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COMPARISON OF INTRAOCULAR PRESSURE (IOP) VALUE BEFORE AND AFTER VITRECTOMY IN DIABETIC RETINOPATHIC PATIENTS

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ABSTRACT

Background: Diabetic retinopathy is one of the second highest complications of microangiopathy in Indonesia due to diabetes mellitus in the form of damage to retina of the eye and can cause blindness in adults. The management of diabetic retinopathy is done by operative measure, one of which vitrectomy. However, this procedure can lead to an increase in the value of intraocular pressure after surgery. In this study, analysis of differences in intraocular pressure values before and after vitrectomy was carried out in patients with diabetic retinopathy. **Objective:** To know, compare, and analyze the intraocular pressure values before and after vitrectomy in patients with diabetic retinopathy. **Method:** The study design was an analytic observation with a study design *cross-sectional*. Sampling using method *consecutive sampling* obtained from medical record of 45 diabetic retinopathy patients who underwent vitrectomy at the RSND for the period July-December 2019. After the data was collected, the data were analyzed using the difference *Wilcoxon rank test*. **Result:** A total of 45 diabetic retinopathy patients underwent vitrectomy from medical records were dominated by 24 people aged >69 years and 26 female patients. The mean values of intraocular pressure before and one week after vitrectomy were 20.32 ± 2.57 mmHg and 23.89 ± 9.24 mmHg. **Conclusion :** The results showed that there was a higher intraocular pressure value after vitrectomy than before vitrectomy in diabetic retinopathy patients ($p=0.021$) or $p,0.05$. **Key Words:** Diabetic Retinopathy, Vitrectomy, Intraocular Pressure.

INTRODUCTION

Diabetes mellitus is chronic metabolic disease characterized by an increase in blood sugar levels (hyperglycemia) above the normal range that occurs when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces.¹ Diabetic retinopathy is one of the microangiopathic complication caused by diabetes mellitus in the form of damage to retina of the eye and may cause blindness in adults.² According to percentage of complication from diabetes mellitus at the Cipto Mangunkusumo National Center General Hospital (RSCM) in 2011, diabetic retinopathy with a prevalence of 33.40%.³

Patients with diabetic retinopathy due to complications of prolonged diabetes mellitus can cause significant decrease of visual acuity and an increase in intraocular pressure (IOP) of the eye.⁴ Patients with diabetic retinopathy can experience vitreous bleeding associated with increased IOP to detachment of the retina (retinal detachment) due to progressive fibrovascular proliferation which can lead to blindness.⁵ Intraocular pressure is the pressure produced by the fluid in the eye ball. An increase in IOP is caused by obstruction of aqueous humor outflow due to occlusion of the trabecular meshwork by the peripheral iris and damage to the ganglion cells and optic nerve.⁶

Vitrectomy is one of the most common diabetic retinopathy procedures performed on retinal detachment with vitreous hemorrhage. Vitrectomy procedures include cleaning the cloudy vitreous due to bleeding, cutting the connective tissue on the surface of the retina, and reattaching the detached retina.⁷ According to Yuan Fang's study, 50 patients (19,5%) had an increase in IOP after vitrectomy at a year follow-up and 68% had an increase in IOP within 1 month after vitrectomy ($p < 0.05$).⁸ Based on Kentaro's research, the increase in IOP that occurs after vitrectomy can lead to the development of new open-angle glaucoma which is a complication that is slow to detect.⁹

Because there is no current study in Indonesia regarding the comparison of IOP values before and after vitrectomy in the diabetic retinopathy patients and several studies have shown that vitrectomy result in an increase in IOP over a period of time, this study aims to compare and analyze the value of intraocular pressure (IOP) before and after vitrectomy in diabetic retinopathy patients.

METHOD

This is an observational study with a cross-sectional study design. This study uses a consecutive sampling technique where the selection of subjects



fit to the research objectives and met the inclusion and exclusion criteria. The inclusion criteria in this study were record from the medical records of patients undergoing vitrectomy at the Diponegoro National Hospital and information on the IOP value before and after vitrectomy. The exclusion criteria of this study were patients with acute eye inflammation, total blindness, retinal disorders other than diabetic retinopathy (optic atrophy glaucoma), and long term use of corticosteroid therapy. The subjects of this study were patients suffering from diabetic retinopathy who underwent vitrectomy at the Diponegoro National Hospital for the period July-December 2019, taken from the medical records of patients who met the inclusion and exclusion criteria. The data collected were data before and one week after vitrectomy.

Based on the result of sample calculations, the minimum number of samples is 30 people. The independent variable in this study was preoperative IOP. While the dependent variable in this study was IOP one week after surgery. The data analysis used a numerical normality test. The data were analyzed using Wilcoxon test. The p value is considered significant if $p < 0.05$. Processing, analysis, and presentation of data using computer software.

RESULTS

The number of research subjects from medical record data that met the inclusion and exclusion criteria was 45 persons. The data collection process for research subjects can be seen in the diagram of the consolidated standards of reporting trials (consort) in figure 1.

Characteristics of diabetic retinopathy patients included in this study consists of age and gender. The description of these patient characteristics can be seen in table 1. The results of the study were dominated by age >60 years as many as 24 people (53.3%). In this study also dominated by women as many as 26 people (57.8%).

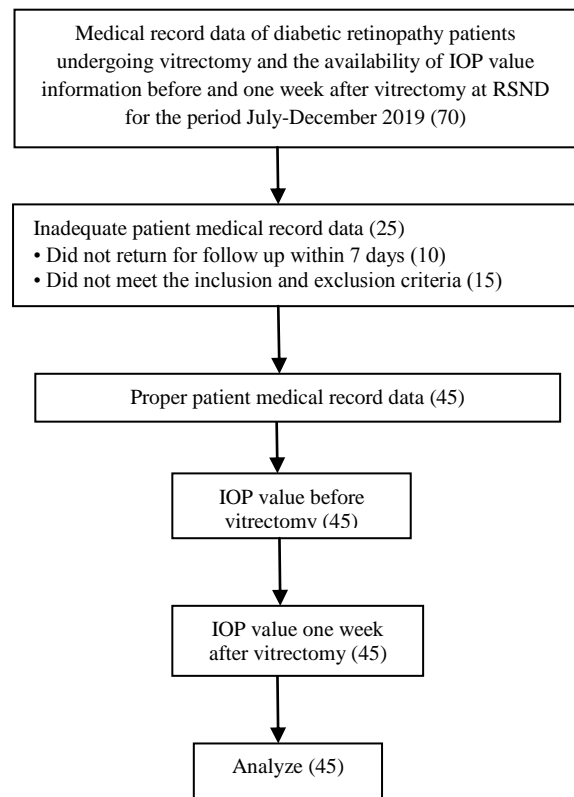


Figure 1. Consort Diagram

Table 1. Subject Characteristics

Characteristics	Frequency	Percentage	
Age (years)	<60	21	46,7%
	>60	24	53,3%
Gender	Male	19	42,2%
	Female	26	57,8%
Number of samples	45		

The results of the study regarding the difference in the value of IOP before and after one week of vitrectomy in patients with diabetic retinopathy can be seen in table 2. The results showed that IOP before the vitrectomy had an average and standard deviation of 20.32 ± 2.57 mmHg with the minimum value is 7.1 mmHg, while one week after the treatment has an average and standard deviation of 23.89 ± 9.24 mmHg with a minimum value of 10 mmHg. The results showed that there was a higher IOP value one week after vitrectomy than before vitrectomy in diabetic retinopathy patients ($p = 0.021$) or $p < 0.05$.



Table 2. IOP before and one week after vitrectomy

Intraocular pressure (IOP)	N	Mean ± SD (mmHg)	Minimal (mmHg)	Maximal (mmHg)	P
Before	45	20,32 ± 2,57	7,1	21	
1 week after	45	23,89 ± 9,24	10	59,1	0,021

*Wilcoxon rank test

DISCUSSION

The results showed diabetic retinopathy patients who experienced an increase in intraocular in this study were more often found at the age of >60 years (53.3%). Based Guede's study, age >60 years with history of diabetic retinopathy has increased intraocular pressure compared to age <60 years and is a risk factor for glaucoma.¹⁰ This is because with age, the flow of aqueous humor decreases and the ciliary epithelial cell structure changes due to the aging process, resulting in an increase in intraocular pressure.¹¹ This is consistent with previous research which states that the higher a person's age, the higher the average intraocular pressure.¹² The results of this study are also in accordance with Chen's research, it was found that at the age of >60 years (55.6%) experienced an increase in IOP with the incidence of secondary open-angle glaucoma after vitrectomy.¹³

The results of this study were dominated by 26 women (57.8%) and 19 men (42.2%). Based on the results of Yunia's study, patients who experience diabetic retinopathy are more in women (60%) than men (40%) because of the lack of physical activity carried out by women than men and women tend to experience gestational diabetes during pregnancy, thus increasing the risk for the occurrence of type II diabetes mellitus which is one of the risk factors for diabetic retinopathy.¹⁴

The results of this study are consistent with Zaldi's research, it was found that the value of IOP increased after a single vitrectomy and the dominant combination in women, especially those aged >40 years (58.5%) compared to men (41.5%). This is probably due to hormonal factors such as post-menopause where there is a decrease in estrogen and progesterone levels which results in various changes in women, one of which is a change in visuals with reduced production of nitric oxide as a vasodilator and a reduction in the antagonistic effect of

glucocorticoids resulting in increased intraocular pressure.¹⁵

In this study, the average intraocular pressure before vitrectomy was 20.32 ± 2.57 mmHg, while the average intraocular pressure one week after vitrectomy was 23.89 ± 9.24 mmHg with a value (p<0.05). Thus there is an increase in the value of intraocular pressure between before and one week after vitrectomy in patients with diabetic retinopathy. This finding is relevant to Xu Pei's study conducted at Tongji Hospital China, that there was a significant 36% increase in intraocular pressure after 1 week of vitreoretinal action using either the 20G vitrectomy technique or 23G pars-plana vitrectomy (PPV) using Goldman's aplanatic tonometry measurements with Goldman's applanation. value (p<0.05).¹⁶

Based on Greek research, there are several etiologies that can cause an increase in intraocular pressure after vitrectomy, one of which is trabecular flow obstruction caused by the occurrence of new open angle glaucoma. The trabecular strands can become clogged with blood after blunt trauma, inflammatory cells, pigment from the iris, and materials used for vitrectomy such as viscoelastic, tamponade gas, silicone oil, and the presence of bleeding and inflammation.⁵ This is consistent with a study conducted by Abdullah, regarding the long-term outcome of secondary glaucoma after vitreoretinal surgery using silicone oil.¹⁷

The results showed that there was an increase in intraocular pressure after vitrectomy and the incidence of secondary glaucoma which is a major complication after vitreoretinal surgery. These results are also in accordance with Kanski's theory, which states that increased intraocular pressure is one of the complications of vitrectomy surgery which causes open-angle glaucoma secondary to the use of silicone oil.¹⁸

The use of silicone oil as a substitute for the vitreous has been used for a long time and has been used for the long term for 2-6 months or more. Silicone oil is a thick liquid with a high level of cohesiveness so that when it is emulsified, it can block trabecular flow and cause an intraocular increase in post vitrectomy diabetic retinopathy patients.¹⁹



CONCLUSION AND SUGGESTIONS

The results of this study found that there was a significant increase in the value of IOP one week after vitrectomy compared to the value of IOP before vitrectomy in diabetic retinopathy patients at the Diponegoro National Hospital from July to December 2019.

This study has limitations and weaknesses, so further research is needed on the results of measuring the value of IOP before and several periods after vitrectomy in diabetic retinopathy patients in order to know the difference in intraocular pressure values after the recommended vitrectomy for example at 1 day, 3 months, and 6 months after vitrectomy and it is necessary to measure the IOP value directly observational in the patient in order to get a valid intraocular pressure value.

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