

## “Post Operative Visual Outcomes after Cataract Surgery in Tertiary Care Eye Hospital: Observational Study”

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### Abstract:

**Introduction:** An uneventful cataract surgery with intraocular lens implant is capable of providing normal vision. Good visual outcome increases patient's satisfaction and quality of life. Aim is to evaluate the postoperative complications and visual outcomes after manual small incision cataract surgery at a teaching hospital.

**Materials and Methods:** This is a clinic-based and hospital based study of consecutive cataract-operated patients who had age-related cataract with vision less than <6/60 before surgery. A total of 140 patients who visited the hospital and met the eligibility criteria were included in the study. In this study 140 patients who underwent uneventful SICS with PCIOL implant were followed up. Patients having pre-existing ocular disease were excluded. IOL power was accurately estimated. Visual acuity, anterior segment and fundus findings were recorded at each postoperative visit upto 6 weeks and in some cases upto 3months. We followed the visual outcome standards set by WHO.

**Results:** 66 males and 74 females in the age group of 45 to 75 and above were selected. On 1st post operative day 38.57% patients had quiet eyes. In 61.43% patients, decreased vision and complications observed on 1st post operative day and upto 1st week were: Striate keratopathy and corneal edema, anterior uveitis with pupillary membrane, residual lens matter, macular edema, endophthalmitis, intraocular hemorrhage with secondary glaucoma and IOL related causes. On the 6th postoperative week during spectacles prescription, 61.42% had uncorrected Astigmatism, 6.42% consecutive myopia/ hypermetropia and 8.57% had posterior capsular opacity. At 3 months follow up, 91.42% had good outcome, 3.57% patients had borderline outcome. 5% poor visual outcome was seen in patients with Bullous keratopathy, endophthalmitis, vitreous hemorrhage and longstanding macular edema.

**Conclusion:** Our hospital based study reports 5% patients with poor visual outcome 3 months after uneventful cataract surgery

Date of Submission: 18-07-2020

Date of Acceptance: 02-08-2020

### I. Introduction

Cataract is the main cause of avoidable blindness worldwide, with the developing world accounting for three - quarters of this blindness.<sup>[1,2]</sup> Cataract continues to be the single largest cause of blindness globally and in India during the “Rapid Assessment of Avoidable Blindness (RAAB) survey conducted in 2006-07, cataract is reported to be responsible for 72.2% of blindness in the 50+ population.<sup>[3]</sup> The targets as per VISION 2020:<sup>[4]</sup> The right to sight, a joint programme of WHO and the IAPB (International Agency for the Prevention of Blindness) are to improve the visual outcome of cataract surgery to match the standards set by WHO. Universal Eye Health: A Global Action Plan (GAP) 2014-19 is a resolution of the World Health Assembly that builds upon have BCVA <6/60.<sup>[5]</sup> Cataract surgery is the most effective and common method of restoring vision from cataract blindness<sup>[6]</sup>. To assess the effectiveness of cataract surgery, indicators such as good visual acuity outcomes is essential to assess the quality of the service.<sup>[7,8]</sup> Limburg recommended that more than 80% of eyes at 4 weeks after cataract surgery should have VA  $\leq$  6/18 with pinhole.<sup>[9]</sup> Cataract outcome related population-based surveys from India, Nepal and other developing countries have reported a poor outcome ranging from 9% to 41%<sup>10,11,12</sup> but the World Health Organization (WHO) recommended that poor outcome should be less than 4%. Recent population based studies in Nepal and India<sup>[13,14]</sup> show that 40–75% of people who have had cataract surgery have a presenting visual acuity of worse than 6/18 in the operated eye, and 21–53% have less than 6/60. But recently, WHO and International Agency for the Prevention of Blindness (IAPB) have recommended that more than 85% of operated cataract cases should have good grade of vision (6/6 to 6/18) (IAPB Action Plan). Therefore at least 85% of the operated eyes should have VA  $\leq$  6/18 after cataract surgery and less than 5% should have BCVA <6/60.<sup>[4]</sup> In the last 2 decades, manual small incision cataract surgeries with posterior

chamber intraocular lens implant (SICS + PCIOL) have improved the outcome of cataract surgery and can reduce the size of the incision and also reduce intraocular manipulation. Patients recover quickly and the risk of postoperative complications is lower.<sup>[15]</sup> Patients are advised to come for follow-up schedules on 1st day, 1st week, and 6 weeks.<sup>[16]</sup> As the surgical wound is healed and the refractive status is stabilized, spectacles for distant and near work are prescribed at 6-week follow-up. We can also identify a few high-risk patients that need further proactive subsequent follow-up for at least 3 months.<sup>[17]</sup>

## **II. Materials and Methods**

This was an observational, descriptive, longitudinal study and hospital-based study of consecutive patients who presented to the eye clinic of Maha Rani Laxmi Bai Medical College, Jhansi, Uttar Pradesh during a 1 year period from March 2019 to February 2020. The institute ethical committee approval was obtained before commencement of this study. Prior informed consent was taken from every patient. An average of 35 to 40 cataract surgeries are carried out every month and the surgeries are performed by 3 faculty consultants and senior residents in ophthalmology and also partially done by 4 postgraduate trainees. Data collected was entered in a data base and analyzed using SPSS (Statistical Package for Social Sciences) version 13. Analysis by percentages was used whenever appropriate.

### **Inclusion Criteria:**

1. Cataract operated patients with age-related (senile) cataract were included in this study. These patients were preferred, as the purpose of this study is to assess the outcome of the age-related blinding cataract after cataract surgery.
2. All patients who underwent uneventful manual small incision cataract surgery with posterior Chamber intraocular lens implants (SICS+ IOL) were selected for this study.

### **Exclusion Criteria:**

2. Traumatic cataracts, complicated cataract and cataract associated with corneal lesions, glaucoma hypertension, diabetic mellitus and other ocular co-morbidities were excluded. These patient were excluded because of poor prognosis for vision after surgery

All socio-demographic and pre-operative data were collected retrospectively from the discharge records, whereas presenting and best corrected visual acuity was collected prospectively from the patients. All the required data, including demographic and surgery related data, were recorded in a pre-tested standard questionnaire form. Slit- lamp grading was done for nuclear cataract (nuclear color NO, nuclear opalescence NC), cortical cataract (C) and posterior subcapsular cataract (P) as per the Lens Opacities Classification System III (LOCSIII).<sup>[18]</sup> Keratometry and A scan ultrasound were carried out to determine the required dioptric power of the intraocular lens (IOL). Operations on cataract are carried out under operating microscope and by using disposable microsurgical instruments. The selected patients having senile cataract were operated with a 5.5 to 6 mm corneo-scleral tunnel incision and using a continuous circular capsulorhexis (CCC) procedure. All patients who underwent uneventful manual small incision cataract surgery with posterior chamber intraocular lens implant (SICS+ IOL) were selected for this study. The IOLs used were all unifocal, single piece, PMMA, biconvex lens with UV absorbing optic and A constant 118.2. Operated patients were assessed on a slit-lamp biomicroscope on the 1st day after surgery and again during the 1st week, to review cornea, surgical wound, anterior chamber and implanted lens. The vitreous and retina were examined with +90 D Volk lens. Steroid, antibiotic, cycloplegic-mydriatic and anti inflammatory eye drops were used for 2 to 6 weeks after surgery. At follow ups, the eye was examined for post operative complications and the Presenting distance visual acuity (PVA) was recorded by using illuminated Snellen charts, without spectacles or with spectacles if the patient was already using them and with best corrected visual acuity (BCVA) was recorded by Snellen's chart and with pinhole. At the 6-week follow-up, besides correcting the refractive error, patients who had persisting post-operative complications were advised to come for further follow-up and management till 3 months. All patients with vision less than 6/18 with any underlying cause that was amenable to treatment were referred for treatment including Nd:YAG laser posterior capsulotomy. The World Health Organization (WHO) recommended manual for Monitoring Cataract Surgical Outcomes (MCSO) were followed to define the produces and cataract surgery outcomes.<sup>[8,19]</sup> The visual acuity of each eye was classified according to the WHO recommended standard cataract outcome grading where good vision indicates VA 6/6 to 6/18, borderline vision indicates VA less than 6/18 to 6/60, and poor vision is less than 6/60. Common complaints after an otherwise uncomplicated, successful cataract surgery with a good visual outcome are unwanted images such as flashes, arcs etc. as in positive dysphotopsia (PD) and a dark shadow or a crescent in negative dysphotopsia (ND). Counselling for

these complaints is all that is required for the patient’s satisfaction and to give the patient a good vision related quality of life (VRQOL).<sup>[20]</sup>

### III. Results

A total of 140 cases were included in this hospital based study. 66 male patients and 74 females in the age group of 45 to 75 years and above were selected. Table 1 represents the socio-demographic characteristics of the cataract-operated patients. Maximum numbers of patients were in the age group of 60 to 69 years. Of these patients, female participation 74 (52.85%) was greater than male 66 (47.14%). A large number of the patients 97 (69.28%) lived in rural areas and only 43 (30.71%) patients were from urban areas. Patient’s literacy status showed that 85 (60.71%) patients were illiterate and 55 (39.28%) literate. Cases were having either senile cortical cataract, nuclear cataract or posterior subcapsular cataract or a combination of all the three opacities. All cases underwent an uneventful SICS with PCIOL implant surgery but the overall outcome also depends on skill of the surgeons in a teaching hospital setting.<sup>[21]</sup> On the 1st postoperative day, 54 patients had a near normal presenting vision of 6/6 - 6/9 for distance and had quiet eyes with no complications (Table 2). In the remaining 86 patients examined, vision was from 6/9 – 6/60 and less. The visual outcome could be classified as good, borderline and poor (Table 4). The most common early complication that occurred on 1st postop day upto 1<sup>st</sup> week was striate keratopathy (SK) in 18 cases. Corneal edema was seen in 13 cases and was graded as: Grade 1: haze not interfering with visibility of iris details, Grade 2: mild obscuration of iris details, Grade 3: moderate obscuration of iris details, Grade 4: complete opacification of stroma. Patients were put on topical 5% NaCl. The next common causes were irregular pupil in 14 cases, residual lens matter in 12 cases .Anterior uveitis, Toxic anterior segment syndrome (TASS), pupillary membrane are seen in 10% cases and a couple of patients were given subconjunctival injection of gentamycin, dexamethasone and mydracaine. The corneal edema clears after 1<sup>st</sup> week and the anterior chamber inflammatory response also resolves then.<sup>[22]</sup> On posterior segment examination 13 cases presented with macular edema, 1 patient had intraocular hemorrhage with secondary glaucoma and 1 patient showed signs of acute onset endophthalmitis. Lobo et al suggested that in uneventful cataract surgery, macular edema subsides at 6 weeks to get the best visual gain.<sup>[23]</sup> The surgical wound heals and surgically induced astigmatism (SIA) is less likely to alter the refractive status of the eye 6 weeks after small incision cataract surgery.<sup>[22]</sup> Table 3 shows the uncorrected presenting vision at 6 weeks postoperatively. Normal distant vision of 6/6 was seen in 28 patients. The most common cause of subnormal vision in our study was astigmatism seen in 60.71% cases, the surgically induced astigmatism (SIA) varies from -0.75D to -2.50D at 90 degrees +/- 20 degrees, the commonest being -1.25D at 90 degrees, with majority of cases having against- the-rule astigmatism (ATR). This high difference in astigmatism is because of the skills of the post graduate trainees doing the initial surgical wound in some cases. Uncorrected myopia is seen in 07 cases and consecutive hypermetropia in 02 case. In our study the other causes of late postoperative complications were posterior capsular opacity (PCO) in 8.57% cases, pseudophakic bullous keratopathy (PBK) in 02 patients, cystoid macular edema (CME) in 02 case, vitreous hemorrhage in 01 case and 01 patient had infective endophthalmitis. Spectacle correction and YAG laser capsulotomy improved the final visual outcome in all cases except a few. Long standing CME progressed to lamellar macular hole in 1 case. In our study, Table 4 shows the postoperative visual outcomes at 6 weeks to 3 months after cataract surgery. Good outcome with best corrected visual acuity (BCVA) 6/6 - 6/18 was recorded in (n=128) 91.42% cases. In 05 cases of borderline outcome (BCVA <6/18-6/60) the causes in our study are high postop astigmatism of > 4D in 2 patient, high consecutive myopia >4.5D recorded in 01 case, and 2 patient had dense PCO even after YAG capsulotomy. Poor visual outcome of BCVA < 6/60 was reported in 5 % of patients in our teaching hospital based study. The complications were PBK (2case), long standing CME (2 case), vitreous hemorrhage (1 case) and endophthalmitis (1 case).

**Table 1 . Demographic characteristics of the patients**

Variable	Number of patients	Percentage
<b>Age</b>		
45-49	8	5.71
50-59	44	31.42
60-69	59	42.14
70-75	29	20.71
<b>Gender</b>		
Male	66	47.14

Female	74	52.85
<b>Area</b>		
Rural	97	69.28
Urban	43	30.71
<b>Educational status</b>		
Illiterate	85	60.71
literate	55	39.28

**Table 2:** Complications on 1st postop day to 1st week

S. No.	Complications	No. of patients(%)
1	No complications	54(38.57%)
2	Striate keratopathy	18(12.85%)
3	Corneal edema	13(9.28%)
4	Anterior uveitis, TASS, pupillary membrane	14(10%)
5	Residual lens matter	12(8.57%)
6	Macular edema	13(9.28%)
7	Irregular pupil, pupillary capture of IOL	14(10%)
8	Acute onset endophthalmitis	01(0.71%)
9	Intraocular hemorrhage with secondary glaucoma	01(0.71%)
Total		140(100%)

**Table 3:** Uncorrected presenting vision at 6 weeks postop

S. No.	Visual acuity	No. of patients(%)
1	Normal distant vision	28(20.00%)
2	uncorrected astigmatism	85(60.71%)
3	uncorrected myopia	07(5.00%)
4	uncorrected hypermetropia	02(1.42%)
5	untreated Posterior capsular opacity	12(8.57%)
6	Pseudophakic bullous keratopathy	02(1.42%)
7	Cystoid macular edema	02(1.42%)
8	infective endophthalmitis	01(0.71%)
9	intraocular hemorrhage	01(0.71%)
Total		140(100%)

**Table 4:** Postop visual outcomes at 6 weeks to 3 months after cataract surgery

Visual outcomes	Causes	No. of patients(%)
Good outcome	BCVA 6/6 – 6/18	128(91.42%)
Borderline outcome	BCVA < 6/18 – 6/60	05(3.57%)
Poor outcome	BCVA < 6/60	07(5.00%)

Pseudophakic bullous Keratopathy	02(1.42%)
Longstanding Cystoid Macular Edema	02(1.42%)
Infective endophthalmitis	01(0.71%)
Unresolving vitreous hemorrhage	02(1.42%)
<b>Total</b>	<b>140(100%)</b>

BCVA: best corrected visual acuity

#### IV. Discussion

The number of cataract operations was seen to be higher in patients with an age range from 60 to 90. Studies from other developing countries also reported a similar age range to this study.<sup>[24,25,26]</sup> Cataract surgery rate was found to be greater in female patients than male patients, which was also evidenced in several studies.<sup>[20]</sup> It has been reported that women have slightly increased the age-adjusted risk for cataract<sup>[25]</sup> while another study claim that longer life expectancy of the female is the reason for this higher prevalence of cataract surgery.<sup>[27]</sup> This study has shown that a small number of patients had received a formal education, although it is not surprising for this age group when considering the educational context of developing countries where elderly is less educated. In our prospective study undertaken at a postgraduate teaching medical college and hospital, we selected 140 cases who underwent uneventful manual small incision cataract surgery with posterior chamber intraocular lens implant during a 1 year period. The 3 faculty specialists in ophthalmology performed the surgeries assisted by the post graduates, and the 4 postgraduate trainees also performed in some of the steps of surgery. As observed by Ang GS et al the complications and outcome also depends on the skill of the operating surgeons in a university teaching hospital setting.<sup>[21]</sup> On the 1st postoperative day, 38.57% patients in our study had a near normal presenting vision of 6/6 - 6/9 and had quiet eyes with no complications. Venkatesh et al also reported 39% patients with good vision at first follow-up.<sup>[28]</sup> Rajiv B Khandekar et al in 2010 reported in their study that one day after cataract surgery, 6618 (46%) patients had good vision, 6213 (43.2%) had borderline vision, and 1545 (10.7%) had poor vision.<sup>[17]</sup> The remaining 61.42% (n=86) patients in our study had a subnormal vision from < 6/9 - 6/60 and less on follow-up from 1st day to 1st week, the most common causes being striate keratopathy (SK) (12.85%) and corneal edema (09.28%). Similarly Sharma et al (2019) reported 15% cases with SK and 12.5% with corneal edema in the visco expression technique of nucleus delivery.<sup>[29]</sup> Venkatesh in a study of 100 eyes that underwent MSICS with white cataract reported corneal edema with >10 Descemet's folds in 6%, and 7% cases had corneal edema with <10 Descemet's folds.<sup>[28]</sup> We had 10% cases with anterior chamber (AC) inflammatory response, and 8.57% with residual lens matter. Similar results of 10% AC response and 10% retained cortical matter was reported by them too.<sup>[29]</sup> Cystoid macular edema (Irvine - Gass syndrome) examined by +90D lens was seen in 9.28% of our cases, and also reported in 9.28% cases of the hospital based study by V H Karambelkar et al<sup>[30]</sup> and similarly CME has been diagnosed in 6.67% patients in a study done by Hiranmoyee et al.<sup>[31]</sup> At 6 weeks postoperative follow -up for spectacles prescription, we had (n=85) 60.71% patients with uncorrected astigmatism with an average of -1.25D against the rule astigmatism. Andleeb Ahangar, Aalia Rasool Sufi et al from Kashmir (2014) reported in their SICS group that 17 (56.6 %) patients had a mean postoperative astigmatism of 0.75+/- 0.40 diopters, with the majority having against-the-rule (ATR) astigmatism.<sup>[32]</sup> In patients not improving with spectacle correction, posterior capsular opacity (PCO) was found in 08.57% of our cases. Due to the affordability of patients, we used only non square edge IOLs in all our selected cases and hence this higher percentage. PCO due to non square edge IOLs was 12% in SICS cases in a study by VH Karambelkar et al.<sup>[30]</sup> These cases were then treated by Nd:YAG laser capsulotomy to improve visual outcome. In Table 4 of our teaching hospital study, poor outcome (BCVA <6/60) at 6 weeks upto 3 months and beyond was seen in 05% of our operated cataract cases. Our study results matched with Pararajasekharam who suggested that less than 5% of operated cataract should have BCVA of <6/60.<sup>[33]</sup> Based on the WHO benchmark of 5% for poor outcome of cataract surgery, the 5% for poor outcome in our study is significantly similar.<sup>[4]</sup> Long standing corneal edema progressed to PBK in 2 (1.42%) of our cases despite vigorous management. Stefan Pricopie et al reported that pseudophakic bullous keratopathy may occur in around 1 to 2% of the patients undergoing cataract surgery.<sup>[34]</sup> PBK was associated with marked visual loss, which was permanent despite clear grafts in 29 of 92 eyes followed-up for one year or longer in a study by Juan J Arentsen et al.<sup>[35]</sup> Poor outcome was also seen in 1 case of CME (0.71%) in our study that eventually progressed to lamellar macular hole. Marilita M et al in 1 case reported that Macular Hole formation may even occur in cases of pseudophakic macular edema, representing a rare complication of Irvine- Gass syndrome.<sup>[36]</sup> The 1 case of poor outcome due to intraocular hemorrhage / vitreous hemorrhage was due to blunt trauma to the eye sustained after surgery. Despite further management the visual outcome remained poor. In our study we also had 1 case of acute onset infective endophthalmitis (0.71%) with poor visual outcome. Instillation of povidone iodine 5% solution in the conjunctival sac for 2 min before surgery is done in all our cases to decrease bacterial

flora. Finally 0.5 ml subconjunctival injection of gentamicin and dexamethasone is given to all patients on completion of cataract surgery. Mahalingam P, Sambhav K et al observed that the visual outcome after endophthalmitis is generally poor but aggressive and appropriate treatment can improve the visual outcome. Although their results showed that standard interventions led to improvement in VA, only a minority of patients achieved final VA of <6/60.<sup>[37]</sup> A retrospective observational series conducted at a single eye hospital by Ravindran et al. reported 0.12% incidence of endophthalmitis after MSICS.<sup>[38]</sup> The final VA of majority of their patients, even after aggressive treatment, was less than 6/60, which indicates the poor prognosis of this disease. Borderline outcome of BCVA < 6/18 to 6/60 was attained in 3.57% of the patients in our study at the end of 6 weeks. (Table 4) Postoperative good visual outcome (BCVA 6/6-6/18) was obtained in 91.42% patients after uneventful MSICS + IOL at our teaching hospital. Parrajasekharam suggested that >90% of patients operated for cataract with lens implant should have good grade of vision (BCVA 6/6 – 6/18) and less than 5% of operated cataract should have BCVA of <6/60.<sup>[33]</sup> But recently, WHO and International Agency for the Prevention of Blindness (IAPB) have recommended that more than 85% of operated cataract cases should have good grade of vision (6/6 to 6/18) (IAPB Action Plan).<sup>[45]</sup> Our study results matched with these indicators and suggest that high quality of SICS with IOL implant in our institute is maintained.

## V. Conclusion

After follow up of patients that were operated in this postgraduate teaching hospital show a high percentage of striate keratopathy, corneal edema, acute onset endophthalmitis, surgically induced astigmatism possibly due to the initial corneo-scleral wound incision being sometimes performed by the trainees. High incidence of PCO may be reduced by implanting costlier square edge IOLs and percentage of macular edema decreased by the blue- light filtering IOLs. In 91.42% operated cases having good outcome, implant of aspheric IOLs can prevent annoying aberrations and help in improving the overall patient satisfaction and quality of life. This study has demonstrated that cataract surgery improves visual acuity in patients who had a poor vision before the operation. Results also highlighted that a careful pre-surgical evaluation is necessary in order to avoid refractive surprise after surgery and to achieve a satisfactory outcome. However, in developing countries like India, regular monitoring of cataract surgical outcome should be carried out at hospital and population level so that obstacles can be identified in this area and appropriate measures can be taken to fill the gaps.

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Dr. Pradeep Kumar Tiwari, et. al. “Post Operative Visual Outcomes after Cataract Surgery in Tertiary Care Eye Hospital: Observational Study.” *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 19(8), 2020, pp. 33-39.