Change in Anterior Chamber Depth and Intraocular Pressure after Phacoemulsification Surgery of Senile Cataract

Zulfahri Lubis[*], Masitha Dewi[**], Delfi[**]

*Ophthalmology Resident, Department of Ophthalmology, Sumatera Utara University.
**Ophthalmologist, Department of Ophthalmology, Sumatera Utara University.

Corresponding Author: Zulfahri Lubis
Ophthalmology Resident, Department of Ophthalmology, Sumatera Utara University
Zulfahrilubis84@gmail.com

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Abstract

Purpose: To evaluate anterior chamber depth (ACD) and Intraocular pressure (IOP) alternation after phacoemulsification.

Patients and Methods : A quasi-experimental study with one group pre and post design were analysed. We analysed 41 eye who underwent cataract phacoemulsification surgery at Medan Baru Eye Hospital. The ACD and IOP were assessed before and after surgery on 1st, 3rd 14th of 41 eyes post phacoemulsification. ACD was measured with IOL Master 500 Karl Zeiss® was measured with Non-Contact Tonometry Shin-Nippon®.

Results : A total of 41 eyes, with characterized by age >60 year (78,3%), female (52,2%), left eyes(52,2%). The mean ACD had increased significantly at D0-D+1,D0-D+3, D0-D+14 and the mean IOP had decreased significantly at D0-D+3, D0-D+14, D+1-D+3, D+1-D+14 ($p<0,05$).

Conclusion : There was a significant increase in ACD and decrease in IOP after phacoemulsification.

Keyword : Anterior chamber depth, intraocular pressure, phacoemulsification, senile cataract.

I. Introduction

Cataract is the opacity of the lens that can occur due to hyper hydration of the lens, denaturation of the lens protein or both. There are several causes of cataracts such as genetic, congenital disorder, metabolic syndrome, trauma, toxicity and senile cataract. Senile cataract is the most common type cataract, associated with the process of degeneration (age-related). Cataracts can occur because the lens cell are very susceptible to both mechanical disturbance and loss of the chemical arrangement of the lens. If there is any damage, the lens cell does not undergo a turnover and will be maintained for life[1,2,3,4,5,6,7]

Cataract is the leading cause of reduced vision in the world. Estimated number of blindness caused by cataracts in the world is around 17 million people and will predicted to increase to 40 million by 2020. Cataracts occur in 10% of Americans and this prevalence increases up to 50% for those who are aged between 65 and 74 years old. And up 70% in aged group over 75 years.[1,2,3,5,8,9.]

In Indonesia, cataract is the most common cause of blindness, as well as in the world. Currently half of the 45 million blindness is caused by cataracts. In Indonesia in 1991, the prevalence of blindness was 1.2% with estimated number blindness due to cataracts was 0.67%. In 1996 the number of blindness caused by cataract was increased to 1.47%, and in 2013 was increased to 1.8%. In 2005 it was reported that rural areas in Indonesia had the highest prevalence of cataracts in Southeast Asia[2,5,10,11]

II. Method

This study was conducted by Quasi Eksperimental method with One Group Pre and Post test design was performed in Medan Baru Eye Hospital. Eligible patient with cataract senilis were collected in March 2018. The inclusion criteria in this study was ≥ 40 years old cataract patients who were willing to undergo senile cataract surgery, and willing to be checked regularly of ACD and IOP changes before and after phacoemulsification cataract surgery. The examination were conducted on days 1st, 3rd and 14th. The Exclusion criteria were patient with senile cataract with history of trauma oculi, corneal abnormalities, glaucoma, and eye infections.

The study was conducted in accord the ethical study of Declaration of Helsinki as approach by Medical Faculty University of Sumatera Utara ethic committee. Informed consent was approved from all patient. All subject were conducted ophthalmology examination include Snellen Chart, Examination of anterior segment with Appasamy ®slitlamp, examination of intraocular pressure with Shin-Nippon non contact tonometry, examination of anterior chamber depth used IOL Master 500 Karl Zeiss®.

All data was analysed with SPSS software 19 to observed changes in ACD and IOP by used t-test and Wilcoxon test, to find the correlation between ACD and IOP before and after phacoemulsification surgery we used Pearson test and Spearman's test.

III. Results

The subjects were 60 eyes but 14 eyes were excluded because the subjects did not complete follow-up after phacoemulsification surgery, so the total number of our study subjects were 46 eyes (n = 46).

Table 4.1. Characteristics patients of senile cataract based on age

AGE (YEARS)	FREQUENCY (n)	PERCENTAGE (%)
41-50	2	4.3
50-60	8	17.4
> 60	36	78.3
TOTAL	46	100

Table 4.1. showed that most cataract subjects were in age group > 60 years as many as 36 people (78.3%). And the least found in the age group 41-50 years as many as 2 people.

Table 4.2. Characteristics patients of senile cataract based on sex

SEX	**FREQUENCY (n)**	**PERCENTAGE (%)**
MALE	22	47.8 %

FEMALE	24	52.2 n%
TOTAL	**46**	**100.0%**

Table 4.2. showed that the subjects of cataract mostly in women 24 people (52.2%), while in men as many as 22 people (47.8%).

Table 4.3. Characteristics patients of Senile cataract based on eye lateralization

EYE	FREQUENCY (n)	PERCENTAGE (%)
Right	22	47.8 %
Left	24	52.2 n%
Total	**46**	**100.0%**

Table 4.3. showed the most cataract mostly in left eyes 24 patients (52.2%), while in the right eye were 22 eyes (47.8%).

Table 4.4. Anterior chamber depth rate of resile cataracts

Anterior Chamber Depth	N	Minimum	Maximum	$\bar{x} \pm SD$
D0	46	2.59	4.04	3.25 ± 0.372
D+1	46	2.30	4.37	3.64 ± 0.484
D+3	46	3.03	4.38	3.69 ± 0.303
D+14	46	3.02	4.50	3.72 ± 0.343

Table 4.4. Showed that the mean anterior chamber depth before phacoemulsification surgery was 3.25 mm, the first day after phacoemulsification surgery was 3.64 mm, the 3rd day was 3.69 mm, and the 14th day was 3.72 mm.

Table 4.5. Intraocular pressure rate of cataracts senile cataracts

Intraocular Pressure	N	Minimum	Maximum	$\bar{x} \pm SD$
D0	46	11	20	16.00 ± 2.309
D+1	46	11	20	15.48 ± 2.483
D+3	46	10	18	13.78 ± 1.788
D+14	46	10	18	13.39 ± 1.680

Table 4.2. It showed that the rate of intraocular pressure before phacoemulsification surgery was 16.00 mmHg, the first day after phacoemulsification operation 15.48mmHg, 3rd day was 13.78 mmHg, and 14th day was 13.39 mmHg.

Table 4.6. Change anterior chamber depth after phacoemulsification surgery.

Anterior Chamber Depth	N	$\bar{x} \pm SD$	Mean Differential	*P*
D0	46	3.25 ± 0.372	0.387	0.0001*
D+1	46	3.64 ± 0.484		
D0	46	3.25 ± 0.372	0.433	0.0001*

D+3	46	3.69 ± 0.303		
D0	46	3.25 ± 0.372	0.464	0.0001*
D+14	46	3.72 ± 0.343		
D+1	46	3.64 ± 0.484	0.047	0.451
D+3	46	3.69 ± 0.303		
D+1	46	3.64 ± 0.484	0.078	0.330
D+14	46	3.72 ± 0.343		
D+3	46	3.69 ± 0.303	0.031	0.389
D+14	46	3.72 ± 0.343		

Note : Paired t-test

** Significant (P< 0.05)*

Table 4.6. The result of paired t-test showed p = 0.0001 (p <0.05) on D0-D +1, D0-D + 3, D0-D + 14 thus according to statistical test found significant changes of anterior chamber depth prior to phacoemulsification surgery and on 1st, 3rd, 14th day 1, after phacoemulsification surgery.

Table 4.7. Change Intraocular pressure of senile cataract after phacoemulsification surgery

Intra Ocular Pressure	**N**	**x̄ ± SD**	**Mean Differential**	***P***
D 0[a)]	46	16.00 ± 2.309	0.522	0.192
D+1	46	15.48 ± 2.483		
D 0[a)]	46	16.00 ± 2.309	2.21	0.0001*
D+3	46	13.78 ± 1.788		
D 0[b)]	46	16 ± 2.309	2.609	0.0001*
D+14	46	13.39 ± 1.680		
D+1[a)]	46	15.48 ± 2.483	1.696	0.0001*
D+3	46	13.78 ± 1.788		
D+1[b)]	46	15.48 ± 2.483	2.087	0.0001*
D+14	46	13.39 ± 1.680		
D+3[b)]	46	13.78 ± 1.788	0.391	0.027
D+14	46	13.39 ± 1.680		

Note : a)Paired t-test

b)Wilcoxon test

** Significant (P< 0.05)*

Table 4.7. The result of statistical test shows that p = 0.0001 (p <0.05) on D0-D+3, D0-D+14, D+1-D+3, D+1-D+14, thus according to statistical test found significant change intraocular pressure.

Table 4.8. Correlation of anterior chamber depth with intra ocular pressure patients with senile cataract after phacoemulsification surgery.

	N	**R**	***P***

ACD D0[c)]	46	0.086	0.256
IOP D0	46		
ACD D+1[c)]	46	0.988	0.002*
IOP D+1	46		
ACD D+3[c)]	46	0.586	0.083
IOP D+3	46		
ACD D+14[d)]	46	0.649	0.069
IOP D+14	46		

Note : c) Pearson Correlation test

d) Spearman's Correlation test

** Significant (P< 0.05)*

Table 4.8. The result of statistical test showed p = 0.002 (p <0.05) on ACD D + 1-IOP D + 1 thus according to statistical test not found Significant correlation of anterior chamber depth on 1st day after phacoemulsification surgery with intraocular pressure 1st day pressure after phacoemulsification surgery.

IV. Discussion

The most cataract subjects in our study were aged over 60 years old (78.3%), female (52.2%), male(47.8%), left eye(52,2%), and right eyes (47,8%). Table 4.4. showed the mean depth of the anterior chamber depth prior phacoemulsification surgery increased which was in accordance with Junejo MK et al's research in Pakistan in 2016 where there was increased in the anterior chamber depth after phacoemulsification surgery. In table 4.5. showed that the mean values of intraocular pressure before phacoemulsification surgery decreased, it was consistent with Dooley et al's study in Ireland where there was decreased in intraocular pressure after phacoemulsification surgery.

In table 4.6 we found significant changes in anterior chamber depth according to statistical test prior phacoelmulsification and after phacoemulsification surgery. This was consistent with the research by Osman C et al in turkey and Wozniack MM in Poland in 2016, where they found increased depth in ACD and decreased IOP after phacoemulsification surgery with uncomplicated IOL implantation. In the Mustafa KJ study in Pakistan in 2016 there was a significant increase in anterior chamber depth after phacoemulsification, as well as a study by Cigdem A et al in Turkey where there was an increase in anterior chamber depth and widening of iridocorneal angle in non-glaucoma patients post phacoemulsification surgery .

According to statistical tests there was a significant changed of intra-ocular pressure from pre-phacoemulsification operation with post-phacoemulsification on 3rd day and 14th day after surgery. It was consistent with the study of Alina D in the Czech Republic in 2016 where cataract surgery could reduced intraocular pressure and increased the anterior chamber depth. Other studies said according to Mohammad et al in Iran, phacoemulsification could reduce high intra-ocular pressure. In a study of Liu XQ et al in China in 2012 there was a decreased in intraocular pressure in first week after phacoemulsification surgery. This is supported by the Qiu J et al study IOP decreased and ACD increased significantly in eyes without history of glaucoma.

Table 4.7. showed decreased intra-ocular pressure on 3rd day and 14th day after phacoemulsification surgery. In Table 4.8. The results of statistical tests showed a significant correlation between anterior chamber with intra-ocular pressure after the first day of phacoemulsification surgery.

V. Conclusion

There was a significant increase in anterior chamber depth and decreased intraocular pressure before and after phacoemulsification surgery.

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