ICMHS_ABS_5379_Intraocular_Pressure

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THE PATTERN OF INTRAOCULAR PRESSURE AFTER PHACOEMULSIFICATION SURGERY IN SENIL CATARACT

ABSTRACT

Background: Senile cataract is a condition where the eye's lens becomes cloudy due to aging (degeneration). Phacoemulsification is a surgical procedure that is widely used today. One of the complications that arise after surgery is an increase in intraocular pressure (IOP) which can be caused by retention of viscoelastic material and inflammatory reactions. A prolonged IOP increase can have serious effects such as glaucoma which can cause damage to the optic nerve. Purpose: Knowing the pattern of IOP changes after phacoemulsification surgery in senile cataract. Methods: This study is *a quasi experimental* study with a cohort design. The study population was male and female senile cataract patients over 50 years of age who underwent phacoemulsification surgery at PKU Muhammadiyah Gamping Hospital, in 2020. IOP measurements using a Transpalpebral Tonometer were carried out before surgery (D-0) and postoperatively on day 2 (D-2), day 9 (D-9), day 16 (D-16) and day- 23 (H-23). The data were analyzed using the Friedman test followed by the Post Hoc LSD test. Results: In this study, 50 cases of senile cataract were obtained with a mean age of 64.10 ± 10.2 years. The results of the Friedman test showed that there were significant differences ($p < 0.05$) in the IOP measurement at H-0, H-2, H-9, H-16 and H-23. Post hoc LSD test showed a significant difference ($p < 0,05$) IOP measurements on H-2 (IOP increased sharply) and did not differ significantly on H-9, H-16 and H-23 compared to before surgery (H-0). Conclusion: There was a change in the IOP pattern after phacoemulsification surgery, that the IOP increased significantly on D-2 that it sloped toward the initial IOP before surgery (D-0) and then decrease slowly to the normal IOP. Intra-ocular pressure at D-9, D-16 and D-23 was not significantly different from before surgery (D-0).

Keywords: *Intraocular Pressure, Senile Cataract, Phacoemulsification*.

1. BACKGROUND

Cataract is a condition in which the lens of the eye becomes cloudy, resulting in impaired light entering the eye. One of the causes of cataracts is a factor of degeneration (aging) and is called senile cataract. Cataracts cause visual disturbances, ranging from blurred vision to blindness. WHO estimates that in the world as many as 18 million people are blind due to cataracts. Based on data from the Ministry of Health of the Republic of Indonesia in 2011, the number of cataract sufferers in Indonesia reached 2.4 million people and increased by about 240 thousand every year. In addition, the Ministry of Health of the Republic of Indonesia estimates that the incidence of cataracts in Indonesia is 0.1% per year or every year among 1,000 people there is a new cataract sufferer. The prevalence of cataracts in Indonesia in the 2013 Riskesdas was 1.8%, the highest in North Sulawesi and the lowest in DKI Jakarta.

Cataract surgery is the most common surgical procedure performed worldwide (Astbury & Nyamai, 2016). Phacoemulsification surgery is an operation that is often used today. The use of viscoelastic materials in phacoemulsification surgery helps in protecting the corneal endothelium from surgical trauma (Soekardi & Hutauruk, 2004). However, in addition to their benefits in protecting the corneal endothelium, viscoelastic materials can cause an increase in intraocular pressure (IOP) due to retention in the anterior chamber of the eye. The duration of the increase in intraocular pressure due to retention of viscoelastic material depends on the amount of viscoelastic residue left in the anterior chamber and the type of viscoelastic used, because

the higher the viscosity, the more difficult it is to expel it through the anterior chamber. However, the increase in intraocular pressure due to viscoelastic material is not serious and only temporary (Soekardi & Hutauruk, 2004).

In addition, postoperative inflammation also plays a role in the transient increase in intraocular pressure. This is supported by research data conducted by (Zahra Parnanda, 2017) which shows an increase in the average intraocular pressure on the first day after surgery from 13.53 mmHg to 16,358 mmHg.

Based on this description, the researchers felt the need to conduct research on changes in intraocular pressure pre and post phacoemulsification surgery in senile cataract patients. Is there a change in the pattern of intraocular pressure pre and post phacoemulsification surgery in senile cataract patients and what is the pattern of changes.

This study aims to determine the changes in intraocular pressure patterns pre and post phacoemulsification surgery in senile cataract patients.

2. METHOD

This study uses a *quasi-experimental* type of research with a one-group pretest-posttest design. The population of this study were senile cataract patients who underwent phacoemulsification surgery at the Kebumen Eye Center Eye Clinic.

[illegible] criteria. The inclusion criteria was male and female senile cataract patient who will undergo phacoemulsification surgery more than > 40 years. The exclusion criteria was [illegible] with complicated cataracts due to [illegible], Diabetes Mellitus, with a history of glaucoma, suffering from an eye infection and subjects who are not cooperative and refuse to continue the research.

The sampling technique in this study was *consecutive sampling*, that is, all subjects who came and met the research criteria were included in the study for a certain period of time so that the required number of research subjects was met.

3. RESULTS

A total of 50 probands have the mean age was 64.10 ±10.17 years, consist of 26 men (52%) and 24 women (48%). A total of 13 probands (26%) were in the age range of 66-70 years, meaning that patients who underwent a lot of phacoemulsification surgery in senile cataract patients were in that age range.

Table 1. Distribution frequencies of range of age

Age (y.o)	Amount	Percentage (%)
40-45	3	6
46-50	4	6
51-55	3	6
56-60	9	18
61-65	4	8
66-70	13	26
71-75	6	12
76-80	8	16
Total	50	100

Previously, normality was tested using Saphiro Wilk because the number of respondents was 50. The results of the normality test showed that p>0.05, this indicates that the IOP data from D-0 to D-23 is not normally distributed. Because the data are not normally distributed and are paired data (more than one measurement) with more than 2 groups, the test used is the Friedman test. The results of the Friedman test analysis showed that the value of p = 0.001 (p <0.05), it was concluded that there was at least a significant difference in IOP in the two measurements. To find out where the difference lies, a post hoc analysis of the Wilcoxon test was carried out.

Table 2. Intraocular Pressure Difference Test on certain days based on Friedman test.

Group	N	Median	p
IOP D-0	[illegible]	[illegible]	[illegible]
IOP D-2	50	[illegible]	0,001*
IOP D-9	50	11,50 (7-20)	
IOP D-16	[illegible]	[illegible]	
IOP D-23	[illegible]	[illegible]	

*) significant differences [illegible]

Table 3. Intraocular Pressure Difference Test between groups on Wilcoxon post-hoc test.

Between groups	p
IOP D-0 vs D-2	0,013*
IOP D-0 vs D-9	0,390
IOP D-0 vs D-16	0,043*
IOP D-0 vs D-23	0,664
IOP D-2 VS D-9	0,004*
IOP D-2 VS D-16	0,001*
IOP D-2 VS D-23	0,002*
IOP D-9 VS D-16	0,322
IOP D-9 VS D-23	0,995
IOP D-16 VS D-23	0,066

*) significant differences 5 %.

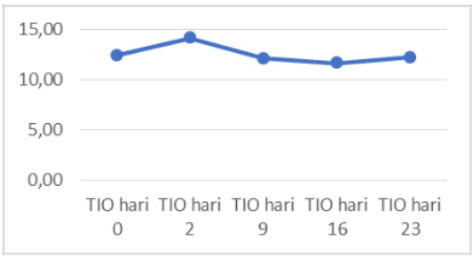

Figure 1. Patern of IOP Pre and Pasca Phacoemulsification Surgery on D-0, D-2, D-9, D-16 and D-23.

4. DISCUSSION

Intraocular pressure is the fluid pressure in the eyeball which is influenced by the production of aqueous humor and the resistance to aqueous humor out of the eye. Aqueous humor is a clear fluid that fills the anterior and posterior chambers of the eye, produced by the ciliary body, namely the ciliary process. Aqueous humor in the back chamber of the eye flows into the anterior chamber through the pupil. The aqueous humor then exits the anterior chamber by one of three routes:

1) Most of it flows through the trabecular meshwork located at the corner of the anterior chamber of the eye into Schlem's canal then into the episcleral vein (Machiele et al., 2020)

2) A small portion enters the suprachoroidal space leading to the venous circulation in the ciliary body, choroid, and sclera (Machiele et al., 2020)

3) A small portion passes through the iris to return to the back chamber of the eye (Machiele et al., 2020)(Aqueous humor secretion is influenced by the sympathetic nervous system. Beta-2 receptors play a role in increasing aqueous humor secretion while alpha-2 receptors play a role in decreasing humor secretion aqueous humor homeostatic mechanisms play an important role in maintaining intraocular pressure (Machiele et al., 2020).

Intraocular pressure is the pressure of the eyeball whose value is influenced by the dynamics of the aqueous humor fluid, namely the rate of formation of aqueous humor and the resistance to discharge from the eye. Factors that influence the production of aqueous humor are age, type II diabetes mellitus, high myopia, corticosteroids, blood pressure, obesity, and prolonged computer use (Martiningsih et al., 2018). A sudden increase in IOP can result in mechanical and ischemic pressure on the retinal nerve layer. Chronically elevated IOP plays a role in the pathogenesis of primary open-angle glaucoma (POAG) (Machiele et al., 2020).

Phacoemulsification is cataract surgery in the form of lens liquefaction using an ultrasound probe that is inserted through a smaller incision in the cornea or anterior sclera, in this technique no suturing is needed (James et al., 2003). The phacoemulsification technique allows the lens to be removed using a bimanual phaco technique, so that the corneal incision is only 1.5 mm.

The goal of phacoemulsification is to destroy the lens nucleus so that it can be removed from the eye through a small incision. Complications that can occur after the phacoemulsification procedure include discomfort, incomplete closure of the incision, corneal edema, atonic pupil, intraocular lens position, TASS (Toxic Anterior Segment Syndrome), CME (Cystoid Macular Edema), retinal detachment, endophthalmitis and increased IOP.

Increased postoperative IOP may be due to retention of viscoelastic material. Therefore, postoperative intraocular pressure checks are highly recommended (Astbury & Nyamai, 2016). The thing that is responsible for reducing intraocular pressure after phacoemulsification is cleaning in the trabecular meshwork (Soekardi & Hutauruk, 2004). Cortical remnant is a frequent complication. When the remaining cortex is not too much, then no additional action is needed, because the cortex will be absorbed slowly. However, when the rest of the cortex is too much and obstructs the visual axis, then expulsion is necessary. This procedure should be performed several days after surgery, so that the remaining cortex is more easily aspirated from the anterior chamber of the eye. If there is residual lens mass in the anterior chamber, it must be removed, because the lens mass in the form of both the nucleus and epinucleus is difficult to absorb and can cause chronic inflammation, especially in patients with a previous history of uveitis, it is easier to experience excessive inflammation. This inflammation can increase intraocular pressure because of the accumulation of inflammatory cells in the aqueous humor and trabecular meshwork.

Although there is an increase in intraocular pressure immediately after phacoemulsification surgery, according to (Majstruk et al., 2019) the long-term effect of phacoemulsification in patients without glaucoma, glaucoma, and cataracts causes a slight decrease in intraocular pressure. According to (Shingleton et al., 2006) that the decrease in intraocular pressure persisted for up to 5 years after cataract surgery. One of the mechanisms that causes a decrease in intraocular pressure is anatomical changes in the form of widening of the iridocorneal angle thereby increasing the flow of aqueous humor to the trabecular meshwork (Majstruk et al., 2019). In addition, there is an anatomical theory proposed by Berdal et al in 2009 which is that the posterior lens shifts after cataract surgery which causes the anterior tendon of the ciliary muscle to relax and changes the arrangement of the trabecular meshwork thereby facilitating the flow of aqueous humor.

CONCLUSION

There was a change in the IOP pattern after phacoemulsification surgery, that the IOP increased significantly on D-2 that it sloped toward the initial IOP before surgery (D-0) and then decrease slowly to the normal IOP. Intra-ocular pressure at D-9, D-16 and D-23 was not significantly different from before surgery (D-0).

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