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Exploring the Diagnosis and Therapeutic Approaches for Vitreous Hemorrhage

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Abstract

Retinal vessels are vulnerable to damage from a variety of factors, including retinal tears, retinal detachment, sickle cell disease, macular degeneration, aneurysms, trauma, and venous occlusion, which can lead to retinal bleeding, commonly referred to as vitreous hemorrhage. This review highlights the advances made in the treatment of vitreous hemorrhage. This review was based on articles selected from the PubMed database, using the following key terms: diagnosis, vitreous hemorrhage, risk factors, pathophysiology, clinical features, and management. Vascular injury usually occurs in the space around the vitreous body, often caused by trauma to the retina or vessels or ischemic conditions resulting from abnormal blood vessel formation. Prompt diagnosis and intervention are critical, especially in cases where vision has deteriorated or there is persistent bleeding. Treatment options include observation, laser therapy, cryotherapy, anti-vascular endothelial growth factor injections, and vitrectomy. While vitreous hemorrhage can sometimes resolve spontaneously, restoring vision, rapid diagnosis, and appropriate management are essential to prevent severe, permanent visual impairment in certain cases.

Keywords: Retinal detachment, Vitreous hemorrhage, Retinopathy, Management

Introduction

The vitreous body, located within the eye, is surrounded by critical spaces that contribute to the eye's proper functioning [1, 2]. Damage to the retinal vessels can occur due to a variety of conditions, including retinal tears, detachment, sickle cell disease, aneurysms, macular degeneration, trauma, and vein occlusions, leading to bleeding in the retina, known as vitreous hemorrhage. The likelihood of developing these conditions and their associated complications can vary across population groups, such as age, gender, and race. Over time, the approach to treating vitreous hemorrhage

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has evolved greatly, moving from the early techniques such as Machemer's pars plana vitrectomy and Kasner's open-sky vitrectomy [3, 4]. This review highlights the advances made in the treatment of vitreous hemorrhage.

Materials and Methods

Articles for this review were sourced from the PubMed database, where relevant papers were retrieved and analyzed. The following key terms were used for the search: vitreous hemorrhage, risk factors, pathophysiology, clinical features, diagnosis, and management. Articles were selected based on their focus on at least one of these key topics: vitreous hemorrhage, its pathophysiology, associated risk factors, as well as diagnostic and management strategies. Articles not centered on these themes were excluded from the review.

Results and Discussion

The vitreous body occupies the majority of the eye globe, consisting primarily of water, with small quantities of collagen and hyaluronic acid. The total volume of the vitreous is about 4 milliliters, and it is entirely avascular. Damage to the vascular structures typically occurs in the areas surrounding the vitreous, which can be caused by trauma to the retina or its vessels or by ischemic conditions due to abnormal vessel formation. This abnormal vascular growth is often associated with chronic conditions like uncontrolled diabetes and diabetic retinopathy [5]. The irregular blood vessels are prone to bleeding due to their defective structure and the general ischemic environment. Retinal detachment is another condition that can lead to bleeding within the eye. Additionally, previous eye surgeries can increase the risk of hemorrhage. In some cases, non-ocular trauma, such as subarachnoid hemorrhage or Terson syndrome, can also result in vitreous hemorrhage [6]. Non-traumatic causes, including leukemia, can also manifest as vitreous bleeding in more subtle, insidious cases [7].

Risk factors

As previously mentioned, ischemia can trigger the development of abnormal blood vessels, which are prone to bleeding. Chronic uncontrolled diabetes is a primary cause of this condition, where bleeding results from diabetic retinopathy. This condition leads to the formation of abnormal new blood vessels in the retina, which are highly susceptible to rupture. Diabetic retinopathy is considered one of the leading causes of vitreous hemorrhage. Other conditions that involve similar abnormal blood vessel formation include age-related macular degeneration, sickle cell retinopathy, and retinal vein occlusion [8].

In addition to abnormal vessel growth, bleeding can also occur due to harm to normal blood vessels. For example, posterior vitreous detachment can cause retinal tears, leading to bleeding. Aneurysms, which can weaken otherwise healthy vessels, when combined with conditions like hypertension and atherosclerosis, may cause these vessels to rupture. Physical trauma, such as injuries sustained in contact sports or accidents involving objects striking the eye, can also result in bleeding [9].

In older individuals, subarachnoid hemorrhage should be considered a potential cause, particularly if the patient presents with a headache. Interestingly, bleeding can also originate outside the eye, and as it progresses, it can reach the retina from behind. This is often seen in rarer occurrences like ocular melanoma [10]. In certain instances, the bleeding may be attributed to abnormal blood vessels located behind the retinal layer.

Clinical features

Individuals experiencing vitreous hemorrhage typically report a range of symptoms, which can vary depending on the underlying cause. A common complaint is blurred or clouded vision, with many patients noticing floating objects in their field of view. This may progressively lead to a decline in visual acuity and overall sight. Some patients also report sensitivity to light or photophobia, which may raise concerns about other conditions like meningitis and should prompt further investigation by the physician. Vitreous hemorrhage symptoms generally affect only one eye initially, though depending on the underlying condition, both eyes may eventually be involved. The hallmark of these cases is the onset of symptoms, which often prompts the patient to seek medical attention.

Diagnosis and management

Vitreous hemorrhage is considered a medical emergency, particularly when there is significant vision loss and a sudden onset of bleeding, and requires immediate evaluation by a specialist. Upon consultation, the physician typically utilizes a slit-lamp examination to assess the extent and location of the bleeding in the vitreous body. The primary goal during diagnosis is to

pinpoint the exact reason and point of origin of the hemorrhage, as this is crucial for determining the appropriate treatment to stop the bleeding and address any damage to the vitreous and retina. Proper management is essential for restoring vision and preventing further visual impairment.

In cases where bleeding has subsided, watchful waiting is sometimes the initial approach, as many instances of vitreous hemorrhage resolve on their own over time, and vision tends to improve naturally [11]. However, if the hemorrhage persists or the underlying cause is identified, more specialized treatments are necessary. These may include photocoagulation, anti-vascular endothelial growth factor (anti-VEGF) injections, cryotherapy, or vitrectomy. In cases of retinal detachment or bleeding caused by abnormal vessel formation, laser photocoagulation is typically preferred, as it can help halt active bleeding and prevent recurrent episodes [12, 13].

For abnormal blood vessel growth, especially in conditions like diabetic retinopathy, anti-VEGF injections are particularly effective [14]. Cryotherapy is beneficial for addressing retinal tears or vitreous detachment that leads to bleeding. Lastly, in more severe cases where other methods are ineffective, vitrectomy may be performed. This surgical procedure involves removing the vitreous body and its surrounding membrane to stop bleeding permanently and is usually reserved for situations where the bleeding remains unresolved, vision does not improve, or no clear cause is identified, such as in sickle cell retinopathy or retinal vein occlusion [15, 16]. Surgical intervention is also employed in syndromic conditions like Terson's syndrome or Ehlers-Danlos syndrome, where persistent vitreous hemorrhage is a concern [17, 18].

Prognosis and Prevention

A thorough assessment, including medical history and examination, helps point out the risk factors and the root cause of the bleeding. It is crucial not only for understanding the progression of the condition but also for preventing future bleeding episodes. The majority of symptoms play a key role in determining the course of treatment and the necessary follow-up care. In cases of posterior retinal detachment, the prognosis tends to be positive, with gradual restoration of vision. However, chronic conditions such as diabetes mellitus and age-related macular degeneration, which involve abnormal blood vessel formation, may not lead to a complete recovery of vision. While surgical treatment can help prevent further deterioration, it may not fully restore sight in these cases. Preventive measures include managing chronic conditions with medications and adopting healthy lifestyle changes, such as quitting smoking, maintaining a balanced diet, and engaging in regular physical activity. The outlook for vitreous hemorrhage due to trauma largely depends on the extent of the injury. Preventive measures for future occurrences include using proper protective gear and avoiding risky activities like contact sports or dangerous situations [19, 20].

Conclusion

Vitreous hemorrhage is a critical condition that can lead to significant and irreversible vision loss if not recognized and treated promptly. The underlying causes of this condition vary, but diabetic retinopathy and traumatic injuries are often responsible. Although many cases resolve naturally with vision restored, some may require medical treatments such as injections or laser therapy. In cases where bleeding persists and vision does not improve, surgical intervention may be required as a final measure.

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References

1. Iosseliani DG, Bosha 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, Yeaney 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.