

## The Effect Of Phacoemulsification And Intra Ocular Lens Implantation On The Intra Ocular Pressure In Glaucomatous And Non Glaucomatous Eyes

**Dr. Ahmed Majeed Rasheed**

Clinical Tutor Al Nahrain Medical College

### Abstract

**Background:** Cataract and glaucoma are two common diseases affecting a large spectrum of the population worldwide. This prospective study aimed to study the effect of phacoemulsification with intraocular lens implantation in non glaucomatous and glaucomatous eyes on the intraocular pressure (IOP).

**Materials:** intraocular pressure before and after phacoemulsification with IOL implantation was recorded. Eyes were divided into 3 groups according to preoperative IOP. Data were recorded preoperatively, 6 months postoperatively, and 1 year postoperatively. Comparison was made between preoperative IOP versus IOP 1 year postoperatively.

**Results:** 70 patients were included in the study. The final mean IOP reduction was 6.411 mm hg (24.65%) in the 24 to 30 mm hg group, 4.439 mm hg (20.41%) in the 20 to 23 mm hg group, and 1.44 mm hg (8.47%) in the 15 to 19 mm hg group.

**Conclusion:** intraocular pressure reduction was proportional to preoperative IOP; the highest preoperative IOP decreased the most and the lowest preoperative IOP decreased the least. Phacoemulsification with iol implantation may help treating adult glaucoma.

**Keywords:** phacoemulsification; IOP.

### Introduction

Cataract and glaucoma are two common diseases affecting a large spectrum of the population worldwide. Each has its own modality of treatment. In many occasions, they coexist in the same eye. Patients having cataract and glaucoma can be managed either by combined surgery i.e. trabeculectomy and cataract removal at one session or by trabeculectomy alone followed by cataract extraction at a later session or by cataract removal alone. Removal of the cataractous lens by phacoemulsification and I.O.L implantation is a common procedure done on a daily basis. The aging human lens even without a clinically significant cataract increases in its antero posterior dimension throughout life, since fibers cannot be desquamated. Because of osmotic changes, cataractous lenses can be even larger anteroposteriorly approaching a spherical shape [1]. This leads to shallow

anterior chamber and can, theoretically, affect drainage of aqueous through the trabecular meshwork. Therefore, Removal of the human lens should aid in lowering of intra ocular pressure. Up to 60% to 80% of glaucoma patients who have undergone cataract surgery and have open angles may have successful pressure control with or without surgery. Cataract removal is usually advised for those patients whose glaucoma is medically controlled prior to surgery [2]. Several studies of the changes in IOP after phacoemulsification with IOL implantation have been published [3-10]. These studies reported wide variations (13.5 to 1.85 mm hg) in mean IOP reductions. The amount of IOP decrease appears to depend on the type of glaucoma. Eyes with angle closure glaucoma have a shallow anterior chamber, high preoperative IOP and a large mean iop reduction. Eyes with open angle glaucoma have a lower preoperative mean iop and a lower iop reduction after surgery.

## Patients and Methods

This is a prospective study conducted at AlKadhimya teaching hospital from the period March 2007 – May 2010 in the ophthalmology department. 75 patients with cataract were subjected to phacoemulsification and intra ocular lens implantation. Some of the patients had normal intra ocular pressure while others had raised iop. Those with high iop were two subtypes: the first group was taking antiglaucoma drops while the other group was not taking any medication. The iop value was recorded for each patient preoperatively by the applanation tonometer. 3 readings were recorded and the average iop was taken. This was done by the same examiner. Phacoemulsification and intra ocular lens implantation was done for the patients , excluding from the study any patient with surgical complication e.g. those with vitreous loss or anterior chamber intra ocular lens implantation. IOP was taken again after 6 months and at 1 year postoperatively. 5 patients were missed from the follow up and therefore were excluded from the study. Eyes were organized into 3 groups according to their preoperative iop as follows : 24-30 mm hg , 20-23 mm hg , and 15-19 mm hg. The results were analyzed according to the preoperative iop , the iop value at 6 months , the iop value at 1 year, and the patients age at surgery

Table 1. Distribution of groups according to age

	No. of eyes	Mean age(years)	S. D.	S. E.	P value
Group1	17	67.18	6.91	1.68	0.001**
Group2	23	62.65	4.76	0.99	
Group3	30	49.93	8.46	1.55	

\*\* Highly statistical significant difference  $p \leq 0.001$ .

## Result

Table 2 shows the characteristics and IOP results by group.

In all eyes ,the mean decrease in iop from preoperatively to the final recording was 4.094mm hg(18.97%.) However, analysis of eyes according to preoperative iop showed iop reductions greater than previously recognized. The iop reduction postoperatively was proportional to the preoperative iop. Eyes with the highest preoperative iop had the greatest iop decrease. Group 1 alone had a mean decrease in iop of 24.657% at 1 year; group 2 had 20.42% decrease iop; and group 3 had 8.47% decrease iop

Figure 2 shows the decline in iop in each group at 6 months and after 1 year. The iop behavior is highly correlated with the preoperative iop.

Table 3 shows that in group 1 all the eyes had a decrease in iop postoperatively ; table 4 also shows that in group 2 there is a universal decline in iop in all eyes postoperatively ;while table 5 shows that in group 3 there was a decline in iop in 21 eyes (70%) , while 6 eyes (20%) had no final change in iop , and that 3 eyes (10%) had increase in iop.

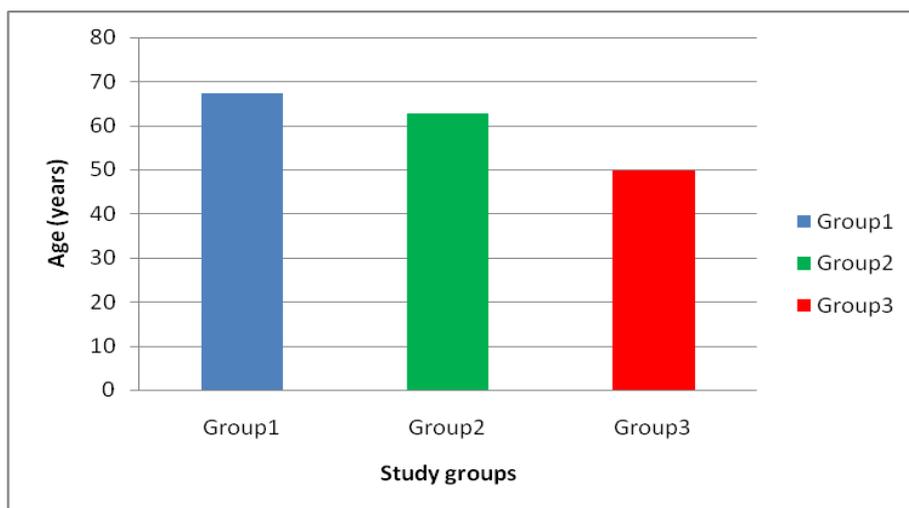


Figure 1. Distribution of groups according to age

Table 2. Changes in IOP before and after surgery in the study groups

IOP group	Number of eyes	IOP At surgery	IOP After 6 months	IOP After 1 year	Final Change in IOP	P value
Group 1 (24-30 mmHg)	17	26.00±0.45	21.18±0.56	19.59±0.42	-6.41(24.657%)	0.001**
Group 2 (20-23 mmHg)	23	21.74±0.25	17.83±0.31	17.30±0.32	-4.44(20.42%)	0.001**
Group 3 (15-19 mmHg)	30	17.00±0.25	15.90±0.19	15.57±0.22	-1.44(8.47%)	0.001**
P value		0.001**	0.001**	0.001**		

Data expressed as Mean±S.E.

\*\* Highly statistical significant difference  $p \leq 0.001$ .

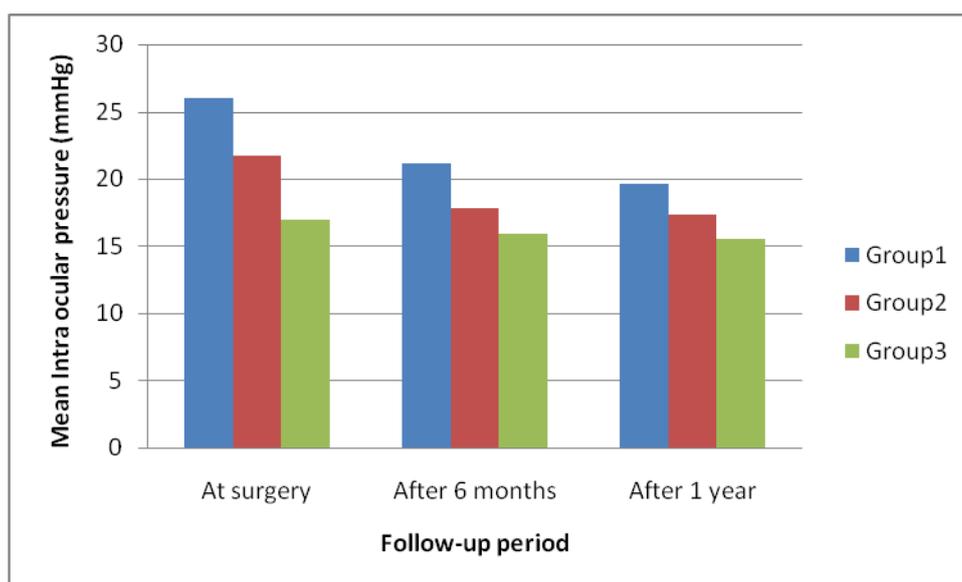


Figure 2. Changes in mean IOP before and after surgery in the study groups

**Discussion**

Initially, we averaged the iop in all eyes to determine the iop reduction, however, eyes

with a high preoperative iop that had a

Table 3. Details of group 1 according to age , and change in IOP before and after surgery  
Group 1

No.	Age(years)	Mean Intra-ocular pressure (mmHg)			
		At surgery	6 month	1 year	Final change
1	68	25	23	19	-6
2	66	24	23	18	-6
3	67	28	22	23	-5
4	70	27	20	21	-6
5	71	30	23	21	-9
6	62	29	22	21	-8
7	65	24	24	20	-4
8	60	25	19	19	-6
9	55	26	19	20	-6
10	78	25	18	17	-8
11	75	24	19	18	-6
12	60	25	20	19	-6
13	80	28	25	21	-7
14	64	24	20	17	-7
15	61	26	19	18	-8
16	65	27	25	22	-5
17	75	25	19	19	-6

Table 4. details of group 2 according to age , and IOP changes before and after surgery  
Group 2

No.	Age(years)	Mean Intra-ocular pressure (mmHg)			
		At surgery	6 month	1 year	Final change
1	64	23	19	18	-5
2	61	21	16	17	-4
3	60	22	15	16	-6
4	57	20	16	16	-4
5	70	20	17	21	1
6	60	23	19	18	-5
7	65	22	18	18	-4
8	65	23	19	17	-6
9	62	20	20	21	1
10	60	21	18	17	-4
11	55	22	19	16	-6
12	54	22	18	16	-6
13	68	23	19	17	-6
14	67	20	18	16	-4
15	70	20	16	16	-4
16	62	21	17	17	-4
17	63	23	20	18	-5
18	66	23	20	19	-4
19	63	22	18	16	-6
20	60	22	17	17	-5
21	59	21	16	16	-5
22	58	23	19	19	-4
23	72	23	16	16	-7

Table 5. group 3 showing details according to age, and IOP changes before and after surgery  
Group 3

No.	Age(years)	Mean Intra-ocular pressure (mmHg)			
		At surgery	6 month	1 year	Final change
1	55	15	15	15	0
2	53	17	17	16	-1
3	42	19	16	16	-3
4	41	18	16	16	-2
5	47	16	16	17	1
6	53	16	15	15	-1
7	58	19	18	17	-2
8	40	18	16	16	-2
9	38	15	15	16	1
10	51	15	16	15	0
11	60	16	17	16	0
12	52	18	15	15	-3
13	55	18	18	17	-1
14	54	18	15	15	-3
15	49	17	17	16	-1
16	53	17	15	15	-2
17	56	19	17	17	-2
18	58	19	18	18	-1
19	40	15	16	15	0
20	43	15	15	16	1
21	60	18	17	16	-2
22	62	16	15	15	-1
23	45	17	15	14	-3
24	50	17	16	14	-3
25	25	19	16	15	-4
26	54	17	15	17	0
27	44	15	15	12	-3
28	64	18	15	14	-4
29	51	16	15	16	0
30	45	17	15	15	-2

The mean iop decrease was 4.094 after 1 year of phacoemulsification and intra ocular lens implantation. However, when we divided the eyes into 3 groups according to the preoperative iop we found greater iop reductions than previously seen. Eyes with the highest preoperative iop had the greatest iop decrease and eyes with the lowest preoperative iop had an insignificant iop reduction. This showed that iop reduction after phacoemulsification with intra ocular lens implantation was proportional to the preoperative iop, and that the eyes most in need of iop reduction had the greatest iop decrease. In our study, eyes with the highest preoperative iop ( range 24-30 mm hg ) had a mean iop reduction of 6.411 mm hg (24.6%) after 1 year. This

indicates that phacoemulsification with intra ocular lens implantation should be considered an option for treating eyes with cataract and mild glaucoma. Eyes in group 2 had a final iop reduction of 4.439 mm hg which is also significant . Hyashi et al [4] found reduced iop in eyes with angle closure glaucoma ACG ,eyes with open angle glaucoma OAG, and control eyes (normal iop )after phacoemulsification and IOL implantation.Shingleton et al [7,8]report results in 55 eyes with OAG with 3 years and 5 years follow up. The eyes included primary OAG , pseudo exfoliation syndrome and pigment dispersion . The study showed small but significant iop reduction (p = 0.0001) after phaco with IOL implantation. Eyes required the same number of or fewer

medications after surgery. Shingleton et al suggest that their results do not imply that phaco with IOL implantation is a substitute for a combined procedure but may be appropriate for certain patients based on medication requirement and the extent of optic nerve damage. Issa *et al* [9] reported that iop reduction in non glaucomatous eyes after phaco with IOL implantation was positively related to pre operative iop and inversely related to pre operative anterior chamber depth ACD. they developed an index called ( the pressure to depth ratio ) that may help predict iop reduction after phaco with IOL implantation. The ophthalmologist must consider several factors when making treatment decisions for eyes with glaucoma. If the pre operative iop is 20 mm hg or greater and a target iop of 18 mm hg is adequate, phaco with IOL

implantation may be the best option. If the target iop is less than 18 mm hg, a combined procedure or trabeculectomy may be the best choice [11]

### Conclusion

There is a significant reduction of iop after phaco with IOL implantation in eyes with an iop greater than 20 mm hg. The decrease in iop is proportional to the preoperative iop. The higher the preoperative iop the greater the postoperative iop reduction. Treating hypertensive eyes by phacoemulsification with IOL implantation appears to be more effective in preventing the development of glaucoma than treatment with glaucoma drops as reported in the 2002 ocular hypertensive treatment study [10]

### References

1. Flocks M, Littwin CS, Zimmermen LE. Phacolytic glaucoma. Arch Ophthalmol 1955;54 : 37.
2. Laakainen L. late results of surgery on eyes with primary glaucoma and cataract. Acts Ophthalmol 1971;49 : 281.
3. Euswas A, Warrasak S. Intraocular pressure control following phacoemulsification in patients with chronic angle closure glaucoma. J Med Assoc Thai 2005 ; 88 : S 121- S 125 .
4. Hayashi K , Hayashi H , Nakao F , Hayashi F . Changes in anterior chamber angle width and depth after intraocular lens implantation in eyes with glaucoma. Ophthalmology 2000;107:698-703.
5. Lai Jsm, Tham Ccy, Chan Jch . The clinical outcomes of cataract extraction by phacoemulsification in eyes with primary angle closure glaucoma and coexisting cataract; a prospective case series . J Glaucoma 2006;15:47-52.
6. MATHALONE N , Hyams M, Neiman S, Buckman G, Hod Y, Geyer O . Long term intraocular pressure control after clear corneal phacoemulsification in glaucoma patients . J Cataract Refractive Surg 2005;31:479-483 .
7. Shingleton B, Gamell Ls, O Donoghue Mw, Baylus Sl, King R . Long term changes in intraocular pressure after clear corneal phacoemulsification : normal patients versus glaucoma suspect and glaucoma patients. J Cataract Refract Surgery 1999;25:885-890.
8. Shingleton BJ, Pasternack JJ , Hung Jw , ODonoghue Mw . Three and five year changes in intraocular pressure after clear corneal phacoemulsification in open angle glaucoma patients , glaucoma suspects, and normal patients . J Glaucoma 2006;15:494-498 .
9. Issa SA, Pucheco J , Mahmood U , Nulan J, Beatty S. A novel index for predicting intraocular pressure reduction following cataract surgery. Br J. Ophthalmol 2005;89:543-546.
10. Kass MA, Heuer DK, Higginbotham EJ, Johnson CA, Keltner JL, Miller Jp, Parrish RK II, Wilson MR, Gordan Mo. The ocular

hypertension treatment study. A randomized trial determines that topical ocular hypotensive medication delays or prevents the onset of primary open angle glaucoma; The ocular hypertension treatment study group. Arch Ophthalmol 2002;120:701-713 .

11. Brooks J Poley , Richard L Lindstrom , Thomas W Samuelson , Richard Schulze . Intraocular pressure reduction after phacoemulsification with intraocular lens implantation in glaucomatous and non glaucomatous eyes . J Cataract Refract Surg 2009 ; 35 : 1946 – 1955 .