

## INTRAOULAR PRESSURE REDUCTION FOLLOWING COMBINED PHACOEMULSIFICATION AND TRABECULECTOMY SURGERY: A STUDY OF 300 CASES

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### ABSTRACT

**Objectives:** The aim of the study was to evaluate intraocular pressure (IOP) reduction following combined phacoemulsification and trabeculectomy surgery in primary glaucomapapient with cataract.

**Methods:** A prospective, comparative study of 300 patients with primary glaucoma and cataract who underwent combined surgery phacoemulsification and trabeculectomy at our center between July 2016 and June 2019 were included in this study. Out of these, 124 patients had primary open-angle glaucoma (POAG) and 176 patients had primary angle closure glaucoma (PACG). Phacoemulsification, intraocular lens implantation, and trabeculectomy were performed in all cases. Follow-up visits were carried out at 1, 3, and 6 months after surgery. Complete ophthalmic examination was done at each follow-up visit.

**Results:** The pre-operative mean IOP of all patients was 34.60±6.33 mmHg and mean IOP at last 6 month follow-up was 13.0±2.18 mmHg. There was a statistically significant difference between IOP at presentation and IOP at 6-month follow-up ( $p < 0.001$ ). No significant difference in post-operative IOP in POAG and PACG patients ( $p > 0.001$ ). Out of 300, 58 patients required anti-glaucoma medication at 1 month and this number decreased to 41 patients at 6 month follow-up. No significant intraoperative complications were noted.

**Conclusion:** Combined phacoemulsification and trabeculectomy surgery is safe and effective in controlling IOP with minimal complications in the management of primary glaucoma patients with cataract in expert hands.

**Keywords:** Cataract, Glaucoma, Phacoemulsification, Trabeculectomy.

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### INTRODUCTION

Within the aging population, comorbidity of glaucoma and cataract is becoming increasingly frequent. Glaucoma is the most important cause of irreversible blindness worldwide. At least 70 million people are suffering from glaucoma of which 10% are bilaterally blind [1]. Elevated intraocular pressure (IOP) is the most important risk factor in the development of the disease. Lowering the IOP is the only treatment option for glaucoma nowadays. Cataract is an age-related disease. According to the WHO, cataract is the leading cause of reversible blindness worldwide. The prevalence of cataract among people >40 years has been found to be around 47.5% [2]. The treatment of either condition can influence the course of the other. It is widely accepted that the use of glaucoma laser treatments and surgical glaucoma procedures can accelerate cataract formation. Glaucoma medications could cause cataract progression as well [3]. On the other hand, phacoemulsification might influence the IOP in glaucoma patients. The association of cataract with glaucoma has become more frequent because of aging populations and the increased risk of cataract development in the patient with glaucoma. There is an increased risk of cataract in some forms of glaucoma, such as pseudoexfoliative glaucoma. In addition, glaucoma surgery increases the risk for the development of cataract [4].

With evolving techniques in both glaucoma and cataract surgery, the optimal management is ever changing in an effort to obtain a higher percentage of perfect results with fewer complications and shorter recovery times. It has been widely reported that modern cataract surgery results in a long-term reduction in IOP; however, the magnitude and clinical significance of this change continues to be debated.

When glaucoma and cataract coexist, it is logical to think of a combined surgical procedure. This would help reduce surgical trauma and

facilitate faster visual and functional recovery. Today's rapidly advancing phacoemulsification techniques, including small incisions and foldable lenses implanted in the bag, as well as the improvements in glaucoma techniques, facilitate safer and more efficient combined surgery. Combined surgery may avoid the occurrence of post-operative IOP spikes following cataract surgery in eyes with advanced glaucoma [5].

The present study was done with the aim to evaluate that whether performing the two procedures (phacoemulsification and trabeculectomy) simultaneously in glaucoma and cataract patients is safe and effective and what post-operative complications are encountered in such cases.

### METHODS

A prospective consecutive case series of 300 patients with uncontrolled primary glaucoma and cataract who underwent combined surgery phacoemulsification and trabeculectomy at our center between July 2016 and June 2019 were included in this study.

The patients included in the study were those who had primary open angle glaucoma (POAG) or primary angle closure glaucoma with uncontrolled IOP, were receiving maximal tolerable anti-glaucoma therapy, and had a visually significant cataract.

Patients developing post-traumatic, uveitic, pseudoexfoliative, neovascular or dysgenetic glaucoma, or having history of previous ocular surgery were excluded from the study.

Before surgical intervention, all patients underwent a baseline examination that included: Slit lamp examination, measurement of best-corrected visual acuity, fundus examination (optic disc changes)

by 90 D lens, Goldmannapplanation tonometry, visual field examination (30–2, Humphrey field analyzer), and gonioscopy.

Patients with high IOP initially received IOP lowering treatment either by oral Acetazolamide 500 mg stat or by 300 mL of 20% mannitol IV over half an hour before surgery or both.

All cases then underwent combined phacoemulsification with posterior chamber intraocular lens implantation and trabeculectomy surgery as a single-site approach under local anesthesia. All surgeries were performed by the same surgery team at our center.

Complete ophthalmic examination was done on each follow-up visit that is day 1, day 5, 1-month, 3-month, and 6-month postoperatively. Data entry was done in Microsoft Excel. Medcalc 12.2.1.0 version software was used for all statistical purpose. For statistical analysis,  $p < 0.05$  was taken as significant.

## RESULTS

A total of 300 patients of mean age  $61.03 \pm 11.73$  years with uncontrolled primary glaucoma and cataract were analyzed during the study period of 6 months. Out of 300, 139 (46.33%) patients were male, and 161 (53.67%) patients were females (Table 1). One hundred and twenty-four patients had POAG and 176 (58.33%) patients had primary angle closure glaucoma.

None of the patient had any significant intraoperative complications.

On the 1<sup>st</sup> post-operative day, there was mild corneal edema in 82 (27.33%) patients, 30 (10%) had Grade 2 reaction in anterior chamber, which resolved with topical medications over the next few days. No significant post-operative complications were seen.

The pre-operative mean IOP of all patients was  $34.60 \pm 6.33$  mmHg. At 1-month post-surgery mean IOP was  $13.6 \pm 4.58$  mmHg. At 3-month post-surgery, mean IOP was  $12.63 \pm 1.92$  mmHg and mean IOP at last 6-month follow-up was  $13.0 \pm 2.18$  mmHg (Table 2). There was a statistically significant difference between IOP at presentation and IOP at last 6-month follow-up ( $p < 0.001$ ) (Table 3).

Mean pre-operative IOP of PACG patients was  $38.07 \pm 5.27$  mmHg. At 1-month post-surgery mean IOP was  $13.47 \pm 4.07$  mmHg. At 3-month post-surgery, mean IOP was  $12.33 \pm 1.88$  mmHg and at last 6-month follow-up, mean IOP was  $13.20 \pm 2.46$  mmHg.

In POAG patients, mean pre-operative IOP was  $31.13 \pm 5.44$  mmHg. At 1-month post-surgery, mean IOP was  $13.73 \pm 5.18$  mmHg. At 3-month post-surgery, mean IOP was  $12.93 \pm 1.98$  mmHg and at last 6-month follow-up, mean IOP was  $12.80 \pm 1.93$  mmHg.

There was no significant difference in post-operative IOP in POAG and PACG patients ( $p > 0.001$ ) although a significant difference in pre-operative IOP was seen between PACG and POAG patients with higher values in PACG group.

Out of 300, 58 (19.33%) patients required anti-glaucoma medication at 1 month and 242 (80.66%) patients did not required anti-glaucoma medication. At 6-month post-surgery, the success rate, defined as IOP  $< 21$  mmHg without medication was 86.33%, that is, only 41 patients required anti-glaucoma treatment and that also in much reduced dosage.

## DISCUSSION

Combined surgery may be best suited for a patient with a visually significant cataract with uncontrolled primary glaucoma despite maximal medical therapy and/or laser trabeculectomy.

Cost is often an issue for many patients and eliminating medications can help reduce the financial burden. Poor compliance with

**Table 1: Patient demographics**

Sex	No. of cases (n=300)	Percentage
Male	139	46.33
Female	161	53.66
Mean age (years)±SD	61.03±11.73	

SD: Standard deviation

**Table 2: Pre-operative and post-operative mean IOP**

IOP Measurements	Total cases (n=300)	
	Mean	Standard deviation
Pre-operative IOP	34.60	6.33
Post-operative IOP at 1 m	13.60	4.58
Post-operative IOP at 3 m	12.63	1.92
Post-operative IOP at 6 m	13.00	2.18

IOP: Intraocular pressure

**Table 3: Comparison of mean IOP at 1-month, 3-month, and 6-month post-operative in PACG and POAG patients**

IOP Measurements	PACG (n=176)		POAG (n=124)		"p"-value
	Mean	SD	Mean	SD	
Pre-operative IOP	38.07	5.27	31.13	5.44	0.001
Post-operative IOP at 1 m	13.47	4.07	13.73	5.18	0.876
Post-operative IOP at 3 m	12.33	1.88	12.93	1.98	0.402
Post-operative IOP at 6 m	13.20	2.46	12.80	1.93	0.624

IOP: Intraocular pressure, SD: Standard deviation, PACG: Primary angle closure glaucoma, POAG: Primary open-angle glaucoma

glaucoma medications can also be an issue to consider both procedures together.

Cataract surgery in patients with POAG requires careful monitoring of post-operative pressure spikes; combined procedures can reduce the frequency and magnitude of this complication [6].

In primary angle closure glaucoma when compared with phacoemulsification, combined surgery seems to be slightly more effective for IOP control ( $p > 0.05$ ). Some studies suggested that the rate of surgical complications is significantly higher in the combined surgery group [7,8]. However, several other authors defended that in the presence of an advanced glaucoma combined surgery is the best option, since it offers a better IOP control than phacoemulsification and, when compared to trabeculectomy, has comparable efficacy in controlling IOP and reducing the requirement for glaucoma drugs with a smaller re-intervention rate [9].

Combined phacotrabeulectomy should be scrutinized under three categories: (1) Two site versus one site, (2) limbus-based versus fornix-based approach, and (3) use of antimetabolites [10].

Several authors have reported no difference in IOP control between the one and two-site approaches [11]. In combined phacotrabeulectomy, limbus-based and fornix-based flaps were found to be equally effective in reducing IOP and improving vision, with no difference in post-operative complications or outcomes [12]. Our same-site approach using a limbus based flap was successful in more than 85% of cases at last follow-up (average of 6 months after surgery).

Over the past decade, antimetabolite agents such as 5fluorouracil and mitomycin C (MMC) have been used in glaucoma surgeries to ensure functional success in bleb survival. However, many investigators have reported an increase in late onset bleb-associated endophthalmitis since the advent of antimetabolite agents [13-15]. Other potential

complications include post-operative hypotony, corneal erosions, endothelial toxicity, and wound instability [16,17]. In our surgery, we did not use any antimetabolite. Postoperatively, we saw no persistent bleb leaks or infections.

Lochhead *et al.* [18] have reported that in elderly white patients with chronic open-angle glaucoma, phacotrabeculectomy is not as effective as trabeculectomy alone in reducing IOP. While this may be true, it has not been documented in well-controlled studies using modern phacoemulsification techniques.

In addition, improved IOP control with fewer medications from the combined procedure may prevent further optic nerve damage in those patients with borderline control and in those patients who are not compliant in taking their medications.

Jampel *et al.* [19] have recently performed an evidence-based literature review of the effects of techniques on IOP after combined cataract and glaucoma surgery. Their conclusion based on the literature review was that the strongest evidence of efficacy exists for using (1) MMC, (2) separating the incisions for cataract and glaucoma surgery, and (3) removing the nucleus by phacoemulsification. We agree with point 3 but caution the indiscriminate use of MMC in lower-risk patients because of the higher complications of bleb leak and endophthalmitis.

The combined phacotrabeculectomy is a reasonably safe and effective procedure. In our study, no significant intraoperative complications were noted. Control of IOP was improved postoperatively. The mean drop in IOP from baseline was 37.57%. About 86.33% of eyes were medication free at the time of last follow-up. Combining the cataract operation with the trabeculectomy offers the main advantage of requiring only one operation to achieve a lower IOP after cataract surgery.

In summary, our series of combined phacotrabeculectomy resulted in excellent IOP control, substantial visual recovery, and a decrease in the number of glaucoma medications with few complications.

## CONCLUSION

Performing phacoemulsification and trabeculectomy surgery as a combined procedure is safe and effective in controlling IOP with minimal complications in the management of primary glaucoma patients with cataract in expert hands.

## AUTHOR'S CONTRIBUTION

The authors confirm contribution to the paper as follows: Study conception and design: SJ; data collection: SJ; analysis and interpretation of results: SJ and MAS; draft manuscript preparation: SJ and MAS. Both authors reviewed the results and approved the final version of the manuscript.

## CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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