

Cataract Surgery and Intraocular Pressure (IOP)

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Introduction and Aim

Cataract is the most common cause of blindness in the world, and cataract surgery is one of the most common ocular procedures performed. Although evidence suggests that cataract surgery is likely to reduce IOP in healthy eyes, the effect of cataract surgery on IOP in patients with varying stages of glaucoma is not well understood.^{1,2}

We sought to analyze fluctuations in IOP in controls, glaucoma suspects, and patients with mild, moderate, and severe primary open angle glaucoma (POAG) undergoing cataract surgery in a well-diversified population. We also sought to determine correlations between patient characteristics and IOP outcomes.

Methods

In an IRB-approved retrospective study, 236 controls (Group A), 37 glaucoma suspects (Group B), and 96 patients with POAG (mild, moderate, severe; Groups C-E) were recruited. One eye was randomly selected per patient. Exclusion criteria included: <18 years, secondary glaucoma, one functional eye, recent intraocular surgery, intra-operative or post-operative complications, or follow-up <3 months. Data collected included: age, race, gender, family history of glaucoma, CCT, axial length (AXL), anterior chamber depth (ACD), lens thickness (LT), cup-to-disc ratio (C/D), number of glaucoma medications, IOP, and visual acuity (VA). Post-operative IOP and VA were determined at several intervals. Linear trends over groups A-E were made with a Jonckheere-Terpstra test. Chi-Square analyses were used to evaluate differences between groups A-E. Wilcoxon Rank-Sum test was used to evaluate postoperative changes. Multiple linear regression was used to evaluate predictors of IOP change at 1 year.

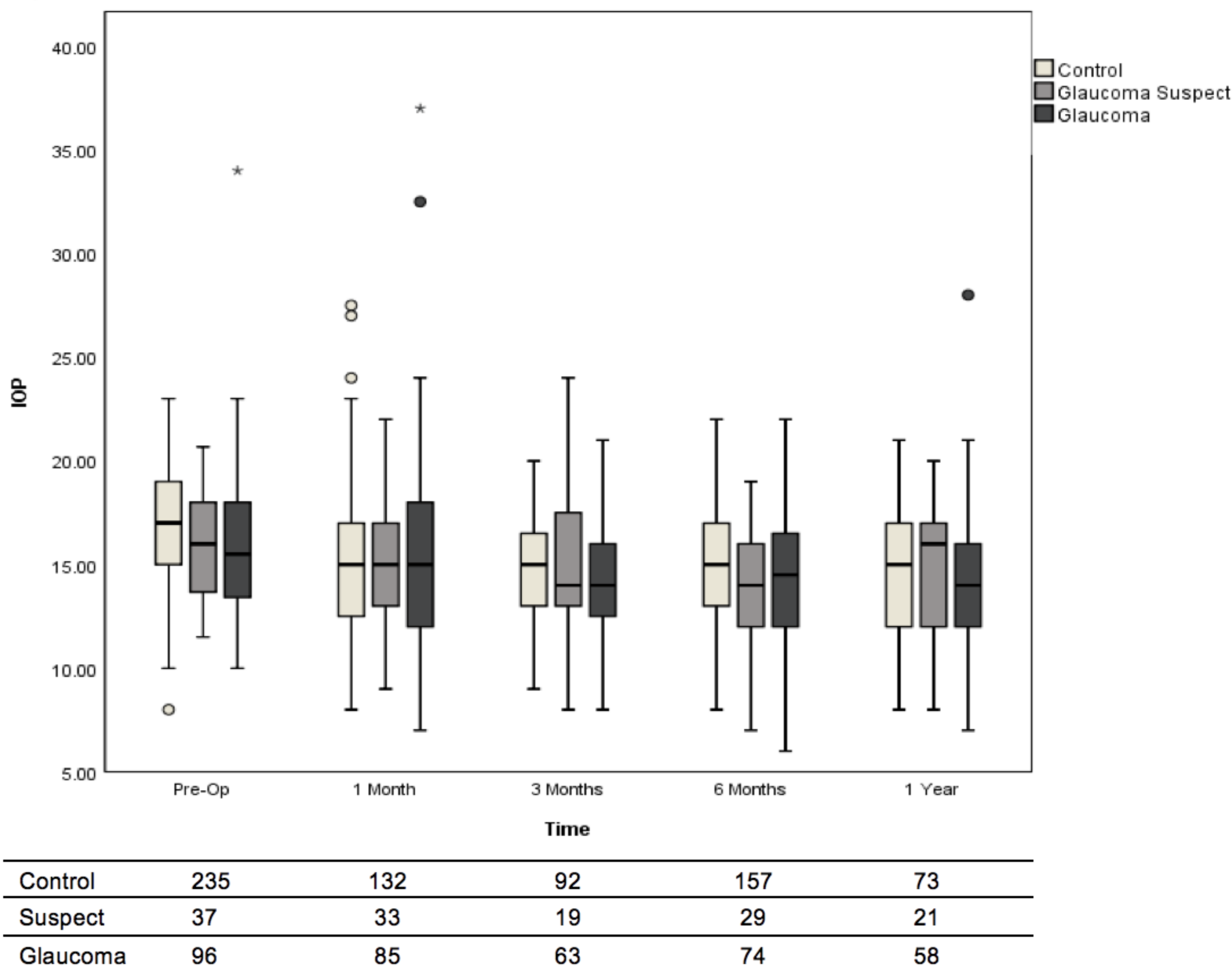
Results

Baseline characteristics and IOP changes are shown in Table 1 and Figure 1. IOP reduction at 1 year in groups A-E were 8.6%, 8.1%, 10.8%, 18.3%, and 9.1%, respectively. Medications at 1 year did not change significantly. In POAG eyes, higher pre-op IOP and more medications were predictive of a higher reduction in IOP at 1 year ($\beta = -0.62, -1.60$; $p < 0.05$). In control eyes, higher pre-op IOP and higher CCT were predictive of greater IOP reduction at 1 year ($\beta = -0.53, -0.02$; $p < 0.05$).

Table 1: Baseline demographics and pre-operative descriptive statistics

Variable	Group A N = 236	Group B N = 37	Group C N = 49	Group D N = 26	Group E N = 21	p (linear trend*, Chi-Square)
Mean age \pm SD (y)	72.8 \pm 8.5	75.6 \pm 9.1	76.6 \pm 6.7	74.0 \pm 8.8	71.8 \pm 9.6	0.033*
Sex						0.624
Female %	59.3	62.2	67.3	57.7	47.6	
Male %	40.7	37.8	32.7	42.3	52.4	
Race						0.195
White %	69.5	81.1	77.6	61.5	42.9	
Black %	11.4	10.8	10.2	26.9	33.3	
Hispanic %	8.9	5.4	4.1	0	4.8	
Other %	9.3	2.7	8.2	11.5	19.0	
BMI \pm SD (kg/m ²)	28.6 \pm 6.4	27.2 \pm 3.7	27.7 \pm 6.1	28.0 \pm 5.1	28.7 \pm 6.0	0.583*
Hypertension %	52.5	35.1	46.9	61.5	61.9	0.170
Diabetes %	24.6	18.9	14.3	26.9	28.6	0.498
Family history of glaucoma %	34.0	80.0	76.5	80.0	65.6	0.002
Myopia %	52.2	51.6	53.3	65.2	64.7	0.680
Hyperopia %	47.6	45.2	46.7	30.4	29.4	0.374
Type of cataract surgery						0.000
Phacoemulsification %	82.1	51.4	46.9	6.3	71.4	
Femto laser %	17.9	48.6	53.1	41.7	28.6	
Median VA (Log Mar)	0.3	0.2	0.3	0.4	0.3	0.076
# of glaucoma meds \pm SD	0	1.1 \pm 0.40	1.4 \pm 0.66	1.7 \pm 0.81	2.1 \pm 0.82	<0.001*
CCT \pm SD (μ m)	549.2 \pm 40.3	536.3 \pm 26.6	524.5 \pm 28.8	536.8 \pm 31.8	515.8 \pm 39.2	<0.001*
AXL \pm SD (mm)	24.1 \pm 1.3	24.2 \pm 1.4	24.3 \pm 1.6	24.3 \pm 1.2	24.5 \pm 1.4	0.126*
ACD \pm SD (mm)	3.2 \pm 0.39	3.2 \pm 0.40	3.1 \pm 0.35	3.3 \pm 0.29	3.2 \pm 0.42	0.251*
LT \pm SD (mm)	4.5 \pm 0.41	4.7 \pm 0.53	4.7 \pm 0.39	4.6 \pm 0.50	4.4 \pm 0.47	0.018*
C/D ratio \pm SD	0.37 \pm 0.16	0.53 \pm 0.18	0.64 \pm 0.21	0.71 \pm 0.15	0.83 \pm 0.14	<0.001*
IOP \pm SD (mm Hg)	16.8 \pm 2.9	16.0 \pm 2.7	15.1 \pm 3.0	17.2 \pm 4.7	15.7 \pm 2.5	0.002*

Figure 1: IOP at follow-up visits



Discussion

In this population, all groups showed reduction of IOP after cataract surgery. Among the glaucoma groups, severe glaucoma patients had the lowest reduction of IOP (9.1%), most probably due to reduced outflow facility. However, the medication load stayed unchanged in all groups. In the control group, pre-op IOP and thicker CCT determined post-op IOP reduction.

Conclusion

IOP reduction one year after cataract surgery in glaucomatous eyes is dependent on higher pre-op IOP and increased glaucoma medications. In non-glaucomatous eyes, higher pre-op IOP and thick CCT determine the degree of post-operative IOP reduction. These findings may help predict which eyes will have IOP reduction following cataract surgery.

References and Acknowledgements

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