State of the art:
femtosecond laser cataract surgery

Moschou Konstantinos M.D.
Diathlasis Day Care Unit

13th Ophthalmology Congress of OETHAMBA
July 9-10, 2016
Samothraki Village Hotel
Samothraki, Greece
I HAVE NO FINANCIAL INTEREST
History of Cataract

- The history of cataract surgery dates back to at least 800 BC when Sushruta in India described the technique.
- It took more than 2500 years for Jaques Daviel of France to invent ECCE in 1747.
- 200 years later (1950) Sir Harold Ridley implanted the first posterior chamber IOL.
- 27 years later (1967) Charles Kelman introduced phacoemulsification.
- Today phacoemulsification is the gold standard of cataract surgery.
- Its rise was made possible by the invention of capsulorhesis, the use of foldable IOLs, the use of viscoelastics.
History of Cataract

- Now, 40 years later a new way of lens replacement surgery has arrived:
  Laser Refractive Lens Surgery with a Femtosecond Laser

- Prof. Zoltan Nagy performed the first Laser Refractive Lens Surgery with a Femtosecond Laser in 2008 (LenSx – ALCON)
What is a Femtosecond Laser?

- 1053 nm Neodymium
- A laser that emits optical pulses with a duration in the range of femtosecond (1fs = $10^{-15}$ seconds)
- This feature allows the light to be focused at a 3μm spot size, accurate within 5μm in the anterior segment.
- Allows for precise cutting of tissue with minimal collateral damage
- In ophthalmology surgery since 2001
- First FDA approved for LASIK flaps in 2001 and 2010 for cataract surgery
Commercially Available Systems

Catalys Optimedica

Alcon LenSx

Victus B+L

Z8 (Ziemer)

LensAR

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# Commercially Available Systems

<table>
<thead>
<tr>
<th>Femtolaser</th>
<th>Catalys</th>
<th>LenSx</th>
<th>Lensar</th>
<th>Victus</th>
<th>Femto LDV Z8</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDA approvals</td>
<td>corneal + arcuate incisions Ant. Capsulotomy lens fragmentation</td>
<td>corneal + arcuate incisions Ant. Capsulotomy lens fragmentation</td>
<td>corneal + arcuate incisions Ant. Capsulotomy lens fragmentation</td>
<td>corneal + arcuate incisions Ant. Capsulotomy lens fragmentation</td>
<td>is not cleared in the United States</td>
</tr>
<tr>
<td>CE mark</td>
<td>Same as FDA</td>
<td>Same as FDA</td>
<td>Same as FDA</td>
<td>Same as FDA</td>
<td>is not cleared in all other countries</td>
</tr>
</tbody>
</table>

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Commercially Available Systems

With guidance systems OCT or Scheimpflug technology it is used to make:

- Capsulorhexis
- Clear corneal incisions
- Arcuate incisions
- Lens Fragmentation

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# Ideal Capsulorhexis

## Reproducible size, shape and well-centered

<table>
<thead>
<tr>
<th>Too large</th>
<th>Too small</th>
<th>Irregular shape</th>
<th>Off center</th>
</tr>
</thead>
<tbody>
<tr>
<td>No capsule-IOL overlap</td>
<td>Phimosis</td>
<td>IOL tilt</td>
<td>IOL decentration</td>
</tr>
<tr>
<td>IOL tilt</td>
<td>Difficult phaco maneuver</td>
<td>IOL decentration</td>
<td>Edge catches visual axis</td>
</tr>
</tbody>
</table>

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Femtosecond Laser Capsulorhexis

- Reproducible, Precise Circular Shape and Diameter Capsulotomy
- Enables Image-Guided Centration of Capsulotomy

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Manual vs. Femtocataract Surgery
1 month postop

Manual Surgery  
Femtocat. Surgery

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Does Capsulotomy Size Impact ELPo?

Consistent capsulorhexis diameter is critical to Effective Lens Position\textsuperscript{1,2}.

- A 4 mm capsulorhexis results in longer post-operative ELPo than does a 6 mm capsulorhexis for the type of IOL used \textsuperscript{3}.

- To ensure that an IOL’s position in the bag matches the anticipated formula used to calculate its power, the capsulorhexis should be round, centered and smaller than the IOL optic.

\begin{itemize}
  \item 3. Cekic, Batman. Ophthalmic Surgery and Lasers, March 1999
\end{itemize}
Femtosecond Laser Phacofragmentation

- Liquefy pattern requires I&A only, no phaco power
- Chop pattern efficiently fragments the lens for removal with reduced phaco power and time
Incision Configurations
Single or Multiplane

- Computerized programming of incision patterns
- Customizable geometry
  - Angle
  - Depth
  - Width
Different operating environment

- Laser-generated gas increases the capsular bag volume
- The nucleus fragmentation technique is altered
- There are laser-included changes within the cortex that make cortical removal different
- Less viscoelastic is required
- Hydrodissection may be eliminated
New problems

- Incomplete capsulorhexis can result in radial extension
- Miosis
- Capsular block syndrome
- Poor incisions
- Subconjunctival hemorrhage
Nagy spends a lot of time discussing technique of manual completion of the capsulotomy depending on which of 4 possible femto rhexis present themselves. "Greater surgeon experience and improved technology are associated with a significant reduction in complications."

Note: PUPIL SIZE: Nagy states that the Rhexis should be set to 1.5 mm less than the pupil or else shockwaves from the laser will hit the pupillary margin thereby causing miosis and inflammation. We know that small rhexi can cause phimosis and hyperopic shifts- Cecik (Oph 1998) compared 4.0 to 6.0 rhexi and Sanders (JCRS 2006) noted if rhexis <5.5mm there is an increased chance of capsule fibrosis with posterior displacement of the IOL with hyperopic shift. According to Nagy to have a $\geq 4.5$mm rhexis a pupil must dilate to $\geq 6.0$. 

Diathlasis Day Care Unit, Thessaloniki, Greece
Complications of femtosecond laser-assisted cataract surgery

Zoltan Z. Nagy, MD, DSc, Agnes I. Takacs, MD, Tamás Filkorn, MD, Kinga Kránitz, MD, Andrea Gyenes, MD, Éva Juhász, MD, Gábor L. Sándor, MD, Illes Kovacs, MD, PhD, Tibor Juhász, MD, PhD, Stephen Slade, MD

PURPOSE: To analyze complications of femtosecond lasers used for cataract surgery.

SETTING: Department of Ophthalmology Semmelweis University, Budapest, Hungary.

DESIGN: Retrospective analysis.

METHODS: Intraoperative complications of the first 100 femtosecond laser-assisted (Alcon-Lensx, Inc.) cataract surgeries were collected. Possible complications of femtosecond capsulotomies and their management were also assessed.

RESULTS: The complications were as follows: suction break (2%), conjunctival redness or hemorrhage (34%), capsule tags and bridges (20%), anterior tear (4%), miosis (32%), and endothelial damage due to cut within the endothelial layer (3%). There were no cases of capsule blockage or posterior capsule tear. During the learning curve, there was no complication that would require vitrectomy. All complications occurred during the first 100 cases.

CONCLUSIONS: Femtosecond laser cataract surgery had a learning curve during the first 100 cases. With cautious surgical technique, the complications can be avoided. The femtosecond laser-assisted method was efficient and safe for cataract surgery.

Financial Disclosure: Drs. Nagy, T. Juhász, and Slade are consultants to Alcon-Lensx, Inc. No other author has a financial or proprietary interest in any material or method mentioned.

Pupil-size alterations induced by photodisruption during femtosecond laser–assisted cataract surgery

Jong Hwa Jun, MD, PhD, Kyu Yeon Hwang, MD, Sung Dong Chang, MD, PhD, Choun-Ki Joo, MD, PhD

From the Catholic Institute for Visual Science (Jun, Joo), Catholic University of Korea, and the Departments of Ophthalmology and Visual Science (Hwang, Joo), Seoul St. Mary’s Hospital, College of Medicine, Catholic University of Korea, Seoul, and the Department of Ophthalmology (Chang), Keimyung University, School of Medicine, Daegu, South Korea

Received: July 17, 2014; Received in revised form: October 13, 2014; Accepted: October 17, 2014;

Purpose
To measure miosis after femtosecond laser pretreatment of cataract surgery and determine correlative factors.

Setting
Department of Ophthalmology and Visual Science, Seoul St. Mary’s Hospital, College of Medicine, and Catholic University of Korea, Seoul, South Korea.

Design
Cross-sectional study.

Methods
Images extracted from surgical videos of femtosecond laser pretreatment and phacoemulsification were used to measure the pupil area. Quantitative analysis of pupil constriction was performed by comparing consecutive images obtained at the initiation of each procedure. Potential factors related to pupil constriction were examined, including laser parameters and anatomic measurements.

Results
The study enrolled 56 eyes. The mean pupil area decreased by 29.7% during the time it took to shift between procedures (shifting time). The total laser treatment duration was highly correlated with the reduction in the pupil area ($r = -0.433$, $P = .001$). The amount of intraoperative miosis was significantly correlated with the duration of lens fragmentation by the femtosecond laser ($r = -0.416$, $P = .001$) and of primary incision creation ($r = -0.289$, $P = .031$). Pupil constriction was correlated with patient age ($r = -0.398$, $P = .002$) and the laser capsulotomy–pupil margin distance ($r = 0.395$, $P = .003$), but not with suction-on time ($r = -0.012$, $P = .930$) or shifting time ($r = -0.091$, $P = .506$).

Conclusions
The pupil area decreased significantly after femtosecond laser pretreatment of cataract surgery. Intraoperative miosis was most significantly correlated with laser pretreatment duration and patient age.
Safety of FLACS

ARTICLE

Femtosecond laser-assisted cataract surgery versus standard phacoemulsification cataract surgery: Outcomes and safety in more than 4000 cases at a single center

Robin G. Abell, MB BS, Erica Darian-Smith, Jeffrey B. Kan, MB BS, Penelope L. Allen, PhD, Shaun Y.P. Ewe, MB BS, Brendan J. Vote, FRANZCO

Diathlasis Day Care Unit, Thessaloniki, Greece
PURPOSE: To compare the intraoperative complications and safety of femtosecond laser-assisted cataract surgery and conventional phacoemulsification cataract surgery.

SETTING: Single center.

DESIGN: Prospective consecutive comparative cohort case series.

METHODS: Eyes had femtosecond laser-assisted cataract surgery (study group) or phacoemulsification (control group) by 1 of 5 surgeons. The technique comprised manual corneal incisions and capsulorhexis or laser-assisted anterior capsulotomy, lens fragmentation, corneal incisions, phacoemulsification, and intraocular lens implantation.

RESULTS: The study group comprised 1852 eyes and the control group, 2228 eyes. Patient demographics were similar between groups. There was a significant improvement in vacuum/docking attempts, surface recognition adjustments, treatment, and vacuum time during the laser procedure in the study group. Anterior capsule tears occurred in 1.84% of eyes in the study group and 0.22% of eyes in the control group ($P < .0001$). There was no difference in the incidence of anterior capsule tears between the first half and second half of laser-assisted cases. Anterior capsulotomy tags occurred in 1.62% study group eyes. There was no significant difference in posterior capsule tears between the 2 groups (0.43% versus 0.18%). The incidence of significant intraoperative corneal haze and miosis was higher and the effective phacoemulsification time significantly lower in the study group ($P < .001$).

CONCLUSIONS: Significant intraoperative complications likely to affect refractive outcomes and patient satisfaction were low overall. The 2 cataract surgery techniques appear to be equally safe. Although anterior capsule tears remain a concern, the safety of femtosecond-assisted cataract surgery in terms of posterior capsule complications was equal to that of phacoemulsification.

Financial Disclosure: No author has a financial or proprietary interest in any material or method mentioned.

J Cataract Refract Surg 2015; 41:47-52 © 2015 ASCRS and ESCRS
Statistical Analysis

Statistical analyses were performed using SPSS software (version 19, International Business Machines Corp.). For comparison of baseline demographics and clinical characteristics between groups, categorical data were analyzed using the Fisher exact test and continuous data using paired t tests. Differences were accepted as significant when the P value was less than 0.05.

Table 2 shows the intraoperative complications. The incidence of anterior capsule tears and anterior capsulotomy tags was statistically significantly higher in the study group than in the control group (P < .001). Although the incidence of posterior capsule tears was higher in the study group, the difference between groups was not statistically significant. One case of anterior capsule tear in each group extended to the posterior capsule, requiring anterior vitrectomy; the remaining cases proceeded uneventfully with IOL placement in the bag. The incidence of significant intraoperative corneal haze affecting the surgical field view and intraoperative miosis was statistically significantly higher in the study group than in the control group (P < .001). The effective phacoemulsification time was statistically significantly lower in the study group (P < .0001). There were no cases of posterior lens dislocation.

There was no difference in the incidence of anterior or posterior capsule tears between the first half and second half of femtosecond laser-assisted cases ($\chi^2(1) = 1.3$, $P = .3$), suggesting the learning curve had little effect on these parameters.

<table>
<thead>
<tr>
<th>Complication</th>
<th>Laser Assisted (n = 1852)</th>
<th>Phacoemulsification (n = 2228)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incomplete capsulotomy</td>
<td>21 (1.13)</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Anterior capsulotomy tags</td>
<td>30 (1.62)</td>
<td>1 (0.004)</td>
<td>.0001</td>
</tr>
<tr>
<td>Anterior capsule tear</td>
<td>34 (1.84)</td>
<td>5 (0.22)</td>
<td>.0001</td>
</tr>
<tr>
<td>Posterior capsule tear</td>
<td>8 (0.43)</td>
<td>4 (0.18)</td>
<td>NS</td>
</tr>
<tr>
<td>Corneal haze</td>
<td>12 (0.65)</td>
<td>1 (0.04)</td>
<td>.0009</td>
</tr>
<tr>
<td>Unstable pupil</td>
<td>30 (1.65)</td>
<td>14 (0.65)</td>
<td>.003</td>
</tr>
<tr>
<td>Iris hooks/Malyugin ring</td>
<td>5 (0.27)</td>
<td>1 (0.04)</td>
<td>NS</td>
</tr>
</tbody>
</table>

NA = not applicable; NS = not significant
Who is not a candidate?

- Does not dilate past 5.5mm
- Retinal and optic nerve disease: h/o AION
- Advanced glaucoma w/VF loss
- Effects of IOP elevation during docking?
- Fuch’s / corneal edema

**An advantage** with Fuch’s (easier capsulorhexis) reduction in endothelial cell loss
Not so good candidates

- Inability to dock:
  - Corneal surface irreg, conjuntivochalasis, trabec bleb, unusual orbital anatomy (small, deep, excess retropulsion)
  - Agitated patients
Femtosecond Cataract Innovations

- Pediatric cataract surgery
- Posterior laser-assisted capsulotomy
- Development of new IOL types implanted with a completely new mode of fixation

<table>
<thead>
<tr>
<th>MASKET ND IOL TYPE 90S // SOON AVAILABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Diameter</td>
</tr>
<tr>
<td>Optic Diameter</td>
</tr>
<tr>
<td>ACCC +2</td>
</tr>
</tbody>
</table>
| Position                                 | Haptic: Capsular Bag  
Groove: ACCC +2 |
| Haptic                                   | C-Loop | 0° |
| Standard-Diopter-Range                   | 10.0 – 30.0 D. (0.5 inc.) |
| On-Request-Range*                        | 8.5 – 9.5 D. (0.5 inc.)  
30.5 – 40.0 D. (0.5 inc.) |
| Theoretical Standard Power               | 23.0 D.  |
| Theoretical A-Con. (optical)             | 118.7   |
| Theoretical ACD (optical)                | 5.37    |
| Material                                 | Hydrophilic Acrylic |
| Water Content                            | 28.0 %  |
| Filter                                   | UV-Filter |
| Refractive Index                         | 1.46    |
| Recommended Caliper Ring +2 for ACCC +2  | Type 5 |
| Feature                                  | Prevent Negative Dysphotops |
| Media                                    | Info Masket ND IOL  |

<table>
<thead>
<tr>
<th>TYPE 89A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indication</td>
</tr>
<tr>
<td>Total Diameter</td>
</tr>
<tr>
<td>Optic Diameter</td>
</tr>
<tr>
<td>Standard-Diopter-Range</td>
</tr>
</tbody>
</table>
| On-Request-Range*                        | 8.5 – 9.5 D. (0.5 inc.)  
30.5 – 35.0 D. (0.5 inc.) |
| Theoretical Standard Power               | 23.0 D.  |
| Theoretical A-Con. (optical)             | 118.2   |
| Theoretical ACD (optical)                | 5.08 mm  |
| Material                                 | Hydrophilic Acrylic |
| Water Content                            | 28.0 %  |
| Filter                                   | UV-Filter |
| Refractive Index                         | 1.46    |
| Injector (recommendation)                | Up to +25.0 diopters: Meditel NAVIJET™ 2.2-1P (LP604425W)  
For all diopters: Meditel NAVIJET™ 2.8-1P (LP6044110W) |
| Recommended Caliper Ring +3 for ACCC +2  | Type 5 |
| Feature                                  | No PCO in visual field |
| Note                                     | Surgeons must partake in prerequisite course before implantation!  
More Information |
| Media                                    | Info Bag-In-The-Lens  
Surgery/Videos |
Statistical analysis between laser assisted and conventional cataract, based on a sample of Diathlasis Day Care Unit.

- Gender distribution
- Age distribution
- Prefecture distribution
- IOL type distribution
- Comparison of post-operative outcome between the two methods
Are the visual results better than manual surgery?

Statistical analysis between laser assisted and conventional cataract surgery, based on a sample of Diathlasis Day Care Unit.

**Purpose:** To compare the 1 month post-operative SE and UDVA between Laser Assisted and Conventional Cataract, by Monofocal, Multifocal, TMF and Toric IOLs.

**Setting:** Diathlasis Day Care Unit, Thessaloniki, Greece
Laser-assisted Cataract
Gender Distribution

<table>
<thead>
<tr>
<th>TOTAL NUMBER OF EYES (n)</th>
<th>FEMALE</th>
<th>MALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>100%</td>
<td>55.56%</td>
<td>44%</td>
</tr>
</tbody>
</table>

Diathlasis Day Care Unit, Thessaloniki, Greece
Laser-assisted Cataract Age Distribution

Age = (55.40 ± 11.987) years
17 years < Age range < 87 years
Mode = 50 years

Diathlasis Day Care Unit, Thessaloniki, Greece
Laser-assisted Cataract Prefecture Distribution

Diathlasis Day Care Unit, Thessaloniki, Greece
Laser-assisted Cataract IOL Type Distribution

n=90 eyes

<table>
<thead>
<tr>
<th>IOL Type</th>
<th>Eyes (n)</th>
<th>Eyes (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MONOFOCAL</td>
<td>46</td>
<td>51%</td>
</tr>
<tr>
<td>MULTIFOCAL</td>
<td>13</td>
<td>14%</td>
</tr>
<tr>
<td>TMF</td>
<td>4</td>
<td>4%</td>
</tr>
<tr>
<td>TORIC</td>
<td>27</td>
<td>30%</td>
</tr>
</tbody>
</table>

Diathlasis Day Care Unit, Thessaloniki, Greece
1 month post-operative SE by IOL type for patients undergoing Laser-assisted cataract surgery

**SE monofocal** IOL = (-0.604D ± 0.769D)  
-2.13D < SE post-operative range < 0.50D

**SE toric** IOL = (-0.452D ± 0.668D)  
-2.38D < SE post-operative range < 0.25D

**SE multifocal** IOL = (-0.125D ± 0.228D)  
-0.75D < SE post-operative range < 0.00D

**SE TMF** IOL = (-0.188D ± 0.217D)  
-0.38D < SE post-operative range < 0.00D
1 month post-operative UDVA by IOL type for patients undergoing Laser-assisted cataract surgery

Diathlasis Day Care Unit, Thessaloniki, Greece
Comparison of 1 month post-operative SE between Laser assisted & Conventional Cataract

Diathlasis Day Care Unit, Thessaloniki, Greece
Comparison of 1 month post-operative UDVA between Laser assisted & Conventional Cataract
Comparison of 1 month post-operative SE between the two methods by Monofocal IOL

Comparison of 1 month post-operative uncorrected SE between the two methods by Monofocal IOL

<table>
<thead>
<tr>
<th>Eyes (n)</th>
<th>-1.01 TO -2.5</th>
<th>-0.01 TO -1.00</th>
<th>EQUAL TO 0.0</th>
<th>+0.01 TO +0.50</th>
<th>+0.51 TO +1.75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional Cataract n=42 eyes</td>
<td>5 12%</td>
<td>26 62%</td>
<td>13 31%</td>
<td>6 14%</td>
<td>4 10%</td>
</tr>
<tr>
<td>Laser-assisted Cataract n=42 eyes</td>
<td>11 26%</td>
<td>6 14%</td>
<td>12 29%</td>
<td>6 14%</td>
<td>1 2%</td>
</tr>
</tbody>
</table>

SE Laser-assisted = (-0.604D ± 0.769D) -2.125D < SE post-operative range <+0.50D

SE Conventional = (-0.473D ± 0.651D) -2.125D < SE post-operative range <+1.75D

Diathalasis Day Care Unit, Thessaloniki, Greece
Comparison of 1 month post-operative UDVA between Laser Assisted & Conventional Cataract, by Monofocal IOL

Diathlasis Day Care Unit, Thessaloniki, Greece
Comparison of 1 month post-operative SE between the two methods by Multifocal IOL

\[ \text{SE Laser-assisted} = (-0.125D \pm 0.228D) \]
\[ -0.75D < \text{SE post-operative range} < 0.00D \]

\[ \text{SE Conventional} = (-0.173D \pm 0.40D) \]
\[ -1.00D < \text{SE post operative range} < +0.38D \]
Comparison of 1 month post-operative UDVA between the two methods by Multifocal IOL

Comparison of 1 month post-operative UDVA between the two methods by Multifocal IOL

- Laser - assisted Cataract n=13 eyes
- Conventional Cataract n=13 eyes

Post operative UDVA

Eyes (n)

0% 8% 0% 0% 15% 100%
0 1 0 2 13 77%

Diathlasis Day Care Unit, Thessaloniki, Greece
Comparison of 1 month post-operative SE between the two methods by TMF IOL

SE Laser-assisted = (-0.188D ± 0.217D)  
-0.375D < SE post-operative range < 0.00D

SE Conventional = (-0.50D ± 0.586D)  
-1.125D < SE post-operative range <+0.00D
Comparison of 1 month post-operative UDVA between the two methods by TMF IOL

Diathlasis Day Care Unit, Thessaloniki, Greece
Comparison of 1 month post-operative SE between the two methods by Toric IOL

SE Laser-assisted = (-0.452D ± 0.668D)  
-0.238D < SE post-operative range < 0.25D

SE Conventional = (-0.327D ± 0.673D)  
-1.88D < SE post operative range < +0.63D
Comparison of 1 month post-operative UDVA between the two methods by Toric IOL

Diathlasis Day Care Unit, Thessaloniki, Greece
Comparing laser-assisted vs. conventional refractive cataract surgery

Premium IOLs improve visual and refractive outcomes

- This was a retrospective study that compared the visual outcomes of 32 eyes from 32 patients undergoing laser assisted refractive cataract surgery with Alcon LenSx (laser group) vs. 30 eyes from 30 patients undergoing conventional refractive cataract surgery (conventional group), all with implantation of premium IOLs — e.g. Alcon AcrySof IQ Toric IOL (Toric), Alcon ReStor IOL (ReStor), and AMO Tecnis Multifocal IOL (TMF)—by the same surgeon, Tj. The primary outcomes were refractive measures mean spherical equivalent (MSE) and uncorrected logMAR acuity at one month post op.

- Factors such as age, sex, axial length, preoperative corneal keratometry, and IOL types were assessed to ensure similarity between the two groups. Statistical analysis was performed using the two sample T-test and Mann-U test.

- Inclusion criteria were only one eye per subject was eligible, only subjects who received a premium IOL were included, and their target distance correction had to be plano.

- Exclusion criteria were the presence of any macular abnormality, corneal dystrophy or degeneration, pseudoexfoliation, or a history of corneal surgery—LASIK, PRK, CK, or RK/AK.

September 29, 2014 By Loretta T. Ng OD FAAO, Tyrie L. Jenkins MD, Andrew L. Nguyen PhD

Diathlasis Day Care Unit, Thessaloniki, Greece
### TABLE 2
Mean spherical equivalent (MSE) by IOL types for the two groups

<table>
<thead>
<tr>
<th>Method</th>
<th>ReStor IOL</th>
<th>Toric IOL</th>
<th>TMF IOL</th>
</tr>
</thead>
</table>
| Conventional | $-0.264\pm0.564\text{ D}$  
$n=9$         | $-0.201\pm0.386\text{ D}$  
$n=18$    | $+0.083\pm0.144\text{ D}$  
$n=3$     |
| Laser      | $-0.000\pm0.459\text{ D}$  
$n=12$         | $-0.063\pm0.265\text{ D}$  
$n=10$    | $-0.031\pm0.199\text{ D}$  
$n=10$     |
<p>| $P$-value  | 0.269            | 0.043*           | 0.535           |</p>
<table>
<thead>
<tr>
<th></th>
<th># Femto Eyes</th>
<th>IOL Type</th>
<th># Phaco Eyes</th>
<th>Deviation from Target Spherical Equiv.</th>
<th>Cylinder</th>
<th>UDVA</th>
<th>CDVA</th>
<th>UNVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kranitz</td>
<td>20</td>
<td>Spherical</td>
<td>25</td>
<td></td>
<td></td>
<td>No Diff.</td>
<td></td>
<td>Femto better at 1mo. &amp; 1yr. (p=.03 &amp; .04 respectively)</td>
</tr>
<tr>
<td>Filkorn</td>
<td>77</td>
<td>Spherical</td>
<td>57</td>
<td>Femto .12D better (p=.04)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abell</td>
<td>100</td>
<td>Negative &amp; Neutral Aspheric</td>
<td>100</td>
<td>No. Diff</td>
<td>No Diff</td>
<td>No Diff</td>
<td>No Diff</td>
<td>No Diff</td>
</tr>
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*only study even among the red with this result*
So What Does the Current Literature Teach Us to Date?

Does Femto create a prettier looking rhesis that leads to better IOL overlap?
   Answer: Yes.

Does a prettier Femto rhesis with better overlap provide a better refractive outcome?
   Answer: No.

Does a prettier Femto rhesis with better overlap provide better quality of vision with spherical, aspheric, neutral aspheric, or multifocal IOL’s?
   Answer: No.

Is the Femto Rhesis edge smoother or rougher than a CCC?
   Answer: Rougher.

Is a Femto Rhesis weaker or stronger than a CCC?
   Answer: Probably weaker.

Is there a significant Learning Curve to Femto?
   Answer: Yes.

Does Femto become as safe as Phaco after the Learning Curve?
   Answer: There is a real danger that it will not in many surgeons’ hands.

Does Femto minimize endothelial damage?
   Answer: Probably somewhat.

Does Femto decrease postop corneal edema?
   Answer: possibly slightly on postop day 1 only

Does Femto minimize macular edema?
   Answer: probably but not in the fovea and only in the inner and outer macular rings

Is Femto superiority to Phaco an inevitability or is the basic platform flawed?
   Answer: The mantra is that it is improving and some day......But perhaps the basic platform is flawed and not only is the benefit not worth the cost but also there may be NO way to improve the jagged rhesis edge despite lowering the energy settings.

Is Femto a Revolution, Evolution or No Solution?
   Answer: you be the judge.
Who will pay for it?

There is no doubt that this technology has added costs and ultimately it is the patients who will pay for this addition to the procedure.
Do We Really Need This?

- Femtosecond laser-assisted cataract surgery seems to be a **safe**, **efficient**, and **reproducible** procedure but further prospective randomized studies will demonstrate the potential clinical benefits of this emerging technology.

- Patients often **will not understand** what “laser cataract surgery” is and what benefits it may provide them.

- Just as FemtoLASIK coexists with mechanical microkeratomes, so does FLACS **coexist** with manual surgery.

- There is place for both.
Is Femto cataract surgery here to stay?
Femtosecond Laser Cataract Surgery
Is this the future?

Diathlasis Day Care Unit, Thessaloniki, Greece
THANK YOU