A Study on the Etiology of Spontaneous Vitreous Hemorrhage in Thammasat University Hospital

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Abstract

Objective: This study aims to study the causes of spontaneous vitreous hemorrhage (VH) in patients at the ophthalmic department at Thammasat University Hospital (TUH).

Study Design: Retrospective cross-sectional study

Methods: Medical records were reviewed to identify TUH patients who were diagnosed with VH due to known causes. Data was collected which included gender, age, underlying disease, laterality of VH, duration of symptoms until time of diagnosis, and etiology of VH. Then, the data was analyzed and presented using tables and graphs.

Results: The study consisted of 317 eyes from 296 patients who fulfilled the inclusion criteria. The average age of participants is 60.21 years. VH affected the right eye, left eye, and both eyes in 134, 141, and 21 patients, respectively, which is 45.3%, 47.6%, and 7.1% of the total participants, respectively. There were 149 male patients (50.3%) and 147 female patients (49.7%). The most common cause of VH in TUH patients is proliferative diabetic retinopathy (PDR), which affected 155 eyes or 48.9% of the study group. The second most common cause is retinal break (RB) or rhegmatogenous retinal detachment (RRD) with 43 eyes or 13.6%. Next, posterior vitreous detachment (PVD) inflicted 35 eyes or 11.0%. Other causes such as retinal vein occlusion (RVO) and age-related macular degeneration (AMD) affected 35 eyes or 11.0% and 19 eyes or 6.0%, respectively.

Conclusion: PDR is the most common cause of VH in Thailand. This study determines the most common causes of VH and also demonstrates the association between cause and duration of symptoms before diagnosis of VH and the association between presence of diabetes mellitus (DM) as an underlying disease and occurrence of VH. Furthermore, these findings will aid in determining the cause of VH in patients, which will lead to appropriate management and treatment.

Keywords: Vitreous Hemorrhage, Etiology, Spontaneous, Proliferative Diabetic Retinopathy

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Introduction

Vitreous hemorrhage occurs when there is blood within the vitreous humor. The vitreous is an avascular structure, but extravasation of blood from retinal vessels and other nearby vessels can cause bleeding in the vitreous cavity. VH is commonly seen in clinical practice and is one of the leading causes of visual loss.

Pathogenesis of VH can be categorized into 4 mechanisms which are bleeding from normal retinal vessels associated with ischemia, bleeding from abnormal ischemic retinal vessels associated with ischemia, bleeding from abnormal retinal vessels without ischemia, and subretinal hemorrhage that has leaked into the vitreous.[2]

The most common etiology of VH is proliferative diabetic retinopathy which commonly occurs in patients with DM.[1,5]

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However, some patients are unaware of their diabetes and the diagnosis of diabetes mellitus (DM) is made after discovering that they have PDR. In patients without DM, the most common cause of VH is retinal vein occlusion.[3,4] Other causes of VH that can be found in patients with and without DM include age-related macular degeneration, retinal break or rhegmatogenous retinal detachment, vitreous degeneration, retinal artery macroaneurysm, and ocular trauma.[8,9,10]

VH commonly presents with acute visual loss that may be accompanied by ocular pain. Symptoms of acute visual loss may last up to days or months and resolve with complete reabsorption of the hemorrhage. Visual loss that does not improve with resolution of VH may indicate underlying retinal pathology.[2,9]

Generally, treatment of spontaneous VH depends on the ophthalmologist's evaluation of the underlying cause in each patient. If the VH is caused by PDR, then treatment may include observation of symptoms or intravitreal injections with follow up evaluation in 2-3 months. If the condition does not improve upon follow up, vitrectomy may be considered. On the other hand, VH that is caused by RB may necessitate early vitrectomy because if left untreated, it may lead to complications that will cause permanent visual damage such as retinal detachment and glaucoma.[6,7,8]

Due to reasons already outlined above, it is important to diagnose the cause of VH which will lead to appropriate treatment and prevention of irreversible visual loss. Hence, the purpose of this paper is to study the prevalence of VH in ophthalmic patients, prevalence of the different etiologies of VH in different age group, and occurrence of VH in diabetic and non-diabetic patients at the outpatient department (OPD) at Thammasat University Hospital's ophthalmology department.

Study Design

Data was collected from medical records of patients in the ophthalmology department at TUH who were diagnosed with spontaneous VH from the year 2017 to 2020. Only patients with known causes of VH were included in the study. Patients with unknown or unclear causes of VH were excluded from the study. A specialized data collection sheet was created to record patient's age, gender, laterality of VH, duration of symptoms until diagnosis, underlying disease of DM, and cause of VH. Then, the collected data is analyzed based on etiology and based on the presence of underlying DM.

Study Results

Of all patients who came to TUH from the year 2017 to 2020 with diagnosis of spontaneous VH, there are 317 eyes from 296 patients who fulfilled the inclusion criteria for the study. The subject's ages ranged from 12 to 90 years old with an average age of 60.21 years with the youngest patient being 12 years old and the eldest patient being 90 years old. There are 134 patients with VH in the right eye (45.3%), 141 patients with VH in the left eye (47.6%), and 21 patients with VH in both eyes (6.8%). There are 149 male patients (50.3%) and 147 female patients (49.7%). Demographic features of the patients are shown in Table 1.

Table 1: Demographic features of patients included in the study

Characteristic		**No. of patients N = 296**	**%**
Laterality	Left	141	47.6
	Right	134	45.3
	Both	21	7.1
Gender	Male	149	50.3
	Female	147	49.7
Duration of Symptom	Less than 1 week	49	16.5
	1 week to 1 month	93	31.4
	More than 1 month	73	24.7
	Unknown	81	27.4
Diabetic Patient		163	55.1

Duration from onset of symptoms until diagnosis of VH can be separated into 4 groups: less than 1 week, 1 week to 1 month, more than 1 month, and unknown duration. There are 49 patients (16.5%) who had symptoms for less than 1 week, 93 patients (31.4%) with symptoms lasting from 1 week to 1 month, 73 patients (24.7%) with symptoms for more than 1 month, and 81 patients (27.4%) with unknown duration. Out of the 296 patients, 163 patients (55.1%) had DM while the other 133 patients (44.9%) denied a history of DM.

From the study, the most common cause of spontaneous VH is PDR with 155 eyes from 137 patients or 48.9% of the total number of eyes. The second most common cause is RB or RRD inflicting 43 eyes (13.5%). RVO, which can be separated into central retinal vein occlusion (CRVO) and branch retinal vein occlusion (BRVO), affected 35 eyes (11.0%) followed by AMD with 19 eyes (6.0%). Polypoidal choroidal vasculopathy affected 11 eyes (3.5%), and retinal vasculitis was found in 6 eyes (1.9%). The prevalence of different causes of spontaneous VH is shown in Table 2, while the duration of symptoms til diagnosis for each etiology is shown in Table 3.

Table 2: Etiology of Spontaneous vitreous hemorrhage

Diagnosis	No. of eyes (N = 317)	%
Proliferative Diabetic Retinopathy	155	48.9
Retinal Break / Rhegmatogenous Retinal Detachment	43	13.6
Posterior Vitreous Detachment	40	12.6
Retinal Vein Occlusion - Branch Retinal Vein Occlusion - Central / Hemi Retinal Vein Occlusion	35 22 13	11.0 6.9 4.1
Age-related Macular Degeneration	19	6.0
Polypoidal Choroidal Vasculopathy	11	3.5
Retinal Vasculitis	6	1.9
Terson Syndrome	4	1.3
Ocular Ischemic Syndrome	2	0.6
Retinal Artery Macroaneurysm	1	0.3
Valsava Retinopathy	1	0.3

Table 3: Etiology of Spontaneous vitreous hemorrhage and onset

Diagnosis	Onset of Ocular Symptoms			
	Less than 1 week N (%)	1 week to 1 month N (%)	More than 1 month N (%)	Unknown N (%)
Proliferative Diabetic Retinopathy	8 (16.3)	38 (38.8)	62 (75.6)	47 (53.4)
Retinal Break / Rhegmatogenous Retinal Detachment	10 (20.4)	18 (18.4)	-	15 (17.0)
Posterior Vitreous Detachment	18 (36.8)	14 (14.3)	1 (1.2)	7 (8.0)
Retinal Vein Occlusion - Branch Retinal Vein Occlusion - Central / Hemi Retinal Vein Occlusion	6 (12.2) 5 1	12 (12.2) 7 5	10 (12.2) 6 4	7 (8.0) 4 3
Age-related Macular Degeneration	2 (4.1)	9 (9.2)	3 (3.7)	5 (5.7)

Table 3: Etiology of Spontaneous vitreous hemorrhage and onset (Cont.)

Diagnosis	Onset of Ocular Symptoms			
	Less than 1 week N (%)	**1 week to 1 month N (%)**	**More than 1 month N (%)**	**Unknown N (%)**
Polypoidal Choroidal Vasculopathy	2 (4.1)	4 (4.0)	1 (1.2)	4 (4.5)
Retinal Vasculitis	1 (2.0)	2 (2.0)	3 (3.7)	-
Terson Syndrome	-	-	2 (2.4)	2 (2.2)
Ocular Ischemic Syndrome	1 (2.0)	-	-	1 (1.1)
Retinal Artery Macroaneurysm	-	1 (1.0)	-	-
Valsalva Retinopathy	1 (2.0)	-	-	-
Total by onset	**49 (100)**	**98 (100)**	**82 (100)**	**88 (100)**

Patients recruited in this study were categorized into 3 age groups: less than 60 years 60-70 years , and more than 70 years. There were a total of 154 eyes in the group of patients less than 60 years old with PDR as the most common cause of spontaneous VH accounting for 75 eyes (48.7%). The second most common cause of spontaneous VH in this age group is RB or RRD in 28 eyes (18.2%), then RVO in 18 eyes (11.7%), PVD in 16 eyes (10.4%) and retinal vasculitis in 6 eyes (3.9%). In patients age 60 to 70 years old with a total of 106 eyes, the leading cause of spontaneous VH is also PDR inflicting 63 eyes (59.4%) followed by PVD in 12 eyes (11.3%), RB or RRD in 9 eyes (8.5%), polypoidal choroidal vasculopathy in 8 eyes (7.5%), and AMD in 7 eyes (6.6%). In patients ages 70 and older with 57 eyes, most of the spontaneous VH is also caused by PDR in 17 eyes (29.8%), then PVD in 12 eyes (21.1%), RVO in 11 eyes (19.3%), and AMD in 10 eyes (17.5%). Prevalence of each etiology of spontaneous VH based on age group is depicted in Table 4.

Table 4: Etiology of Spontaneous vitreous hemorrhage and age group of patients

Diagnosis	Age		
	less than 60 years N = eyes (%)	**60-70 years N = eyes (%)**	**More than 70 years N = eyes (%)**
Proliferative Diabetic Retinopathy	75 (48.7)	63 (59.4)	17 (29.8)
Retinal Break / Rhegmatogenous Retinal Detachment	28 (18.2)	9 (8.5)	6 (10.5)
Posterior Vitreous Detachment	16 (10.4)	12 (11.3)	12 (21.1)
Retinal vein occlusion - Branch Retinal Vein Occlusion - Central / Hemi Retinal Vein Occlusion	18 (11.7) 13 (8.4) 5 (3.3)	6 (5.7) 3 (2.8) 3 (2.8)	11 (19.3) 6 (10.5) 5 (8.8)
Age-related Macular Degeneration	2 (1.3)	7 (6.6)	10 (17.5)
Polypoidal Choroidal Vasculopathy	3 (1.9)	8 (7.5)	-
Retinal Vasculitis	6 (3.9)	-	-
Terson Syndrome	4 (2.6)	-	-
Ocular Ischemic Syndrome	1 (0.6)	-	1 (1.8)
Retinal Artery Macroaneurysm	-	1 (0.9)	-
Valsalva Retinopathy	1 (0.6)	-	-
Total by age group	**154 (100)**	**106 (100)**	**57 (100)**

This study recruited 296 patients with 317 cases of spontaneous VH in which 178 eyes (56.2%) are from patients with a known history of DM or are receiving DM medications, while 139 eyes (43.8%) are uncertain or denied history of DM. The top three causes of spontaneous VH in the DM group are PDR, PVD, and RVO affecting 147 eyes (82.6%), 12 eyes (6.7%), and 10 eyes (5.6%), respectively. In patients without DM, the three most common causes of spontaneous VH are RB or RRD, PVD, and RVO inflicting 39 eyes (28.1%), 28 eyes (20.1%), and 25 eyes (18.0%), respectively. Prevalence of different etiologies of spontaneous VH with respect to the history of DM is displayed in Table 5.

Table 5: Etiology of spontaneous vitreous hemorrhage and Diabetic history

Diagnosis	History of DM N = eyes (%)	No history of DM N = eyes (%)
Proliferative Diabetic Retinopathy	147 (82.6)	8 (5.8)
Retinal Break / Rhegmatogenous Retinal Detachment	4 (2.2)	39 (28.1)
Posterior Vitreous Detachment	12 (6.7)	28 (20.1)
Retinal vein occlusion - Branch Retinal Vein Occlusion - Central / Hemi Retinal Vein Occlusion	10 (5.6) 7 (3.9) 3 (1.7)	25 (18.0) 15 (10.8) 10 (7.2)
Age-related Macular Degeneration	1 (0.6)	18 (12.9)
Polypoidal Choroidal Vasculopathy	2 (1.1)	9 (6.5)
Retinal Vasculitis	-	6 (4.3)
Terson Syndrome	-	4 (2.9)
Ocular Ischemic Syndrome	1 (0.6)	1 (0.7)
Retinal Artery Macroaneurysm	1 (0.6)	-
Valsava Retinopathy	-	1 (0.7)
Total by DM history	**178 (100)**	**139 (100)**

Discussion

Spontaneous VH affects approximately 7 people in a population of 100,000 per year.[1] Previous studies revealed that the most common etiology of spontaneous VH is PDR, while other common causes include RB or RRD, PVD, and RVO.[1,3,4,5] Similarly, this study found PDR to be the most common cause followed by RB or RRD, PVD, RVO, and AMD in that order.

In regard to duration from onset of symptoms to diagnosis, most patients who received medical attention within 1 week of ocular symptoms were those with spontaneous VH from PVD (36.8%) and RB or RRD (20.4%). A possible explanation for this finding is that most patients who have spontaneous VH from PVD and RB or RRD usually have normal retina and macula which makes it easier and faster for them to detect any changes in vision. PDR is the most common etiology of spontaneous VH in patients who present to the hospital 1 week to 1 month after onset of symptoms with even higher occurrences in patients who present more than 1 month after onset accounting for 38.8% and 75.6% of cases, respectively. PDR as a common cause in more chronic cases can be attributed to the slow disease progression making it longer for patients to detect the visual changes. Similar to PDR, RVO is more prevalent in patients with longer duration of diagnosis from onset which may also be attributed to the progressive nature of the disease.

Compared between different age groups, PDR was the most common etiology of spontaneous VH in all age groups. The second most common cause of spontaneous VH is RB or RRD in patients less than 60 years old, PVD in patients ages 60 to 70 years old and also in patients more than 70 years old. The third most common cause is RVO for all three age groups.

AMD is more prevalent in patients older than 70 years. There are a few differences between diabetic and non-diabetic patients. For instance, the most common cause of spontaneous VH in diabetic patients is PDR accounting for 147 eyes (82.6%). However, in patients without DM, PDR only affected 8 eyes (5.8%). The most common causes of spontaneous VH in non-diabetic patients are RB or RRD followed by PVD, RVO, and AMD in that order.

This study revealed that the most prevalent cause of spontaneous VH is PDR in every age group. PDR is often diagnosed at least 1 month after onset of symptoms and is most commonly found in patients with underlying DM with a prevalence of 82.6% in the diabetic patient group. Approach to a patient with spontaneous VH includes history taking about DM and hyperglycemic symptoms, family history of DM, onset of symptoms, and age. Other than history taking, it is also important to inspect the other eye for signs of PDR to aid in diagnosis of spontaneous VH from PDR. Almost 6% of patients who denied history of DM present with spontaneous VH due to PDR. Possible reasons as to why some patients are unaware of their diabetes when eye examination reveals PDR include lack of access to healthcare, lack of knowledge on DM screening and its importance, level of education and socioeconomic status. Therefore, DM screening and awareness can be improved with increasing accessibility to healthcare and raising awareness on the importance of DM screening.

The second most common cause of spontaneous VH is RB or RRD causing extravasation of blood from a tear in the retinal vessels, which accounts for approximately 13% of all cases. While PVD, with a prevalence of 12%, causes traction of retinal vessels leading to VH which often occurs near the optic disc. Both RB or RRD and PVD are most common in patients less than 60 years of age and in patients who present with symptoms lasting less than 1 week. These two etiologies are also the most common causes in non-diabetic patients with RB or RRD affecting 28.1% and PVD accounting for 20.1% of non-diabetic eyes with spontaneous VH.

RVO is another common cause of spontaneous VH and is found to be the fourth most common cause, which correlates with past studies.[3,4] RVO is present in all age groups and in all onset duration but is more prevalent in patients that present to the hospital after 1 week of symptoms. In non-diabetic patients, RVO is the third most common cause of spontaneous VH with a prevalence of 18%. Other than the etiologies mentioned, AMD is also frequently seen in non-diabetic patients and in patients older than 70 years. Other known causes of spontaneous VH include polypoidal choroidal vasculopathy, retinal vasculitis and Terson syndrome.

Summary

All in all, PDR is found to be the most common cause of spontaneous VH in Thailand. This study has revealed the prevalence of different etiologies of spontaneous VH, along with the association between each cause and onset of symptoms and also the presence of DM. The i nformation presented in this study is pertinent in evaluation and accurate diagnosis of spontaneous VH leading to appropriate management based on the different etiologies.

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