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Cataract surgery in Ibadan, Nigeria: Visual outcome and post-operative refractive error

Fasina O*, Okwudishu IA, Bekibele CO

Department of Ophthalmology, University of Ibadan/University College Hospital, Ibadan, Nigeria.

***Correspondence:** Dr O. Fasina, Department of Ophthalmology, University College Hospital, Ibadan, Nigeria. Tel: +234-803 075 7075; Email: yemifash2000@yahoo.com

Abstract

Background: Cataract is the leading cause of blindness worldwide and can be treated by various surgical techniques with good visual outcome.
Objective: To describe the visual outcome and post-operative refractive status among patients who had cataract surgery in a tertiary centre.
Methods: In a retrospective study, the demographic data, type of cataract, surgical procedure and complications, visual outcome and post-operative refractive status of the treated eye were retrieved from the hospital records of all adult patients who had cataract surgery.
Results: Four hundred and sixty eyes of 456 patients (mean age 61.2 ± 17.3 years, Male: Female = 1.1: 1) had cataract surgery during the study period January 2012 and December 2014. The pre-operative visual acuity was < 3/60 in 415 (90.2%) eyes. All the surgeries were performed under local anaesthesia with 331 (72%) eyes undergoing extracapsular cataract extraction while 129 (28%) had small incision cataract surgery. Visual outcome in those who had a minimum of six weeks follow-up revealed unaided visual acuity of ≥ 6/18 in 185 (56.9%) eyes. Following refraction, 237 (72.9%) eyes had acuity of ≥ 6/18. Post-operative spherical refractive error ranged from -6.75D to +4.50D (mean -1.61 ± 1.41D) while cylindrical error ranged from 0.00DC to 6.00DC (mean 2.33 ± 1.80DC). Pre-existing ocular problems contributing to poor post-operative visual outcome included glaucoma (50; 15.4%), and age-related macular degeneration (10; 3.1%).
Conclusion: Extracapsular cataract extraction gave better visual outcome compared with small incision cataract surgery, but a higher incidence of post-operative cylindrical error was observed.

Keywords: Cataract extraction; Refractive error; Small incision cataract surgery; Visual acuity.

Introduction

Cataract is the most common cause of blindness worldwide, with an expected increase in incidence due to the aging of populations and increased life expectancies in the developed world.[1] In Nigeria, cataract accounts for 45.3% of adults with severe visual impairment and 43% of those who are blind.[2] The treatment for cataract is surgery, and this is commonly performed in Nigeria as

extracapsular cataract extraction (ECCE), manual small incision cataract surgery (SICS) while a few centres offer phacoemulsification. The outcome of cataract surgery can be assessed by the visual outcome or overall improvement in the quality of life of patients after surgery.

A major factor influencing the visual outcome following cataract surgery is post-operative astigmatism, which is a refractive error resulting from various refraction of light in different meridians of the eye thus, surgical techniques that minimise post-operative astigmatism and give the best uncorrected visual acuity are encouraged. [3] Visual outcome following cataract surgery is frequently satisfactory in the developed countries with over 90% of eyes left without co-morbidities and between 77% and 90% of all the eyes achieving acuity of greater than 6/12.[4] However, the Nigeria National Blindness Survey reported that visual outcome after cataract surgery in Nigeria is poor, with only 29.9% achieving good visual outcome (visual acuity >6/18) at presentation and improving to 59.9% with correction.[5] On the other hand, Olawoye *et al.* [6] in a hospital-based study reported 78.8% of patients had good visual outcome with refraction. Although there are studies [6-9] on the visual outcome of patients following cataract extraction in Nigeria, the post-operative refractive status of the operated eyes and thus, the magnitude of residual refractive error to be corrected post-operatively were infrequently reported. Therefore, the present study described the pattern of visual outcome and post-operative refractive error after cataract surgery from a single tertiary health facility in south-west Nigeria.

Methods

The hospital records of all adult patients (aged at least 16 years), who had cataract surgery at the University College Hospital, Ibadan, Nigeria between 1st January 2012 and 31st December 2014, were reviewed. This study followed the principle of the Helsinki Declaration, and it was approved by the Institutional Review Board of the hospital.

The relevant data included the patients' demographics, pre-operative ocular status, surgical details including type and power of the intra-ocular lens (IOL) and complications. Notes were also taken of postoperative data such as the visual outcome and refractive status of the operated eyes. Randomization for the type of surgery was not carried out. The earlier surgeries were extracapsular extraction (ECCE), but this method was subsequently replaced with small incision cataract surgery (SICS), but both procedures included intra-ocular lens implantation. ECCE was performed by Consultant Ophthalmologists and resident doctors while the SICS was performed exclusively by Consultants.

Patients were monitored post-operatively, and the information recorded in the cataract record forms were retrieved and analysed for surgical outcome. The WHO recommendation was applied in categorizing the visual outcome, using the visual acuity, into "good - $\geq$6/18", "borderline - < 6/18 to 6/60", or "poor - < 6/60".

Statistical analysis

Data entry, validation, cleaning and analysis were done using SPSS version 15. Descriptive statistics such as means, medians, ranges and standard deviations were used to present quantitative variables while categorical variables were presented in the form of proportions and percentages. Independent sample t-test was conducted to compare means of two independent groups, and all analyses were carried out at 5% level of statistical significance.

Results

Four hundred and sixty eyes of 456 adult patients were operated during the study period. The mean age of the patients was 61.2 ± 17.3 years, (range 16 to 98 years) with 240 (52.2%) being males (Male: Female = 1.1: 1). The right eye was operated on in 237 (52.0%) patients, while four (0.9%) patients had bilateral non-simultaneous surgery. The presenting visual acuity was < 3/60 in 415 (90.2%) eyes, < 6/60 to3/60 in 30 (6.5%) and < 6/18-6/60 in 15 (3.3%) eyes.

All the surgeries were performed under local anaesthesia with 306 (66.5%) eyes [comprising 177 (38.5%) eyes treated with ECCE and 129 (28.0%) eyes treated with SICS] handled by Consultants. On the other hand, 154 (33.5%) eyes [all ECCE] were performed by residents. Altogether, 331 (72%) eyes had ECCE while 129 (28%) had SICS; no patient had phacoemulsification.

Four hundred and fifty (97.8%) eyes had primary Intra-ocular Lens (IOL) inserted, with a mean power of +21.34 ± 2.05D. Pre-operative biometry was performed in 394 (87.6%) eyes, with an average K1 reading of 42.71 ± 1.98 (range of 34.25 to 50.25). The average K2 reading was 44.00 ± 1.89 (range of 39.25 to 57.00) while the mean axial length was 22.97 ± 1.12 mm (range of 18.23 to 28.98 mm). The mean calculated IOL power to give post-operative emmetropia was +21.78 ± 2.45D (range: +12.50 to +36.50D), and patients received IOLs within 0.5D of their calculated IOL power. The remaining 56 (12.4%) eyes operated without biometry were given IOLs based on refraction of the second eye (where possible), or an average power of +21.00D was inserted.

A minimum follow-up of 6 weeks was achieved in 325 (70.7%) eyes which were analyzed for visual outcome. Unaided visual acuity of ≥ 6/18 was achieved in 185 (56.9%) eyes [ECCE – 118 (53.4%) eyes, SICS - 67 (64.4%) eyes) and < 6/18 to 6/60 in 85 (26.2%) eyes [ECCE – 62 (28%) eyes, SICS – 23 (22.1%) eyes]. Following refraction, visual acuity of ≥ 6/18 was achieved in 237 (72.9%) eyes [ECCE - 157 (71%) eyes, SICS – 80 (76.9% eyes)] and < 6/18-6/60 in 52 (16.0%) eyes [ECCE – 38 (17.2%) eyes, SICS – 14 (13.5%) eyes] as shown in Table I.

Post-operative spherical error in all eyes ranged from -6.75DS to +4.50DS with an average of -1.61 ± 1.41DS (ECCE = -1.75D, interquartile range 1.75D; SICS = -1.38D, interquartile range 2.13). The cylindrical error ranged from 0.00D to 6.00D with a mean of 2.85D ± 1.84D for ECCE, and from 0.00D to 4.50D with a mean of 1.23D ± 1.11D for SICS ($p < 0.001$). The operative complications include intra-operative events such as posterior capsule rent (48 eyes; 10.4%) and vitreous loss (40 eyes;

8.7%). The post-operative events included severe inflammation (17 eyes; 3.7%) and posterior capsular opacity (12 eyes; 2.6%). Three hundred and forty eyes (73.9%) had no complications as depicted in Table II.

Pre-existing ocular problems contributing to poor visual outcome (< 6/18) in the 325 patients included glaucoma in 50 (15.4%) eyes and age-related macular degeneration in 10 (3.1%) eyes (Table III).

Table I: Pattern of post-operative visual acuity in 325 eyes

	Unaided Visual Acuity			*Post-refraction Visual Acuity*		
Visual Acuity Category	ECCE N (%)	SICS N (%)	Total	ECCE N (%)	SICS N (%)	Total
≥ 6/18	118 (53.4)	67 (64.4)	185	157 (71.0)	80 (76.9)	237
< 6/18 – 6/60	62 (28.0)	23 (22.1)	85	38 (17.2)	14 (13.5)	52
< 6/60 – 3/60	40 (18.1)	14 (13.5)	54	25 (11.3)	10 (9.6)	35
< 3/60	1 (0.5)	0 (0.0)	1	1 (0.5)	0 (0.0)	1
Total	221 (100.0)	104 (100.0)	325	221 (100.0)	104 (100.0)	325

ECCE = extracapsular cataract extraction, SICS = small incision cataract surgery

Table II: Operative complications among 460 operated eyes*

Complications	Frequency	Percentage
Intra-operative		
Posterior capsule rent	48	10.4
Vitreous loss	40	8.7
Iridodialysis	5	1.1
Descemet stripping	1	0.2
Total	94	20.4
Post-operative		
Severe inflammation/fibrinous uveitis	17	3.7
Posterior capsule opacity	12	2.6
Elevated intra-ocular pressure	8	1.7
Striate keratopathy	5	1.1
Persistent epithelial defect/Bullous Keratopathy	5	1.1
Wound gape	4	0.9
Endophthalmitis	3	0.7
Decentered intra-ocular lens	2	0.4
Total	56	12.2

***Some eyes had more than one complication**

Table III: Frequencies of pre-existing ocular pathologies in 325 eyes*

Pathologies	*Frequency*	*Percentage*
Glaucoma	50	15.4
ARMD	10	3.1
Old RD	7	2.2
Chorioretinal scar	6	1.8
Diabetic maculopathy	5	1.5
Macular hole	3	0.9

***More than one condition identified in some cases**
ARMD= Age-related macular degeneration, RD= Retinal detachment

Discussion

The outcome of cataract surgery can be assessed by several parameters including the visual outcome,[10] improvement in the quality of life [11] function of the patient [12] and economic rehabilitation.[13] All the other parameters, apart from visual outcome, require larger, time-consuming, more expensive studies to assess [14] hence, most reports [5,6,9,14,15] had focused only on the post-operative visual outcome among patients with cataract.

The mean age of the patients (61.2 ± 17.3 years) in the present study was comparable with the findings in previous studies, [6-8, 16] thus, conforming to the mean age at presentation of patients with age-related cataract in the country. Similar to previous reports [6, 8, 17, 18] from the same study centre and other African population, the males with cataract slightly outnumbered the female counterparts. The females had been noted to access health services, including cataract surgery, at a lower rate compared to males. [19]

Similar to studies in other parts of Nigeria, [6-8, 20] the pre-operative acuity was less than 3/60 in about 90% of our patients, suggesting acceptance of surgical intervention for cataract when their daily living activities became significantly hampered by the reduced vision.

A greater number of the patients in the present study had ECCE compared to SICS while phacoemulsification was not performed. This observation conformed to the general pattern of cataract surgery in many developing countries [6, 21] during the study period. Although phacoemulsification gives better visual outcome with less post-operative astigmatism, it is more expensive, has steeper learning curve and it is less suitable for hypermature cataracts when compared with ECCE and SICS. [22]

About 57% of all the eyes operated on, had good visual outcome (unaided visual acuity of ≥ 6/18) at the sixth-week post-operative visit and this yield improved to about 72% with refraction. This improvement was slightly lower than the

rates reported in a previous study by Olawoye *et al*. [6] However, patients with pre-existing pathologies for poor visual outcome were excluded in their study, possibly accounting for the difference. The findings in the present study were better than the report from the National Blindness Survey [5] (presenting VA 29.9%, corrected VA 59.9%). The latter was a community-based survey, and many participants had undergone cataract surgery some years before the study with the possibility of long-term post-operative complications contributing to their poor vision. The visual outcome in the present study was worse than the outcome reported from other parts of Africa [23-25] and developed countries [26-28] and far less than the WHO recommendation.[29]

The pre-existing co-morbidities, non-availability of pre-operative biometry in some cases, and the perioperative complications in some patients could have contributed to the poor visual outcome in this study. It has been noted that pre-existing co-morbidity is the single most important reason for poor post-operative visual acuity among cataract patients.[21,30] Worthy of note is that most of our patients had improved visual acuity post-operatively as over 90% were in the blindness category pre-operatively while the only patient still blind post-operatively had a pre-existing macular hole.

Comparing the outcome of the two surgical techniques, a higher proportion of patients who had SICS had good outcome in comparison with ECCE (64.4% versus 53.4%) using the unaided visual acuity. However, this difference reduced following refraction (76.9% versus 71.0%). The higher post-operative astigmatic error in the patients who had ECCE could have accounted for this observation (mean cylindrical correction, ECCE = 2.85D ± 1.84D, SICS = 1.23D ± 1.11D). Studies [3,15,23,31] had shown that ECCE induces greater post-operative astigmatism than SICS or phacoemulsification. The visual outcome of cataract surgery is greatly dependent on the amount of post-operative astigmatism; for ECCE, this is determined by the surgical wound and suturing technique. [3] Therefore, greater details need to be given to good wound construction and suturing during ECCE procedure.

The commonest intra-operative complication in this study was posterior capsule rent in about 10.4% eyes, similar to previous reports.[6,23,32] The higher prevalence of posterior capsule rent among Africans compared to Caucasians had been attributed, in part to the type of cataract (dense and hypermature cataracts among Africans), experience of the surgeon, and the availability of necessary equipment.[23] Other complications included vitreous loss consequent upon posterior capsule rent, iridodialysis and descemet stripping. Post-operatively, about 4% eyes developed severe inflammation. This complication is usual among Africans where such severe inflammatory reaction have been attributed to the dark pigmentation of irides. [23,33,34] However, the inflammatory reactions resolved with frequent topical and occasionally, systemic steroids. There were three (0.7%) cases of endophthalmitis in the present study, slightly higher than observed in previous studies in the country. Adepoju *et al*., [8] Nwosu and co-worker, [16] and Agbeja [33]

recorded no case of endophthalmitis in their series of 116 eyes, 41 eyes and 51 eyes respectively, while Olawoye *et al*. [6] recorded a single case out of 165 eyes. The fewer number of patients studied by these authors could have accounted for this difference.

The retrospective design of this study is acknowledged as a limitation as many patients were lost to follow-up and were not available for post-operative visual outcome assessment. This shortage of data also made adequate assessment of long-term post-operative complications in the cohort difficult, just as some early post-operative complications might not have been recorded. The same surgeon did not perform all the surgeries, and this technical issue might have contributed to the refractive outcome in some of the patients.

Conclusion

ECCE was associated with better visual outcome for cataract surgery compared with SICS. However, it was also associated with a higher post-operative cylindrical error. Efforts should be made to reduce post-operative astigmatism in patients undergoing ECCE, but SICS should be encouraged for cataract extraction in our region.

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