International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 4, April 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.4.2025.148

ORIGINAL RESEARCH

Comparative Study of Visual Outcomes Between Toric and Non-Toric Intraocular Lenses in Cataract

[1]Atul Kumar Anand, [2]Vivek Prasad, [3]Abhishek Ranjan, [4]Pradeep Karak

[1,2,3]Assistant Professor, [4]Associate Professor & HOD, Department of Ophthalmology, Nalanda Medical College & Hospital, Patna, Bihar, India

Corresponding Author
Abhishek Ranjan
Assistant Professor, Department of Ophthalmology, Nalanda Medical College & Hospital, Patna, Bihar, India

Received: 14 March, 2025 Accepted: 31 March, 2025 Published: 06 April, 2025

ABSTRACT

Aim: To compare postoperative visual outcomes between toric and non-toric intraocular lenses (IOLs) in patients undergoing cataract surgery with regular pre-existing corneal astigmatism. **Material and Methods:** This prospective, comparative observational study was conducted over 24 months at Nalanda Medical College and Hospital, Patna. A total of 100 patients aged 50–80 years with visually significant age-related cataract and regular corneal astigmatism (1.0–3.0 D) were randomized into two groups: Group A (n=50) received toric IOLs, and Group B (n=50) received non-toricmonofocal IOLs. All surgeries were performed by a single surgeon using standard phacoemulsification technique. Visual outcomes including uncorrected distance visual acuity (UDVA), best corrected distance visual acuity (BCDVA), residual refractive astigmatism, and spherical equivalent (SE) were assessed at 1 week, 1 month, and 3 months postoperatively. **Results:** The toric IOL group showed significantly better UDVA at all follow-up points (e.g., 0.12 ± 0.05 LogMAR at 3 months vs. 0.30 ± 0.08 in the non-toric group; $p < 0.001$). BCDVA also favored the toric group at 3 months (0.08 ± 0.03 vs. 0.10 ± 0.04; $p = 0.039$). Residual astigmatism was significantly lower in the toric group throughout (0.41 ± 0.16 D vs. 1.18 ± 0.31 D at 3 months; $p < 0.001$). Postoperative SE was comparable between both groups with no significant difference. **Conclusion:** Toric IOLs provided superior visual outcomes in terms of UDVA, BCDVA, and astigmatism correction compared to non-toric IOLs, without compromising spherical refractive accuracy. They are recommended for achieving optimal postoperative vision in cataract patients with regular astigmatism.

Keywords: Toric intraocular lens, cataract surgery, astigmatism correction, visual acuity, refractive outcomes

INTRODUCTION

Cataract surgery has undergone a paradigm shift in recent years, evolving from a procedure focused solely on the removal of opacified lenses to one that also addresses pre-existing refractive errors, thereby aiming for spectacle independence and enhanced quality of vision. The increasing expectations of patients for optimal visual outcomes have driven the development and adoption of advanced intraocular lens (IOL) technologies. Among these innovations, multifocal, toric, and extended depth of focus (EDOF) lenses have gained significant attention for their ability to improve uncorrected distance, intermediate, and near visual acuities in a variety of clinical scenarios.[1]

The choice of IOL plays a pivotal role in achieving optimal postoperative refractive outcomes. While monofocal lenses have traditionally been the standard for cataract extraction, their inherent limitation in addressing presbyopia and corneal astigmatism has prompted the use of alternative designs such as multifocal, EDOF, and toric lenses. Multifocal IOLs are designed to provide multiple focal points, thereby improving near and distance vision, while EDOF lenses extend the range of vision by creating a continuous focal point. These lenses are particularly beneficial in reducing the dependence on glasses, especially for daily tasks requiring intermediate visual function.[2]

Toric IOLs represent another breakthrough in cataract surgery, particularly for patients with pre-existing corneal astigmatism. Corneal astigmatism is highly prevalent among patients presenting for cataract surgery, with studies indicating that a significant proportion—ranging from 20% to 30%—have more than 1.0 diopter of regular astigmatism. If left uncorrected, this astigmatism may significantly impair uncorrected visual acuity and patient satisfaction,

DOI: 10.69605/ijlbpr_14.4.2025.148

even after a technically successful cataract extraction. Historically, incisional techniques such as limbal relaxing incisions (LRIs) and clear corneal incisions (CCIs) were employed to reduce astigmatism, but these methods often yielded variable outcomes and lacked long-term stability.[3]

Toric IOLs provide a more predictable and stable correction of astigmatism compared to these manual techniques. These lenses are specifically designed with astigmatic correction built into their optics and must be aligned precisely along the intended axis to counteract corneal toricity. Accurate alignment and rotational stability are key determinants of success with toric IOLs. Even minimal degrees of postoperative rotation can lead to a significant decrease in the cylinder correction, thereby compromising the visual outcome.[4]

Emerging comparative studies have provided insights into the relative performance of different IOL platforms, including toric variants of monofocal and multifocal lenses. For instance, some randomized trials have demonstrated superior visual acuity outcomes and patient-reported satisfaction with toric IOLs compared to conventional spherical IOLs in patients with regular astigmatism. Moreover, with the integration of image-guided systems, the precision in axis marking and IOL alignment has significantly improved, further enhancing the predictability of outcomes with toric implants.[5,6]

In addition to astigmatism correction, the selection of a multifocal or EDOF toric lens can offer the dual benefit of presbyopia correction and refractive astigmatism management. This combined approach, however, requires careful patient selection, preoperative counseling, and a thorough understanding of ocular surface health, macular status, and biometric parameters. Not all patients are ideal candidates for multifocal or EDOF lenses, particularly those with irregular astigmatism, significant ocular comorbidities, or unrealistic expectations. Therefore, customized IOL selection based on individual visual demands and anatomical considerations is essential.[7,8]

The impact of residual astigmatism on visual performance has also been a subject of extensive research. Studies have shown that even low levels of residual astigmatism can negatively influence distance and intermediate vision, especially in eyes implanted with multifocal or EDOF lenses. This underscores the importance of achieving precise astigmatic correction in patients who are candidates for these premium IOLs. Furthermore, recent analyses have explored the visual quality metrics and contrast sensitivity in patients receiving toric versus non-toric lenses, adding to the growing body of evidence supporting the clinical efficacy of toric designs.[9]

While toric IOLs have demonstrated consistent success in reducing astigmatic refractive error, their performance is also dependent on advancements in biometry, surgical technique, and postoperative monitoring. The integration of optical coherence biometry, intraoperative aberrometry, and intraoperative guidance systems has significantly enhanced the surgeon's ability to plan and execute toric IOL implantation with greater precision. Such technological improvements have helped minimize sources of error that could otherwise compromise the intended correction.[10]

Moreover, comparative studies between different brands and models of toric IOLs—such as Tecnis, AcrySof, and Precizon—have shown variations in rotational stability, visual outcomes, and patient-reported outcomes. These differences highlight the importance of evaluating not just the design but also the material properties, haptic configuration, and overall biomechanics of the lens when choosing among available options. The rotational behavior of a toric IOL is critical because a misalignment as small as 10 degrees can reduce its corrective effectiveness by approximately one-third.

MATERIAL AND METHODS

This prospective, comparative observational study was conducted in the Department of Ophthalmology at Nalanda Medical College and Hospital, Patna, over a period of 24 months, from October 2022 to September 2024, following approval from the Institutional Ethics Committee. The study aimed to evaluate and compare postoperative visual outcomes between toric and non-toric intraocular lenses (IOLs) implanted during cataract surgery in patients with corneal astigmatism.

A total of **100 patients** diagnosed with age-related cataract and regular preoperative corneal astigmatism were enrolled after obtaining written informed consent. Patients were selected based on the following inclusion and exclusion criteria.

Inclusion Criteria

- Age between 50 and 80 years
- Presence of visually significant age-related cataract in at least one eye
- Regular corneal astigmatism between 1.0 and 3.0 diopters, as measured by automated keratometry and confirmed by corneal topography
- Best-corrected visual acuity potential of 6/9 or better
- Willingness to comply with follow-up protocol

Exclusion Criteria

- Irregular astigmatism or corneal ectasia
- History of ocular trauma or prior ocular surgery
- Coexisting ocular pathology such as advanced glaucoma, diabetic retinopathy, or macular degeneration
- Zonular weakness or capsular bag compromise noted intraoperatively

All patients were randomly divided into two groups of 50 each using a computer-generated randomization table:

DOI: 10.69605/ijlbpr_14.4.2025.148

- **Group A (n = 50)**: Underwent phacoemulsification with implantation of a **toric intraocular lens**
- **Group B (n = 50)**: Underwent phacoemulsification with implantation of a **non-toricmonofocal intraocular lens**

All surgical procedures were carried out under local anesthesia by a single experienced surgeon using a standardized phacoemulsification technique. Preoperative biometric measurements were obtained using optical biometry to ensure accurate IOL power selection. For patients in the toric IOL group, the power and axis of the lens were determined using manufacturer-recommended toric calculators that accounted for posterior corneal curvature, ensuring precise astigmatic correction. Visual outcomes were assessed through a series of standardized parameters, including uncorrected distance visual acuity (UDVA), best corrected distance visual acuity (BCDVA), manifest refraction, and the measurement of postoperative residual refractive astigmatism. These evaluations were conducted at baseline (preoperatively) and during follow-up visits scheduled at 1 week, 1 month, and 3 months postoperatively to monitor and compare visual recovery and refractive outcomes between the two groups.

Data analysis was carried out using SPSS version 25.0. Quantitative variables were expressed as mean ± standard deviation and compared using independent sample t-tests. Categorical variables were compared using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

RESULTS

The baseline demographic and clinical characteristics of both groups were comparable, as shown in Table 1. The mean age of participants in the toric IOL group was 64.2 ± 6.1 years, while that in the non-toric group was 63.7 ± 5.8 years, with no statistically significant difference (p = 0.62). The gender distribution was also balanced, with 28 males and 22 females in the toric group, and 26 males and 24 females in the non-toric group (p = 0.68). Preoperative uncorrected distance visual acuity (UDVA) was similar between the two groups (0.82 ± 0.17 LogMAR in the toric group vs. 0.84 ± 0.15 in the non-toric group; p = 0.54), indicating a comparable baseline visual status. Likewise, the mean preoperative corneal astigmatism did not differ significantly between groups (2.1 ± 0.5 D in the toric group vs. 2.0 ± 0.6 D in the non-toric group; p = 0.43), establishing a fair comparison for assessing postoperative outcomes.

In terms of uncorrected distance visual acuity (UDVA), Table 2 demonstrates a clear and consistent superiority of toric IOLs across all postoperative follow-up visits. At 1 week, patients in the toric group achieved a significantly better UDVA (0.28 ± 0.09 LogMAR) compared to the non-toric group (0.45 ± 0.12 LogMAR), with p< 0.001. This trend continued at 1 month (0.18 ± 0.07 vs. 0.34 ± 0.10; p< 0.001) and remained statistically significant at 3 months postoperatively (0.12 ± 0.05 vs. 0.30 ± 0.08; p< 0.001). These results indicate that patients who received toric IOLs experienced significantly sharper unaided vision at every stage of recovery, likely due to the correction of pre-existing corneal astigmatism.

Postoperative best corrected distance visual acuity (BCDVA), as presented in Table 3, also favored the toric IOL group, albeit with more modest differences. At 1 week post-op, the toric group had a mean BCDVA of 0.15 ± 0.06 LogMAR compared to 0.18 ± 0.07 in the non-toric group (p = 0.041). This difference persisted at 1 month (0.10 ± 0.04 vs. 0.12 ± 0.05; p = 0.047) and 3 months (0.08 ± 0.03 vs. 0.10 ± 0.04; p = 0.039), indicating a statistically significant advantage for toric lenses. Although both groups achieved good corrected visual acuity postoperatively, the slightly superior BCDVA in the toric group underscores the added benefit of astigmatism correction even with spectacle correction.

Residual refractive astigmatism, outlined in Table 4, was markedly lower in the toric IOL group at all postoperative intervals. At 1 week, residual astigmatism in the toric group was 0.68 ± 0.21 D compared to 1.48 ± 0.38 D in the non-toric group (p< 0.001). This significant difference persisted at 1 month (0.52 ± 0.19 vs. 1.32 ± 0.35; p< 0.001) and at 3 months (0.41 ± 0.16 vs. 1.18 ± 0.31; p< 0.001). These results clearly demonstrate that toric IOLs were far more effective in minimizing residual postoperative astigmatism, leading to improved uncorrected vision and reduced dependency on spectacles.

Postoperative spherical equivalent (SE) refraction, detailed in Table 5, showed no statistically significant difference between the two groups at any postoperative time point. At 1 week, the toric group had a mean SE of -0.29 ± 0.23 D compared to -0.34 ± 0.27 D in the non-toric group (p = 0.38). At 1 month and 3 months, the differences remained non-significant (p = 0.31 and p = 0.22, respectively). This suggests that both types of IOLs provided comparable accuracy in achieving targeted spherical refractive outcomes, and the advantage of toric IOLs lies primarily in cylindrical (astigmatic) correction rather than spherical refractive precision.

Table 1: Baseline Demographic and Clinical Characteristics

Parameter	Toric IOL Group (n = 50)	Non-Toric IOL Group (n = 50)	p-value
Mean Age (years)	64.2 ± 6.1	63.7 ± 5.8	0.62
Gender (Male/Female)	28 / 22	26 / 24	0.68
Mean Preoperative UDVA (LogMAR)	0.82 ± 0.17	0.84 ± 0.15	0.54
Mean Preoperative Corneal Astigmatism (D)	2.1 ± 0.5	2.0 ± 0.6	0.43

DOI: 10.69605/ijlbpr_14.4.2025.148

Table 2: Postoperative Uncorrected Distance Visual Acuity (UDVA)

Time Point	Toric IOL Group (LogMAR)	Non-Toric IOL Group (LogMAR)	p-value
1 Week	0.28 ± 0.09	0.45 ± 0.12	<0.001
1 Month	0.18 ± 0.07	0.34 ± 0.10	<0.001
3 Months	0.12 ± 0.05	0.30 ± 0.08	<0.001

Table 3: Postoperative Best Corrected Distance Visual Acuity (BCDVA)

Time Point	Toric IOL Group (LogMAR)	Non-Toric IOL Group (LogMAR)	p-value
1 Week	0.15 ± 0.06	0.18 ± 0.07	0.041
1 Month	0.10 ± 0.04	0.12 ± 0.05	0.047
3 Months	0.08 ± 0.03	0.10 ± 0.04	0.039

Table 4: Postoperative Residual Refractive Astigmatism

Time Point	Toric IOL Group (D)	Non-Toric IOL Group (D)	p-value
1 Week	0.68 ± 0.21	1.48 ± 0.38	<0.001
1 Month	0.52 ± 0.19	1.32 ± 0.35	<0.001
3 Months	0.41 ± 0.16	1.18 ± 0.31	<0.001

Table 5: Postoperative Spherical Equivalent (SE) Refraction

Time Point	Toric IOL Group (D)	Non-Toric IOL Group (D)	p-value
1 Week	-0.29 ± 0.23	-0.34 ± 0.27	0.38
1 Month	-0.24 ± 0.21	-0.30 ± 0.25	0.31
3 Months	-0.18 ± 0.18	-0.26 ± 0.23	0.22

DISCUSSION

The present study demonstrates a significant advantage of toric intraocular lenses (IOLs) over non-toric IOLs in managing patients with cataracts and pre-existing regular corneal astigmatism. The findings are consistent with several high-quality studies and meta-analyses that validate the superior visual outcomes associated with toric IOLs in comparison to conventional spherical lenses.

The comparable preoperative profiles of the two groups indicate that observed differences in postoperative outcomes are likely attributable to the type of IOL implanted rather than confounding baseline characteristics. Both groups had statistically similar age, gender distribution, preoperative uncorrected distance visual acuity (UDVA), and corneal astigmatism. These findings align with the patient selection methodologies used in prior randomized trials, such as those by Visser et al. and Holland et al., where matching preoperative characteristics ensured fair comparative analysis of IOL types.[11,12]

The postoperative UDVA outcomes significantly favored the toric IOL group at all follow-up intervals, consistent with the findings of Yamauchi et al., who demonstrated that toric IOLs yielded better UDVA than non-toric lenses, particularly in the early postoperative period.[13] The difference observed in our study (0.12 ± 0.05 LogMAR vs. 0.30 ± 0.08 at 3 months; $p < 0.001$) underscores the impact of correcting pre-existing corneal astigmatism at the time of surgery. This benefit is clinically meaningful, as uncorrected astigmatism is known to compromise distance visual acuity and increase patient dependence on spectacles postoperatively.[14,15] The significance of these findings has also been supported by FDA clinical approval data, which emphasize the visual rehabilitation potential of toric IOLs.[16]

While both groups achieved good BCDVA postoperatively, toric IOLs provided a modest yet statistically significant advantage throughout the follow-up period. This aligns with the results of the large multicenter trial by Holland et al., which showed slightly improved BCDVA in patients with toric IOLs even when corrected with spectacles.[12] The minor improvement in BCDVA may reflect better optical quality and reduced higher-order aberrations due to improved correction of astigmatism.[17,18] Furthermore, as observed by Mangione et al., even small improvements in visual acuity can translate into better quality of life and higher scores on patient-reported outcomes like the National Eye Institute Visual Function Questionnaire (NEI VFQ-25).[19]

Residual astigmatism is a critical determinant of postoperative visual function, especially with monofocal IOLs. The toric IOL group demonstrated significantly lower residual astigmatism at all postoperative time points, with mean values as low as 0.41 ± 0.16 D at 3 months, compared to 1.18 ± 0.31 D in the non-toric group ($p < 0.001$). These findings are in agreement with the meta-analysis by Kessel et al., which reported that toric IOLs reduced residual astigmatism by more than 0.75 D in a majority of patients.[17] The robust rotational stability and astigmatic precision of modern toric lenses have been documented extensively, with studies such as those by Visser et al. noting improved outcomes even with modest degrees of preoperative astigmatism.[11] Importantly, even small residual refractive errors in cylinder can significantly impair

DOI: 10.69605/ijlbpr_14.4.2025.148

visual performance in pseudophakic eyes, as shown by Singh et al., emphasizing the necessity of accurate astigmatic correction.[15]

In contrast to the marked differences observed in cylindrical correction, both groups showed comparable spherical equivalent refractions postoperatively. This suggests that both toric and non-toric IOLs are equally effective in achieving the targeted spherical refractive goal, with no significant difference in the final spherical refractive accuracy (e.g., -0.29 ± 0.23 D vs. -0.34 ± 0.27 D at 1 week; p = 0.38). These findings mirror the results of prior randomized controlled trials, such as those by Yamauchi et al. and Lin et al., which showed no significant disparity in spherical equivalent outcomes between toric and spherical lenses when modern biometry and IOL calculation formulas are employed.[13,20] The consistency in SE outcomes underscores that the advantage of toric IOLs lies primarily in their ability to neutralize astigmatism without compromising spherical accuracy.

CONCLUSION

This study clearly demonstrates the superiority of toric intraocular lenses over non-toric IOLs in patients with cataracts and pre-existing regular corneal astigmatism. Toric IOLs provided significantly better uncorrected and best corrected visual acuity, along with markedly lower residual astigmatism across all postoperative follow-ups. While both groups achieved comparable spherical equivalent outcomes, the astigmatic correction offered by toric IOLs translated into enhanced visual performance and reduced dependence on spectacles. These findings support the routine use of toric IOLs for optimized refractive outcomes in appropriately selected cataract patients.

REFERENCES

1. Schallhorn JM, Pantanelli SM, Lin CC, al-Mohtaseb ZN, Steigleman WA III, Santhiago MR, et al. Multifocal and accommodating intraocular lenses for the treatment of presbyopia: a report by the American Academy of Ophthalmology. Ophthalmology. 2021;128(10):1469–82. doi:10.1016/j.ophtha.2021.03.013
2. Schallhorn JM. Multifocal and extended depth of focus intraocular lenses: a comparison of data from the United States Food and Drug Administration premarket approval trials. J Refract Surg. 2021;37(2):98–104. doi:10.3928/1081597X-20201111-02
3. Mohammadi M, Naderan M, Pahlevani R, Jahanrad A. Prevalence of corneal astigmatism before cataract surgery. IntOphthalmol. 2016;36(6):807–17. doi:10.1007/s10792-016-0201-z
4. Schallhorn S, Hettinger K, Pelouskova M, Teenan D, Venter JA, Hannan SJ, et al. Effect of residual astigmatism on uncorrected visual acuity and patient satisfaction in pseudophakic patients. J Cataract Refract Surg. 2021;47(8):991–8. doi:10.1097/j.jcrs.0000000000000560
5. Wolffsohn JS, Bhogal G, Shah S. Effect of uncorrected astigmatism on vision. J Cataract Refract Surg. 2011;37(3):454–60. doi:10.1016/j.jcrs.2010.09.022
6. Kaur M, Shaikh F, Falera R, Titiyal J. Optimizing outcomes with toric intraocular lenses. Indian J Ophthalmol. 2017;65(12):1301–13. doi:10.4103/ijo.IJO_810_17
7. Pedrotti E, Carones F, Aiello F, Mastropasqua R, Bruni E, Bonacci E, et al. Comparative analysis of visual outcomes with 4 intraocular lenses: monofocal, multifocal, and extended range of vision. J Cataract Refract Surg. 2018;44(2):156–67. doi:10.1016/j.jcrs.2017.11.011
8. Jeon YJ, Yoon Y, Kim TI, Koh K. Comparison between an intraocular lens with extended depth of focus (TecnisSymfony ZXR00) and a new monofocal intraocular lens with enhanced intermediate vision (TecnisEyhance ICB00). Asia Pac J Ophthalmol (Phila). 2021;10(6):542–7. doi:10.1097/APO.0000000000000439
9. Jung NY, Lim DH, Hwang SS, et al. Comparison of clinical outcomes of toric intraocular lens, PrecizonvsTecnis: a single center randomized controlled trial. BMC Ophthalmol. 2018;18:292. doi:10.1186/s12886-018-0955-3
10. Ding N, Song X, Wang X, Wei W. Comparison of visual outcomes between toric intraocular lenses and clear corneal incisions to correct astigmatism in image-guided cataract surgery. Front Med (Lausanne). 2022;9:837800. doi:10.3389/fmed.2022.837800
11. Visser N, Beckers HJ, Bauer NJ, et al. Toricvsaspherical control intraocular lenses in patients with cataract and corneal astigmatism: a randomized clinical trial. JAMA Ophthalmol. 2014;132(12):1462–8. doi:10.1001/jamaophthalmol.2014.3602
12. Holland E, Lane S, Horn JD, Ernest P, Arleo R, Miller KM. The AcrySofToric intraocular lens in subjects with cataracts and corneal astigmatism: a randomized, subject-masked, parallel-group, 1-year study. Ophthalmology. 2010;117(11):2104–11. doi:10.1016/j.ophtha.2010.07.033
13. Yamauchi T, Tabuchi H, Takase K, Ohara Z, Imamura H, Kiuchi Y. Comparison of visual performance of toricvs non-toric intraocular lenses with same material. ClinOphthalmol. 2018;12:2237–43. doi:10.2147/OPTH.S183899
14. Sawusch MR, Guyton DL. Optimal astigmatism to enhance depth of focus after cataract surgery. Ophthalmology. 1991;98(7):1025–9. doi:10.1016/s0161-6420(91)32182-1
15. Singh A, Pesala V, Garg P, Bharadwaj SR. Relation between uncorrected astigmatism and visual acuity in pseudophakia. Optom Vis Sci. 2013;90(4):378–84. doi:10.1097/OPX.0b013e318288afb5
16. U.S. Food and Drug Administration. Data for FDA approval. [Internet]. [cited 2024 Apr 17]. Available from: http://www.accessdata.fda.gov/cdrh_docs/pdf/P930014S015b.pdf
17. Kessel L, Andresen J, Tendal B, et al. Toric intraocular lenses in the correction of astigmatism during cataract surgery: a systematic review and meta-analysis. Ophthalmology. 2016;123(2):275–86. doi:10.1016/j.ophtha.2015.10.002
18. Visser N, Bauer NJ, Nuijts RM. Toric intraocular lenses: historical overview, patient selection, IOL calculation, surgical techniques, clinical outcomes, and complications. J Cataract Refract Surg. 2013;39(4):624–37. doi:10.1016/j.jcrs.2013.02.020

Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.4.2025.148

19. Mangione CM, Lee PP, Gutierrez PR, et al. Development of the 25-item National Eye Institute Visual Function Questionnaire. Arch Ophthalmol. 2001;119(7):1050–8. doi:10.1001/archopht.119.7.1050
20. Lin IC, Wang IJ, Lei MS, Lin LL, Hu FR. Improvements in vision-related quality of life with AcrySof IQ SN60WF aspherical intraocular lenses. J Cataract Refract Surg. 2008;34(8):1312–7. doi:10.1016/j.jcrs.2008.04.023