Original Article

Visual outcome of small-incision Cataract surgeries

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ABSTRACT

Aim: To determine the visual outcome of the patients who underwent manual small incision cataract surgery (MSICS)

Study Design: Prospective, observational study.

Duration and Settings of the Study: From December 2021 to April 2022 at Kawasoti Eye Hospital, Nepal.

Methods: This study included 255 eyes of 255 patients with age-related cataracts who underwent MSICS with intraocular lens implantation (IOL). All the consecutive patients who were 40 years of age and above, and presented for cataract surgery from the outreach camp service, were included in the study.

The exclusion criteria consisted of age less than 40 years, those who underwent phacoemulsification, traumatic cataracts, and subluxated lenses, patients wanting cataract surgery for cosmetic reasons, uncontrolled systemic hypertension, and diabetes mellitus. While ocular comorbidities were not excluded from the study. Informed written consent was obtained from all patients before their enrollment in this study.

Pre-operative evaluation included a comprehensive eye examination which was performed on all the patients referred from the outreach camp for cataract surgery. Cataract surgery was then performed on all the patients and visual outcome was assessed. The vision was recorded on Snellen's chart as well as converted to a Logarithm of the Minimum Angle of Resolution (Log MAR). Data was entered and analyzed using IBM SPSS software version 16.

Results: In this study, 255 eyes of 255 patients were evaluated with a mean age of 69.64 years. Male patients were 131(51.4%) and female were 124(48.6%). Visual acuity significantly improved in postoperative examinations performed on the first day, first week, and fifth week as compared to preoperative visual acuity (p=0.009).

Conclusion: Visual outcome monitoring after the cataract surgery especially in the outreach camp is required to be performed to increase the congruity of the community toward such welfare programs.

Keywords: cataract surgery; manual small incision; visual outcome

INTRODUCTION

Globally, approximately one billion people have avoidable visual impairment, out of which, cataracts account for 65.2%.[1] In the context of Nepal, bilateral blindness was observed in 2.5% of the people older than 50 years, and 62.2% of blindness was caused due to cataracts in 2012.[2] As per a study of the Rapid Assessment of Avoidable Blindness Survey 2019, conducted in the community eye hospital Gandaki province of Nepal, bilateral blindness was observed in 1% of the population where untreated cataract causes 42.6% of the blindness. In the same survey, cataract surgical coverage for eyes with cataracts with vision less than 3/60 was 80.3%.[3] Irrespective of the cataract surgical coverage, there is a prominent backlog of cataracts which is predominant in developing countries with limited resources as Nepal.[4,5] The American Academy of Ophthalmology states that symptomatic cataracts are a surgical burden and surgery is the most accurate therapy.[6] Cataract surgery holds a significant history for its advancement, evolution from couching to intra-capsular cataract surgery, manual small incision cataract surgery (MSICS), phacoemulsification, and femto-laser surgical technique.[6,7,8] Along with the evolvement of these surgical techniques, the rate of complications and ocular comorbidities have reduced over time with

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ocular comorbidities have reduced over time with early visual rehabilitation.[8] MSICS and phacoemulsification are the most commonly performed surgeries in the developing world.[6,8,9] These techniques have comparable visual outcomes, safety, and efficacy.[10,13] MSICS has wider applicability and is significantly faster, cost-effective, and less technology-dependent than phacoemulsification.[5,8,11,,12,13,14] All these advantages have led it to be widely preferred in resource-limited countries like Nepal to reduce the huge cataract backlog.[15]

Several cataract outreach programs have been conducted at the local level where a team of eye health workers goes to the community and provides primary eye care services to the patients and refers the patients requiring cataract surgical treatment to the hospital.[16,17] This has enormously helped to increase the cataract surgical coverage at the community level. These types of community-based surgical care interventions with good visual outcomes and fewer complications are also helpful in encouraging patients to come to the hospital to seek better ocular care in the future. Also, visual outcome monitoring could be a helpful quality indicator for monitoring cataract surgical programs.[18]

Kawasoti Eye Hospital is one of the community-based eye hospital situated in Nawalpur district of Gandaki province of Nepal which aims to serve and prevent the ocular illness present in the community diligently. The objective of this study is to determine the visual outcome of the patients who underwent MSICS from the outreach camps and to determine the intraoperative complications observed during the surgery.

METHODS

This was a prospective, observational study that included 255 patients with age-related cataracts who underwent MSICS with intraocular lens implantation (IOL) from December 2021 to April 2022 at Kawasoti Eye Hospital, The surgeries were performed by a single ophthalmologist (SR) who completed a three-year residency in ophthalmology and a six-months training in MSICS. All the ocular examinations and surgeries were carried out by a single surgeon. This study adheres to the tenets of the declaration of Helsinki and ethical clearance was obtained from the institutional review committee of the hospital with reference number 1/302/079/80 dating 16th September 2022.

All the consecutive patients who were 40 years of age and above, presented for cataract surgery from the outreach camp service were included in the study. The exclusion criteria of the study were,

1. Age less than 40 years
2. Those who underwent phacoemulsification
3. Traumatic cataract and subluxated lens
4. Patients wanting cataract surgery for cosmetic reasons
5. Uncontrolled systemic hypertension and diabetes mellitus

While other ocular comorbidities were not excluded from the study. Informed written consent was obtained from all patients before their enrollment in this study.

Preoperative evaluation included a comprehensive eye examination which was performed on all the patients referred from the outreach camp for cataract surgery. Eye examinations included uncorrected visual acuity (UCVA), and best corrected visual acuity (BCVA). Visual outcome was categorized as per World Health Organization's standard category for visual impairment and blindness in which normal to mild visual impairment is equal to 6/6 and equal to or better than 6/18, moderate visual impairment is less than 6/18 and equal to or better than 6/60, severe visual impairment vision is less than 6/60 and equal to or better than 3/60 and blind if the visual acuity is less than 3/60.[1] Detailed anterior segment and dilated posterior segment examination was performed using slit lamp biomicroscope (Inami. co ltd, Tokyo, Japan) and 90 D Volk lens. Air puff tonometry was performed to document intraocular pressure (IOP).

Amplitude scan and keratometry were done to calculate IOL power. Cataract grading was done based on Lens Opacification Grading System III (LOCS III).[19] Patients were subjected to blood investigations including complete blood count, fasting blood sugar,

urine routine, and microscopy and serologic parameters. Blood pressure was measured with a sphygmomanometer.

On the day of surgery, the eye to be operated on was marked and dilated using eye drops containing tropicamide 0.8% and phenylephrine 5%. All the surgeries were performed under peribulbar anesthesia with lidocaine 2% with adrenaline 1: 2,00000 IU and hyaluronic acid 1500 IU.

Under all aseptic precautions, superior fornix-based peritomy was done followed by a 6-7 mm scleral corneal tunnel was created with a frown incision 1.5-2 mm behind the limbus. The chord length was then widened to 8-9 mm while it was moved forward 1- 1.5 mm into the clear cornea. A side port was created at 10'O, clock to facilitate intraocular manipulations. Capsulotomy was performed using a continuous curvilinear capsulorhexis (CCC) technique after staining the capsule with trypan blue dye 0.5%. The sclero-corneal tunnel was entered using a 3.2mm metal keratome. Hydro procedures were carried out and the nucleus was prolapsed into the anterior chamber. Viscoelastic was injected around the nucleus and an irrigating Vectis was used to deliver the nucleus through the scleral tunnel. The cortex was removed manually with Simcoe irrigation and aspiration cannula and a 6.5 mm three-piece polymethyl methacrylate lens was implanted in the bag. In cases with posterior capsular rent, manual vitrectomy was performed and followed by placement of rigid IOL in the sulcus or anterior chamber IOL (AC-IOL) along with surgical peripheral iridectomy. Viscoelastic was used time and again to maintain the anterior chamber and cleaned at the end of the procedure. The side port was hydrated and the anterior chamber formed with a balanced salt solution (BSS). Intracameral moxifloxacin 100µg/0.1ml was given followed by sub-conjunctival Gentamycin (20 mg/ml) and Dexamethasone (4mg/ml) injection. Conjunctival flap was mobilized to cover the tunnel. Topical application of Moxifloxacin 0.5% eyedrop, Prednisolone 1% eyedrop, and eye ointment Polymyxin-B Sulphate 1000 units, Chloramphenicol 10 mg, and Dexamethasone Sodium Phosphate 1mg was used. Sclero-corneal tunnel in case of premature entry were secured with 10-0 nylon sutures. The eye was then patched and observed overnight. Intraoperative complications were noted in the operative notes.

Postoperatively, the patient was examined on the first day, one week, and fifth week. Unaided and pinhole visual acuity were documented. Anterior and posterior segments were examined using the slit lamp biomicroscope and IOP was measured. Every patient received a standard postoperative regime of moxifloxacin 0.5% eyedrop and prednisolone acetate 1% eyedrop in a tapering manner for five weeks. On the fifth week follow-up refraction was performed and glasses were prescribed.

Data was entered and analyzed using IBM SPSS software version 16. Continuous variables were presented as mean and standard deviation. The vision was recorded in Snellen's chart as well as converted to a Logarithm of the Minimum Angle of Resolution (Log MAR). Frequencies and percentages were computed to describe the categorical variables. A two-way ANOVA test was performed to determine the association of different variables. p-value <0.05 was considered significant.

RESULTS

Our study comprised 255 eyes of 255 patients with a mean age of 69.64 ± 9.61 (40-104 years). Male patients were 131 in number (51.4%) and female were 124 (48.6%). Cataract surgeries were exceedingly performed in right eyes i.e. in 138 eyes (54.1%) than in left eyes which were 117 eyes (45.9%). In 213 patients (83.5%) there were no associated systemic diseases, however, 26 patients (10.2%) had hypertension followed by type II diabetes mellitus in seven patients (2.7%) and respiratory illness in 5 patients (2%). Demographic parameters are summarized in Table-1 and Table-2.

Table 1: Demographic parameters of the study

Demographic parameters	Frequency		Percentage
Age Distribution (years)	≤40	1	0.4
	40-49	5	2
	50-59	26	10.2
	60-69	83	32.5
	70-79	106	41.6
	≥80	34	13.3
Gender Distribution	Male	131	51.4
	Female	124	48.6
Laterality	Right Eye	138	54.1
	Left Eye	117	45.9
	Both	29	
Associated Systemic disease	None	213	83.5
	Hypertension	26	10.2
	Diabetes mellitus	7	2.7
	COPD / Asthma	5	2
	Benign prostatic hyperplasia	2	0.8
	Uterine Carcinoma	1	0.4
	Rheumatoid arthritis	1	0.4

COPD=Chronic obstructive pulmonary disease

Table 2: P**reoperative assessment of eyes for associated ocular disease**

Parameters	Frequency	Percentage
None	219	85.9
Glaucoma	12	4.7
Corneal Opacities	11	4.3
Pterygium	9	3.5
Epiretinal membrane	2	0.8
Retinitis Pigmentosa	2	0.8
Total	255	100

Nuclear sclerosis was the predominant type of cataract observed in 105 eyes (41%), followed by mature senile cataract in 74 eyes (29%), brunescent cataracts in 43 eyes (17%), posterior sub capsular cataract in 25 eyes (10%) and cortical cataract in eight eyes (3%) of the patients. Fellow eyes showed age related cataract in 150 eyes (58.8%), pseudophakia was observed in 103 eyes (40.3%) and 2 patients (0.007%) fellow eyes were aphakic. Associated ocular disease were not observed in 219 (85.9%) of eyes, however glaucoma was present in 12 eyes (4.7%), followed by corneal opacities in 11 eyes (4.3%), pterygium in nine eyes (3.5%), epiretinal membrane in two eyes (0.8%), and retinitis Pigmentosa in two eyes (0.8%).

Preoperative mean visual acuity in the patients was LogMAR 1.89±1.71 and intraocular pressure was measured to be 13.40±3.93 millimeters of mercury. Visual acuity on the first post operative day was LogMAR 0.38±0.33, which improved further to LogMAR 0.27±0.25 on the first postoperative week and LogMAR 0.22±0.16 on the fifth postoperative week.

No intraoperative complications were noted in 237 eyes (92.9%). However, posterior capsular rent was the most commonly encountered complication intraoperatively in six eyes (2.4%), followed by premature entry in five eyes (2%), and scleral button hole in two eyes (0.8%). Other complications such as capsulotomy-related complications, irido-dialysis, zonular disinsertion, Descemet's membrane detachment, and intraoperative floppy iris syndromes were observed in single patients (0.4%) respectively. Intraoperative complications are shown in Table-3.

Table 3: Intraoperative complications

Parameters	Frequency	Percentage
No Complications	237	92.9
PCR	6	2.4
Premature entry	5	2
Scleral buttonhole	2	0.8
Capsulotomy related complication	1	0.4
Iridodialysis	1	0.4
Zonular disinsertion	1	0.4
DMD	1	0.4
IFIS	1	0.4
Total	255	100

DMD=Descemet's membrane detachment; IFIS= Intraoperative floppy iris syndrome; PCR= Posterior capsular rent.

During the surgical procedure, IOL was placed in a capsular bag in 249 patients (97.6%). After encountering the complications intraoperatively, IOL was placed in the sulcus in four patients (1.6%) and AC IOL was placed in two patients (0.8%). None of the patients were left aphakic.

Immediate postoperative examinations showed no complications in 221 eyes (86.6%). However, frequently encountered complications were striated keratopathy in 23 eyes (9%), followed by hyphaema in five eyes (2%), displaced IOL in two eyes (0.8%), cortical fibers in the anterior chamber in two eyes (0.8%) and rise in IOP in two eyes (0.8%).

Preoperatively 118 eyes (46.3%) were categorized as having VA of less than 3/60 due to cataracts, which is considered to be blind according to WHO classification of visual impairment. Visual impairment (VA 6/18-3/60) was observed in 129 eyes (50.6%) and only eight eyes (3.1%) were considered to have normal visual acuity preoperatively.

On the first postoperative day, VA significantly improved and only three eyes (1.2%) were observed to have visual acuity of <3/60. Seventy-seven eyes (30.2%) had VA documented to be 6/18-3/60. Immediate postoperative complications were seen to decrease VA which is summarized in Table-4, these complications were successfully managed. The rest of the 175 eyes (68.6%) were documented to have VA of 6/6-6/18.

The first postoperative week, showed normal VA of 6/6-6/18 in 205 eyes (80.4%), and 50 eyes (19.6%) showed VA of 6/18-3/60.

A final visual acuity assessment was performed on the fifth postoperative week where 231 eyes (90.5%) were observed to have normal VA of 6/6-6/18. VA of 6/18-3/60 was documented in 24 eyes (9.5%). During the first and fifth postoperative week examination, none of the patients had a VA of <3/60. This is summarized in table 5.

Table 4: Table showing Visual acuity preoperatively and postoperatively

Visual Acuity	Pre operative		1st POD		1st Post operative week		5th Post operative week	
	N	%	N	%	N	%	N	%
6/6-6/18	8	3.1	175	68.6	205	80.4	231	90.5
6/18-3/60	129	50.6	77	30.2	50	19.6	24	9.5
≤3/60	118	46.3	3	1.2	0	0	0	0
Total	255	100	255	100	255	100	255	100

N:=Frequency, %= Percentage, POD= Postoperative day

Visual acuity significantly improved in postoperative examinations performed on the first day, first week, and fifth week as compared to preoperative visual acuity (p=0.009).

A statistically significant association was not observed between immediate postoperative complications and age, gender, laterality of the eye, associated systemic and ocular disease, and preoperative and fifth-week postoperative visual acuity using a two-way ANOVA test (p= 0.1).

The two-way ANOVA test did not show any statistically significant association between intraoperative complications and age, gender, laterality of the eye, associated systemic and ocular disease, and preoperative and fifth-week postoperative visual acuity (p=0.4).

DISCUSSION

The patients included in this prospective study had a mean age of 69.64 ± 9.61 (40-104 years) which is comparable with the studies performed by Khanna et al and Thanuja et al where the mean age of the patient was 65.9 years and 65.5 years respectively.[8,20] Highest number of patients including 106 eyes (41.6%) with cataracts were observed in the 70-79 years age group which is similar to the study performed by Huang et al where the highest number of patients with cataracts was noted to be in 70-79 year age group.[21]

Male patients were 131 in number (51.4%) and female patients were 124 (48.6%), this is similar to the studies performed by Khanna et al and Mengistu et al where the female patients were 49.7% and 43.9%

respectively .[20,22] Higher number of male patients in our study is in contrast to other studies performed by Wetarini et al and Ward et al where female were 56.5% and 59.5% respectively (more as compared to male counterparts).[14,23] In our part of the developing world, lack of awareness regarding cataract surgery and difficult access to medical services due to social, economic, and cultural differences, mostly among female patients could lead to this disparity. This has been further endorsed by a meta-analysis, conducted by Ye Q et al where the lack of knowledge regarding the cost of the surgery and transportation, awareness, and community-based education for cataract surgery, led to a decrease in cataract surgical coverage in female patients.[24]

Cataract surgeries were exceedingly performed in the right eyes in 138 eyes (54.1%) than in the left eyes i.e.117 eyes (45.9%), which is similar to the studies performed by Rohit et al, Wetarini et al and Ranabhat et al where the right eyes were operated more in 329 (57.4%), 18 (52.9%) and 32 eyes (50.8%) of the patients respectively.[14,20,25]

This study was performed, including the rural population with less access to health facilities where associated systemic diseases were not observed in 213 patients (83.5%), however, 42 patients (16.5%) had associated systemic diseases. Hypertension was the most frequently associated comorbidity observed in 26 patients (10.2%) followed by type II diabetes mellitus in seven patients (2.7%). A similar study, performed in another province resonates with this study, where hypertension was most commonly encountered comorbidity in 17.8%, followed by diabetes mellitus in 14.7%.[26] Studies performed by Khanna et al in Liberia and Olawoye et al in Ibadan, observed associated systemic diseases in 20 patients (3.5%) and 62 patients (33.7%) respectively.[17,20].

Associated ocular comorbidities were noted in 36 patients (14%) which resonates with the studies performed by Khanna et al and Olawoye et al where pre-existing ocular comorbidities were observed in 82 patients (14.3%) and 19 eyes (11.5%) respectively.[17,20] Glaucoma was the most commonly encountered complication in 12 eyes (4.7%) of the patients in this study.

In this study, most of the cataracts were still in an immature stage which included nuclear sclerosis, cortical cataract, posterior subcapsular, and brunescent cataracts, observed in 181 eyes (71%). Mature senile cataracts, which were in 74 eyes (29%). This is consistent with the studies performed by Ward et al, Thanuja et al and Wetarini et al where immature cataracts were higher in number, that is 90 eyes (85.7%), 64.7% of the eyes, 36 eyes (57.1%) than mature cataract in 15 (14.2%), 12 eyes (19%) and 35.3% and respectively.[8,14,23]

This study which was performed at the community level eye hospital, showed the number of patients that were blind by cataracts before the surgery to be 118 eyes (46.3%), that is with VA of less than 3/60. Further, VA of 6/18-3/60 was observed in 129 eyes (50.6%) and only eight eyes (3.1%) were considered to have normal visual acuity. A study performed in western Nepal by Bhatta et al showed similar results with 40.67% of patients with vision of <3/60 preoperatively.[15] Also, this is comparable to the study performed in South India, where 48 eyes (45.7%) were blind before surgery, 48 eyes (45.7%) had moderate vision and only 9 eyes (8.5%) had good vision.[23] Another study performed at Liberia, showed 349 eyes (60.9%) with vision less than 6/60. [20]

Cataract is one of the common causes of avoidable blindness in our part of the world. It hold, an enormous share in causing people, more in the rural areas, to live with blindness. The causes may be difficult geographical adversity and lack of awareness. The outreach camps with surgeries performed in the community level eye hospital, bridge the difference between the people in the community and the health facility. However, monitoring the surgical outcome is of utmost necessity to improve the quality of vision and patient compliance towards such surgical camps. Improved visual rehabilitation of the cataract surgery performed in such surgical camps can be further enhanced by adequate training and

supervised surgical exposure of the surgeon during the residency training duration.[27] In our study the final visual acuity assessment was performed on the fifth postoperative week, where 231 eyes (90.5%) were observed to have normal VA of 6/6-6/18. VA of 6/18-3/60 was documented in 24 eyes (9.5%). During the first and fifth postoperative week examination, none of the patients had VA of <3/60. Studies performed by Ward et al, Jha et al and Katuwal et al showed similar results where 103eyes (96.1%), 302 eyes (95.8%), and 1411 eyes (94.5%) respectively had a good vision of 6/6-6/18 and 2 eyes (1.9%), 6 eyes (1.9%) and 81 eyes (5.3%) had moderate vision respectively.[22,23,28]

Our study adhered to the WHO and the International Agency for the Prevention of Blindness (IAPB) action plan which stated that post cataract surgery, >85% of the patients should have a vision of 6/6-6/18.[23] This is further reinforced as, visual acuity significantly improved in postoperative examinations performed on first day, first week and fifth week as compared to preoperative visual acuity (p=0.009).

During the surgical procedure, in 249 patients (97.6%) IOL was placed in a capsular bag. After encountering the complications intraoperatively, IOL was placed in the sulcus in four patients (1.6%) and AC IOL was placed in two patients (0.8%). None of the patients were left aphakic.

Intraoperative complications during the surgical procedure in our study were observed in 18 eyes (7.1%). Posterior capsular rent was the most encountered complication intraoperatively in six eyes (2.4%). Similar rate of intraoperative complications has been observed in studies performed by Mavrakanas et al and Venkatesh et al in 6.4% and 6% respectively.[29,30] However, intraoperative complications in a study performed by Wairagade et al was on the higher end (22.4%).[31] WHO recommends targeting less than five percent of vitreous loss during cataract surgery and in our study vitreous loss is observed in 4% of the patients. This is similar to the study performed by Khanna et al where vitreous loss is observed in 3.3% of the patients.[20]

Immediate postoperative complications were observed in 34 eyes (13.4%), frequently encountered complications were striated keratopathy in 23 eyes (9%), followed by hyphema in five eyes (2%), displaced IOL in two eyes (0.8%), cortical fibers in the anterior chamber in two eyes (0.8%) and rise in IOP in two eyes (0.8%). This resonates with the studies performed by Jha et al and Wairagade et al where 8.25% and 12.8% of patients had postoperative complications.[28,31] However, it contradicts the study performed by Venkatesh et al where the immediate postoperative complications were observed in a slightly higher number of patients i.e. 23%.[30]

The primary limitation of this study could be the shorter duration of follow-up after the surgery. It would have been better if, a higher number of patients could have been included from different centers advocating the collaborative outcomes.

CONCLUSION

This study demonstrates that the people residing in rural areas with poor visual status due to avoidable causes of blindness, such as cataracts could be rescued, and can be rendered with quality vision. This not only leads to an improved quality of life but also decreases the prevalence of blindness in the community. Visual outcome monitoring after the cataract surgery especially in the outreach camps should be performed to increase the congruity of the community toward such welfare programs.

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