A rare case of unilateral pre-retinal hemorrhage following hemotoxic snakebite

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Abstract

Introduction: Snakebite envenomation is a major medical emergency, especially in tropical and rural areas such as Karnataka, India. Hemotoxic venoms from viperid snakes disrupt coagulation and damage vascular endothelium, often causing systemic hemorrhagic complications. Ocular manifestations, although rare, are clinically significant and can include hemorrhages and visual disturbances. Most reported cases are bilateral; however, this case report describes a unilateral presentation.

Objective: To present and discuss a rare case of unilateral pre-retinal hemorrhage as an ocular manifestation following a hemotoxic snakebite.

Material and Methods: A clinical case report approach was used, involving the documentation and investigation of symptoms, clinical findings, and treatment outcomes of a patient presenting with ocular symptoms after a snakebite. A 42-year-old male presented with a snakebite on the right foot. Clinical examination, including ophthalmologic evaluation, fundus photography, and coagulation studies (WBCT, D-dimer, FDPs), were performed. The patient was treated with polyvalent anti-snake venom and observed for recovery.

Results: Fundoscopic examination revealed a localized pre-retinal hemorrhage in the right eye, with the left eye remaining unaffected. Coagulation tests indicated venom-induced consumptive coagulopathy. The patient responded to ASV therapy, and conservative management was sufficient for ocular symptoms, with expected spontaneous resolution of the hemorrhage.

Conclusion: This case underscores an unusual presentation of hemotoxic snakebite-induced unilateral pre-retinal hemorrhage. It highlights the importance of recognizing rare ocular complications of systemic envenomation and the need for prompt multidisciplinary management. Ongoing follow-up is crucial to prevent long-term visual sequelae.

Keywords: Pre-retinal hemorrhage, Snakebite, Hemotoxic snake venom

Introduction

Snakebite is a significant medical emergency, particularly in tropical and rural regions such as Karnataka, India. The World Health Organization recognizes snakebite envenomation as a neglected tropical disease, with an estimated 5.4 million snakebites annually worldwide, resulting in 81,000 to 138,000 deaths and many more cases of long-term disability, especially in South Asia and sub-Saharan Africa[1].

The variety of local and systemic effects that can result from envenomation depends on the type of venom neurotoxic, hemotoxic, or myotoxic. Hemotoxic venoms, which are typically extracted from viperids, are known to cause coagulopathy and hemorrhagic symptoms by changing platelet function, damaging vascular endothelium, and interfering with the coagulation cascade[2].

Snake venom is a complex mixture of biologically active proteins and enzymes. Hydrolases such as metalloproteinases, phospholipases A_2, and hyaluronidases play a central role in the local tissue destruction observed in snakebite envenomation. Conventional antivenoms, primarily composed of IgG antibodies, are often ineffective at neutralizing these enzymes due to poor tissue penetration. Notably, these venom enzymes share structural similarity with human counterparts like matrix metalloproteinases and inflammatory phospholipases, for which numerous pharmaceutical inhibitors already exist[2].

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Disintegrins interfere with platelet aggregation by targeting integrins such as GPIIb/IIIa, promoting hemorrhage and vascular damage[3].

Although systemic effects of hemotoxic venom are well documented, ocular involvement remains a rare but clinically significant manifestation. Reported ophthalmic complications include blepharoptosis, extraocular muscle palsies, subconjunctival and intraocular hemorrhages, optic neuritis, papilledema, and visual impairment[4,5].

Case history

A 42-year-old male from Vadageri, Bagalkot district, Karnataka, presented with an alleged history of an unknown bite on the right foot. Examination revealed multiple fang marks over the lateral malleolus with localized swelling and tenderness. Ophthalmologic referral revealed visual acuity of 6/18 in the right eye improving to 6/9 and 6/9 in the left. Intraocular pressure was 16 mm Hg bilaterally measured using Goldman applanation tonometer. Fundoscopic examination of the right eye showed a localized pre-retinal hemorrhage superior to the optic disc (Fig 1); the left eye was within normal limits (Fig 2).

Whole blood clotting time (WBCT) was prolonged (29 minutes), suggestive of hemotoxic envenomation. Laboratory investigations showed elevated D-dimer and fibrin degradation products (FDPs), consistent with venom-induced consumptive coagulopathy. There was no prior history of bleeding disorders.

The patient was treated with polyvalent anti-snake venom (ASV) and managed conservatively.

Figure 1 : Fundus photograph of Right eye showing pre retinal hemorrhage.

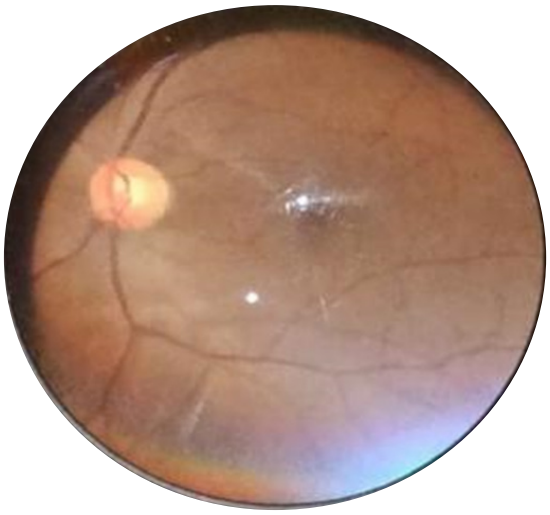

Figure 2 : Fundus photograph of Left eye within normal limits.

Discussion

Snakebite-induced coagulopathy, especially from viperid species such as *Daboia russelii* (Russell's viper), is characterized by consumption of clotting factors, platelet dysfunction, and vascular injury, predisposing to hemorrhagic complications. The local and systemic effects of hemotoxins can lead to spontaneous bleeding in multiple organs, including rare sites such as the retina[6].

Our patient exhibited preretinal hemorrhages restricted to the right eye, a rare case of unilateral retinopathy which may be associated to hemotoxin-induced vasospasm, endothelial injury, and venous stasis. The unilateral presentation could be due to anatomical variations in the ocular blood vessels or localized venous stasis or blockage in the left eye. Hemotoxic coagulopathy leads to bilateral retinal hemorrhages commonly.

Similar ocular manifestations, have been described by Ramachandra et al. they reported a case of unilateral retinal hemorrhages following hemotoxic snakebite, implicating venom-mediated endothelial injury and coagulation abnormalities[7].

The ophthalmic manifestations of snake envenomation are diverse and may include blepharoptosis (drooping of the eyelid), ocular muscle palsies, and hemorrhages affecting the conjunctiva, anterior chamber, vitreous, or retina. Additional effects include eyelid edema, conjunctival chemosis, retinal and optic nerve swelling (edema), alterations in pupil response, optic neuritis, and eventual optic atrophy. These complications result from the neurotoxic, hemotoxic, or cytotoxic effects of snake venom and can vary based on the species involved and the nature of the venom[6].

The study by Baldo et al. investigates how hemorrhagic

snake venom metalloproteinases (SVMPs) cause vascular damage. Using in situ analyses, the researchers demonstrate that SVMPs target and hydrolyze specific components of the basement membrane and extracellular matrix in blood vessels, particularly collagen and laminin. This degradation disrupts the structural integrity of the vascular walls, leading to hemorrhage. The tissue distribution of SVMP activity correlates with sites of hemorrhagic lesions observed in envenomed animals. The findings highlight the critical role of SVMPs in inducing vascular injury through precise proteolytic activity, contributing to the bleeding complications seen in snakebite victims[8].

Timely administration of ASV remains the cornerstone of treatment. ASV neutralizes circulating venom components, reducing progression of systemic toxicity. However, supportive care, including management of complications such as ocular hemorrhage, is essential. In this case, spontaneous resolution of hemorrhage is expected over weeks, but patients should be followed closely for persistent visual deficits or complications such as epiretinal membrane or vitreous hemorrhage.

Snakebite is a major yet neglected global health issue especially in rural tropical regions. It causes significant death and disability each year. Snake venoms are complex and medically important, offering insights for drug development. Prevention through education and behavioral changes is essential. Interdisciplinary collaboration is needed for better antivenoms, and healthcare access[9].

Conclusion

This case underscores an unusual ocular manifestation characterized by unilateral pre-retinal hemorrhage following hemotoxic snakebite. It highlights the pathophysiological impact of venom-induced coagulopathy on ocular structures and the need for heightened awareness among clinicians.

Prompt diagnosis, administration of anti-snake venom, and interdisciplinary collaboration between medical and ophthalmological teams are crucial in managing such cases. Continued follow-up is necessary to monitor resolution of ocular findings and prevent long-term sequelae.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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