

EFFECT OF PHACOEMULSIFICATION ON LONG TERM IOP CONTROL

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INTRODUCTION:

The co-occurrence of glaucoma and cataract, together with the fact that Intraocular pressure (IOP) is the only modifiable risk factor for the management of Glaucoma, has increased the interest in the effect of cataract surgery on IOP control. The Ocular Hypertensive Treatment Study demonstrated decreased IOP after cataract surgery. A report by the American Academy of Ophthalmology, has shown that phacoemulsification resulted in IOP reduction and fewer glaucoma medications in patients with PXF glaucoma, POAG and primary angle closure glaucoma (PACG).¹ Armstrong et al showed that POAG patients did not show as high a reduction of IOP after cataract surgery as their counterparts with closed-angle glaucoma.² Some studies have reported immediate IOP elevation after surgery for OAG. Other studies have reported that IOP reduction was not high when the preoperative IOP was not high.^{3,4} Recent studies have reported significant IOP reduction after cataract surgery in patients with ocular hypertension (OHT). Moghimi et al. showed that non-glaucomatous patients with PXF syndrome experienced moderate IOP reduction after phacoemulsification which was correlated with preoperative IOP.⁵ The degree of change of IOP after cataract surgery can be unpredictable. Thus, phacoemulsification has been shown to decrease IOP but the magnitude of change has been varied.

AIM OF STUDY:

To evaluate the effect of phacoemulsification on long term IOP control in glaucoma patients.

MATERIAL & METHODS:

Medical records of all patients aged 18 years or older who had clear corneal phacoemulsification with posterior-chamber intraocular lens (IOL) implantation from January 2021 to March 2022 were assessed. The study group included Glaucoma patients with medically controlled, preoperative IOP

< 22 mmHg, attending the glaucoma clinic. The control group included healthy subjects with a normal anterior segment on slit-lamp examination, IOP between 10 and 21 mmHg, cup-to-disc ratio of less than 0.6, no Retinal Nerve Fiber Layer (RNFL) defects in OCT, and no glaucomatous VF defects.

Patients with acute angle closure glaucoma, previous intraocular surgery, neovascular glaucoma, uveitis and complications during phacoemulsification were excluded. Patients who underwent any additional non-glaucoma-related or glaucoma related surgical or laser procedures in the follow up year were also excluded from the analysis.

IOP was collected preoperatively and at 2 months, and 1 year postoperatively. The preoperative and postoperative IOP values were derived from the mean of IOP readings taken on two separate days on the regular visit schedule using the Goldmann applanation tonometer. Out of 493 patients evaluated, 248 patients were healthy (control) and 245 were glaucoma patients. Change in IOP and Glaucoma medications was compared between the two groups.

STATISTICAL ANALYSIS

Data entry was done in the Microsoft excel spreadsheet and the final analysis was done using Statistical Package for Social Sciences (SPSS) software version 25.0

RESULTS:

Four hundred ninety three patients were included in the study. Mean age of the patients was 67 years \pm 9.3 SD. There were 242 (49%) males and 251 (51%) females. Out of 493 patients 248 patients had no glaucoma and 245 were glaucoma patients. Among glaucoma patients 112 were POAG patients, 113 were PACG patients and 20 had Pseudoexfoliative glaucoma (PXF).

Mean preoperative IOP in the control group was 15.6 ± 3.2 mm Hg and mean postoperative IOP was 13.09 ± 3.2 mm Hg. Mean preoperative IOP in glaucoma patients was $16 \text{ mm Hg} \pm 3.4$ SD and mean postoperative IOP was 13.09 ± 3.2 mm Hg. Mean decrease in IOP after 1 year was similar for both control and glaucoma patients i.e 2.8 ± 2.34 mm Hg. There was no significant change in the IOP after phacoemulsification in both the groups (control p value =0.6; glaucoma group p value =0.59) (Table.1)

Mean change in IOP in PACG patients was 3.73 ± 3.11 mm Hg (p value = 0.56) and change in glaucoma medications was 0.37 ± 0.8 . In POAG patients mean

change in IOP was 2.82 ± 2.65 mmHg (p value= 0.6) and change in AGM was 0.25 ± 0.48 .(Table 2) Decrease in IOP after phacoemulsification in PACG patients was greater as compared to POAG patients. This can be attributed to lens thickness being an important etiology for narrow angles. There was no significant change in the glaucoma medication after phacoemulsification in all the three groups (p >0.5 for all the three groups) (Table 3)

There is no statistical significant difference (p=0.14) in the change in IOP after phacoemulsification in POAG and PACG patients.

Mean change in IOP in pseudoexfoliative glaucoma patients was 3.5 ± 2.55 mm Hg which was higher than the POAG group and similar to PACG group. Mean change in AGM was 0.7 ± 0.95 . (Table 2 and Table 3)

In the study group, decrease in IOP ranged from 0 mm Hg to 12 mm Hg. In PACG patients, 73 % patients experienced a drop of IOP more than 2 mm Hg and 39 % more than 4 mm Hg. IOP drop more than 4 mm Hg was seen in only 25% of POAG patients. In 61% of POAG patients IOP decreased by 2 mm Hg.(Table 4)There is no significant correlation (p= 0.7) mean preoperative IOP and postoperative change in IOP. (Table 5) Our finding is contrary to the most common explanation that the single most significant factor associated with greater IOP drop after phacoemulsification is higher preoperative IOP

Table 1: Comparison of IOP change in Glaucoma group and Control group

	IOP(mmHg) (Pre-OP)	IOP (mm Hg) (Postop 1 year)	Change in IOP	P value
CONTROL	15.64 ± 3.2	13.09 ± 3.2	2.85 ± 2.34	0.6
GLAUCOMA	16 ± 3.4	13.09 ± 3.2	2.85 ± 2.35	0.59

- Values are presented as mean \pm SD

Table 2: Change in IOP in Glaucoma Patients

	Pre-OP IOP	IOP (post OP 1y)	Change in IOP	P value
PACG	16.28 ± 3.53	12.63 ± 3.26	3.73 ± 3.11	0.56
POAG	15.85 ± 3.35	13.10 ± 2.72	2.82 ± 2.65	0.6
PXF	15.5 ± 3.17	12 ± 2.24	3.5 ± 2.55	0.6

- Values are presented as mean \pm SD

Table 3: Change in number of Glaucoma medications in study group

	Pre op no. of AGM	Post OP (1y) No of AGM	Change in AGM	P value
PACG	1.84± 1.44	1.47± 1.21	0.37± 0.8	0.79
POAG	1.66±1.13	1.48 ±1.07	0.25 ±0.48	0.8
PXF	1.9 ±1.79	1.2 ±1.13	0.7±0.95	0.7

- Values are presented as mean ±SD

Table 4: Degree of change in IOP in Glaucoma patients

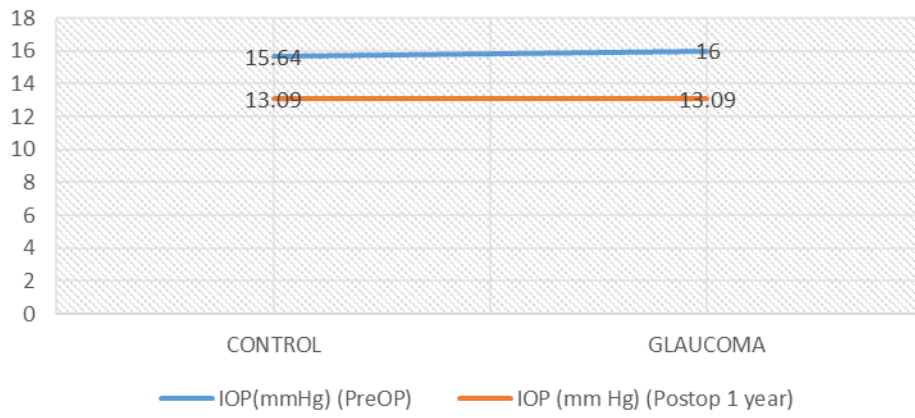
	IOP < 2 mm Hg	IOP 2-4 mm Hg	IOP > 4 mm Hg
PACG	26%	34%	39%
POAG	39%	36%	25%
PXF	70%	30%	0

Table 5: comparison between IOP change and preoperative IOP in Glaucoma patients

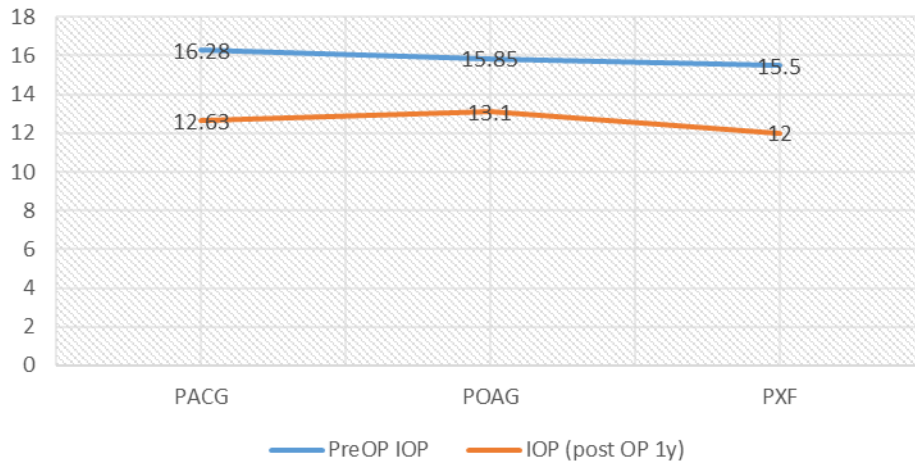
	Change in IOP (<2mm Hg)	Change In IOP (> 4 mm Hg)	P value
Pre IOP (PACG)	16.28 ±3.53	16.74 ±3.47	0.7
Pre OP IOP (POAG)	15.87±3.35	15.96 ±3.41	0.69

- Values are presented as mean ±SD

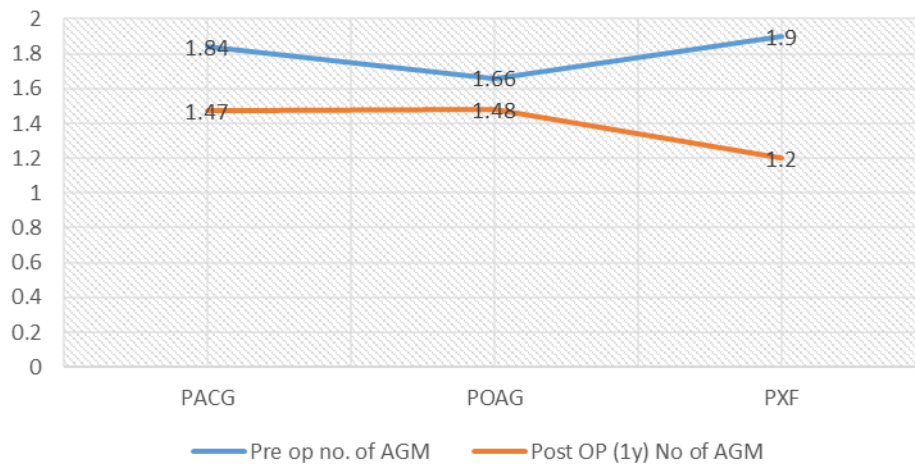
comparison of IOP change in glaucoma and control



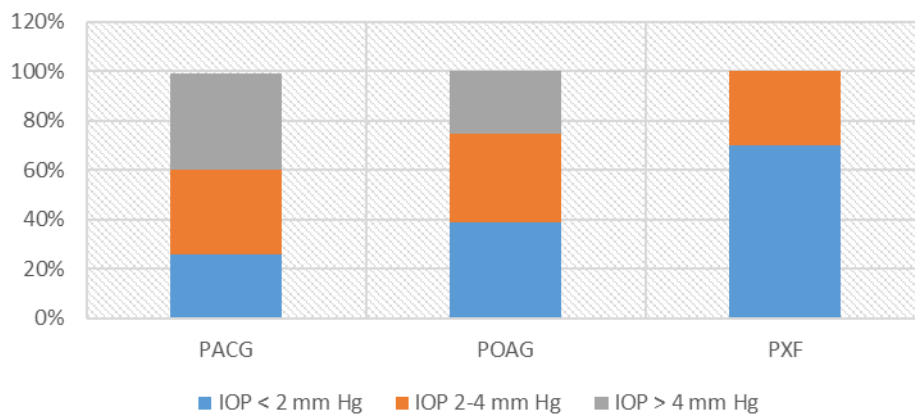
change in IOP in Glaucoma patients



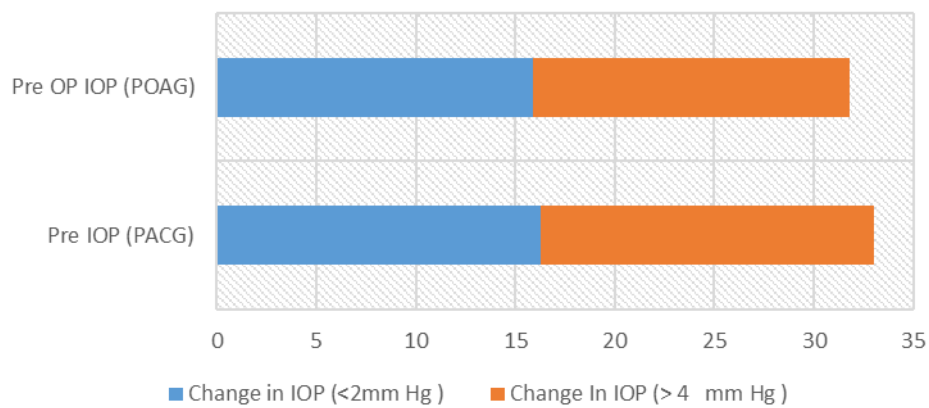
change in AGM after phacoemulsification



Degree of IOP change in Glaucoma patients



comparison between IOP change and Pre Op IOP



DISCUSSION:

The mean difference between preoperative IOP and post operative value was found to be 2.85 ± 2.35 mm Hg after 1 year follow up. A similar study by Baek et al found the mean difference between the preoperative value and the final follow up to be -1.01 ± 3.74 mmHg.⁶ The study included only open angle glaucoma patients whereas our study includes PACG and PXF patients also. Mean follow up in the above study was 1.59 ± 0.82 years in the healthy group and 1.47 ± 0.62 years in the glaucoma group. They also demonstrated that the effect of phacoemulsification on IOP control regressed over long term follow up.

CONCLUSIONS:

Most of the patients experienced drop in IOP after phacoemulsification (range 1 mm Hg to 12 mm Hg). Decrease in IOP was more in PACG and PXF patients as compared to POAG patients but there is no statistically significant difference in IOP change between PACG and POAG patients. A drop of IOP >2 mm Hg was seen in 73% of the PACG patients, 61% of POAG patients. A significant number of applanation tonometry instruments have a calibration error of ± 2 mm Hg and the IOP measurements are further affected by the CCT, ocular surface and interobserver and intra observer variations. Keeping these facts into consideration the clinical significance of a drop of IOP of 2-4 mmHg must be incorporated into the therapeutic algorithm. Baseline should be re-established and target IOP should be reassessed. Glaucoma medications should be continued to attain Target IOP after cataract surgery.

No significant decrease in glaucoma medications was observed before and after surgery ($p=0.8$). In patients with severe AGM allergy phacoemulsification should be combined with other IOP lowering procedures to reduce the medications. Thus, choosing phacoemulsification alone or combining it with medications/other IOP lowering surgeries depends on type of glaucoma, Target IOP and the need to reduce the glaucoma medications.

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