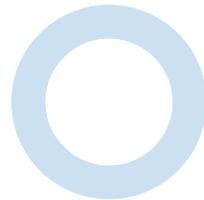


# **LONG-TERM STABILITY OF IRIS REGISTERED, FEMTOSECOND LASER-CREATED BEVELED ARCUATE INCISIONS FOR THE CORRECTION OF ASTIGMATISM**

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# Disclosures



- LENSAR (I, C)
- Johnson & Johnson Vision (I, C, S)
- SUN Pharmaceuticals (C, S)
- Carl Zeiss Meditech (C)
- Gore (C)
- Oculus Biologics (C)
- Advanced Euclidian Solutions (I, C)

I = Investigator

C = Consultant

S = Speaker

# Introduction

- Femtosecond laser-assisted arcuate keratotomy is a widely used method for correcting mild astigmatism during cataract surgery.
- Arcuate keratotomy (AK) created with a femtosecond laser is precise and reproducible in incision depth and arc length.<sup>1</sup>
- Most femtosecond lasers create AKs perpendicular to the corneal plane, resulting in wound gapping and the formation of epithelial plugs.<sup>2,3</sup>
- Lensar femtosecond laser-assisted AKs are created perpendicular to the coronal plane (beveled incisions), that decreases the chances of regression and improves astigmatic stability.



# Purpose

To assess the long-term stability  
(12 months) of femtosecond laser-created  
arcuate incisions for the correction of  
astigmatism up to 1.6 D.



# Methods

## Study procedure

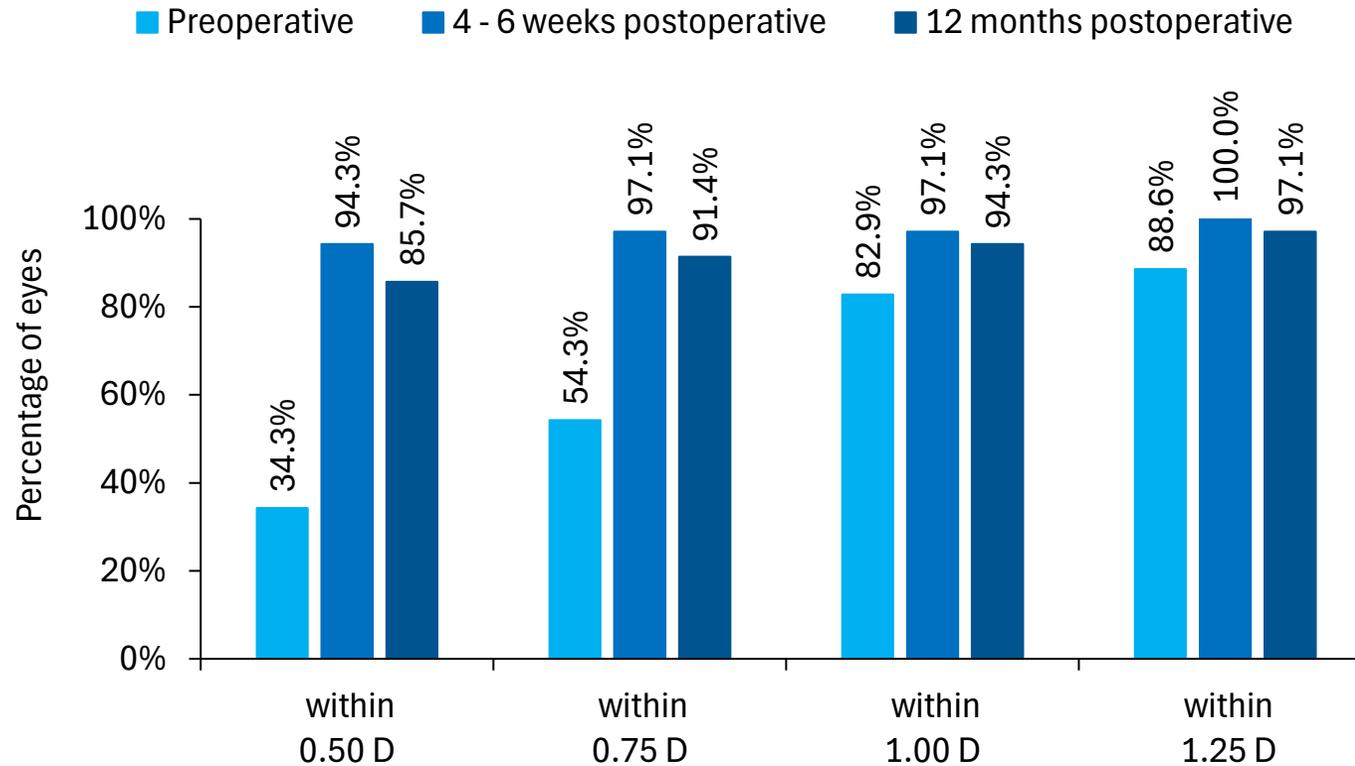
Case records of 35 patients who had previously undergone astigmatism correction with femtosecond laser (ALLY, Orlando, FL) beveled arcuate incisions were analyzed. Data were evaluated at the 6-week and 12-month postoperative time intervals.

## Study design: Retrospective chart review.

## Outcome measures

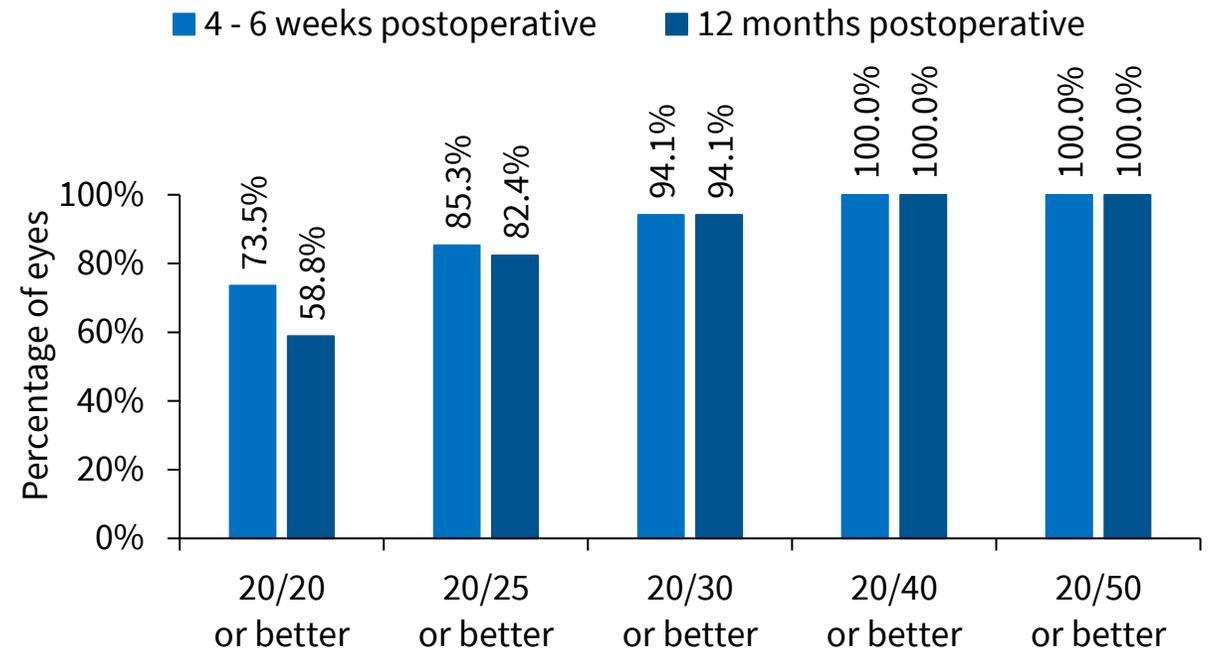
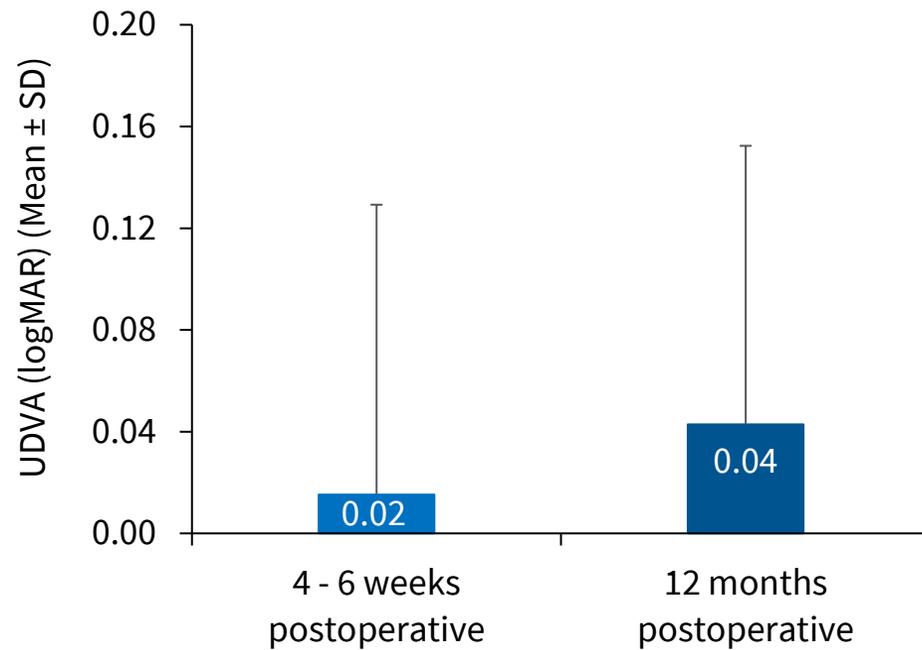
Vector analysis by Alpins method; angle of error; comparison of change in keratometric astigmatism along the original steep and orthogonal meridians; percentages with  $\leq 0.25D$ ,  $0.50D$ ,  $1.00D$ ,  $1.25D$  of intended astigmatic correction to target; UDVA.

# Results: Astigmatism



- With a statistically significant reduction in astigmatism from preop to postop, 94.3% and 85.7% of eyes achieved cylinder within 0.50 D at 4-6 weeks and 12 months, respectively.

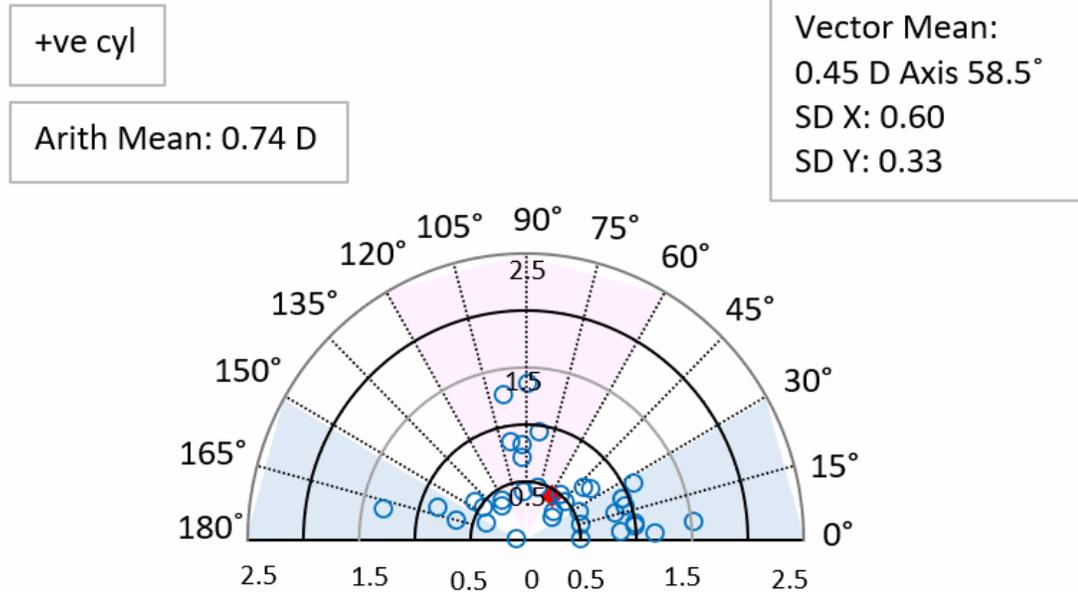
# Results: UDVA



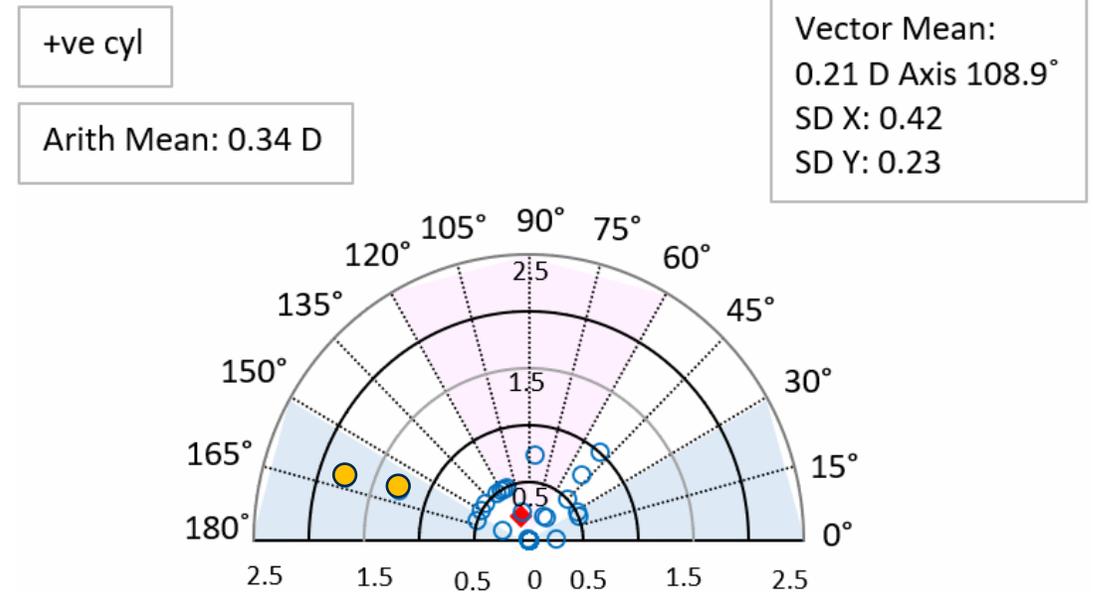
- UDVA of 20/25 or better was achieved in 85.3% at 4-6 weeks and 82.4% at 12 months.

# Results: Single Angle Vector Plots

## Preoperative



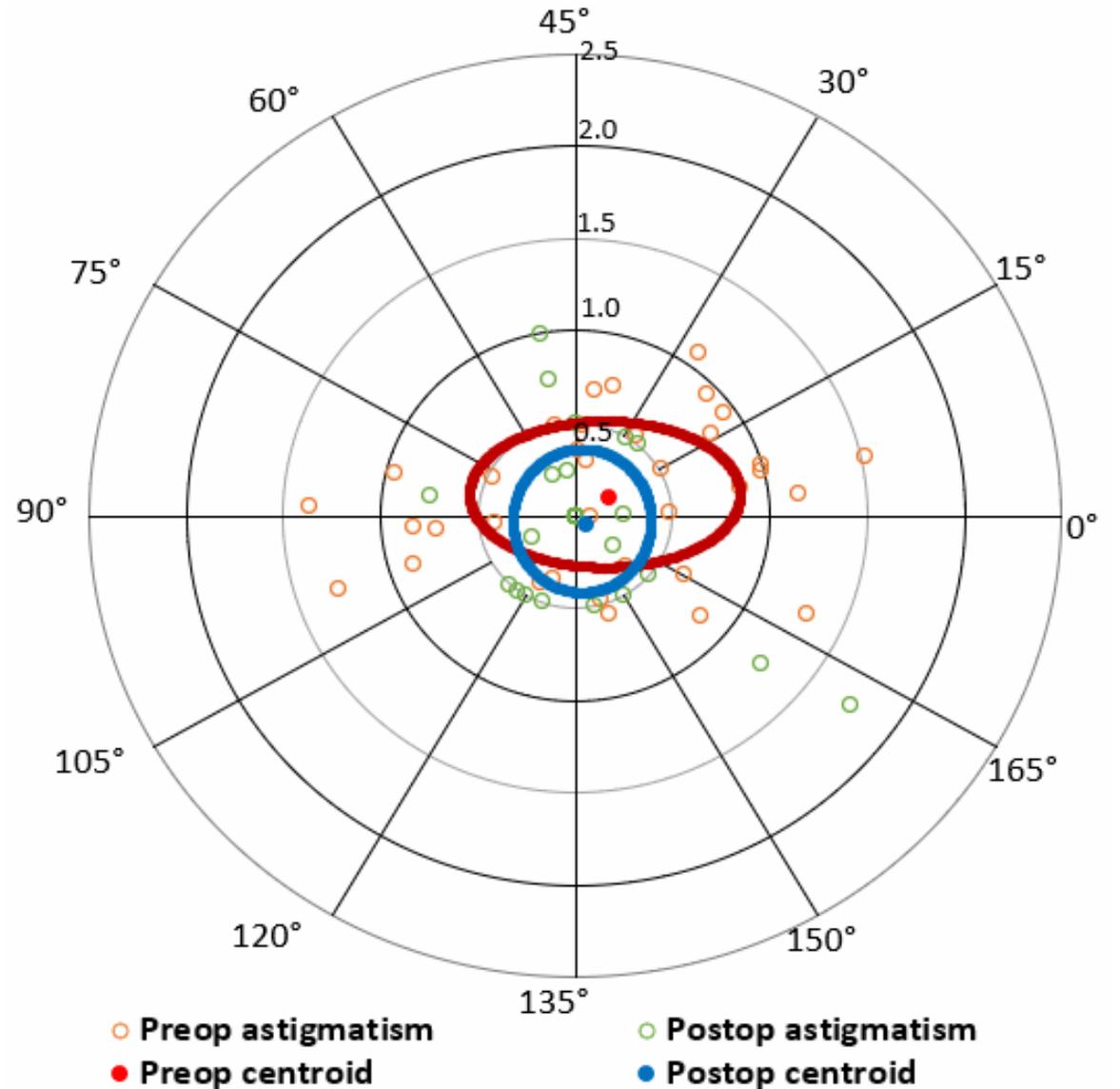
## Postoperative at 12 months



- Mean astigmatism was reduced from 0.74 D to 0.19 D at 4–6 weeks and 0.34 D at 12 months.

# Results: Double Angle Vector Plot at 12 months

- Vector analysis revealed a postoperative reduction in vectoral standard deviation, as represented by the postoperative ellipse.

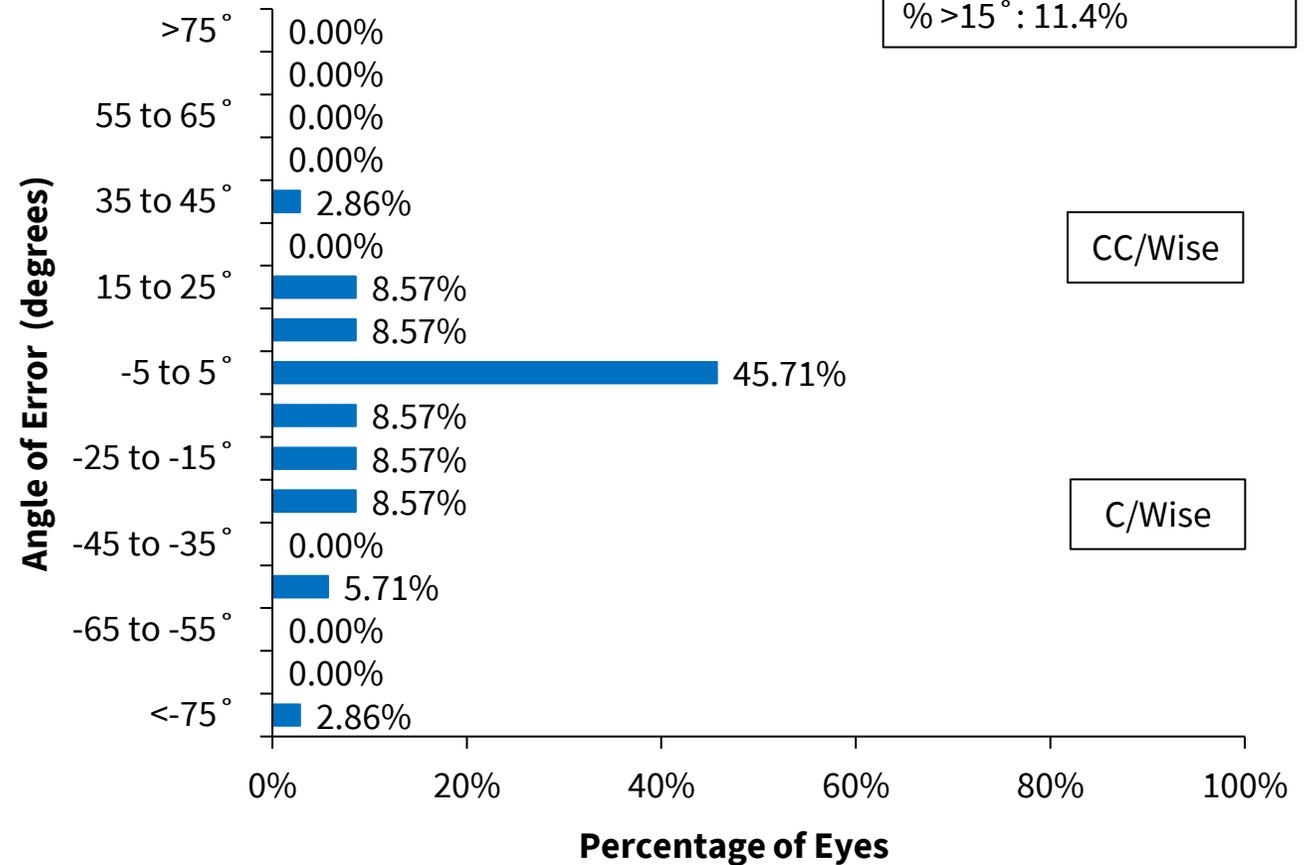


# Results: Angle of Error at 12 months

- The angle of error was small, with 45.7% of eyes showing an angle of error within 5 degrees, and 62.6% of eyes showing an angle of error within 15 degrees.

35 astigmatic eyes  
12 months postop

Arith. Mean:  $-6.0 \pm 23.1$   
Abs. Mean:  $14.1 \pm 19.1$   
%  $< -15^\circ$ : 25.7%  
%  $> 15^\circ$ : 11.4%



# Results: Blehm Potvin analysis at 12 months

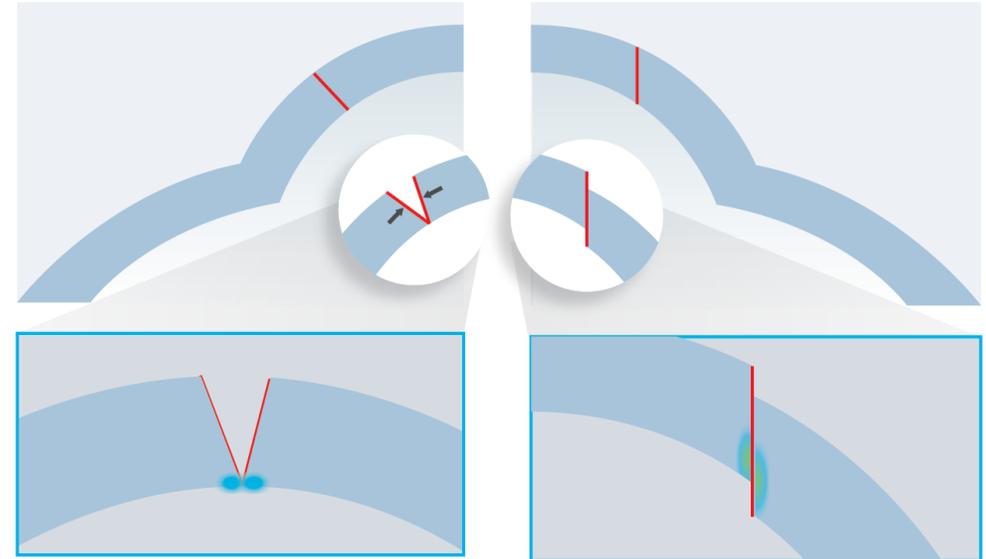
- The efficacy ratio was 61.53%, indicating some undercorrection along the steep axis
- The mean percentage of keratometric to refractive correction was 105.31%

| Vector analysis of refractive and keratometric changes   |  |         |         |          |         |
|--|--|---------|---------|----------|---------|
| N  |  | 32      |         |          |         |
| Properties   |  | Mean    | SD      | Minimum  | Maximum |
| Change in corneal (keratometric) astigmatism, D  | Total  | 0.94    | 0.84    | 0.05     | 3.22    |
|  | along original steep keratometry meridian      | 0.36    | 0.94    | -1.73    | 3.16    |
|  | along Orthogonal to steep keratometry meridian | -0.14   | 0.74    | -2.91    | 1.94    |
| Percentage of keratometric to refractive correction <sup>#</sup>                               |  | 105.31% | 128.15% | -154%    | 660.40% |
| Efficacy ratio (ratio of SIA along the steep axis (cos) to preoperative keratometric cylinder) |  | 61.53%  | 151.12% | -199.11% | 660.40% |

#Change in refractive cylinder along original refractive cylinder steep keratometry meridian / change in corneal astigmatism along original refractive cylinder steep keratometry meridian

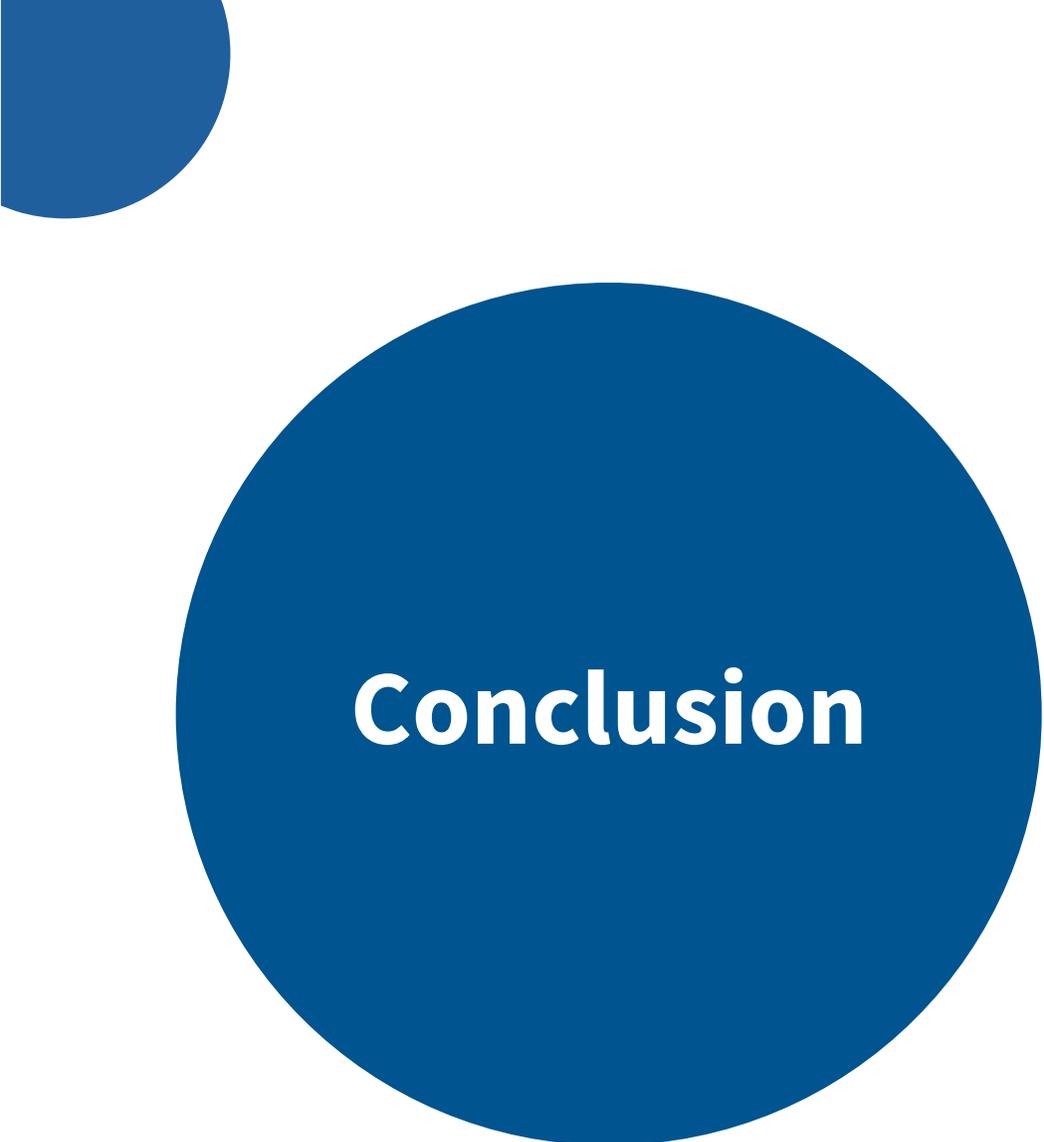
# Discussion

- Standard AK incisions are usually made perpendicular to the corneal surface, which can lead to wound gapping.
  - The epithelial plug that deeply fills the gap is partially replaced by a loosely-arranged fibrotic scar, inducing wound contraction over time and reducing the surgical effect of AK.
- Beveled incisions allow the anterior cornea to slide forward in relation to the posterior cornea, and the realigned stroma heals without wound gapping or formation of epithelial plug.



**Standard AK:**  
Figure showing gapping  
of the cornea.

**Beveled AK:**  
Figure showing  
forward slide of  
anterior cornea and  
lesser gapping.



# Conclusion

- In the present study, iris registration-guided beveled AKs created with LENSAR ALLY femtosecond laser resulted in good astigmatic outcomes that remained stable over 12 months.



**Thank You**