

## Characteristics of Retinal Detachment Patients with Proliferative Vitreoretinopathy at Dr. Soetomo General Academic Hospital

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### ABSTRACT

**Introduction:** The aim of this study is to evaluate the incidence and characteristics of retinal detachment patients with proliferative vitreoretinopathy.

**Methods:** Retrospective review of medical record from primary retinal detachment (RD) patients with proliferative vitreoretinopathy (PVR) between 2013 and 2017 at Outpatient Department of Ophthalmology, Dr. Soetomo General Academic Hospital, Surabaya, Indonesia.

**Result:** : The number of RD patients with PVR at Dr. Soetomo General Academic Hospital in 2013-2017 was 80 patients (21%), consisting of 59 men and 21 women with mean of age was  $47.5 \pm 14.3$  years. The characteristics of the subjects were phakic 72.5%, aphakic 1.25%, high myopia 23.75%, history of trauma 18.75% and affected to right eye 60%. Retinal characteristics were break conditions in the retina (located at superotemporal (34%), horseshoe tear (56%), and single break (60%)), macula off (90%), area of detachments were 4 quadrants (43,75%), PVR conditions were grade B PVR (45%), mean duration of RD was 156 days, mean length of surgery waiting list was 61.1 days. The majority of treatment types were vitrectomy (70,4%), majority of tamponade using silicone oil (59.3%), majority of pre-operative and post-operative visual acuity were less than 3 meters counting finger, pre-operative (91.25%) , post-operative 1 month (76%) and 6 months (52.5%), and the majority of post-operative retinal reattachment were 77.3%.

**Conclusion:** The results of this study indicate the number of RD patients with PVR was lower than previous studies. Various results of patient characteristics can be used as guidelines for ophthalmologists in determining actions and explaining the prognosis of the disease. Further research with a larger sample size and prospective methods will be better able to provide better results.

**Keywords:** retinal detachment, proliferative vitreoretinopathy, characteristic pvr

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### INTRODUCTION

Retinal detachment (RD) is one of the most common causes of blindness under cataracts and glaucoma, where surgery is only treatment for this condition. Although the techniques and equipment in vitreoretina surgery have become increasingly improved, some conditions may accompany RD in severe grade that can reduce the success rate of retinal reattachment, such

as Proliferative Vitreoretinopathy (PVR). PVR condition does not always appear in every case of RD, thus the characteristics of patients need to be studied in order to predict the emergence of PVR condition in RD cases. However, currently research on the characteristic of RD patients with PVR is still relatively less.<sup>1-3</sup>

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The incidence of RD with PVR remain high in developing countries, where Tseng *et al.*, 2004,<sup>4</sup> conducted research in Venezuela in 2004, incidence of PVR was 52.9%. Shon *et al.*, 2007,<sup>1</sup> conducted a study of the patient characteristics of RD with PVR in Colombia, there were 239 patients who experienced RD with PVR between 2002-2006 and as many as 82.4% of patients had visual acuity <20/200. In Dr. Soetomo General Academic Hospital, Wijayanti *et al.*, 2008,<sup>5</sup> also mentioned the rate of Rhegmatogenous RD patients with PVR was 37.1%.

The characteristics of RD patients with PVR could be the basis for ophthalmologists to choose and arrange management, and became the basis for explaining to the patients regarding prognosis of disease condition. PVR is one of the risk factors for retinal redetachment postoperatively that leads to bad prognosis.<sup>6</sup>

The researcher was interested in examining the characteristics of RD patients with PVR at Dr. Soetomo Hospital retrospectively in 2013-2017 in order to be able to further strengthen the basic data in providing an overview to patients regarding postoperative prognosis if PVR conditions were obtained.

## METHODS

This study was a retrospective descriptive study using secondary data from the patient's medical record diagnosed with RD in period 2013-2017 at the Outpatient Department of Ophthalmology at Dr. Soetomo General Academic Hospital. Ethical Approval of Studies had been reviewed and approved by Ethics Committee at Dr. Soetomo General Academic Hospital.

The study sample was RD patient with PVR and meet the inclusion and exclusion criteria. The inclusion criteria in this study were RD patients with PVR. The exclusion criteria in this study were RD patients without PVR and incomplete medical record data.

Research variables in this study were age, gender, lens status, refraction status, trauma history, location of the affected eye, break conditions in the retina (location, number, size), macular condition, detachment location, PVR condition, duration of retinal detachment, length of surgery waiting time, type of treatment, pre-operative and post-operative visual acuity, and postoperative retinal reattachment conditions.

Datas from the research results will be recorded on special data collection sheets, categorized and presented in various forms of tabulations and graphics. Descriptive analysis is carried out using SPSS.

## RESULTS

The total RD patients in 2013-2017 were 387 patients and cases of RD patients with PVR were 80 patients or 21% of the total RD cases. In this study, there were 59 men (73.75%), and 21 women (26.25%)(Table 1).

In this study (Table 1), there were 2 patients (2.5%) in 11-20 years old group, 10 patients (12.5%) in 21-30 years old group, 12 patients (15%) in 31-40 years old group, 23 patients (28.8%) in 41-50 years old group, 21 patients (26.3%) in 51-60 years old group, 7 patients (8.8%) in 61-70 years old group, and 5 patients (6.3%) in 71-80 years old group. The mean age of RD patients with PVR in this study was  $47.5 \pm 14.3$  years old.

In this study (Table 1), the lens status of patients was obtained, 58 patients (72.5%) phakic, 21 patients (26.25%) pseudophakic, and 1 patient (1.25%) aphakic. The refraction status were 16 patients (20%) with mild myopia, 4 patients (5%) with moderate myopia, 19 patient (23.75%) with high myopia, and 41 patients (51.25%) refraction status were unknown before retinal detachment occurred.

The history of trauma revealed 15 patients (18.75%) having a history of trauma, while the remaining 65 patients (81.25%) did not have history of trauma.

The location of affected eye was 48 patients (60%) in the right eye, 29 patients (36.25%) in the left eye, while the remaining 3 patients (3.75%) in both eyes.

Macular condition data from RD patients with PVR were 72 patients (90%) in macula off conditions, and 8 patients (10%) in macula on conditions. The area of detachment was 3 patients (3.75%) 1 quadrant, 18 patients (22.5%) 2 quadrants, 24 patients (30%) 3 quadrants, and 35 patients (43.75%) 4 quadrants. PVR condition were 2 patients (2.5%) with grade A, 36 patients (45%) with grade B, 31 patients (38.75%) with Grade C, and 11 patients (13.75%) with PVR but no information for grading found from medical record.

Table 2 showed data on break conditions in the retina were obtained from 62.5% of the total cases (50 cases out of 80 cases), which consisted of data on location of the breaks, types of breaks, and number of breaks on the retina. The number of patients based on the location of retinal break was 17 patients (34%) at superotemporal, 9 patients (18%) at superonasal, 7 patients (14%) inferonasal, 1 patient (2%) at inferotemporal, 3 patients (6%) at superior, 1 patient (2%) at inferior, 1 patient (2%) at temporal, 2 patients (4%) in the macula, and 9 patients (18%) more than 1 location (combination).

The number of patients based on the type of retinal break were 28 patients (56%) tear, 15 patients (30%) hole, 1 patient (2%) atropic hole with lattice, and 6 patients (12%) in more than 1 type (combination). The number of patients based on the number of breaks in the retina were 30 patients (60%) with 1 break, 13 patients (26%) had 2 breaks, 3 patients (6%) had 3 breaks, and 4 patients (8%) with more than 3 breaks.

Visual acuity pre-operative

> 6/18	1	1,25
6/18-6/60	3	3,75
6/60-3/60	3	3,75
< 3/60	73	91,25
<b>Total</b>	<b>80</b>	<b>100</b>

**Tabel 1. Characteristic of Subject**

Characteristic	Total (N)	Percentage(%)
<b>Sex</b>		
Male	59	73,75
Female	21	26,25
<b>Age (years)</b>		
0-10	0	0
11-20	2	2,5
21-30	10	12,5
31-40	12	15
41-50	23	28,8
51-60	21	26,3
61-70	7	8,8
71-80	5	6,3
81-90	0	0
<b>Lens status</b>		
Phakic	58	72,5
Pseudophakic	21	26,25
Aphakic	1	1,25
<b>Refraction</b>		
Mild myopia	16	20
Moderate myopia	4	5
High myopia	19	23,75
No data	41	51,25
<b>History of trauma</b>		
Yes	15	18,75
No	65	81,25
<b>Affected eye</b>		
Right	48	60
Left	29	36,25
Both	3	3,75
<b>Macula</b>		
Off	72	90
on	8	10
<b>Area of detachment</b>		
1 quadrant	3	3,75
2 quadrant	18	22,5
3 quadrant	24	30
4 quadrant	35	43,75
<b>PVR grade</b>		
A	2	2,5
B	36	45
C	31	38,75
No information	11	13,75

**Tabel 2. Break condition in retina**

Break condition	N	Percentage (%)
<b>Location of break</b>		
Superotemporal	17	34
Superonasal	9	18
Inferonasal	7	14
Inferotemporal	1	2
Superior	3	6
Inferior	1	2
Temporal	1	2
Nasal	0	0
Combination	9	18
Macula	2	4
<b>Type of break</b>		
<i>Tear</i>	28	56
<i>Hole</i>	15	30
Combination	6	12
<i>atropic hole with lattice</i>	1	2
<b>Number of break</b>		
1	30	60
2	13	26
3	3	6
>3	4	8
<b>Total</b>	<b>50</b>	<b>100</b>

In this study (Table 3), data were obtained on the number of retinal detachment patients with PVR who underwent surgery as many as 33.75% of the total cases (27 cases out of 80 cases). The type of treatment performed were 19 patients (70.4%) underwent only vitrectomy surgery, and 8 patients (29.6%) underwent combination vitrectomy and scleral buckle surgery. In addition, 10 patients were declared to have received conservative treatment. The type of tamponade used in each operation was 16 patients (59.3%) who received silicone oil tamponade, 10 patients (37%) received gas tamponade, and 1 person (3.7%) without tamponade.

As we can see from Table 4, mean duration of RD was 156 days, with maximum was 3650 days (10 years) and minimum was 3 days, with a median was 30 days. Mean duration of waiting time for surgery was 61.1 days, with maximum was 548 days and minimum was 7 days, with a median was 30 days.

Table 1 also showed pre-operative visual acuity (VA), 1 patient (1.25%) with VA>6/18, 3 patients (3.75%) with VA 6/18-6/60, 3 patients (3.75%) with VA 6/60-3/60, and 73 patients (91.25%) with VA <3/60. From table 5, Visual acuity data 1 month post-operatively from RD patients with PVR as many as 25 patients (31.25% of the total cases), were 3 patients (12%) with VA 6/18-6/60, 3 patients (12%) with VA 6/60-3/60, and 19 patients (76%) with VA <3/60.

From Table 6, visual acuity data 6 months post-operatively from RD patients with PVR as many as 19 patients (23.75% of the total cases), were 1 patient (5.3%) with VA>6/18, 4 patients (21.2%) with VA 6/18-6/60, 4 patients (21.1%) with VA 6/60-3/60, and 10 patients (52.5%) with VA<3/60.

Post-operative retinal conditions of RD patients with PVR as many as 22 patients (27.5% of the total cases), were 17 patients (77.3%) with retinal reattachment and 5 patients (22.7%) with retinal redetachment.

**Tabel 3. Type of Management**

Type of Management	N	Percentage (%)
<b>Operation</b>		
Vitrectomy (PPV)	19	70,4
Combination (PPV+SB)	8	29,6
pneumatic	0	0
scleral buckle (SB)	0	0
<b>Tamponade</b>		
silicon oil	16	59,3
gas	10	37
bss	1	3,7
air	0	0
<b>Total</b>	<b>27</b>	<b>100</b>

**Tabel 4. Duration of RD and Surgery**

Duration	Days
<b>Duration of RD</b>	
Mean (SD)	156 (443,8)
Median (min-max)	30 (3-3650)
<b>Waiting of surgery</b>	
Mean (SD)	61.1 (106,5)
Median (min-max)	30 (7-548)

**DISCUSSION**

In this study, cases of RD patients with PVR at Dr. Soetomo General Academic Hospital in 2013-2017 was 80 patients (21%) of the total number of patients with retinal detachments. This incidence is lower than other studies, where Tseng *et al.*, (2004)<sup>4</sup> was 52.9%, Shon *et al.*, (2007)<sup>1</sup> have 239 patients between 2002-2006, and Wijayanti *et al.*, (2008),<sup>5</sup> where 37.1% were obtained. The possible cause of this condition is an increasing of ophthalmologist ability and the increasing of diagnostic tools to early detection of

retinal detachments that surgery can be carried out quickly and prevent the emergence of PVR. This is consistent with the statements of Nagasaki *et al.*, (1998)<sup>6</sup> and Kwon *et al.*, (2016)<sup>7</sup> where the only way that was considered effective in preventing the formation of PVR was to perform surgery as soon as possible after a retinal detachment occurs.

In this study, the majority of retinal detachment patients with PVR were male, 59 patients (73.75%). These results are similiar with previous studies.<sup>1,4,8-15</sup> However, the results of this study are different from Yanyali *et al.*, 2012,<sup>16</sup> and Jonas *et al.*, 2000,<sup>17</sup> where the majority were women.

**Table 5. Visual acuity post-operation (H+1 month)**

Visual Acuity	N	Percent (%)
Category 1 = > 6/18	0	0
Category 2 = 6/18-6/60	3	12
Category 3 = 6/60-3/60	3	12
Category 4 = < 3/60	19	76
<b>Total</b>	<b>25</b>	<b>100</b>

**Table 6. Visual Acuity Post-operative (H+6 month)**

Visual Acuity	N	Percent (%)
Category 1 = > 6/18	1	5,3
Category 2 = 6/18-6/60	4	21,1
Category 3 = 6/60-3/60	4	21,1
Category 4 = < 3/60	10	52,5
<b>Total</b>	<b>19</b>	<b>100</b>

**Table 7. Retinal Condition Post-operative (H+6 month)**

Retina condition	N	Percent (%)
Attached	17	77,3%
Redetached	5	22,7%
<b>Total</b>	<b>22</b>	<b>100</b>

The majority of retinal detachment events in men are the probability of men working outside more and prone to have trauma, which is one of the factors causing the retinal detachment. However, this condition can also be caused by variations in the collection of research data. Based on the theory and literature, incidence of RRD is found more in men than women.<sup>2,7,18</sup>

In this study, mean age of retinal detachment patients with PVR was 47.5±14.3 years old, the majority consisted of 41-50 years old (28.75%), and 51-60 years old (26.25%). What we found in this study is younger than previous studies.<sup>3-4,10-13,15,17, 19-21</sup> However, the results in this study are similar with other studies.<sup>14, 22-25</sup>

Age factors are considered to have an effect on the incidence of retinal detachment. It associated with liquefaction conditions from the vitreous and the incidence of PVD, where the older the patient, the percentage of PVD events will increase. Vitreous liquefaction is found in 90% of patients over 40 years while the incidence of PVD is found in 27% of patients aged 60-69 years and 63% of patients aged over 70 years.<sup>26</sup>

In this study, the majority of lens status was phakic (72.5%). The results of this study were similar with other studies.<sup>4,27</sup> These results are slightly different from the research of Banerjee *et al.*, 2017,<sup>3</sup> Iwashami-shima *et al.*, 2013,<sup>23</sup> Ahmadi *et al.*, 2008,<sup>12</sup> and Williams *et al.*, 1996,<sup>13</sup> where the majority are pseudophakic.

In this study, the number of patients with aphakic was 1 patient (1.25%). This data was lower than other previous studies.<sup>4,12,13,23</sup> Aphakic condition leads to damage of the blood ocular barrier (BRB), and this condition will also produce cytokines and growth factors such as PDGF which causes the formation of PVR. Miyake *et al.*, 1985,<sup>28</sup> and Nagasaki *et al.*, 1998,<sup>6</sup> compared aphakic patients and non-aphakic patients, PVR conditions were found more in aphakic patients (13.7%) than non-aphakic patients (2.5%).

In this study, the number of patients with high myopia, which is considered as one of the risk factors for retinal detachment, was higher than data from previous studies.<sup>1,4,15,29</sup> The percentage of patients with high myopia in this study is similar with several studies.<sup>10,12,27</sup> Refraction status factors, especially high myopia, according to Kanski and Bowling, 2011,<sup>18</sup> was one of the risk factors for retinal detachment, where patients with high myopia who have a long eyeball axis are considered to have higher risk of peripheral retinal degeneration.

The history of trauma found in this study was obtained in 15 patients (18.75%). The number of patients with a history of trauma, which is considered as one of the risk factors for retinal detachment, was higher than other studies.<sup>1,4</sup> However, the trauma history in this study is lower than research by Jamil *et al.*, 2012.<sup>24</sup>

The majority location of affected eye in this study was in the right eye (60%). In contrast to previous research by Iwashami-shima *et al.*, 2013,<sup>23</sup> the majority of affected eye was left eyes. The location of affected eye found to be varied in this study, where in the Solomon and Teshome study, 2011,<sup>30</sup> there was no significant difference on the side of eye experiencing retinal detachment.

This study also found that the number of patients based on the location of the break in the retina was mostly superotemporal (34%). The number of patients based on the type of break in the retina was mostly tear (56%). This is similar with the study by Tseng *et al.*, 2004.<sup>4</sup> The number of patients based on the number of breaks in retinal, majority was single break (60%). The results of this study are different from those of Tseng *et al.*, 2004.<sup>4</sup> The data on macular conditions, majority was macula off (90%). The results of this study are similar with several previous studies.<sup>3,10,15,21</sup> According to Tseng *et al.*, 2004,<sup>4</sup> macula off showed severe PVR conditions. According to Khanzada *et al.*, 2014,<sup>31</sup> macular conditions will influence the visual prognosis of post-RRD surgery outcomes, where the longer macula off, the poorer visual outcome.

In this study, the majority area of detachment was 4 quadrants (43.75%). This similar with some studies.<sup>3,4</sup> The results of this study different from other studies of Pollreis *et al.*, 2015,<sup>27</sup> Ricker *et al.*, 2011,<sup>10</sup> and Bali *et al.*, 2010,<sup>21</sup> where the majority of retinal detachment area was 2 quadrants. The area of detachment factor is said to be related to the severity of PVR. According to Capeans *et al.*, 1998,<sup>32</sup> in RD patients with a detachment area of more than 3 quadrants, was more risky of PVR appeared, because greater area of detachment made greater damage to BRB, and the more retinal pigment epithelial (RPE) cells interact with the vitreous.

Majority of PVR condition in this study was grade B (45%). This result is different from the research of Tseng *et al.*, 2004,<sup>4</sup> which obtained the majority of patients was grade C. This is probably due to the presence of PVR data in this study which is still not classified into PVR grading as many as 11 patients.

In this study, mean duration of RD was 156 days (5 months) with SD 443.8 days. The duration of the retinal detachment with PVR in this study is similar with some studies.<sup>1,33</sup> The results of this study are longer than those other studies.<sup>3,4,10,12,20,24</sup> The long duration of retinal detachment causes an extension of the interaction between RPE cells and vitreous, which allows RPE cells more and more in invading the vitreous.<sup>1,6,33</sup> The longer duration of retinal detachment was caused by long surgery waiting list. Dr. Soetomo General Academic Hospital is a referral center in Eastern Indonesia, resulting in a build up of patient queues. This is due to the lack of availability of facilities and retinal specialist in the area.

Mean duration of waiting time for surgery in this study was 61.1 days.

The results of this study indicate a longer waiting time for operations compared to the study of Tseng et al., 2004.<sup>4</sup> The longer duration of waiting time for surgery in this study is due to the limited facilities, number of doctors and operating rooms at Dr. Soetomo General Academic Hospital for retinal detachment surgery. In this study, majority type of treatment was vitrectomy (70.4%). The type of tamponade used mostly silicon oil (59.3%). Majority pre-operative visual acuity was category 4, VA <3/60 (91.25%). This result is similar to other studies.<sup>1,4,10,11,12,14,17</sup> According to Tseng et al., 2004,<sup>4</sup> eyes with poor VA show a severe PVR condition because the membrane may appear in subretina, the fixed fold extends to the fovea area, and high macular detachment. Pre-operative visual acuity data in this study showed that the average patient who came to Dr. Soetomo General Academic Hospital was in an advanced condition, one of which was caused by PVR conditions that arise due to late handling.

Data of VA 1 month post-operatively from retinal detachment patients with PVR, the majority was category 4, VA <3/60 (76%). While VA data 6 months post-operatively was category 4, VA <3/60 (73.5%). This data shows that VA prognosis after surgery of retinal detachment with PVR was poor. VA post-operative in this study was found lower than Sohn et al., 2007,<sup>1</sup> where VA post-operative (60.7%) were able to get a vision of 20/200 or better, but only 4.4% who get 20/40 or more vision.

Anatomical condition post-operative were obtained in 22 patients (27.5% of the total cases), retina were attached (77.3%). The results of this study is slightly lower than Sohn et al., 2007,<sup>1</sup> where it was found that the number of patients who succeeded anatomically in first operation was 91.7%, and for 6 months observation, the numbers of anatomical success in patients with retinal detachment with PVR of 97.8%. This can be caused by differences in the grading factor of PVR, where the majority of patients in this study were grade B and C PVR which were theoretically more risky of redetachment, whereas in Sohn et al., 2007,<sup>1</sup> there is no detailed grading of PVR.

## CONCLUSION

The results of this study indicate the lower incidence of retinal detachment patients with PVR than previous studies. Various results of patient characteristics can be used as guidelines for ophthalmologists in determining actions and explaining the prognosis of the disease. Limitation of this study was retrospective study. Further research with a larger

sample size and prospective methods will be better able to provide better results.

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