Predicting retinal tears in posterior vitreous detachment

Kelly D. Schweitzer, MD*, Amaka A. Eneh, MD*, Jonathan Hurst, BS, MD*, Mark D. Bona, MD*, Karim J. Rahim, MSc*, Sanjay Sharma, BSc, MD, FRCS, MS (Epid), MBA*

ABSTRACT • RÉSUMÉ

Objective: The purpose of this study is to determine whether patients with acute posterior vitreous detachment (PVD) who develop delayed retinal tears within the first 6 weeks after initial presentation have predictive characteristics.

Design: Prospective cohort study.

Participants: All patients presenting to the Hotel Dieu Hospital Emergency Eye Clinic between September 2008 and July 2009 diagnosed with acute PVD were offered enrollment.

Methods: At the initial visit, patients were given the previously validated Queen's University Posterior Vitreous Detachment Patient Diary to record their daily symptoms for 6 weeks. Two or 6 weeks later, patients were reexamined in detail, and their diaries were collected and analyzed. Exact logistic regression was used to establish characteristics predictive of delayed retinal tears.

Results: In our study population of 99 patients, 2 developed delayed retinal tears. One had retinal hemorrhages and the other had a cloud-like floater at initial presentation. Vitreal or retinal hemorrhage, large number of floaters at initial presentation, and high floater frequency at initial presentation indicated a high risk of delayed retinal tear formation, yielding a median unbiased estimated odds ratio of 36.18 with *p* value 0.009. No other presenting risk factors or symptomatology followed daily over the first 6 weeks after acute PVD were predictive of delayed retinal tear formation.

Conclusions: PVD patients with retinal or vitreal hemorrhage, a significant number of floaters or a cloud like appearance to the floaters, or high floater frequency are at higher risk of developing delayed retinal tears.

Objet : Déterminer si les patients atteints d'un décollement postérieur aigu du vitré (DPV), qui développent une déchirure de la rétine à retardement dans les six premières semaines suivant la présentation, ont des caractéristiques prédictives.

Nature : Étude prospective de cohorte.

Participants : Tous les patients qui s'étaient présentés à la clinique d'urgence oculaire de l'Hôpital Hôtel-Dieu dans les mois de septembre 2008 à juillet 2009 et avaient reçu un diagnostic de DPV aigu, ont été invités à participer.

Méthodes : À la première visite, les patients recevaient de l'Université Queen's le Carnet de suivi du patient sur le décollement postérieur du vitré pour y noter quotidiennement leurs symptômes pendant six semaines. Après deux ou six semaines, les patients subissaient un nouvel examen approfondi et l'on recueillait et analysait les carnets. La régression logistique exacte servait à établir les caractéristiques prédictives du retard des déchirures de la rétine.

Résultats : Parmi les 99 patients de notre étude, 2 avaient développé une déchirure rétinienne à retardement; l'un avait une hémorragie rétinienne et l'autre, une apparence de corps flottants nuageux, à la première présentation. L'hémorragie du vitré ou de la rétine ainsi que le grand nombre et la fréquence des corps flottants à la première présentation indiquaient un risque élevé de formation des déchirures rétiniennes à retardement, donnant une probabilité moyenne estimée à 36,18 avec une valeur p de 0,009. Aucun autre facteur de risque ou symptôme apparent dans les suivis quotidiens des 6 premières semaines suivant le DPV aigu n'a prédit la formation des déchirures rétiniennes à retardement.

Conclusions : Les patients ayant un DPV avec hémorragie de la rétine ou du vitré, un nombre important de corps flottants ou de corps flottants ayant l'apparence de nuages ou encore une forte fréquence de corps flottants courent davantage de risque de déchirures de la rétine à retardement.

Posterior vitreous detachments (PVD) are a common age-related condition among patients aged 45 years or older. The pathophysiology of PVD involves the separation of the vitreous cortex from the internal limiting lamina of the retina.[1] This typically causes the patient to see flashing lights and floaters at varying amounts of severity and frequency.[2] The main complications associated with PVDs are retinal detachments or breaks either at initial presentation or at a later date.[2,3] Therefore, all patients presenting with flashes or floaters are typically examined using slit lamp biomicroscopy, indirect ophthalmoscopy, and scleral indentation both at initial presentation and during a 6-week follow-up visit. PVDs have a high incidence in the general population and they necessitate multiple eye examinations. Thus, the management of PVDs consumes significant amounts of resources.[4]

There is considerable interest in identifying symptoms that can predict the later development of retinal detachments or breaks so that follow-up visits can be reserved for patients with serious risk factors. A recent study by van Overdam et al.[5] suggested that among patients with isolated PVDs, only those with more than 10 floaters, a curtain or cloud, vitreous hemorrhages, or retinal hemorrhages at initial presentation need to be rescheduled for a follow-up visit. All other patients can be instructed to return if the number of floaters increases.

The purpose of this study is to determine if our patients who present with acute PVD and later develop retinal tears

From the *Department of Ophthalmology, Queen's University, Kingston, Ont.

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Correspondence to Amaka Eneh, Hotel Dieu Hospital, Department of Ophthalmology, 166 Brock Street, Kingston, ON K7L 5G2; 7aae1@queensu.ca

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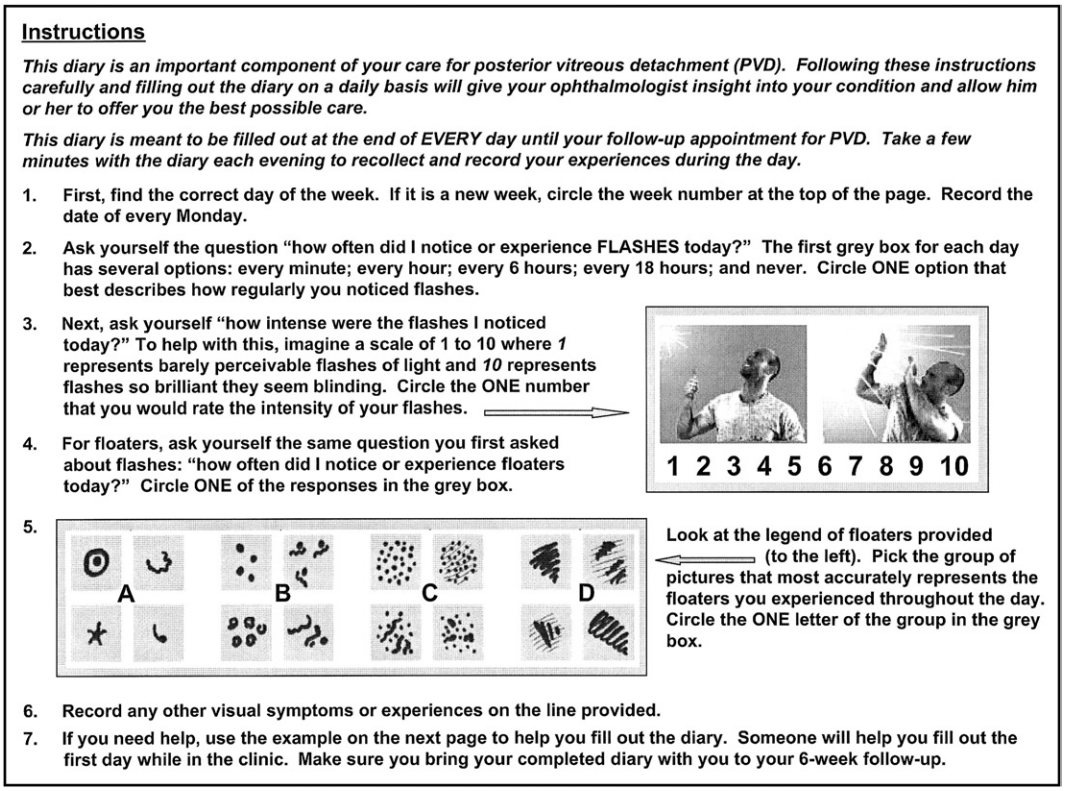

Fig. 1—Instructions sheet outlining the procedure for recording symptoms of posterior vitreous detachment in the Queen's University Posterior Vitreous Detachment Patient Diary. Floater shapes are represented in the lower left corner of the page. Groups A, B, and C represent 1-3 floaters, 3-10 floaters, and >10 floaters respectively. Group D represents a curtain or cloud.

display these predictive characteristics, and to look for additional predicting factors.

Methods

Study population

All patients presenting to the Hotel Dieu Hospital Urgent Eye clinic diagnosed with acute PVD were offered enrollment in the study. The Urgent Eye clinic is a tertiary care centre accepting urgent referrals from ophthalmologists, optometrists, and medical doctors in Kingston and surrounding areas of southeastern Ontario. Exclusion criteria of the study included retinal breaks or detachments at initial presentation, prior diagnosis of ocular disease, patients under the age of 40 years or who had symptoms for >1 month, or an identified history of blunt trauma to the eye. Patients with any history of ocular surgery except uncomplicated phacoemulsification cataract extraction with in the bag IOL insertion without posterior capsular rupture or vitreous loss were also excluded.

All patients were asked about risk factors for retinal tears and underwent a full ophthalmologic examination including slitlamp biomicroscopy, indirect ophthalmoscopy, and scleral indentation. Goldmann 3-mirror examination was used as required based on clinical examination. All patients were seen by a Queen's University ophthalmology resident as well as an attending staff physician, vitreoretinal fellow, or vitreoretinal surgeon.

On completion of the examination and a thorough explanation of the nature of the diagnosis, enrollment and consent was obtained. Each patient then received a Queen's University Posterior Vitreous Detachment Patient Diary. The diary included an instructions sheet (Fig. 1). The bulk of the diary centered around the main symptoms of PVD including the frequency and quality of photopsias and floaters. There was also room for any other symptoms the patient wished to record (Fig. 2). At the initial presentation, patient demographic information, visual acuity, and risk factors for retinal tears were recorded in the diary. Risk factors included subjective vision loss, family history of retinal detachment, myopia >6D, pseudophakia, lattice degeneration, vitreous hemorrhage, retinal hemorrhage, and tobacco dust. Symptoms from the first day were recorded by the examining physician with the patient's input to ensure proper understanding. Four symptoms were recorded and they included floater frequency, floater group (A through D), flash frequency, and flash intensity (1-10). The images of the various floater groups (Fig. 2) were adapted from van Overdam et al.[4] Groups A, B, and C represent 1-3 floaters, 3-10 floaters, and >10 floaters respectively. Group D represents a curtain or cloud (Fig. 1 and Fig. 2).[4]

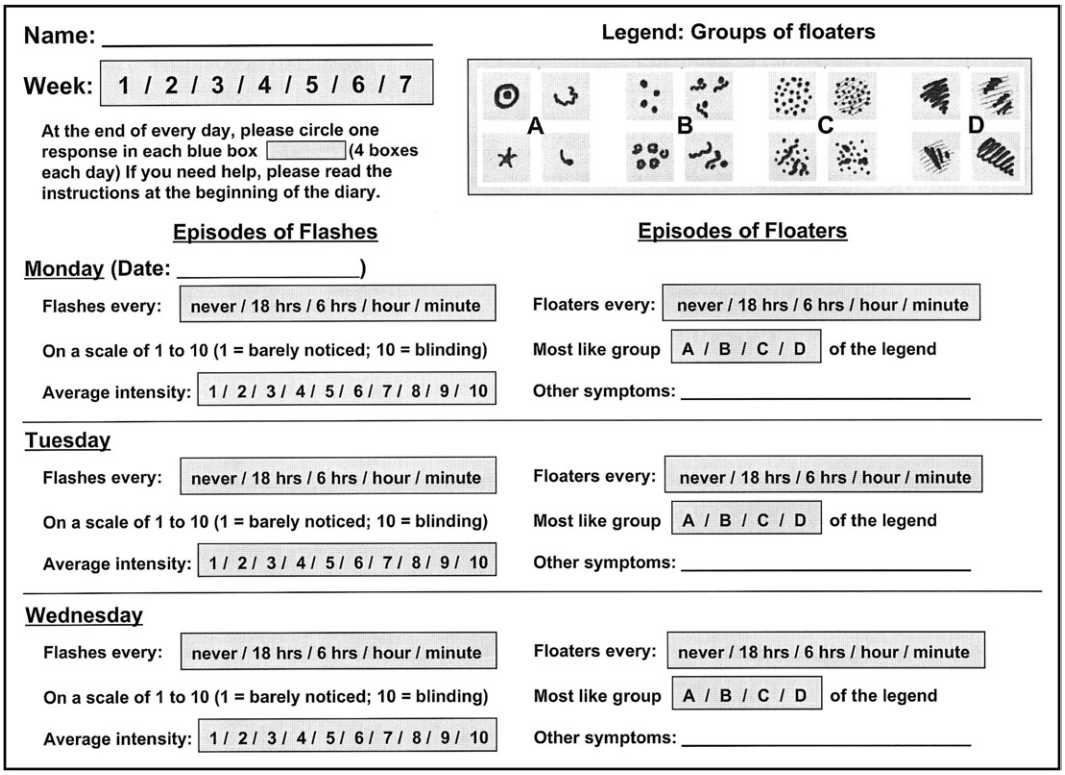

Fig. 2—Daily recording pages for PVD symptoms. These pages were duplicated to provide enough daily records to record symptoms for 6 weeks after the initial visit. The floater groups adapted from van Overdam et al[4] are in the top right hand corner. Floater shapes are represented in the upper right corner of the page. Groups A, B, and C represent 1-3 floaters, 3-10 floaters, and >10 floaters respectively. Group D represents a curtain or cloud.

All patients were examined at 6 weeks. If additional risk factors such as retinal or vitreal hemorrhage, or pigment visualized in the anterior vitreous were present on the initial exam, patients had another exam 2 weeks after initial presentation. A full examination was repeated at each visit. At every visit, the patient was reminded to return to clinic immediately if they noticed increasing photopsias, an increased number of floaters, or a visual field defect. All diaries were collected at the 6-week visit.

Study design was approved by the Queen's University Research Ethics Review Board.

Data analysis

Longitudinal data from the diary was recorded on Microsoft Excel (Microsoft, Seattle, Wash) and statistical analysis was done using version 9.2 of the SAS System for Windows (SAS Institute, Cary, NC). Retinal or vitreous hemorrhage, and multiple floaters at presentation (group C or D) were tested with exact logistic regression.[5-7] In addition, any longitudinal changes in the 4 symptoms recorded in the diary that may predict a retinal tear were explored.

Results

Over the course of the study, 2 patients offered enrollment declined participation due to an inability to keep the 6-week follow-up visit. A total of 102 patients were given a Queen's University Posterior Vitreous Detachment Patient Diary. Three patients were lost to follow-up. Nine patients were given 2-week follow-up appointments. In total, we analyzed 99 diaries. Of these, 2 people developed retinal tears within 6 weeks. One of these patients had both vitreous and retinal hemorrhages and had been seen at a 2-week follow-up appointment. The other patient reported a curtain or cloud pattern of floaters at presentation (group D floaters).[4]

In our study, the first patient presenting with a delayed retinal tear had group D floaters but also presented with the highest floater frequency possible, and did not indicate any change in floater frequency. In terms of flashes, this patient only reported flashes on a total of six days during the 6-week study period. The intensity ranged from 2 of 10 to 5 of 10 and the flash frequency, when flashes occurred, was once every 18 h. The second patient presenting with a delayed retinal tear had retinal hemorrhages at presentation. This patient had group A floaters throughout the study period and demonstrated no changes in flash frequency or intensity. However, this patient did report a decrease in floater frequency from once every minute to once every hour on day 3. On day 28, there was another decrease in floater frequency to once every 6 h. Regardless of the decrease noted in floater frequency, this patient would still have been scheduled for follow-up because he/she had a retinal hemorrhage at presentation.

Table 1—Sensitivity, specificity, positive likelihood ratios, and positive and negative predictive values of the criteria for re-examination for delayed retinal tears among acute PVD patients proposed by van Overdam et al.[5] and the effects of including 1 additional criterion (high flash frequency at presentation)

Predictor	Sensitivity (%)	Specificity (%)	Positive Likelihood Ratio	Positive Predictive Value (%)	Negative Predictive Value (%)
Hemorrhage or floaters in group C or D	100	84.5	6.45	11.8	100
Hemorrhage or floaters in group C or D combined with initial floater frequency of once every 6 h or higher	100	87.6	8.06	14.3	100
Hemorrhage or floaters in group C or D combined with initial floater frequency of once every hour or higher	100	88.7	8.85	18.2	100
Hemorrhage or floaters in group C or D and initial floater frequency once every minute	100	94.8	19.2	40.0	100

In total, 15 of 99 patients in our study fulfilled the criteria for scheduling a follow-up visit, namely, vitreal or retinal hemorrhage and group C or D floaters. Because these criteria captured our 2 patients who developed delayed retinal tears, they displayed 100% sensitivity for our study population. The specificity, positive predictive value, and likelihood ratios were 84.5%, 11.8%, and 6.45 respectively (Table 1). The median unbiased estimated odds ratio (OR) was 12.244 ($p = 0.0561$) (Table 2). In addition, our data suggested that stronger predictors can be explored by considering the floater frequency at presentation. As both patients presenting had the highest floater frequency, we attempted models that included high floater frequency at presentation. We found that when using hemorrhage, group C or D floaters, and the highest floater frequency at presentation, the estimated the OR was 36.18 ($p = 0.009$) (Table 2). The sensitivity remained 100%, and the specificity increased to 94.8%. The likelihood ratio increased to 19.2, and the positive predictive value increased to 40.0% (Table 1). Again, we used exact logistic regression to compensate for the small sample size.

We did not detect any changes in floater frequency, floater type, flash frequency, or flash intensity over the 6-week period that were predictive of delayed retinal tears. Nor were the other risk factors recorded at presentation predictive of delayed retinal tears.

Discussion

It has been suggested that patients with floater group C or D or vitreal or retinal hemorrhages at presentation should be scheduled for reexamination.[5] Patients not within the above group should be asked to return for reexamination only if they experience an increase in the number of floaters.[5] Our prospective cohort study on patients presenting with delayed retinal tears is supportive of this basic predictive pattern that only patients with either large or numerous floaters, or retinal or vitreal hemorrhages need to be scheduled for a follow-up visit after experiencing acute PVD.[5] One important caveat is that based on our data, we are unable to support or refute the common dogma that increasing floaters are predictive of delayed retinal tears. This is because both our patients who experienced delayed retinal tears presented initially with floaters at the maximum frequency. In fact, one of them indicated a decrease in floater frequency. However, this is insignificant as the patient who described a decrease in floaters would have been scheduled for a follow-up appointment based on the other factors suggested for follow-up, e.g., numerous or cloud-like floaters at presentation.

Our data also indicates that follow-up criteria can be further refined by exploring floater frequency at presentation. By including the highest floater frequency in the aforementioned criteria, we found that as the specificity of the criteria increased, so did the estimated OR.

Because some patients were assessed by an attending staff physician or vitreoretinal fellow rather than by a vitreoretinal attending physician, it is theoretically possible that some retinal tears were not detected at the initial presentation. However, all patients received detailed scleral depression indirect and 3-mirror gonioscopic retinal examination.

The main limitation of this study is the small number of delayed retinal tears, despite that we were able to confirm

Table 2—Estimated OR of the criteria for reexamination for delayed retinal tears among acute PVD patients proposed by van Overdam et al.[5] and the effects of including 1 additional criterion (high flash frequency at presentation)

Predictor	Predicted Tears (n)	Observed Tears (n)	Exact OR	*P* Value
Hemorrhage or floaters in group C or D	15	2	12.2	0.056
Hemorrhage or floaters in group C or D combined with initial floater frequency of once every 6 h or higher	12	2	15.6	0.0375
Hemorrhage or floaters in group C or D combined with initial floater frequency of once every hour or higher	11	2	17.1	0.0322
Hemorrhage or floaters in group C or D and initial floater frequency once every minute	5	2	36.2	0.0087

Note: OR, odds ratio.

the predictive value of the previously suggested acute PVD follow-up criteria. We suggest floater frequency at presentation as a possible addition to these criteria. The small number of delayed retinal tears may also contribute to our inability to detect any changes in daily symptoms that might also have been predictive of delayed retinal tears. Nonetheless, given that the follow-up of patients with PVD requires a considerable amount of resources, it is worthwhile to confirm the findings of this study by expanding it to include more centers, longer follow-up intervals, and a larger sample size.

Disclosures: The authors have no proprietary or commercial interest in any materials discussed in this article.

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