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CLINICAL CHARACTERISTICS OF PROLIFERATIVE DIABETIC RETINOPATHY (PDR) PATIENTS WITH VITREOUS HEMORRHAGE AT CIPTO MANGUNKUSUMO HOSPITAL

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Abstract

Introduction: *Proliferative Diabetic retinopathy is the most common cause of blindness in adults. In the management of vitreous hemorrhage, vitrectomy is the main choice and also laser photocoagulation with or without anti-VEGF administration as additional therapy. This study aims to determine the number of patients, demographic characteristics, clinics, risk factors, distribution of treatment, and treatment outcomes for PDR patients with vitreous hemorrhage at Cipto Mangunkusumo Hospital.*

Methods: *This study was retrospective descriptive study conducted from January 2020 to October 2022 who met the inclusion criteria. Population in this study were patients at Cipto Mangunkusumo Hospital with PDR accompanied by vitreous hemorrhage. Data shown in the table were mean (standard deviation) and number (percentage) based on the type of the data.*

Result: *A total of 146 patients with the diagnosis of Proliferative Diabetic Retinopathy (PDR) with vitreous hemorrhage. Majority of subjects were men (60,9%), diagnosed with DM more than 10 years (63,0%) with another systemic risk factor. The most common clinical characteristics found visual acuity at the initial visit <3/60 (80,8%), diagnosed phakia (78,9%), retinal detachment (85,3%), grade 2 vitreous hemorrhage (80,8%). The majority of eyes underwent vitrectomy (90,44%), Anti-VEGF injections (22,92%), Laser PRP (11,46 %), Phacoemulsification pre and post-vitrectomy as adjuvant treatment. The condition of the vitreous was clear after vitrectomy (99,1%). Mean visual acuity before vitrectomy is 2.10 (1.80 – 2.50), while mean visual acuity after vitctomy was 1.00 (1.30 – 2.40), with a difference in initial and final visual acuity of -0.10 (-0.50 – 0.60).*

Conclusion: *Majority of study subjects were men with an age range of 25-77 years. Vitrectomy as the main treatment combined with intravitreal injection of anti-VEGF, laser PRP as adjuvant treatment. In nearly all cases, vitreous hemorrhage was clear after vitrectomy treatment. Visual acuity after vitrectomy shows progress even though in some cases there was no improvement.*

Keywords: Diabetic Retinopathy, Proliferative Diabetic Retinopathy, Vitreous Hemorrhage, Vitrectomy.
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INTRODUCTION

The vitreous is a transparent gel-like structure inside the eyeball. This structure has a composition of 98% water, 2% structural protein, extracellular matrix and other components.[1] Vitreous hemorrhage is a condition where there is blood in the vitreous cavity which occurs as a result of extravasation of blood on the posterior side of the eyeball namely the internal limiting membrane (ILM), the anterior side, namely the posterior lens capsule, and the lateral side of the ciliary body.

With a significant amount of lod this condition can interfere with vitreous transparency and result in impaired vision.[2, 3] One of the most common causes of vitreous hemorrhage is proliferative diabetic retinopathy (PDR).

Diabetic retinopathy is the most common cause of blindness in the age range of 25-74 years, with 3 out of 4 patients suffering from diabetic retinopathy within 15 years of being diagnosed with diabetes mellitus. Chronic hyperglycemia is a major factor in the occurrence of diabetic retinopathy. The classic sign of diabetic retinopathy are microaneurysms, venous beading, hard exudate, cotton-wool spots, intraretinal microvascular abnormality (IRMA) and neovascularization. Diabetic retinopathy is divided into non-proliferative diabetic retinopathy (NPDR) and proliferative diabetic retinopathy (PDR) phases. Patients with vitreous hemorrhage experience decreased visual acuity and the condition of the blood in the vitreous can last for days to months, until the bleeding is absorbed or disappears. However, permanent decreased visual acuity can occur in some cases.[4]

Diagnosis is based on anamnesis and physical examination of ophthalmological status. Investigations for the posterior segment, such as ultrasonography (USG), can be performed if visualization is obstructed by the density of vitreous hemorrhage. In conditions of vitreous hemorrhage, minimal turbidity can be found due to red blood cell particles or vitreous opacity. If there is detachment of the posterior hyaloid membrane, vitreous strands may be found, which may also develop into tears or traction on the retina.[5] In the management vitreous hemorrhage, vitrectomy is the main choice and also laser photocoagulation with or without anti-VEGF administration as additional therapy. Pars plana vitrectomy is the main choice in conditions of non-clearing vitreous hemorrhage and other conditions such as retinal tears. PDR patients with vitreous hemorrhage with visual acuity less than 5/200 mostly do not experience spontaneous resolution even after 1 year of observation. With the development of surgical techniques with better surgical outcomes and minimal complications, operations can be carried out more quickly with an observation clinical period of less than 3 months.[6] This study aims to determine the number of patients, demographic characteristics, clinics, risk factors, distribution of treatment, and treatment outcomes for PDR patients with vitreous hemorrhage at Cipto Mangunkusumo Hospital in the period January 2020 - October 2022.

METHODS

This study is a retrospective descriptive study based on medical records. This study was conducted at Cipto Mangunkusumo Hospital, Jakarta. The data were collected between November 2022- December 2022. The population in this study were patients at Cipto Mangunkusumo Hospital with PDR accompanied by vitreous hemorrhage in the period January 2020 – October 2022. The subjects of this study were accessible populations that met the inclusion and exclusion criteria.

Subject with Incomplete data, untreated patients, patient with no return visit after the initial visit, didn't come for post-treatment evaluation or the duration of follow-up less than 1 month after treatment, vitreous hemorrhage caused other than PDR were not included in this study.

We recorded and searched for medical records that met the inclusion criteria, based on data from the clinic , Operating Room, and procedure room register books. Age, gender, chief complaint, duration, HbA1c data, antiplatelet drugs, visual acuity, refractive status, eyeball pressure, lens status, diagnosis, treatment. performed, treatment time, and follow-up visual acuity, eye pressure, and post-treatment ophthalmological examination each subjects were recorded

Ethics statement

This study was conducted following the Declaration of Helsinki and approved by the Health Research Ethics Committee Faculty of Medicine Universitas Indonesia (no. KET1396/UN2.F1/ETIK/PPM.00.02/2022). Written informed consent was obtained for all subjects before study enrollment.

Statistical analysis

Data presented in this paper were analyzed using SPSS ver. 25.0 (SPSS Inc., Chicago, IL, USA). Data shown in the table were mean (standard deviation) and number (percentage) based on the type of the data.

RESULTS

A total of 169 medical records of patients with the diagnosis of Proliferative Diabetic Retinopathy (PDR) with vitreous hemorrhage. However, after conducting a search based on predetermined inclusion and exclusion criteria, a total of 146 medical records were included in the analysis. The record tracing flow can be seen in the following diagram

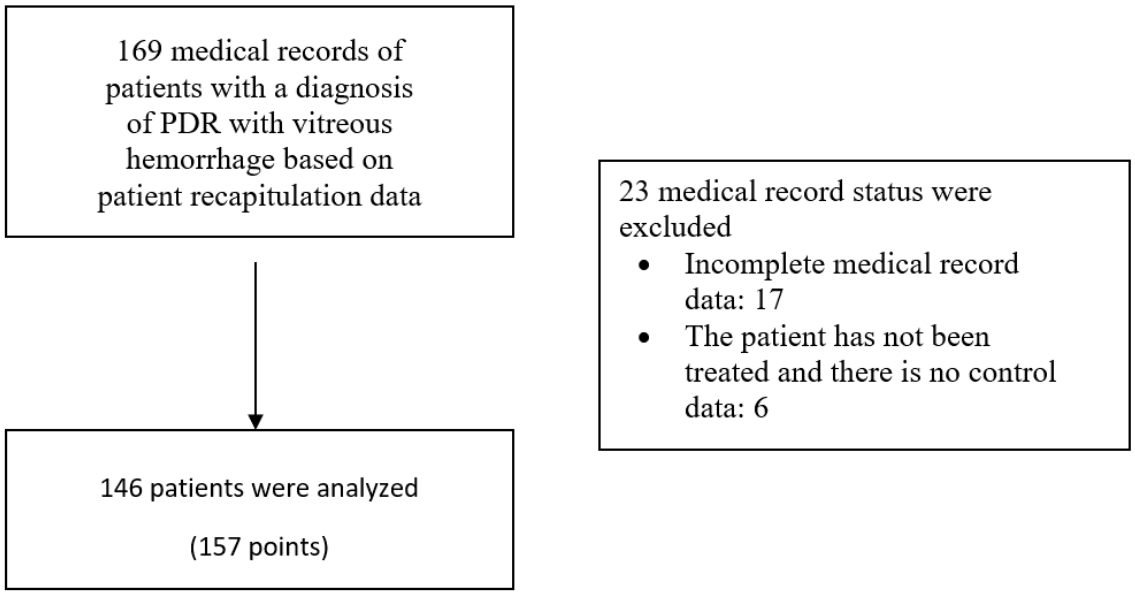

Figure 1. Flow chart of research subjects

Table 1. Demographic Data

Variable	Frequency (n=146 patient)	Percentage (%)
Sex		
Male	89	60,9
Female	57	39,1
Age	55 (22-77) years	
Laterality		
Unilateral	135	89,7
Bilateral	11	10,3

Vitreous hemorrhage were found more in males than females with an age range of 25 – 77 years. In this study, it was found that the majority of patients experienced vitreous hemorrhage in one eye only. The demographic characteristics of the groups were presented in Table 1.

Table 2. Systemic risk factors of research subjects

Variable	Frequency (n=146 patient)	Percentage (%)
Systemic risk factors- Hypertension		
	95	65,0
Chronic kidney failure	1	0,2
Strokes	3	2,7
Coronary Heart Disease	4	2,7
Dyslipidemia	43	29,4
Long suffered from DM		
< 5 years	18	12,4
5-10 years	36	24,6
>10 years	92	63,0
HbA1C		
≤ 7,0 %	46	31,5
> 7,0%	95	65,0
No data	5	3,4
Antiplatelet drugs		
Yes	8	5,4
No	138	94,6
Consulted to internal medicine		
Yes	31	21,2
No	115	78,8

In this study, the other systemic risk factor beside PDR such as hypertension and dyslipidemia. In the study subjects, data were collected on the history of used anticoagulants, and found 8 patients using blood-thinning drugs, due to coronary heart disease, if was

Table 3. Clinical characteristics of study subjects

Variable	Frequency (n=157 patient)	Percentage (%)
Initial complaint		
Blur	141	90,4
Floaters	5	3,1
Blur and floaters	7	4,4
Blur, floaters, photopsia	4	2,1
Complaint duration		
≤ 6 months	24	15,3
> 6 months	133	84,7
Early vision		
≥ 6/12 (LogMAR ≥ 0.30)	0	0
< 6/12 s.d. ≥ 6/18 (LogMAR < 0.30 to ≥ 0.48)	2	1,3
< 6/18 to ≥ 6/60 (Log MAR < 0.48 to ≥1.00)	7	4,5
< 6/60 to ≥ 3/60 (LogMAR < 1.00 to ≥1.30)	21	13,4
< 3/60 (Log MAR < 1.30)	127	80,8
Diagnostic tool		
Funduscopy	72	45,9
Ultrasound	85	54,1
Initial lens status		
Phakia	124	78,9
Pseudophakia	31	19,7
Aphakia	2	1,4
Initial retinal condition		
No retinal detachment	134	85,3
Retinal detachment	23	14,7
Grading Vitreous hemorrhage		
Grade 0	0	0
Grade 1	13	8,2
Grade 2	127	80,8
Grade 3	17	11,0

that stroke and chronic kidney failure undergoing hemodialysis therapy. However, no information was obtained regarding the type and amount of these drugs. In patients suspected of having systemic disorders who have not received adequate treatment, consult to internal medicine specialist for evaluation and management of to systemic disorders was done. The duration of from DM in the subjects of this study was grouped into 3 groups, less than 5 years, 5 to 10 years and more than 10 years, Most subjects were in the group have suffered from DM between >10 years suffering from DM. Data on the HbA1c values of the study subjects were also shown and the majority were research subjects with an HbA1c value of more than 7.0%. Systemic risk factors in research subjects are described in **Table 2.**

The main complaint of the subjects of this study was blurring that occurred slowly or suddenly with the most onset being more than 6 months. Blur of vision is also sometimes followed by other complaints such as floaters and photopsia. Initial visual acuity assessment, method of diagnosis of vitreous hemorrhage, initial lens status, and initial retinal condition were carried out in patients. Visual acuity at the initial visit was the most in the blindness group with the best visual acuity with correction at <3/60. The diagnosis of vitreous haemorrhage was made by fundoscopy or ultrasound, with the number of diagnostic methods being similar between groups, which were and respectively 45.9% and 54.1%. The most common lens status found is phakia and the most common initial retinal condition is non-retinal detachment. The grading of vitreous hemorrhage was based on the grading of the Diabetic Retinopathy Vitrectomy Study (DRVS) and the majority subjects were with grade 2 vitreous hemorrhage. The clinical characteristics of the subjects are described in **Table 3.**

The treatment depends on the condition of vitreous turbidity due to accumulation of blood in the vitreous cavity. The initial treatment obtained from this study included intravitreal injection, PRP laser, vitrectomy surgery, and other operations, such as cataract surgery or hyphema irrigation/aspiration in cases of bleeding in the anterior chamber. Initial management was carried out when the patient first came and was diagnosed as a vitreous hemorrhage. **Table 4** describes the types of initial management of research subjects based on the grading of vitreous hemorrhage.

Table 4. Initial management based on the grade of vitreous hemorrhage

Etiology	Eyes n (%)	Observation n (%)	Intravitreal injection	PRP laser	Vitrectomy	Other operations
Grade 1	13	0	3 (23)	10 (77)	0	0
Grade 2	127	0	23 (18,1)	0	91 (71,6)	13 (10,3)
Grade 3	17	0	2 (11,8)	0 (0)	12 (76,4)	3 (1,9)

From **Table 3.5**, a total of 157 eyes diagnosed with vitreous hemorrhage underwent different initial management and then continued with secondary treatment during the follow-up period. Initial management can be the main action or supporting action for visualization of the surgeon for the next action plan, which is vitrectomy. The majority of subjects underwent vitrectomy surgery as initial management. In a total of 28 eyes treated initially with intravitreal anti-VEFG injections, 3 eyes were grade 1 and 25 eyes were grade 2 and 3 which were treated with the aim of reducing vitreous turbidity. At follow-up there were 3 patients who responded so they continued for further intravitreal injections. Meanwhile, 20 patients did not show any improvement in vitreous opacities, so the vitrectomy was continued. In grade 2 and grade 3 patients who were treated with phacoemulsification + IOL, the procedure was aimed at improving operator visualization before vitrectomy was performed. In one case, during the follow-up period, post-vitrectomy rebleeding occurred, so the follow-up treatment was re--vitrectomy. Other advanced treatments were PRP laser as a top up from the previous laser, continued intravitreal laser injection, NDYag capsulotomy after phacoemulsification, hyphema irrigation in cases of anterior chamber bleeding due to neovascular, complicated cataract phacoemulsification surgery after vitrectomy and filtration surgery with VGI implants as a treatment for secondary glaucoma as a complication the care of. Silicon oil or neovascular glaucoma **Table 5.**

Table 5. Distribution of types of treatment of research subjects Distribution of types of treatment of research subjects

Variable	Frequency (n)	Percentage (%)
Initial Treatment (n=157)		
Anti-VEGF Injection	28	17,8
Laser PRP	10	6,3
Vitrectomy	103	65,8
Phacoemulsification + IOL	16	10,1
Follow up-treatment		
Anti-VEGF Injection	8	10,5
Laser PRP	8	10,5
Nd yag laser capsulotomy	3	2,6
Vitrectomy after phacoemulsification	16	21,1
Vitrectomy after intravitareal injection	22	28,9
Re-vitrectomy for current bleeding	1	1,3
Another operation		
Irigation/ hyphema aspiration	1	1,3
Phacoemulsification + IOL	16	21,1
VGI (Virna Glaucoma Implant)	2	2,6

Table 6. Distribution of The Types of Primary and Secondary Vitrectomy Procedures

Variable	Frequency (n)	Percentage (%)
Primary Vitrectomy (n=103)		
Intraoperative tamponade		
Gas	101	1,9
Silicone Oil	2	98,1
Laser intraoperative		
With Endolaser	103	100
Without endolaser	0	0
Secondary Vitrectomy (n=39)		
Intraoperative tamponade	3	2,6
Gas	0	0
Silicone Oil	39	100
Laser intraoperative		
With Endolaser	39	100
Without endolaser	0	0

Vitrectomy performed on patients with vitreous hemorrhage can be done as a primary treatment or as a secondary treatment. The total eyes of the study subjects who underwent vitrectomy were 142 eyes. Primary vitrectomy was performed in all eyes with hemorrhages grades 2 and 3. Secondary vitrectomy was performed in patients after other medical procedures, such as intravitreal injection, photocoagulation and phacoemulsification. All vitrectomy procedures were accompanied by endolaser procedures and the most common use of tamponade was with silicone oil. In the secondary vitrectomy procedure, an endolaser procedure was also carried out and in all cases a silicon oil tamponade was inserted. The distribution of the types of primary and secondary vitrectomy procedures is described in **Table 6**

.

Table 7. Vitreous anatomical condition follow-up after the last treatment

	Vitreus final condition			
Management	N (157 eyes)	Clearing (%)	Nonclearing n(%)	Re-bleeding(%)
Vitrectomy	120	119(99,1)	0(0)	1(0,8)
Anti-VEGF Injection	8	6 (75)	2 (25)	0 (0)
PRP Laser	7	4(57,1)	3(42,9)	0 (0)
NDYAG laser	3	2(100)	0 (0)	0 (0)
Phacoemulsification + IOL	16	16(100)	0 (0)	0 (0)
VGI	2	2 (100)	0 (0)	0 (0)
Hyphema irigation	1	0(0)	1 (100)	0 (0)

There were two outcomes assessed in this study at the end of the set follow-up period, which are the final condition of the vitreous, and changes in visual acuity with correction. **Table 7** shows the final condition of the vitreous after follow-up treatment at the end of the follow-up period. All patients who underwent vitrectomy had a clear vitreous end condition, with silicone oil tamponade. At the last follow-up, the majority of vitreous clearing was found in almost all treatment groups, vitreous clearing were found in 100% in vitrectomy treatments. While in the case of intravitreal injection and PRP laser residual vitreous hemorrhage non-clearing conditions were still found in study subjects who grade 1 vitreous hemorrhage which. There was one case of rebleeding that underwent re-vitrectomy, but postoperatively the patient was seen again. In patient eyes that underwent phacoemulsification procedure, VGI insertion and hyphema irrigatio who had previously been treated with vitrectomy. Cataract, glaucoma and hyphema are complications of vitrectomy and insertion of silicone oil tamponade

Visual acuity with correction in the LogMAR was obtained from the initial visit and post-treatment follow-up. In general, mean visual acuity before treatment is 2.10 (1.80 – 2.50), while mean visual acuity after treatment was 1.00 (1.30 – 2.40), with a difference in initial and final visual acuity of -0.10 (-0.50 – 0.60). This data, the majority of subjects experienced improvement in visual acuity, except for the group which underwent VGI and Hyphema treatments. The mean or median of best visual acuity with correction in LogMAR changes based on management can be seen in **Table 8.**

Table 8. Changes in visual acuity with correction based on the last treatment at the end of follow-up

Treatment	N (157 eyes)	Early Visual acuity	Final Visual acuity	ΔLogMAR
Vitrectomy	120	2.10 (1.80– 2.50)	1.00 (1.30 – 2.40)	-0.10 (-0.50– 0.60)
Anti-VEGF Injection	8	1.30 (1.00 – 1.80)	1.20(0.70 – 1.80)	-0.10 (-1.18 – 0.32)
PRP Laser	7	0.70(0.30 – 1.20)	0.60 (0.30-1.20)	-0.10 (0.30-0.32)
NDYAG laser	3	2.20 ±0.20	2.20 ±0.20	0.0
Phacoemulsification + IOL	16	2.10 (1.80-2.40)	2.00(1.50 – 2.40)	-0.10 (-0.30- 1.50)
VGI	2	2.40	2.40	0.0
Hyphema irigation	1	2.40	2.40	0.0

DISCUSSION

Based on demographic characteristics, the number of subjects with vitreous hemorrhage was male (60.9%) compared to female. Research on diabetes based on gender conducted by Willer stated that men are more susceptible to diabetes because of the obesity factor which tends to occur more quickly in men than women of the same age. It is also said that the lower limit of the Body Mass Index (BMI) for men to get DM is also lower than women.[7] Research on vitreous hemorrhage in general was carried out by Fitri et al[6], Wang et al[8], show that subjects with vitreous hemorrhage were found more in men, with a percentage of around 52.18 - 64.1%.[3, 6, 8] The age range in this study was 55 years with an age range of 25-77 years. This is similar to the study by Ansari et al., Diabetic retinopathy is recorded as the main cause of blindness in the working age group, namely 20-65 years.

Progression of complications of diabetes is higher when compared to older age[9]. Study by Zou et al. showed that subject with diabetes in the age range of 31-45 years, the risk of developing complications from diabetes is higher when compared to older age.[10] Based on clinical characteristics, in the study subjects, the majority of vitreous hemorrhages occurred unilaterally (89.7%). This is similar to the study by Metita et al regarding vitreous hemorrhage with most patients being the result of PDR, it was stated that unilateral cases occurred in 89.6% of cases.[4]

This study shows that most common systemic risk factors were hypertension and dyslipidemia. Bek T,et al, DM patients who are accompanied by increased pressure diastolic over 80, is more at risk for the progression of PDR, while an increase in systolic > 160 mm Hg, is at risk for Diabetic Macular Edema (DME).[11] The grouping of duration of DM in the study was divided into 3 groups, with the highest number of patients in the duration > 10 years. This is in accordance with research by Piyush et al who examined the duration of DM which was associated with the incidence of NPDR and PDR where duration <5 years of suffering from DM had a risk of 9.04% and increased to 76.47% after >20 years of suffering from DM.[12] The highest HbA1c in the subjects of this study was in the group of subjects with an HbA1c value > 7%. In a study by Lind et al, it wasconcluded that the risk of diabetic retinopathy and nephropathy was not significant at HbA1c values <6.5% and began to increase at HbA1c values >7% and the risk of severe complications was higher at HbA1c values > 8.6%.[13]The use of anticoagulants was also noted in this study, especially in patients with a history of CHD, stroke and chronic kidney failure. A study by Jeng et al, states that the use of antiplatelet/anticoagulant (APAC) significantly protects against the emergence of NPDR. It was not significant to the emergence of PDR and DME.[14]

The study subjects complained of increasingly severe blurred vision and sometimes accompanied by floaters and photopsia because of vitreous hemorrhage. In NPDR that does not involve the macula, the patient's vision is not impaired. As the retinopathy process progresses, macular involvement can be a major factor in decreased visual acuity. In PDR neovascularization is at high risk for rupture and blood extravasation occurs into the intraretinal, pre retinal and vitreous. A significant amount of blood can cause decreased vision. Examination of the posterior segment in conditions of accumulation of blood in the vitreous cavity is difficult to do, as the number of subjects who underwent ultrasound examination was quite large. The majority of the lens status in the our study were phakia,. In patients planned for vitrectomy, phacoemulsification + IOL surgery was performed to assist in visualization of the posterior segment during surgery. Retinal detachment occurred in 23 patients. The most common type of retinal detachment is the tractional type as a complication of proliferation of the retinal and vitreous fibrovascular membranes. In an article by Stewart et al, it was stated that the presence of tractional retinal detachment is a predictor of poor prognosis in PDR patients. Retinal detachment can also be a combination of tractional and rhegmatogenous detachment.[15] Other studies also state that 17-35% of PDR cases that undergo vitrectomy are with tractional or rhegmatogenous detachment. The classification of vitreous hemorrhage in this study was the DRVS classification where most patients were grade 2 where the fundus reflex was still visible but the details of the posterior segment were difficult to identify. A study conducted by Petrovic et al to assess the effectiveness of intravitreal triamcinolone against vitreous hemorrhage due to PDR also used the DRVS classification.[5]

Initial management of grade and grade 3 patients is vitrectomy. However, in 25 patients administration intravitreal injection was performed prior to vitrectomy. In a study by Chatziralli et al, Anti-VEGF injections 3-7 days before vitrectomy could reduce the risk of intraoperative bleeding, lower the duration of surgery and reduce the risk of rebleeding.[15] A study by Lim et al mentioned that proactive and periodic intravitreal injections every 3-4 months in patients PDR can prevent the formation of NVD and reduce the risk of vitreous hemorrhage. In ten patients with grade 1, laser PRP was performed. The ischemic condition of the retina triggers the formation of neovascularization. The laser is applied to non-perfused areas to improve oxygenation and prevent neovascularization. Based on the ETDRS, the laser is given in the phase between severe NPDR and early PDR.[16]

The majority of follow-up treatments for the subjects of this study were vitrectomy after the initial treatment of phacoemulsification, post-intravitreal injection and one case was rebleeding. Follow-up anti-VEGF and PRP injections are given to patients who respond well to the initial treatment. Phacoemulsification surgery is performed on complicated cataracts after vitrectomy. Cheng et al reported that cataracts occurred in 80% of cases after vitrectomy within 6 months of follow-up. Cataracts occur due to oxidation of the lens due to high air pressure during a vitrectomy, or due to the use of gas or silicone tamponade or also due to iatrogenic effects due to contact with the vitrector. In two study subjects, VGI implants were performed for indications of secondary glaucoma. Studies by Nicolai et al. mention that increased intraocular pressure (IOP) occurs in 3-40% of cases. The onset of increased IOP was <2 weeks postoperatively and decreased by follow-up. Increased IOP after silicon tamponade is caused by inflammatory reaction that causes trabecular damage, microbubbles from SO that migrate to the trabeculum and increased levels of peroxide and free radicals that cause trabecular damage.[21]

Management of vitreous hemorrhage is observation or vitrectomy. Observation is carried out if the vitreous opacities are not sight threatening. Indications for vitrectomy in cases of vitreous hemorrhage are conditions where the vitreous hemorrhage is permanent and does not experience resolution. Vitrectomy aims to overcome media turbidity and stabilize the proliferative process and increase retinal vascularization.[4, 15, 17] In this study the majority of treatments were vitrectomy performed in 142 eyes. All cases that underwent vitrectomy were grade 2 and 3 vitreous hemorrhage. The final condition of the vitreous after vitrectomy treatment using silicone oil tamponade at the end of follow-up found that 99% of patients had clear vitreous.[4, 17, 18] This is due to good management of vitreous cleansing and intraoperative endolaser action to overcome neovascularization causes of bleeding. The majority of patients who underwent vitrectomy experienced an improvement in visual acuity when compared before and after the procedure. However, visual acuity is greatly affected by other conditions such as the macula and optic nerve. In patients with secondary glaucoma, VGI procedure does not show changes in visual acuity after the procedure which may be caused by the atrophic condition of the optic disc.

CONCLUSION

The subjects of this study were 157 eyes of 146 patients diagnosed with PDR with vitreous hemorrhage. Majority of study subjects were men with an age range of 25-77 years and most vitreous hemorrhage occurred unilaterally. The choice of treatment for the majority of patients is vitrectomy as the main treatment or by intravitreal injection of anti-VEGF as adjuvant treatment.

Anatomical assessment showed good results, as the condition of the vitreous that was clear after vitrectomy treatment, and there was no deterioration in treatment with anti-VEGF injections and PRP laser. Visual acuity before treatment compared to after treatment shows progress even though in some cases there was no improvement.

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