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Clinical Paper

Immediate sequential bilateral cataract surgery (ISBCS): A single-site experience of 41 patients during the COVID-19 pandemic

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ABSTRACT

Background

The practice of immediate sequential bilateral cataract surgery (ISBCS) was more widely adopted in the UK during the COVID-19 pandemic, in response to limited surgical capacity and the risk of nosocomial infection. This study reports on a single site experience of ISBCS in Northern Ireland.

Methods

Data was collected prospectively between 17th November 2020 and 30th November 2021. The ISBCS surgical protocol, recommended by RCOphth and UKISCRS, was followed. Primary outcomes measures were: postoperative visual acuity (VA), refractive prediction accuracy, intraoperative and postoperative complications.

Results

Of 41 patients scheduled, 39 patients completed ISBCS and two patients underwent unilateral surgery (n=80 eyes). Mean age at the time of surgery was 71.6 years (standard deviation (SD) ±11.8 years). Median preoperative VA was 0.8 logMAR (range: PL to 0.2 logMAR). Seventeen (20.9%) eyes were highly myopic and 9 (11.1%) eyes were highly hypermetropic. Median cumulative dissipated phacoemulsification energy was 15.7 sec (range: 1.8 sec to 83.4 sec). Median case time was 10.4 min (range: 4.3 min to 37.1 min).

One eye (1.3%) developed iritis secondary to a retained tiny cortical fragment. Four eyes (5.0%, n=3 patients) developed cystoid macular oedema, with full resolution. On wide field imaging, an asymptomatic unilateral peripheral suprachoroidal haemorrhage was noted in two highly myopic patients (axial lengths of 27.01mm and 25.05mm respectively). The posterior pole was spared, and both resolved spontaneously without any visual impairment.

Conclusions

In our initial experience, ISBCS was found to be a safe approach to cataract surgery. Our patient cohort included eyes with dense cataracts and high ametropia. Further studies are required to assess patient reported outcome measures and the possible economic benefits of ISBCS in our local population.

Introduction

Cataract surgery is one of the most commonly performed procedures worldwide, with over 486,000 publicly funded operations taking place in England during the 2021 NHS year.[1] The surgical techniques and perioperative care for patients undergoing cataract surgery have evolved significantly over the last century.[2] The current standard approach for the treatment of visually-significant bilateral cataract in the United Kingdom (UK) and Ireland is delayed sequential bilateral cataract surgery (DSBCS), where each eye undergoes surgery on sequential dates. The alternative approach is immediate sequential bilateral cataract surgery (ISBCS), where surgery is performed on both eyes sequentially during the same theatre session.[3]

The practice of ISBCS varies worldwide and it poses controversial ethical concerns for both the patient and the ophthalmologist despite compelling benefits. A survey of ophthalmologists in the UK in 2020 found that 13.9% were currently performing ISBCS.[3] The historical reason for the low uptake of ISBCS is concern regarding the serious risk of irreversible bilateral blindness, especially from endophthalmitis.[3,4] However, a large cohort study has demonstrated a lower risk of postoperative endophthalmitis with ISBCS than previously published BDSCS rates.[5] Refractive surprise and lack of option to adjust IOL selection for the second eye has also been cited for a reluctance to adapting this approach.[3] However a large cohort study showed

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similar rates of VA improvement and targeted refraction between DSBCS and ISBCS patients.[6] As a departure from the traditional practice of DSBCS, medicolegal concerns were also purported as a disincentive despite acceptance by recognised local and international regulatory bodies.[3,7] The availability of surgical opportunities for ophthalmologists in training also needs to be considered.[3]

The challenge which COVID-19 pandemic posed to the national healthcare systems of England and the devolved nations (Northern Ireland, Scotland and Wales) prompted an examination of the public health policy surrounding cataract surgery in the UK.[8] The concept of ISBCS offered the potential benefits of reduced hospital visits and a shorter period for binocular visual rehabilitation. Economic analysis in Finland has demonstrated both healthcare and non-healthcare related savings associated with ISBCS compared to DSBCS.[9] A recent study taken from the same national population as this study had demonstrated that one-fifth of patients awaiting cataract surgery were 'clinically extremely vulnerable' to COVID-19.[10] ISBCS reduces clinical contact time per patient, therefore reducing COVID-19 transmission risk.[8]

In conjunction with the UK and Ireland Society of Cataract and Refractive Surgeons (UKISCRS), the Royal College of Ophthalmologists (RCOphth) published rapid guidance regarding best practice for ISBCS.[11] This document provided guidance for the safe delivery of ISBCS. We implemented this and designed a surgical pathway as ISBCS was rolled out. We aim to report the clinical outcomes of a cohort of patients undergoing ISBCS during the COVID-19 pandemic.

Methods

A case series of patients scheduled for ISBCS between 17th November 2020 and 30th November 2021, along with subsequent clinical follow-up is reported. All cataract operations were carried out at the Downe Hospital (South Eastern Health and Social Care Trust, Northern Ireland), under a single Ophthalmic surgeon. Ophthalmology specialist trainees (OSTs) performed surgery for cases of suitable complexity as judged by the supervising consultant.

Inclusion criteria

Careful selection of patients followed full ocular examination and informed consent. Patient choice and family/support member engagement was key. Bilateral significant cataracts with low risk of intra and postoperative ocular complications were considered. There were no age limitations.

Exclusion criteria

Ocular exclusion criteria included concomitant active eye disease such as diabetic retinopathy, ongoing intravitreal anti-VEGF treatment, Fuchs corneal endothelial dystrophy, pseudoexfoliation, shallow anterior chamber, and previous laser refractive surgery. Patient factors included high risk of infection (e.g. recurrent infective exacerbations of COPD) and cognitive impairment. Axial length extremes were not a set as an exclusion criteria, as exclusion of patients with shallow anterior chambers was felt to minimise the risk associated with short axial lengths.[12]

Patient consultations and assessment

Each patient referred to the cataract service underwent an initial consultation and surgical preassessment. This process included a full ocular examination and biometry. Optical biometry was performed where possible (IOLMaster 500 or IOLMaster 700, Carl Zeiss Meditec AG), with contact biometry (EchoScan US800, NIDEK) reserved for cases of dense cataracts where optical biometry was not possible. IOLMaster 500 or IOLMaster 700 biometers were used depending on availability at the clinical site of preoperative assessment.

Surgical procedure

The ISBCS surgical protocol, recommended by RCOphth and UKISCRS, was followed.(11) Following completion of the first eye operation, patients were given the opportunity to reconsider second eye surgery. Should a significant intraoperative complication occur during first eye surgery then second eye surgery would be deferred to a later date.

All patients underwent day case surgery. Topical anaesthetic (oxybuprocaine hydrochloride 0.4% v/w) with adjunct subconjunctival anaesthetic (1% lidocaine v/w) was used bilaterally without sedation. Each patient received 1mg intracameral cefuroxime intraoperatively. Postoperatively, topical prednisolone acetate 1% (4 times daily for 4 weeks) and chloramphenicol 0.5% (4 times daily for 7 days) were administered. Patients left surgery with a clear plastic shield applied to each eye. Cases were either completed by one surgeon (trainee or consultant), or a team of two surgeons (trainee and consultant).

Post-operative review

Each patient had a telephone review on postoperative day one, then a clinical review at approximately four weeks postoperatively, followed by a community optometry review approximately six weeks postoperatively for a final subjective refraction.

Data collection

Data was collected prospectively at the time of surgery. Descriptive statistics only have been applied to describe the outcomes of the included patients. Descriptive statistics analysed using R (v.4.2.0). Data was assessed for parametric or non-parametric distribution using the .hist function. If data was parametric, mean and standard deviation were reported and if non-parametric, median and range were reported. Not all data points were retrievable and the proportion retrieved

is displayed for each data point (Table 2).

Results:

Forty-one patients attended for planned ISBCS and 39 patients completed ISBCS. Two patients underwent unilateral surgery only; reporting anxiety and wished to defer second eye surgery to a later date. In total, 80 eyes underwent phacoemulsification and intraocular lens (IOL) implantation.

Mean age at time of referral was 69.5 years (standard deviation (SD) ±11.4 years, range: 46 to 91 years) and mean age at time of surgery was 71.6 years (SD ±11.8 years, range: 46 to 94 years). There were 16 (39.0%) male patients and 25 (61.0%) female patients. Ophthalmic comorbidities included: 2 (4.8%) patients with amblyopia, 5 eyes (6.1%) with dry AMD, 17 eyes (20.9%) with high myopia (<-6 dioptres (D)) and 9 eyes (11.1%) with high hypermetropia (>+4 D). General health comorbidities included: 16 (39.0%) patients with diabetes mellitus, 5 (12.2%) patients on oral anticoagulant medication, 3 (7.3%) patients with chronic obstructive pulmonary disease (COPD) and 3 (7.3%) patients concurrently taking alpha-adrenoreceptor antagonists.

Mean time from referral to surgery was 23.0 months (SD ±11.8 months, range: 3 to 58 months), and surgery to final follow-up was 48.1 days (SD ±40.1 days, range: 8 to 253 days) (Table 1). All patients completed clinical follow-up but 5 (12.2%) patients did not attend their community optometrist for a final subjective refraction.

Mean preoperative visual acuity (VA) was 0.8 logMAR (SD ±0.5, range PL to 0.2 logMAR). The mean axial length was 23.18mm (SD ±1.6, range 20.08 to 27.01mm). The mean spherical equivalent (SE) refractive error preoperatively was -1.31 D (SD ±5.39 D, range +9.63 to -16.63D). The mean SE postoperatively was -0.62 (SD ±0.77, range +2 D to -2 D) and mean SE prediction error was +0.03 D (SD ±0.73, range +1.56 D to -1.88 D). In total 5 (9.4%) patients who completed ISBCS and attended postoperative refraction had a first eye with a SE prediction error of more than ±1D. For patients who attended for postoperative refraction, there were no cases of significant anisometropia between eyes (>1D) (Table 2).

Median cumulative dissipated phacoemulsification energy (CDE) was 15.7 sec (range: 1.8 sec to 83.4 sec). Median case time was 10.4 min (range: 4.3 min to 37.1 min). Forty-seven (58.8%) eyes were operated on by the consultant (OE) and 33 (41.3%) eyes by senior trainees (OST4-7). In total 20 (51.3%) complete ISBCS cases were completed by the consultant (OE), 6 (15.4%) as a team and 13 (33.3%) complete ISBCS cases by senior trainees. One eye (1.3%) developed iritis secondary to a retained cortical fragment. Four eyes (5.0%) of 3 patients developed cystoid macular oedema (CMO), with full resolution. There were two cases of unilateral, peripheral, acute intraoperative suprachoroidal haemorrhage (AISH). There were were subclinical at time of surgery and only noted on wide-field imaging at clinic follow-up. A unilateral peripheral limited suprachoroidal haemorrhage occurred in two highly myopic patients (preoperative axial length of 27.01mm and 25.05mm), but posterior pole and postoperative vision were not affected (Table 3).

Discussion

This study is the first to report patient outcome data from ISBCS patients in Northern Ireland and to the authors' knowledge, one of the first to report outcomes in the UK since the beginning of the COVID-19 pandemic, along with the RCOphth national audit database cataract audit.[1] We demonstrate safe practice and reduced patient exposure during the COVID-19 pandemic, while supporting OST training.

Similar studies have been conducted during the COVID-19 era examining patient experiences following ISBCS. The largest of these, a study of 406 patients who underwent ISBCS in Canada between July 2020 and December 2020 found a 25% increase in surgical volume and a 50% decrease in patient visits was achieved when compared with DSBCS, within COVID-19 restrictions.[13] Public familiarity with the concept of ISBCS is low and patient's concerns about safety over convenience needs to be addressed. A preoperative patient perspective study of 267 patients on a cataract surgical waiting list found that just 45% agreed strongly with opting for ISBCS.[14] A study of 24 postoperative ISBCS patients in the UK reported that, following surgery, 79% of patients would recommend this procedure to friends and family.[15] Regarding surgical outcomes of ISBCS during COVID-19, one study of 22 eyes found a mean SE prediction error of <0.5 D in 77% of patients and statistically similar intraoperative and postoperative complication rate when compared with DSBCS.[16]

In the UK, ISBCS does not stand alone in delivering bilateral ocular surgery; laser refractive, lid and squint surgery are all routinely performed bilaterally. Bilateral intravitreal anti-VEGF injections for macular pathology are also performed regularly. Intravitreal injections may be viewed as the most relevant comparator to cataract surgery – they are both intraocular procedures and similarly carry a risk of endophthalmitis.[17] The use of ISBCS in the UK has been demonstrated to have increased from 238 reported patients in the 2018/2019 RCOphth National Ophthalmology Database report to 1463 reported patients in the 2021/2022 report, There was a corresponding decrease of general anaesthesia use from 57.1% to 7.3% of patients.[1,18] This lower use of general anaesthesia may be considered as a surrogate marker of a changing demographics and medical need in the cohort of patients being selected for ISBCS. There was also a decrease in the proportion of patients between the 2018/2019 and 2020/2021 reports recorded as being unable to lie flat or cooperate during the procedure (15.9% vs. 7.5%

respectively).[18,19] Subsequent reports will show if this change in surgical practice will persist or revert to DSBCS.

The rate of CMO in this study was higher than pre-pandemic published incidence rates (1.2% - 3.4% vs. 5.0% in this case series). It was comparable (4.9% - 6.9% vs. 5% in this case series) with a UK-based study published in 2022.[20,21] It may be due to the increase rate of dense cataracts presenting as an indirect consequence of the COVID-19 pandemic; of note the mean presenting vision acuity in this case series was 0.9 logMAR units (6/48 Snellen). Additionally, this rate may be due to small sample size variability.

There were two cases of assumed acute intraoperative suprachoroidal haemorrhage (AISH). The previously reported rate by the British Ophthalmological Surveillance Unit is 0.04%.[22] Both of these cases of unilateral, peripheral suprachoroidal haemorrhage were only noted on wide field imaging which was part of clinic follow-up for each patient. These cases involved myopic eyes (axial length 27.01mm and 25.05mm), however they had no risk factors (pre-operative increased IOP, posterior capsular rupture, concurrent glaucoma or age >90) as identified by a recent RCOphth report.[23] The rate of subclinical suprachoroidal haemorrhage identified incidentally on wide field imaging postoperatively is not well reported in the literature.

The rate of significant SE prediction error (>1D) for 1st eye surgery was 9.4% and there were no cases of significant postoperative anisometropia (>1D). A prior study of 3561 ISBCS patients refractive outcomes had found a rate of anisometropia >2D of 1.4%; but they did not report 1st eye SE prediction error.(6)second-eye outcomes were no different than first-eye outcomes; (2 A previously published benchmarking study had reported a rate of 13.0% of patients with a SE prediction error of >1D.(24)between January 2003 and February 2006. The electronic medical record automatically recommends the formula to be used according to the College guidelines and allows A constants to be customised separately for either ultrasound or partial coherence interferometry methods of axial length measurement and for different intraocular lens models. Consultants and trainees performed routine phacoemulsification cataract surgery and new intraocular lens models were introduced during the cycles. Uncomplicated cases with 'in-the-bag fixation', achieving 6/12 Snellen acuity or better were included. Community ophthalmic opticians performed refraction at 4 weeks.\nRESULTS: The postoperative subjective refraction was within 1 D of the predicted value in 79.7% of the 952 cases in cycle 1, 83.4% of 2406 cases in cycle 2, and 87.0% of 1448 cases in cycle 3.\nCONCLUSIONS: On the basis of our data, using College formula, optimising A constants and partial coherence interferometry, a benchmark standard of 85% of patients achieving a final spherical equivalent within 1 D of the predicted figure and 55% of patients within 0.5 D should be adopted.","container-title":"Eye (London, England

The authors agree with the included absolute and relative contraindications included in rapid guidance published by RCOphth and UKISCRS.[11] In light of the two incidences of limited suprachoroidal haemorrhage in patients with axial myopia, additional consideration and patient counselling may be required for patients with a longer axial length if ISBCS is being offered. We do not feel longer axial length is an absolute contraindication to ISBCS, as these patients will likely experience significant anisometropia between first- and second-eye surgery for DSBCS and therefore will benefit from the rapid binocular visual rehabilitation of ISBCS. However, the presence of other risk factors for suprachoroidal haemorrhage, in additional to increased axial length, may be a relative contraindication for ISBCS.

Now that post-pandemic service planning has begun, the future role of ISBCS in service provision, along with training, must be reconsidered. Although not examined in this study, the efficiency benefit has been previously demonstrated in both low- and high-volume cataract settings.[9,11]

The authors believe that one barrier to the implementation of ISBCS locally is that it could initially create inequality between patients, with a cohort of patients with ISBCS having a relative advantage over DSBCS who remain longer on a waiting list for second eye surgery. If ISBCS was adopted as a default option offered to patients, we postulate that there would be an initial inequality, but eventually a break-even point and subsequent shortening of the cataract surgery waiting list because of the increased efficiency that would ensue.

The authors acknowledge that this study was confined to the patients under the care of one consultant ophthalmic surgeon and is not reflective of all surgeons undertaking ISBCS in Northern Ireland. In addition, no efficiency or economic evaluation took place. Future studies may examine these aspects.

In conclusion, ISBCS was found to be a safe approach to cataract surgery. There were no cases of loss of best-corrected visual acuity and no cases of significant (>1D) anisometropia.

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Conflict of Interest:
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Table. 1. Patient demographics, referral and follow-up. AMD = age related macular degeneration.

Patient demographics, referral and follow-up	
Time from referral to surgery (Mean ± SD, range)	23.0 ±11.8 months, range 3-58
Mean age at time of surgery (Mean ± SD, range)	71.6 years SD ±11.8, range 46 - 94
Female / male (n, %)	25 (61.0%) female / 16 (39.0%) male
Ophthalmic co-morbidities included (n eyes, %)	Amblyopia 2 (4.8%) Dry AMD 5 (6.1%) High myopia (<-6 D) 17 (20.7%) High hypermetropia (>+4 D) 9 (10.9%)
General medical co-morbidities included (n patients, %)	Diabetes mellitus 16 (39.0%) Anticoagulation 5 (12.2%) COPD 3 (7.3%) Alpha-blockers 3 (7.3%)
Clinical follow-up rate (n, %)	42 patients (100%)
Refractive follow-up rate (n, %)	39 patients (87.8%)

Table. 2. Pre- and postoperative visual acuity and refractive outcomes

Parameter	**Descriptive statistics**	**Data retrieved**
Mean preoperative VA	0.8 logMAR (SD ±0.5, range: PL to 0.2 logMAR)	All
High ametropia	Myopia 17 (20.9%) Hyperopia 9 (11.1%)	81 out of 82 eyes (98.7%)
Axial length (Mean ± SD, range)	23.18mm (SD ±1.6, range 20.08 to 27.01mm)	34 of 82 eyes (41.5%)
Postoperative SE refractive error (Mean ± SD, range)	-0.62D (SD ±0.77, range +2 D to -2 D)	53 of 80 eyes (66.3%)
SE prediction error (Mean ± SD, range)	+0.03 D (SD 0.73, range +1.56 D to -1.88 D)	53 of 80 eyes (66.3%)
Number of eyes with SE prediction error >1D	5 (9.4%)	53 of 80 eyes (66.3%)
Significant (>1 D) postoperative anisometropia	0.0%	39 patients (87.8%)

High ametropia = High myopia (<-6D), high hypermetropia (> 4D).

Table. 3. Cumulative dissipated phacoemulsification energy (CDE), case time, surgeon mix, post-operative complications.

CDE (Median, range)	15.7 sec (1.8 sec to 83.4 sec)
Median case time (Median, range)	10.4 min (range: 4.3 min to 37.1 min)
Consultant performed procedures (n eyes, %)	47 (58.8%)
Senior (OST4-7) performed procedures (n eyes, %)	33 (41.3%)
Postoperative complications (n eyes, %)	CMO 4 (5.0%) SCH 2 (2.5%)

CMO, cystoid macular oedema; SCH, suprachoroidal haemorrhage

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