EVALUASI INDUKSI ASTIGMATISMA AKIBAT PEMBEDAHAN DENGAN INSISI TEMPORAL 2.75 MM PASCA FAKOEMULSIFIKASI

(Evaluation Of Surgical Induced Astigmatism In 2.75 Mm Temporal Clear Corneal Incision After Phacoemulsification)

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ABSTRACT

Background : *Cataract is still one of the eye health problem. Blindness due to cataract can be prevented with cataract surgery so the vision can be corrected. Cataract surgery have huge development and now phacoemulsification is used widely. Surgically induced astigmatism is one of many tools to evaluate the success of cataract surgery. Surgically induced astigmatism will affect visual acuity. There are many factors contributing the incident of surgically induced astigmatism such as size of incision, location of incision, and pre surgery astigmatism.* ***Objective :*** *to analyze surgically induced astigmatism after cataract surgery with 2.75 mm temporal clear corneal incision phacoemulsification technique.* ***Material and Methods :*** *Cross-sectional studies has been conducted on 92 subject. Astigmatism were evaluated in every subject before and after cataract surgery. Surgically induced astigmatism were evaluated by evaluating keratometry before and after cataract surgery. Comparative statistics were used to evaluate comparison between variable.* ***Result :*** *The mean pre-operative astigmatism were 0.88 D, and mean of post-operative astigmatism were 0.81 D. Decreased in post-operative astigmatism found in 41 subject (44.6%), increased in 31 subject (33.7%), and 20 subject (21.7%) had no changes in astigmatism. There was no statistically significant difference between pre and post-operative astigmatism (p = 0.214).* ***Conclusion :*** *There was no significant surgically induced astigmatism in patients undergo phacoemulsification with 2.75 mm temporal clear corneal incision.*

Key Words*: Cataract, Astigmatism, Phacoemulsification*

ABSTRAK

Latar Belakang : Katarak masih menjadi salah satu masalah kesehatan mata. Penyebab kebutaan akibat katarak dapat dicegah dengan dilakukan operasi katarak sehingga dapat memperbaiki penglihatan. Operasi katarak telah mengalami banyak perkembangan hingga sekarang telah banyak dilakukan pembedahan dengan teknik fakoemulsifikasi. Salah satu evaluasi kesuksesan operasi

katarak adalah evaluasi terjadinya induksi astigmatisma pasca operasi. Induksi astigmatisma pasca operasi katarak ini akan mempengaruhi tajam penglihatan. Banyak faktor yang menyebabkan terjadinya induksi astigmatisma saat operasi katarak seperti besar insisi, lokasi insisi, astigmatisma pra operasi. **Objektif :** Menganalisis induksi astigmatisma pasca operasi katarak dengan fakoemulsifikasi insisi 2.75 mm, temporal *clear corneal*. **Material dan Metode :** Studi potong lintang telah dilakukan pada 92 pasien. Setiap subyek penelitian dilakukan pemeriksaan keratometri pra dan pasca operasi katarak. Induksi astigmatisma didapatkan dari pengukuran pra dan pasca operasi katarak. Analsis komparatif dilakukan untuk melihat perbandingan antar variabel. **Hasil :** Rerata astigmatisma pra operasi sebesar 0.88 D, dan rerata astigmatisma pasca operasi sebesar 0.81 D. Penurunan Astigmatisma pasca operasi terjadi pada 41 subjek (44.6%), peningkatan pada 31 subjek (33.7%), dan 20 subjek (21.7%) tidak mengalami perubahan. Tidak terdapat perbedaan yang bermakna secara statistik antara astigmatisma pra dan pasca operasi (p = 0.214). **Kesimpulan :** Bedah fakoemulsifikasi katarak dengan insisi temporal *clear corneal* 2.75 mm tidak menginduksi terjadinya astigmatisma pasca operasi.

Kata Kunci: Katarak, Astigmatisma, Fakoemulsifikasi

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BACKGROUND

Cataract is one of eye health problems in the world. According to WHO 2.2 billion people are estimated to suffer eye problems, cataract comes in second place with approximately 65.2 million people suffering cataract.[1] According to RAAB survey, in Indonesia the blindness prevalence on people older than 50 years old, cataract is the main cause of the blindness and eye problems. 77.7% of the cases has not being addressed and blindness prevalence caused by cataract is 1.9%.[2] East Java ranked 1st as the Province with high prevalence of blindness (4.4%). The risk of having cataract increases along with age.[1] According to the data from United Nations in 2017, the life expectancy rate in 2010-2015 is 71 years old, there was an increase of 6 years compared to 1990-1995 which is 65 years old, and estimated to reach 83 years old by the year of 2095-2100.[3] An increase in life expectancy rate increases the risk of developing cataract.[4]

Indonesia as a developing country is trying to increase health development with the aims of increasing economic sector. Indonesian Ministry of Health is working together with the Indonesian National Eye Committee and Indonesia Ophthalmologists Association to carry out a program to solve the vision problems.[2] The blindness caused by cataract are preventable by surgery to improve the patient's vision. Cataract surgery has undergone a lot of improvements. Nowadays, many cataract surgeries are done using the phacoemulsification technique. The main purpose of this modern cataract surgery is to obtain the optimal visual acuity without correction in a shorter period of time, minimal surgical complication and to reduce surgical induced astigmatism[5].

The success of cataract surgery can be evaluated by the presence of post-operative astigmatism induction. Post-operative astigmatism frequently occurred, even with recent phacoemulsification surgery technique.[6] Many factors affecting the induction of post-operative astigmatism such as incision size, incision site and pre-operative astigmatism.[5,7,8]

Phacoemulsification can be done with 1.8 – 2.75 mm incision size,[9] but the availability of intraocular lens (IOL) in Indonesia are mostly for 2.75 mm incision size. Phacoemulsification technique with 2.75 mm temporal clear corneal incision has been done for a long period of time in PHC Hospital of Surabaya, this research is conducted to find out the occurrence of surgical induced astigmatism after phacoemulsification with 2.75 mm temporal clear corneal incision.

METHODS

This study was a prospective study with cross sectional research design, conducted at PHC Hospital of Surabaya on December 2019 until March 2020. This study was approved by the Health Research Ethics Commission of Medical Faculty Widya Mandala Surabaya Catholic University based on WHO-CIOMS International Ethical Guidelines for Health-related Research Involving Humans. Patient undergone phacoemulsification surgery were evaluated 1 week pre-operative and 1 month post-operative using Shin-Nippon autorefractokeratometer. We did a simple random sampling and enrolled 92 patients to the study. The inclusion criteria were patients undergone cataract extraction with phacoemulsification technique in PHC Hospital of Surabaya on December 2019 until January 2020, willing to participate in the study, never had any refractive and intraocular surgery prior to

phacoemulsification. The surgeries in this study were done by one surgeon. The exclusion criteria were patients that did not show up on the keratometry examination schedule and patients who had post-operative complication.

RESULTS

In this study, sample age were about 41-80 years old. Most of the patients were aged 61-70 years old (43.9%). The mean age was 65 years old. 39.2% samples were male, and 60.8% samples were female. Most eyes in this study were right eyes (65.2%).

The range of pre-operative corneal astigmatism were 0.0 – 3.00 D with 41 patients (44.6%) having pre-operative corneal astigmatism ≤ 0.5 D with average flat and steep keratometry were 43.56 and 44.01 respectively. The range of post-operative corneal astigmatism were 0.0-2.75 D with 40 patients (43.5%) having ≤ 0.5 D post-operative corneal astigmatism. This group had average flat and steep keratometry of 43.77 and 44.08 respectively.

Table 1. Subject Demographic Characteristic

Parameters	Value (%)	Percentage
Age		
Mean ± SD	64.96 ± 7.14	
Group of Age		
41-50	3	3.2
51-60	23	25
61-70	40	43.5
71-80	26	28.3
Gender		
Men	36	39.2
Women	56	60.8
Eye Side		
Right Eye	60	65.2
Left Eye	32	34.8
Pre-Operative Keratometry (D)		
K1 mean ± SD	43.52 ± 1.22	
K2 mean ± SD	44.43 ± 1.28	
Pre-Operative Keratometry (D)		
K1 mean ± SD	43.65 ± 1.27	
K2 mean ± SD	44.45 ± 1.32	
Corneal Astigmatism		
Pre-operative	0.88 ± 0.68	
Post-operative	0.81 ± 0.66	

*D diopter, K1 flat keratometry, K2 steep keratometry

Table 2. Comparison of Pre- and Post-Operative Corneal Astigmatism and Keratometry

Corneal Astigmatism	Pre-operative Astigmatism				Post-operative Astigmatism			
	Number	Percentage	K1	K2	Number	Percentage	K1	K2
≤0.5 D	41	44.6 %	43.56	44.01	40	43.5 %	43.77	44.08
0.6-1 D	28	30.4 %	43.45	44.31	34	36.9 %	43.62	44.43
≤ 2 D	16	17.4 %	43.60	44.89	12	13.1 %	43.41	44.92
≤ 3 D	7	7.6 %	43.66	46.23	6	6.5%	43.44	46.04
Mean Comparison in Keratometry								
K1	p=0.015							
K2	p=0.679							

We compared pre- and post-operative corneal astigmatism and data showed 41 patients (44.6%) had reduction in corneal astigmatism, 31 patients (33.7 %) had increment in corneal astigmatism and 20 patients (21.7%) did not have any change in corneal astigmatism. The number of patients with astigmatism reduction was higher in a=0.214).

Comparison of flat and steep keratometry on pre- and post- operative data showed significant difference between flat keratometry (p=0.015) and steep keratometry found to be not having any statically significant different pre- and post-operatively (p=0.679).

DISCUSSION

The age distribution in this research was 40-80 years old, dominated by the age of 61-70 years old (43.9%). This data was consistent with WHO data as the risk of cataract increase with age[1] and based on Rapid Assessment of Avoidable Blindness (RAAB) data, cataract rank first as cause of blindness in person > 50 years old.[2] The subjects were dominated by female (60.8%) compared to male (39.2%). This data was similar to study by Madeleine, which showed the prevalence of lens opacity especially on the cortical area was higher in female,[10] and research by Gupta et.al. showed post-menopausal female has higher risk of cataract because the decrease in estrogen level.[11] The eye side distribution was dominated by right eye in our study and this result was in accordance with the study conducted by Young and Dane which showed that the right eye has higher risk of cataract because of the parasympathetic impulses are higher in the dominant eye and the motoric movement is better in the dominant eye. This mechanisms caused lenses to turn into round shaped while

looking at close objects compared to the non-dominant eye.[12]

Pre-operative astigmatism was dominated by ≤ 0.5 D astigmatism (44.6%) with the average of flat and steep keratometry 43.56 and 44.01 respectively, while post-operative astigmatism also dominated by ≤ 0.5 D astigmatism (43.5 %), with the average of flat and steep keratometry 43.77 and 44.08 respectively. The post-operative corneal astigmatism reduction occurred more often (44.6%) compared to increment of corneal astigmatism (33.7%) but not significant statistically (p=0.214). The decrement might be caused by several factors, one of them is the type of astigmatism which was not recorded in this study. According to research done by Yuta et.al. and Wakefield et.al., changes in astigmatism type from with the rule (WTR) type to against the rule (ATR) type increase along with aging.[13,14] Archana et.al. and Muftuoglu found that temporal incision induced less post-operative astigmatism.[12,15] WTR astigmatism has bigger vertical than horizontal curvature, however ATR astigmatism has bigger horizontal than vertical curvature.[16] Schmitt et.al. found that 2.75 mm temporal clear corneal incision showed no significant difference on posterior astigmatism.[9] Mohammadi et.al. found that aging caused changes in corneal curvature which made horizontal curvature steeper than the vertical curvature anteriorly. This does not happen on the posterior surface of cornea causing posterior cornea tends to have ATR compensating WTR on the younger age. This condition caused a higher incidence of astigmatism on the elderly.[17] In our study, the temporal incision might cause flattening on horizontal curvature which induced WTR astigmatism. This WTR astigmatism might be the cause of decrease in post-operative corneal astigmatism because it is compensating the ATR astigmatism on the posterior surface of cornea. [9,17]

The limitation of this study was our study did not measure the axis of corneal astigmatism which made us could not determine the type of astigmatism.

CONCLUSION

This research shows that 2.75 mm temporal clear corneal incision will not induce post-operative corneal astigmatism.

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