

Immediate Sequential Bilateral Cataract Surgery in Office Procedures at a Single Center: Retrospective Analysis of 560 Eyes of 280 Patients Undergoing Bilateral Cataract Surgery at a Single Site

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Abstract

Objective: Retrospective safety study of events and best-corrected visual outcomes after simultaneous bilateral cataract surgery (SBCS).

Participants: patients undergoing refractive lens exchange or planned routine cataract surgery at a single site from May 2015 to February 2018.

Methods: The medical records of 280 consecutive SBCS patients were analyzed included patient factors, specifically subsets of diabetics, hypertensive and current or past history of alpha adrenergic blockers.

Main Outcome Measures: average change in BCVA, safety

Results: 560 eyes of 280 patients underwent uncomplicated cataract surgery by two high volume cataract surgeons. The patient population was predominantly with Caucasian with a slight predominance of females. The average age of the patient was 57.6 years with a range of 18-86. 10% of eyes had diabetes although none had proliferative changes before or after surgery. Only 1% of patients were current or previous alpha adrenergic blocker users. 11% of eyes were affected by the use of blood thinners with less than 1% of eyes affected by two or more concurrent blood thinners. Fifty percent of lenses placed were multifocal, 24.6% monofocal, 21.7% toric and the small remainder evenly split between multifocal torics and crystalens. Average axial lengths were 24 mm with ranges of 18-30.5 mm. The predominant co-morbidities included hypertension. Hypercholesterolemia, thyroid disorders, depression or anxiety, allergies, osteoarthritis and gerd. The predominant ocular co-morbidities included open angle glaucoma, dry macular degeneration and dry eye. There were no intraoperative complications and less than 1% of patients experienced postoperative CME. One patient was transferred to emergency room for uncontrolled migraine from the preoperative area although she ultimately successfully underwent SBSC. No cases of endophthalmitis occurred

Conclusions: Bilateral same day surgery can be safe with significant cost and time savings for surgeons, ASCs and patients with no serious adverse events and no increased complication risk, specifically for endophthalmitis.

Keywords: Phacoemulsification; Immediate bilateral sequential cataract surgery; Cataract; Cataract surgery; Healthcare economics

Introduction

Cataract remains the leading cause of treatable blindness worldwide [1]. The efficient delivery of healthcare continues to present challenges as the number of cataract surgeries rising with an aging US population and declining numbers of physicians and reimbursements for cataract surgeries [2]. These factors are in addition to the increased likelihood that those of cataract age are more likely than ever to continue in the workforce for some time after cataract surgery and the now recognized miniscule risk of endophthalmitis with current techniques, technology and medications [3,4]. This combination of factors necessitates the re-examination of current healthcare delivery schemes, many of which were created twenty or more years ago, prior to the advent of small

incision surgery, more advanced and accurate lens prediction nomograms and measurements and the widespread acceptance of bilateral same day LASIK surgery [5]. Many current cataract patients have previously experienced LASIK surgery and have expectations that cataract surgery will provide a similar experience.

The purpose of this review was to retrospectively examine the characteristics, outcomes and safety of the performing bilateral same day cataract surgeries in adults in a single center as an option to streamline care, costs and physician time as well as to improve patient satisfaction and ability to comply with postoperative medication instructions.

Methods

The study was a retrospective survey performed at a single center with two surgeons. No financial support was provided for this study to any authors. No ethics review was sought as this was a retrospective review according to the Code of Clinical Research published July 19, 2011 however; the study was conducted according to the Declaration of Helsinki and its principles.

The Toyos Clinic is a private ophthalmic practice with multiple locations in Tennessee and Mississippi comprised of medical offices and independent surgery centers. The surgery center utilized is the Toyos Clinic Surgery Center in Nashville, a free-standing surgery center, not contracted with Medicare or other insurers located within one of our clinic locations. Patients utilizing this surgery center paid out of pocket without utilizing insurance benefits if they had them. Clear corneal phacoemulsification was performed using a supracapsular technique (Dr. R. Toyos) or divide and conquers (Dr. M. Toyos). Biometry was done with IolMaster 700, (Zeiss, Oberkochen, Germany) Pentacam (Oculus, Inc, Wetzlar, Germany), initial operating microscope was Leica Stativ (Wetzlar, Germany) and was upgraded to Zeiss Lumera with Callisto in 2017. Lenses utilized were primarily Tecnis multifocal (Johnson & Johnson, Santa Ana, CA) and ReStor 2.5 (Alcon, Fort Worth, TX). Topical, intracameral and monitored anesthesia care was provided with monitored care being provided by a board certified fully licensed anesthesiologist who also employed an independent RN as an assistant. Surgical techs, scrubs, circulators and instrument cleaners were specially trained existing ophthalmic technicians.

Each eye operation was performed as a single procedure with a single instrument tray. Prior to the surgery, the patient's face was prepped with 5% povidone-iodine for 3 minutes unless there was a direct contraindication. Local anesthesia and monitored care by an anesthesiologist. Vancomycin was added to the irrigating solution and immediately postoperatively, antibiotic drops, non-steroidal drops and a steroid drops were given which were continued at home for 3-8 weeks.

Study population

This study included patients qualified for and desiring of cataract extraction with lens replacements well as those opting for refractive lens exchanges from May 2015 to February 2018. No cases were excluded from participating and all patients receiving immediate sequential bilateral cataract surgery were included in the study. Cases that were performed included those with a history of diabetes, prior retinal or glaucoma surgery, prior trauma, non-English speaking immigrants and hypermature lenses.

This study focused on the safety of bilateral procedures done on the same day and the refractive outcomes of those surgeries. Patients were followed for a minimum of 3 months and a maximum of 3 years.

Data collection

Visual Acuity: Best corrected visual acuity was measured by using Snellen charts projected by standard equipment (Nikon, Tokyo, Japan). We did not include acuity measurements from automated refractions, cycloplegic refractions, over-refractions, or retinoscopy as these was not routinely performed.

Surgical Complications: We captured intraoperative and postoperative complications by means of review of operative notes and

EMR charting. We searched for endophthalmitis, wound leaks, postoperative macular edema and need for postoperative LASIK, the majority of which were planned and performed for toric corrections prior to the availability of presbyopic toric lenses.

Demographic Factors and Systemic Comorbidity: Patient age, sex, health history, race and ethnicity were self-reported in demographic clinic intake forms.

Ocular Comorbidity: Pre-existing ocular diseases were obtained by review of EMR chart notes.

Medications: EMR chart review was used to obtain presence of alpha agonists and glaucoma medications including prostaglandins.

Biometry: Pentacam and IolMaster 700 technology was used to obtain and record axial length, anterior chamber depth, keratometry, posterior corneal measurements, macular oct and lens thickness.

Data analysis

Patients were analyzed to determine mean patient ages as well as age ranges, breakdown of ethnicity and gender, presence of diabetes mellitus, use of Flomax and use of blood thinners of any kind. Information was collected regarding ocular comorbidities including number and types of ocular medications and prior ocular surgeries and systemic comorbidities although each systemic medication was neither collected nor analyzed. Best corrected visual acuities prior to and at the final 6 week post op visit was collected as well as any additional medications apart from standard of care medications for cataract surgery. Statistical analysis was conducted by reporting the statistical average of each category. Safety was measured by the occurrence of serious adverse events as defined as an unexpected medical occurrence that results in hospitalization, death, is life-threatening or results in ongoing significance disability or loss of function [6]. Postoperative ocular morbidities were collected noting it was a new diagnosis or pre-existing condition and if any follow up treatment was required. Types of lenses were collected along with axial lengths.

Results

Eligibility

No patients were excluded from the study although many patients self-excluded by choosing to utilize insurance or Medicare/Medicaid benefits through other contracted facilities. Patients who underwent cataract surgery in only one eye because only one eye qualified for surgery, needed surgery or because it was their choice were not included for analysis.

Characteristics of patients

The study population was predominantly Caucasian at 81%, with 8% African American, 7% Hispanic/Latino, 3% Asian and one bilateral American Indian patient. The study had a slight predominance of females, 55% and 45% male subjects with an average age of 57.6 years and a range of 18-86 years. The age range with the greatest number of subjects was 50-59 (37.5%) followed by 60-69 (34%). Patients under age 50 comprised 18% of the study population. Fifty-six eyes were affected by diabetes although none had proliferative changes before or during the study. Six eyes were affected by current or previous use of alpha adrenergic blockers and sixty eyes were affected by use of any

blood thinner, with four eyes having exposure to two or more blood thinners.

Patients in this study population chose a multifocal lens (either Tecnis multifocal or ReStor 2.5) in 50% of the cases, with 24.6% of patients choosing monofocal or standard lens, and 21.7% choosing toric lenses. A small minority of patients chose Crystalens (Baush +Lomb, Rochester, NY) or a multifocal toric (Tecnis, Johnson & Johnson, Santa Ana, CA).

The average axial length was 24 mm in both right and left eyes with a range of 18-30.5 mm. The majority of patients fell within 23-23.9 mm (27%) with 26% falling in the <22.9 mm range. The most common systemic co-morbidities were hypertension, hypercholesterolemia, thyroid disorder, depression and/or anxiety, allergies, osteoarthritis, GERD and lesser instances of prostate disorders asthma, gout, MI, CVA, CHF, irregular heartbeat, migraine, headache, ADHD, seizures, history of bypass surgery and one patient each with multiple sclerosis, celiac disease, lupus, hepatitis B, hepatitis C and bronchitis.

Twenty two eyes were affected with open angle glaucoma, fourteen eyes were diagnosed with dry macular degeneration and another fourteen with dry eye, six eyes had a diagnosis of non-proliferative diabetic disease, two eyes were previously diagnosed with ptosis and the following conditions were present in one eye of a study patient: trichiasis, wet macular degeneration, Fuch's, prior LASIK, posterior vitreous detachment, herpes zoster keratitis, optic pit, choroidal nevus, strabismus, pthisis, pathologic myopia, keratoconus, amblyopia, prior RK, prior INTACS, and central serous retinopathy.

Forty-two eyes were affected with glaucoma, sixteen eyes were using tears or prescription dry eye medication, four were using prescription allergy medications and four eyes were using over the counter redness relievers.

The average best corrected visual acuity for right eyes was 0.6 and for left 0.5 with minimums of -0.1 (20/15) and maximum of 1.6 (20/800). Two patients with light perception vision were assigned 20/800 for analytical purposes. Post-operative best corrected visual acuities were 0.2 in the right eye and 0.1 in the left eye with minimums of -0.1 and maximum of 20/800. Post-operatively, dry eye was the most commonly noted ocular morbidity, occurring in 5% of patients with residual astigmatism (1%) and at less than 1% each: glaucoma, dry macular degeneration, epiretinal membrane, cystoid macular edema, retinal hemorrhage, hyperopia, posterior vitreous detachment, trichiasis, ocular allergy, Fuch's, non-proliferative diabetic retinopathy, scleritis, branch retinal vein occlusion and retinal detachment (pre-existing) (Table 1).

Year of Surgery	Number
2015	45
2016	124
2017	100
2018	11
Sex	
Female	154
Male	126
Age	

Avg	57.6
Min	18
Max	86
<50	51
50-59	105
60-69	94
70-80	26
>80	4
Race/ethnicity	
Caucasian	227
African American	23
Hispanic/Latino	21
Asian American	8
Multiracial	0
Pacific Islander	0
American Indian	1
Other	0
Diabetes	28
Flomax or similar	3
Blood thinner	30
2+ blood thinner	2
Lens type	
Monofocal	69
Multifocal	140
Toric	61
Crystalens	5
Mftoric	5
Axial length od	
<22.9	71
23-23.9	77
24-24.9	62
>25	66
Avg	24
Min	18.2
Max	30.5
Axial length os	
<22.9	74
23-23.9	76

24-24.9	67	Wet Amd	1
>25	63	Fuchs	1
Avg	24	Lasik	1
Min	18	PVD	1
Max	30.3	HZV	1
Preoperative systemic conditions		Optic Pit	1
HTN	75	Nevus	1
Cholesterol	46	Strabismus	1
Thyroids	25	Pthisis	1
Depression/anxiety	23	Pathologic Myopia	1
Allergies	21	Keratoconus	2
Osteoarthritis	11	Amblyopia	1
GERD	11	RK	1
Prostate	6	Intacs	1
Asthma	6	CSR	1
Gout	3	Preoperative medications	
MI	4	Glaucoma	21
CVA	2	Tears	5
CHF	2	Dry Eye	3
Irreg Hb	6	Allergy	2
Migraine	4	Visine	2
Headache	2	Preoperative medications	
ADHD	1	Timolol	6
Seizures	1	Teras	4
MS	1	Travatan	5
Celiac Disease	1	Lumigan	3
Bypass Surgery	3	Latanoprost	3
Lupus	1	Brinzolamide	2
Hep B	1	Dorzolamide	2
Hep C	1	Xiidra	2
Bronchitis	1	Visine	2
Preoperative ocular conditions		Pazeo	1
Glaucoma	11	Flarex	1
Dry Amd	7	Restasis	1
Dry Eye	7	bcva preop od	
NPDR	3	Avg	75
Ptosis	2	Min	15
Trichiasis	1	Max	800

bcva preop os	
Avg	60
Min	15
Max	800
bcva post op od	
Avg	32
Min	10
Max	800
bcva post op os	
Avg	27
Min	15
Max	800
Postoperative conditions	
Dry eye	13
Residual astig	4
Glaucoma	3
Dry amd	3
ERM	3
CME	2
Retinal heme	2
Hyperopia	2
PVD	2
Trichiasis	1
Allergy	1
Fuchs	1
NPDR	1
Scleritis	1
BRVO	1
RD	1

Table 1: Bilateral Cataract Surgery.

Surgical complications

All cases were completed at bilateral sequential surgeries with no cases being postponed or aborted due to complications in the first eye. In this series there were no vitrectomies or posterior capsule ruptures. There were no unintended lenses placed although one patient was unexpectedly 1 diopter hyperopic after crystalens placement.

Discussion and Conclusion

The first large scale study of in office bilateral cataract surgery was first reported by Kaiser Permanente with patient enrollment beginning

in 2010 [7]. This important study determined that there was no evidence to show differences in best corrected visual acuity or refractive error in immediate sequential or delayed sequential cataract surgeries. Bilateral cataract surgery has been performed routinely in pediatric patients due to the risk of amblyopia and risk of anesthesia and in some developing countries due to lack of resources and health care access [8]. It remains controversial in developed countries largely due to the risk of endophthalmitis [8]. Health insurers generally only reimburse one surgery per day at full rate and discount simultaneous second eyes. Additionally, the Royal College of Ophthalmologists declared in 1995 that simultaneous surgeries should only be used in exceptional circumstances [9].

Cataract surgery is the most commonly performed surgical procedure in the United States Medicare population and with the aging of the baby boomers, costs for surgery have increased with total volume increase and age adjusted rates as the procedures has become substantially faster with reduced recovery times, better visual quality and improved surgical technology and pharmaceutical agents [10]. The number of immediately sequential bilateral cataract surgery is expected to continue to increase in order to achieve surgical efficiencies, improve patient satisfaction, improved visual rehabilitation, to improve patient convenience, reduce surgical schedule waiting times and to reduce payor costs [11].

Immediate bilateral sequential cataract surgery is not currently the standard of care and significant concerns have been raised about the safety especially in patients with co-morbid conditions, the potential for endophthalmitis, the potential for bilateral inflammation in the event of breach of protocol in instrument sterilization or the lack of time for adjustment of lens power after the first surgery [11]. The risk of these adverse events has been shown to be extremely low with modern technology, intracameral antibiotics and standard operating room protocols [12]. One of the biggest arguments against immediate sequential bilateral cataract surgeries has been the loss of opportunity to adjust lens powers if inaccurate lens powers are predicted. This was not shown to be the case in the Kaiser Study nor was the concern regarding potential for infection at the time of surgery shown to be a significant risk in the study [7]. It is believed that improvements in technology and formula that incorporate anterior and posterior corneal measurements, anterior chamber depths and lens thickness have improved the accuracy of lens predictions.

Currently, uncomplicated cataract surgery takes approximately ten minutes to complete [13]. It has been demonstrated that in private surgical centers with experienced to highly efficient surgeons, cycle times per surgical case can range from 17-24 minutes, with 1 minute to set room up and place anesthesia monitors, 3-4 minutes devoted to prepping, draping and setting up microscope, 6-10 minutes for the surgery itself, 2 minutes to remove drape, apply topical postoperative drops and apply shield or patch and 5-7 minutes to get the next patient in the room [14]. By utilizing our technique, patients utilize 1 minute for set up of both eyes (saving 1 minute), 4 minutes for prepping and draping both eyes and microscope adjustment (saving 4 minutes, case times would be unchanged, the drapes for both eyes are removed at the same time saving an additional 2 minutes, and the saving of 7 minutes of turnover time by having the next surgical case already in the room. Therefore, for every bilateral case there is a potential time savings of 14 minutes.

The limitations of this study include the relative homogeneity of the self-selecting study population, the study of only two surgeons, both with approximately twenty years surgical experience each and the

study of only a single site in one geographic location. A larger group of surgeons, patients, varied geographic locations and longer follow up times may be useful to gain more information about this method as a surgical technique.

Current barriers to adoption include financial penalties from insurance agencies, lack of adoption by the ophthalmic community as standard of care, fear of complications especially in potentially complicated patients or those with co-morbid conditions, and more peer-reviewed evidence and studies demonstrating the safety and efficacy of immediately sequential bilateral cataract surgery [15]. Consensus has also not been reached regarding operating standards. Small studies have been conducted outside the US demonstrating safety and outcomes in both pediatric and adults patients both with and without general anesthesia [16-18].

Immediate sequential bilateral surgeries have many advantages including the reduced number of office follow up visits for both patients, physicians and staff. Leivo et al. Conducted an economic analysis comparing simultaneous and sequential cataract surgeries in Finland and concluded that outcomes were similar with significant savings for health care and non-health care costs [19]. Simultaneous surgeries also present the opportunity to synchronize medication dosing especially important when dealing with multiple medications and tapering dosing schedules. At an approximate cost of 350 dollars per minute in the average ophthalmic operating room, prepping, draping and operating on two eyes simultaneously can deliver care more efficiently without separate packs or separate turnover minutes that translate into healthcare savings, approximately 4900 USD per bilateral case performed in operating room time savings [20].

The relative safety of modern cataract surgery, the increasing aging baby boomer population, the current physician shortage and the patient expectation of fast recoveries and limited time away from normal routine are all factors that make immediate sequential bilateral cataract surgery an attractive option. More studies and meta-analyses may demonstrate to insurers that it is a safe, effective and more efficient option eliminating the current financial penalties for bilateral surgery.

Maximal safety precautions should future research to investigate these efficiencies on outcomes in larger populations, access to care and cost savings in the clinic as well as for patients are warranted to more fully understand the impact of cost savings in all areas.

References

1. Resnikoff S, Pascolini D, Etya'ale D, Kocur I, Pararajasegaram R, et al. (2004) Global data on visual impairment in the year 2002. *Bull World Health Organ* 82: 844-851.
2. Teel P (2018) Five top challenges affecting healthcare leaders in the future, *Becker's Hospital Review*.
3. Bowman R (2019) Not Your Grandparents' Cataract Surgery: Smoother recovery, better results.
4. Cordoves L (2014) The Prevention of Endophthalmitis After Cataract Surgery, CRSTEurope.
5. Thompson V (2019) Is LASIK Performed On Both My Eyes The Same Day? www.fda.gov/Safety/MedWatch/HowToReport/ucm03087.html.
6. Herrinton LJ, Liu L, Alexeeff S, Carolan J, Shorstein NH (2017) Immediate Sequential vs. Delayed Sequential Bilateral Cataract Surgery: Retrospective Comparison of Postoperative Visual Outcomes. *Ophthalmology* 124: 1126-1135.
7. Giles K, Robert E, Come EM, Wiedemann P (2017) Simultaneous Bilateral Cataract Surgery in Outreach Surgical Camps," *Ophthalmol Eye Dis* 9: 1179172117701738.
8. The Royal College of Ophthalmologists (1995) Guidelines for Cataract Surgery. London, England.
9. Schein OD, Cassard SD, Tielsch JM, Gower EW (2012) Cataract Surgery among Medicare Beneficiaries. *Ophthalmic Epidemiol* 19: 257-264.
10. Singh R, Dohlman TH, Sun G (2017) Immediately sequential bilateral cataract surgery: advantages and disadvantages. *Curr Opin Ophthalmol* 28: 81-86.
11. Grzybowski A, Wasinska-Borowiec W, Claoué C (2016) Pros and Cons of Immediately Sequential Bilateral Cataract Surgery (ISBCS). *Saudi J Ophthalmol* 30: 244-249.
12. Slonim C (2019) Cataract Surgery Recovery by Marilyn Hadrill contributions and review.
13. Devgan U (2017) Improving efficiency in the operating room," *Ocular Surgery News US Edition*.
14. Lansingh VC, Eckert KA, Strauss G (2015) Benefits and risks of immediately sequential bilateral cataract surgery: a literature review. *Clin Exp Ophthalmol* 43: 666-672.
15. Totan Y, Bayramlar H, Cekic O, Aydin E, Erten A, et al. (2000) Bilateral Cataract Surgery in Adult and Pediatric Patients in a Single Session. *J Cataract Refract Surg* 26: 1008-1011.
16. Cholevík D, Timkovič J, Němčanský J, Mašek P, Šalounová D (2015) One-day simultaneous bilateral cataract surgery" *Cesk Slov Oftalmol* 71: 3-14.
17. Huang TE, Kuo HK, Lin SA, Fang PC, Wu PC, et al. (2007) Simultaneous Bilateral Cataract Surgery in General Anesthesia Patients, *Chang Gung Med J* 30:151-160.
18. Leivo T, Sarikkola AU, Uusitola RJ, Hellstedt T, Ess SL, et al. (2011) Simultaneous bilateral cataract surgery: economic analysis; Helsinki Simultaneous Bilateral Cataract Surgery Study Report 2. *J Cataract Refract Surg* 37: 1003-1008.
19. Sarka P, Michaela Z (2016) Example of cost calculation for operating rooms in the hospital. *Intl J Econ Manage Systems* 1: 202-205.