Matteo Piovella MD, Barbara Kusa MD</td>
<td></td>
</tr>
<tr>
<td>Multifocal IOLs : Directions to Improve Patient Satisfaction</td>
<td>7</td>
</tr>
<tr>
<td>Matteo Piovella MD; Barbara Kusa MD</td>
<td></td>
</tr>
<tr>
<td>Addresses</td>
<td>18</td>
</tr>
</tbody>
</table>
“Lens Surgery in Patients at Risk for Narrow-Angle Glaucoma: Three Years Follow Up”
Matteo Piovella MD; Barbara Kusa MD
IOP variation: Preop. VS Postop

Viscosity

Ability of a solution to resist flow.
Refers to the thickness of the OVD relative to water.
Viscosity is determined by:
- Molecular weight (higher MW = higher viscosity)
- Concentration

Anterior Chamber Depth & Narrow Angle

- Hyperopic Patient (+15 sf)
- Angle: 2 degree
- Normal IOP

OVD's: Arshinoff Technique

- Double filling after safer capsulorhexis
- Management
- Capsulorhexis using standard OVD

Proper Use of OVD's makes things easier!

Anterior Chamber Depth Variation

Preop. 1.52 mm Vs Postop. 3.68 mm

Preop.: Angle opening 13.8° ACU: 1.32 mm
Discussion

Given the insidiousness of glaucoma and the increased life expectancy of the population, prevention of glaucomatous damage is of the foremost importance. The AC OCT provides previously unseen images of the anterior segment, with immediate visualization of its structures and almost instantaneous diagnostic opportunities. Presently, the indications for cataract surgery in eyes with very shallow ACD and narrow angle are being reconsidered on the basis of the new images provided by AC OCT as well as on the increasingly limited invasiveness of cataract and lens surgery. Our studies indicate that it is possible to determine these three parameters.

The Three “A”
Age: over 50 y.o. - ACD: ≤ 2.4 mm - Angle Width ≤ 15°

OCT Technology Widened Indications for Clear Lens Extraction
In Patients at risk for glaucoma, removal of crystalline lens implies:
- Reduced need for iridectomy.
- Reduced need for topical glaucoma therapy.
- Reduced social cost of glaucoma.
- Reduced number of challenging cataract cases.

Refractive Clear Lens Exchange vs. Cataract Surgery:
Age and Life Expectancy

68 Patients (Tecnis® & ReZoom® Implantation)
Patients Age Range Variables

- Refractive Lens Exchange: 53.50 y.o. ± 7.92 SD
- Lens Exchange OS/VA ≥ 0.0: 68.00 y.o. ± 8.00 SD
- Cataract Surgery: 75.09 y.o. ± 7.84 SD

Low Anterior Chamber & Narrow Angle (Three “A”)
BCVA: 36 Hyperopic Eyes with Multifocal IOL Implantation
<table>
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<tr>
<th>Condition</th>
<th>MEAN ETDRS</th>
<th>MEAN JÄGER</th>
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<tr>
<td>UCVA PHOTOPIC</td>
<td>35.37</td>
<td>3.6</td>
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Thank you for your attention!
“Multifocal IOLs: Directions to Improve Patient Satisfaction”
Matteo Piovella MD; Barbara Kusa MD
Residual Refractive Error as Function of Pupil Size and Defocus

Diffractive Technology
Snellen Visual Acuity as Function of Pupil Size and Defocus

- Toric vs. spherical: it is two times difference: the effect of 1 D cylinder error on VA is about 4 D spherical refractive error.
- In multifocal lenses, VA sensitivity to refractive error depends on a multifocal design.
- Refractive Multifocal Technology was close to monofocal for the width of the Distance Peak in Defocus Curve measurements.
- Diffractive Multifocal Technology width of the Distance Peak was about half the monofocal width.
- The effect of refractive error was about twice more sensitive to than in case of a monofocal optic.

Weak Points of Diffractive Multifocal Bifocal IOLs

- Reduction of Contrast Sensitivity (up to 30%)
- Diffraction Grooves/Blaze height) Creates Different Diffraction Efficiency and Light Loss
- Tone Multifocal when 0.75 D of Corneal Astigmatism
- Heats, Glare and Ghost Images are Difficult to Manage in Suspicious Patients
- Poor Intermediate Distance Vision
- 0.50 Dispter SE generates loss of one line of Visual Acuity
- Perfect Target: Plane Postop Refractive Results

% Distribution of Light Rays

With Accommodative IOLs there is no loss of light, so quality of vision is not compromised.

<table>
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<tr>
<th>Pupil</th>
<th>Synergy</th>
<th>Reston</th>
<th>Tecres</th>
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<tr>
<td>Near</td>
<td>2 mm</td>
<td>100%</td>
<td>60%</td>
<td>41%</td>
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<td></td>
<td>5 mm</td>
<td>100%</td>
<td>84%</td>
<td>41%</td>
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<tr>
<td>Distance</td>
<td>2 mm</td>
<td>100%</td>
<td>44%</td>
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<tr>
<td></td>
<td>5 mm</td>
<td>100%</td>
<td>13%</td>
<td>41%</td>
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<tr>
<td>Intermediate</td>
<td>2 mm</td>
<td>100%</td>
<td>0%</td>
<td>4%</td>
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<tr>
<td></td>
<td>5 mm</td>
<td>100%</td>
<td>0%</td>
<td>4%</td>
</tr>
<tr>
<td>LIGHT LOSS</td>
<td>2 mm</td>
<td>0%</td>
<td>20%</td>
<td>10%</td>
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<tr>
<td></td>
<td>5 mm</td>
<td>0%</td>
<td>0%</td>
<td>10%</td>
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Rays and Wavefront

Wavefront Error is commonly called Wavefront

Lens REFRACTS light ray = TRANSFORMS wavefront shape Rays and Wavefront

The key advantage of Wavefront over Rays is that the wave nature of light can be introduced with the Wavefront and then the image is formed by constructive interference of the light waves.

Image is Constructive interference of wave

Spherical wavefront

Plane wavefront (object at infinity)

Parallel beams = plane wavefront

Spherical ideal wavefront $W_{ideal}$

Aberrated beams = irregenerate wavefront $W_{(x,y)}$

Wavefront Error $W_{(x,y)}$ is defined as the difference between the actual wavefront $W_{(x,y)}$ and spherical wavefront, so called Reference wavefront $W_{REF}$. 

provella@provella.com
**AT LISA® tri - Trifocal Optic**

Specific Asymmetrical Light Distribution

The optical zone of the AT LISA® tri 600MP provides:
- A near addition of +0.3 D for a comfortable reading distance
- An intermediate addition of +0.66 D for improved intermediate vision
- A far addition of +1.67 D for far vision

AT LISA® tri has fewer rings on the IOL surface for reduced potential visual disturbances and improved night vision.

**AT LISA® tri - Materials and Methods**

- AT LISA® tri implanted in 56 eyes of 51 patients
- Mean age 67.8±11.3
- Mean preoperative BCVA, 20/42 ± 4.57
- Mean time follow-up 3 years ± 1 month
- Mean preoperative sphere equivalent, -0.01 ± 3.06

**AT LISA® tri - UCVA, BCVA and Sphere Equivalent (94 Eyes)**

- UCVA
- BCVA
- Sphere Equivalent

**MTF (50 lp/mm) sensitivity to IOL rotation error**

up to 2.0 D cylinder correction - Pupil size 5 mm

"E" (20/60) sensitivity to IOL rotation errors of 0, 5, 10, 15, 20 degrees for 2.00 cylinder correction
ATLUSA® tri (36 Eyes)

YAG LASER TREATMENTS

- ATLUSA® tri implanted in 36 eyes of 38 patients
- 23 Eyes: YAG laser treatments (63.89%)
- Mean days P0: 58 ± 21.18 days

ATLUSA® tri toric No correction
Far Vision

ATLUSA® tri toric No correction Intermediate Vision

ATLUSA® tri toric No correction Near Vision

Quality of Vision
Contrast Sensitivity and Control Values

Control values for CS are derived from Hollinger paper

- 16-14 healthy phakic subjects for the following age groups:
  <30, 30-39, 40-49, 50-59, 60+
- Functional Image Analyzer OPTOS S600P
- Daytime (85 cd/m²), Nighttime (1 cd/m²) and Nighttime with Glasses (3 cd/m²)
- Monocular testing
- Paper demonstrated strong age dependence of CS with age
Multifocal IOLs Contrast Sensitivity

Retina: normal
Visual Field: normal

Do not wear glasses at all: 56 patients – 36.32%
4 patients use discontiuously near glasses to feel confidet with near vision
1 patient uses intermediate glasses
1 patient uses far glasses

AT LISA® tri:
IOL decentration

Advanced Technologies IOLs

- Trifocal Technology has replaced Stifocal Technology
- Normally we are presenting long term data that do not match the today technology
- Normally Eye Doctors that has no enough direct experience on advanced technology IOLs make all their efforts and criticisms to support the patients to not understand their problems
- The Eye after cataract surgery needs at least three months to get back to standard quality of vision
- By the point of view of the patients many complain seem similar for monofocal and advanced technologies IOLs
- Adoption of new technologies takes time and is very expensive

The Advanced Technologies IOLs

- Costs / Benefits do not match the best possible results needs
- Costs / Benefits match high Volume Low Cost cataract system
- Normally the responsibility of the eye Doctors is to promote best care and best results despite the costs
Small Aperture Moves Inside the Eye

KAMRA™ Corneal Inlay

IC-8™ Small-Aperture IOL

Proven Benefits of a Small Aperture

- Improves near and intermediate vision while maintaining good distance vision
- No competing focal points to degrade image quality
- Binocularity maintained despite monocular implantation
- Maintained binocular contrast sensitivity
- High patient satisfaction
- Much less sensitive to decentration

IC-8™ IOL Design

- IOL Material
  - Single-piece hydrophobic acrylic
- Mask
  - PVDF & nano-particles of carbon
  - 1.36mm aperture
  - 3.23mm total diameter
  - 3200 microporperations
  - 5 misicross thick

Study Design

- Inclusion Criteria:
  - Subjects must be ≥ 45 years of age
  - Clear intraocular media other than cataract
  - BDDVA 26/36 or worse as a result of cataract in the operative eye
  - Fellow eye could have either the natural crystalline lens or prior monofocal IOL implantation
- Procedure:
  - Patients were implanted monocularly with an IC-8 IOL

Study Design

Procedure:

- First eye: DOMINANT EYE → monofocal IOL → target: PLANO
- Second eye: NON DOMINANT EYE → IC-8 → target: 0.75 sf

Six Months PO L Monocular VA Results

40 eyes of 20 patients

- Monofocal IOL VA (20)
- Intermediate 67 cm
- Near 40 cm

- IC-8 IOL VA (20)
- Intermediate 67 cm
- Near 40 cm
Six Months Unispheric VA Results
20 Patients

Optical Modeling
Extended Depth of Focus Effective for Far Vision
(3.0 mm pupil size)

IC-8™ Small-Space IOL (Target Corneal 0.75 D)

Standard Monofocal IOL

Diffractive Multifocal IOL

Retinal Evaluation and Surgery:
Single-center, prospective, animal study

- Imaging through the IOL was visual.
- Minimal differences noted when comparing IC-8™ IOL eyes to monofocal or multifocal IOL eyes.

Fundus Photography

- Conduction by Barry Kupersman, Ph.D., MD:
  - 8 New Zealand Black rabbit eyes implanted with IC-8 IOL
  - Controls: Monofocal and Multifocal
  - Evaluations/Procedures Performed:
    - Anterior vitrectomy
    - Simulated in vivo retinal laser photocoagulation
    - Posterior vitrectomy
    - Air fluid exchange
    - Intraocular lens replacement
    - Intraocular ophtalmoscopy and index laser treatment of the retina
  - Results: Retinal surgery in eyes implanted with the IC-8 IOL can be performed with ease and good visibility

Summary

- Early results for the IC-8™ small-aperture IOL show:
  - Extended range of vision after cataract extraction
  - Mean score of 20/20 across near, intermediate, and far distances
  - No difference in symptoms or visual fields caused between IC-8 and fellow eyes
  - Retinal evaluations and surgical procedures are possible and easy to perform.
- Additional data and results to be presented at future meetings

Circular Assessments Post-Implantation

- Four technicians were asked to assess the ease of performing the following routine diagnostic assessments in IC-8™ implanted eyes:
  - Visual field
  - Fundus photography
  - Retinal OCT
  - They reported that:
    - Successful diagnostic testing was completed in all patients.
    - No different instructions were required between IC-8 eyes and fellow eyes.
    - For most patients, there was no additional time needed when performing evaluations.

1/6 Figueroa or University of California/Banana University School of Optometry, San Diego, CA. All rights reserved.
Visual Field

- Visual field assessment in ICL-8™ ICL implanted eyes shows a similar trend as the KAMRA™ Inlay
  - Visual field remains within normal limits after ICL implantation
  - Data from the clinical trial showed a slight overall decrease in sensitivity (-1.6 dB change from baseline)
  - No symptoms induced by the presence of the Inlay
  - No statistically significant difference in extent and total area of the visual field was found between implanted and non-implanted eyes

Retinal Optical Coherence Tomography

- Retinal OCT through the ICL-8™ ICL central aperture is possible
- Minimal differences between implanted and fellow microfocal ICL implanted eyes were noted in this series
- Minimal differences were found when comparing results with multifocal ICL implanted eye

Conclusions

- Tritral Diffractive IOLs technology is difficult to manage to avoid quality of vision penalization at a significant number of patients. Tritral Diffractive IOLs technology has no significant % of light for intermediate distance and an important amount of light loss.
- The Tritreal Diffractive IOLs technology overcome this weak point providing specific % of light for intermediate distance and reduce the light loss % improving diffractive efficiency and quality of vision.
- Heidelberg Clara and Green images are difficult to manage in demanding patients.
- Tritreal Diffractive IOLs Technology is an effective tool to reduce night driving problems of near symmetric % of light distribution.
- 3 mm pupil size cataract works at the best to minimize patient complaints. Larger pupil size to be detected must. It is really important a proper patient selection related to pupil dynamics.
- Perfect target after Diffractive IOLs Technology Implantation is Piemio Postop results.

Catalys Femtolas Assisted Cataract Surgery
Surgeon: Burkhard Döck - Bochum - Germany

Surgery performed:
on July 3rd 2014 (Right Eye - RD)
on July 4th 2014 (Left Eye)

Preoperative data:
Right Eye  BCVA 20/25 - 8 sph
Left Eye  BCVA 20/25 - 8 sph - 1.56 cyl axis 185°
Right Eye  AT LISA tri + 10.00
Left Eye  AT LISA tri + 0.50 + 1.56 axis 100°

Two Months PO Results:
Right Eye  UCVO 20/15  UCV 20/25  UCVN 20/12 (Bright Light)
Left Eye  UCVO 20/15  UCV 20/25  UCVN 20/12 (Bright Light)

And LISA®
(10 eyes of 3 patients)
Mean age: 59.7 ± 12.99 years
5 Years Post op Result
Accommodating IOLs Best

- No Contrast Sensitivity Penalization
- Halos or Glare similar to Monofocal IOLs
- Future AMD: No Future Visual Penalization due to IOLs Technology
- Best Choice for Suspicious Patient with Possible High Sensitivity to Glare and Halos, but Highly Demanding for New Technology IOLs
- Provides Intermediate Vision

YAG LASER TREATMENTS 15 Eyes: YAG laser treatments (36.4%)
- AT LISA® tri toric implanted in 58 eyes of 38 patients

- 9 Eyes - YAG laser treatments (6.82%)

- Mean days PO: 33.1 ± 123.30 days

Thank you for your attention!
### ADDRESSES

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