

ETIOLOGICAL SPECTRUM AND CLINICAL MANAGEMENT OF VITREOUS HEMORRHAGE: A HOSPITAL BASED STUDY

Santosh Kumar Sethi¹, Susanta Kumar Pujahari², Bhagirathi Pradhan³, Satyajit Jena⁴, Soumya Ranjan⁵

Received : 29/10/2023
Received in revised form : 01/12/2023
Accepted : 13/12/2023

Keywords:

Vitreous Hemorrhage, Proliferative Diabetic Retinopathy, Ocular Trauma, Eale's Disease, Clinical Management, Hospital.

Corresponding Author:

Dr. Satyajit Jena,
Email: drbapi@gmail.com

DOI: 10.47009/jamp.2023.5.6.152

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (6); 731-735



¹Associate Professor, Department of Ophthalmology, SCB medical College and Hospital, Cuttack, Odisha

²Assistant Professor, Department of Ophthalmology, SCB medical College and Hospital, Cuttack, Odisha

³Assistant Professor, Department of Anaesthesiology, FM Medical college & Hospital, Balasore, Odisha

⁴Assistant Professor, Department of Obstetrics and Gynaecology, SCB medical College and Hospital, Cuttack, Odisha

⁵Senior Resident, Department of Biochemistry, Dharanidhar Medical College and Hospital, Keonjhar, Odisha

Abstract

Background: Vitreous hemorrhage, characterized by blood leakage into the vitreous cavity, presents a complex condition with diverse etiologies. Understanding the unique anatomical and physiological properties of the vitreous is crucial for comprehending the complexities of vitreous hemorrhage. This study delves into foundational aspects, addressing the vitreous composition, structure, and physiological behavior, providing a comprehensive background for investigating vitreous hemorrhage and its associated factors.

Materials and Methods: A prospective study involving 200 patients diagnosed with vitreous hemorrhage was conducted. Comprehensive diagnostic approaches, including history-taking, clinical examinations, A and B-scan ultrasonography, general/systemic evaluations, laboratory investigations, and imaging studies, were employed. The study aimed to analyze the management and prognosis of vitreous hemorrhage cases. **Result:** The study spanned from October 2020 to September 2022, including 200 cases with age incidence between 10 to 70 years. Proliferative diabetic retinopathy, ocular trauma, Eale's disease, and spontaneous posterior vitreous detachment were identified as the primary causes, collectively accounting for 74% of cases. Surgical management was performed in 27% of cases, demonstrating improved visual outcomes. Discussion is proliferative diabetic retinopathy emerged as the most prevalent cause, associated with specific patterns of vitreous hemorrhage. Ocular trauma, Eale's disease, and spontaneous posterior vitreous detachment were identified as significant contributors. The discussion provides insights into the varied causes, emphasizing the impact of demographics and regional factors on vitreous hemorrhage etiology. **Conclusion:** The study highlights the diverse etiological factors contributing to vitreous hemorrhage, with proliferative diabetic retinopathy, ocular trauma, and Eale's disease playing pivotal roles. Surgical intervention, particularly Pars Plana Vitrectomy, demonstrated significant improvements in visual acuity for non-clearing vitreous hemorrhage cases, underscoring the effectiveness of surgical management.

INTRODUCTION

Vitreous hemorrhage is characterized by the presence of leaked blood within the vitreous cavity, and its origin can stem from various etiologies and pathological mechanisms. The vitreous, with its unique anatomical, physiological, and biochemical properties, undergoes distinct blood catabolism compared to other bodily tissues, resulting in

differences in vitreous hemorrhage compared to hemorrhages in other parts of the body.^[1,2]

To facilitate a comprehensive understanding of vitreous hemorrhage, it is pertinent to address the following topics before delving into the specifics of this condition:

The vitreous cavity is anteriorly bound by the lens and the ciliary body and posteriorly by the retina. It comprises approximately 4cc, constituting about

two-thirds of the eye's volume. Composed predominantly of water (99%), the vitreous has a gel-like consistency. The vitreous base extends 2mm anteriorly to the pars plana and 4mm posterior to the ora serrata. The outer or cortical layer contains specialized cells known as halocytes, primarily concentrated around the vitreous base. These halocytes exhibit phagocytic activity and generate hyaluronic acid.^[3-5]

A delicate meshwork of collagen fibers, along with hyaluronic acid, imparts rigidity and viscosity to the vitreous. This collagen meshwork is denser at the vitreous base, with the strongest attachments at the pars plana and the retina periphery. The vitreous is firmly attached to the peri-papillary region and less firmly to the posterior surface of the lens and the macula, forming the hyaloid capsular ligament of Weigert. Irregularly arranged vitreous surrounds blood vessels, and the anterior hyaloid membrane results from the anterior condensation of peripheral vitreous, while the posterior hyaloid membrane is formed by condensation posterior to the vitreous base. Vitreous fibrils are parallel to the retina elsewhere, except at the vitreous base, where they attach perpendicularly to the retinal surface.^[4-7]

The vitreous is a gel-like substance with a composition that includes water, halocytes, collagen fibers, and hyaluronic acid. Its unique structure and arrangement contribute to its physiological functions and interactions within the eye. The vitreous exhibits specific physiochemical properties that govern its behavior, particularly in relation to blood catabolism and the development of vitreous hemorrhage.^[6-9]

By exploring these foundational aspects, one can establish a comprehensive background before delving into the specifics of vitreous hemorrhage and its associated factors. The aim of the present study is to analyse the management & prognosis of cases of vitreous hemorrhage.

MATERIALS AND METHODS

A prospective study involving 200 patients diagnosed with vitreous hemorrhage, regardless of age or gender, was conducted. The diagnostic process included a comprehensive approach encompassing history taking, routine clinical examination, direct ophthalmoscopy, indirect ophthalmoscopy, slit lamp biomicroscopy, A-scan, B-scan, assessment of clinical findings in the contralateral eye, systemic evaluation, and laboratory investigations.

The history-taking component covered symptoms such as flashes of light, smoke signals, photophobia, perception of shadows and cobwebs, visual haze, defective vision, and loss of vision. Specific attention was given to:

- History of trauma
- Ocular disorders like proliferative retinopathy, inflammatory occlusive retinal vascular disorders, retinal tear, and posterior vitreous detachment
- Infections

- Systemic illnesses such as diabetes mellitus, hypertension, blood disorders, and connective tissue disorders

- Ocular tumors

- Surgical procedures

Clinical Examination

The clinical examination involved anterior segment examination through oblique illumination and slit lamp examination. Visual acuity assessment was tailored to the location and density of vitreous hemorrhage. Tension assessment was conducted, particularly in cases of ghost cell hemolytic and hemosiderotic glaucoma. Fundus examination was performed using direct ophthalmoscopy, indirect ophthalmoscopy, and slit lamp biomicroscopy, including a three-mirror examination with a +90D lens. Fundus fluorescein angiography was utilized to assess the vascular status of the choroid and retina.

A and B Scan Ultra Sonography:

A-scan and B-scan ultrasonography were employed to determine the location and density of vitreous hemorrhage. These scans also assessed the extent of tractional membranes and retinal detachment, providing valuable information for predicting visual outcomes following vitreous surgery.

General and Systemic Evaluation

The general and systemic evaluation aimed to rule out conditions such as hypertension, diabetes, and infectious diseases like tuberculosis, syphilis, and connective tissue disorders.

Laboratory Investigations

Laboratory investigations included peripheral smear, blood sugar assessment, serum cholesterol levels, serum proteins, VDRL (Venereal Disease Research Laboratory), Mantoux test, and testing for anti-nuclear antibodies and rheumatoid factors.

Imaging Studies

X-ray of the skull, CT scan, and MRI were employed to rule out increased intracranial tension and hemorrhages.

By adopting this comprehensive diagnostic approach, the study aimed to provide a thorough understanding of vitreous hemorrhage and its associated factors, enabling effective clinical management and decision-making.

RESULTS

The study conducted at SCB Medical College and Hospital in Cuttack, Odisha, spanning from October 2020 to September 2022, focused on vitreous hemorrhage etiology. The total number of cases included in the study was 200, with age incidence observed between 10 to 70 years. In terms of gender distribution, 67% were male, and 33% were female. The predominant causes of vitreous hemorrhage identified in this study were proliferative diabetic retinopathy, ocular trauma, Eale's disease, and senile posterior vitreous detachment with or without retinal tear. These four factors collectively accounted for 74% (148 out of 200) of all cases. On the other hand,

vitreous hemorrhage secondary to retinal vein occlusion, pars planitis, spontaneous posterior vitreous detachment, retinal vasculitis, postoperative complications, and cases with unknown causes comprised the remaining 26% (52 out of 200) of all cases. [Table 1]

The distribution of cases based on eye involvement revealed that 18% had involvement in both eyes, 40% in the left eye, and 42% in the right eye. [Table 2]

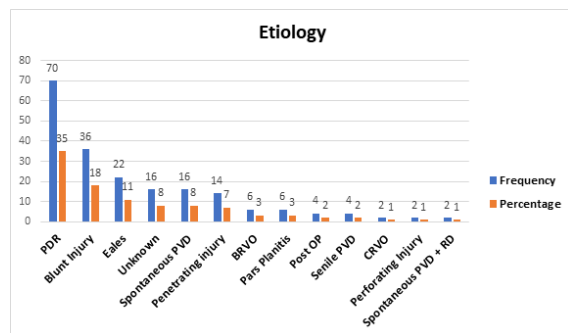


Figure 1 Etiology of Vitreous Hemorrhage

Visual acuity varied among the study participants. The majority presented with counting fingers close to the face (CFCF) (27%), followed by hand movement (HM) (60%) and perception of light (PL) (13%). Ocular findings associated with vitreous hemorrhage included PVD (59%), PVD with retinal tear

(PVD/RT) (20%), retinal detachment (RD) (13%), PVD with RD (7%), and retinal tear (RT) (2%).

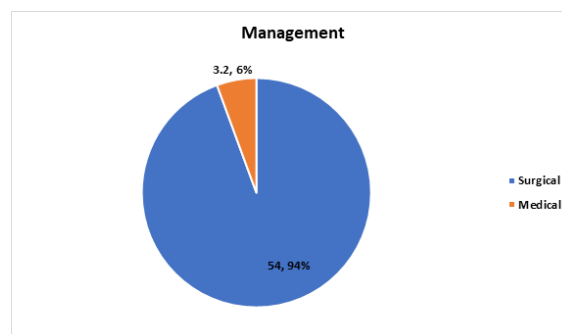


Figure 2: Management among study participants

Surgical management was performed in 27% of cases, while medical management was the chosen approach in 73% of cases. A substantial portion, constituting 52% of the cases, underwent observation as part of their management. Additionally, 15% of cases received antitubercular therapy (ATT) with or without steroids. Pan retinal photocoagulation (PRP) was carried out in 13% of cases, while 11% underwent primary wound repair. Steroids were administered in 4% of cases, and Anti-VEGF therapy was applied in 1% of cases. Furthermore, 4% of cases had systemic disease control measures implemented as part of their medical management approach.

Table 1: Incidence of the various etiology of vitreous hemorrhage

| Diagnosis | Age Group | Gender | | Laterality | | Posterior vitreous detachment (PVD) | | Retinal tear | Retinal detachment | Total | Percent age |
|------------------------------------|-----------|--------|--------|------------|-----------|-------------------------------------|-------------|--------------|--------------------|-------|-------------|
| | | Male | Female | Unilateral | Bilateral | With PVD | Without PVD | | | | |
| Proliferative diabetic retinopathy | 35 – 70 | 52 | 18 | 44 | 26 | 16 | 42 | | 12 | 70 | 35 |
| Ocular Trauma | 22-52 | 32 | 20 | 52 | 0 | 20 | 32 | 10 | 10 | 52 | 26 |
| Eale's disease | 22-58 | 16 | 6 | 12 | 10 | 16 | 6 | | | 22 | 11 |
| Spontaneous pvd | 62-70 | 14 | 2 | 16 | 0 | | 6 | 8 | 2 | 16 | 8 |
| Retinal vein occlusion | 45-63 | 6 | 2 | 8 | 0 | 6 | 2 | | | 8 | 4 |
| Pars planitis | 34-46 | 2 | 2 | 4 | 0 | 4 | | | | 4 | 2 |
| Retinal vasculitis | 44-58 | 0 | 4 | 4 | 0 | 4 | | | | 4 | 2 |
| Senile pvd | 44-78 | 2 | 2 | 4 | 0 | 0 | 4 | | | 4 | 2 |
| Post op complication (ecce/pciol) | 65-68 | 2 | 2 | 4 | 0 | 4 | | | | 4 | 2 |
| Unknown | 23-54 | 6 | 10 | 16 | 0 | 16 | | | | 16 | 8 |

Table 2: Demographic characteristics of study participants

| Demographic characteristics | Frequency | Percentage |
|-----------------------------|-----------|------------|
| Gender | Male | 33 |
| | Female | 67 |
| Eye | Both eye | 18 |
| | Left eye | 40 |
| | Right eye | 42 |

Table 3: Visual acuity and associated ocular findings of study participants

| Clinical presentation | Frequency | Percentage |
|-------------------------------|--------------------------------------|------------|
| Visual Acuity at presentation | CFCF (Counting finger close to face) | 27 |
| | HM (Hand Movement) | 60 |
| | PL (Perception of Light) | 13 |
| Associated Ocular findings | PVD | 58 |
| | PVD/RT | 20 |
| | RD | 13 |
| | PVD/RD | 7 |
| RT | 2 | |

Table 4: Medical management among study participants

| Medical Management | | Frequency | Percentage |
|---|-----------------------------------|-----------|------------|
| Medical Management | Observation | 104 | 52 |
| | ATT+/- Steroids | 30 | 15 |
| | PRP | 26 | 13 |
| | Primary wound repair | 22 | 11 |
| | Steroids | 8 | 4 |
| | Anti-VEGF | 2 | 1 |
| | Sytemic Disease Control | 8 | 4 |
| Visual Acuity following Medical Management | Non clearing vitreous haemorrhage | 54 | 27 |
| | 1/60 | 4 | 2 |
| | 2/60 | 30 | 15 |
| | 3/60 | 54 | 27 |
| | 4/60 | 36 | 18 |
| Post OP BCVA (Best corrected visual acuity) | 6/36 | 52 | 26 |
| | 6/60 | 52 | 26 |
| | 6/24 | 44 | 22 |
| | 5/60 | 30 | 15 |
| | 6/18 | 14 | 7 |
| | 4/60 | 8 | 4 |

Non-clearing vitreous hemorrhage persisted in 27% of cases. Improved visual acuity was observed in various cases, with specific values documented at different follow-up time points. Postoperative BCVA outcomes were documented, ranging from 0.17 to 1.0, with improvements noted in different cases.

DISCUSSION

The study reveals the incidence of vitreous hemorrhage in cases of proliferative diabetic retinopathy (PDR) and its association with other ocular pathologies. Among the PDR cases, 22% experienced vitreous hemorrhage without posterior vitreous detachment (PVD), 60% with PVD, and 18% with retinal detachment (RD) out of a total of 35 cases. Proliferative diabetic retinopathy emerged as the primary cause of vitreous hemorrhage in multiple retrospective studies, with a mean age ranging from 48 to 65 years, representing 32% of cases. Notably, 89% of these cases were associated with type 1 diabetes mellitus, and 64% were associated with type 2 diabetes mellitus.^[8-11]

Ocular trauma ranks as the second most common cause of vitreous hemorrhage, constituting 26% of all cases. The age incidence varies between 22 and 52 years, with a male incidence of 65% and female incidence of 35%. The study details various types of ocular trauma and their associated vitreous hemorrhage, including blunt injury (69%), penetrating injury (27%), and perforating injury (4%).^[11-13]

Eale's disease is identified as the most common cause of vitreous hemorrhage, accounting for 11% of all cases, with an age incidence between 22 and 58 years. Among Eale's disease cases, 73% are males, and 27% are females, with 55% presenting with unilateral involvement and 45% with bilateral involvement. The associated ocular pathologies include vitreous hemorrhage without PVD (73%) and with PVD (27%). Interestingly, the incidence of Eale's disease as a cause of vitreous hemorrhage contrasts with

previous studies conducted in Western countries, where its occurrence is notably low.^[12-15]

Spontaneous posterior vitreous detachment (PVD) is the fourth most common cause of vitreous hemorrhage, constituting 8% of cases. The age incidence ranges from 62 to 70 years, with 88% males and 12% females. The associated pathologies include vitreous hemorrhage with PVD (38%), vitreous hemorrhage with retinal tear (50%), and vitreous hemorrhage with RD (12%). Previous retrospective studies consistently identified spontaneous PVD, with or without retinal tear, as the first most common cause of vitreous hemorrhage, accounting for 38% of all cases.^[14-17]

Retinal vein occlusion stands as the fifth most common cause of vitreous hemorrhage, representing 4% of all cases. The age incidence ranges from 45 to 63 years, with 75% males and 25% females. Hypertension is a common factor among all patients studied. The associated pathologies include vitreous hemorrhage with PVD (25%) and without PVD (75%). In past retrospective studies, retinal vein occlusion was identified as the third or fourth single most common cause of vitreous hemorrhage, accounting for 11% of all cases, with a mean age of incidence at 64 years, and 88% of cases associated with hypertension.^[17-20]

Additional causes of vitreous hemorrhage include pars planitis, retinal vasculitis, senile PVD, postoperative complications, and unknown causes, collectively accounting for 16% of all cases (16 out of 100). The reported findings present a comprehensive insight into the various etiologies and associated ocular pathologies contributing to vitreous hemorrhage in the studied population.

CONCLUSION

The diverse etiological factors contributing to vitreous hemorrhage exhibit variations based on the study population, mean age, gender, and geographic region. This study's findings highlight that Proliferative Diabetic Retinopathy (PDR) emerges as

the most prevalent cause, attributing its prominence to the higher incidence of Diabetes mellitus within the studied population.

Ocular trauma stands out as the second most common cause of vitreous hemorrhage, reflecting the notably high frequency of ocular injuries in our region. Furthermore, it ranks as a leading cause of non-congenital blindness among younger individuals. Eales' disease occupies the third position in terms of frequency, with an incidence of 1 in 250 ophthalmic patients in the Indian subcontinent. This underscores its significant impact on vitreous hemorrhage cases within this population.

Spontaneous Posterior Vitreous Detachment (PVD) is identified as the fourth most common cause of vitreous hemorrhage, while Retinal Vein Occlusion holds the fifth position. The spectrum of causes extends to include other factors such as pars planitis, retinal vasculitis, senile PVD, postoperative complications, and cases with unknown causes.

In the course of our study, we employed both medical and surgical approaches for case management. Medical interventions comprised head end elevation, bed rest, systemic factor control, pan-retinal photocoagulation, and three months of observation. However, a noteworthy observation was that a subset of patients (27%) managed medically exhibited persistent non-clearing vitreous hemorrhage during the third visit. Consequently, these cases underwent surgical intervention in the form of 3-port 23-gauge Pars Plana Vitrectomy (PPV) with vitreous hemorrhage aspiration and, when applicable, endo laser treatment.

The outcomes of surgical management demonstrated a significant improvement in visual acuity during the first week of postoperative follow-up. Therefore, it is

concluded that surgical intervention yields a more favorable outcome for cases of non-clearing vitreous hemorrhage, emphasizing the efficacy of this approach in enhancing patient recovery.

REFERENCES

1. Survey of Ophthalmology, Volume 42, No.1, July-August 1997.
2. Indian Journal of Ophthalmology, Volume 42, No.1, March 1994.
3. Archives of Ophthalmology, 92:297, 1974.
4. Southern Medical Journal, 73:1450-1452, 1980.
5. British Journal of Ophthalmology, 64:469-471, 1980.
6. American Journal of Ophthalmology, 119:458-465, 1995.
7. Annals of Ophthalmology, 14:268-270, 1982.
8. Dnan MR, Werner MS, Viana MA, Shapiro MJ: "Spontaneous vitreous hemorrhage." Ophthalmology, 100:1377-1383, 1993.
9. Transactions of the Ophthalmological Society of the United Kingdom, 95:335-339, 1991.
10. Archives of Ophthalmology, 104:34-41, 1986.
11. Survey of Ophthalmology, 38:519-540, 1994.
12. Survey of Ophthalmology, 27:211-232, 1983.
13. Archives of Ophthalmology, 102:686-690, 1984.
14. Spraul CW, Grossniklaus HE. "Vitreous hemorrhage." Survey of Ophthalmology, 1997;42:3-39.
15. Forrester JV, Grierson I, Lee WR. "The pathology of vitreous hemorrhage. II. Ultrastructure." Archives of Ophthalmology.
16. OpZiemianski MC, McMeel JW, Franks EP. "Natural history of vitreous hemorrhage in diabetic retinopathy." Ophthalmology, 1980;87:306-12.
17. Ross WH, Goofner MJ. "Peripheral retinal cryopexy for subtotal vitreous hemorrhage." American Journal of Ophthalmology, 1988;105:377-80.
18. Dana MR, Werner MS, Viana MA, Shapiro MJ. "Spontaneous and traumatic vitreous hemorrhage." Ophthalmology, 1993;100:1377-83.
19. Kumar D, Saxena RC, Saxena S. "Vitreous hemorrhage in Eales' disease." Afro-Asian Journal of Ophthalmology, 1995;13:19-22.
20. Ferrone PJ, de Juan E. Jr. "Vitreous hemorrhage in infants." Archives of Ophthalmology, 1994;112:1185-89.