Chu, C. J., Dick, A. D., Johnston, R. L., Yang, Y. C., Denniston, A. K., & UK Pseudophakic Macular Edema Study Group (2017). Cataract surgery in uveitis: a multicentre database study. British Journal of Ophthalmology. DOI: 10.1136/bjophthalmol-2016-309047

TITLE: Cataract surgery in uveitis: a multicenter database study

SUBTITLE (35 words): Demographics, surgical factors and outcomes from 1173 eyes with uveitis undergoing cataract surgery were compared to control eyes using electronic medical records, which highlighted the increased complexity and management requirements of this patient group.

AUTHORS:
Colin J. Chu[1,2], Andrew D. Dick[1,2,3], Robert L. Johnston[4], Yit C. Yang[5], Alastair K. Denniston[6] for the United Kingdom Pseudophakic Macular Edema Study Group*

STUDY COLLABORATORS (to be listed on Medline under the group):
*Sobha Sivaprasad, Clare Bailey, Arijit Mitra, Atul Varma, Martin Mckibbin, Muhammed Tahir, Nick Lee, Peter Scanlon.

AFFILIATIONS:

1. Academic Unit of Ophthalmology, School of Clinical Sciences and School of Cellular and Molecular Medicine, University of Bristol, Bristol, BS8 1TH, UK.
2. Bristol Eye Hospital, Lower Maudlin Street, Bristol, BS1 2LX, UK.
3. Institute of Ophthalmology, UCL, London EC1V 2PD, UK and National Institute for Health Research (NIHR) Biomedical Research Centre at Moorfields Eye Hospital and University College London Institute of Ophthalmology, London, EC1V 2PD, UK.
4. Gloucestershire Eye Unit, Cheltenham General Hospital, Sandford Road, Cheltenham, UK.
5. Wolverhampton Eye Infirmary, Royal Wolverhampton Hospitals NHS Trust, New Cross, Wolverhampton, UK.
6. Ophthalmology Department, University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK and Academic Unit of Ophthalmology, Institute of Inflammation and Ageing, University of Birmingham, Birmingham, UK.

CORRESPONDING AUTHOR:

Alastair K Denniston (Ophthalmology Department, University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK. a.denniston@bham.ac.uk)

KEYWORDS:

Uveitis, cataract, phacoemulsification, real-world, database.

WORD COUNT:

2486 (2866 post-revision) in main text

STRUCTURED ABSTRACT (250 words):

"Background/aims"

Cataract is an important source of visual loss in patients with uveitis. Whether or not outcomes of cataract surgery in eyes with uveitis are worse compared to non-uveitic eyes have to date been compromised by lack of reliable estimates of benefit and harm, which require data from large cohorts.

"Methods"

Electronic medical record data were extracted from eight independent UK clinical sites for eyes undergoing cataract extraction between January 2010 and December 2014. 1173 eyes with a recorded diagnosis of uveitis were compared to a reference group of 95573 eyes from the same dataset.

"Results"

Uveitic eyes represented 1.2% of all eyes undergoing cataract surgery. Eyes in the uveitic group had worse pre-operative visual acuity (0.87 vs 0.65 logMAR units), were from younger patients and had shorter axial lengths and a higher incidence of ocular co-pathology including glaucoma. A greater number had documented small pupils, required additional surgical procedures, developed more intraoperative complications and had poorer post-operative visual acuity at all timepoints measured up to 6 months (0.41 vs 0.27 logMAR units at 12-24 weeks).

"Conclusion"

This large study cohort of eyes with a diagnosis of uveitis undergoing cataract surgery highlights more precisely the complex surgical demands, co-pathology and worse visual outcomes in this group. This data will allow more accurate pre-operative counselling and planning. Although improvement in visual acuity is achieved in most cases, prognosis should be guarded so patient expectations are met. Compared to the non-uveitic population, the mean post-operative visual acuity is between one to two lines worse at all time-points.

INTRODUCTION:

Cataract is a major cause of visual loss in patients with uveitis; up to 40% of the visual loss is either solely or largely due to cataract [1]. Surgical treatment may be effective but is associated with higher complication rates than in eyes without previous uveitis. Quantifying this risk is important in order to inform patients and surgeons as to the likely short- and long-term benefit or harm of undertaking cataract surgery, and may affect the timing of such surgery.

Currently most data on cataract surgery in patients with uveitis comes from small case series or cohort studies, with data gathered over long time periods to attain sufficient numbers. As this may be so long that practice changes, the studies may not reflect current practice or be generalisable [2-7]. The outcome of cataract surgery in patients with uveitis is regarded as far less predictable than in most groups of patients, due to numerous factors including technical challenges at the time of surgery, the uncertain impact of inflammatory sequelae and the variable and unpredictable reversibility of these complications.

The relative paucity of evidence on which to base treatment decisions was noted in a survey of uveitis practioners by *Sreekantham et al*, in which the majority stated that there was no or only low level published evidence to support key treatment decisions regarding perioperative management and choice of intraocular lens in these patients [8]. There is a real need for large volume population data in uveitic patients to help bridge this evidence gap, improving the decision-making process and helping inform patient and clinician expectations around outcome.

The use of electronic medical record (EMR) systems provides a way of acquiring large-scale pre-specified standardised data that are relevant to daily practice. In the context of cataract surgery we have recently reported on a multicenter database study of 81 984 eyes undergoing cataract surgery in the United Kingdom [9]. The United Kingdom National Health Service is an ideal setting for this study because it serves more than 90% of the population for cataract surgery and there has been widespread adoption of EMR systems that mandate collection of detailed standardised datasets developed by The Royal College of Ophthalmologists [10,11]. The ability to pool anonymised data from multiple centres enables relatively precise estimates of complication rates even for uncommon conditions such as uveitis. It also means that there is sufficient power for hypothesis testing. This is particularly relevant to complex diseases such as uveitis, for which multiple complications of the disease present at the time of surgery may affect visual outcome and would ideally be factored into any estimate of the risk of undertaking surgery.

The primary aim of this study is to define estimates of the likelihood and magnitude of visual gain and the risk of intra-operative and post-operative complications in uveitic eyes undergoing cataract surgery in a real-world setting compared to eyes without uveitis.

MATERIALS & METHODS

Eight independent NHS hospital ophthalmology departments in the United Kingdom using the same EMR system (Medisoft Ophthalmology, Medisoft Limited, Leeds, UK) provided routinely captured clinical data, based upon nationally standardised datasets approved by The Royal College of Ophthalmologists [10]. Lead clinician and Caldicott Guardian approval was obtained for all sites before extraction of the anonymised data. The Declaration of Helsinki, UK Data Protection Act and NIHR guidance on ethical approval were adhered to.

The study period was from 1st January 2010 to the 31st December 2014. All sites performed small-incision day-case phacoemulsification surgery. Raw data were electronically extracted and anonymised in May 2015. No verification against paper records was made as part of this study, so fidelity of documentation cannot be determined.

Following the decision to operate by an ophthalmologist, all sites recorded standardised nurse-led pre-operative assessment (with multiple standard data fields mandated by the EMR) and biometry. Routine post-operative care included a single visit 4-6 weeks following surgery conducted by a specialist nurse or optometrist. Eyes identified as high risk, such as those with known uveitis, were more likely to be reviewed earlier by an ophthalmologist.

Data fields extracted on demographics and pre-operative characteristics included: age, gender, laterality, visual acuity, intra-ocular pressure, diabetic status and ETDRS grading if relevant, use of preoperative intravitreal steroid, use of pre-operative topical NSAIDs and the presence of glaucoma, trabeculectomy and other pre-existing co-pathologies and use of prostaglandin analogues.

Data fields extracted from intra-operative records included: pupil size, grade of operating surgeon, use of pupil manipulation, any intraoperative complications, capsular rupture with or without vitreous loss and combined procedures such as pars plana vitrectomy.

Data fields extracted from post-operative visits included: visual acuity, intra-ocular pressure, use of intravitreal corticosteroid or topical NSAIDs, and whether there was any record of the development of cystoid macular oedema.

All eyes of patients who did not have their diabetic status recorded were excluded from subsequent analyses. The remaining eyes were classified as either uveitic or non-uveitic. Eyes were classified as uveitic if the term ‘uveitis’ was selected in the mandatory co-pathology field for the operated eye at the time of surgery or if there was any recorded diagnosis including the word ‘uveitis’ or either of the two terms ‘neuroretinitis’ or ‘ocular sarcoidosis’ at any preoperative visits. The latter terms were included as pre-existing specific diagnoses available from the limited pre-populated diagnosis database not featuring the term ‘uveitis’. In the EMR version used more common specific diagnoses were not readily available.

Pre-operative visual acuity and IOP used the values recorded closest to the date of surgery. If no value was recorded within 3 months prior to surgery the eye was excluded from analysis. Post–operative visual acuity and IOP used the last recorded measurements within each time period. If visual acuity was recorded in Snellen fractions these were converted to logMAR units with values corresponding to count fingers (CF), hand movements (HM), perception of light (PL) and no PL (NPL) substituted with 2.10, 2.40, 2.70 and 3.00 logMAR units respectively.[10]

Pre-existing co-pathologies were not mutually exclusive and were analysed individually but the aggregate number of co-pathologies for each eye (single or multiple) were also presented.

Due to the anonymised extraction of records, it was not possible in this study to identify, which patient each eye belonged to and therefore it was not possible to differentiate between two eyes from the same individual. Therefore all eyes were treated as independent units for the purpose of data analysis.

Comparisons of multiple pre, intra and post-operative characteristics and outcomes were made between eyes with uveitis (uveitic group) and those with no uveitis (reference group). To prevent the confounding effect of diabetic macular oedema on the occurrence of pseudophakic macular oedema, eyes of patients with diabetes were excluded from this particular analysis. Differences between groups were tested for statistical significance using multiple t test analysis with the Holm-Šídák method for multiple comparisons or chi-square tests for independence as indicated in figure legends using GraphPad Prism version 6.00 (GraphPad Software, La Jolla California USA). Linear regression was performed using STATA (StataCorp. 2013. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP).

RESULTS

An initial dataset was collected on a total of 111 641 eyes comprising all eyes undergoing cataract surgery between January 2010 and December 2014 at 8 centres. Of this cohort, 14 895 eyes were excluded as the diabetic status was not recorded. Of the remaining eyes, 1173 eyes were classified into the uveitis group and 95 573 eyes were classified into the non-uveitis reference group.

Tables 1 and 2 show the pre-operative demographic and clinical characteristics of the eyes and patients. The uveitic group was associated with a younger age, worse visual acuity, and a higher prevalence of co-existing glaucoma, previous trabeculectomy, prior use of topical prostaglandin analogues, intravitreal corticosteroid administration, and possessing one or more co-existing pathologies, shorter axial length and less high myopia. The reference cohort was associated with a greater prevalence of type II diabetes and age-related macular degeneration. There was no statistically significant difference between the two groups in terms of gender, laterality, pre-operative topical NSAID use, the presence of epiretinal membrane, amblyopia, corneal pathology, white cataract, previous retinal detachment, retinal vein occlusion, optic nerve disease, Pseudoexfoliation or the presence of type I diabetes or maculopathy and retinopathy.

Tables 3 and 4 show the differences in intra-operative and post-operative characteristics between the two groups. The uveitic group was associated with smaller pupil size, having surgery performed by consultant surgeons, requiring surgical pupil manipulation, or combined surgery such as planned pars plana vitrectomy. A higher incidence of PC rupture was documented when only cases performed by senior surgeons were compared between the two groups. No correlation between VA gain and total surgeon or cataract numbers at different sites was seen (**Supplementary Figure 1**).

The uveitic group was associated with poorer visual acuity at all three post-operative time points of 4 weeks, 4-12 weeks and 12-24 weeks, higher post-operative IOP and over twice as high preponderance of post-operative macular oedema (3.33% vs 1.35% $p<0.0001$) once eyes of diabetic patients were excluded from the analysis. Eyes of patients with uveitis had a mean pre-op VA of 0.87 compared to 0.65 LogMAR units in controls. At 12-24 weeks post-operatively, mean VA was 0.41 and 0.27 LogMAR units respectively. As a cohort, on average both groups of eyes improved by 3 to 4 lines on the LogMAR chart. Using a multivariate regression model controlling for pre-operative VA, the mean post-operative VA was significantly associated with uveitic status (coefficient 0.085; 95% confidence interval [CI]: 0.05-0.12; $t = 4.86$; $p < 0.01$). When controlling for pre-operative VA, the regression equation is as follows: Mean post-operative VA = 0.095 + 0.085 x uveitic status (1 or 0) + 0.28 x pre-operative VA. This implies both improve proportionately to pre-operative VA, although eyes with uveitis were on average 0.085 LogMAR worse post-operatively compared to controls.

Marked visual harm defined as a loss greater than 0.3 logMAR units from pre-operative baseline was assessed at 12-24 weeks post-op where data was available. The incidence was 3.8% of eyes in the uveitic group (16 of 421 eyes) however this was not statistically different from those in the control group at 2.9% (826 of 28305, $p=0.3577$, Chi-square). Eyes with uveitis suffering marked visual harm showed no consistent intraoperative complications, but had a higher mean IOP (21.3 vs 15.9mmHg) and greater incidence of glaucoma surgery (12.5% vs 1.2%).

DISCUSSION

This is the largest real-world study of cataract surgery in patients with uveitis reported and provides clear evidence of the burden of disease, additional risk of complications and worse visual outcomes in this cohort. Based on the analysed 96746 eyes from eight different centres, eyes with uveitis are noted to account for 1.2% of all cases and represent a younger, surgically demanding cohort, which may require significant additional resources at each treatment stage. Our study shows that whilst surgery for cataract in eyes with uveitis is associated with an improvement in mean VA, there are significantly higher rates of both intra-operative and post-operative complications with final VA in the uveitic cohort worse than the non-uveitic cohort at all time-points.

Visual Outcome

The key finding that cataract surgery is associated with improved visual outcome in patients with uveitis is consistent with previous studies. A systematic review analysed 13 studies of phacoemulsification, 10 of extra-capsular cataract extraction and eight of pars plana lensectomy in mixed groups of uveitis patients. It noted overall 71% that had intraocular lens (IOL) implantation achieved 20/40 postoperatively vs 52% of those left aphakic [12]. The review however contains a high proportion of older studies (up to 1997 for phacoemulsification) and mixes prospective and retrospective designs. Our study showed that of 1173 uveitic eyes undergoing cataract surgery between 2010 and 2014, 69% achieved a visual acuity of at least 20/40 in the 4-12 week post-op interval. Given recent advances in surgical (IOL, phacoemulsification machine, surgical technique) and medical aspects (increased range of drugs to control uveitis including local therapies) it is salutary that visual outcomes observed are similar to the systematic review, suggesting that there has not been a significant improvement in outcome during the intervening period.

More recent studies are limited by their size (and in some cases design) but do provide a useful comparison, with similar outcomes to our study. A single-surgeon retrospective study in 171 uveitic eyes reported that at 6 months a VA of 20/40 or better was achieved in 71% of eyes [6]. A small non-masked RCT investigating the effect of perioperative oral corticosteroid in 52 uveitic eyes undergoing phacoemulsification reported a VA improvement from 0.68 to 0.31 logMAR in the standard therapy group (intensive topical corticosteroid) and from 0.75 to 0.20 in the intervention group (intensive topical plus oral corticosteroid) [13]. During the two-year follow-up of the Multicenter Uveitis Steroid Treatment Trial, 117 eyes underwent cataract surgery where 62% of eyes achieved a VA of 6/12 or better at the 3 month post-operative visit, from a median of 56 letters at baseline to 79 letters at 3 months [14]. A multicentre trial randomising 126 uveitic eyes to phacoemulsification vs small incision cataract surgery noted that 44% achieved at least 20/36 and 91% achieved at least 20/63 at 6 months in the phacoemulsification group [15].

Our study provides a large survey of contemporary practice in an unselected uveitis cohort where all data was gathered into prospectively fixed data fields, then analysed retrospectively. This has clear advantages over smaller retrospective studies in terms of scale, but also avoids the selection bias inherent in studies that arise from single tertiary centres. The eight centres included in our study comprise a wide range of settings and size, providing a good representation of the UK population.

Risk of surgery

This study confirms that the uveitic population differs in being younger, with more advanced cataract and having much higher rates of co-pathology. Many of these pathologies will limit visual outcome. Surgery is shown to be technically more challenging with small pupils recorded in nearly a third of all uveitic eyes and significantly higher rates of additional procedures being required. The additional skill required is demonstrated by the larger proportion performed by Consultant (senior) surgeons.

It is likely the worse pre-operative VA represents a combination of the presence of more advanced cataract in this cohort combined with higher rates of visually significant pre-operative co-pathology, which is supported by the fact that mean VA fails to recover to the same levels as in the non-uveitic cohort. Whilst over two-thirds of eyes operated upon gained VA of at least 20/40, the more guarded prognosis might mean surgeon and patient preference may delay the decision to operate or be enforced by difficulties in achieving inflammatory control. Our linear regression model indicates despite uveitic status, pre-operative VA is the key determinant of post-operative VA. This association suggests delaying until VA significantly deteriorates might not always be the preferred option.

Direct comparison with other studies is difficult due to the variation in reporting. However, where evidence is available, studies report a high rate of additional procedures, notably intraoperative iris hook use between 19 and 67%, but a low risk of intraoperative complications [6,13,15]. The largest of these studies reported no posterior capsular ruptures in any of 171 uveitic eyes undergoing surgery [6].

Limitations

This study has a number of limitations. First, it is entirely observational. It allows the detection of interesting associations, estimates of risk and provides valuable benchmark data, but cannot provide high-level evidence to justify any particular intervention that a clinical trial might. Furthermore, EMR data could not be readily checked against paper medical notes, so the exact degree of verification is uncertain.

Second, a number of datafields are non-compulsory leading to higher rates of missing data than would be seen in a prospective clinical trial. Additionally, the accuracy of data entry is not subject to the routine audits of a trial. Our study does benefit from almost complete datasets for key variables of VA and presence of complications, which are compulsory fields mandated by the software. In contrast some other variables, which might be used to stratify patient risk are not compulsory, and thus are not available for analysis in our dataset. For example, details of the uveitic syndrome are not compulsory and so we have not attempted subgroup analysis by uveitis anatomical subtype or syndrome. Previous studies suggest that the prognosis may vary across uveitis subtype and this should be considered when counselling patients pre-operatively [12,14]. The inclusion strategy means the eyes included were predominantly those where the surgeon selected the co-pathology ‘uveitis’ at the time of operation. With regard to the use of corticosteroids, immunosuppressants and other treatments, the EMR could only capture a limited range of data, which was not sufficient to undertake meaningful subgroup analysis or stratification.

Finally, we acknowledge that due to the ‘real-world’ setting of our study the follow-up visits were not fixed. We dealt with this by grouping follow-up visits into pre-specified intervals reflecting clinically relevant follow-up periods. Whilst not all patients had

visits during all three time-frames reported, the scale of the study means that at any single time point, more than 400 uveitic eyes and 28 000 non-uveitic eyes were assessed. Indeed in the 4-12 week time-point, 595 uveitic eyes and 50 611 non-uveitic eyes were assessed, an unparalleled resource from a single study.

ACKNOWLEDGEMENTS

CJC is an NIHR Academic Clinical Lecturer in Ophthalmology. AKD has received a proportion of his funding from the following charities: Fight for Sight, the Birdshot Uveitis Society and the Uveitis Information Group (24BU151, 1994, 24UV13). We thank Dr Ines Leal, University of Lisbon for her assistance with statistical analysis. RLJ is a shareholder and the Medical Director of Medisoft Limited.

CONTRIBUTIONS

All authors (CJC, ADD, RLJ, YCY, AKD) according to ICMJE recommendations made substantial contributions to the conception or design of the work, the acquisition, analysis, or interpretation of data for the work and drafting the work, revising it critically for important intellectual content and gave final approval of the version to be published. All agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

COMPETING INTERESTS

There are no direct competing interests relating to this manuscript. Alcon (Fort Worth, TX, USA) provided a research grant to cover the cost of the initial data extraction but has not played any role in the study design or conduct. All authors have completed ICMJE disclosure forms.

REFERENCES

1 Durrani OM, Tehrani NN, Marr JE, *et al.* Degree, duration, and causes of visual loss in uveitis. *Br J Ophthalmol* 2004;**88**:1159–62. doi:10.1136/bjo.2003.037226

2 Foster CS, Fong LP, Singh G. Cataract surgery and intraocular lens implantation in patients with uveitis. *Ophthalmology* 1989;**96**:281–8. doi:10.1016/S0161-6420(89)32898-3

3 Estafanous MF, Lowder CY, Meisler DM, *et al.* Phacoemulsification cataract extraction and posterior chamber lens implantation in patients with uveitis. *Am J Ophthalmol* 2001;**131**:620–5. doi:10.1016/S0002-9394(00)00909-0

4 Süllü Y, Oge I, Erkan D. The results of cataract extraction and intraocular lens implantation in patients with Behçet's disease. *Acta Ophthalmol Scand* 2000;**78**:680–3.

5 Suresh PS, Jones NP. Phacoemulsification with intraocular lens implantation in patients with uveitis. *Eye (Lond)* 2001;**15**:621–8. doi:10.1038/eye.2001.197

6 Tomlins PJ, Sivaraj RR, Rauz S, *et al.* Long-term biocompatibility and visual outcomes of a hydrophilic acrylic intraocular lens in patients with uveitis. *J Cataract Refract Surg* 2014;**40**:618–25. doi:10.1016/j.jcrs.2013.09.013

7 Kawaguchi T, Mochizuki M, Miyata K, *et al.* Phacoemulsification cataract extraction and intraocular lens implantation in patients with uveitis. *J Cataract Refract Surg* 2007;**33**:305–9. doi:10.1016/j.jcrs.2006.10.038

8 Sreekantam S, Denniston AKO, Murray PI. Survey of expert practice and perceptions of the supporting clinical evidence for the management of uveitis-related cataract and cystoid macular oedema. *Ocul Immunol Inflamm* 2011;**19**:353–7. doi:10.3109/09273948.2011.592260

9 Chu CJ, Johnston RL, Buscombe C, *et al.* Risk Factors and Incidence of Macular Edema after Cataract Surgery: A Database Study of 81984 Eyes. *Ophthalmology* 2016;**123**:316–23. doi:10.1016/j.ophtha.2015.10.001

10 Day AC, Donachie PHJ, Sparrow JM, *et al.* The Royal College of Ophthalmologists' National Ophthalmology Database study of cataract surgery: report 1, visual outcomes and complications. *Eye* 2015;**29**:552–60. doi:10.1038/eye.2015.3

11 Keenan TDL, Keenan TDL, Johnston RL, *et al.* United Kingdom National Ophthalmology Database Study: Diabetic Retinopathy; Report 1: prevalence of centre-involving diabetic macular oedema and other grades of maculopathy and retinopathy in hospital eye services. *Eye* 2013;**27**:1397–404. doi:10.1038/eye.2013.196

12 Mehta S, Linton MM, Kempen JH. Outcomes of cataract surgery in patients with uveitis: a systematic review and meta-analysis. *Am J Ophthalmol* 2014;**158**:676–7. doi:10.1016/j.ajo.2014.06.018

13 Mora P, Gonzales S, Ghirardini S, *et al.* Perioperative prophylaxis to prevent recurrence following cataract surgery in uveitic patients: a two-centre, prospective, randomized trial. *Acta Ophthalmologica* Published Online First: 5

February 2016. doi:10.1111/aos.12955

14 Sen HN, Abreu FM, Louis TA, *et al.* Cataract Surgery Outcomes in Uveitis: The Multicenter Uveitis Steroid Treatment Trial. *Ophthalmology* 2016;**123**:183–90. doi:10.1016/j.ophtha.2015.09.022

15 Bhargava R, Kumar P, Sharma SK, *et al.* Phacoemulsification versus small incision cataract surgery in patients with uveitis. *Int J Ophthalmol* 2015;**8**:965–70. doi:10.3980/j.issn.2222-3959.2015.05.20

	No Uveitis			Uveitis			P value
	Mean	SD	n	Mean	SD	n	
Age (years)	74.36	10.77	95568	66.43	15.35	1173	<0.0001
Pre-op VA (logMAR)	0.65	0.55	95471	0.87	0.70	1172	<0.0001
Axial length (mm)	23.49	1.40	95507	23.23	1.50	1173	<0.0001
Pre-op IOP (mmHg)	16.41	3.67	67584	16.03	5.30	780	0.0043

Table 1. Pre-operative continuous data characteristics of the Uveitis and reference groups. *Pre-op VA and IOP values are within 3 months of surgery unless stated otherwise. P values are shown for multiple t tests using the Holm-Sidak method for multiple comparisons using an α of 5.00. SD = Standard deviation, VA = Visual acuity, pre-op = pre-operatively, IOP = Intraocular pressure. logMAR = logarithm of the minimum angle of resolution, mm= millimetres, mmHg = millimetres of mercury.*

Nominal characteristic	No Uveitis		Uveitis		
	No. of eyes	Frequency (%)	No. of eyes	Frequency (%)	P-value
Baseline Total number of eyes	95573	-	1173	-	-
Laterality					
Left eye	46886	49.1	601	51.2	0.1380
Right eye	48687	50.9	572	48.8	
Gender					
Male	40252	42.1	471	40.2	0.1758
Female	55320	57.9	702	59.8	
Intravitreal Steroid use					
Any time Pre-op	180	0.18	14	1.19	<0.0001
Within 3 months Pre-op	19	0.01	5	0.43	<0.0001
Topical NSAID use					
Pre-op	18	0.02	2	0.17	0.0102
Other co-pathology excluding uveitis					
Single	32012	33.49	432	36.82	0.0177
Multiple	268	0.28	147	12.53	<0.0001
Co-pathology subgroups					
Epiretinal membrane	1300	1.36	11	0.94	0.2146
Amblyopia	855	0.89	6	0.51	0.1650
Corneal pathology	2502	2.62	21	1.79	0.0771
Previous retinal detachment surgery	955	1.00	6	0.51	0.0941
Previous trabeculectomy	44	0.05	3	0.26	0.0012
Glaucoma	6628	6.94	148	12.62	<0.0001
White cataract	2295	2.40	38	3.24	0.0629
High Myopia	2740	2.87	10	0.85	<0.0001
Optic Nerve/CNS disease	189	0.20	0	0	0.1274
Pseudoexfoliation/ phacodonesis	606	0.63	2	0.17	0.0458
Pre-op topical PGA use	7583	7.93	160	13.64	<0.0001
Previous retinal vein occlusion	838	0.88	13	1.11	0.3988
Age-related Macular Degeneration	5477	5.73	14	1.19	<0.0001
Diabetes Mellitus					
Any Diabetes	23286	24.4	242	20.6	0.0031
Type I Diabetes	1799	1.9	25	2.1	0.5332
Type II Diabetes	21104	22.1	213	18.2	0.0013
Diabetic Retinopathy (eyes with ETDRS data)					
Eyes with ETDRS data available	9142	-	88	-	-
No retinopathy	4987	54.6	47	53.4	0.8306
Maculopathy	662	7.2	4	4.5	0.3307
Non-proliferative DR	3107	34.0	31	35.2	0.8067
Proliferative DR	408	4.5	4	4.5	0.9702
Previous PRP, stable Retinopathy	640	7.0	6	6.8	0.9468

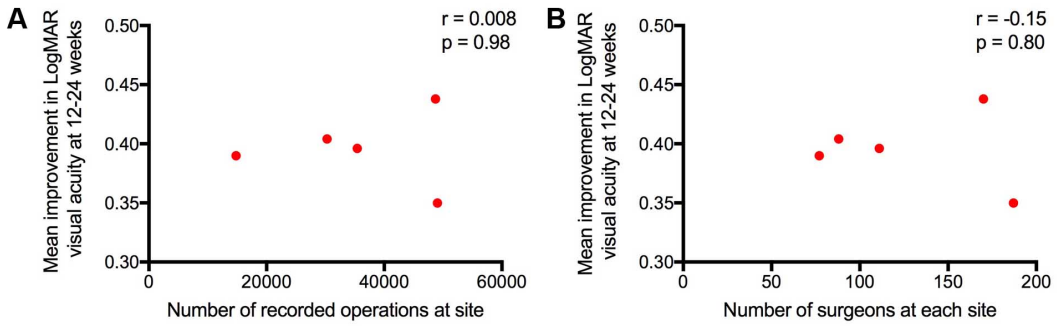
Table 2. Pre-operative nominal data characteristics of the Uveitis and reference groups. *DR = Diabetic retinopathy, ETDRS = Early treatment of diabetic retinopathy study, PRP = Panretinal photocoagulation, NSAID = Non-steroidal anti-inflammatory drug, CNS = central nervous system, PGA = Prostaglandin analogue, Pre-op = pre-operatively. P-values from Chi-square test for independence.*

Nominal characteristic	No Uveitis		Uveitis		
	No. of eyes	Frequency (%)	No. of eyes	Frequency (%)	P-value
Baseline Total number of eyes	95573	-	1173	-	-
Pupil size					
Small	3113	3.26	287	24.47	<0.0001
Medium	13669	14.30	186	15.86	
Large	78791	82.44	700	59.68	
Seniority of operating surgeon					
Consultant	52669	55.11	856	72.98	<0.0001
Non-consultant	42904	44.89	317	27.02	
Type of Surgery					
Phaco + IOL alone	89403	93.54	848	72.3	<0.0001
Phaco + Iris procedure (iris hooks, pupil ring, sphincterotomy, iris stretch or synaechiolysis)	560	0.59	91	7.76	<0.0001
Phaco + Glaucoma procedure (trabeculectomy, cyclodiode, needling, MIGS or gonio surgery)	881	0.92	42	3.58	<0.0001
Phaco + injection of drug (Intravitreal or sub-tenon injection)	78	0.08	29	2.47	<0.0001
Phaco + Capsular tension ring	153	0.16	32	2.72	<0.0001
Phaco + Pars Plana Vitrectomy	138	0.14	8	0.68	<0.0001
Other (including multiple surgical procedures)	4276	4.47	117	9.97	<0.0001
Intraoperative complications					
Any complication	3719	3.89	69	5.88	0.0005
PC rupture – with or without vitreous loss (all surgeons)	1787	1.87	28	2.39	0.1944
PC rupture – with or without vitreous loss (consultant only)	804	0.84	18	1.53	0.0101
Intravitreal Steroid use					
Any time Post-op	271	0.28	20	1.70	<0.0001
Within 3 months Post-op	48	0.05	6	0.51	<0.0001
Topical NSAID use					
Post-op	2975	3.11	118	10.06	<0.0001
Pseudophakic macular oedema (non-diabetic eyes)					
Total non-diabetic eyes	72300	-	931	-	<0.0001
Non-diabetic eyes with pseudophakic macular oedema	999	1.38	31	3.33	

Table 3. Intraoperative and post-operative nominal data characteristics of the Uveitis and reference groups. *PC = Posterior capsule, IOL = Intraocular lens, Phaco = Phacoemulsification cataract surgery, NSAID = Non-steroidal anti-inflammatory drug, P-values from Chi-square test for independence.*

	No Uveitis			Uveitis			P value
	Mean	**SD**	**n**	**Mean**	**SD**	**n**	
Post-op VA (logMAR)							
4 week	0.32	0.41	42174	0.52	0.57	531	<0.0001
4-12 week	0.22	0.36	50611	0.36	0.48	595	<0.0001
12-24 week	0.27	0.38	28305	0.41	0.54	421	<0.0001
Improvement in VA from baseline to 12-24 week	0.34	0.52	25789	0.4	0.61	398	0.0227
IOP (mmHg)							
Post-op	15.23	3.97	57514	15.54	5.91	688	0.0432

Table 4. Post-operative continuous data characteristics of the Uveitis and reference groups. *Post-op VA values are the latest recorded value within the time period. Post-op IOP is the first recorded in the EMR within 3 months of surgery. P values are shown for multiple t tests using the Holm-Sidak method for multiple comparisons using an α of 5.00. SD = Standard deviation, VA = Visual acuity, mmHg = millimetres of mercury, IOP = Intraocular pressure, logMAR = logarithm of the minimum angle of resolution.*



Supplementary Figure 1. No correlations were identified between contributing clinical sites in terms of surgeon or operation numbers. Mean visual acuity improvement for five sites where separate data was available for all cataract surgery was correlated with **A)** the total number of cataract operations recorded and **B)** total number of surgeons at each site. No statistically significant correlations were observed. Pearson correlation used.