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RETINAL DISORDERS

Clinical findings in acute posterior vitreous detachment

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Abstract

Purpose To analyze the typical presentation of acute posterior vitreous detachment (PVD), including demographics and prevalence of various treatable findings in the same and fellow eye.

Methods Retrospective analysis of medical records from 2346 patients with acute PVD. Descriptive statistics were generated on age, sex, contact date, visual acuity, and slit lamp, and fundoscopy findings. Multivariate regressions were used to generate odds ratios with 95% confidence intervals (CI) to quantify associations between variables.

Results A total of 4692 eyes from 2346 patients were analyzed. Most patients were female (60.5%) with an average age of 62.8 years old. Overall, 605 patients (25.8%) had any additional ocular finding on fundus exam, including pigmentation ($N = 184$, 7.8%), lattice degeneration ($N = 158$, 6.7%), tear ($N = 131$, 5.6%), and hole ($N = 131$, 5.2%). Unilateral retinal detachment was present in 26 patients (1.1%), and these patients demonstrated a similar rate (26.9%) of additional ocular findings compared to the entire sample size. Female sex (OR 1.21, 95% CI 1.03–1.43, $p = 0.020$) was independently associated with presentation during spring or summer.

Conclusion Acute PVD is associated with a number of risk factors and peripheral lesions. These findings may be useful in treating and predicting the course and development of PVD.

Keywords Posterior vitreous detachment · Retinal detachment · Retinal tear

Key messages

- While the pathophysiology of PVD and some of its risk factors and complications have been well characterized, the full spectrum of risk factors and clinical findings in acute PVD remains incompletely studied.
- In this retrospective study, we present new findings on the risk factors and prevalence of peripheral lesions and complications in acute PVD.
- These findings may be useful in treating and predicting the course and development of PVD.

Background

Posterior vitreous detachment (PVD) is a common ocular condition defined as the separation of the vitreous cortex from the internal limiting membrane of the retina [1]. An age-related process, its prevalence increases from 24% among patients aged 50–59 years to 87% among patients aged 80–89 years [2]. PVD classically presents with flashes, floaters, or the sensation of a curtain falling over the visual field, but may be asymptomatic in up to 20% of cases [3]. Slit-lamp biomicroscopy, optical coherence tomography, and B-scan ultrasonography are tools used to assess and diagnosis PVD [4].

There are several known risk factors associated with PVD. Old age, female sex, myopia, certain underlying ocular diseases, menopause, vitamin B6 excess, ocular

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inflammation, trauma, ocular surgery, and retinal laser therapy have all been associated with increased risk of developing PVD [5]. Environmental risk factors have also been hypothesized to play a role in the development of PVD [6]. While there is a significant evidence that retinal detachment (RD), an ocular emergency and notable complication of PVD, increases in incidence in the summer months, data is lacking on climate influences on PVD [7–9]. We hypothesized a similar environmental impact on PVD, due to increased sun exposure, physical activity in warmer weather, dehydration, or other factors. Investigation into this realm may provide new insights into seasonal predictability of PVD.

PVD's complications and peripheral findings are numerous. Its complications include RD, retinal tears, macular holes, and epiretinal membrane formation [10]. RD is one of the most serious complications, and its incidence following acute PVD has been reported to be between 8 and 15% [11, 12]. Risk factors for development of RD include hemorrhage, presence of retinal pigment–epithelial cells, myopia, trauma, pseudophakia, aphakia, lattice degeneration, RD in the fellow eye, and a family history of RD [11]. Peripheral lesions associated with PVD include lattice degeneration, hemorrhage, pigmented cells, holes, tears, and breaks [4]. The exact prevalence of these lesions is still unknown, but is important in guiding therapeutic decision-making, since they may predispose to the development of RD [4].

While the pathophysiology of PVD and some of its risk factors and complications have been well characterized, the full spectrum of risk factors and clinical findings in acute PVD remains incompletely studied. Here, we aim to evaluate the prevalence of ocular findings in patients with acute PVD, as well as further define the typical presentation of an acute PVD patient, including demographics, seasonal presentation, and visual acuity. We present an analysis on the prevalence of various treatable at initial presentation in the same and fellow eye of acute PVD patients. In doing so, we provide additional information on the clinical presentation of PVD for improvements in prediction and management.

Table 1 Demographics, seasonal presentation, and visual acuity of new acute PVD patients

Patient demographics, $N = 2346$	Mean ± SD or N (%)
Age (years)	62.8 ± 8.5
Sex	
Male	926 (39.5%)
Female	1420 (60.5%)
Seasonal presentation	
Winter	543 (23.2%)
Spring	656 (28.0%)
Summer	584 (24.9%)
Fall	563 (24.0%)
Visual acuity	
OD	31.8 ± 44.1
OS	30.3 ± 26.4

Methods

Data source

This study was ethically approved and adhered to the guidelines set forth by the Declaration of Helsinki. We performed a retrospective, non-interventional analysis of medical records on patients presenting to the University of Pittsburgh Medical Center with acute PVD from January 2015 to June 2021.

Study location

Pittsburgh, Pennsylvania is a city in the Northeast USA located at latitude 40.44. Its climate is a hot-summer humid continental climate, according to the Köppen-Geiger climate classification [13]. Monthly temperature means from a 30-year data range from − 1.8 °C in January to 22.9 °C in July (https://www.weather.gov/media/pbz/records/histemp.pdf).

Data collection and analysis

Patients with new cases of acute PVD were included in the study. Acute PVD was defined as patients presenting with new symptoms of PVD, including flashes or floaters in one or both eyes, or patients with diagnosis of PVD in their code. New was defined as patients experiencing symptoms for less than 2 months leading up to presentation. Patients with a history of any associated ocular disease, prior PVD, and intraocular injections were excluded. The final study cohort included 2346 patients with new acute PVD. Medical records were reviewed for demographics and ocular finding data at presentation including age, sex, contact date, visit order number, visual acuity, and slit lamp–exam fundoscopy findings. Data was analyzed using STATA16 [14]. Descriptive statistics were generated as mean and standard deviation for continuous variables and frequencies and percentages for categorical variables. Multivariate regressions were used to generate odds ratios with 95% confidence intervals (CI) to quantify associations between variables.

Results

A total of 4692 eyes of 2346 patients with acute PVD were analyzed for demographics and other ocular findings (Table 1). The patients were 62.8 years on average and were predominantly female at 60.5%. Age distribution did not differ significantly between sexes (Fig. 1).

Of 2346 patients, 605 (25.8%) had any additional ocular finding, while 1741 (74.2%) had no other significant ocular findings to their acute PVD (Table 2). The most common ocular findings included pigmentation ($N = 184$, 7.8%), lattice degeneration ($N = 158$, 6.7%), tear ($N = 131$, 5.6%), and hole ($N = 131$, 5.2%). Unilateral RD was present in 26 patients (1.1%) had, of whom 7 (26.9%) had any additional ocular finding in the fellow eye. Female sex was independently associated with increased rates of retinal tears (OR 1.50, 95% CI 1.03–2.19, $p = 0.033$) and decreased rates of retinal holes (OR 0.68, 95% CI 0.47–0.98, $p = 0.04$) compared to male sex. The highest proportion of bilaterality was observed in pavingstone degeneration (60.0%), cobblestone degeneration (51.4%), and lattice degeneration (36.7%). There were no cases of bilateral nevi, subretinal fluid, or retinal detachment.

While the male patients demonstrated no significant variance in seasonal presentation, the female patients followed a

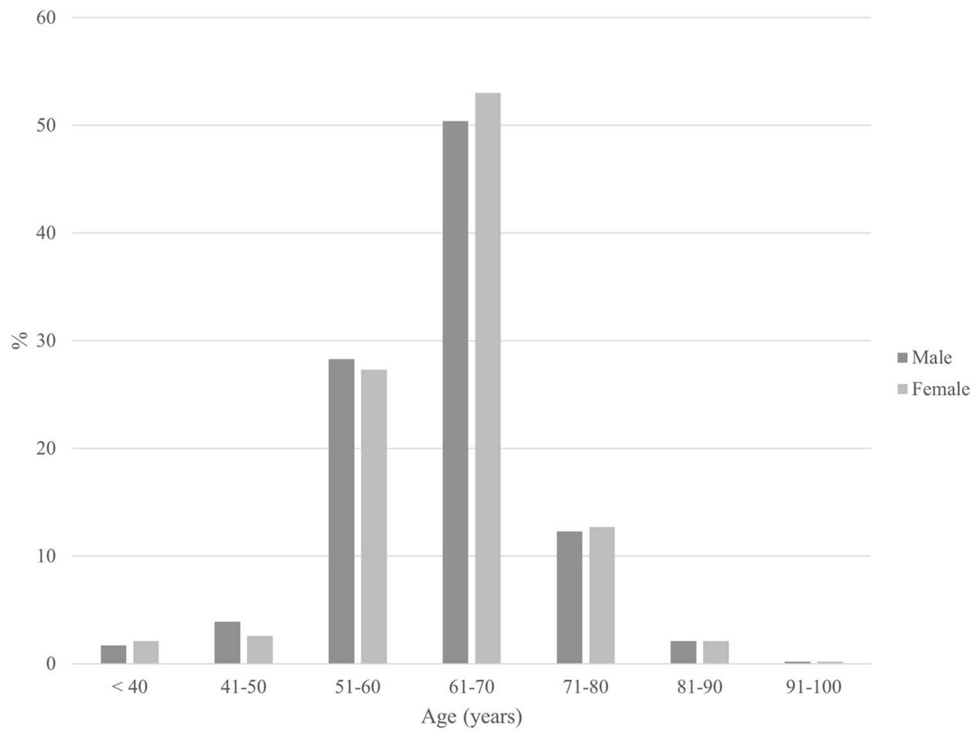

Fig. 1 Age distribution of acute PVD patients. Data shows the distribution of age on contact date for male and female PVD patients. Males and females were 62.6 ± 8.5 and 62.9 ± 8.5 years-old on average, respectively. Distribution did not differ significantly ($p = 0.2193$)

Table 2 Ocular findings in new acute PVD patients

Ocular finding $N = 2346$	Total, N (%)	Unilateral, N (%)	Bilateral, N (%)	Fellow eyes ($N = 26$) of retinal detachment, N (%)
Retinal detachment	26 (1.1%)	26 (100%)	0 (0%)	0 (0%)
Pigmentation	184 (7.8%)	132 (71.7%)	52 (28.3%)	1 (3.8%)
Lattice degeneration	158 (6.7%)	100 (63.3%)	58 (36.7%)	4 (15.4%)
Tear	131 (5.6%)	125 (95.4%)	6 (4.6%)	3 (11.5%)
Hole	122 (5.2%)	116 (95.1%)	6 (4.9%)	1 (3.8%)
Chorioretinal scar	67 (2.9%)	53 (79.1%)	14 (20.9%)	0 (0%)
Pavingstone degeneration	45 (1.9%)	18 (40.0%)	27 (60.0%)	0 (0%)
Cobblestone degeneration	37 (1.6%)	18 (48.6%)	19 (51.4%)	0 (0%)
Nevus	33 (1.4%)	33 (100%)	0 (0%)	0 (0%)
Subretinal fluid	23 (1.0%)	23 (100%)	0 (0%)	1 (3.8%)

significantly different trend ($p=0.049$) (Fig. 2). More female patients presented in warm seasons compared to cold seasons with frequency peaking in the spring. Multivariate regressions showed associations between both female sex (OR 1.21, 95% CI 1.03–1.43, $p=0.020$) and increased age (OR 1.01, 95% CI 1.00–1.01, $p=0.043$) with presentation during a warmer season.

Discussion

In this study, we present data on the presentation, risk factors, and complications of acute PVD. Of 2346 patients, the majority were female with an age of 62.8 years. While the male patients showed no significant seasonal tendencies, female and older patients showed a slight association with presentation during the spring or summer. Overall, 25.8% of the patients had any additional ocular finding and 6.8% had bilateral findings. The most common peripheral lesions were pigmentation, lattice degeneration, tear, and hole. Female patients demonstrated increased rates of retinal tears and decreased rates of retinal holes compared to the male patients.

A number of studies have focused on acute PVD patients previously [2, 15–19]. The typical presenting patient in our cohort was a 62.8-year-old female, which aligns with previous studies. Some studies have reported a younger age of onset for female patients, but age distribution did not differ significantly between sexes in our population. Our cohort's rate of RD (1.1%), the most emergent sequela of PVD, was lower than the previous large-scale studies on PVD (4.3–16.6%), which may reflect lesser acuity in our population overall.

We provide new insights into the seasonal dependence of PVD. A previous study of 567 cases on climatic influence on PVD presentation showed a strong association between weekly average temperatures and incidence of PVD [6]. Here, we expand on this analysis with a larger sample size and evidence of other factors influencing seasonal presentation, including female sex and advanced age on presentation. While statistically significant, these additional factors were not associated with overwhelmingly increased odds of a warmer seasonal presentation and thus merit further investigation.

While the incidence of several complications of acute PVD, including RD, retinal tear, retinal hole, hemorrhage, and lattice degeneration, has been studied extensively, our study details the incidence of several less-studied ocular findings associated with PVD. There was a particularly high percentage of patients with pigmentation (7.8%) and a smaller population with chorioretinal scarring (2.9%), pavingstone degeneration (1.9%), cobblestone degeneration (1.6%), nevus (1.4%), and subretinal fluid (1.0%). Understanding the prevalence of these findings may yield additional criteria for identifying patients at risk of developing PVD, and may also suggest linkages between PVD and damage to other structures in the eye. Additional studies addressing the relationship between these other ocular observations and PVD, especially with regard to timing, are warranted.

This study was limited by several factors. First, the study population was evaluated by different physicians. While this was beneficial in increasing diversity and magnitude of the cohort, it introduced a degree of subjectivity and bias to medical record keeping. Furthermore, while a number of different search criteria were included in generating summary statistics for the population, some differences in documentation may have led to a small number of relevant patients being missed. Missed patients due to the often-asymptomatic nature of PVD were another limitation of the

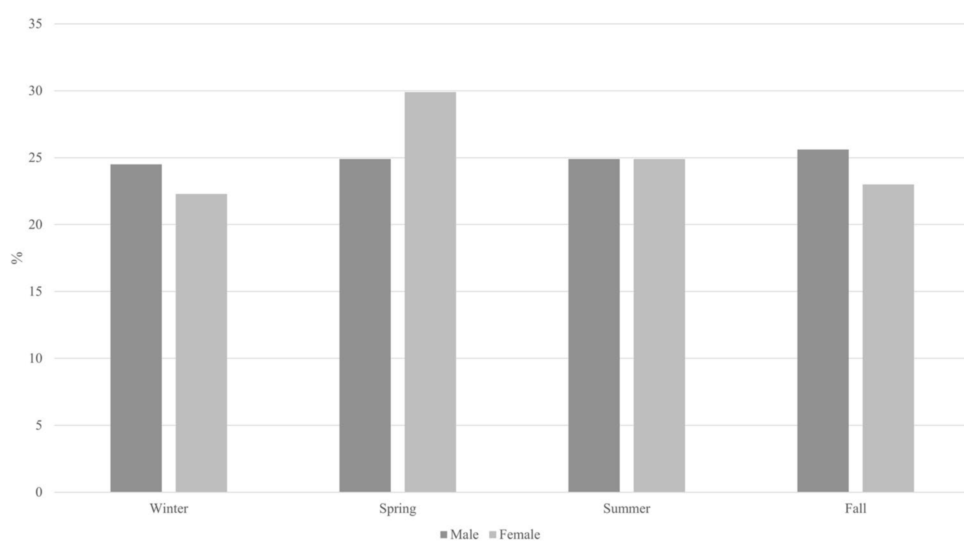

Fig. 2 Seasonal distribution of acute PVD cases by sex. Female and male seasonal presentations varied significantly by season ($p=0.049$), peaking in the spring (29.9%). Male seasonal presentation was between 24.5 and 25.5% for each season

study. Asymptomatic PVD patients may differ from symptomatic patients in their demographics and rate of complications, but are not easily studied because they do not present for eye care in the first place. There was also a possibility for recall error, since our definition of new PVD allowed for up to 2 months of symptoms prior to presentation. Finally, inherent patterns in demographics in colder climates like Pittsburgh may confound our seasonality analysis. Some relevant patients may opt to spend the winter in a warmer climate and present with acute PVD elsewhere. The size of this population and effect is unknown, and it is impossible to determine the extent to which it mediates the relationship between climate and development of PVD.

In this study, we present new findings on the risk factors and prevalence of peripheral lesions and complications in acute PVD. We show associations between female sex and presentation during the spring or summer. Additionally, we highlight the incidence of previously unstudied ocular findings in acute PVD, which may be useful in predicting development of other ocular conditions or reciprocally for identifying patients at risk for future PVD.

Author contribution Conceptualization and data acquisition were done by Jay Chhablani. Data analysis and original draft preparation were performed by Matthew Driban. All the authors contributed to review and editing. All the authors read and approved the final manuscript.

Data availability Data are available upon request.

Code availability Not applicable.

Declarations

Ethics approval This retrospective research study was reviewed by the IRB of the University of Pittsburgh and determined to meet regulatory requirements for exempt research.

Consent to participate Not applicable.

Consent for publication Not applicable.

Conflict of interest The authors declare no competing interests.

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