International Medical Case Reports Journal

Dovepress
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CASE REPORT

Valsalva Retinopathy in Pregnancy: A Case Report and Review of the Literature

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Abstract: The current case report and literature review evaluate the management and optimal mode of delivery for Valsalva retinopathy in pregnancy. A 30-year-old primigravid female was discussed presenting with Valsalva retinopathy in the left eye at 35 weeks of gestation after dry heaving with a visual acuity of 20/200. Four weeks after cesarean-section, she had worse central vision and improving residual hemorrhage. A literature review of 25 Valsalva retinopathy cases showed all patients treated with laser posterior hyaloidotomy or pars plana vitrectomy achieved complete resolution (median of 1.5 weeks, p = 0.08), compared to 67% of untreated eyes (median of 5 months, p = 0.08). Average final visual acuity was 20/30 for the treated and untreated cohorts. Intervention may result in faster recovery time but with similar final visual acuity. Four (15%) cases of Valsalva retinopathy were incited by vaginal delivery. However, neither vaginal delivery nor cesarean section resulted in recurrence/worsening of premacular hemorrhage. These findings may help guide treatment of challenging Valsalva retinopathy cases in pregnancy.

Keywords: valsalva, retinopathy, hemorrhage, pregnancy, retina, spontaneous vaginal delivery, cesarean section

Introduction

Valsalva retinopathy (VR) presents as spontaneous vision loss that is characterized by a sudden increase in intrathoracic or intra-abdominal pressure, leading to an acute rise in intravenous pressure in retinal capillaries.[1] The rupture of these vessels leads to hemorrhage leaking into the vitreous, preretinal, sub-hyaloid, or sub-internal limiting membrane (ILM) spaces. Pregnancy is a known risk factor for VR due to an increase in vessel density and high incidence of increased intrathoracic or intra-abdominal pressure (ie vomiting, labor).[2,3] Treatment for VR is debated throughout literature and may consist of conservative management, neodymium-doped yttrium aluminum garnet (Nd:YAG) laser posterior hyaloidotomy, or pars plana vitrectomy (PPV).[4] There is limited literature discussing treatment for VR in pregnancy or the benefit of selecting cesarean section (CS) over spontaneous vaginal delivery (SVD) to decrease the risk of recurrence of macular hemorrhage.[5]

Contributing to the minimal literature on VR, we describe a case of a healthy pregnant woman who developed vision loss and VR in her third trimester. A systematic review of the literature is then included to discuss which treatment(s) and mode of delivery resulted in the best outcomes in VR cases.

Methods

The current case describes a patient treated in Dallas, Texas. The patient underwent vision testing, intraocular pressure measurement with tonometry, and ocular examination. Ancillary testing was obtained with optical coherence tomography (Heidelberg Spectralis, Heidelberg Engineering, Germany) and wide-field fundus photography (Optos®, UK). Institutional approval at UT Southwestern Medical Center was obtained to publish the case details. A literature review was then conducted analyzing 25 total cases of VR in pregnancy. Cases were identified by searching for "Valsalva", "retinopathy", and "pregnancy" in the MEDLINE and Google Scholar databases. These cases were then divided into

Received: 12 March 2025
Accepted: 19 June 2025
Published: 30 June 2025

those who underwent treatment for VR and those who did not. *T*-test and chi-square analysis were utilized to calculate p-values. A p-value less than 0.05 was determined to be statistically significant.

Case Report

A 30-year-old healthy G1P0 female was admitted to the hospital in her 35th week of pregnancy for sudden-onset vision loss in her left eye following an episode of dry heaving lasting 30 seconds that morning. Her pregnancy course was previously uneventful. She described seeing "bright stars" followed by a black spot in the center of her vision in her left eye and blurriness surrounding this area. Her best-corrected visual acuity (BCVA) was 20/20 in the right eye and 20/200 in her left eye. Her intraocular pressure (IOP) was 12 and 17, respectively. Fundus exam of the left eye revealed a large pre-macular hemorrhage and fundus exam of the right eye was normal. There was no afferent pupillary defect present. Her anterior segment exam was normal bilaterally.

There was extensive discussion about whether to pursue SVD or CS, and ultimately, the patient developed pre-eclampsia and decided to undergo an uncomplicated CS at 36 weeks. She returned to clinic 4 weeks after delivery with persistently poor central vision. VA of the right eye was 20/20 and of the left eye was 20/400, with IOPs of 20 in both eyes. The hemorrhage persisted with evidence of resorption. Fundus exam exhibited perifoveal heme and irregular reflex. Optical coherence tomography (OCT) revealed sub-ILM and sub-foveal heme/hyperreflectivity extending to the inner retinal layers and deep vitreous opacities in the left eye, as well as subfoveal ellipsoid zone disruption (Figure 1). Consistent with these findings, fundus photography demonstrated the sub-ILM pre-macular hemorrhage (Figure 2). She did not complete any subsequent follow-up visits to assess for resolution.

Results: Review of the Literature

A total of 25 VR case reports were reviewed and accumulated into a table to compare to our current case (Table 1). The cases consist of 27 pregnant women (28 eyes) (Table 1). Two cases (2 eyes) were excluded from analysis because they described prenatal/postpartum hemorrhage secondary to an underlying disease present before the pregnancy.[5,6] The remaining 25 patients (26 eyes) were included in the analysis.

The demographics of these cases vary widely, with a mean age of 29 years old (range 19–38). All patients had uncomplicated pregnancies prior to experiencing hemorrhage, and no patients were known to have risk factors for hemorrhage before the pregnancy (ie liver disease, sickle cell disease, anticoagulant use). Only one (4%) patient had a preexisting ocular condition of strabismus.

The types of hemorrhage included subhyaloid (7 eyes, 27%), preretinal (6 eyes, 23%), sub-ILM (2 eyes, 7.7%), and mixed (11 eyes, 42%). The timing of hemorrhage varied between cases. For patients who experienced a prenatal hemorrhage, the mean gestational age at the time of hemorrhage was 30 weeks (median 32; range 11–38). Meanwhile, four (15%) patients experienced VR after uncomplicated SVD. Average BCVA for these patients was 20/600 at the time

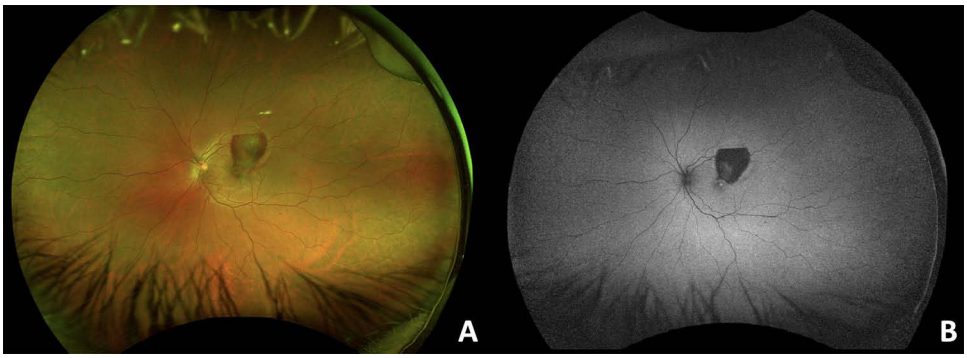

Figure 1 (**A**) Wide field fundus photograph one month after initial presentation, illustrating a resolving sub-hyaloid pre-macular hemorrhage. (**B**) The corresponding fundus autofluorescence demonstrates hypoautofluorescence in the region of the hemorrhage, and there is sparing of fovea.

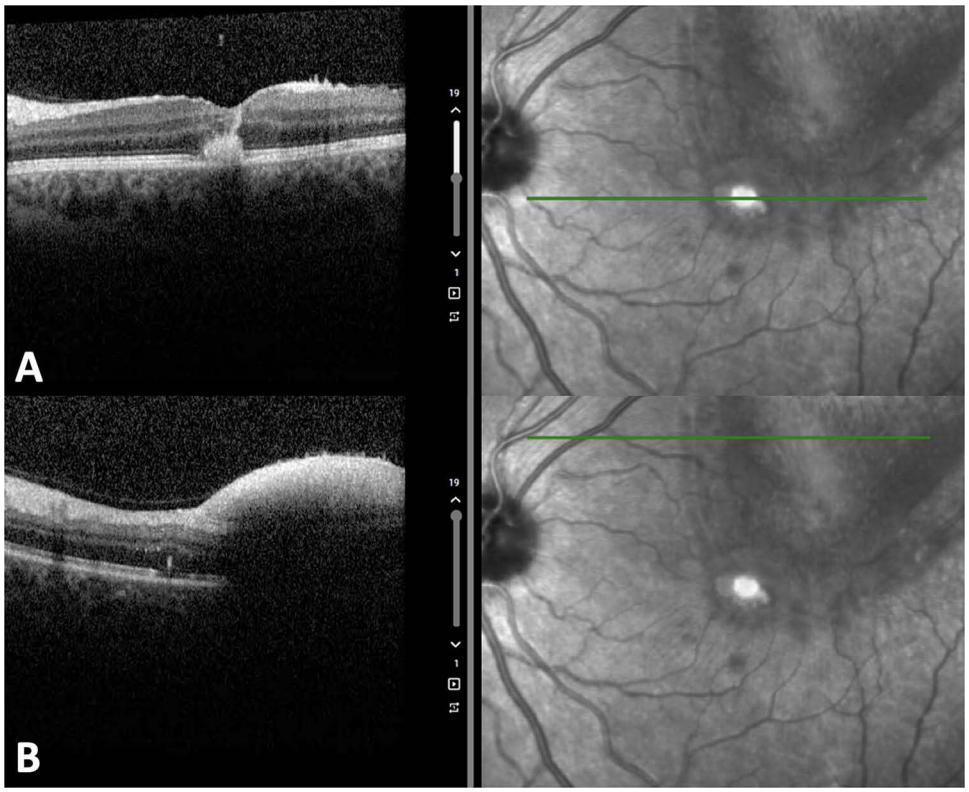

Figure 2 Optical coherence tomography (OCT) 1 month after the initial presentation. (**A**) Subfoveal ellipsoid zone disruption with a linear hyperreflectivity extending to the inner retinal layers. (**B**) A raster through the superior aspect of the macula illustrates the sub-hyaloid component of the hemorrhage.

of diagnosis. Sixteen (61%) eyes experienced severe vision loss down to hand motion or counting fingers at the onset of the hemorrhage.

Of the patients who had prenatal hemorrhage, only 16 patients had mode of delivery reported. Out of these cases, none of the patients experienced recurrence after SVD (11 patients, 71%) or CS (6 patients, 29%). Three (50%) of the 6 patients who underwent CS elected to do so to avoid worsening retinal hemorrhage. Two patients experienced pre-eclampsia as a complication of their pregnancy after the onset of retinal hemorrhage and elected to undergo CS.

Of the total cases (26 eyes), 18 (69%) eyes did not undergo intervention. Of the remaining treated eyes, 5 (19%) eyes were treated with Nd:YAG laser alone, 2 (7.7%) eyes of the same patient were treated with PPV, and 1 (3.8%) eye had combined treatment with Nd:YAG laser followed by PPV. All treated patients had an initial period of observation, with a median time to intervention of 0.75 months (average 1.05 months, range 0 to 2 months).

Overall, 20 (77%) eyes had complete VR resolution. Out of the 8 eyes that received treatment, they all achieved complete resolution. Out of the 18 untreated eyes, 12 (67%) eyes had complete resolution, 5 (28%) had partial resolution, and 1 (5.6%) did not have a follow-up exam reported. Follow-up for patients with partial resolution ranged from 1 to 11 months. Time to complete resolution after intervention ranged from immediately to 8 months (average 2 months; median 1.5 weeks). For patients without intervention, the time from initial presentation to resolution ranged from 2 weeks to 11 months (average and median of 5 months) ($p = 0.08$). There was no significant difference in the final mean BCVA between treated and untreated eyes (20/30, $P = 0.77$).

 https://doi.org/10.2147/IMCRJ.S524362

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Table 1 Summary of Case Reports Published Describing VR in the Setting of Pregnancy, Including the Current Case Study

Review of Valsalva Retinopathy in Literature													
Study Information		**Demographics**			**Initial Visit**			**Treatment**	**Follow-Up/Resolution**			**Delivery**	
Study	**Year**	**Age**	**Eye**	**Medical Hx**	**BCVA**	**Type of Hemorrhage**	**VR Dx?**		**Mo.**	**BCVA**	**Resolution**	**Mode**	**Complications**
Current Case	2023	30	OS	Headaches	20/200	Subhyaloid	Y	None	1	20/400	Partial	CS	Preeclampsia
Al-Mujaini et al[7]	2008	23	OS	None	20/50	Preretinal	Y	None	1	20/20	Complete	SVD	None
Belidi et al[8]	2023	30	OD	None	HM	Mixed	Y	None	4	N/A	Complete	SVD	N/A
Callender et al[1]	1995	26	OD	None	CF	Preretinal	Y	None	6	6/6	Complete	N/A	None
Chidley et al[9]	1997	32	OD	Asthma	CF	Mixed	Y	None	3	6/18	Complete	CS	CS elected due to VR
Choudhry et al[10]	2014	25	OS	None	20/80	Preretinal	Y	None	5	20/25	Complete	N/A	N/A
Dağlioğlu et al[11]	2013	27	OS	None	HM	Subhyaloid	Y	2x Nd:YAG	1	20/20	Complete	CS	None
Deane et al, Case #1[12]	1997	27	OD	None	CF	Mixed	Y	None	10	6/18	Complete	SVD	None
Deane et al, Case #2[12]	1997	35	OS	None	6/9	Mixed	Y	None	10	6/5	Complete	SVD	None
El-Defrawy et al, Case #1[4]	2011	26	OS	N/A	6/60	Mixed	Y	None	N/A	6/6	Partial	SVD	None
El-Defrawy et al, Case #2[4]	2011	34	OS	None	CF	Subhyaloid	Y	None	5	6/6	Complete	CS	None
El-Khayat[13]	2017	35	OS	None	HM	Mixed	Y	None	5	6/5-2	Partial	SVD	None
Eneh et al[14]	2013	36	OS	None	20/20	Sub-ILM	Y	None	2.5	20/20	Complete	SVD	None
Garcia Fernandez et al[15]	2012	36	N/A	N/A	0.1	Sub-ILM	Y	Nd:YAG (failed); PPV	N/A	10/10	Complete	SVD	N/A
Jayaprakasam et al[16]	2011	35	OD	None	CF	Subhyaloid	Y	Nd:YAG	1	6/6	Complete	N/A	N/A
Kaveri et al[17]	2017	29	OD	Asthma	6/24	Mixed	Y	None	0.5	N/A	Complete	CS	CS elected due to VR; preeclampsia
Ladjimi et al[18]	2002	29	OS	None	CF	Preretinal	Y	Nd:YAG	1	20/20	Complete	CS	CS elected due to VR
Li et al[19]	2018	21	OD	None	HM	Subhyaloid	Y	Nd:YAG (failed)	9	6/6	Complete	SVD	None
Mutha et al, OD[20]	2018	25	OD	None	CF	Mixed	Y	PPV	3	20/50	Complete	SVD	None
Mutha et al, OS[20]	2018	25	OS	None	CF	Mixed	Y	PPV	N/A	20/40	Complete	SVD	None

Nganga Ngabou et al[21]	2018	36	OS	None	HM	Preretinal	Y	None	5	20/20	Complete	SVD	None
O'Bryan et al[22]	2018	19	OS	HG, Goiter, Tobacco use, Strabismus	N/A	Mixed	Y	None	N/A	N/A	N/A	N/A	N/A
Ramskold et al[23]	2012	26	OD	HG	CF	Subhyaloid	Y	None	11	6/6	Partial	SVD	None
Tara et al[24]	2015	23	OS	None	CF	Preretinal	Y	None	5	20/20	Complete	SVD	None
Tian et al[25]	2021	24	OD	N/A	CF	Subhyaloid	Y	Nd:YAG	5	10/20	Complete	SVD	None
Wickremasinghe et al[26]	2003	38	OS	None	6/24	Mixed	Y	None	5	6/9	Partial	SVD	None

Abbreviations: BCVA, best-corrected visual acuity; CF, counting fingers; CS, cesarean section; Dx, diagnosis; HG, hyperemesis gravidarum; HM, hand motion; Hx, history; ILM, internal limiting membrane; IVI, intravitreal injection; Mo, month; N/A, not available; Nd:YAG, neodymium-doped yttrium aluminum garnet laser; OD, right eye; OS, left eye; PCIOL, posterior chamber intraocular lens placement; PDR, proliferative diabetic retinopathy; PPV, pars plana vitrectomy; PRP, panretinal laser photocoagulation; SVD, spontaneous vaginal delivery; VR, Valsalva retinopathy.

Discussion

The current case and the literature review illustrate the clinical course of retinal hemorrhage secondary to VR in pregnancy. In non-pregnant patients, VR is often managed conservatively. Laser membranotomy is another option for rapid restoration of vision, where Nd:YAG laser membranotomy inserts a hole into the posterior hyaloid for blood evacuation into the inferior vitreous cavity.[27,28] Another option for rapid resolution of a hemorrhage is PPV in non-pregnant patients.[29] Management for pregnant patients specifically has not been thoroughly investigated in the literature.

Despite spontaneous resolution in most eyes, 5 (19%) eyes had only partial resolution, and those that did have complete resolution required an average of 5 months to reach that status. This highlights VR as a significant disease entity that impacts patient vision and function. Additionally, post-partum is a sensitive time for new mothers. Managing the care of a child and the disease burden of poor vision can be anxiety-inducing and further emphasizes the importance of discussing patient values and priorities in their care. Considerations include surgical recovery time and potential implications post-partum, post-operative care that can be difficult to manage alongside taking care of a newborn, and the mental health status of the mother while making decisions about how to manage her vision.

Current treatment available for VR consists of conservative management, Nd:YAG laser, and PPV. The decision for treatment modality depends on the size and location of the hemorrhage, including patient preference. Prior studies have proposed conservative management for hemorrhage less than 1 disc diameter due to concerns that larger hemorrhages would take longer to resolve.[15,19,30] Large hemorrhages can also result in permanent visual impairment due to formation of an epiretinal membrane, macular hole, macular pigmentary changes, or toxic retinal damage from prolonged contact with hemoglobin.[15,19,30] According to the current literature, eyes that were treated had a higher degree of resolution of VR over untreated eyes (100% versus 67%) as well as a quicker time to resolution ($P = 0.08$). There was a subset of eyes (4 of 20 untreated eyes, 20%) who did not have a follow-up exam.

In our review of the literature, Nd:YAG laser was performed for non-resolving hemorrhages after a period of observation. Daglioglu et al discussed a patient who attributed her postpartum depression to her loss of vision and chose to pursue Nd:YAG for more rapid resolution of the hemorrhage.[11] Tian et al discussed a patient with an enlarging underlying macular hole who chose to pursue Nd:YAG laser treatment, leading to the resolution of the macular hole 3 months later.[25] Ladjimi et al reported the use of several 5 mJ pulses directed at the inferior margin of the anterior surface of hemorrhage.[18] Two cases describe unsuccessful attempts with Nd:YAG to drain the hemorrhage, with one patient ultimately undergoing PPV for resolution.[15,19] Adverse reactions of Nd:YAG laser hyaloidotomy include photomechanical injury to the retina, macular hole or persistent premacular cavity, retinal detachment, and epiretinal membrane formation, although no VR case reports have reported such findings.[11,15,16,18,19,25]

PPV for VR in pregnancy has only been reported in two patients, one of whom had binocular VR.[15,20] Mutha et al described a patient who developed bilateral vitreous hemorrhage with subhyaloid hemorrhage in the right eye after an uncomplicated SVD, requiring PPV in the left eye immediately and PPV in the right eye three months later. This led to improvement in VA from counting fingers at face to 20/50 and 20/40 in the right and left eyes, respectively.[20] These authors hypothesized that the lack of lateral decubitus positioning, infrequent breathing, and labor unaided by forceps or vacuum contributed to the development of VR. Garcia et al described using 23-gauge PPV by creating a posterior vitreous detachment, releasing the ILM, and cleaning premacular blood that coagulated below the ILM after attempted Nd:YAG membranotomy.[15] Thus, they endorsed the use of Nd:YAG only when the hemorrhage is non-dense, non-coagulated, and subhyaloid. While these complications were not reported in these two cases, the patient's decision-making should include the known risks of PPV, such as increased rates of cataract progression, glaucoma, macular edema, retinal detachment, and endophthalmitis. Premacular hemorrhage related to VR has also been treated in the past with SF6 gas injection, intravitreal tissue plasminogen activator, and non-vitrectomizing hemorrhage removal, but these treatment modalities have not been performed in the antepartum or postpartum context.[31–33]

A common concern with VR in pregnancy is recurrence of hemorrhage with either SVD or CS. Abdelaal et al discussed the optimal mode of delivery to avoid VR in a patient with diabetic retinopathy.[5] SVD involves powerful, repetitive Valsalva maneuvers, which increase the risk of VR, as evidenced by the current literature review where five (19%) patients had VR after SVD.[8,14,18,20] Three (12%) patients elected for CS in fear of incurring or worsening their retinal hemorrhage.[9,17,18] There are rare cases of VH developing during CS, likely secondary to epidural anesthesia, increased intraocular venous pressure during

Trendelenburg positioning or due to increased cerebrospinal fluid pressure.[34,35] None of the reported cases of VR in pregnancy experienced recurrence or worsening of their premacular hemorrhage after delivery, regardless of method of delivery. Four (15%) patients had an onset of VR after SVD, but none were identified in this literature review as occurring after CS. The choice of delivery method should be a comprehensive discussion between the obstetrician and the patient, as neither choice seems to worsen visual outcomes.[5] In the present case, the patient elected for CS due to preeclampsia, which represents a patient-centered approach to choosing delivery method in VR cases.

The limitations of the current literature review include the heterogeneity of the data. As such, statistical analysis may be affected by reporting bias, especially given the limited prevalence of cases in the literature. The rate of resolution without intervention is limited by varying follow-up times between the included cases. We hope this detailed review can assist with clinical decision-making and guide future studies in Valsalva retinopathy in pregnancy.

Conclusions

VR can produce severe vision loss in pregnant woman. While intervention with PPV and/or YAG hyaloidotomy may lead to more rapid resolution of hemorrhage, there were no significant differences in final visual acuity between patients who were treated versus observed. While there was no noted worsening of VR in patients undergoing SVD in this cohort, there have been reported cases of VR occurring after SVD. Thus, the mode of delivery should be chosen with careful discussion between the treating physician(s) and patient.

Patient Consent

Consent to publish the case report was obtained. This report does not contain any personal information that could lead to the identification of the patient.

Acknowledgments

Cody Hansen, MD

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

This work was supported by the NIH Core Grant P30 EY030413 to the University of Texas Southwestern Medical Center, Department of Ophthalmology. This work was funded in part by a Challenge Grant from Research to Prevent Blindness, Inc.

Disclosure

All authors have no relevant disclosures for this work.

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