

## ORIGINAL ARTICLE

# Oral Acetazolamide Administration to Control Intraocular Pressure on First Day Post Phacoemulsification Surgery : Is It Necessary ?

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## ABSTRACT

**Introduction :** The incidence of early postoperative intraocular pressure (IOP) increase is reported to be 2.3–8.9% in phacoemulsification surgery. This increase typically peaks at 3–7 hours after surgery and persists during the first 24 hours. Although most eyes can tolerate the transient IOP elevation that occurs after cataract surgery, IOP spikes are potentially more dangerous if it persist. In order to minimize postoperative intraocular pressure (IOP) rise, routine medication by oral acetazolamide has been widely used among ophthalmologists. Objective of this study is to investigate the relationship between IOP changes on first day after phacoemulsification with administration of oral acetazolamide.

**Method :** This is a descriptive study. The samples were include 50 patients diagnosed with cataract who underwent phacoemulsification surgery with intraocular lens implantation. Samples were randomized divided into two groups. First group is patient who treated with 250 mg acetazolamide post operative and other group is untreated. All respondents must have no history of glaucoma or ocular hypertensive and attend follow up on the first day postoperative. IOP is measured with non-contact tonometer.

**Results :** Mean age of respondents is  $61 \pm 9.8$  years old. Preoperative IOP mean is  $18.04 \pm 3.6$  mmHg and postoperative IOP mean is  $18.58 \pm 6.9$  mmHg. This study revealed that there is no significant relation between oral administration of acetazolamide and the lowering of intraocular pressure on first day post phacoemulsification ( $p = 0.2$ ) Visual acuity pre operative and nuclear density of cataract are also no relationship with the IOP on first day postoperative ( $p = 0.2$ )

**Conclusion :** The use of oral acetazolamide is not significantly related to the IOP on first day post phacoemulsification surgery.

**Keywords :** corneal ulcer, clinical profile, microbiology examination, therapy, improvement

Phacoemulsification is the most effective way of cataract surgery today, although complications of increased postoperative intraocular pressure are quite common. <sup>1</sup>Several

studies have been conducted to assess the ocular damage due to the temporary high IOP. Findl et al.<sup>2</sup> reported that a 20-mm Hg increase in IOP for 5 minutes caused reduced blood flow to the optic nerve,

retina, and choroid in healthy subjects. Acute IOP elevations for less than 1 minute may inhibit the retrograde transport of essential neurotrophins from the brain to the retina.<sup>3</sup> Immediate postoperative intraocular pressure adjustment on first day after phaco surgery become a consideration of every surgeon, since it reduce risk of choroidal macular edema (CME) after phacoemulsification surgery. CME become one of the dreaded complications for beginner phaco surgeon, since it can result in a decreased vision that could be permanent.<sup>4,5</sup> Jarstad, 2017 found that patients who had an initial postoperative pressure higher than 21 mmHg were noted to have a 2.5 times greater incidence of macular thickening ( $p = 0.029$ ).<sup>6,7</sup> In UK, study has conducted among eye surgeons and the result is of the 505 surgeons, who performed cataract surgery, 316 (62.6%) did not use any IOP lowering agent following uncomplicated phacoemulsification, and lens implant surgery. The remaining 189 (37.4%) routinely prescribed some form of medication for IOP prophylaxis and 168 surgeons used oral Diamox /acetazolamide in varied dose.<sup>6</sup> The use of oral anti glaucoma agent still debatable and on the other side, it is still widely applied in Indonesia. The purpose of this study is to revealed the relevancy of acetazolamide oral as a treatment to control IOP after uneventful phacoemulsification by beginner phaco surgeon in Jakarta.

## METHODS

The patients were recruited from the Department of Ophthalmology, Christian University of Indonesia General Hospital Jakarta, over 6 months period ( March 2017 – September 2017). We collect all medical record of patient which had got phacoemulsification surgery under local topical anesthesia and came to control on one day postoperative. Inclusion criteria is all outpatients who diagnosed as senile cataract without any other eye disease and

underwent routine procedure of phacoemulsification with implantation of Intraocular Lens (IOL) without any intraoperative complication and came to control on first day after surgery. Patient may come for the first time to eye clinic, or may come as referral from another polyclinic such as internal medicine due to blurred vision. Patient will undergo several preoperative examination include visual acuity using optotype snellen, slit lamp examination, intraocular pressure with non contact tonometer. Slitlamp examination was conducted to asses anterior segment include clarity of cornea, anterior chamber depth, grade of nucleus opacity dan pupillary reflex. Grade of nucleus in cataract are based on Lens Opacities Classification System III (LOCS III). Patient with systemic disease had to done routine blood examination. The highest blood sugar level allowed for undergoing a surgery was random blood sugar level <200g/dl. And for hypertension patient, the highest blood pressure allowed was systolic <180mmHg and diastolic <95mmHg. Routine phacoemulsification procedure is based on The International Council of Ophthalmology (ICO) guidance. Exclusion criteria is cataract patients with comorbidities high myopia/hyperopia eyes, primary open angle glaucoma, ocular hypertension, ocular trauma and secondary glaucoma. High myopia and hyperopia are related with anterior chamber depth that could be result in deviation on intraocular changes after surgery. There were 50 patients who met the criteria and divided into two groups. First group is patients with acetazolamide 250 mg twice daily after the surgery dan second group is without antiglaucoma medication.

On the first day after surgery patients have got examined visual acuity, anterior segment by slit lamp, and intraocular pressure by non contact tonometry. Interviews were done to collect personal data include age, gender, activity, education, and history of past illness. Data were processed with SPSS, correlation between two variables were using Npar tes,

Kolmogorov smirnov test and Spearman test.

## RESULT

From 114 patients underwent phacoemulsification, 50 patients meets criteria of study sample. Of the 50 samples that have been meet the inclusion criteria, the average age is  $61 \pm 9.8$  years old with number of male compare with female is 3 : 2. Standard setting of phacoemulsification were applied in all surgeries. Mean of Pre operative visual acuity is  $0.01 \pm 0.32$  with more than half number of sampel had characteristic of grade 3 nuclear opacification. Unfortunately we didn't have data of phaco time in our study but all surgery was done smoothly without intraoperative complication. 33 of 50 patients were got acetazolamide oral 250 mg BID for 24 hours and we also prescribed topical antibiotics include levofloxacin eye drop 6 times per day and Polymixin Dexamethason eye drop 6 times per day. The application of eye drops starts at one day after surgery meanwhile the oral acetazolamide should be consumed right after surgery and on next morning before control to the clinic. Patients were come back to control their operated eye and almost all patients got better visual acuity. It shows in table 1 below, pre operative visual acuity mean is 0.1 and mean of visual acuity post surgery become  $0.4 \pm 0.46$  on first day. Related to comorbidities , more than half of our sample has systemic disease, 34% had diabetes type II, 24 % had hypertension and the rest had heart disease. All patient had to controlled by medication from internist before undergone the phacoemulsification surgery.

**Table 1.** Age and intraocular pressure

Variables	N(%) mean	p
Age ( mean)	$61.8 \pm 9.78$	0.02
Sex		
Female	24 (48)	0.4
Male	26 (52)	

**Table 2.** Best Corrected Visual Acuity with Intraocular pressure

Variables	N(%) mean	p
BCVA prior to phacoemulsification (decimal)	$0.01 \pm 0.32$	0.002
BCVA on 1 day after phacoemulsification (decimal)	$0.4 \pm 0.46$	0.2

**Table 3.** Intraocular pressure before and after surgery

Variables	N(%) mean	p
Prior intraocular pressure (mmHg)	$18.04 \pm 3.65$	0.2
Post op IOP (mmHg)	$18.58 \pm 6.94$	0.004
Delta IOP (mmHg)	$4.62 \pm 4.05$	0.00

**Table 4.** Nucleus opacity grade and intraocular pressure

Variables	N(%) mean	p
Nucleus opacification grade		
Grade 2	11(22)	0.00
Grade 3	28(56)	
Grade 4	7(14)	
Grade 5	4(8)	

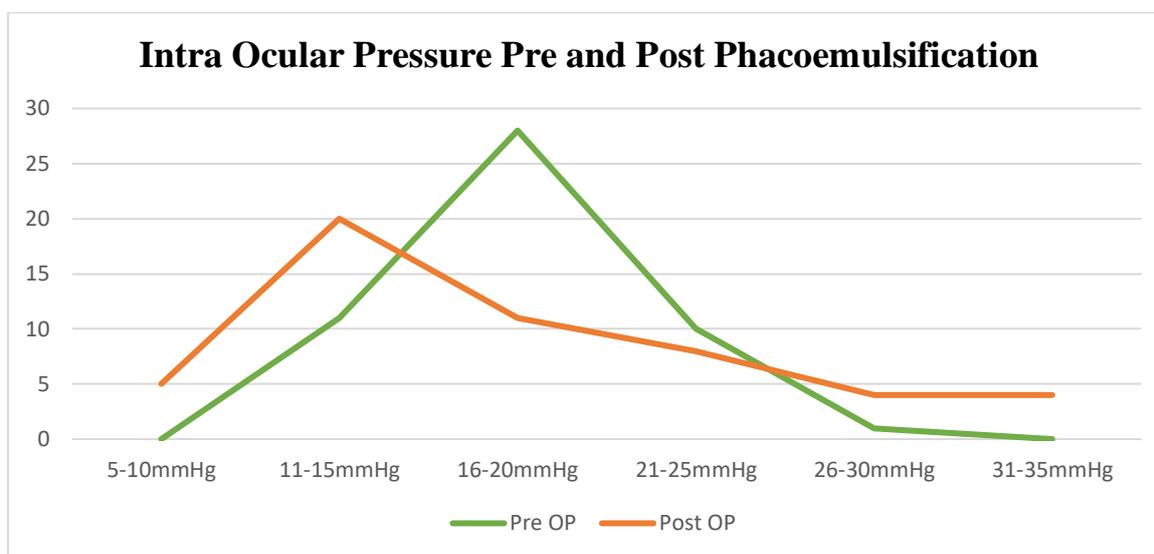
**Table 5.** Oral medication and systemic diseases

Variables	N(%) mean	p
Oral acetazolamide medication		
Yes	33(66)	0.2
No	17(34)	
Systemic disease		
Hypertension	12 (24)	
Diabetes type II	17 (34)	
Heart disease	8 (16)	

Mean of pre operative intraocular pressure (IOP) in this study is  $18.04 \pm 3.65$  mmHg ( $p = 0.2$ ) and post operative IOP is slightly increase in this study, with the mean IOP is  $18.58 \pm 6.94$  mmHg. We calculate the delta IOP of our samples and it was found that mean of IOP deviation before and after surgery is  $4.62 \pm 4.05$  mmHg with the highest IOP after surgery in our study is 35 mmHg.

We did the correlation test amongst several variables and the test revealed that there is no relation between age and visual acuity post operative ( $p = 0.7$ ) so are the lens opacity grade with visual acuity post operative ( $p = 0.8$ ).

This study also shows that visual acuity is not correlated with the IOP ( $p = 0.2$ ) and much the same with lens opacity grade ( $p = 0.8$ ).



**Fig 1.** Intraocular pressure pre and post Phacoemulsification surgery in this study

Regarding to the oral acetazolamide medication to control the IOP on the first day after surgery, the study denote that there is no significant correlation between it ( $p = 0.2$ ).

## DISCUSSION

RF Brubaker stated that the cause of a postoperatively elevated IOP was unknown, since IOP was found to be elevated on postoperative examination the day following uncomplicated cataract surgery even before viscoelastics (ophthalmic viscoelastic device's) were introduced.<sup>6</sup> There are several risk factor that can caused elevation of intraocular pressure after surgery include central corneal thickness, scleral rigidity in high myopia or high hyperopia eyes, and intraoperative

procedure itself, include remain viscoelastic, posterior capsular rent, and afakia with vitreous trap on anterior chamber.<sup>1,6,7</sup> In this study we exclude patients who had high myopia/hypermopia, history of glaucoma, and related to the procedure itself.

Study on intact cadaver eyes is done to record the dynamic pressure changes in routine phacoemulsification procedure, it is found that the changes are occurring in specific procedures as follows filling of the anterior chamber with an ophthalmic viscosurgical devices (OVD), hydrodissection and hydrodelineation, nuclear disassembly with a chopping method and cortical cleanup. Final IOP at the end of surgery is around 30 mmHg.<sup>8</sup>

In our study the intraocular pressure

at one day after surgery is ranged between 8 mmHg to 37 mmHg. Study from Korean Journal of Ophthalmology found that immediate unadjusted postoperative IOP ranged from 9 mmHg to 87 mmHg was deemed by the operating surgeon to be a "safe" adjusted IOP on the operating table after the ophthalmic viscoelastic device material was removed mechanically with the irrigation/aspiration tip and the eye was refilled with balanced salt solution.<sup>6</sup> On the otherside, Grinbaum et al. measured IOP continuously during in vivo phacoemulsification operations with a column height at 65 cm above eye level. They did not change the settings during the different parts of the operation and found that IOP varied from 38 to 2–3 mm Hg during phacoemulsification.<sup>9,10</sup>

Twenty-six patients (55%) in our study has grade 3 of lens opacification and this grade statistically didn't has relationship with intraocular pressure after surgery (P:0.8), this was similar with study from Issa 2005 that grade of opacification didn't significantly related to changes in IOP.<sup>11</sup> Irak 2010, made a hypotheses that the grade of opacities didn't affect the changes of IOP after phacoemulsification. It was different with lens thickness. The greater the preoperative lens thickness, the greater IOP reduction one could expect.<sup>12</sup>

This study denote that there is no significant correlation between oral acetazolamide medication with the reduction of intraocular pressure on the first day after surgery (p:0.2). Hayashi 2017 found that for controlled POAG patients, oral acetazolamide administration 1 hour preoperatively significantly reduced the IOP elevation from 1 to 24 hours, while administration 3 hours postoperatively reduced the IOP elevation at 5 hours or more after surgery.<sup>13</sup> Study by Byrd found that preoperative acetazolamide was significantly effective to control IOP at 24 hours, and postoperative elevation IOP is around 35mmHg at 6 or 24 hours is manageable.<sup>14</sup>

Several studies have evaluated the

prophylactic effects of many types of topical antiglaucoma medications, including prostaglandin F2a analogs, topically active carbonic anhydrase inhibitor II, b-blockers, or topical a-adrenergic agonists, against immediate postoperative IOP increases, but the findings regarding their short-term effectiveness are conflicting.<sup>13,15</sup>

In contrast, administration of oral acetazolamide has a rapid and substantial effect against short-term IOP spikes. Indeed, in a United Kingdom wide consultant survey, 87% of responders who routinely prescribe prophylactic medications prefer oral acetazolamide administration to topical agents.<sup>15,16,17</sup> However, in most studies and in clinical situations, antiglaucoma medications, including oral acetazolamide, are used just before or after cataract surgery. Because the exact time course of short-term IOP elevation after cataract surgery remains controversial, the optimal time for administration of antiglaucoma medications to protect against postoperative IOP elevation is unclear.<sup>13,16</sup>

Related to the complication of cystoid macular edema after immediate changes of intraocular pressure, several studies has compared the efficacy of topical NSAIDs, topical corticosteroids, sub-Tenon corticosteroids, oral NSAIDs, and oral acetazolamide. The result is that there is no significant differences between treatment group.<sup>7,14,15</sup>

This study has several limitation, we didn't investigate the anterior chamber depth and lens thickness of our samples. Study by Issa at 2005 found a formula called the novel ratio, which is, the pressure to depth (PD) ratio (preoperative IOP/preoperative ACD), was found to be significantly and positively related to the surgically induced reduction in IOP ( $r^2 = 73\%$ ;  $p,0.01$ ), and IOP was reduced by  $>4$  mm Hg in all patients with a PD ratio 7.<sup>11</sup> In

our study, we just classsified the anterior chamber qualitative using slit lamp.

## CONCLUSION

In conclusion, acetazolamide oral is not statistically significance to control IOP after phacoemulsification. But, we believe that it is safer to avoid the IOP spike to avoid complication although the surgery was done smoothly.

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