

## Visual Rehabilitation after Phacoemulsification with Rigid Intraocular Lens Implantation at Tertiary Care Hospital-Jamshoro

Mona liza Mahesar, Noman Ahmed, Asadullah Jatoi, Ashok Kumar Nasrani

Liaquat University of Medical and Health Sciences, Jamshoro Pakistan

### ABSTRACT

**Objective:** To evaluate the visual rehabilitation after phacoemulsification with rigid intraocular lens implantation.

**Study Design:** Prospective longitudinal study.

**Place and Duration of Study:** Institute of Ophthalmology, Liaquat University of Medical and Health Sciences, Jamshoro Pakistan, from Jul to Dec 2020.

**Methodology:** Ninety-four subjects diagnosed with unilateral cataracts were evaluated completely. Subjects with any other ocular disease were excluded from the study. Pre-operative and post-operative, surgical and visual outcomes along with follow-up of 4 weeks and 12 weeks best-corrected visual acuity, were recorded.

**Results:** The mean age of study participants was  $61.77 \pm 7.34$  years. Post-operative complications were evaluated within one week of surgery. 22(23.4%) subjects showed striate keratopathy, 2(2.1%) indicated bullous keratopathy, and 7(7.4%) reported residual lens matter as a complication. The difference between good visual outcomes was 33(35.1%) within eight weeks (4th week till 12th week); similarly, the difference between satisfactory visual outcomes was 22(23.4%). The visual outcomes improved more than two folds after phacoemulsification with a rigid intraocular lens.

**Conclusion:** The foldable intraocular lens is comparatively expensive and unaffordable for many patients in developing countries. Rigid IOL with phacoemulsification is a cost-effective method to remove cataracts and restore patient visual acuity. Accurate diagnosis, evaluation, and surgeon's experience are important factors in achieving the required results.

**Keywords:** Cataracts, Phacoemulsification, Rigid intraocular lens (IOL), Visual rehabilitation.

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### INTRODUCTION

A rough estimate of blindness prevalence is 1/200, with 36 million populations suffering from blindness.<sup>1</sup> The cataract is known as the primary origin of preventable blindness not only in western countries but in Pakistan too.<sup>2,3</sup> the major surgery workload of the country's ophthalmology department comprises cataract surgeries. As per WHO (world health organization), 18 million population suffer from blindness due to mature bilateral cataracts, while old aged population prevalence has increased to 50 million in 2020\* 87% of the blind population resides in developing nations like Pakistan.<sup>4</sup> surgeries have increased in the past few years. A prevalence-based study from Asia and Africa indicated that 20% of cataract operation recipients have <6/60 presenting vision.<sup>5</sup> Cataract-causing blindness, or in other words, preventable blindness, affects the quality of life of the person, and it is important to achieve better outcomes to retain the visual acuity of patients and enable them to live quality life to the fullest.<sup>6-8</sup> In Pakistan, the most common surgeries to eliminate cataracts are conventional

extracapsular cataract extraction, Manual small incision cataract surgery, and phacoemulsification.<sup>1</sup> The phacoemulsification procedure extracts the cataract with the help of ultrasonic waves and emulsifies the cataract. This procedure is a simple yet safe method to eradicate cataracts and reduce astigmatism. However, other complications, such as corneal oedema and posterior capsule rupture, have been reported after phacoemulsification.<sup>9</sup> In 1949 first Intraocular lens was implanted by Harold Ridley. Since then, much advancement has been observed. Phacoemulsification has been a dramatic invention that allows reduced incision size with smaller 5.0–5.5mm rigid lenses and micro-incision for foldable intraocular lenses. Smaller incision reduces the chances of astigmatism and improves visual outcomes. Many studies evaluated foldable and rigid intraocular lens efficacy. They indicated similar visual acuity and better post-operative Contrast Sensitivity with Rigid intraocular lenses,<sup>10</sup> required qualities of any intraocular lens are fine optical assets, dimensional permanence, and reduced post-operative problems. The definitive outcome for phacoemulsification surgeries is to recover visual precision, rigid intraocular lenses are economically reasonable, and improved results can benefit big socio-economic classes to

**Correspondence:** Dr Mona Liza Mahesar, B.16-17, Mona villas, Sindhi Muslim Housing Society, Hyderabad, Pakistan

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acquire phacoemulsification surgery and restore visual rehabilitation outcomes. Therefore, this study aims to assess visual outcomes after phacoemulsification with rigid IOL.

**METHODOLOGY**

This was a prospective longitudinal study conducted at the Institute of Ophthalmology, Liaquat University of Medical and Health Sciences, Jamshoro, Hyderabad Pakistan, from July 2020 to December 2020. Ethical approval was obtained from IERB Committee (Reference number: LUMHS/R.E.C/I.O.L-14).

**Inclusion Criteria:** Patients diagnosed with unilateral cataracts who were included in the study.

**Exclusion Criteria:** Subjects with any other ocular disease, previous surgeries of cataract, diabetic retinopathy, and age-related visual impairments were excluded from the study.

After signing the informed consent, subjects were recruited into the study preceding intraocular lens implantation. Pre-operatively demographic details along with best-corrected visual acuity were recorded. A rigid intraocular lens was implemented after phacoemulsification of cataracts, and intra-operative complications were recorded. Patients were evaluated for visual acuity after one month and three months of follow-ups. Best-corrected visual acuity was recorded along with keratometry. The efficacy of the procedure was evaluated with the help of categorical distribution of visual results, and subjects were categorized according to their BCVA pre and post-operatively. 6/6 to 6/18 BCVA were considered good visual outcomes. Subjects with 6/24 to 6/60 were considered satisfactory, while <6/60 indicated poor outcomes. The difference between pre-operative BCVA and post-operative BCVA indicated the visual rehabilitation after the procedure.

Statistical package for social sciences (SPSS) version 21.0 was used to analyze data. Continuous variables such as demographics (Age), Keratometry K1 and K2 were presented in mean±standard deviation. At the same time, the gender distribution of study subjects and Intraoperative complications, BCVA pre-operative and post-operative were presented as frequency and percentages.

**RESULTS**

A total of 94 subjects were enrolled in this study, out of which there were 39(41.5%) male subjects and 55(58.5%) female subjects. The mean age of study participants was 61.77±7.34 years. For pre-operative

evaluation, automated keratometry was performed, resulting in K1=43.02±1.067 and K2=43.59±1.15 (Table-I).

**Table-I: Descriptive Analysis of Demographics and Keratometry K1 and K2 (n=94)**

Parameters	n (%)	
Gender	Male	39 (41.5%)
	Female	55 (58.5%)
Age (Years)	61.77±7.34	
Keratometry K1 (D)	43.02±1.06	
Keratometry K2 (D)	43.59 ±1.15	

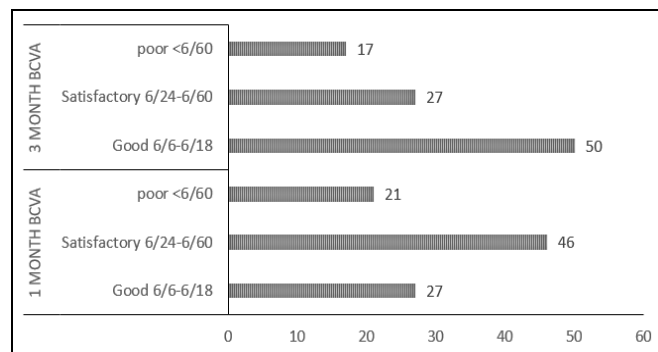
Intraoperative complications were recorded and indicated Conjunctival chemosis, Subconjunctival haemorrhage, posterior capsule rupture, and Descemet membrane detachment in 18(19.1%), 9(9.6%), 3(3.2%) and 3(3.2%), subjects respectively. Post-operative complications were evaluated within one week of surgery, and 22(23.4%) subjects showed striate keratopathy, 2(2.1%) indicated bullous keratopathy, 7(7.4%) reported residual lens matter as a complication (Table-II).

**Table-II: Intraoperative and Postoperative complications**

Parameters	n (%)
<b>Intra Operative Complications</b>	
Conjunctival chemosis	18 (19.1%)
Subconjunctival hemorrhage	9 (9.6%)
Posterior capsule rupture	3 (3.2%)
Descemet membrane detachment	3 (3.2%)
PC rent	6 (6.4%)
<b>Post-Operative Complications</b>	
Striate keratopathy	22 (23.4%)
Bullous keratopathy	2 (2.1%)
Residual lens matter	7 (7.4%)

Best-corrected visual acuity was analyzed upon discharge to maintain post-operative BCVA values. 40 out of 94 subjects showed Good visual outcomes, while 11/94 indicated satisfactory results. The difference between pre-operative and post-operative BCVA. The graphic representation of compared results clearly showed improved results after surgery. For analyzing the difference between best-corrected visual acuity (BCVA), patients were requested to follow up after four weeks (1 month) and 12 weeks (3 months) of surgery. Upon follow-up, the primary investigator conducted a detailed interview, and patients were asked about the visual improvements, changes in the quality of life, and any reported complications. The BCVA was measured post-operatively on follow-ups and compared with the pre-operative results. The difference between immediate post-operative, four weeks post-operative, and 12 weeks post-operative is enormously

visible, and the transformation of visual outcomes of subjects towards better BCVA was shown in Figure.



**Figure: Best-Corrected Visual Acuity (BCVA) Statuses on Post-Operative Follow-Up after One Month and Three Months (n=94)**

On four weeks follow-up, the visual outcomes among participants was 17(18.1%) as the good category (6/6-6/18), 49(52.1%) as the satisfactory category (6/24-6/60), and 28(29.8%) as poor category (<6/60). The difference between good visual outcomes was 35.1% within eight weeks (4th week till 12th week); similarly, the difference between satisfactory visual outcomes was 23.4%. The visual outcomes improved more than two folds after phacoemulsification with a rigid intraocular lens (Table-III).

**Table-III: Best-corrected Visual Acuity (BCVA) Post-Operative Follow-ups (n=94)**

Parameters	n (%)
<b>Best-corrected visual acuity (BCVA) status 1 month Post OP</b>	
Good 6/6-6/18	17 (18.1%)
Satisfactory 6/24-6/60	49 (52.1%)
poor <6/60	28 (29.8%)
<b>Best-corrected visual acuity (BCVA) status 3 months Post OP</b>	
Good 6/6-6/18	50 (53.2%)
Satisfactory 6/24-6/60	27 (28.7%)
poor <6/60	17 (18.1%)

**DISCUSSION**

The foldable Intraocular lens has reported complications such as uncontrollable unfolding characteristics and discolourations and an incidence of posterior capsular opacification (PCO) higher than reported for PMMA IOLs.<sup>11</sup> Consequently, there is interest in alternatives such as foldable acrylic IOLs.

This study aims to evaluate and interpret the difference of best-corrected visual acuity (BCVA) after cataract surgery with phacoemulsification technique using a rigid intraocular lens within pre-structured. The results of post-operative visual outcomes depend upon many factors, including pre-operative details and intraoperative and post-operative measurements. The

post-operative visual outcomes depend upon many factors ranging from the surgeon’s expertise to the hospital burden of ophthalmology patients. Latest research studies indicated visual acuity from different countries with <6/18 in 40-75%, <6/60 in 21-53% population.<sup>12,13</sup> The refractive error contributes to poor vision post-operatively.<sup>14,15</sup> while second, the most common reason for an impaired visual outcome is related to posterior capsular rupture (PCR), which was 3.2% in our study, which is comparable with another study conducted on the Pakistani population with PCR results of 3.01%, while few studies mentioned 10% and 11.3%.

In the study of the African population, the PCR was 4.4%.<sup>16</sup> The mean age of another study was 56.69±8.95 years 17 which is less than our study subjects (61.77±7.34 years). This study measured the visual acuity one month, three months and six months post-operatively. The results indicated 0.57±0.38 D, 0.65±0.46 D, and 0.71±0.48 D, respectively; with 6/6 best-corrected visual acuity after 1, 3, and 6-months post-operative follow-up with results of 39%, 38%, and 34% respectively. Post-operative complications after cataract surgery are reported in many studies from different populations around the world, and our study indicated striate keratopathy in 23.4% of subjects, making it the most commonly reported post-operative complication in our study subjects, with residual lens matter in 7.4% and Bullos keratopathy in 2.1% of subjects. The BCVA after four weeks of surgery were 18.1%, and 53.2% after 12 weeks as a good visual outcome. This result is promisingly good compared to another study that reported 39.0% of good visual outcomes. Various studies proved that post-operative visual acuity is the finest constraint to evaluate the visual outcome.<sup>17,18</sup> Our study reported 17 subjects out of 94 subjects changing visual acuity from 6/24 and only a few from 6/60 to 6/6-6/18. Therefore, the post-operative complications should be a concern for developing countries rather than the frequency measure of cataract surgeries performed.<sup>18</sup> The visual outcomes of our study were improved by 35.1% within eight weeks (4th week till 12th week) from a satisfactory or poor category into a good category. Similarly, the difference in satisfactory visual outcomes was 23.4% from a poor category, indicating two folds improvements in overall BCVA. Ongoing concerns require an appropriate solution to improve the outcome of cataract surgery in the developing world, and our study data indicated that age concern is not comorbidity to achieve visual acuity while getting better results of visual outcomes post-

surgery follow-up are important along with proper care and choice of the procedure according to the patient's needs.

### CONCLUSION

Our study indicated restoration of visual outcomes by two folds after surgery and transformation of 6/60 and 6/24 into 6/18 and 6/6. The foldable intraocular lens is comparatively expensive and unaffordable for many patients in developing countries; the expense of purchasing a foldable lens is difficult for middle and lower socio-economic classes. The efficacy of rigid IOL proved that the functioning of this lens is economical, and better visual outcomes can be obtained with follow-up evaluation and care. Rigid IOL with phacoemulsification is a comparatively cost-effective method to remove cataracts and restore visual acuity in patients without any age discrimination, as it has been proved that age does not work as a confounding factor for visual acuity. Accurate diagnosis, evaluation, and surgeon's experience are important factors in achieving the required results.

**Conflict of Interest:** None.

### Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

MIM: Study design, data analysis, critical review, drafting the manuscript, critical review, approval of the final version to be published.

NA: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

AJ & AKN: Conception, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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