International Journal of Community Medicine and Public Health
*Khatri J et al. Int J Community Med Public Health. 2024 May;11(5):1988-1993*
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040
DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20241198

**Original Research Article**

# Visual outcome and patient satisfaction in patients undergoing cataract surgery with premium intraocular lens implantation

**Jitesh Khatri[1], Vijay Gupta[1], Pragya Garg[1]*, Pushpendra Bairwa[2]**

[1]Department of Ophthalmology, Rabindranath Tagore Medical College, Udaipur, Rajasthan, India
[2]Department of Community Medicine, SMS Medical College, Jaipur, Rajasthan, India

**Received:** 17 March 2024
**Accepted:** 18 April 2024

***Correspondence:**
Dr. Pragya Garg,
E-mail: pragsgarg@gmail.com



## ABSTRACT

**Background:** Cataract is a one of the leading cause of treatable visual impairment. Premium intraocular lens (IOL) implantation refers to the use of advanced and high-quality lenses during cataract surgery. Objective was to study the visual outcome with astigmatism correction in patients following multifocal, trifocal and EDOF IOL implantation.
**Methods:** This hospital-based interventional study was carried on 33 patients who underwent cataract surgery with premium IOL implantation. Patients with astigmatism exceeding 1 dioptre who expressed willingness for premium IOL implantation were included in the study.
**Results:** In the study, visual acuity and contrast sensitivity were assessed in patients who underwent Premium IOL implantation at 1 week, 6 weeks, and 3-months post-surgery. Results indicated a notable decrease in uncorrected distance visual acuity (UCDVA), uncorrected intermediate visual acuity (UCIVA), and uncorrected near visual acuity (UCNVA) compared to preoperative values across all premium IOL groups. However, contrast sensitivity exhibited a significant improvement at these specified time points after the premium IOL implantation.
**Conclusions:** In our study, all premium IOLs effectively corrected astigmatism and met patient satisfaction needs. However, toric IOLs exhibited notably higher patient satisfaction compared to EDOF, multifocal, and trifocal IOLs.

**Keywords:** Multifocal IOL, Trifocal IOL, Toric IOL, Visual acuity

## INTRODUCTION

Cataract, the pathological opacification of the clear natural lens, is the leading cause of treatable visual impairment, affecting over 94 million individuals globally.[1] It can manifest as either congenital or acquired.[2]

Aging is commonly the primary cause of acquired cataracts, attributed to the continuous addition of new fibres to the lens throughout life.[3] This leads to the gradual thickening, compaction, and reduced optical clarity of the translucent lens over time. Other causes include the use steroids, ocular trauma and diabetes mellitus.[4] Age-related cataracts, including nuclear, cortical, and posterior subcapsular types, can occur alone or in combination.[4] Progression may cause refractive error changes, decreased acuity, color loss, and glare.[5]

Worldwide evaluations show there to be around 285 million optically weakened individuals across all age gatherings.[6] Globally, the main sources of this visual weakness were uncorrected refractive error (43%) followed by cataract i.e. 33%.[7]

Different cataract extraction techniques include intracapsular cataract extraction, extra capsular cataract extraction (ECCE), and phacoemulsification.[8] While ECCE involves removing the opaque lens material but preserving the capsular bag, phacoemulsification, uses ultrasonic waves and it is preferred over CCE, which is associated with higher astigmatism and longer visual recovery. However, ECCE is still chosen in hard cataracts

and also due to low cost. The introduction of femtosecond lasers aims to automate and enhance safety in cataract surgery.[9,10]

Standard IOLs, which have a solitary, fixed focal length, are right now the most usually embedded IOL type.[11] The development of foldable IOLs, empowered the corneal cuts, quicker with short recuperation time.[12] Present IOLs incorporate toric, multifocal, and extended depth focus frequently alluded to as "premium" or "trend setting innovation" IOLs.[13]

Research indicates that the toric IOLs result in residual astigmatism of less than or equal to 1.00 dioptres cylinder (DC) in about 90% of subjects, surpassing limbal relaxing incisions at 40. Two commercially available types are toric monofocal and toric multifocal IOLs. Toric multifocal IOLs used to overcome the deficiency of accommodation following cataract surgery including presbyopia.

There is no universally accepted method for measuring defocus curves in presbyopic correction assessments. subjective testing is time consuming while objective methods offer faster testing but measures is uncertain.[14] The multifocal IOLs are classify as refractive, diffractive, or combined. They can be bifocal/trifocal or multifocal IOL.[15]

Multifocal IOLs are sensitive to pupil dynamics, prone to halos and glare, and may reduce contrast sensitivity.[16]

Newly introduce EDOF IOLs utilize a few distinct techniques to build the increase of depth of focus across a persistent territory, without limiting it to 2–3 central focuses. Research in the process to show the possible benefits and limitation of these new models dependent on their clinical performance.[7]

Premium IOL implantation refers to the use of advanced and high-quality lenses during cataract surgery or refractive lens exchange to enhance vision beyond simply correcting for the clouded natural lens. These premium lenses are designed to address issues such as presbyopia, astigmatism, and other visual imperfections, providing patients with improved visual outcomes. So this study was design to assess visual outcome with astigmatism correction in patients following multifocal, trifocal and EDOF IOL implantation.

## METHODS

This hospital-based retro-prospective study was carried out from 2019 to 2021 at Maharana Bhupal Hospital, RNT Medical College, Udaipur, a prominent tertiary care centre in Northern India.

This study enrolled 33 patients who underwent cataract surgery with premium IOL implantation. Data from both preoperative and postoperative follow-up assessments were collected and analysed.

### *Inclusion criteria*

The inclusion criteria involved patients with astigmatism exceeding 1 dioptre who expressed willingness for premium IOL implantation.

### *Exclusion criteria*

Exclusion criteria included patients with retinal pathology, anterior segment abnormalities, and pre-existing eye inflammation.

### *Study procedure*

In toric IOL group, toric-monofocal IOL is used in this study. Multifocal and trifocal IOL of diffractive optics were used in respective arm. EDOF IOL of refractive technology is utilized in this study.

### *Study tool and technique*

Distant intermediate visual acuity was taken using logarithm of the minimum angle of resolution (LogMAR) chart. Near vision was taken using roman chart and converted to metre notation (M) equivalent. Institute visual function questionnaire 25 (VFQ 25) was used to quantify patient's difficulty in day to day life. Contrast sensitivity was checked using Pelli Robson chart. Detailed slit lamp examination was done for cataract morphology and grading and to rule out any anterior segment abnormality. Optical biometry was done to calculate axial length, K1-K2 (keratometry), anterior chamber depth (ACD) and steep axis. Power for toric IOL was calculated using online Barrett toric calculator. Power of other premium IOL calculated using online Barrett Universal II formula. B scan was performed where fundus examination was not possible due to dense cataract.

### *Operational technique*

#### *For toric intraocular lenses*

To ensure precise alignment for effective astigmatism correction, a three-step marking procedure was used. Preoperative markings were made on the horizontal axis while the patient was upright to prevent cyclotorsion. During surgery, the marked axis assisted in positioning the Mendez ring, and the alignment axis was marked using a Bores axis marker, aiming for accurate toric IOL alignment and minimizing cyclotorsion impact.

#### *Phacoemulsification*

Phacoemulsification was performed by a 2.2 mm clear corneal incision made at the site determined by the toric calculator. Targeted capsulorrhexis diameter was kept 5.0-5.5 mm to ensure sufficient overlap of the IOL optic

border. After cataract extraction, a toric IOL was implanted in the posterior chamber. Gross alignment was done by placing the IOL horizontally 20-30 degrees short of the intended axis. Viscoelastic was removed and the IOL then finally rotated to align the cylindrical axis with the marked corneal meridian.

*For multifocal and EDOF IOL*

Under topical anaesthesia, a 2.2 mm clear corneal incision was made. After making continuous curvilinear capsulorrhexis (CCC), cataractous lens was phacoemulsified and aspirated followed by a multifocal/EDOF/trifocal IOL implantation in the capsular bag.

***Post-operative evaluation***

Follow up was taken at 1 week, 6 weeks and 3 months post operatively. Following examinations were undertaken: Patient's satisfaction was assessed by using visual function questionnaire 25 at the end of three months to determine the quality of vision subjectively.[17] Scoring VFQ-25 with or without optional items is a two-step process. In the first step, original survey numeric values are re-coded based on scoring rules and transformed to a 0 to 100 scale, where higher scores indicate better functioning. In the second step, sub-scale scores are derived by averaging items within each sub-scale, excluding items with missing data. Sub-scales with at least one answered item contribute to generating a sub-scale score, representing the average of answered items within that subscale.

***Composite score calculation***

To calculate a composite score for the VFQ-25, simply averaged the vision-targeted subscale scores, excluding the general health rating question. By averaging the sub-scale scores rather than the individual items, we gave equal weight to each sub-scale, whereas averaging the items would have given more weight to scales with more items.

***Statistical analysis***

The data obtained was coded as master chart on Microsoft excel, Microsoft 13.07. Quantitative and qualitative variables were analyzed on statistical package for the social sciences (SPSS) version 20.0. Qualitative variables were expressed as proportions while mean and standard deviation were used for quantitative variables. Relevant statistical tests were used for calculation of p values are paired, unpaired t test and Chi square test. P value ≤0.05 considered significant.

## RESULTS

The study initially enrolled 33 subjects (eyes), but 3 were excluded due to lost follow-up. Out of the total, majority of subjects (EYE) were underwent multifocal IOL implantation (22), followed by trifocal DEFF (3), toric (3) and EDOF (2). Among these patients, 70% were above 60 years of age. Male was 66.67% and 33.33% was female.

In our study after 1 week, 6 weeks, and at the 3rd month following lance implantation, the UCDVA, UCIVA and UCNVA showed a significant decrease in all interventional groups compared to the preoperative UCDA, UCIVA and UCNVA respectively (Tables 1-3). Similarly, the contrast sensitivity shows significantly improvement at 1 week, 6 weeks, and at the 3rd month after IOL implant (Table 4).

In our study, the mean preoperative astigmatism was 3.33±1.45 diopters, and the postoperative mean astigmatism correction achieved by the toric IOL was 3.00±0.75 diopters at 3 months. The astigmatism correction demonstrated statistical significance with a p value of 0.014. The Comparison of patient satisfaction score at the end of 3-month in different IOL groups are depicts in Figure 1.

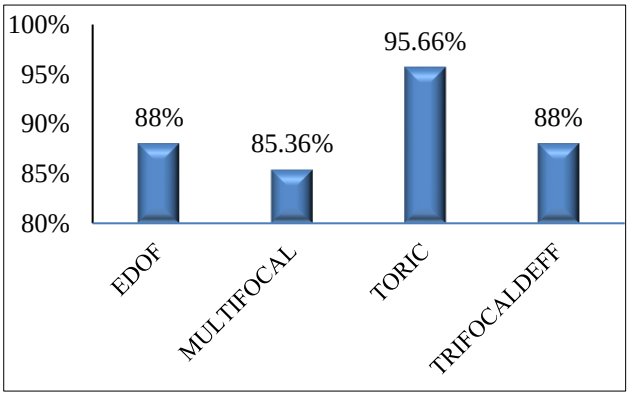


**Figure 1: Comparison of patient satisfaction score in different study group.**

**Table 1: Comparison of UCDVA (log MAR) at preoperative and at 1 week, 6 weeks, and at the 3rd month of IOL implantation in different IOL groups.**

| IOL implant | Pre-operative | | At 1st week following implantation | | | At 6-week following implantation | | | At 3rd month following implantation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SE | UCDVA mean± SD (P1) | SE | UCDVA mean± SD (P2) | P value (P1 versus P2) | SE | UCDVA mean± SD (P3) | P value (P1 versus P3) | SE | UCDVA mean± SD (P4) | P value (P1 versus P4) |
| **EDOF** | 6/ | 1.40± | 6/ | 0.35± | 0.011 (s) | 6/ | 0.25± | 0.009 (s) | 6/ | 0.25± | 0.009 (s) |

Continued.

| IOL implant | Pre-operative | | At 1st week following implantation | | | At 6-week following implantation | | | At 3rd month following implantation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SE | UCDVA mean± SD (P1) | SE | UCDVA mean± SD (P2) | P value (P1 versus P2) | SE | UCDVA mean± SD (P3) | P value (P1 versus P3) | SE | UCDVA mean± SD (P4) | P value (P1 versus P4) |
| | 152 | 0.14 | 12 | 0.07 | | 10 | 0.07 | | 10 | 0.07 | |
| **MF** | 6/60 | 1.01± 0.58 | 6/10 | 0.26± 0.13 | <0.001 (s) | 6/10 | 0.20± 0.14 | 0.001 (s) | 6/9 | 0.18± 0.13 | 0.001 (s) |
| **TFD** | 6/300 | 1.70± 1.04 | 6/9 | 0.17± 0.06 | 0.041 (s) | 6/9 | 0.17± 0.06 | 0.041 (s) | 6/9 | 0.17± 0.06 | 0.04 (s) |
| **Toric** | 6/30 | 0.73± 0.40 | 6/6 | 0.03± 0.06 | 0.040 (s) | 6/6 | 0.07± 0.06 | 0.048 (s) | 6/6 | 0.06± 0.06 | <0.001 (s) |

EDOF: extended depth-of-focus, MF: multi focal, TFD: trifocal-diffractive, SE: Snellen's equivalent

**Table 2: Comparison of UCIVA (LogMAR) at preoperative versus at 1 week, 6 weeks, and at the 3rd month of IOL implantation, in different IOL.**

| IOL implant | Pre-operative | | At 1st week following implantation | | | At 6-week following implantation | | | At 3rd month following implantation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SE | UCIVA mean± SD (P1) | SE | UCIVA mean± SD (P2) | P value (P1 versus P2) | SE | UCIVA mean± SD (P3) | P value (P1 versus P3) | SE | UCIVA mean± SD (P4) | P value (P1 versus P4) |
| **EDOF** | 6/96 | 1.20± 0.01 | 6/12p | 0.35± 0.21 | <0.001(s) | 6/9 | 0.20± 0.014 | <0.001 (s) | 6/9 | 0.15± 0.07 | <0.001 (s) |
| **MF** | 6/24 | 0.62± 0.25 | 6/15p | 0.450± 0.11 | <0.001 (s) | 6/15 | 0.40± 0.11 | <0.001 (s) | 6/15 | 0.40± 0.12 | <0.001 (s) |
| **TFD** | 6/15 | 0.40± 0.01 | 6/10 | 0.20± 0.01 | <0.001 (s) | 6/6P | 0.13± 0.12 | <0.001 (s) | 6/6 | 0.13± 0.12 | 0.01 (s) |

SE: Snellen's equivalent, EDOF: extended depth-of-focus, MF: multi focal, TFD: trifocal-diffractive

**Table 3: Comparison of preoperative versus postoperative UCNVA at 1 week, 6 weeks, and at the 3rd month of IOL implantation in different IOL groups.**

| IOL implant | Pre-operative | | At 1st week following implantation | | | At 6-week following implantation | | | At 3rd month following implantation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SE | UCNVA mean± SD (P1) | SE | UCNVA mean± SD (P2) | P value (P1 versus P2) | SE | UCNVA mean± SD (P3) | P value (P1 versus P3) | SE | UCNVA mean± SD (P4) | P value (P1 versus P4) |
| **EDOF** | N/36 | 3.45± 0.07 | N/6 | 0.43± 0.07 | <0.001 | N/6 | 0.43± 0.07 | <0.001 | N/6 | 0.43 | 0.007 |
| **MF** | N/24 | 2.59± 0.133 | N/6 | 0.43± 0.07 | <0.001 | N/6 | 0.43± 0.07 | <0.001 | N/6 | 0.43 | 0.007 |
| **TFD** | N/18 | 1.500± 0.01 | N/6 | 0.43± 0.07 | <0.001 | N/6 | 0.43± 0.07 | <0.001 | N/6 | 0.43 | 0.007 |

SE: Snellen's equivalent, EDOF: extended depth-of-focus, MF: multi focal, TFD: trifocal-diffractive

**Table 4: Comparison of preoperative and postoperative contrast sensitivity in logarithms of contrast sensitivity (LogCS) at 1 week, 6 weeks, and at the 3rd month of IOL implantation in different IOL groups.**

| IOL implant | Pre-operative | | At 1st week following implantation | | | At 6-week following implantation | | | At 3rd month following implantation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SE | Contrast sensitivity, mean± SD (P1) | SE | Contrast sensitivity, mean± SD (P2) | P value (P1 versus P2) | SE | Contrast sensitivity mean± SD (P3) | P value (P1 versus P3) | SE | Contrast sensitivity, mean± SD (P4) | P value (P1 versus P4) |
| **EDOF** | N/ | 3.45±0.07 | N/6 | 0.43±0.07 | <0.001 | N/6 | 0.43±0.07 | <0.001 | N/6 | 0.43 | 0.007 |

Continued.

| IOL implant | Pre-operative | | At 1st week following implantation | | | At 6-week following implantation | | | At 3rd month following implantation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SE | Contrast sensitivity, mean± SD (P1) | SE | Contrast sensitivity, mean± SD (P2) | P value (P1 versus P2) | SE | Contrast sensitivity mean± SD (P3) | P value (P1 versus P3) | SE | Contrast sensitivity, mean± SD (P4) | P value (P1 versus P4) |
| | 36 | | | | | | | | | | |
| **MF** | N/24 | 2.59±0.133 | N/6 | 0.43±0.07 | <0.001 | N/6 | 0.43±0.07 | <0.001 | N/6 | 0.43 | 0.007 |
| **TFD** | N/18 | 1.500±0.01 | N/6 | 0.43±0.07 | <0.001 | N/6 | 0.43±0.07 | <0.001 | N/6 | 0.43 | 0.007 |

## DISCUSSION

This hospital based interventional conducted on 33 samples (eye) in our study, we observed UCDVA 6/6P or better in 100% of eye underwent toric IOL. Similar observations are reported by Holland et al and Emesz et al conducted RCTs and compared toric and monofocal IOLs, a UCDVA of 6/9P or better was accomplished in 63% to 76% of eyes following toric IOL implantation.[18,19]

Visser et al and Emesz et al comparing toric and monofocal IOLs have reported a remaining refractive astigmatism of 1.0 D or less in 74 to 96% of eyes with toric IOLs.[19,20] Patil et al conducted hospital-based interventional prospective study.[21] In total, 92.5% had residual astigmatism less than 1D at 3 months postoperatively. In our study we observed similar result and found residual astigmatism of 0.5 dioptre or less in all eye at the end of 3 months.

Toygar at al conducted retrospective study to find out patient satisfaction after implantation of multifocal IOL and found VFQ-25 score between 87 to 93%.[22] Similarly, in our study we found VFQ-25 score in multifocal group 85.36%.

Carneros-Llorente et al compared the subjective outcomes between multifocal and trifocal IOL group and found no significant difference in VFQ-25 score.[23] Similarly in our study, difference of VFQ-25 score in trifocal, multifocal IOL and EDOF group is non-significant. In addition, we found VFQ-25 score in toric IOL group is 95.66% which is significantly better than other IOL group.

Deshpande et al conducted study and implanted 920 multifocal IOL.[24] In his study they found UCDVA at the end of 1 month is 0.15±0.2 LogMAR and UCNVA at the end of 1 month was N6 and notice reduce in contrast sensitivity in all patient. In our study we notice similar result, at end of 3 month UCDVA was 0.18±0.13 LogMAR and UCNVA is N6. However, Mesci et al demonstrated better visual acuities and higher contrast sensitivity with diffractive multifocal IOL use.[25] Similarly, in our study we didn't notice reduce in contrast sensitivity.

Tygar et al studied the clinical outcome of new diffractive multifocal IOL and found UCDVA at the end of 6 months 20/25 or better in 59% of patient, UCIVA was J-3, UCNVA was J4 and contrast sensitivity was 1.85 LogCS at the end of 6 months.[22] He concluded that diffractive multifocal IOL provide effective restoration of visual acuity at far, near and intermediate distances without compromising contrast sensitivity. Our study also provides similar result.

Abdulmohsen et al conducted study on trifocal diffractive IOL to determine visual outcome and patient satisfaction.[26] In his study UCDVA was 0.90 decimal (6/6P), UCIVA is 0.92 decimal and UCNVA is 0.91 after 3 months of IOL implantation. They concluded that diffractive trifocal IOL can provide excellent spectacle free distance, intermediate and near vision. In our study we also observe similar result. UCDVA 0.17 LogMAR (6/9), UCIVA 0.13 LogMAR (6/6P) and UCNVA N6 at the end of 3 months.

Sinha et al conducted study with 104 eye to find out visual outcome of extended depth of focus IOL.[27] In his study they found that mean UCDVA improved from 0.84±0.33 LogMAR (preop) to 0.11±0.08 LogMAR at 3 months UCIVA is 0.15±0.07 LogMAR after 3 months of IOL implantation. UCNVA is 0.41±0.08 LOGMAR at the end of 3 months.

In our study UCDVA improved from 1.40±0.14 LogMAR to 0.25±0.07 LogMAR at 3 months post IOL implantation. UCIVA is 0.15±0.07 LogMAR after 3 months of IOL implantation. UCNVA is 0.43±0.007 LogMAR at the end of 3 months.

## CONCLUSION

In conclusion, toric IOLs effectively treat astigmatism with high patient satisfaction, while diffractive multifocal, trifocal, and EDOF IOLs offer good options for varied vision needs. Although EDOF and trifocal IOLs provide superior intermediate vision compared to multifocal IOLs, the difference is not statistically significant. All three types demonstrate similar patient satisfaction and contrast sensitivity.

*Funding: No funding sources*
*Conflict of interest: None declared*
*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES


1. Ong HS, Evans JR, Allan BD. Accommodative intraocular lens versus standard monofocal intraocular lens implantation in cataract surgery. Cochrane Database Syst Rev. 2014;5.
2. World Health Organization. Blindness and vision impairment. 2023. Available at: https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment. Accessed on 09 January 2024.
3. Asbell P, Dualan I, Mindel J, Brocks D, Ahmad M, Epstein S. Agerelated cataract. The Lancet. 2005;365:599-609.
4. Pollreisz A, Schmidt-Erfurth U. Diabetic cataract-pathogenesis, epidemiology and treatment. J Ophthalmol. 2010;1-8.
5. Michael R, Bron AJ. The ageing lens and cataract: a model of normal and pathological ageing. Philos Trans R Soc Lond B Biol Sci. 2011;366:1278-92.
6. Pascolini D, Mariotti SP. Global estimates of visual impairment: 2010. Br J Ophthalmol. 2012;96:614-8.
7. World Health Organization. Global data on Visual Impairments. 2022. Available at: https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment. Accessed on 09 January 2024.
8. Linebarger EJ, Hardten DR, Shah GK, Lindstrom RL. Phacoemulsification and modern cataract surgery. Survey Ophthalmol. 1999;44:123-47.
9. Khanna R, Pujari S, Sangwan V. Cataract surgery in developing countries. Curr Opinion Ophthalmol. 2011;22:10-4.
10. Pershing S, Kumar A. Phacoemulsification versus extracapsular cataract extraction: where do we stand? Curr Opinion Ophthalmol. 2011;22:37-42.
11. Horvath K, Constantinescu D, Vultur F, Muhlfay G. Premium Intraocular Lenses: Patient Satisfaction. Acta Medica Transilvanica. 2014;19:228-30.
12. Bhartiya S, Sethi S, Bhargava S, Lakhotia S. History of intraocular lenses: Triumphs and Tribulations. Delhi J Ophthalmol. 2009;20:71-6.
13. Ale JB, Power J, Zohs K, Cunningham F. Refractive and visualoutcome of toric intraocular lens implantation following cataract surgery. Nepalese J Ophthalmol. 2012;4:37-44.
14. Wolffsohn JS, Jinabhai AN, Kingsnorth A, Sheppard AL, Naroo SA, Shah S, et al. Exploring the optimum step size for defocus curves. J Cataract Refractive Surg. 2013;39:873-80.
15. Alió JL, Pikkel J. Multifocal intraocular lenses: The art and the practice. Essentials in Ophthalmology. Switzerland: Springer International Publishing. 2014.
16. Alió JL, Plaza-Puche AB, Fernandez-Buenaga R, Pikkel J, Maldonado M. Multifocal Intraocular Lenses: An Overview on the Technology, Indications, Outcomes, Complications and their Management. Surv Ophthalmol. 2017;62(5):611-34.
17. National Eye Institute. Visual Function Questionnaire 25. 2000. Available at: https://www.nei.nih.gov/learn-about-eye-health/outreach-resources/outreach-materials/visual-function-questionnaire-25. Accessed on 09 January 2024.
18. Holland E, Lane S, Horn JD, Ernest P, Arleo R, Miller KM. The Acrysof Toric Intraocular Lens in Subjects with Cataracts and Corneal Astigmatism A Randomized, Subject-Masked, Parallel-Group, 1-Year Study. Ophthalmology. 2010;117(11):2104-11.
19. Emesz M, Dexl AK, Krall EM, Bachernegg A, Moussa S, Jell G, et al. Randomized controlled clinical trial to evaluate different intraocular lenses for the surgical compensation of low to moderate-to-high regular corneal astigmatism during cataract surgery. J Cataract Refract Surg. 2015;41(12):2683-94.
20. Visser N, Beckers HJ, Bauer NJ, Gast ST, Zijlmans BL, Berenschot TT, et al. Toric vs Aspherical Control Intraocular Lenses in Patients With Cataract and Corneal Astigmatism: A Randomized Clinical Trial. JAMA Ophthalmol. 2014;132(12):1462-8.
21. Patil MS, Nikose AS, Bharti S. Visual outcome and refractive status with monofocal toric intraocular lens implantation to correct astigmatism during cataract surgery. Indian J Ophthalmol. 2020;68(12):3016-9.
22. Toygar B, Yabas Kiziloglu O, Toygar O, Hacimustafaoglu AM. Clinical outcomes of a new diffractive multifocal intraocular lens. Int J Ophthalmol. 2017;10(12):1844-50.
23. Martínez de Carneros-Llorente A, Martínez de Carneros A, Martínez de Carneros-Llorente P, Jiménez-Alfaro I. Comparison of visual quality and subjective outcomes among 3 trifocal intraocular lenses and 1 bifocal intraocular lens. J Cataract Refract Surg. 2019;45(5):587-94.
24. Deshpande R, Mangiraj V, Deshpande M, Dole K, Bharucha K, Sanghavi N. A clinical study to assess feasibility, acceptance, and outcome of multifocal intraocular lens in patients with bilateral immature cataract at a tertiary eye care institute. Indian J Ophthalmol. 2020;68(11):2421-6.
25. Mesci C, Erbil H, Ozdoker L, Karakurt Y, Bilge AD. Visual acuity and contrast sensitivity function after accommodative and multifocal intraocular lens implantation. Eur J Ophthalmol. 2010;20(1):90-100.
26. Almulhim AK, Alarfaj KM, Altaisan AA, Alromaih AZ, Aldawod RA. Visual outcomes and patient satisfaction after bilateral implantation of a new trifocal diffractive intraocular lens. Saudi J Ophthalmol. 2018;32(4):310-7.
27. Sinha R, Sahay P, Saxena R, Kalra N, Gupta V, Titiyal JS. Visual outcomes of binocular implantation of a new extended depth of focus intraocular lens. Indian J Ophthalmol. 2020;68(10):2111-6.


**Cite this article as:** Khatri J, Gupta V, Garg P, Bairwa P. Visual outcome and patient satisfaction in patients undergoing cataract surgery with premium intraocular lens implantation. Int J Community Med Public Health 2024;11:1988-93.