■ ***Original article***

Outcomes of high volume cataract surgeries at a Lions Sight First Eye Hospital in Kenya

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Abstract

Background: High volume cataract surgery is practised in many eye centres.

Objective: To investigate whether routine high volume cataract surgery can be performed without compromising the quality of surgery.

Materials and methods: A retrospective interventional study was carried out at a high volume eye care centre including 368 subjects with cataract operated within 5 randomly selected theatres. Suture-less manual small incision cataract surgery (SICS) with PCIOL was performed in all except nine cases.

Results: Of the total, 81.8 % of the patients achieved post-operative uncorrected visual acuity (UCVA) of 6/18 and better by the 4th week. Only 0.3 % had a posterior capsule tear without vitreous loss, 0.5 % posterior capsule tear with vitreous loss and 0.8 % had hyphema. Post-operative examination done at the camp site after Day 30 did not reveal anterior segment complications in any of the patients. Fifteen patients were found to have posterior capsular opacification and had the UCVA between 6/24 – 6/60. Only 12.9 % of the patients had first post operative day complications, which included transient corneal oedema (3.0 %) with less than 10 Descemet folds, transient corneal edema with > 10 Descemet folds (3.6 %), transient corneal edema (4.3 %), shallow anterior chamber (0.3 %) and others like iritis and peaked pupil. Multiple logistic regression analysis showed no significant association between risk factors like age, sex, laterality, pre-operative visual acuity, surgeon, time of surgery and post-operative UCVA.

Conclusion: The study results show that high quality cataract surgery can be attained in a high volume setting.

Key words: small-incision cataract surgery, surgical outcome, blindness

Introduction

Of the total estimated 38 million blind persons (Visual acuity <3/60) in the world, seven million are in Africa. Estimated reports say half of these are blind due to cataract (Jose, 1997; Minnasian et al 1990). This number is likely to increase substantially, as approximately 600,000 Africans become blind from cataract each year. Despite the enormity of the problem, few cataract operations are performed in Africa. The cataract surgery rate (CSR), a measure of the volume of cataract surgery performed in a population, is about 500 per million per year in Africa. To tackle cataract blindness, the vision 2020 initiative aims to increase the CSR in Africa to about 20,000 per million per year (Dandona et al 200). An apparent increase in infrastructure, human resources and streamlining cataract surgical services is needed to increase the performance. Natchier et al (1994) suggested that productivity per individual surgeon/ unit should also be increased through a high volume and high quality cataract surgery approach to solve the problem. More recently WHO initiatives have

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called for a dramatic increase in surgical volumes worldwide (Thylefors, 1998), but as it is becoming more evident that the outcomes of cataract surgery are not always good, more attention needs to be given to this aspect (Foster, 1999). In order to investigate whether high volume surgeries can be performed on routine basis without compromising quality, a retrospective review of surgical result and complications in 368 surgeries performed by two surgeons on 5 high-volume surgery days (5 operating hours /day) in a hospital setting in Nairobi was conducted.

Patients and methods

A retrospective analysis of patient records of 368 eyes of 368 patients operated by two high-volume surgeons was performed (Surgeons who had track record of consistently performing more than 60 surgeries per day in 6 hours operating time, at Lions Sight First Eye Hospital, were defined as ''high volume surgeons''). For sample collection, 5 days were picked randomly from each study surgeon's high-volume surgery days. The intraoperative complications and immediate complications were recorded using Oxford Cataract Treatment Evaluation Team (OCTET) definitions (Oxford Cataract, 1986). Post-operative uncorrected visual acuity (UCVA), visual acuity and complications at the first follow up visit after 30 days were noted. Levels of visual acuity (VA) were categorized using WHO guidelines, that is, a good outcome defined as 6/6-6/18, an intermediate outcome as 6/24-6/60 and a poor outcome as < 6/60.

Possible risk factors that might affect the outcomes like age, sex, eye, and pre-operative visual acuity were also recorded. Further chronological quarters were used as a measure to denote the time of surgery.

All patients who underwent surgery were screened at various community-based screening camps, transported to and operated at the base hospital. At the hospital, A scan and B scan and keratometry were done by qualified ophthalmic assistants. Patients were operated on the following day. Post-operative ward round was done by the operating surgeons. The patients were counselled at discharge about the date, time and venue of the follow-up examination. Post-operative VA and complication of the 1st day were recorded on the case sheet in the hospital. Post-operative VA and complications of the 30th day were documented by ophthalmic clinical officers at the campsite where the patient was first seen after the surgery. All of the patients operated by the study surgeons on these randomly selected days were included for analysis. Suture-less manual small-incision cataract surgery (SICS) with PCIOL was performed in all except nine cases, where extra-capsular cataract extraction with Posterior Chamber Intraocular Lens with suture (ECCE + PC-IOL) was done on one patient and Intracapsular Cataract Extraction (ICCE) was done on 8 patients with subluxated lens. Patient flow in the operating room followed a system. Normal cases (cataracts with good pupillary dilatation and with no coexistent eye pathology) were operated first, since complicated cases required more time and effort.

Statistics

Data on outcomes of 368 cases were analysed using SPSS 12.0 version. Association of risk factors with outcomes were assessed by regression analysis.

Results

A total of 368 eyes of 368 operated patients were included for the study. The average time per surgery was 4.25 minutes. The mean age of the patients operated was 67.13 ± 10.11. Eighty patients were between 41- 60 years, two hundred and thirty-five between 61 - 80 years, thirty-eight above 80 years and fifteen patients were 40 years and below. 54.6 % were females and 45.4 % were males. 45.1 % had surgery in their right eye and 54.9 % in the left eye. 85.6 % had a pre-operative uncorrected visual acuity between PL and 5/60, 14.2 % between 6/60 - 6/24 and 0.3 % had 6/18 (Graph-1).Table 1 presents the number of surgeries done by two surgeons on each randomly selected day with no statistically significant difference (p = 0.874).

Post-operative visual acuity

Post-operatively, UCVA of the 1st day and the 30th day were measured by Snellens chart. All the patients were followed up on the 30th day. Of the 368 patients, UCVA of the 1st post-operative day was 6/6-6/18 for 66.8 %, 6/24 to 6/60 in 27.9 %, and lesser than 6/60 in 5.2 %. On the 30th day, 81.8% of the patients achieved UCVA of 6/6 to 6/18, 58 (15.7 %) patients 6/24 - 6/60 and 2.4 %, patients had less than 6/60. Table 2 presents the distribution of patients according to the post-operative UCVA on the 1st day and the

Table 1
Distribution of surgeries according to surgeons and random days

Surgeon	Random day					Total
	Day 1	Day 2	Day 3	Day 4	Day 5	
Surgeon I	45	40	42	45	42	214 (58.5 %)
Surgeon II	30	33	30	32	29	154 (41.8 %)
Total	**75**	**73**	**72**	**77**	**70**	**368 (100 %)**

Table 2
Distribution of patients with postoperative VA

VA	No. of patients (%) 1st day	No. of patients (%) 30th day
< 6/60 (Poor)	**19 (5.2 %)**	**9 (5.2%)**
HM	7 (1.9 %)	3 (0.8%)
1/60	2 (0.5 %)	3 (0.8%)
2/60	0 (0 %)	1 (0.3%)
3/60	10 (2.7 %)	2 (0.6%)
6/24 – 6/60 (Intermediate)	**103 (27.9 %)**	**58 (15.7%)**
6/60	20 (5.4 %)	11 (3.0%)
6/36	31 (8.4 %)	16 (4.3%)
6/24	52 (14.1 %)	31 (8.4%)
> 6/18 (Good)	**246 (66.8 %)**	**301(81.8 %)**
6/18	85 (23.1 %)	75 (20.4 %)
6/12	74 (20.1 %)	103 (28.0 %)
6/9	60 (16.3 %)	91 (24.7 %)
6/6	27 (7.3 %)	31 (8.4 %)

Table 3
Potential risk factors for post-operative VA - 1st day

Risk factor	≥ 6/18 N = 246	<6/18 N = 122	Odds Ratio (95% CI)	P value
Sex				
Male	107(29.1 %)	60 (16.3 %)	1.257 (0.813-1.943)	
Female	139 (37.8 %)	62(16.8 %)	1.0	0.302
Age				
≤ 60	62 (16.0 %)	33(9.0 %)	1.10(0.673-1.800)	
> 60	184 (50.0 %)	89(24.2 %)	1.0	0.703
Eye				
Right	103 (28.0 %)	63(17.1 %)	1.482 (0958-2.293)	
Left	143 (38.9 %)	59(16.0 %)	1.0	0.076
Pre op VA				
≥ 6/60	35 (9.5 %)	18 (4.9 %)	1.0	
< 6/60	211(57.3%)	104 (28.3 %)	0.958(0.518-1.773)	0.892
Surgeon				
Surgeon 1	132 (35.9 %)	82(22.3 %)	1.77(0.1125-0.2786)	
Surgeon 2	114 (31.0 %)	40(10.9 %)	1.0	0.013
Time of surgery				
1st	65 (32.2 %)	41(21.6 %)	1.0	
2nd	56 (29.6 %)	27(14.3 %)	0.764(0.716-2.391)	0.382
3rd	63 (32.2 %)	21(11.1 %)	0.528(1.008-3.552)	0.046
4th	62 (30.8 %)	33 (16.4 %)	0.600(0.667-2.107)	0.563

Table 4
Potential risk factors for postoperative visual acuity on the 30th day

Risk factor	≥ 6/18 N = 301	<6/18 N = 67	Odds Ratio (95% CI)	P value
Sex				
Male	24(6.5 %)	143 (39.9 %)	0.617 (0.356-1.057)	
Female	43(11.7 %)	158 (42.9 %)	1.0	0.820
Age				
≤ 60	82 (22.3 %)	13 (3.5 %)	0.643 (0.333-1.240)	
> 60	219 (59.5 %)	54 (14.7 %)	1.0	0.185
Eye				
Right	132 (35.9 %)	34(9.2 %)		
Left	169 (45.9 %)	33 (9.0 %)	1.319 (0.776-2.242)	
			1.0	0.305
Pre op VA				
≥ 6/60	39 (10.6 %)	14 (3.8 %)	1.0	
< 6/60	262 (71.2 %)	53 (14.4 %)	0.564 (0.286-1.110)	0.094
Surgeon				
Surgeon I	172(46.7 %)	42 (11.4 %)	1.260 (0.730-2.173)	
Surgeon II	129(35.1 %)	25 (6.8 %)	1.0	0.405
Time of surgery				
1st	88 (43.8 %)	18 (9.2 %)	1.0	
2nd	67 (35.4 %)	16 (8.5 %)	1.116 (0.407-1.804)	0.683
3rd	70 (36.8 %)	14 (7.4 %)	0.977 (0.476-2.199)	0.954
4th	76 (37.8 %)	19 (9.5 %)	1.222 (0.401-1.671)	0.581

30th day. On multiple logistic regression analysis, there was no statistically significant association between risk factors like age, sex, eye, pre-operative visual acuity, surgeon, time of surgery and post-operative UCVA (Table 3). In case of UCVA on the 30th day, there was statistically significant association with the sex, eye and the surgeon (Table 4).

Intra-operative complications

Of the 368 patients, only 6 (1.6 %) patients had intraoperative complications (Table 5). Among them, 1 (0.3 %) patient had a posterior capsule (PC) tear without vitreous loss, 2 (0.5 %) patients had PC tear with vitreous loss and 3 (0.8 %) patients had iris bleed. Further, on multiple logistic regressions, none of the risk factors had an association with intraoperative complications (Table 6).

Immediate post-operative complications

Of the 368 eyes, 325 (88.1 %) did not have any immediate post-operative complications at the 1st day follow-up examination. Forty-three eyes had post-operative complications (12.9 %, Table. 7). Transient corneal edema with Descements membrane folds < 10 were found in 10 (3.0 %) cases and transient corneal edema with Descements membrane folds > 10 were found in 12 (3.6 %) eyes. Other complications were transient corneal edema in 16 (4.3 %) cases, shallow anterior chamber in 1 (0.3 %), mild iritis in 2 (0.5 %) and peaked pupil in 2 (0.5 %) cases. All the complications (12.9 %) according to the OCTET grading were Grade I complications (Table 7).

On multiple logistic regressions significant association was found with age and surgeons. Patients above 60 years were one half times more likely to have post-operative complications than those below 60 years. Surgeon I had 0.77 times risk to have post-operative complications than surgeon II (Table 8).

Follow up post-operative complications

Post-operative examination done at the camp site with a torch did not reveal any anterior segment complications in 368 patients. The UCVA was used as the surrogate success. Posterior segment was examined using direct ophthalmoscope whenever the patient had UCVA < 6/60. One aphakic patient was found to have cystoid macular edema. Fifteen patients were found to have PCO and had UCVA between 6/24 - 6/60.

Table 5
Distribution of intra-operative complications

Complication	OCTET Grading*	No. (%)
PC tear without vitreous loss	II	1 (0.3 %)
Iris bleed	I	3 (0.8 %)
PC tear with vitreous loss	III	2 (0.5 %)
Total		**6 (1.6%)**
Total surgeries		**368 (100%)**

*OCTET Grading
Grade I : Trivial complications that may have needed medical therapy, but were not likely to result in a marked drop in visual acuity
Grade II : Intermediate complications that needed medical therapy and would have resulted in a marked drop in visual acuity
Grade III : Serious complications that would have needed immediate medical or surgical intervention to prevent gross visual loss

Table 7
Distribution of postoperative complications

Complication	OCTET Grading*	Frequency
Transient corneal edema, Descements membrane folds < 10	I	10 (3.0 %)
Transient corneal edema	I	16 (4.8 %)
Peaked pupil	I	2 (0.6 %)
Transient corneal edema, Descements membrane folds >10	I	12 (3.6 %)
Shallow anterior chamber	I	1 (0.3 %)
Mild iritis	I	2 (0.6 %)
Total		**43 (12.9 %)**
Total surgeries		**368 (100 %)**

Table 6
Potential risk factors for intra-operative complications

Risk factor	Without complication n = 362	With complication n = 6	Odds ratio (95 % CI)	p-value
Sex				
Male	163(44.3 %)	4 (1.08 %)	0.162 (0.019-1.401)	
Female	199 (54.1 %)	2 (0.54 %)	1.0	0.060
Age				
≤ 60	93 (25.3 %)	2 (0.54 %)	0.691 (0.128-3.837)	
> 60	269(73.1 %)	4 (1.08 %)	1.0	0.671
Eye				
Right	163 (43.8 %)	3 (0.8 %)	0.160 (0.019-1.385)	
Left	199 (54.1 %)	3 (0.8 %)	1.0	0.058
Pre op VA				
≥ 6/60	20 (5.4 %)	1 (0.3 %)	1.0	
< 6/60	342(92.9 %)	5 (1.4 %)	3.420 (0.381-30.677)	0.243
Surgeon				
Surgeon I	212 (57.8 %)	2 (0.8 %)	2.827 (0.511-15.632)	
Surgeon II	150 (40.8 %)	4 (1.4 %)	1.0	0.214
Time of surgery				
1st	104 (28.0 %)	2 (0.5 %)	1.0	
2nd	83 (22.6 %)	1 (0.3 %)	0.634 (0.057-7.116)	0.710
3rd	82 (23.3 %)	2 (0.5 %)	0.627 (0.056-7.030)	0.702
4th	94 (25.3 %)	1 (0.3 %)	1.118 (0.154-8.098)	0.912

Table 8
Potential risk factors for post-operative complications

Risk factor	Without complication N = 325	With complication N = 43	Odds Ratio (95% CI)	P value
Sex				
Male	144(39.13 %)	23 (6.25 %)	0.950 (0.502-1.797)	
Female	181 (49.2 %)	20 (5.43 %)	1.0	0.874
Age				
≤ 60	84(22.82 %)	11 (3.0 %)	1.169 (0.552-2.473)	
> 60	241(65.5 %)	32 (8.7 %)	1.0	0.683
Eye				
Right	147 (39.94 %)	19 (5.16%)		
Left	178 (48.36 %)	24 (6.52%)	1.446 (0.751-2.787)	
			1.0	0.268
Pre op VA				
≥ 6/60	20 (5.4 %)	1 (0.3 %)	1.0	
< 6/60	305 (82.8 %)	42 (11.4 %)	0.363 (0.047-2.776)	0.309
Surgeon				
Surgeon 1	194 (52.7 %)	20 (5.4 %)	1.239 (0.654-2.347)	
Surgeon 2	131 (35.6 %)	23 (6.25 %)	1.0	0.509
Time of Surgery				
1st	95 (25.8 %)	11(3.0 %)	1.0	
2nd	72 (19.5 %)	11(3.0 %)	1.948 (0.417-4.642)	0.128
3rd	74 (20.10 %)	10 (2.7 %)	1.152 (0.446-2.978)	0.770
4th	85 (23.1 %)	10 (2.7 %)	1.129 (0.448-2.845)	0.796

Discussion

In the present study, on the 30th day, 301 (81.8 %) achieved UCVA of 6/18 and better, 58 (15.7 %) patients achieved UCVA between 6/24 - 6/60, while 9 (5.2 %) patients had UCVA of less than 6/60. Pre-existing ocular pathology in patients with poor vision is the most attributable reason, some of which were optic atrophy (4 patients), age related macular degeneration (3 patients), macular hole (1 patient), macular scar (2 patients) and glaucoma (1 patient). One patient with aphakia had poor vision which could be attributed to surgery.

The UCVA result in our study compares favourably with the results reported from similar studies on manual SICS (Natchier et al 2000). The results are also comparable with standard ECCE and phacoemulsification surgeries (Riley et al 2002).

Taking UCVA as a parameter, only 58 patients had intermediate and 9 had poor visual acuity. This may probably represent the real-life situation since most of the patients will not be using corrective spectacles. Compared with our pre-operative visual acuity status of 85.6 % having poor vision between PL and 5/60), the visual outcomes were a marked improvement. We were not able to do the best refractive correction for the patients. This would have brought out the residual refractive error as a major determinant of a successful outcome. This fact has been brought out in other studies.

Intra-operative complications were present in 6 (1.6 %) of the study patients, which is similar or a little less than other manual SICS studies (Natchier et al 2000). The intra-operative complications found in our study were managed as follows. In one patient who

had a PC tear without vitreous loss, the IOL was implanted in the ciliary sulcus. In two patients who had a posterior capsule tear with vitreous loss, anterior vitrectomy was done and intraocular lens implanted in the ciliary sulcus for one patient. Intraocular lens was not implanted in the other patient.

The post-operative complications of manual SICS in our study compared to other studies of ECCE (Natchier et al 2000, Riley et al 2002) are much lower-graded and were managed as follows. Mild iritis was managed by frequent steroids (1 % prednisolone acetate) drops to control inflammation. The patients with peaked pupil were managed with pilocarpine 0.5 % eye drops. The rest of the complications resolved with routine post-operative medical therapy without affecting the outcome. The patient who had shallow anterior chamber was taken back to theatre to reform the anterior chamber by putting one scleral suture and an air bubble.

Our results showed low rates of complications. The variability of the surgeons has also been reported elsewhere and probably is not avoidable (Natchier, 1998). The present study did not exclude any patients including those with ocular co-morbidity. This was adopted to demonstrate what happens on a routine basis rather than to present the efficacy of the procedure. We feel that the immediate post-operative complications were very low in the present study, with only grade I or grade II complications. The average time per surgery was around 4.25 minutes. Other IOL studies have reported surgical time of 12-16 cases per hour, which is around 4.4 minutes.

One of the limitations of the study was that we were not able to record the exact time duration for each surgery since the study was done retrospectively. This leaves a chance of bias due to the association of complications with increased length of time of surgery.

Traditionally, the most time-consuming part in ECCE+ PC IOL is the suturing. 99.7 % of the surgeries in our study done were done as a sutureless procedure. We infer that variation in time would not be significant. Even if there were association, we assume that this would not be clinically significant since the complication rate in our study was very low and the outcomes were good. Another limitation of our study is the comparison of the high-volume days with low-volume surgery days. On a prospective basis, we could have compared outcomes with patients operated by the same surgeons on low-volume days. However, the analysis was not to demonstrate the outcomes of a prospective research setting but to show the outcomes on a day-to-day basis.

In addition, the pre-operative astigmatism and post-operative astigmatism decay could not be recorded on a routine basis. Other complications like difference in endothelial cell count also could not be recorded. These are the limitations of the study. The results of high-volume surgery may not be the actual representation of all developing countries and generalization of the results needs to be exercised with caution.

The study results show that high-quality cataract surgery (88.56%) can be attained in a high volume setting. This is dependent on the choice of the surgical technique, standardized training of the surgeons and paramedical personnel and overall organisational structure that supports the high-volume patient flow. This has significant implications to developing countries because the principal solution to the backlog of the cataract blind is performing cataract operations on a large scale. Our study highlights the need to establish systems to monitor the quality of cataract surgery. These results are of significant relevance for World Health Organisation's ''Vision 2020'' Program (Thylefors, 1998).

Conclusion

The study results show that high quality cataract surgery can be attained in a high volume setting.

References

R. Jose (1997). National Programme for control of blindness. Indian J Community Health; 3:5-9.

Minnasian D, Mehra V (1990). Projections from the first epidemiological study of incidence of cataract blindness in India. Br J Ophthalmol; 74(6).

Dandona L, Dandona R, Anand R et al (2003) .Outcome and number of cataract surgeries in India: policy issues for blindness control. Clin experiment Ophthalmol; 31: 23-31.

Natchier G, Robin AL, Ravilla D et al (1994). attacking the backlog of India's curable blind. Arch Ophthalmol; 112: 987-993.

Thylefors B (1998). A Global initiative for the elimination of avoidable blindness [editorial].Am J Ophthalmol; 125:90-9.

Foster A (1999). Cataract-A global perspective: output, outcome and out lay. Eye (Lond); 13 (Pt 3b):449-53.

Oxford Cataract Treatment Evaluation Team (1986). Use of grading system in evaluation complications in a randomised controlled trial.Br J Ophthalmol; 70:411-14.

Natchier G, Dabraalkar T (2003). Manual Small incision suture less cataract surgery- An alternative technique to instrumental Phacoemulsification. Operative Techniques Cataract Refract Surg; 3:161-70.

Riley AF, Malik TY, Grupcheva CN et al (2002). The Auckland Cataract study: co-morbidity, surgical techniques and clinical outcomes in public hospital service.Br J Ophthalmol; 86:185-190.

Natchier GN, Thulasiraj RD, Negrel D et al (1998). The Madurai intraocular lens study I: a randomised clinical trial comparing complications and vision outcomes of intracapsular cataract extraction and extracapsular cataract extraction with posterior chamber intraocular lens. Am J Ophthalmol; 125:1-13.

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