Bladeless Femtosecond Laser-assisted compared to manual phacoemulsification in clear cornea cataract surgery: Refractive outcomes.

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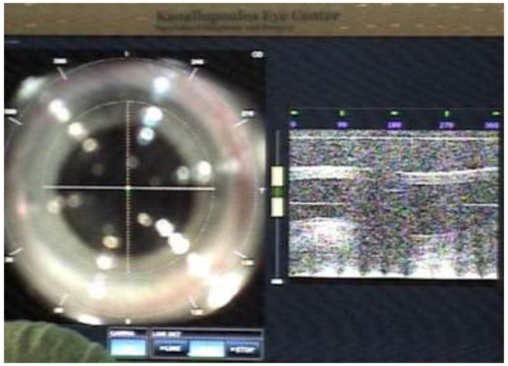
Purpose

Comparative evaluation of refractive outcomes of manual small-incision versus femtosecond-laser assisted clear-cornea cataract surgery.



Methods

133 consecutive eyes subjected to cataract surgery.

- group-A manual phacoemulsification(n=66);
- group-B femtosecond-laser assisted (n=67), employing the LenSx (Alcon Surgical, Ft. Worth, TX) laser.

All cases were evaluated for refraction, visual acuity, keratometry, tomography, pachymetry, endothelial cell counts, intraocular pressure, and type of spherical or toric IOL implanted.

The groups were matched for age, gender, pre-operative vision metrics, and cataract severity.

- Follow-up time was up to 1 year.
- Toric IOL subgroups were also compared.

Results

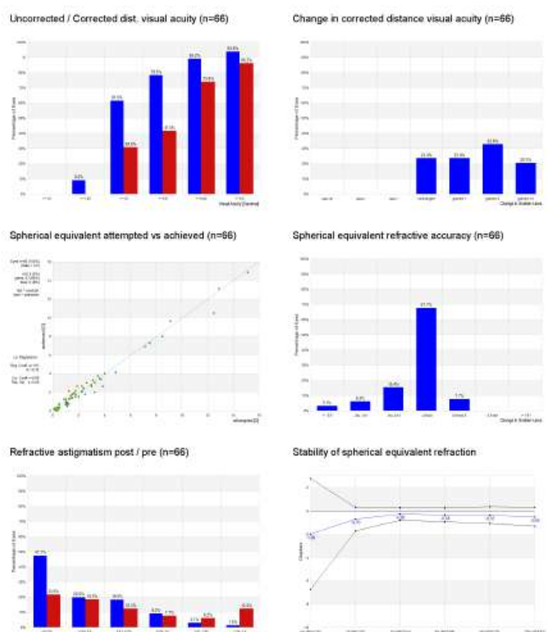
In group-A post-operative UDVA was 20/20 or better in 61.5% of the eyes and 20/25 in 78.5%. The femtosecond group-B had improved outcomes (p=0.075 and p=0.042): post-operative UDVA was 20/20 in 62.7% of the eyes and 20/25 in 85.1%.

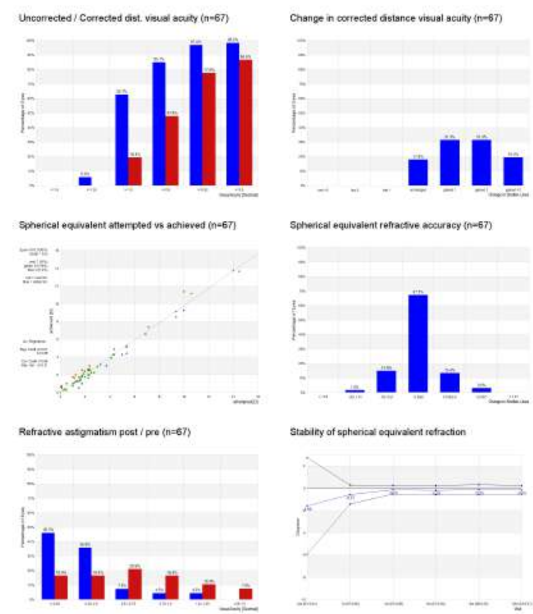
Linear regression scatterplots of achieved versus attempted spherical equivalent had excellent regression coefficients (a=1.01 group-A, 0.97 group-B). There were 67.7% cases in group-A and 67.2% in group-B (p=0.873) within ±0.50D of refractive equivalent.

Slight trend of under-correction was noted in group-A.

Average residual manifest cylinder in the toric subgroup-A was -0.50D (95% Limit-of-Agreement, LoA=-0.78D), and in toric subgroup-B -0.45D (95% LoA=-0.45D).

Results: group-A manual

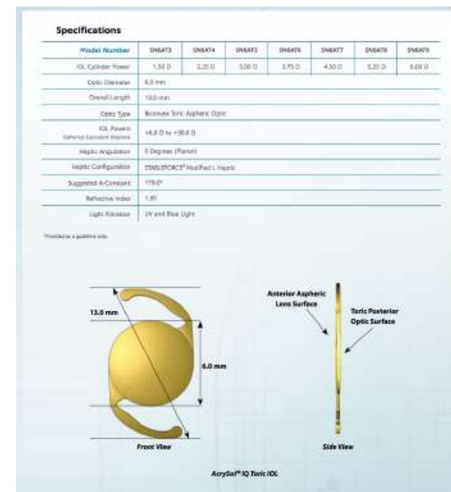




Results: group-B, LenSx

Toric IOL evaluation

We further evaluated the refractive outcomes of the subgroups within each group in which toric IOLs were implanted. The AcrySof T2 up to T4 were employed in 26/66 cases in group-A, and in 24/67 cases in group-B. There was one T6 (3.75D) in group-A, and one T5 (3.0 D) in group-B. Average cylinder power implanted in group-A was 1.94 ± 0.60 (1.00 to 3.75) D and 1.60 ± 0.47 (1.00 to 3.00) D in group-B. Comparative results are illustrated in figure 5.



Specifications

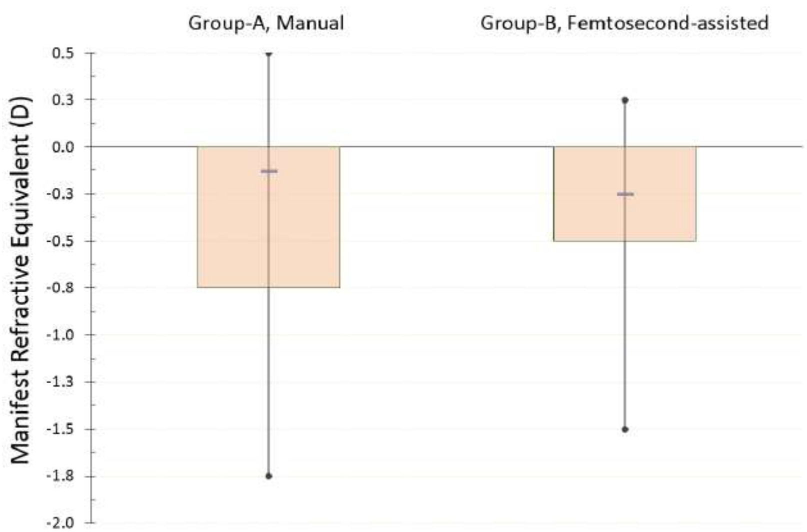
Model Number	SN6AT3	SN6AT4	SN6AT5	SN6AT6	SN6AT7	SN6AT8	SN6AT9
IOL Cylinder Power	1.50 D	2.25 D	3.00 D	3.75 D	4.50 D	5.25 D	6.00 D
Optic Diameter	6.0 mm						
Overall Length	13.0 mm						
Optic Type	Biconvex Toric Aspheric Optic						
IOL Powers	+6.0 D to +30.0 D						
Haptic Angulation	0 Degrees (Planar)						
Haptic Configuration	STABLEFORCE® Modified L Haptic						
Suggested A-Constant	119.0*						
Refractive Index	1.55						
Light Filtration	UV and Blue Light						

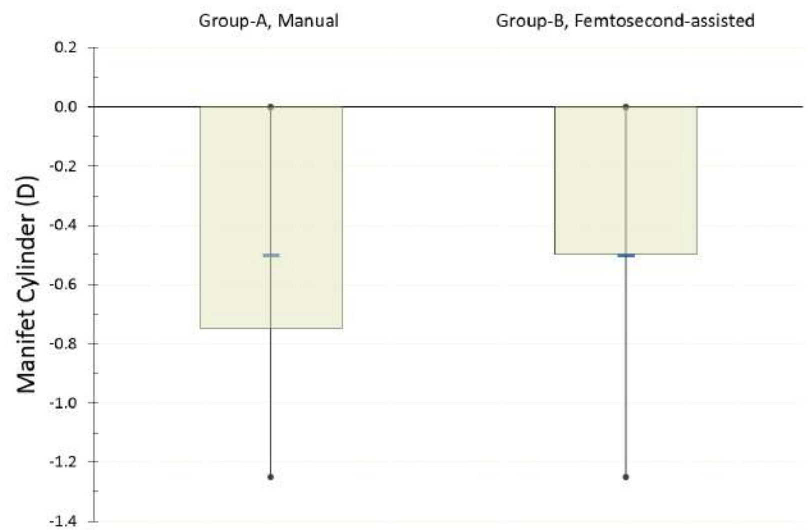
*Provided as a guideline only.

Preoperative manifest refractive Spherical Equivalent in toric subgroup-A was -2.17±4.95 D, and in the toric subgroup-B -1.90±4.38 D (p = 0.18). Three-month postoperative residual manifest cylinder for toric phaco subgroup-A was -0.39±0.95 D and for the toric subgroup-B -0.27±0.19 D (p =0.131).

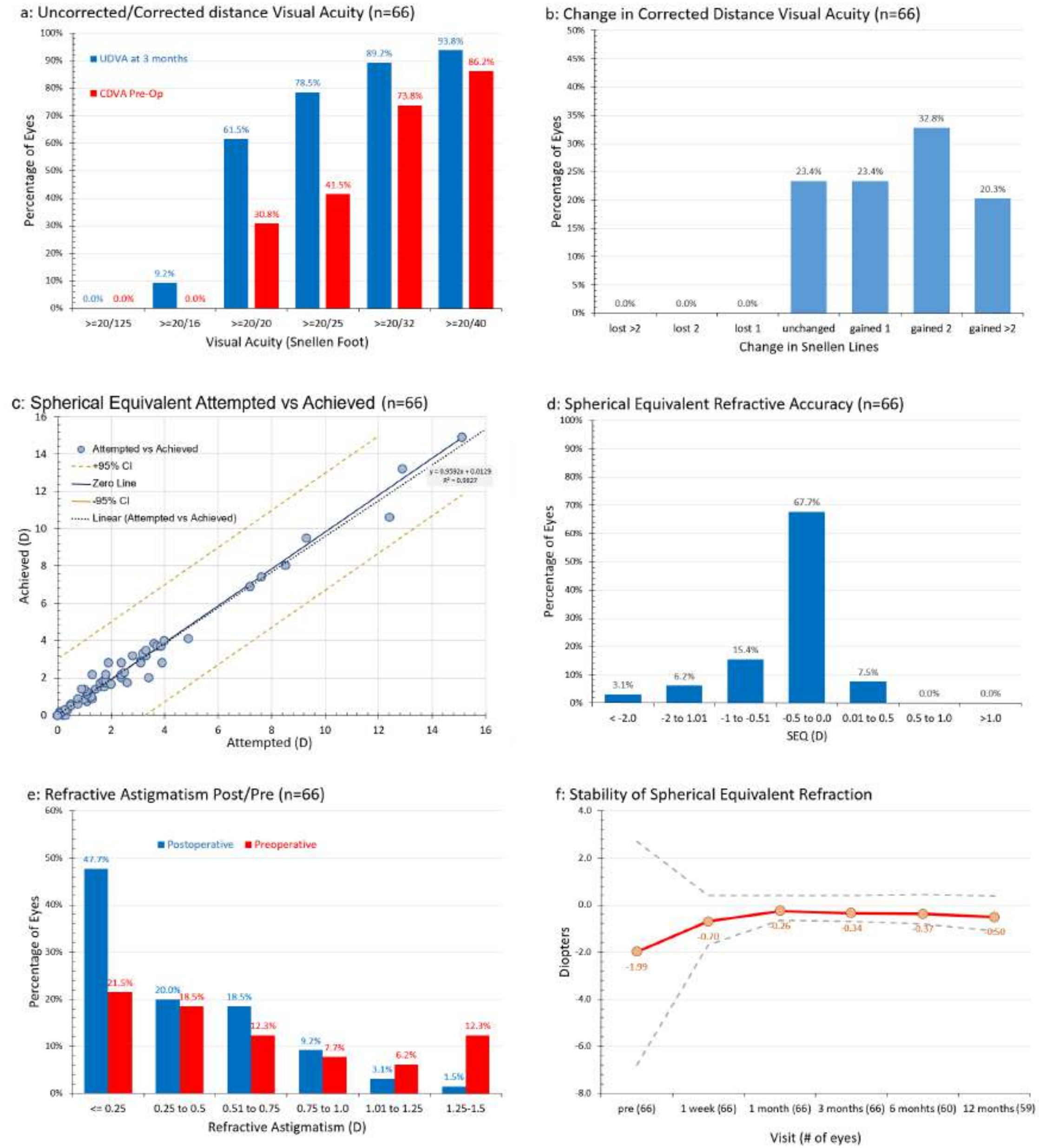
Preoperative manifest cylinder in toric subgroup-A was -1.05±0.89, and in toric subgroup-B, -0.96±0.80 (p =0.23). Three-month postoperative residual manifest cylinder for toric subgroup-A was -0.53±0.38 D, and in toric femtosecond laser subgroup-B -0.41±0.24 D (p = 0.075).

Results: Toric Subgroups





Manual group summary



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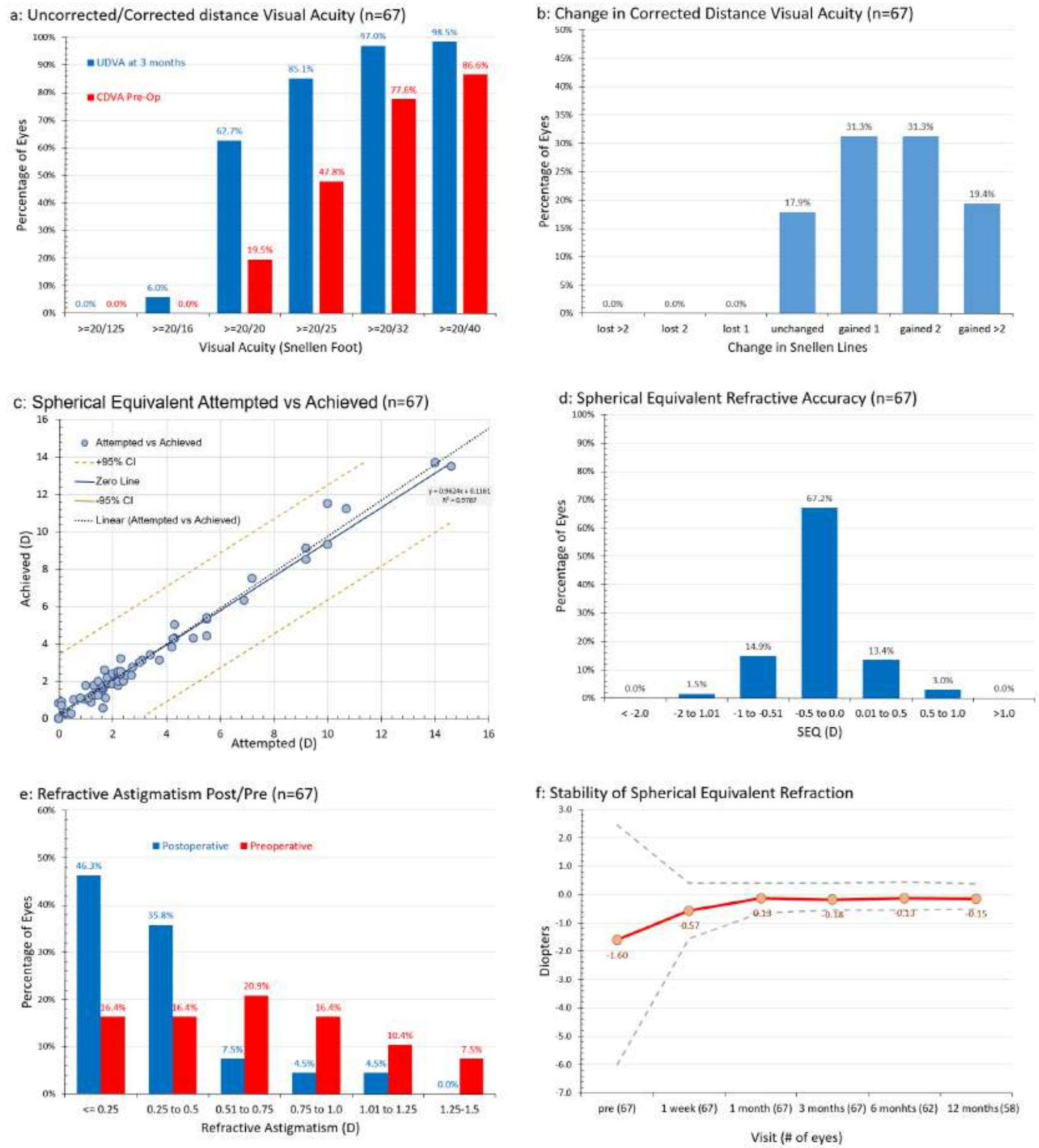
LenSx group summary



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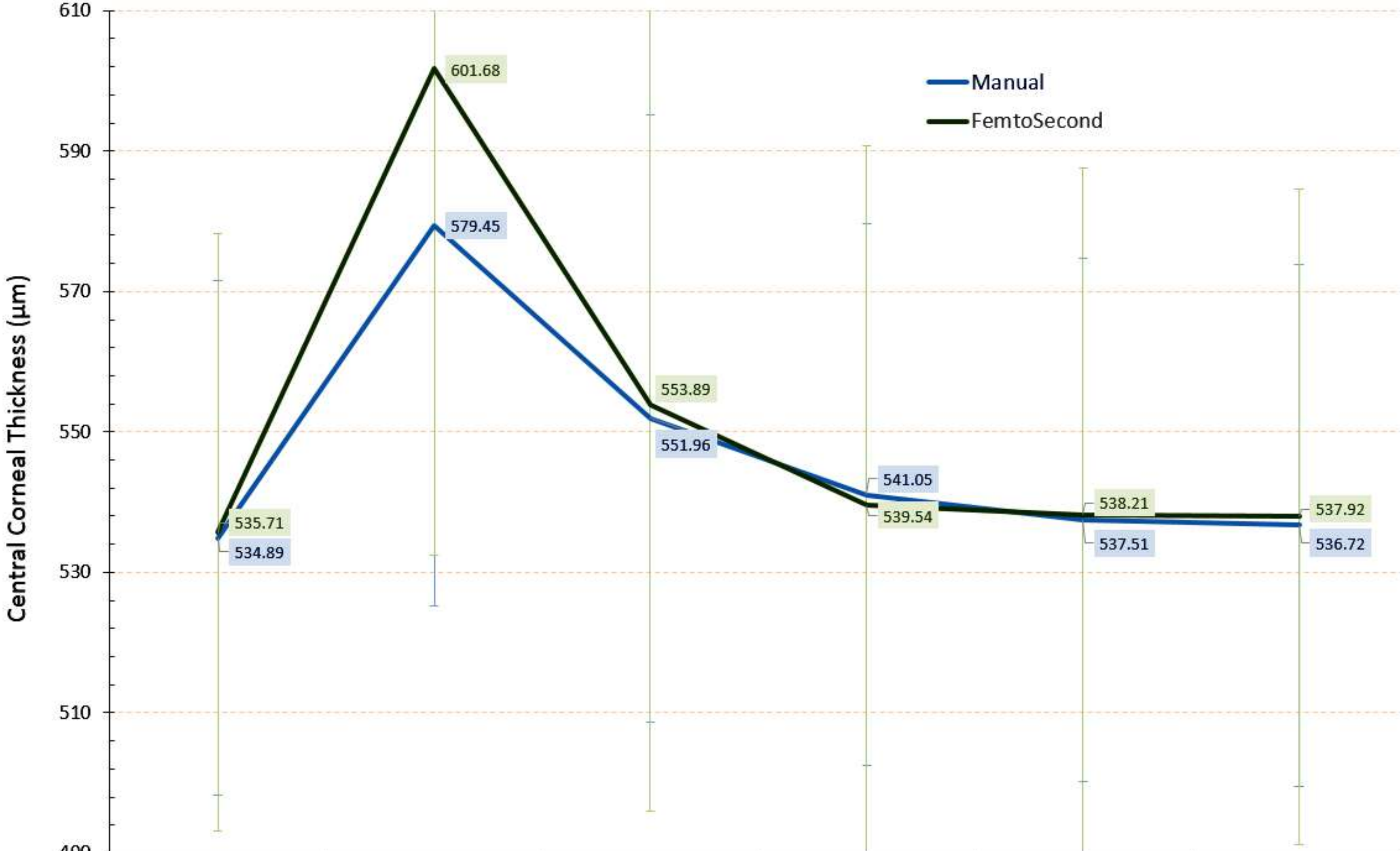
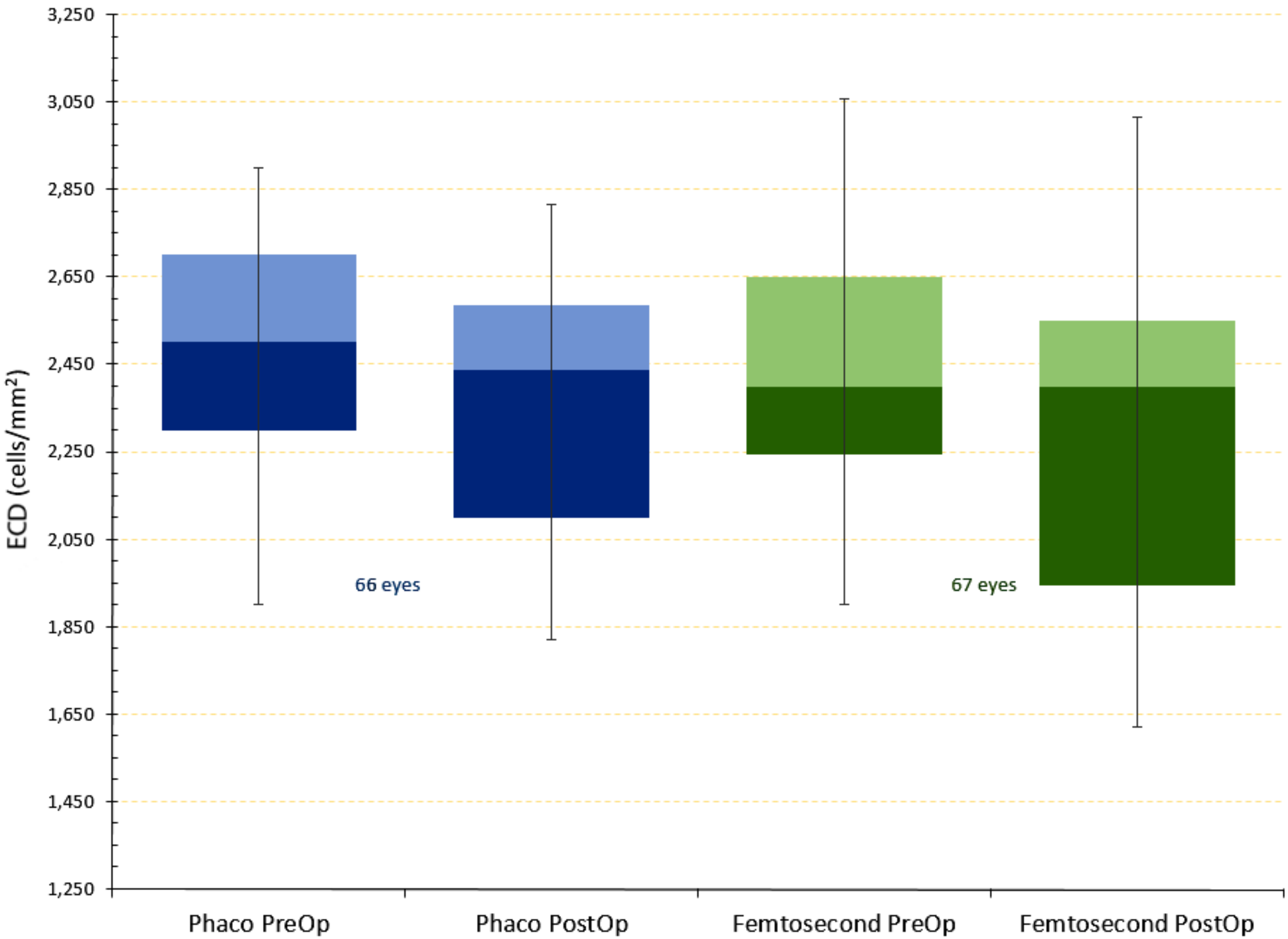
CCT box plot results



	PRE OP	1 DAY	1 WEEK	1 MONTH	3 MONTHS	6 MONTHS
Manual	66 eyes	66 eyes	66 eyes	66 eyes	66 eyes	59 eyes
FemtoSecond	67 eyes	67 eyes	67 eyes	67 eyes	67 eyes	62 eyes

ECD box plot results



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Discussion

Cataract surgery, although initially employed to remove the opaque crystalline lens, has recently been increasingly evaluated in regard to its optimal refractive outcome that may significantly affect the quality of everyday life. Patients and clinicians' expectations dictate the least amount of post-operative astigmatism and sphere.

The projected improvement in corneal incision and capsular opening precision, as well as the reduction of total ultrasound energy required for lens nucleus breakdown, may potentially improve refractive outcomes and enhance safety for patients in comparison to 'manual' phacoemulsification.

Exact positioning and dimensioning of the anterior capsular opening may also help reduce IOL decentration and tilt.

Determination of effective ELP and lens placement with minimal tilt are among the challenges in modern cataract surgery.

This is even more important in cases with past corneal refractive surgery (eg LASIK or PRK), a population that is expected to soon reach 'cataract maturity': Considering that the first 'wave' of such refractive surgeries occurred approximately twenty years ago, at an estimated average patient age of 30, this population is now approaching the onset for cataract surgery.

Conclusions

- Femtosecond laser–assisted cataract surgery is as safe and effective as manual incision & ultrasound phacoemulsification cataract surgery. Mean spherical equivalent refraction and visual acuity are comparable. Improved astigmatism correction may be among the benefits of femtosecond laser–assisted cataract surgery.
- Refractive outcomes in terms of visual acuity, residual refractive error, as well as total phacoemulsification energy appear to favor the femtosecond laser-assisted group, suggesting clinical benefit in utilizing this technology in routine small-incision cataract surgery.