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LASER CATARACT SURGERY USING AN INTRAOCULAR FEMTOSECOND LASER

Michael C. Knorz
 Medical Faculty Mannheim, University of Heidelberg
 Mannheim, Germany

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 AcuFocus Inc., ForSight Labs LLC, Optical Express Ltd., Alcon LenSx Lasers, Inc.


Limitations of Phaco Cataract Surgery

- **Visual Outcomes**
 - Distance correction predictability
50% that of LASIK
 - Astigmatism Correction
 - Effective Power of IOL
- **Safety**
 - Complications 10x LASIK
 - Ultrasound associated with
 - corneal burn,
 - corneal edema, endothelial cell loss^(1,2)




Common	Incidence	Vision Threatening	Incidence
Posterior Capsular Opacification	10-30%	Retinal Detachment	0.6-1.7 %
Cystoid Macular Edema (transient)	2-10%	Cystoid Macular Edema (persistent)	1-2%
Vitreous Loss	1-5%	IOL Malposition	0.3%
Corneal Endothelial Cell Loss	4-10%	Need for Corneal Transplant	0.3%
		Endophthalmitis	0.1%

¹Pereira et al. JCRS 2006 Oct;32(10):1661-6 ²Park et al. Ophthalmic Surg Lasers Imaging. 2010 Mar-Apr;41(2):236-41



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Incidence of Capsular Tears in Phaco

Marques FF, Marques DM, Osher RH, Osher JM.

Fate of anterior capsule tears during cataract surgery.

J Cataract Refract Surg 2006;32:1638-42

- 2,646 eyes
- Anterior tear of capsulorhexis in 0.8 %
 - 40% of tears extended into the posterior capsule,
 - 20% required vitrectomy

Unal M, Yücel I, Sarici A, Artunay O, Devranoğlu K, Akar Y, Altin M.

Phacoemulsification with topical anesthesia: Resident experience.

J Cataract Refract Surg. 2006 Aug;32:1361-5

- Anterior tear of capsulorhexis in 5.3%
- Irregular anterior capsulorhexis in 9.3%
- Posterior capsule tears with vitreous loss in 6.6%



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Goals of Laser Refractive Cataract Surgery

- **Improve every step of cataract surgery**
 - Incision
 - Capsulorhexis
 - Nucleus fragmentation

Key Step	Current Surgery	Refractive Impact	Safety Impact
Corneal Incision	Underutilized Not Optimized	Astigmatism	Infection
Capsulorhexis	Variable Sized, Not Centered	Variable IOL Position & Effective Lens Power	Capsular Tears, Posterior Capsule Opacification
Lens Fragmentation	Excessive Ultrasound Power	Delayed visual recovery	Loss of endothelial cells, Capsule Rupture



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Purpose

To evaluate the use of a novel femtosecond laser in cataract surgery for

- liquefaction of the lens,
- capsulorhexis,
- corneal incisions



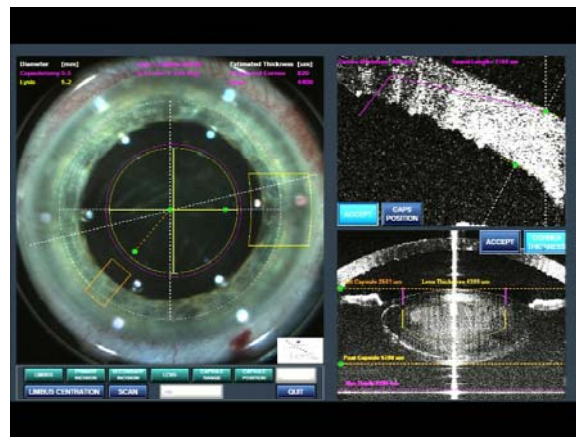
LenSx Femtosecond Laser
(LenSx Laser, Inc., Aliso Viejo, CA)



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Image-Guided Surgery



- Integrated OCT projects images of cornea, lens, iris and capsule onto video microscope
- Surgeon selects incisions, lens treatment; confirms patterns on OCT images
- Procedure time < 1 minute: lens liquefaction, capsulotomy, corneal incisions



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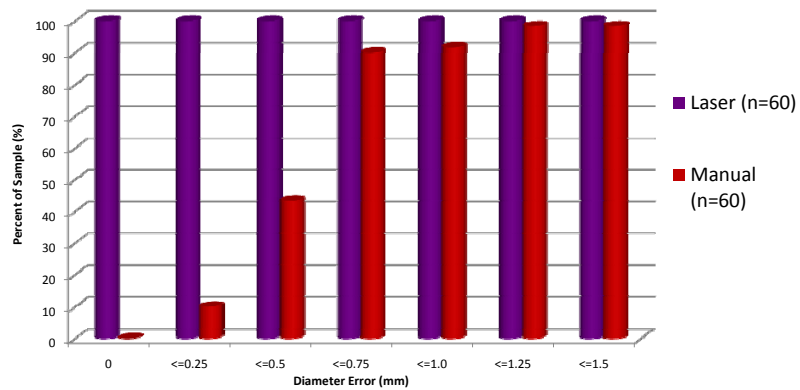
Methodology

- Procedures performed by Michael Knorz at Semmelweis University, Budapest, Hungary
- Thanks to my host, Zoltan Nagy



Results: Capsulorhexis was perfectly centered and highly reproducible in all cases

Capsulotomy Diameter Accuracy
(Absolute difference between Attempted and Achieved)



Only 10% of manual rhexis achieved diameter accuracy of +/- 0.25mm

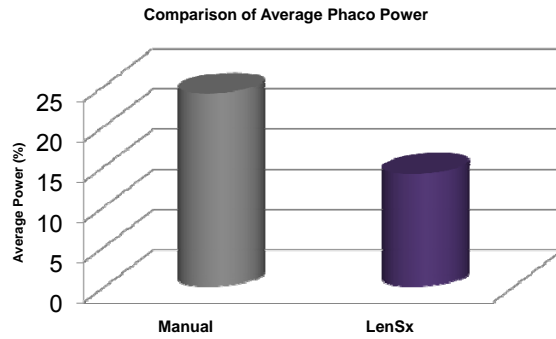


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Results: More Efficient/Safer Lens Removal

46% reduction in Phaco Power



•FS laser was highly effective in liquefying lenses up to 2+ density – often only I/A (no phaco required).

•Harder lenses of up to 4+ were efficiently fragmented for removal with reduced phaco power

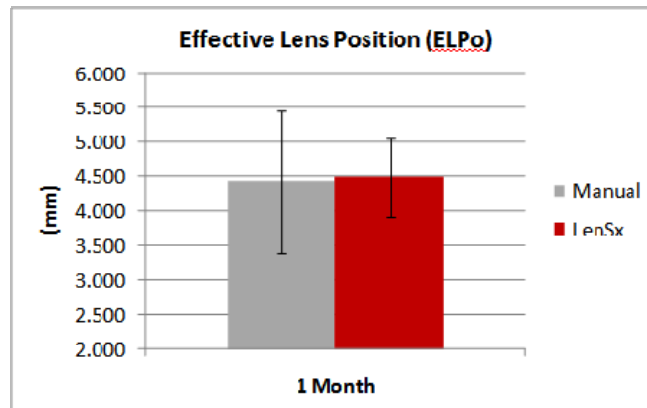
28% Decrease in Endothelial Cell Loss In Laser Group Compared to Phaco Group.



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Results: Reduced Variability in Effective Lens Position



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Conclusions

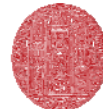
- Femtosecond laser application in liquefaction, capsulorhexis and corneal incisions was safe and effective
- All-laser cataract surgery will increase safety and efficiency of cataract removal
- Laser capsulorhexis was perfectly centered and highly reproducible in all cases
- IOLs with femtosecond laser created capsulotomy showed reduced variability in Effective Lens Position (ELPo)



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THANK YOU !