Phaco 1967 - What is next?

- Laser Refractive Lens Surgery using a femtosecond laser!
  - 2008: first surgery performed in Budapest by Zoltan Nagy
  - 2009: Alcon LenSx first laser to receive FDA approval for cataract surgery
  - 2010: first surgery in the US performed by Stephen Slade

Financial Disclosure

- Alcon Laboratories, Inc. - C,L
- Alcon LenSx - C,L
- Optical Express Inc. - C

OVERVIEW OF LASER SYSTEMS

- Alcon LenSx (CA, USA)
- OptiMedica CATALYS (CA, USA)
- LensAR (FL, USA)
- Technolas VICTUS (Munich, GER)
- Others
**Alcon LenSx**
- Femtosecond laser
- OCT
- 510K approvals
- CE marked
  - Capsulorhexis
  - Liquefaction
  - Corneal incisions (AK !)

**OptiMedica CATALYS**
- Liquid Optics Interface
- OCT
- Femtosecond laser
- Not approved in US
- CE-marked for
  - Capsulorhexis
  - Lens fragmentation

**LensAR Laser**
- Initially designed to soften lens to correct presbyopia
- Picosecond laser
- Scheimpflug camera, not real-time
- 510K approval for
  - Capsulotomy
  - Lens fragmentation

**Technolas VICTUS**
- Femtosecond laser
- Only combined platform
  - Flaps
  - Corneal transplants
  - AK
  - INTRACOR
  - Not approved:
    - Capsulorhexis and liquefaction

**My Personal Experience**
- Alcon LenSx laser
- Surgery performed in Budapest, Hungary 2009
- Alcon LenSx laser in Mannheim since 7-2011

**OR Setup, Mannheim, Germany**
OR Setup, Mannheim, Germany

LenSx Laser – User Interface

Why Laser Refractive Lens Surgery?
- Capsulorhexis
- Lens fragmentation / liquefaction
- Corneal incisions
- Astigmatism correction

Ideal Capsulorhexis
- Reproducible size and shape, well centered
**Laser Capsulorhexis**

![Manual capsulorhexis](image1.png) ![LenSx laser capsulorhexis](image2.png)

**Laser Capsulorhexis SEM**

![Manual Capsulorhexis](image3.png) ![LenSx Capsulotomy](image4.png)

**How strong is the Laser CCC?**

- **Nagy Z, Takacs A, Filkorn T, Sarayba M**
  *Initial Clinical Evaluation of an Intracocular Femtosecond Laser in Cataract Surgery*
  *J Refract Surg 2009; 25:1053-1060*
  - 8 porcine eyes each group, 5-mm CCC using corneal mark
  - CCC stretched with calipers, ratio calculated
  - **Laser CCC**
    - Ratio 2.13 +/-0.03 (range, 2.07 – 2.1)
  - **Manual CCC**
    - Ratio 1.98 +/-0.08 (range, 1.84 – 2.09)

- **Kranitz K, Takacs A, Mihaltz K, Kovacs I, Knorz MC, Nagy Z**
  *Femtosecond laser capsulotomy and manual CCC parameters and their effects on IOL centration*
  *J Refract Surg 2011; 27:558-563*
  - Better IOL centration with laser capsulorhexis!
Lens Liquefaction

- Used for softer lenses (to Grade 2)
- Number of cylinders customizable

Lens Fragmentation

Liquefy and Chop Pattern

- Liquefy: Generally used for harder lenses (grade 3, 4+)
- Number of cuts customizable

Hybrid Technique

Phaco vs Laser Fragmentation

- 43% reduction
- 51% reduction

- 28% lower endothelial cell loss in Laser group compared to Phaco group (one month postop)
Laser Corneal Incision

PostOp OCT image of LenSx 2-plane corneal incision

Laser Injections

- Laser incisions are more architecturally reproducible and have greater self-sealing properties

![Laser Arcuate Incisions](image)

- Fully Customizable and adjustable
- Refractive incisions are no longer an art form, but a science.

Manual Arcuate Incision

Hand-held diamond knife
- Inconsistent depth control
- Poorly predictable

ASTIGMATISM CORRECTION

![Manual Arcuate Incision](image)
MARKET POTENTIAL

Issues to Consider
- Can the market support another premium technology?
- Do we need a laser to improve our clinical performance?
- Will our patients understand and embrace the technology?
Conclusions

- Laser Refractive Lens Surgery increases safety and efficacy of cataract removal
- Laser fragmentation requires less phaco power and preserves endothelial cells
- Laser CCC improves IOL centration
- Laser-created incisions correct astigmatism
- Laser Refractive Lens Surgery improves lens surgery and therefore presents a new paradigm!

Welcome to the Future!

Laser Refractive Lens Surgery

THANK YOU!