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Changes in Intraocular Pressure and Anterior Segment Morphometry after Uneventful Phacoemulsification Cataract Surgery

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CLINICAL STUDY

Changes in intraocular pressure and anterior segment morphometry after uneventful phacoemulsification cataract surgery

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Abstract

Purpose To study changes in anterior segment morphometry after uneventful phacoemulsification cataract surgery, and to investigate whether there is a relationship between any observed changes and intraocular pressure (IOP) reduction after the procedure.
Methods The anterior chamber depth (ACD), anterior chamber volume (ACV), anterior chamber angle (ACA), central corneal thickness (CCT), and IOP were measured in 101 non-glaucomatous eyes before and after uneventful phacoemulsification cataract surgery.
Results After cataract surgery, the mean ACD, ACV, and ACA values increased by 1.08 mm, 54.4 mm^3, and 13.1°, respectively, and the mean IOP (corrected for CCT) decreased by 3.2 mm Hg. The predictive value of a previously described index (preoperative ACD/preoperative IOP (corrected for CCT) or CPD ratio) for IOP (corrected for CCT) reduction after cataract surgery was confirmed, reflected in an r^2 value of 23.3% between these two parameters ($P<0.001$). Other indices predictive of IOP reduction after cataract surgery were also identified, including preoperative IOP/preoperative ACV and preoperative IOP/preoperative ACA, reflected in r^2 values of 13.7 and 13.7%, respectively ($P<0.001$ and $P<0.001$, respectively).
Conclusions Our study confirms the predictive value of the CPD ratio for IOP reduction after cataract surgery, and may contribute to the decision-making process in patients with glaucoma or ocular hypertension. Furthermore, two novel indices of preoperative parameters that are predictive for IOP reduction after cataract surgery were identified, and enhance our understanding of the mechanisms underlying IOP changes after this procedure.
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Keywords: intraocular pressure; anterior chamber depth; anterior chamber volume; anterior chamber angle; phacoemulsification; predictive ratio

Introduction

An increase in anterior chamber depth (ACD) after phacoemulsification cataract surgery has been well documented,[1–6] and a significant decrease in intraocular pressure (IOP) after this surgery has also been consistently reported,[1,7–9] especially in eyes with narrow angles where it has been found that cataract extraction can permanently normalise IOP.[1,10–15]

In 2005, Issa *et al* showed that the reduction in IOP after cataract surgery was positively related to preoperative IOP and inversely related to preoperative ACD. They also described a novel index, the preoperative IOP to the preoperative ACD (PD) ratio, which is strongly predictive for IOP reduction after phacoemulsification cataract surgery,[1] and this has since been confirmed by other investigators in extreme hypermetropes.[14] However, in these studies, IOP readings were not adjusted for central corneal thickness (CCT).

Given that reductions in IOP after cataract surgery are inversely related to preoperative ACD,[1] it would seem reasonable to hypothesise that any observed reduction in IOP after cataract surgery would also be inversely (and perhaps more significantly) related to preoperative anterior chamber volume (ACV) and/or anterior chamber angle (ACA). In this study, we prospectively investigated changes in ACD, ACV, ACA, and IOP after uneventful phacoemulsification cataract surgery, and also investigated whether there were demonstrable relationships between any observed changes in these parameters.

Materials and methods

We prospectively studied 120 non-glaucomatous eyes of 102 patients without visually consequential ocular comorbidity, all of whom underwent uneventful phacoemulsification cataract surgery between November 2008 and May 2009. Eyes of patients with a history of trauma or ocular surgery were excluded. This study was approved by the South East Regional Ethics Committee, and the study protocol adhered to the tenets of the Declaration of Helsinki. Valid and informed consent was obtained from each volunteer before enrolment. We certify that all applicable institutional and governmental regulations regarding the ethical use of human volunteers were followed during this research.

Preoperative assessment

Preoperative assessment was typically conducted 3–5 weeks before cataract surgery, and included recording the following data: demographic and contact details, general health status, uncorrected visual acuity, best-corrected visual acuity (BCVA), contrast sensitivity, examination of the eye by slit-lamp biomicroscopy, including IOP measurements by Goldmann applanation tonometry, ocular biometry (IOLMaster version 5, Carl Zeiss Ltd., Welwyn Garden City, UK), autorefraction (Potec PRK-5000, Auto-ref keratometer, Daejeon City, South Korea), a discussion regarding the desired postoperative refraction for individual subject, and a discussion regarding the risks and benefits of cataract surgery, so that informed and valid consent could be given.

In patients undergoing sequential bilateral phacoemulsification cataract surgery, we randomly selected (by coin toss) only one eye to be included in the study.

Evaluation of anterior segment anatomical parameters

Thereafter, for this study, the following measurements were recorded on the Pentacam (Oculus Optikgeräte GmBH, Germany): (1) CCT, (2) internal ACD (not Q1
including CCT), (3) ACV, and(4) ACA.

The Pentacam measurement was performed with the patient seated using a chinrest and forehead strap. All measurements were performed in a room with a standard dim illumination. The patient was asked to fixate on a black fixation target over a blue background illumination. The Pentacam system uses a rotating Q2
Scheimpflug camera and a monochromatic slit-light source that together rotate 360° around the optical axis of the eye. The system thus acquires 25 or 50 images of the anterior segment of the eye in 2 s, and the software enables evaluation and quantification of anterior and posterior corneal elevation data, corneal thickness, ACV, ACD (not including corneal thickness), and ACA from the acquired images. In this study, the system was set to acquire 25 images per scan at the automatic release mode (images captured automatically) and software version 1.16 was used. Three measurements were obtained in each study eye and the best was used in quantitative analyses. Postoperative ACD was examined, using inbuilt calipers on the Pentacam screen (Figure 1) because of the possible failure to identify the anterior surface of the IOL.[15] IOP values were adjusted for CCT

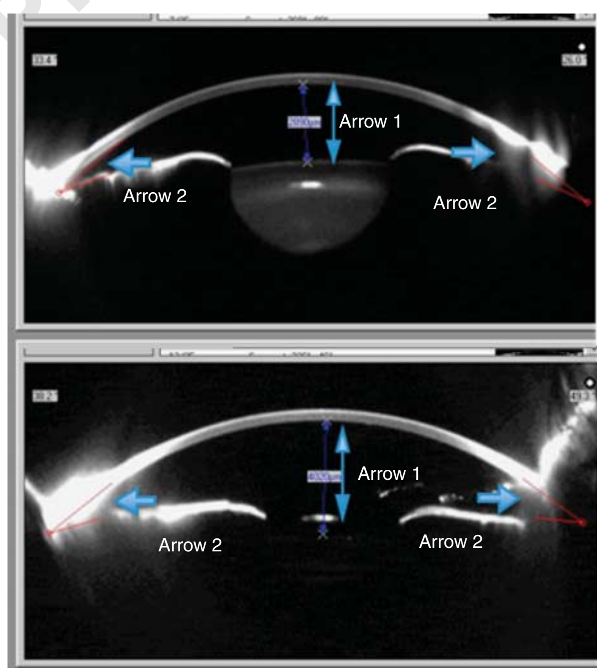

Figure 1 (a and b) A screenshot for the Pentacam, displaying the anterior segment images preoperatively (panel a) and 6 weeks after cataract surgery (panel b) in a study eye. Internal anterior chamber depth (ACD) (Arrow 1); anterior chamber volume (ACV); anterior chamber angle (ACA) (Arrow 2).

by the Pentacam software using the Ehlers formula (corrected IOP = uncorrected IOP−(CCT−520) × (5/70)).[11–13]

Surgical procedures

In each study eye, surgical procedures were conducted under topical anaesthesia (proxymetacaine hydrochloride 0.5%, Minims, Chauvin Pharmaceuticals, Surrey, UK). All operations were performed through a 2.75-mm superior clear corneal incision. A continuous curvilinear capsulorrhexis was completed after viscoelastic injection (Healon, Advanced Medical Optics Inc., Santa Ana, CA, USA), and hydrodissection was Q3 performed using balanced salt solution (BSS, Alcon Laboratories Inc., UK). The irrigation solution contained 16% gentamicin sulphate (80 mg Genticin, Roche, Welwyn Garden City, UK) in 500 ml of BSS PLUS surgical solution (Alcon Laboratories Inc.). After removing the nucleus using torsional phaco-technology (Infiniti, Alcon Laboratories Inc.), irrigation and aspiration of soft lens matter was performed; thereafter a foldable, posterior chamber intraocular lens (Tecnis ZA9003, Advanced Medical Optics Inc.) was implanted in the capsular bag using an introducer (AMO EmeraldT Series Unfolder and Cartridge, Advanced Medical Optics Inc.). Stromal hydration was then performed to achieve wound integrity; a 10-0 nylon suture was occasionally placed in the corneal wound when wound integrity was deemed inadequate by the surgeon. Intracameral cefuroxime Q4 (1 mg Zinacef, GlaxoSmithKline, UK, in 0.1 ml of sterile water for injection, B Braun Medical Inc., Bethlehem, PA, USA) was administered through the paracentesis. A single drop of 1% apraclonidine (Iopidine 1%, Alcon laboratories Inc.) and an aliquot of 1% fucidic acid ointment (Fucithalmic Leo Pharmaceutics, ON, Canada) were then administered to the corneal surface.

Postoperative examination

The patient was re-examined 6 weeks postoperatively, using a protocol identical to that of the preoperative assessment (but with the exception of ocular biometry).

Statistical analysis

Q5 Data were analysed using an Aabel software package (version 3), and differences between preoperative and 6-week postoperative measures were assessed using a paired-sample two-tailed Student's t-test. The P-values presented were not adjusted for multiple comparisons; however, many of the reported P-values are extremely small (<0.001), and it is unlikely that our conclusions with respect to statistical significance would have been altered, had we used the very conservative Bonferroni adjustment procedure. Standard tests for normality of differences (paired t-tests) and residuals (regression) were conducted, and data were found to be normally distributed in all cases. Relationships between anterior segment parameters (and changes in anterior segment parameters) and IOP were investigated using Pearson's correlation coefficient. In this paper, r^2 values from regression analysis are reported. Correlation (r) is also reported, to indicate the existence (or not) of an inverse relationship ($r<0$) which is not conveyed by the r^2 value. A P-value of <0.05 was considered statistically significant. We also calculated the true-positive percentage, false-positive percentage, false-negative percentage, true-negative percentage, sensitivity, specificity, and positive-predictive value for a postoperative IOP reduction of $\geqslant 2$ mm Hg for a given critical value of each ratio of preoperative parameters that we generated.

Results

We studied 101 eyes (53 left and 48 right eyes) of 101 volunteers. Mean age ± SD was 69.2 ± 10.9 years, and 38.2% were male and 61.8% female. Mean LogMAR BCVA was found to improve significantly from a preoperative level of 0.43 ± 0.53 to a postoperative level of 0.04 ± 0.32 (paired two-tailed Student's t-test; $P<0.001$).

Preoperatively, there were 8 (7.9%) emmetropes (spherical equivalent (SE) $<+0.50$ D, >-0.50 D), 52 (51.5%) hypermetropes (SE $\geqslant +0.50$ D), and 41 (40.6%) myopes (SE $\leqslant -0.50$ D). The mean absolute SE was found to change significantly from a preoperative level of 2.29 ± 3.28 D to a postoperative level of 0.57 ± 0.45 D (paired two-tailed Student's t-test; $P<0.001$). There was a mean postoperative absolute SE prediction error of 0.49 ± 0.41 D with a range of −1.47 to +1.68 D.

The mean preoperative and postoperative internal ACD were 2.66 ± 0.38 and 3.70 ± 0.75 mm, respectively, and this represented a significant mean increase of 1.08 ± 0.50 mm (two-tailed paired Student's t-test; $P<0.001$). The mean preoperative and postoperative ACV were 142.3 ± 38.6 and 193.5 ± 33.6 mm^3, respectively, and this represented a mean increase of 54.4 ± 26.5 mm^3 (two-tailed paired Student's t-test; $P<0.001$). The mean preoperative and postoperative ACA were 30.1 ± 6.0 and 42.3 ± 7.5°, respectively, and this represented a mean increase of 13.1 ± 6.6° (two-tailed paired Student's t-test; $P<0.001$).

The mean preoperative and postoperative IOP (not corrected for CCT) were 14.8 ± 3.1 and 12.3 ± 2.7 mm Hg, respectively, and this represented a mean decrease of 2.5 ± 3.2 mm Hg (two-tailed paired Student's t-test;

$P < 0.001$). The mean preoperative and postoperative IOP (corrected for CCT) were 15.6 ± 3.8 and 11.8 ± 4.0 mm Hg respectively, and this represented a mean decrease of 3.8 ± 4.0 mm Hg (two-tailed paired Student's *t*-test; $P < 0.001$). Furthermore, it was noted that corrected IOP reduction was not significantly inversely related to preoperative ACD (Pearson's correlation; $r = -0.13$; $r^2 = 1.6\%$; $P = 0.104$), ACV (Pearson's correlation; $r = -0.12$; $r^2 = 1.4\%$; $P = 0.123$, or ACA (Pearson's correlation; $r = -0.03$; $r^2 = 0.1\%$; $P = 0.4$).

The mean preoperative and postoperative CCT were 528.1 ± 35.0 and $531.4 \pm 35.1\,\mu$m, respectively, and this mean increase of $3.4 \pm 12.6\,\mu$m was not statistically significant (two-tailed paired Student's *t*-test; $P = 0.52$). The mean pupil diameter did not change significantly from the mean preoperative level of 2.72 ± 0.46 mm to 2.70 ± 0.53 postoperatively (two-tailed paired Student's *t*-test; $P = 0.48$). Male patients experienced a mean postoperative reduction in corrected IOP of 5.6 ± 3.7 mm Hg, which was significantly greater than that for female patients (2.7 ± 3.7; two-tailed unpaired Student's *t*-test; $P < 0.001$). Other variables, including age, change in pupil diameter, and laterality, were not significantly related to mean postoperative-corrected IOP reduction (multiple linear regression analysis; range of *P*-values: 0.43 to >0.5).

Our results confirmed the predictive value of the preoperative (uncorrected) IOP to preoperative ACD ratio, or PD ratio (preoperative IOP/preoperative ACD).[1] The (uncorrected) PD ratio was positively related to the extent of uncorrected IOP reduction (Pearson's correlation; $r = 0.56$; $r^2 = 31.4\%$; $P < 0.001$). The positive-predictive value for a PD ratio >6.0 mm Hg/mm experiencing a postoperative decrease in (uncorrected) IOP $\geqslant 2$ mm Hg was 86.1% (Table 1), and this compares favourably with that for a PD ratio <6.0 mm Hg/mm of only 42.9% for such an (uncorrected) IOP reduction. A sensitivity of 46.3% and a specificity of 85.3% for a PD ratio of >6.0 mm Hg/mm for such an IOP reduction were found.

The predictive value of the PD ratio is retained when the IOP is corrected for CCT using the Ehlers formula.[13] CPD is significantly and positively related to the postoperative reduction in corrected IOP (Pearson's correlation; $r = 0.48$; $r^2 = 23.3\%$; $P < 0.001$) (Figure 2). The positive-predictive value for a CPD ratio $\geqslant 6.2$ mm Hg/mm experiencing a postoperative decrease in IOP (corrected for CCT) of $\geqslant 2$ mm Hg was 86.4% (Table 1),

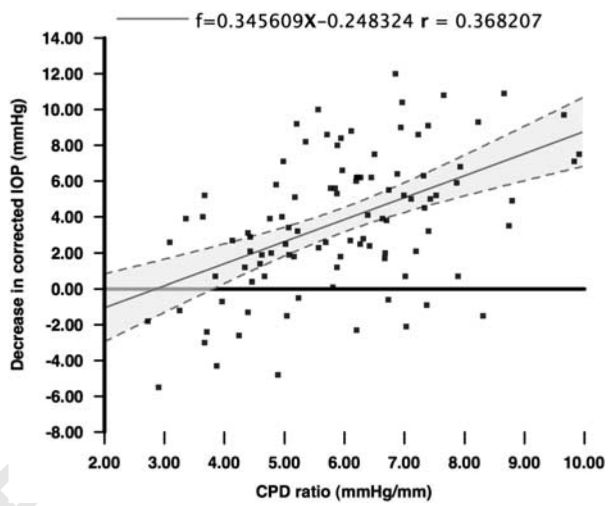

Figure 2 Scatter plot of the significant and positive relationship between the (corrected) intraocular pressure (IOP) to anterior chamber depth ratio (CPD ratio; mm Hg/mm; *x* axis) and reduction in (corrected) IOP after uneventful phacoemulsification cataract surgery; red line—best-fit line equation: postoperative decrease in corrected IOP $= 1.23 \times$ PD-3.53; shaded area—95% confidence belt (Pearson's correlation; $r = 0.48$; $r^2 = 23.3\%$; $P < 0.001$). The colour reproduction of this figure is available on the html full text version of the manuscript.

Table 1 Sensitivities, specificities, and positive-predictive values for all ratios with respect to a reduction in (corrected) intraocular pressure (IOP) of at least 2 mm Hg after cataract surgery

Ratio	*Critical value*	*TP (%)*	*FP (%)*	*FN (%)*	*TN (%)*	*Sensitivity (%)*	*Specificity (%)*	*Positive-predictive value (%)*
PD	6.0 mm Hg/mm	30.7	5.0	35.6	28.7	46.3	85.3	86.1
CPD	6.2 mm Hg/mm	37.6	5.9	31.7	24.8	54.3	80.6	86.4
PV	11.2 mm Hg/mm^3	35.6	6.9	33.7	23.8	51.4	77.4	83.7
PA	5.6 mm Hg per degree	36.6	5.9	32.7	24.8	52.9	80.6	86.0

CPD, (corrected) preoperative IOP to preoperative anterior chamber depth ratio; FN, false negative refers to the number of eyes with a given ratio less than the critical value and a postoperative reduction in IOP of $\geqslant 2$ mm Hg; FP, false positive refers to the number of eyes with a given ratio greater than or equal to the critical value and a postoperative reduction in IOP of <2 mm Hg; PA, (corrected) preoperative IOP to preoperative anterior chamber angle ratio; PD, (uncorrected) preoperative IOP to preoperative anterior chamber depth ratio; PV, (corrected) preoperative IOP to preoperative anterior chamber volume ratio; TN, true negative refers to the number of eyes with a given ratio less than the critical value and a postoperative reduction in IOP of <2 mm Hg; TP, true positive refers to the number of eyes with a given ratio greater than or equal to the critical value and a postoperative reduction in IOP of $\geqslant 2$ mm Hg.

Critical value: When a given ratio has a value greater than or equal to the critical value, the corresponding sensitivity, specificity, and positive-predictive values relate to a postoperative reduction in corrected IOP of at least 2 mm Hg.

and this compares favourably with that observed for a CPD ratio <6.2 of only 42.1% for such a (corrected) IOP reduction. A sensitivity of 54.3% and a specificity of 80.6% for a CPD ratio of ⩾6.2 mm Hg/mm for such an IOP reduction were found.

We also investigated the predictive value of the corrected pressure to volume ratio, or PV ratio (100 × preoperative-corrected IOP/preoperative ACV). The PV ratio was positively related to the extent of corrected IOP reduction (Pearson's correlation; $r = 0.37$; $r^2 = 13.7\%$; $P < 0.001$) (Figure 3). The positive-predictive value for a PV ratio ⩾11.2 mm Hg/mm^3 experiencing a postoperative decrease in corrected IOP ⩾2 mm Hg was 83.7% (Table 1), and this compares favourably with that observed for a PV ratio <11.2 mm Hg/mm^3 of only 44.2% for such a (corrected) IOP reduction. A sensitivity of 51.4% and a specificity of 77.4% for a PV ratio ⩾11.2 mm Hg/mm^3 for such an IOP reduction were found.

We also investigated the predictive value of the pressure to angle ratio, or PA ratio (preoperative-corrected IOP/preoperative ACA). The PA ratio was positively related to the extent of corrected IOP reduction (Pearson's correlation; $r = 0.37$; $r^2 = 13.7\%$; $P < 0.001$) (Figure 4). The positive-predictive value for a PA ratio ⩾5.6 mm Hg per degree experiencing a postoperative decrease in corrected IOP ⩾2 mm Hg was 86.0% (Table 1), and this compares favourably with that for a PA ratio <5.6 mm Hg per degree of only 42.9% for such a (corrected) IOP reduction. A sensitivity of 52.9% and a specificity of 80.6% for a PA ratio ⩾5.6 mm Hg per degree for such an IOP reduction were found.

Discussion

In this study, we observed a significant increase in ACD, ACV, and ACA (1.08 mm, 54.4 mm^3, and 13.1°, respectively) and a decrease in mean IOP (uncorrected: 2.47 mm Hg; corrected: 3.18 mm Hg) after uneventful phacoemulsification cataract surgery, and these findings were broadly comparable with those of previous reports (ACD: 0.87–1.62 mm;[1,10,16] ACV: 35.0–36.2 mm^3;[1,10,16] ACA: 5.8–9.0°;[1,10,16] decrease in (uncorrected) IOP: 1.8–2.6 mm Hg[1,10,16]). However, increases in ACV and ACA observed in this study were somewhat greater than those reported by previous investigators, and this may be attributable to the fact that our patients had a tendency towards hypermetropia preoperatively (median preoperative SE: +0.50 D), as it has been shown that hypermetropes exhibit more dramatic changes in anterior segment parameters after cataract surgery.[14] The refractive state of the patients is not commented on in the study by Doganay *et al*[10] or by Ucakhan *et al*,[16] both of which also used the Pentacam but on slightly younger patients (and therefore with potentially thinner crystalline lenses preoperatively), than in our study

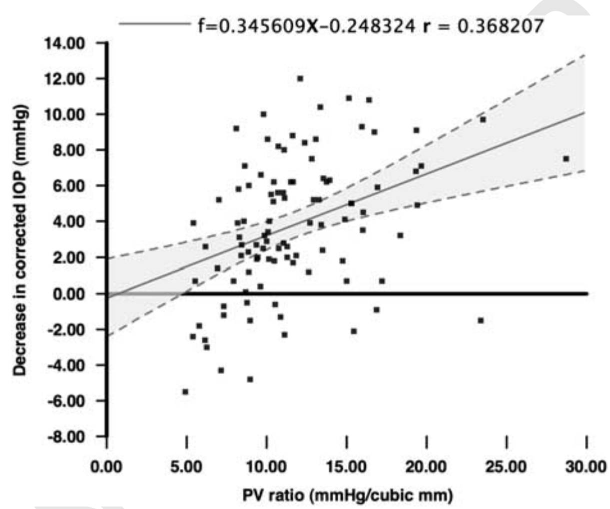

Figure 3 Scatter plot of the significant and positive relationship between the (corrected) intraocular pressure (IOP) to anterior chamber volume ratio (PV ratio; mm Hg/mm^3; x axis) and reduction in (corrected) IOP after uneventful phacoemulsification cataract surgery; red line—best-fit line, equation: postoperative decrease in corrected IOP = 0.35 × PV−0.25: shaded area—95% confidence belt (Pearson's correlation; $r = 0.37$; $r^2 = 13.7\%$; $P < 0.001$). The colour reproduction of this figure is available on the html full text version of the manuscript.

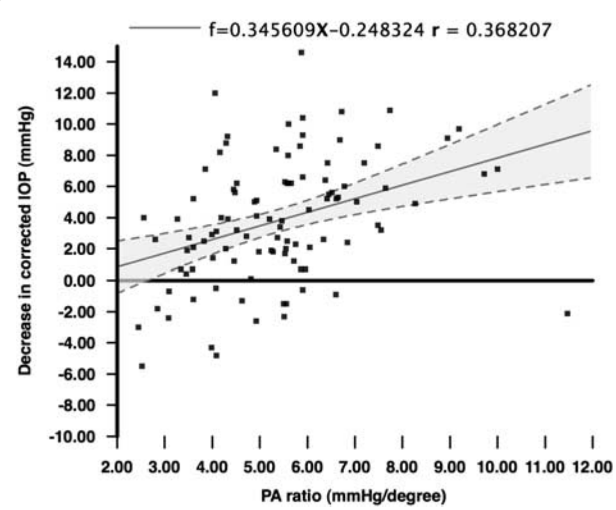

Figure 4 Scatter plot of the significant and positive relationship between the (corrected) intraocular pressure (IOP) to anterior chamber angle ratio (PA ratio; mm Hg/mm; x axis) and reduction in (corrected) IOP after uneventful phacoemulsification cataract surgery; red line—best-fit line, equation: postoperative decrease in corrected IOP = 0.87 × PA−0.91: shaded area—95% confidence belt (Pearson's correlation; $r = 0.37$; $r^2 = 13.7\%$; $P < 0.001$). The colour reproduction of this figure is available on the html full text version of the manuscript.

(65.37[10] and 65.8 years[16] *vs* 69.2 years in the current study). It is noteworthy that excellent reproducibility and test–retest variability of anterior segment parameters measured using the Pentacam has been previously reported.[17–19] Another important, but possibly related, difference between our study and that of Doganay *et al*[10] and Ucakhan *et al*[16] rests on the ethnic differences between study populations. All of our participants were White Caucasians, whereas those studied by Doganay *et al*[10] and Ucakhan *et al*[16] were of Turkish origin. Toker *et al*[20] reported, in a study on the refractive status of 95 Turkish adults, that 39 and 19% were myopic and hypermetropic, respectively. The greater proportion of hypermetropes in our study ($n = 53$; 52.0%) could have contributed to the greater changes in ACV and ACA that we observed, when compared with the work of other investigators.

Six weeks after uneventful phacoemulsification cataract surgery, mean CCT had not changed significantly, and this is in keeping with the work of previous investigators.[1,10,16]

Our study confirms the predictive value of the PD ratio for IOP reduction after uneventful cataract surgery, even when IOP is corrected for CCT.

Issa *et al*[1] found that only 28% of their patients had a (uncorrected) PD ratio >6.0, whereas in our study, 35.6% of operated eyes exhibited a (uncorrected) PD ratio >6.0, and the difference between the two studies in this respect may be due to differing methodologies (non-contact measurement of the internal ACD in this study, *vs* the contact method used to measure the unspecified ACD by Issa *et al*[1]).

This study shows, for the first time, that the PD ratio remains positively correlated with IOP reduction after cataract surgery, even when its components are corrected for corneal thickness using the Ehlers formula[11] (corrected pressure-to-depth ratio, or CPD ratio). Data suggest that a CPD ratio of $\geqslant$6.2 mm Hg/mm yields a high positive-predictive value, a high specificity, and a high sensitivity for an IOP reduction of $\geqslant$2 mm Hg after cataract surgery (Table 1). In other words, our findings represent an evidence base in support of the use of the CPD ratio as a clinical tool to identify patients likely to exhibit a clinically meaningful IOP reduction after cataract surgery (of at least 2 mm Hg).

In this study, we also identified two further (but related) indices, which are predictive for IOP reduction after cataract surgery. The (corrected) PV ratio and the (corrected) PA ratio were shown to be significantly and directly related to the observed postoperative reduction in (corrected) IOP. However, of the various indices corrected for CCT, the CPD ratio exhibited the strongest relationship with IOP reduction after cataract surgery. Intuitively, one might have expected the PA ratio to be the strongest predictor of IOP reduction after cataract surgery, but this is not the case, and this is attributable to the fact that the observed reduction in IOP after cataract surgery had a stronger (although not statistically significant) relationship with preoperative ACD than with preoperative ACA.

Postulated mechanisms for the observed reduction in IOP after cataract surgery include a reduction in aqueous production,[1,10,16] an increase in uveoscleral outflow,[10] and an increase in conventional outflow mediated by the relief of latent and/or relative pupillary block in eyes with shallow anterior chambers.[21] This latter mechanism is considered to be mediated by a backward shift of the iris (with a consequential mean opening of the ACA by 10°) after removal of the crystalline lens.[16] The two former postulated mechanisms are unlikely to be related to the changes that we recorded in anterior segment parameters after cataract surgery, whereas the latter would, intuitively, seem to be related to the changes that we observed. Interestingly, Fraser and Wormald[22] reported a reduction in the need for management of angle closure glaucoma and narrow angle glaucoma in conjunction with the reducing threshold (and consequential increase in volume) of cataract surgery in the United Kingdom, reflected in a 30% reduction in laser iridotomies synchronous with a 52% increase in cataract operations in 300 NHS (National Health Service) trusts over a 6-year study period.[22] The findings by Fraser and Wormald[22] are consistent with the hypothesis that IOP reduction after cataract surgery is attributable to enhanced aqueous outflow through the ACA after this procedure.

Previous investigators have reported that the observed reduction in IOP after cataract extraction can allow for reduction in the use of anti-glaucoma medication in the postoperative period in subjects with primary open-angle glaucoma (POAG).[23] It has also been shown that the postoperative reduction in IOP persists for at least 6 months[10] and that the observed reduction in IOP after cataract surgery is observed in both glaucomatous and in non-glaucomatous eyes.[24] It would seem, therefore, that the value of the CPD ratio as a clinical tool warrants further investigation, as such an index could contribute to the surgical decision-making process when considering the various options in attempting to decrease IOP in patients with POAG or ocular hypertension.

In conclusion, this study confirms the predictive value of the CPD ratio for corrected IOP reduction after uneventful cataract surgery in non-glaucomatous eyes. Furthermore, we identified two further indices of preoperative anterior segment parameters, namely the PV and the PA ratios, which are also predictive for IOP reduction after phacoemulsification cataract surgery. Further study is warranted to investigate whether our findings can be replicated in glaucomatous and/or ocular hypertensive eyes, before firm recommendations can be made with respect to the value of these indices in the clinical decision-making process.

Summary

What was known before

- Intraocular pressure (IOP) has been shown to be reduced in some patients after routine phacoemuslification cataract surgery. Previous work has described the predictive value of an index, which can identify from preoperative measurements of anterior chamber depth and IOP those likely to experience a significant postoperative reduction in IOP. This has been called the pressure-to-depth ratio. Central corneal thickness affects IOP measurement.

What this study adds

- This study confirms the predictive value of the existing pressure-to-depth ratio. This study demonstrates for the first time the predictive value of this index when corrected for central corneal thickness. This study describes two novel predictive indices, which incorporate anterior chamber volume and angle, respectively, to identify from preoperative measurements those likely to experience a significant postoperative reduction in IOP, corrected for central corneal thickness.

Conflict of interest

The authors declare no conflict of interest.

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B Answer
C Answer
D Answer

4. Question

A Answer
B Answer
C Answer
D Answer

5. Question

A Answer
B Answer
C Answer
D Answer

Activity evaluation

1. The activity supported the learning objectives.

Strongly disagree				Strongly agree
1	2	3	4	5

2. The material was organized clearly for learning to occur.

Strongly disagree				Strongly agree
1	2	3	4	5

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