

Comparing Rotational Stability of Clareon and Eyhance Toric IOLs in a Real-World Setting

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Background: The Eyhance Toric intraocular lens (IOL) builds upon the Tecnis Toric platform, initially associated with considerable post-operative rotational instability. Version 2, the Eyhance Toric IOL has been modified to enhance rotational stability. This study evaluates the post-operative rotational stability of the Eyhance Toric IOL compared to the Clareon Toric IOL, recognized for its stable performance.

Methods: Patients undergoing cataract surgery received either the Eyhance or Clareon Toric IOLs. Placement was guided by the Barrett Toric Calculator at baseline (P0). IOL stability, uncorrected distance visual acuity (UDVA), corrected distance visual acuity (CDVA), and refractive astigmatism were assessed at 6–24 hours (P1) and 3 weeks to 6 months (P2) post-operatively. IOL rotational measurements were recorded at each interval.

Results: The study included 187 patients (median age: 74 for Clareon, 79 for Eyhance, $p = 0.004$). No significant differences were found in UDVA, CDVA, or refractive astigmatism at P2. Median rotation from P0 to P1 (3.0 vs 4.0 degrees, $p = 0.091$) and P0 to P2 (1.0 vs -0.5 degrees, $p = 0.482$) were not statistically different. However, the Clareon IOL showed less rotation between P1 and P2 (0.0 vs 1.0 degrees, $p = 0.049$). Absolute rotation from P0 to P1 (4.0 degrees), P1 to P2 (1.0 vs 2.0 degrees, $p = 0.064$), and P0 to P2 (4.0 vs 3.5 degrees, $p = 0.095$) were comparable.

Conclusion: The Eyhance Toric IOL demonstrated comparable rotational stability and visual outcomes to the Clareon Toric IOL. Modifications in the Eyhance design have successfully improved its rotational stability, positioning it as a viable alternative to the Clareon Toric IOL in clinical practice.

Keywords: Eyhance toric, Tecnis toric, Clareon toric, rotational stability

What Is Already Known on This Topic

Before this study, it was established that postoperative rotational stability of toric intraocular lenses (IOLs) is crucial for optimal refractive outcomes in cataract surgery. The initial Tecnis Toric IOL exhibited significant postoperative rotational instability, which was addressed in the updated Tecnis Toric 2 platform. The Clareon Toric IOL is recognized for its stable performance. However, the real-world performance and comparative rotational stability of the newer Eyhance Toric IOL had not been thoroughly evaluated.

What This Study Adds

This study provides a real-world comparison of the rotational stability between the Eyhance Toric IOL and the Clareon Toric IOL. The findings indicate that the Eyhance Toric IOL demonstrates a slight, statistically significant but clinically non-significant increase in rotational movement compared to the Clareon IOL.

Despite this, both IOLs demonstrated comparable overall rotational stability and visual outcomes, suggesting that the modifications in the Eyhance Toric IOL have brought its performance in line with the Clareon IOL.

How This Study Might Affect Research Practice or Policy

The findings support the use of the Eyhance Toric IOL as a viable alternative to the Clareon Toric IOL, with both offering comparable rotational stability and visual outcomes. This could influence clinical decisions regarding IOL selection in cataract surgery, promoting confidence in the newer Eyhance Toric IOL. Future research may build on these findings to further refine IOL designs and postoperative management strategies, potentially leading to improved patient outcomes and broader adoption of toric IOLs.

Background

Achieving optimal refractive outcomes post-cataract surgery is contingent upon addressing postoperative refractive astigmatism, which can diminish uncorrected visual acuity and heighten dependence on corrective eyewear. One strategy to counteract this issue is the deployment of toric intraocular lenses (IOLs).¹ The success of toric IOL implantation is largely influenced by three pivotal factors: the precision of preoperative corneal astigmatism measurements, accuracy of intraoperative IOL alignment, and selection of an IOL characterized by robust postoperative rotational stability. Conversely, rotational instability can result in uncorrected astigmatism, thereby reducing visual quality. Significant deviations may require additional surgical intervention, which can compromise patient comfort and lead to increased healthcare costs.

Historically, the Tecnis Toric 1 IOL (Johnson & Johnson, Santa Ana, CA, USA) has exhibited less favourable rotational stability when juxtaposed with the AcrySof toric IOL (Alcon Laboratories, Inc., Fort Worth, TX, USA).² Nonetheless, advancements in the design of the subsequent Tecnis Toric 2 platform have ostensibly ameliorated stability, a change attributed to the novel frosting applied to the external haptic surface to increase friction with the capsule.^{3,4} A recent single-arm, prospective study of the Eyhance IOL which utilises the Tecnis Toric 2 platform demonstrated very high rotational stability.⁵

The current study offers a real-world, retrospective examination of the rotational stability of the Eyhance IOL, which utilizes the advancements inherent in the Tecnis Toric 2 platform, in comparison to the Clareon IOL, to ascertain whether these design modifications translate into clinically significant improvements in IOL rotational stability.

Material and Methods

This investigation was conducted at Eye Surgery Associates in Victoria, Melbourne, Australia, where the primary objective was to compare post-operative rotational stability between two different models of toric intraocular lenses (IOLs).

This study was conducted in accordance with the STROBE guidelines, ensuring comprehensive reporting and methodological rigor in observational research,⁶ and was carried out in full compliance with the principles outlined in the Declaration of Helsinki.

Ethics approval was obtained from the Human Research Ethics Committee of the Royal Victorian Eye and Ear Hospital (ID 23/1560HL). All surgical procedures were performed by a single surgeon following routine standard-of-care practices for cataract patient management. The ethics committee waived the requirement for individual patient consent as the study was retrospective and did not influence patient care. The data utilized for analysis were de-identified to preserve patient confidentiality and adhere to privacy standards.

Inclusion and Exclusion Criteria

Patients aged 18 years and older who underwent uncomplicated conventional or femtosecond laser-assisted cataract surgery during the year 2021 were considered for inclusion in this study. Refractive lens exchange cases were not included. Those with coexisting ocular conditions such as significant corneal scarring, ectasia (keratoconus or pellucid marginal degeneration), a history of keratoplasty, prior excimer laser treatments, current or historical pterygium, zonular instability, previous trabeculectomy, or retinal detachment were excluded to minimize confounding factors in visual outcomes. Also excluded were individuals with intraoperative complications (eg, capsular tears, vitreous loss, zonular

dehiscence), those without a documented intraoperative toric alignment system, and patients with persistent postoperative corneal oedema that could interfere with refractive assessment.

Postoperative refractive measurements were a prerequisite for inclusion, specifically if performed between 21 and 183 days after the operation. Cases were also excluded if there was no postoperative refraction data or if the postoperative best corrected distance visual acuity was below 6/12, suggesting suboptimal visual correction. The study was limited to patients who received topical anaesthesia. If both eyes of a patient were eligible, they were both included in the analysis.

Pre-Operative Assessments

Pre-operative biometry measurements were taken using the IOLMaster 700 (with software version 1.88 or later; Carl Zeiss Meditec AG, Jena, Germany), factoring in a surgically-induced astigmatism value of 0.10 dioptres. The IOLMaster was programmed with the latest iteration of the Barrett calculator, which provided recommendations for the intended axis of intraocular lens implantation.

Intraocular Lenses

Patients underwent cataract surgery with implantation of either the Clareon toric IOL models CNA0T2, CNA0T3, CNA0T4, or CNA0T5 (Alcon Laboratories Inc, Fort Worth, TX, USA) or the Tecnis Eyhance toric IOL models ICU100, ICU150, ICU225, or ICU300 (Johnson and Johnson Vision, Santa Ana, CA, USA). These lenses were chosen to correspond with the required toricity in the IOL plane, available in powers of 1.0, 1.5, 2.25, and 3.0 dioptres. Both IOLs share common features: they are one-piece, aspheric, foldable, and feature a C-loop design for placement in the posterior chamber. They have an optical diameter of 6.0mm and an overall haptic diameter of 13.0mm. A distinguishing feature between the two is that the Clareon IOL is supplied as a preloaded system, while the Eyhance IOL requires manual loading during the surgical procedure.

Surgical Techniques

The surgical procedures, which encompassed the creation of the wounds, capsulotomy, and phacoemulsification, were carried out using either conventional methods or the FLACS technique. These processes were performed through a temporal clear corneal incision measuring 2.4mm. The size of the incision was adjusted when necessary, depending on the power of the intraocular lens (IOL) being implanted, following the manufacturers' guidelines.

After the extraction of the cataract, the under-surface of the anterior capsule was polished. Subsequently, the IOL was rotated to the axis specified by the Barrett toric calculator. For IOL alignment, the surgeon employed one of three methods: (1) using a Mendes marker (Albert Heiss GmbH & Co. KG, Tuttlingen, Germany) to make weighted preoperative marks on the eye at the 0 and 180-degree axes with the patient in an upright position; or utilizing the image guided systems (2) Zeiss Callisto Eye® (Carl Zeiss Meditec AG, Jena, Germany) or (3) Verion™ (Alcon, Fort Worth, TX, USA) for toric alignment. These image guided systems provide an intra operative digital overlay on the eye to guide IOL rotational placement.

Throughout the procedure, special care was taken to ensure the complete removal of viscoelastic from behind the IOL and from within the fornices of the capsular bag. Capsular tension rings were not utilized. The position of the IOL at end of the surgery was recorded as time point "P0".

Follow-Up

Post-operative evaluations were conducted at two designated time-points: an initial follow-up at 6 to 24 hours post-surgery ("P1") and a final assessment scheduled between three weeks and six months after the operation ("P2"). At the P2 visit, assessments included uncorrected distance visual acuity (UDVA), corrected distance visual acuity (CDVA), manifest refraction, and posterior segment examination. Visual acuity results were quantified and recorded using the logMAR scale, which measures the smallest letter size that can be reliably identified.

During both the P1 and P2 follow-up visits, pupil dilation was performed to determine the intraocular lens (IOL) orientation. This was accomplished by a single observer (BC) aligning a narrow-slit beam of light with the toric markers on the peripheral optic part of the IOL and axis then read with one degree precision from the 5-degree steps slit lamp

graticule. The alignment of the toric IOL was noted when both IOL marks were directly visible and could be aligned accurately.

Patients were only considered for a return to the operating room for IOL repositioning if there was a clinically significant misalignment that warranted correction, and the patient provided consent for the additional procedure.

The degree of IOL rotation (signed rotation) was determined by calculating the difference in the IOL's position between the three time points (P0, P1, P2). If the IOL had rotated in a clockwise direction from the earlier to the subsequent position, the rotation was assigned a positive value. Conversely, a counterclockwise rotation was indicated with a negative value. The "absolute rotation" was defined as the absolute value of the rotational difference, disregarding the direction of the rotation.

Statistical Analysis

Statistical analyses were conducted using STATA software (STATA Corporation, College Station, TX, USA). Due to the non-normal distribution of baseline variables and intraocular lens (IOL) rotation measurements, these data were described using the median and interquartile range (IQR) rather than the mean and standard deviation, which are typically used for normally distributed data. To compare the quantitative data between the two groups, the Wilcoxon Rank Sum Test, a non-parametric statistical test, was utilized. This test is appropriate for comparing medians from two independent samples, especially when the assumption of normal distribution is not met. For categorical variables, the Fisher exact test was employed. This test is used instead of the Chi-square test when sample sizes are small, as it provides an exact p-value that is more reliable for the statistical inference of such datasets. These statistical methods ensure that the analysis is robust and less sensitive to the violations of the normality assumption, thereby providing more accurate and reliable results for the variables assessed in this study.

Results

The analysis incorporated data from 187 eyes in total, with 137 eyes having been implanted with the Clareon toric IOL and the remaining 50 with the Eyhance toric IOL, as detailed in Table 1. There was a statistically significant age difference between the two groups, with the median age of patients receiving the Clareon IOL being lower (74 years)

Table 1 Baseline Characteristics of Eyes Receiving the Clareon and Eyhance IOLs Included in the Final Analysis

Patient characteristics	Clareon (n=137) Median ¹ (IQR)	Eyhance (n=50) Median (IQR)	P for difference (Wilcoxon Rank Sum Test)
Age (years)	74.0 (69.0, 80.0)	79.0 (74.0, 81.0)	0.004
Male %	47.4	48.0	1.00 ²
UDVA ³	0.5 (0.3, 0.8)	0.5 (0.4, 0.7)	0.985
CDVA ⁴	0.2 (0.1, 0.3)	0.2 (0.1, 0.3)	0.842
Axial length ⁵ (mm)	23.6 (23.1, 24.4)	23.2 (23.0, 23.6)	0.006
Anterior chamber depth ⁶ (mm)	3.1 (2.8, 3.3)	3.1 (2.8, 3.3)	0.514
Lens thickness ⁷ (mm)	4.7 (4.3, 5.0)	4.7 (4.5, 5.0)	0.292
Mean Keratometry ⁸ (dioptries)	43.8 (42.7, 44.5)	43.9 (42.7, 44.5)	0.711
Corneal astigmatism ⁹ (dioptries)	0.8 (0.6, 1.1)	0.9 (0.6, 1.3)	0.263
Central corneal thickness ¹⁰ (μm)	549(526, 568)	547 (527, 569)	0.825
Horizontal white to white ¹¹ (mm)	12.1 (11.7, 12.3)	11.8 (11.5, 12.4)	0.082

(Continued)

Table 1 (Continued).

Patient characteristics	Clareon (n=137) Median ¹ (IQR)	Eyhance (n=50) Median (IQR)	P for difference (Wilcoxon Rank Sum Test)
Pupil diameter ¹² (mm)	3.7 (3.2, 4.3)	3.6 (3.3, 4.3)	0.819
IOL spherical equivalent power ¹³ (dioptries)	21.5 (19.5, 23.5)	23.0 (22.0, 24.0)	<0.001
Refractive aim ¹⁴ (dioptries)	−0.2 (−0.6, 0.0)	−0.3 (−0.6, −0.2)	0.035
Technique ¹⁵ : Conventional/FLACS N(%)	33/104 (24%/76%)	21/29 (42%/58%)	0.028 ²
IOL toricity ¹⁶ 1.0 (dioptries) N(%)	70 (51.1%)	20 (40.0%)	0.049 ¹⁷
IOL toricity 1.5 (dioptries)	47 (34.3%)	15 (30.0%)	
IOL toricity 2.25 (dioptries)	15 (10.9%)	10 (20.0%)	
IOL toricity 3.0 (dioptries)	5 (3.6%)	5 (10.0%)	
Alignment ¹⁸ : Weighted marker N(%)	114 (83.2%)	35 (70%)	0.064 ²
Alignment: Image guided	23 (16.8%)	15 (30%)	
IOL orientation ¹⁹ (against the rule) N(%)	87 (63.5%)	40 (80%)	0.096 ²
IOL orientation (oblique)	20 (14.6%)	5 (10.0%)	
IOL orientation (with the rule)	30 (21.9%)	5 (10.0%)	

Note: 1 IQR- Median and Interquartile ranges have been provided. 2 Fisher exact test. 3 UDVA=uncorrected distance visual acuity. 4 CDVA=corrected distance visual acuity. 5 Distance from cornea to retina. 6 Distance between the posterior surface of the cornea and the anterior surface of the lens, measured in millimetres. 7 Measurement of the distance between the anterior and posterior surfaces of the crystalline lens. 8 Average of the steepest and flattest curvatures of the cornea, measured in dioptries. 9. Refers to the regular curvature of the cornea, resulting in different refractive powers along two principal meridians. 10 Measurement of the thickness of the cornea at its centre, in micrometres. 11 The horizontal distance between the edges of the cornea where it transitions to the sclera, measured in millimetres. 12. The measurement of the pupil's size, in millimetres. 13 The effective focusing power of an intraocular lens (IOL), calculated as the sum of its sphere power plus half of its cylinder power. 14. The targeted postoperative refractive outcome, typically expressed in dioptries. 15. Refers to the surgical method used for cataract removal, where Conventional indicates manual phacoemulsification, and FLACS (Femtosecond Laser-Assisted Cataract Surgery). 16. Cylindrical power of a toric intraocular lens (IOL), designed to correct corneal astigmatism. 17. Kendall's Tau Test for trend across categories. 18 Refers to the alignment technique used to align the intraocular lens. 19 Classification of the toric IOL alignment>.

compared to those receiving the Eyhance IOL (79 years; $p=0.004$). Despite this age disparity, the distribution of genders across the two groups was comparable.

Within the study cohort, the Clareon group had a higher proportion of eyes receiving low toricity IOLs, whereas the Eyhance group was more likely to have high toricity IOLs implanted ($p=0.049$). Despite these differences in IOL toricity, there was no observed disparity in the magnitude of corneal astigmatism between the two groups.

Additionally, significant differences were noted in the Clareon group, which had a greater axial length ($p=0.006$), a lower median dioptric power of implanted IOLs ($p<0.001$), and a smaller proportion of surgeries performed using conventional methods as opposed to femtosecond laser-assisted cataract surgery (FLACS) ($p=0.028$).

Vision

Table 2 provides comparative data on postoperative visual outcomes, which show no statistically significant difference between the groups in terms of uncorrected distance visual acuity (UDVA), corrected distance visual acuity (CDVA), spherical equivalent, refractive astigmatism, or surgically induced astigmatism. Figure 1 demonstrates the low refractive astigmatism outcomes in both groups. These results suggest that both types of intraocular lenses (IOLs) perform similarly with respect to these key measures of visual function following cataract surgery.

IOL Rotation

Table 3 outlines the data regarding rotation of the intraocular lenses (IOLs) at different postoperative time points. Analysis of the rotational stability between the initial placement of the IOL (P0) and the early postoperative period (P1), as well as between P0 and the later postoperative period (P2), revealed no significant differences in either the median or median absolute rotation between the Clareon and Eyhance groups.

Table 2 Comparison of vision and Astigmatism at the Final Visit (P2) Between Groups

	Clareon (n=137)	Eyhance (n=50)	P for difference (Wilcoxon Rank Sum Test)
UDVA¹ (logMAR)			
Median (IQR)	0.1 (0.0, 0.3)	0.2 (0.1, 0.2)	0.310
Mean (95% CI)	0.2 (0.0,0.3)	0.2 (0.2,0.3)	
CDVA² (logMAR)			
Median (IQR)	0.0 (−0.1, 0.0)	0.0 (0.0, 0.1)	0.141
Mean (95% CI)	0.00 (0.0, 0.0)	0.0 (0.0, 0.0)	
Spherical outcome (dioptres)			
Median (IQR)	−0.4 (−0.8, 0.0)	−0.5 (−1.0, −0.3)	0.148
Mean (95% CI)	−0.6 (−0.8, −0.5)	−0.7 (−0.9, −0.5)	
Refractive astigmatism⁴ (dioptres)			
Median (IQR)	0.25 (0.0, 0.5)	0.25 (0.0, 0.5)	0.189
Mean (95% CI)	0.4 (0.3, 0.4)	0.3 (0.2, 0.4)	
Corneal surgical induced astigmatism⁵ (dioptres)			
Median (IQR)	0.3 (0.2, 0.5)	0.4 (0.2, 0.5)	0.555
Mean (95% CI)	0.4 (0.4, 0.5)	0.4 (0.4, 0.5)	

Note: 1 uncorrected distance visual acuity. 2 corrected distance visual acuity. 3 refractive result after cataract surgery, specifically the spherical component of the patient's prescription. 4 residual astigmatism in the patient's prescription after surgery. 5 refers to the change in corneal astigmatism resulting from surgical interventions. Median and Interquartile ranges (IQR) have been provided. Mean and ninety five percent confidence interval values have been provided.

However, when examining the period between the early (P1) and later postoperative checks (P2), while the median absolute rotation did not differ significantly, the median rotation itself was slightly but significantly lower for the Clareon group ($p=0.049$), suggesting a marginal advantage in terms of rotational stability for the Clareon IOL during this specific interval. On cataract surgical technique subgroup analysis, this small statistically significant difference in median rotation between P1 and P2 persisted for the Femtosecond technique group (0/2 degrees, $p=0.001$, Wilcoxon Rank Sum test) but not for the Conventional technique group (0/0 degrees, $p=0.90$). There was no difference in rotation or absolute rotation between all other time points for the Femtosecond and Conventional groups.

Sub group analysis for the IOL alignment technique demonstrated no difference in rotation or absolute rotation between all time points for both weighted marker and image guided sub groups.

No patient in either group underwent secondary IOL rotation, which implies that any rotations that did occur were not clinically significant enough to warrant further surgical intervention.

Direction of Rotation

Between surgery and the early post operative period (P1), rotation was more likely in the clockwise direction than anti clockwise (Clareon/Eyhance: 76/87% v 21/0%, $p<0.001$, Fisher exact). Between the other time points there was no significant difference in direction of rotation.

Study Power

Using the observed mean absolute rotations of 5.5 and 4.0 degrees, with estimated pooled standard deviation of 3 and group sizes as observed, we would be able to detect as significant the difference between groups (at alpha level 0.05, the two-tailed Wilcoxon-Mann-Whitney test under a minimum asymptotic relative efficiency parent distribution), a - Cohen's d of 0.5 with power of 80%.

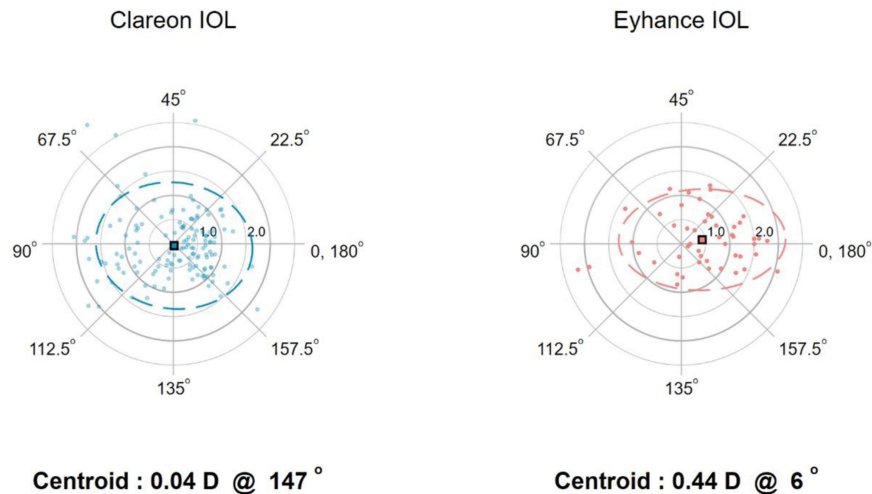
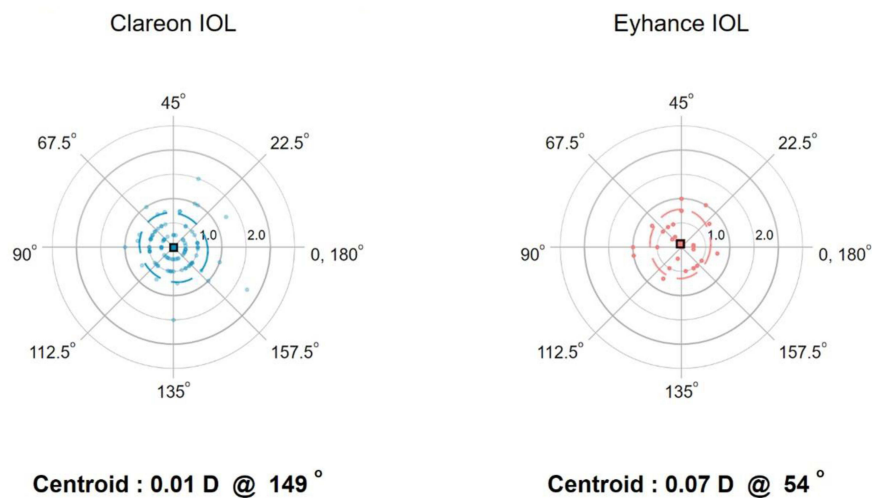
A.**B.**

Figure 1 Preoperative corneal and postoperative refractive astigmatism in Clareon and Eyhance Toric IOL groups. **(A)** Preoperative corneal astigmatism: The centroid for the Clareon IOL group was 0.04 D @ 147°, whereas the centroid for the Eyhance IOL group was 0.44 D @ 6°. **(B)** Postoperative refractive astigmatism: The centroid for the Clareon IOL group was 0.01 D @ 149°, while the centroid for the Eyhance IOL group was 0.07 D @ 54°. Each concentric ring represents 0.5 dioptres (D). The square box denotes the centroid, and the broken ring represents the 95% confidence interval of the dataset.

Discussion

This real-world study delineates the performance evaluation of Clareon and Eyhance toric IOLs, where no significant difference in final uncorrected distance visual acuity (UDVA), corrected distance visual acuity (CDVA), or refractive astigmatism was observed between the two IOL types. The Clareon IOL demonstrated marginally less rotation between the immediate postoperative period (P1) and the final postoperative visit (P2). However, no difference in absolute rotation between these time points was noted. Additionally, the study established that rotational stability from the time of surgery to both P1 and P2 was consistent.

A single-surgeon design, with systematic inclusion and exclusion criteria, bolstered the study's strength, achieving well-matched groups for corneal astigmatism, surgically induced astigmatism, and a prolonged follow-up duration, which enabled robust comparisons.^{2,7}

Table 3 Comparison of Rotational and Absolute Rotational Stability of Clareon and Eyhance IOLs

Rotation/Time Points	Clareon (n=137) Median (IQR)	Eyhance (n=50) Median (IQR)	P-value (Wilcoxon Rank Sum Test)
Rotation			
P0 → P1 (degrees)	3.0 (1.0, 6.0), n=116	4.0 (2.0, 7.0), n=47	0.091
P1 → P2 (degrees)	0.0 (-1.0, 2.0), n=111	1.0 (0.0, 3.0), n=43	0.049
P0 → P2 (degrees)	1.0 (-4.0, 5.0), n=126	-0.5 (-4.0, 3.0), n=46	0.482
Absolute Rotation			
P0 → P1 (degrees)	4.0 (2.0, 7.0), n=116	4.0 (2.0, 7.0), n=47	0.805
P1 → P2 (degrees)	1.0 (0.0, 2.0), n=111	2.0 (1.0, 3.0), n=43	0.064
P0 → P2 (degrees)	4.0 (2.0, 7.0), n=126	3.5 (1.0, 7.0), n=46	0.143

Notes: - P0 = position of the IOL at the end of surgery. - P1 = IOL position 6 to 24 hours after surgery. - P2 = IOL position at the final assessment between 3 weeks and 6 months after surgery.

Abbreviations: IQR, Interquartile Range.

It is also noteworthy that none of the patients in either group required a return to the operating theatre for additional repositioning of the IOL, which implies that any rotations that did occur were not clinically significant enough to warrant further surgical intervention.

The early postoperative assessment at 6 to 24 hours post-surgery was indicative of the long-term IOL stability, which aligns with the findings by Inoue et al⁷ and Lee and Chang.² The later assessment window (3 weeks to 6 months) offered the advantage of evaluating visual outcomes post corneal wound edema resolution, thus allowing for more accurate measures of UDVA and post-operative refractive astigmatism, integral in toric IOL studies.

Minor discrepancies in group demographics were considered negligible in impacting outcomes. Intergroup variances in age and the proportion of high toricity IOLs were observed but deemed unlikely to influence the findings. The age discrepancy reflected the surgeon's relative preference for performing surgery in older patients with a peri bulbar eye block and Clareon IOL for superior akinesia and faster IOL loading to reduce surgical time, an important consideration in older patients. These patients were excluded from the study because of their peribulbar anaesthetic however this reduced the median age of included patients receiving the Clareon IOL.

Intraoperative IOL alignment was performed using either a weighted marker or image guided system, with the latter documented for superior accuracy.⁸ There was no difference in IOL rotation between all time points, when the analysis was performed for the weighted marker and image guided subgroups. The balanced use of both techniques across cohorts is assumed to have mitigated potential impacts on different techniques on the results.

The Clareon cohort's higher prevalence of femtosecond laser-assisted cataract surgery (FLACS) could imply an advantage in IOL stability due to better capsulotomy overlap.⁷ Despite concerns that larger capsulotomy areas might elevate the risk of IOL rotation,⁹ this study did not exhibit marked discrepancies in capsulotomy dimensions between groups, rendering this concern moot. Subgroup analysis for the FLACS and conventional groups demonstrated significantly less IOL rotation between P1 and P2 for the FLACS subgroup but not the conventional group. This difference was very small however and unlikely clinically significant.

Axial length differences, with the Clareon group presenting longer lengths, were acknowledged, yet the exclusion of extremely long eyes in both groups suggests that such variance did not affect the outcomes. This assertion is supported by the absence of significant lens thickness variation between the groups, indicating axial length disparities did not confer advantages.⁹

This study's objective measures of IOL stability, including IOL movement across three time points, UDVA, and refractive astigmatism, are in line with recognized methodologies. Repositioning rate was not included as an outcome measure, yet this omission does not diminish the study's validity, given that repositioning is a somewhat subjective measure influenced by various factors.^{2,10}

Although this study included IOLs with toricity up to three dioptres, the findings are applicable to patients with higher levels of astigmatism requiring IOLs with greater toricity, as the external toric surface frosting, which provides rotational stability, remains consistent regardless of the degree of toricity. Retrospective studies have suggested superior rotational stability of AcrySof compared to Tecnis toric 1 IOLs,^{2,11} attributed to a sticker IOL material. A recent single arm prospective study of the Eyhance Tecnis toric 2 platform⁵ demonstrated mean rotation of 1.35 degrees, more commonly clockwise, a similar finding to our study.

Our findings resonate with these studies, noting minimal absolute rotation in the initial 24 hours post-surgery for both IOL groups examined.

While differences in postoperative IOL rotational stability are reported in literature, they seldom correlate with differences in functional outcomes such as UDVA or refractive astigmatism.²

In summary, the current study demonstrates comparable stability in most postoperative rotational measures for both the Eyhance and Clareon toric IOLs. Although a minor statistically significant superiority in rotational stability for Clareon was noted, it lacked clinical significance. There were no differences in postoperative UDVA and refractive astigmatism, supporting the efficacy of both IOLs. Further larger and more powered studies are anticipated to explore these outcomes comprehensively.

Disclosure

BC has received speaker fees from Alcon and Johnson & Johnson. BL is a consultant to Alcon and Zeiss. The authors report no other conflicts of interest in this work.

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