



## AN OVERVIEW ON DIAGNOSIS AND MANAGEMENT OF VITREOUS HAEMORRHAGE

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### ABSTRACT

The retinal vessels may become susceptible to damage due to retinal tear, retinal detachment, sickle cell insult, aneurysms, macular degeneration, trauma, and venous occlusion. These conditions could cause retinal bleeding, also known as vitreous hemorrhage. PubMed database was used for articles selection, papers were obtained and reviewed. PubMed database was used for articles selection, and the following keys terms: vitreous hemorrhage, pathophysiology, risk factors, clinical features, diagnosis, and management. The vascular insult occurs in the surrounding potential space around the vitreous. This insult is a result of traumatic injury to the retina or the vessels or ischemic condition of the vessels due to an abnormal vessel formation. Immediate diagnosis and management of the bleeding are needed, especially in cases with deteriorating vision and continued bleeding. Management options include watchful waiting, laser therapy, cryotherapy, antivascular growth injections, and vitrectomy. Vitreous hemorrhage is a medical emergency that could lead to severe and permanent visual loss if not diagnosed and managed fastidiously. The disease may often resolve on its own and vision is restored, however, medical and surgical therapy might be urgently required in selected cases.

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### Introduction

Within the anatomical structure of the eye lies the vitreous body, surrounded by potential spaces important for the normal functioning of the eye [1, 2]. The retinal vessels may become susceptible to damage due to retinal tear, retinal detachment, sickle cell insult, aneurysms, macular degeneration, trauma, and venous occlusion. These conditions could cause retinal bleeding, also known as vitreous hemorrhage. Epidemiological variation according to gender, race, and age are related to the diseases that are risk factors for vitreous hemorrhage and its complications. The medical and surgical treatment of vitreous hemorrhage has gone a long way since the days of Machemer's pars plana and Kasner's open-sky vitrectomies [3, 4]. In this review we discuss the advances in the therapeutic management of vitreous hemorrhage.

### Materials and Methods

PubMed database was used for articles selection, papers were obtained and reviewed. PubMed database was used for articles selection, and the following keys terms: vitreous hemorrhage, pathophysiology, risk factors, clinical features, diagnosis, and

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management. Regarding the inclusion criteria, the articles were selected based on the inclusion of one of the following topics: vitreous hemorrhage, its pathophysiology and risk factors, diagnosis, and management. Exclusion criteria were all other articles that did not have one of these topics as their primary endpoint.

## Results and Discussion

Most of the globe of the eye is made up of the vitreous body. The vitreous body is made up of water, with a minute amount of collagen and hyaluronic acid. This is important as the whole vitreous is four milliliters and is completely avascular. The vascular insult occurs in the surrounding potential space around the vitreous. This insult is a result of traumatic injury to the retina or the vessels or ischemic condition of the vessels due to an abnormal vessel formation. Abnormal vessel formation usually occurs when there is an underlying chronic condition of uncontrolled diabetes, diabetic retinopathy [5]. These abnormal new vessels are susceptible to bleeding to their abnormal structure and the general condition of ischemia. Bleeding from insults to the retina occurs in conditions of retinal detachment. The previous operation on the eye could also be a cause of bleeding. Non-intraocular trauma could result in vitreous hemorrhage, for instance in cases of subarachnoid hemorrhage and Terson syndrome [6]. There are non-traumatic causes of vitreous hemorrhage, the bleeding could be a sign of insidious leukemia [7].

### *Risk Factors*

As mentioned, ischemia could lead to the abnormal vascular formation, certain conditions are the cause for their development and subsequent bleeding. In patients with chronic uncontrolled diabetes, the bleeding could be a result of direct retinal damage from diabetes itself. In diabetes, retinopathy occurs with neovascularization and rupture of these abnormally formed new vessels in the retina. Diabetic retinopathy is likely the most common cause of vitreous hemorrhage. Other conditions with similar abnormal vessel formation include age-related macular degeneration, sickle cell retinopathy, and retinal vein occlusion [8].

Bleeding could also occur from damage to normal blood vessels, this includes damage caused by posterior vitreous detachment because of tear damage to the retina. Aneurysms may also weaken otherwise normal vessels and combined with underlying hypertension and atherosclerotic insult would result in breakage in the vessel wall. Trauma could also cause bleeding, as what occurs in contact sports, and injuries with balls or punch or penetration by objects to the eyeball [9]. In older patients the physician should be alerted to the possibility of a subarachnoid hemorrhage, especially when the complaint includes a headache.

Bleeding could occur from outside the eye, but as the bleeding progresses it engulfs the retina from behind. This is especially the case in rare conditions like ocular melanoma [10]. In some cases, this bleeding could be due to abnormally formed vessels behind the retina layer.

### *Clinical Features*

Patients with vitreous bleeding would present in a variety of symptoms depending on the cause. However, there are common complaints of eyesight haze or cloudiness. Patients may see floating objects within their visual field, which might progress to cause lowered visual acuity and sight. Some patients may complain of avoidance of lights or photophobia, which should alert the physician to exclude meningitis. Importantly, the symptoms of vitreous bleeding commonly occur in one eye only but depending on the cause it might progress or be present in both eyes. Regardless of the cause, the sudden onset of symptoms is what causes the patient to present for a checkup.

### *Diagnosis and Management*

Vitreous bleeding, as in any sudden onset of bleeding and eyesight loss, is an emergency that requires specialist consultation. The physician will examine the eyes using a slit lamp to view the bleeding in the vitreous body. An important objective of the diagnostic measures is to identify the cause and source of bleeding, this is important as the management aims to halt the bleeding process and repair any vitreous and retinal damage as it is vital for the restoration of normal vision and as a preventive measure against visual loss.

Watchful waiting is often the first step in management if the bleeding had already halted. This is because most cases of vitreous bleeding stop spontaneously, with the visual field returning to normal as time passes [11]. Specialist management of the bleeding includes photocoagulation, anti-vascular endothelial growth factor (anti-VEGF) injections, cryotherapy, and vitrectomy. In cases of retinal detachment and bleeding from the abnormally formed vessel, the treatment is preferably laser photocoagulation as it could stop the ongoing bleeding and prevent further episodes of bleeding [12, 13].

Another method for treating abnormal new vessels includes injections with anti-VEGF, this is especially important for diabetic retinopathy [14]. Cryotherapy is useful for cuts and insults in the retina and vitreous detachment causing bleeding. Finally, vitrectomy is done in severe cases where removal of the vitreous body and its surrounding membrane would stop the bleeding permanently. This procedure is done as a last resort when a cause is not identified, bleeding has not stopped, and vision has not improved as in cases of sickle cell retinopathy and retinal vein occlusion [15, 16]. Surgical intervention is also used in syndromic patients, with Terson's or Ehlers-Danlos, who develop unremitting vitreous bleeding [17, 18].

### *Prognosis and Prevention*

An investigation by history and examination should identify the risk factors and underlying cause of the bleeding. This is important for both the progression of the condition and the prevention of future bleeding episodes. The severity of the symptoms is also important in judging how to proceed with management and follow-up. In posterior retinal detachment, the progression of the disease is favorable as visual power is restored gradually. This is not the case in chronic conditions such as diabetes mellitus and age-related macular degeneration as both conditions have an underlying abnormal vascular formation, and the vision may not return to normality but could be prevented from worsening by surgical intervention [19, 20]. Prevention methods include controlling chronic conditions by medications and appropriate lifestyle changes of stopping smoking, healthy diet, and exercise. Vitreous bleeding due to trauma has a prognosis depending on the severity of the trauma, future trauma should be prevented by adequate protection for example by avoidance of contact sports or dangerous situations.

## Conclusion

Vitreous hemorrhage is a medical emergency that could lead to severe and permanent visual loss if not diagnosed and managed fastidiously. The causes are variable but commonly the cause is diabetic retinopathy or traumatic injury. While in many cases the injury resolves on its own and vision is restored, some cases may require medical injections and laser therapy. Surgical intervention is used as a last resort in selected cases with persistent bleeding and vision loss.

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## References

1. Iosseliani DG, Boshia NS, Sandodze TS, Azarov AV, Semitko SP. The effect of revascularization of the internal Carotid artery on the Microcirculation of the eye. *J Adv Pharm Edu Res.* 2020;10(2):209-14.
2. Algahtani FD. Healthy lifestyle among Ha'il university students, Saudi Arabia. *Int J Pharm Res Allied Sci.* 2020;9(1):160-7.
3. de Juan E, Machemer R. Vitreous surgery for hemorrhagic and fibrous complications of age-related macular degeneration. *Am J Ophthalmol.* 1988;105(1):25-9.
4. Cerasoli JR, Kasner D. A follow-up study of vitreous loss during cataract surgery managed by anterior vitrectomy. *Am J Ophthalmol.* 1971;71(5):1040-3.
5. Sehgal P, Mathew S, Sivadas A, Ray A, Tanwar J, Vishwakarma S. LncRNA VEAL2 regulates PRKCB2 to modulate endothelial permeability in diabetic retinopathy. *Embo J.* 2021;40(15):e107134.
6. Qi H, Yan H, Cheng Y, Zuo L. Macular hole with inner limiting membrane peeling off spontaneously in Terson syndrome: A case report. *Medicine (Baltimore).* 2021;100(22):e25960.
7. Gawas L, Sahoo N, Khalsa A, Kelgaonkar A. Eye: the door to undiagnosed chronic myeloid leukemia. *BMJ Case Rep.* 2021;14(5):e240949.
8. Shifa JZ, Gezmu AM. Sight threatening vitreous haemorrhage and retinal detachment in a patient with sickle cell disease. *Pan Afr Med J.* 2020;35:1.
9. Liu Y, Hoskin AK, Watson SL. Epidemiology, aetiology, and outcome of paediatric ocular trauma in Sydney. *J Paediatr Child Health.* 2021;57(9):1479-84.
10. Raval V, Bowen RC, Soto H, Biscotti C, Yeane G, Sears J, et al. Vitreous seeding of choroidal melanoma. *Retina.* 2021;41(4):890-4.
11. Uner OE, Stelton CR, Hubbard III GB, Rao P. Visual and anatomic outcomes of premacular hemorrhage in non-accidental trauma infants managed with observation or vitrectomy. *Ophthalmic Surg Lasers Imaging Retina.* 2020;51(12):715-22.
12. Chen G, Chen P, Chen X, Wang J, Peng X. The laser combined with intravitreal injection of ranibizumab for treatment of macular edema secondary to branch retinal vein occlusion: A protocol for systematic review and meta-analysis. *Medicine (Baltimore).* 2021;100(4):e23675.
13. Yates WB, Mammo Z, Simunovic MP. Intravitreal anti-vascular endothelial growth factor versus panretinal LASER photocoagulation for proliferative diabetic retinopathy: a systematic review and meta-analysis. *Can J Ophthalmol.* 2021;56(6):355-63.
14. Wang DY, Zhao XY, Zhang WF, Meng LH, Chen YX. Perioperative anti-vascular endothelial growth factor agents treatment in patients undergoing vitrectomy for complicated proliferative diabetic retinopathy: a network meta-analysis. *Sci Rep.* 2020;10(1):18880.
15. Okonkwo ON, Lewis K, Hassan AO, Gyasi ME, Oluyadi B, Ogunro A. Indications and outcomes of vitrectomy surgery in a series of 1000 black African eyes. *BMJ Open Ophthalmol.* 2019;4(1):e000083.

16. Imai H, Tetsumoto A, Yamada H, Hayashida M, Otsuka K, Miki A. Intraoperative three-dimensional fluorescein angiography-guided pars plana vitrectomy for branch retinal vein occlusion. *Retin Cases Brief Rep.* 2020.
17. Hanai K, Hashimoto M, Sasaki M, Nakamura H. Microsurgical observation of the posterior vitreous in patients with vitreous hemorrhage caused by Terson syndrome. *Am J Ophthalmol Case Rep.* 2020;17:100613.
18. Lumi X, Bergant G, Lumi A, Mahnic M. Outcomes of vitrectomy for retinal detachment in a patient with Ehlers-Danlos syndrome type IV: a case report. *J Med Case Rep.* 2021;15(1):249.
19. Iwase T, Baba T, Saito Y, Nizawa T, Yokouchi H, Kubota-Taniai M. Surgical outcomes of vitrectomy for breakthrough vitreous hemorrhage in eyes with exudative age-related macular degeneration. *Int Ophthalmol.* 2021;41(5):1835-44.
20. Nishi K, Nishitsuka K, Yamamoto T, Yamashita H. Factors correlated with visual outcomes at two and four years after vitreous surgery for proliferative diabetic retinopathy. *PLoS One.* 2021;16(1):e0244281.