

Immediate Sequential Bilateral Cataract Surgery in Covid-19 Pandemic - A Prospective Study in a Tertiary Eye Care Centre of Eastern India

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ABSTRACT

BACKGROUND

Immediate sequential bilateral cataract surgery (ISBCS) is the procedure in which both eyes are simultaneously operated in a single hospital visit. The onset of corona virus disease-19 (COVID-19) pandemic has raised the interest among ophthalmic surgeon in considering immediate sequential bilateral cataract surgery to reduce hospital visit of patients. This study was done to assess the intraoperative and post-operative complications and average number of hospital visits required after performing immediate sequential bilateral cataract surgery in COVID-19 pandemic. Also, the post-operative visual outcomes were evaluated.

METHODS

Patients with visually significant bilateral cataract with best corrected visual acuity $\leq 6/18$ in better eye, axial length within range of 21 - 25 mm and age >18 years with no ocular and systemic co-morbidity were included in the study. All patients underwent immediate sequential bilateral cataract surgery from July 2020 to September 2020. Strict intraoperative protocols were followed in all cases. Intracameral injection of 0.1 ml moxifloxacin 0.5 % (vigamox / Novartis health care Pvt Ltd. Texas, USA) was given at the end of surgery in all cases. Intraoperative and post-operative complications, visual and refractive outcomes were analysed.

RESULTS

Sixty-four eyes of 32 patients with mean age 55 ± 2.82 years (range: 48 - 71 years) were included in the study. The mean pre-operative best corrected visual acuity was 0.64 ± 0.08 logarithm of minimum angle of resolution which improved significantly to 0.03 ± 0.03 at the end of second follow up on day 14 ($P < 0.0001$). The mean post-operative spherical equivalent was -0.22 ± 0.48 D. The target refraction within ± 0.50 D was achieved in 56 eyes (87.50 %) and within ± 1.0 D in all eyes. No vision threatening complications such as endophthalmitis, cystoid macular oedema, retinal detachment or corneal decompensation occurred in any of eyes. Total hospital visits were reduced to four per patients for both eye surgeries.

CONCLUSIONS

Immediate sequential bilateral cataract surgery may be considered as preferred practice in selected cases to reduce the risk of cross infection of COVID-19 by short hospitalization and less follow up visits.

KEYWORDS

Bilateral Cataract Surgery, COVID-19, Endophthalmitis

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BACKGROUND

Cataract is the leading cause of preventable blindness in the world as well as in India.¹⁻³ The onset of COVID-19 pandemic followed by nationwide lockdown in India led to shut down of all the elective medical services including the cataract surgery. As per data of National Programme of Control of Blindness (NPCB) 2018-2019, approximately ten lakhs cataract surgeries which are supposed to be performed have been pending. When outpatient department (OPD) services were resumed in late June 2020, a large number of patients presented with bilateral senile cataract.

Immediate sequential bilateral cataract surgery is the procedure in which both eyes are simultaneously operated in a single hospital visit.⁴ In spite of technological and technical advancement in cataract surgery such as decrease in incision size to sub 2 mm, better biometry technique such as optical biometer and refined newer intraocular lens (IOL) power calculation formulae, simultaneous bilateral cataract surgery is still not preferred. The main reason for not performing simultaneous bilateral cataract surgery is the fear of vision threatening complications such as endophthalmitis. Also, simultaneous bilateral cataract surgery is not preferred due to chances of post-operative refractive surprise.

However, now a days in the era of evidence based clinical practice, various studies proved the benefits of immediate sequential bilateral cataract surgery such as faster visual rehabilitation, short hospitalization period, time and cost effective for both health care system and patients.⁵⁻⁸ The onset of COVID-19 pandemic has raised the interest among ophthalmic surgeon in considering immediate sequential bilateral cataract surgery to reduce hospital visit of patients.

However, most of the study of immediate sequential bilateral cataract surgery available is from developed country and the western world and no prospective study has been done in developing country such as India. So, this prospective study on immediate sequential bilateral cataract surgery was planned especially in the context of COVID-19 pandemic.

The main aim of this prospective study was to assess the intraoperative and post-operative complications and average number of hospital visits required after performing immediate sequential bilateral cataract surgery in COVID-19 pandemic. Also, post-operative visual acuity and spherical equivalent were studied after performing immediate sequential bilateral cataract surgery in COVID-19 pandemic.

METHODS

This was a prospective longitudinal study done in tertiary care hospital, Regional Institute of Ophthalmology, Rajendra Institute of Medical Sciences, Ranchi, India from July 2020 to September 2020. The study was conducted in accordance with the tenets of the declaration of Helsinki and was cleared by departmental research committee. Thirty-two patients with bilateral senile cataract were examined, counselled and underwent immediate sequential bilateral cataract surgery.

Informed consent was taken from each patient explaining about the benefits and risks of procedure.

The inclusion criteria was bilateral senile cataract with best corrected visual acuity (BCVA) $\leq$ 6/18 in better eye with axial length within range of 21 - 25 mm.

The exclusion criteria were:

- Age < 18 years.
- Uncontrolled diabetes mellitus.
- Pseudoexfoliation syndrome.
- Posterior polar cataract.
- Traumatic and complicated cataract.
- Lid and adnexal disorder e.g. blepharitis, entropion, ectropion.
- Severe dry eye.
- Any other ocular co-morbidity.

Pre-Operative Evaluation

All patients with visually significant bilateral cataract underwent complete ophthalmic evaluation including visual acuity, intraocular pressure (IOP) by applanation tonometer, and detailed slit lamp examination. Types of cataract were noted and grading of cataract was done according to lens opacification classification system III (LOCS III). Fundus examination was done after pupillary dilatation by indirect ophthalmoscopy and 360-degree indentation. Biometry was done by IOL Master 500 (Carl Zeiss Meditec AG, Germany) and IOL power was calculated using SRK-T formula. In cases of mature or total cataract, biometry was done by immersion ultrasound and manual keratometer. Routine investigations e.g. fasting and post prandial blood sugar, routine examination of urine, HIV 1 & 2, HBsAg, Anti HCV Ab were done. Screening and test for COVID-19 (RT-PCR) were done on the basis of symptoms, contact and travel history.

All patients were given topical antibiotic moxifloxacin 0.5 % three times a day and systemic antibiotic Tab ciprofloxacin 500 mg two times a day one day before surgery.

Intraoperative Protocol

All surgeries were done by single experienced surgeon (S.K.) having experience of more than 15 years. Eye with worse visual acuity was operated first.

Povidine iodine 5 % drop was instilled in the conjunctival sac with minimum contact period of 3 minutes. Also 5 % Povidine iodine solution was used to clean the eyelid and adnexa, nose, forehead and cheek. Disposable eye drape was applied to cover the lid margin and keeping the eyelashes away from surgical field.

All surgeries were done under topical anaesthesia (proparacaine 0.5 %) maintaining all aseptic and antiseptic measures. Two side port incisions were made with 15-degree disposable blade six clock hour apart. Anterior chamber was filled with viscoelastics. 2.8 mm superior/temporal clear corneal incision was made with disposable keratome. Continuous curvilinear capsulorhexis of about 5 - 5.5 mm was made with the help of Utrata forceps. Phacoemulsification with direct chop technique was done. Single piece hydrophobic acrylic intraocular lens was

implanted in the capsular bag. Intracameral injection of 0.1 ml moxifloxacin 0.5 % (vigamox/Novartis health care Pvt Ltd. Texas, USA) was given at the end of surgery. Sterile eye pad and bandage was applied after instillation of antibiotic eye drop.

After surgery of one eye, surgeon and assistant would re-scrub and put on new gown and gloves. The second eye was cleaned and prepared in same manner as the first eye. A new set of instruments, new sets of all disposables and phaco tips and tubings were used for second eye surgery. Rest of the surgery was done in similar manners as in the first eye. Second eye also received intracameral antibiotic at the end of surgery and sterile eye pad and bandage was similarly applied.

Post-Operative Management

Pad and bandage were removed after 2 - 4 hours of surgery. All patients were given dark goggles and discharged on same day with post-operative advice. The post-operative medications included topical steroid prednisolone acetate 1 %, 4 - 6 times a day and tapered off in 4 - 6 weeks and topical antibiotic moxifloxacin 0.5 % QID for 15 days. Separate post-operative medications were provided for each eye. Post-operative follow-ups were done on day 1 and day 14. All patients were explained about the ocular hygiene and advised them to report immediately in case if they had any warning symptoms e.g., pain, decreased vision or redness. Post-operative follow-up measures were visual acuity, intra ocular pressure measurement, slit lamp biomicroscopy and fundus examination. All patients completed at least 2 weeks follow up. Visual acuity, refraction, prescription of glasses and dilated funduscopy were done on second follow up on day 14.

Statistical Analysis

All the data were entered on MS Excel sheet and analysed using statistical package for social sciences (SPSS) for Windows software (version 18.0, SPSS Inc., Chicago, IL, USA). The mean age, visual acuity, and axial length were calculated using Microsoft Excel. Snellen visual acuity at 6 m was converted into logarithm of minimum angle of resolution (logMAR) for statistical analysis. Paired t-test was used to compare between pre-operative and post-operative visual acuity. A P - value < 0.05 was considered to be statistically significant.

RESULTS

Sixty four eyes of 32 patients (18 female and 14 male) were included in study. The mean age was 55.89 ± 2.82 years (range 48 - 71 years). No ocular co-morbidity was present in any of 64 eyes in preoperative evaluations. The mean preoperative best corrected visual acuity was 0.64 ± 0.08 log MAR. Types of cataract were nuclear (26.56 %), cortical (14.06 %), posterior subcapsular (18.75 %) and mixed (40.62 %) [Table 1]. The mean axial length was 22.85 ± 0.77 mm (range 21.67 - 24.34 mm) and the mean IOL power

was 20.97 ± 0.70 D (Range 18.50 - 23.00 D). No any intraoperative complication occurred in any eyes and IOL was implanted in the capsular bag in all eyes.

On day one of post-operative, uncorrected visual acuity was $\geq 6/9$ in 46 eyes (71.8 %). AC (anterior chamber) reaction was noted 1+ in 56 eyes (87.50 %), 2 + in 6 eyes (9.3 %), and 3 + in 2 eyes (3.12 %) [SUN Classification]. Mild corneal oedema was noted in 8 eyes (12.5 %). Moderate to severe corneal oedema occurred in 4 eyes (6.25 %) which were managed by topical hypertonic saline. Intraocular pressure was recorded within normal range in 56 eyes (87.50 %) and 8 eyes (12.5 %) had recorded intraocular pressure of range 21 to 26 mm of Hg which subsided on topical antiglaucoma medications. None of the eyes had any sign and symptoms of endophthalmitis or toxic anterior segment syndrome (TASS).

In all patient refraction were done on second follow up at day 14 and glasses were prescribed. Uncorrected visual acuity of $\geq 6/9$ was achieved in 52 eyes (81.25 %). The mean preoperative BCVA which was 0.64 ± 0.08 logMAR improved significantly to 0.03 ± 0.03 at the end of second follow up on day 14 ($P < 0.0001$). The mean post-operative spherical equivalent was -0.22 ± 0.48 D. The target refraction within ± 0.50 D was achieved in 56 eyes (87.50 %) and within ± 1.0 D in all eyes [Table 2]. No any other post-operative complications were noted in any of the eyes.

Total hospital visits were reduced to four per patients for both eye surgery and none of the patients required any additional follow-up.

Parameter	Mean $\pm$ S.D.	Range/Percentage
Age (years)	55.89 ± 2.82	48 - 71
Male	14	43.75 %
Female	18	56.25 %
Axial length (mm)	22.85 ± 0.77	21.67-25
BCVA (LogMAR)	0.64 ± 0.08	
Type of cataract		
Nuclear	17	26.56 %
Cortical	9	14.06 %
Posterior sub capsular	12	18.75 %
Mixed	26	40.62 %

Table 1. Baseline Demographic and Preoperative Data of Patients

Parameter	Snellen Visual Acuity	No. of Eyes (Percentage) (n=64)
UCVA * (day 14)	6 / 6 - 6 / 9	52 (81.25 %)
	< 6 / 9 - 6 / 12	12 (18.75 %)
BCVA ‡ (day 14)	6 / 6 - 6 / 9	60 (94.36 %)
	< 6 / 9 - 6 / 12	4 (5.64 %)
Spherical equivalent	≤ 0.50 D	56 (87.50 %)
	> 0.50 - 1.0 D	8 (12.50 %)
	> 1.0 D	0.00 %

Table 2. Post-Operative Visual Acuity and Spherical Equivalent

*UCVA- Uncorrected visual acuity, ‡ BCVA- best corrected visual acuity

DISCUSSION

Cataract surgery is the most common surgical procedure performed worldwide. With improvement in technology and cataract surgical technique such as accuracy in biometry and IOL power calculations, use of foldable intraocular lenses, and aseptic intraoperative and post-operative management, immediate sequential bilateral cataract surgery may be considered as a preferred practice in eligible cases which is favourable and beneficial for both patient and health care

system. The main aim of our study for performing immediate sequential bilateral cataract surgery during COVID-19 pandemic was to limit contact amongst patients and health care workers for COVID-19 infection as it is highly contagious disease.

In our study we strictly followed the guidelines proposed by All India Ophthalmologic Society about screening and operating cataract patient.^{9,10} Maintaining social distancing of at least one meter while assessing visual acuity and during refraction, use of breath shield while doing slit lamp biomicroscopy examination and avoiding use of direct ophthalmoscope were some of the preventing measures.

Previous studies have reported that most dreaded complication in performing immediate sequential bilateral cataract surgery are increased risk of endophthalmitis, retinal detachment, cystoid macular oedema, irreversible corneal oedema and refractive surprises.¹¹⁻¹⁴

Although bilateral endophthalmitis has been reported in the literature following immediate sequential bilateral cataract surgery.¹²⁻¹⁴ Kashkouli MB et al. reported a case of bilateral endophthalmitis caused by pseudomonas aeruginosa in a 67 years old male after bilateral cataract surgery.¹² Similarly, Puvanachandra N et al. reported a case of bilateral endophthalmitis in 81 year old female after bilateral sequential cataract surgery.¹³ In our study, no patient developed endophthalmitis unilateral or bilateral attributed to the strict antiseptic and aseptic protocol, careful patient selection and skilful surgery. The preventive measures taken intraoperatively included complete segregation of the two eye procedures by using separate sets of gown, drape, instruments and disposables for both eyes. Intraoperatively utmost care was taken to ensure asepsis, minimal tissue injury, leak proof incision. In addition, all eyes received prophylactic intracameral antibiotic (moxifloxacin 0.5 mg) at the end of surgery. Use of intracameral antibiotic had been shown to significantly reduce the risk of endophthalmitis.¹⁵⁻¹⁹ Previous study from Aravind eye hospital, Madurai India showed that use of prophylactic intracameral moxifloxacin significantly reduces the risk of post-operative endophthalmitis.¹⁸

Although bilateral severe corneal oedema after immediate sequential bilateral cataract surgery has been reported in previous study by Wertheim and Burton.²⁰ In their study of 218 eyes who underwent bilateral sequential phacoemulsification, 5 eyes (2.3 %) developed severe bilateral corneal oedema. None of the patient in our series had bilateral corneal oedema and corneal decompensation. Use of direct chop technique and use of dispersive viscoelastic agent intraoperatively (Aurocoat, sodium hyaluronate 20 mg/ml) also helped in endothelial protection. Most of the corneal oedema in our study group was mild to moderate which resolved with medical management.

In our study target refraction was achieved within $\pm 0.50D$ in 87.50 % and $\pm 1.0 D$ in all eyes. These refractive outcomes were comparable with previous studies.^{21,22} Study by Johansson B have reported postoperative refraction within $\pm 0.5D$ in 43 %, $\pm 1.0D$ in 71 % and $\pm 2.0 D$ in 95 % of eyes. Similar refractive outcomes were achieved in study by Ganesh S et al. with 92.05 % eyes with post-operative residual spherical equivalent within $\pm 0.5 D$ and 98.83 %

within $\pm 1.0 D$.²¹ Refractive surprises following immediate sequential bilateral cataract surgery in previous studies were mainly observed in high myopes.²¹ In our study we excluded extremes of axial length (< 21 and > 26 mm), irregular corneal astigmatism (corneal scar, ectatic corneal disease such as keratoconus, pellucid marginal degeneration), history of refractive surgery. Along with this use of optical biometer (IOL Master 500), appropriate IOL formulae resulted in favourable refractive outcomes.²³ Previous studies had shown no refractive differences in long term between immediate sequential bilateral cataract surgery and delayed sequential bilateral cataract surgery (DSBCS).⁶

Cystoid macular oedema is another vision threatening post-operative complication noted in immediate sequential bilateral cataract surgery.^{20,21,24} In study by Wertheim M and Bruton R done on 218 eyes, 3 eyes (1.4 %) developed cystoid macular edema.²⁰ In their series one patient (0.9 %) developed bilateral cystoid macular oedema. In another study done by Ganesh S et al. 0.08 % of eyes developed unilateral cystoid macular edema.²¹ In our study no patient developed unilateral or bilateral cystoid macular oedema. Exclusion of high-risk cases e.g., uncontrolled diabetes, high myopes, any retinal pathology, active uveitis led to prevention of post-operative cystoid macular oedema (CME) and also our study period was too short.

There is no report of bilateral retinal detachment following immediate sequential bilateral cataract surgery till date. In our study we excluded the cases with extremes of axial length, previous history of retinal detachment, or any retinal pathology leading to risk of retinal detachment. Previous studies on immediate sequential bilateral cataract surgery reported with post-operative retinal detachment (0.15 % - 0.2 %) which is comparable with unilateral scenario (0.1 % - 0.7 %).^{21,25} Ramsey et al. have reported 0.2 % of eyes with unilateral retinal detachment after bilateral sequential cataract surgery done in 518 eyes.²⁵

Posterior capsular rent or vitreous loss was the most common intraoperative complication noted in previous studies.^{21,24,26} Posterior capsular rent with or without vitreous loss is known to be associated with high-risk of post-operative endophthalmitis. Previous study on immediate sequential bilateral cataract surgery by Kontkanen and Kaipianen the incidence of posterior capsular rent was 0.14 % which is comparable with delayed sequential bilateral cataract surgery.²⁴ Incidence of posterior capsular rupture in study done by Ganesh S et al. was 0.44 % out of total 2470 eyes who underwent sequential bilateral phacoemulsification.²¹ Study by Arshinoff et al. have reported 1.47 % of eyes with intraoperative posterior capsular rent in sequential bilateral cataract surgery done in 2040 eyes.²⁶ In our study no intraoperative posterior capsular rupture or vitreous loss was noted in any of eyes. This could be because of very less number of patients and also exclusion of high risk cases such as posterior polar cataract, pseudoexfoliation syndrome, traumatic and complicated cataract.

In our study, total hospital visits were reduced to four per patients for both eye surgery and none of the patients required any additional follow-up. Decreased hospital visit helps to limit contact amongst patients and health care

workers for COVID-19 infection. The other benefits for patient and their caregiver were early visual rehabilitation, short hospitalization period, less transport expenses and need for one pair of glasses. But we do not recommend doing immediate sequential bilateral cataract surgery in the camp set up and also in the eye care centre where strict aseptic protocol cannot be followed. Also, immediate sequential bilateral cataract surgery should not be done by less experienced surgeon.

Immediate sequential bilateral cataract surgery may be particularly preferred in paediatrics and non-compliant patients to topical and peribulbar anaesthesia, requiring general anaesthesia owing to better safety and faster visual rehabilitation.

CONCLUSIONS

Immediate sequential bilateral cataract surgery may be considered as preferred practice in selected cases to reduce the risk of cross infection of COVID-19 by short hospitalization and less follow up visits. Careful patient selection, skilful surgery and adherence to surgical guidelines to ensure aseptic and independent surgery of both eyes are key to success.

Limitations

The limitation of our study is less number of patients and short study period. Study with larger number of patients and longer follow-up is required to further validate the findings. Also, we did not study the economic benefit of doing immediate sequential bilateral cataract surgery.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

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