

CLASSIFICATION SYSTEMS FOR VITREOUS HEMORRHAGE

Dr. Preeti Singh MBBS, Dr. Ankita MS, Dr. Sandeep Saxena MS, FRCSEd, FRCS, FRCOphth, FAICO, FAMS

Department of Ophthalmology, King George Medical University, Lucknow, India

Abstract: Vitreous hemorrhage is one of the most common causes of acute or subacute decreased vision. The management of VH depends upon the underlying etiologies such as retinal vascular abnormalities associated with retinal ischemia or without retinal ischemia, mechanical stress, and blood from an adjacent source and hematological disorders. Several classification systems have been developed as per clinician's perspectives which are basically based on the density of vitreous hemorrhage, visibility of optic disc, macula and retinal vessels. These classification systems play important role in monitoring and on management of vitreous hemorrhage.

Vitreous hemorrhage (VH) is defined as bleeding into the vitreous body (Figure 1&2). The incidence of VH is 7 cases per 100000¹, which makes it one of the most common causes of acute or subacute decreased vision. Hemorrhage in the vitreous results in clot formation. Once the bleeding stops it is followed by slow clearance at the rate of approximately 1% per day. The management of VH depends upon the underlying etiology.

Vitreous hemorrhage may result in a number of complications including, proliferative vitreoretinopathy, ghost cell glaucoma, hemolytic glaucoma and hemosiderosis bulbi.

MECHANISMS OF VITREOUS HEMORRHAGE

The mechanisms of vitreous hemorrhage falls into 5 main categories-

- 1) Retinal vascular abnormalities with associated retinal ischemia.
- 2) Vascular abnormalities in retina without underlying retinal ischemia.
- 3) Mechanical stress induced vessel rupture.
- 4) Blood from an adjacent source.
- 5) Associated hematological disorders.

Retinal vascular abnormality associated with retinal ischemia: Diabetic retinopathy, sickle cell retinopathy, retinal vein occlusion, retinopathy of prematurity, ocular ischemic syndrome, Eales' disease, familial exudative vitreoretinopathy (FEVR) and vasculitis are various examples of this group. The key mechanism involved in these conditions is retinal ischemia. The release of angiogenic factors, such as Vascular Endothelial Growth Factor (VEGF), Basic Fibroblast Growth Factor (bFGF), Insulin-Like Growth Factors (IGF) and Erythropoietin and Platelet-Derived Growth Factor (PDGF) induce neovascularization of the retina². These newly formed blood vessels lack tight junctions. Therefore they are leaky and prone to bleed. Even a small amount of stress to the vitreous can rupture these fragile vessels. This leads to vitreous hemorrhage in majority of the cases.

Vascular abnormalities in retina without underlying retinal ischemia: Rupture of retinal arteriole macroaneurysm

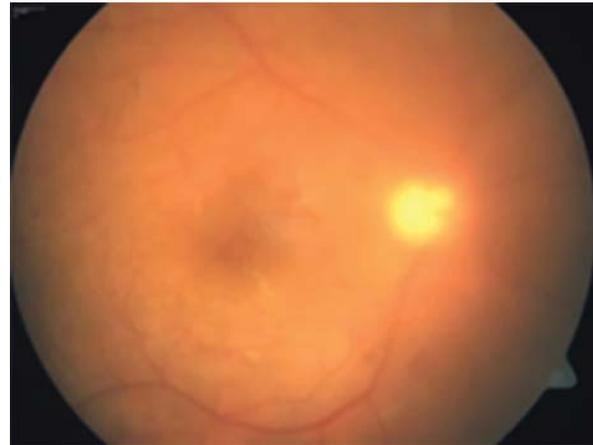


Figure 1: Vitreous hemorrhage.

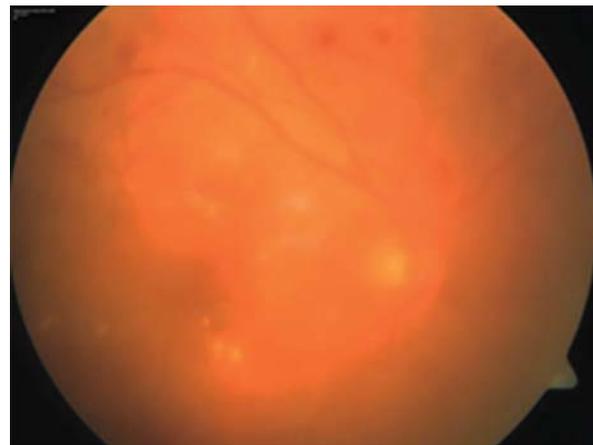


Figure 2: Vitreous hemorrhage in diabetic retinopathy.

associated with systemic hypertension can also lead to vitreous hemorrhage. Hemorrhage from a retinal angioma and congenital peripapillary arterial loops can also occur.

Mechanical stress induced vessel rupture: Mechanical stress can be induced by posterior vitreous detachment, which can

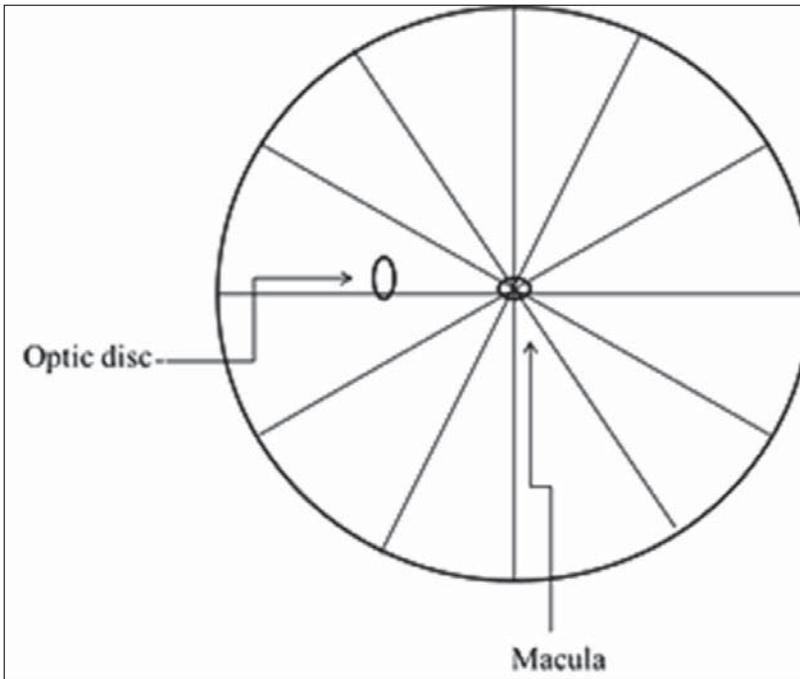


Figure 3: Division of fundus into 12 segments

either be spontaneous or due to blunt trauma. This may lead to rupture of retinal blood vessels and hence, vitreous hemorrhage.

Another mechanism of stress induced vessel rupture is during sudden increase in intracranial pressure, which causes rupture of retinal venules. This includes Terson syndrome and Valsalva retinopathy, which are rare but important causes.

Blood from an adjacent source: Various pathologies like retinochoroidal tumors (capillary hemangioma) and choroidal neovascularization lying adjacent to the vitreous, can extend through the internal limiting membrane and cause vitreous hemorrhage. The subretinal hemorrhage leads to necrosis of the overlying retina and fragmented erythrocytes migrate through the intact internal limiting membrane and cause vitreous clouding³.

Associated with hematological disorders: Various hematological disorders like anemia, leukemia, coagulation disorders including anticoagulant therapy may be associated with massive vitreous hemorrhage but are less common.

CLASSIFICATION SYSTEMS FOR VITREOUS HEMORRHAGE

Several classification systems have been developed as per clinician's

perspectives which are basically based on the density of vitreous hemorrhage, visibility of optic disc, macula and retinal vessels.

1) Classification system based upon density of vitreous hemorrhage:

Grade 0: No blood present in the vitreous, retina clearly visible.

Grade 1: Some hemorrhage present, which obscures between a total of 1 to 5 clock hours of retina.

Grade 2: Hemorrhage obscures between a total of 5 to 10 clock hours of central and/or peripheral retina or a large hemorrhage is located posterior to the equator, with varying clock hours of anterior retina visible.

Grade 3: A red reflex is present, with no retinal detail seen posterior to the equator.

Grade 4: Dense VH with no red reflex present⁴.

2) Classification system based upon the visibility of the optic disc and retinal vessels:

None: No vitreous hemorrhage.

Mild: Most of the optic disc or retinal vessels are visible.

Moderate: Optic disc or retinal vessels are barely visible.

Severe: Optic disc and retinal vessels are not visible⁵.

3) Classification system of vitreous hemorrhage based on visibility of optic disc and macula:

Grade 0 - No VH (a clear view throughout).

Grade 1 - Mild to moderate VH where a good view of the optic disc and macular details was maintained.

Grade 2 - Dense VH with significant obscuration of the disc and macular details⁶.

4) Classification system of vitreous hemorrhage depends on involvement of number of segments: A classification of vitreous hemorrhage introduced by Lee et al. Depends on the number of segment involved and divides the fundus into 12 segments (Figure 3).

H1- Involvement of less than two segments.

H2- Involvement of two to four segments.

H3- Involvement of four to eight segments.

H4- more than eight segments involved⁷.

5) Classification system of vitreous hemorrhage based on the extent of vitreous hemorrhage, implemented by the DRVS research group;

- Diffuse Vitreous Hemorrhage Group - Fundus details obscured posterior to the vortex vein ampullae, and no new vessels or fibrous proliferations were visible.

- Posterior Vitreous Hemorrhage Group- Elevated fibrovascular proliferations were visible through relatively clear anterior vitreous.

- Preretinal Hemorrhage Group- Fundus details within 15° from the center of the macula were obscured by vitreous or preretinal hemorrhage to the extent that no fundus landmark could be traced for a distance as great as 3 disc diameters⁸.

CONCLUSION

A thorough ocular and systemic history, meticulous clinical evaluation and relevant laboratory investigations with an ocular ultrasonography may help to arrive at an etiological diagnosis and subsequent management. To conclude, these classification systems which are physician friendly and easy to recall, might have a significant impact in the monitoring and on the management of vitreous hemorrhage.

REFERENCES

1. Lindgren G, Sjodell L, Lindblom B. A prospective study of dense spontaneous vitreous hemorrhage. *Am J Ophthalmol*. 1995;119:458-65.
2. J. Cunha. Diabetic Retinopathy -Vaz (World, 2011) WW (2).
3. Harvey Lincoff, MD; Bogidar Madjarov, MD; Norah Lincoff, MD; Alexander Movshovich, MD; Sandeep Saxena, MD; D. Jackson Coleman, MD; Herman Schubert, MD; Daniel Rosherger, MD; Stephen McCormack, MD. Pathogenesis of the Vitreous Cloud Emanating From Subretinal Hemorrhage. *ARCH OPHTHALMOL/VOL 121, JAN 2003, 91-96*.
4. Lieberman RM., Gow J., Grillone LR. Development and implementation of a vitreous hemorrhage grading scale. *Retinal Physician*, 2006;3(3).
5. Bhavsar AR., Grillone LR., McNamara TR., Gow JA., Hochberg AM., Pearson RK. Predicting response of vitreous hemorrhage after intravitreal injection of highly purified ovine hyaluronidase (Vitrace) in patients with diabetes. *Invest Ophthalmol Vis Sci*, 2008;49;4219-25.
6. Wayne R. Lo, MD1, Stephen J. Kim, MD1,2, Thomas M. Aaberg Sr, MD, MSPH1, Christopher Bergstrom, MD1, Sunil Srivastava, MD1, Jiong Yan, MD1, Daniel F. Martin, MD1, and G. Baker Hubbard III, MD1 Visual Outcomes and Incidence of Recurrent Vitreous Hemorrhage after Vitrectomy in Diabetic Eyes Pretreated with Bevacizumab (Avastin) NIH Public Access Author Manuscript *Retina*. 2009;29:926-31.
7. Ziemianski MC, McMeel JW, Franks EP. Natural history of vitreous hemorrhage in diabetic retinopathy. *Ophthalmology*. 1980;87:306-12.
8. The DVRS Research Group. Two-year course of visual acuity in severe proliferative diabetic retinopathy with conventional management. Diabetic Retinopathy Vitrectomy Study (DRVS) Report #1. *Ophthalmology*. 1985;92:492-502.



Correspondence to:
Dr. Preeti Singh

Department of Ophthalmology,
King George Medical University,
Lucknow, India

For Kind Attention of DOS Members **Non Receipt of DOS Times issue**

DOS members not receiving DOS Times may please write to dosrecords@gmail.com with their details.

Call for contribution to DOS Times

- * All DOS Members may send good quality manuscripts to me for consideration for publication in DOS Times – 2017-2019.
- * Acceptance will be subject to editorial review
- * Please refer to Author Guidelines for manuscript preparation
- * Please note change in email address for all future correspondence to me.

Dr. Subhash Dadeya MD
Secretary – DOS
dosrecords@gmail.com, dadeyassi@gmail.com
011-23210810, +91-9868604336
WhatsApp: 8448871622