# Comparing Astigmatic Toric Intraocular Lens Outcomes of Ophthalmology Residents to a Fellowship-Trained Refractive-Cataract Surgeon

*Category: Keratorefractive*

**Keywords:** Astigmatism Outcomes, Resident Outcomes, Ophthalmology Education/Training

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# Disclosures

- No relevant financial disclosures

# Introduction

- **What is astigmatism?**
  - One of the two principal perpendicular meridians of the cornea is steeper than the other. This gives the eye the colloquial “football shape,” and not the expected regular spherical arc.[1]

- **Treatment Options for Astigmatism**
  - Toric IOL, LASIK, PRK, Limbal Relaxing Incisions (LRI)[2], Astigmatic Keratotomy (AK)[3]

- **Statistics**
  - By age 75, approximately half of all American will have cataracts[4]
  - More than 24 million Americans aged 40 or older have cataracts[4]
  - Of patients who are candidates for cataract surgery, almost 1 in 3 have at least 1.0 diopter (D) of astigmatism[5]

- **Outcomes**
  - Astigmatism of less than 0.75 diopters is well tolerated visually by most patients[6]

- **Literature**
  - No other published manuscript has compared resident and attending astigmatism outcomes in Toric IOLs

# Purpose

- To compare the post-operative astigmatism outcomes, measured by cylinder, in patients undergoing Toric intraocular lens (IOL) implantation by an ophthalmology resident at a county hospital as primary surgeon and a fellowship-trained refractive-cataract surgeon in private practice.

# Methods

- This was a retrospective study with **142 eyes** that underwent Toric IOL implantation, with AcrySof (Alcon), for astigmatism:
- **63 eyes** had surgery performed by a PGY-4 ophthalmology **resident (RES)**
- **79 eyes** had surgery performed by a fellowship-trained refractive-cataract **attending (ATT)**

**Toric IOL:**

- AcrySof (Alcon), Material: hydrophobic acrylic, IOL Diameter: 13.0 mm

**Patient Age:**

- Median age was 73 +/- 7 for the RES cohort
- Median age was 64 +/- 12 for the ATT cohort.

**Outcomes:**

- Primary outcome measures were post-operative cylinder classified into three categories:
  - < 0.25, 0.25 to 0.75, and > 0.75
- Pre-operative cylinder was separated into **> 2 (44 RES eyes, 21 ATT eyes)** and ≤ **2 (19 RES eyes, 58 ATT eyes)** for sub-group analysis

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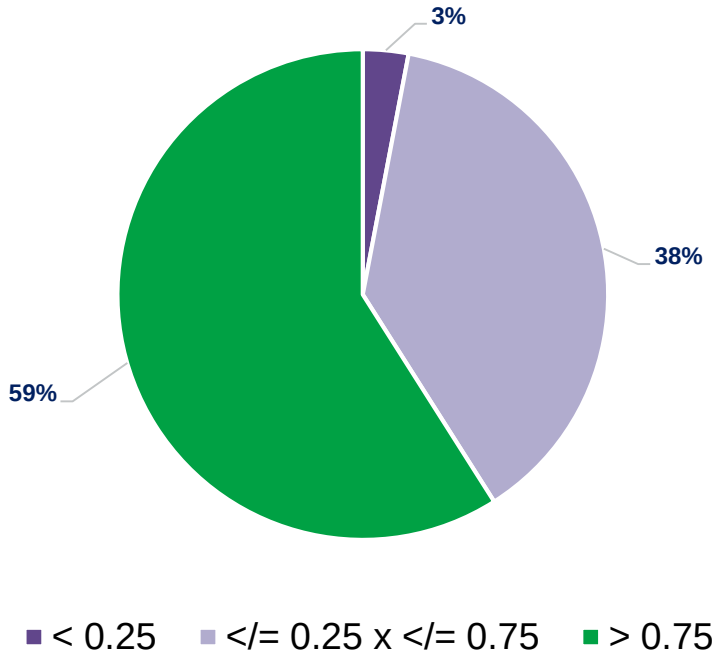
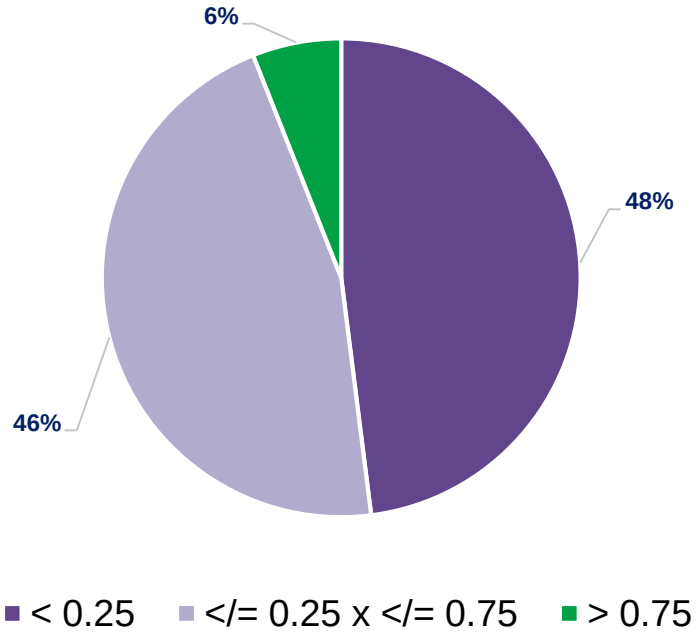
# Results

| | RESIDENT (RES) | ATENDING (ATT) |
|---|---|---|
| Average Pre-Op Cylinder | 3.08 D | 1.70 D |
| Average Post-Op Cylinder | 1.11 D | 0.40 D |
| Average % Improvement in Cylinder | 64% | 77% |

**Resident Post-Operative Outcomes Stratified by Cylinder**




**Attending Post-Operative Outcomes Stratified by Cylinder**

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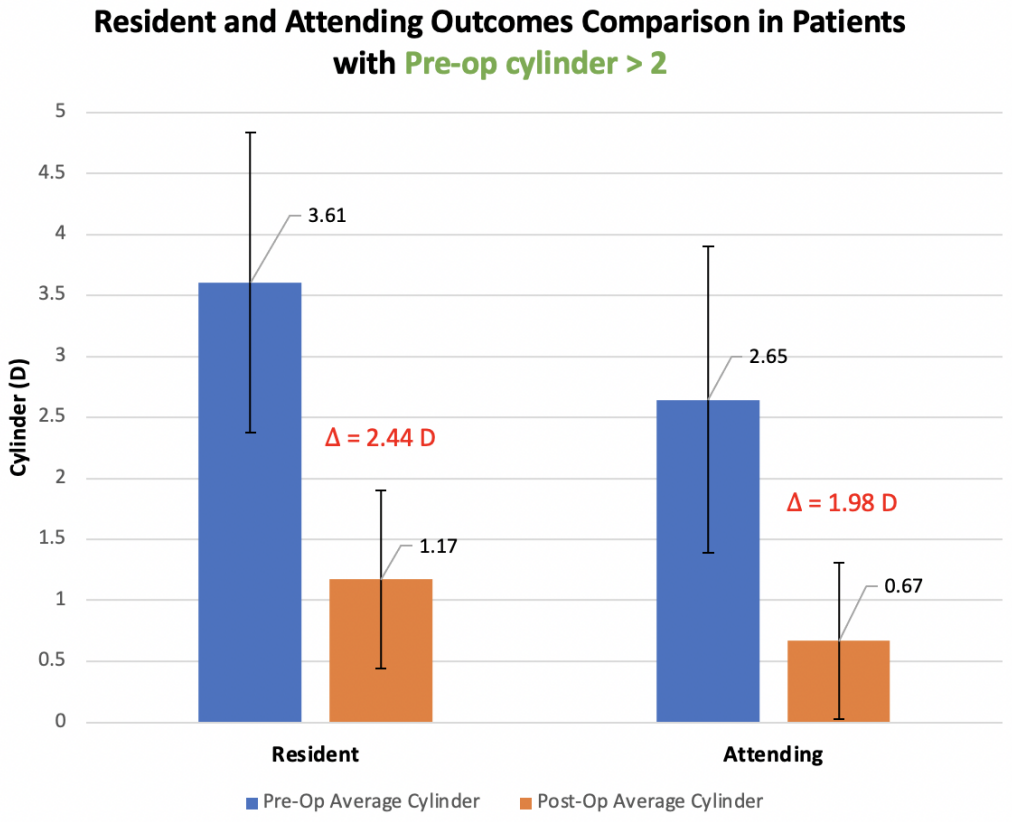


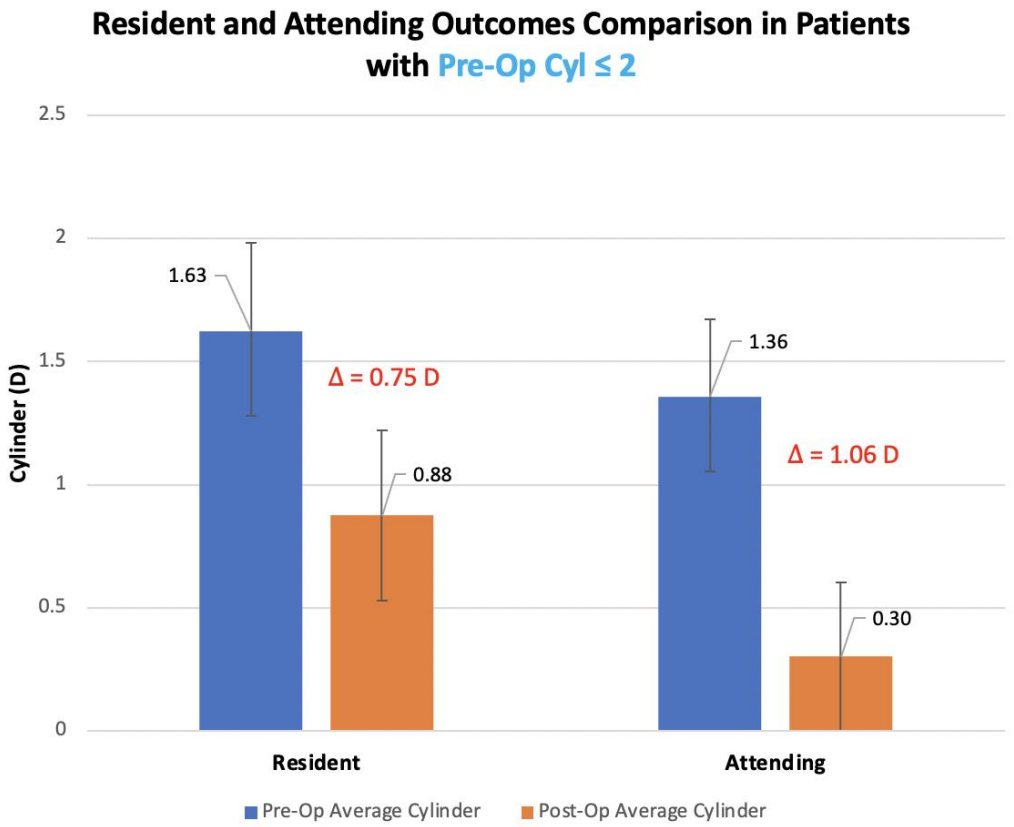


- When comparing **Attending** and **Resident** outcomes via sub-group analysis for patients with:
  - **Pre-op cylinder > 2**, there was **no significant difference** in the **magnitude of improvement in cylinder (Δ)** from pre-op to post-op between RES and ATT (p= 0.22).
  - However, when comparing patients with a **pre-op cylinder ≤ 2**, the ATT group demonstrated a **statistically significant** larger **magnitude of increase in pre-op to post-op cylinder (Δ)**, compared to the RES group (p = 0.01).

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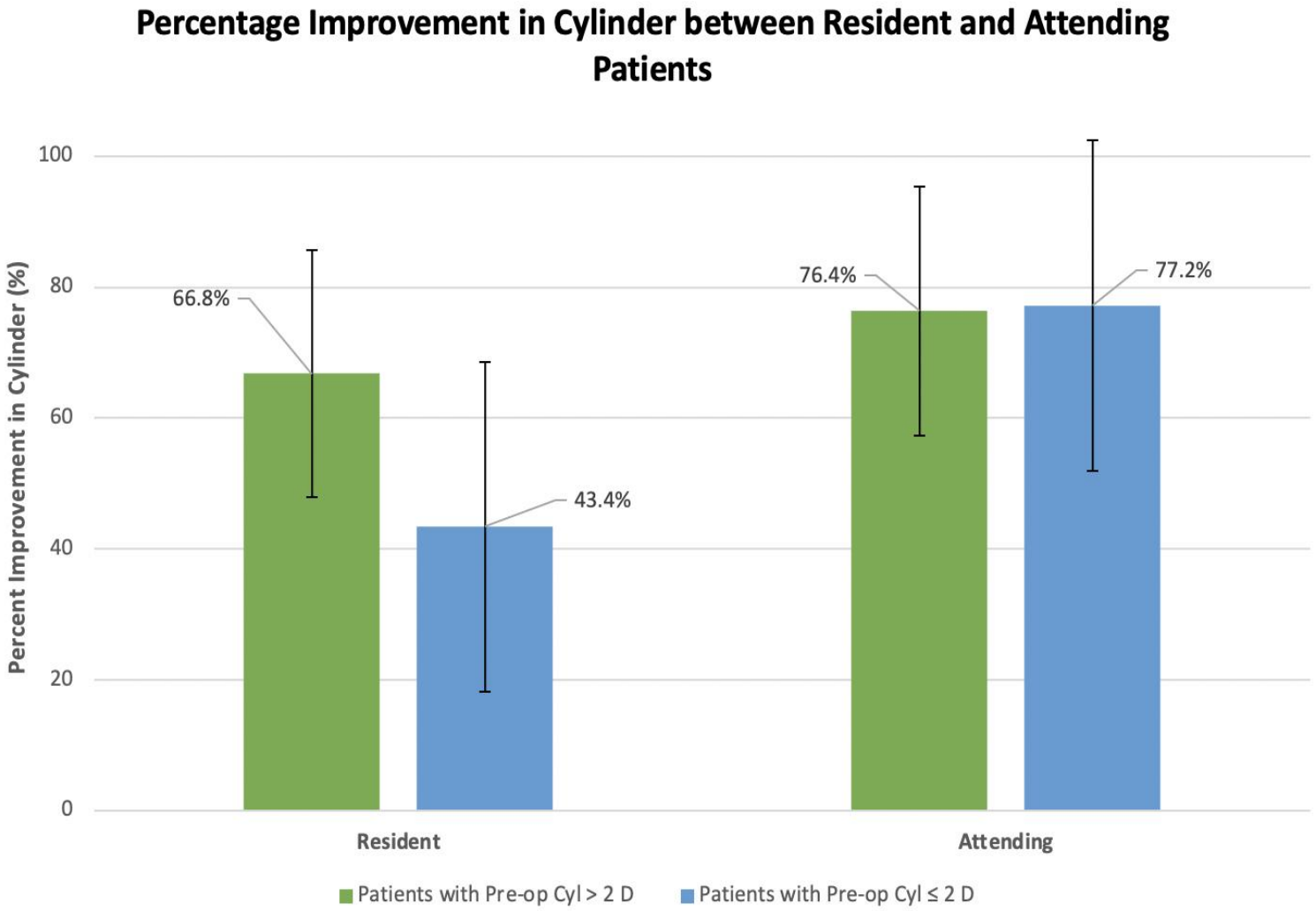
# Results




- **Attending** → **SAME** percent improvement in Cyl, regardless of a pre-operative Cyl **> 2** or **≤ 2** (p = 0.89).
- **Resident** → **SMALLER** percent improvement in Cyl in patients with pre-operative Cyl **≤ 2**, compared to **> 2** (p = 0.0002).

- Comparing **Attending** and **Resident** outcomes in terms of percentage (%) improvement in cylinder:
  - When **pre-op cylinder > 2**, there was **no significant difference** in the percentage (%) of improvement in cylinder from pre-op to post-op between RES and ATT (p=0.06).
  - However, when comparing patients with a **pre-op cylinder ≤ 2**, the ATT group demonstrated a **statistically significant** larger percentage (%) increase in pre-op to post-op cylinder, compared to the RES patient group (p < 0.00001).

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# Discussion

## Attending

- The **attending** group outcomes had an impressive **94%** of patients with a post-operative Cyl of ≤ 0.75 D.
- Regardless of the pre-operative starting cylinder the **attending** has a **consistent reduction** in Cyl, with respect to the % improvement.

## Resident

- The **resident** group only had **41%** of patients with a post-operative Cyl of ≤ 0.75 D.
- On the other hand, the **residents** are **not able to maintain consistency** and performed worse with a pre-op cylinder ≤ 2, compared to > 2.

## Comparison

- When **pre-op cylinder > 2**, there was **no difference in outcomes** between the attending and resident group
- However, when **pre-op cylinder ≤ 2**, the **attending group performed better** than then resident group

## Factors Affecting Residual Astigmatism[7]

- **Pre-Operative**
  - Technique for measurement of Cyl
  - Keratoconjunctivitis sicca, Corneal pathology (abrasions, keratoconus, etc.)
  - History of corneal surgery or laser procedures
  - Anatomical Anomalies (Salzmann nodules, Epithelial Basement Membrane Dystrophy, eyelid lesions)
- **Intraoperative**
  - Proper placement of the Phaco incision
  - Use of intraoperative aberrometry (i.e. Optiwave Refractive Analysis)[8] to identify and ensure proper axis placement of the Toric IOL
- **Post-Operative**
  - Permanent Axis of Toric IOL (can vary from intended and can be affected by heavy lifting and posture changes in post-op week 1)
  - Technique for measurement of Cyl

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# Conclusions and Takeaways

- In conclusion, a fellowship-trained refractive-cataract surgeon, has overall improved outcomes compared to residents when performing Toric IOL implantation for the correction of astigmatism.
  - This discrepancy is particularly statistically significant in patients with a pre-op cylinder $\leq 2$.

- Residents are NOT as successful when the MARGIN for improvement in cylinder is reduced (pre-op cyl >2).
- The **attending maintained precision** in outcome, with respect to % cyl improvement, regardless of the pre-operative cylinder.

- Therefore, to enhance patient outcomes, **resident case selection can preference patients with a pre-op cylinder >2**.

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