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Assessment and Management of Ocular Envenoming: A Case Report in a Rural Setting in Ghana

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Abstract

Purpose: This report presents a case of venom spit ophthalmia, an uncommon but serious ocular emergency caused by snake venom contacting the eye.

Case Presentation: A 31-year-old carpenter presented with venom spit ophthalmia in the right eye (RE) after a cobra spat venom into his eye. The patient received timely irrigation with normal saline and intravenous hydrocortisone in the emergency unit, followed by antibiotic and antifungal eye drops to prevent further infection. Despite a 2-hour delay in treatment, the patient achieved complete visual recovery with minimal scarring located outside the visual axis, preserving his vision.

Discussion: This case emphasizes the effectiveness of early intervention, including copious eye irrigation, to mitigate venom-induced ocular damage.

Conclusion: The positive outcome underscores the need for readily available ophthalmic care in rural settings, where snake encounters are common, to prevent severe complications in similar cases. Protective eyewear is highlighted as a critical preventive measure, especially in high-risk environments.

Keywords: Venom spit ophthalmia, cobra venom, ocular emergency, eyewear.

Introduction

Venom spit ophthalmia is an uncommon but serious ocular emergency caused by snake venom contacting the eye. Spitting cobras have been known since ancient times to spit venom into human eyes, with records dating back to the pharaonic period [1]. Historical reports from the Gold Coast (modern-day Ghana) describe a stonemason who was blinded instantly after a snake spat venom into his eyes [2]. More recently, a case in the Volta Region of Ghana was reported, though it did not result in blindness [3].

Globally, about 5.4 million people are attacked by snakes every year, leading to 2.7 million cases of snake envenoming [4]. Overall, 95% of snake attack cases occur in tropical and low-income countries.[5] The majority of attacks occur among people with low socioeconomic status and are linked to occupations such as farming, fishing, animal rearing, and hunting [6,8]. A study in Ghana reported a snake attack incidence of 82.8 per 100,000, with Bole and Kintampo recording incidences of 110 per 100,000 and 74 per 100,000 populations, respectively [9,10].

Snake venom is a complex mixture of toxins primarily used for prey capture and self-defense when the snake feels threatened. The venom of spitting cobras can travel varying distances, with reports indicating that it can reach between 2 and 5 meters [11,12] and it is typically precise enough to aim at the eyes of perceived threats [13]. The toxins in spitting cobra venom are believed to cause damage due to their membrane-damaging properties [14,15]. When venom contacts the eye, a cascade of enzymatic reactions occurs, causing ocular injury and inducing inflammatory reactions, primarily affecting the anterior segment of the eye, which has been known to cause intense pain, conjunctival injection and chemosis, eyelid and corneal edema, blepharospasm, epiphora, and in some cases, blepharitis, corneal opacity, punctate keratitis, uveitis, and even blindness if not treated promptly [16-18].

This report details a case of venom spit ophthalmia in the right eye of a 31-year-old carpenter, emphasizing the importance of timely intervention in preventing severe ocular damage.

Case Presentation

A 31-year-old male carpenter was referred to the eye clinic from the emergency unit due to severe pain, photophobia, and tearing in his RE, following exposure to cobra venom. The patient reported that a black cobra had spat venom into his eye while he was working on a roof. The incident occurred two hours before presentation. Upon arrival at the emergency department, he was treated with intravenous hydrocortisone (200 mg), and his eyes were copiously irrigated with normal saline by the attending medical officer. His medical history (MHx)was unremarkable.

Ophthalmic Examination:

- Entrance Visual Acuity (VA):
  - RE: Counting fingers at 3 meters (CF @ 3m)
  - LE: 6/6
  - Pinhole Acuity: Not assessed in the RE due to pain and photophobia.
- Conjunctiva: The conjunctiva in the RE showed moderate hyperemia, with mild redness graded 2 on the Efron scale, but no chemosis.
- Palpebral Aperture: The RE palpebral aperture was slightly narrowed as the patient was attempting to keep the eye closed due to photophobia and discomfort.
- Pupil Examination: The pupil in the RE was slightly smaller than the LE, likely due to ciliary spasm before administering cyclopentolate. Both pupils were reactive to light.
- Corneal Examination: A penlight examination, combined with a magnifying loop, revealed a grey mark on the cornea approximately 2 mm below the visual axis in the RE. Fluorescein dye staining was positive, confirming it was an ulcer. Due to equipment limitations, a slit-lamp examination

could not be performed, and the depth of the ulcer could not be fully appreciated.

- Other Ocular Structures: There were no signs of uveitis, hypopyon, or stromal edema. The anterior chamber was quiet, and the examination of other ocular structures using a penlight and direct ophthalmoscope (with the +8 dial at 1 meter) was unremarkable. The lens and vitreous of both eyes were found to be clear. The fundus background of both eyes appeared orange in color with the optic disc yellow and round in both eyes. Margins of both eyes were distinct. Optic disc cupping exhibited Elschnig type II with a C/D ratio of 0.2 in both eyes. A cup depth of 1D was measured in both eyes. The retinal blood vessels were normal and healthy. AV crossing appeared to be 2/3 with no spontaneous venous pulsation present in both eyes. Foveal reflexes were present in both eyes. There were no pathologies present in the macula or the periphery of both eyes.

Initial Management:

After instilling a drop of cyclopentolate 1% in the RE, the patient reported reduced pain. The patient was prescribed Gutt ciprofloxacin 0.3% hourly on the first day, then every two hours for the next two days, and Gutt fluconazole 0.3% four times daily for three days. Ciprofloxacin ointment 0.3% was applied at night.

First Follow-up:

A follow-up appointment was carried out after three days. The patient reported a significant reduction in pain and photophobia. His primary complaint had improved, and the conjunctival hyperemia had reduced significantly. Upon examination, pinhole acuity in the RE showed no improvement over the unaided visual acuity, which had improved to 6/9 in the RE and remained 6/6 in the LE. Fluorescein staining was showed few inferior punctate stains. A 2 mm inferior corneal scar was also noted, located below the visual axis. The remainder of the ocular examination was unremarkable. The patient was advised to continue using Gutt ciprofloxacin 0.3% and Gutt fluconazole 0.3% four times daily. A follow-up review was scheduled for one week later to monitor further progress.

Second Follow-up:

The patient reported no discomfort or new complaints. His visual acuity was 6/6 in both eyes. An ocular examination revealed no signs of inflammation, and the inferior corneal scar remained stable. Fluorescein staining was negative. The remainder of the ocular examination was unremarkable. The patient was prescribed Gutt methylcellulose Eye 0.5% to be used four times daily to maintain corneal hydration and was instructed to return for a final review in one month.

Discussion

Venom spit ophthalmia, while rare, poses a significant risk of ocular damage, particularly in rural areas where snake encounters are more common [19], due to greater natural habitats, agricultural lifestyles, increased outdoor activities, and less infrastructure, which brings humans into closer contact with snake populations.[20,21] Unlike venom bite ophthalmia, which introduces venomous toxins into the host's body and reaches the retina and choroid, which are rich in blood vessels and lead to ocular complications like venom-induced retinal hemorrhages that may require surgical interventions [22,23], venom spit ophthalmia generally has better visual outcomes [24]. The cornea and conjunctiva are the primary structures affected in venom spit ophthalmia, as these tissues are most exposed and vulnerable to injury from venom [16]. Snake venom toxins and enzymes can cause direct ocular damage and trigger an inflammatory response, leading to symptoms such as pain, photophobia, foreign body sensation, and reduced vision, as observed in this patient [25]. The severity of ocular damage depends on several factors, including the volume of venom, the time between exposure and treatment, and the effectiveness of follow-up care to prevent complications [21].

In this case, the patient identified the snake as a black cobra, likely *Naja nigricollis*, which is known for its ability to penetrate the corneal epithelium and bind to the stroma, resulting in severe corneal damage [16]. The presence of a corneal scar in the RE, despite treatment, suggests that the venom had penetrated deeply into the corneal stroma. Studies have shown that after 30 minutes to 12 hours of binding to the ocular tissues, it can cause severe corneal damage [16]. The patient received treatment 2 hours after exposure, at which point the damage had already occurred.

The pH of snake venoms ranges from 5.49 to 7.4, including *Naja nigricollis* venom which has an average pH of 5.60, which makes it acidic [26]. While the acidic nature of the venom may contribute to chemical injury to the cornea, the venom's proteolytic and cytotoxic components are the primary agents of damage, leading to epithelial disruption, stromal inflammation, and coagulative necrosis [27]. Immediate irrigation with normal saline helps slow down the seeping of venom into the deeper structures of the cornea, thus minimizing ocular injury and reducing the risk of permanent damage from venom exposure. In fact, 77% of ocular complications are alleviated by copious irrigation [24]. The positive prognosis in this case highlights the importance of prompt irrigation and appropriate ophthalmic care. Had treatment been delayed further, the patient might have experienced more severe complications, including permanent vision loss, as reported in other cases of venom spit ophthalmia. Additionally, the positioning of the scar, 2 mm below the visual axis, spared the patient's vision. Had it been on the visual axis, the patient may not have had the same favorable visual outcome. The use of antifungal and antibiotic treatment also prevented further complications. For example, in Nigeria, a case of permanent blindness was documented after venom spit ophthalmia [28].

Treatment typically includes topical vitamin C, mydriatics, antibiotics, and antihistamine eye drops, depending on the clinical presentation [29]. The use of intravenous hydrocortisone in the emergency department was aimed at preventing severe systemic allergic reactions to the venom. While there is some controversy regarding the use of systemic corticosteroids as first-line treatment for venom ophthalmia, their role in preventing systemic complications cannot be ignored [30]. Topical or intravenous antivenom treatment is generally not necessary for venom spit ophthalmia [28,31].

One limitation in the management of venom spit ophthalmia is the lack of well-established, evidence-based guidelines in humans, especially in cases involving significant corneal compromise. In the absence of such guidelines, treatment must be aggressive in cases of severe complications, particularly in settings where microbial infections pose a high risk of blinding people. The decision to use both antifungal and antibiotic agents reflects a cautious and comprehensive approach to managing a case with multiple risk factors for infection. This approach was particularly warranted given the two-hour delay in treatment, during which the cornea remained vulnerable to microbial invasion. Lorch et al. [32] documented cases of fungal diseases in snakes. Although it is unlikely that snake venoms are contaminated with fungal pathogens, the patient's corneal defects might have been exposed to fungal organisms, increasing the risk of fungal keratitis. The decision to use both antifungal and antibiotic agents was a cautious and comprehensive approach aimed at preventing secondary infections in a high-risk case. The patient's corneal ulcer, resulting from venom exposure, created vulnerable entry points for opportunistic infections. Given the rural environment, where exposure to soil and organic matter increases the risk of fungal contamination, fluconazole 0.3% eyedrops were administered as a precautionary measure to prevent fungal keratitis, a serious complication that could lead to significant visual impairment. Simultaneously, ciprofloxacin 0.3% eyedrops, a broad-spectrum antibiotic, was employed to prevent bacterial colonization of the compromised corneal tissue. This dual therapy addressed the multiple infection risks posed by both fungal and bacterial pathogens, ensuring comprehensive protection during the delayed treatment window. The patient was given cyclopentolate 1%, a cycloplegic to alleviate discomfort caused by ciliary muscle spasms.

The patient could have prevented the venom from entering his eyes by wearing protective eyeglasses while working on the roof. This emphasizes the critical importance of using protective eyewear in work environments, particularly where there is a risk of exposure to harmful substances. Proper eye protection serves as a barrier, safeguarding the ocular surface from potential injuries and hazardous materials (21)

In this case, we were unable to utilize a slit lamp because the facility did not have one, which may have led to the oversight of certain ocular abnormalities, constituting a limitation of this case presentation. Despite this, the situation underscores the importance of clinicians adapting to the lack of specialized instrumentation to provide the best possible care for their patients. This highlights the need for flexibility in clinical practice, especially in resource-limited settings. Furthermore, it is crucial for health initiatives to prioritize the provision of essential ophthalmic instruments in rural areas, as these regions are often at greater risk of ocular diseases and injuries (33,34).

Conclusion

This case of venom spit ophthalmia in a rural Ghanaian setting illustrates the critical importance of prompt and appropriate management in preventing severe ocular damage from snake venom exposure. Despite a two-hour delay in treatment, the patient achieved full visual recovery with minimal scarring outside the visual axis, thanks to immediate irrigation, topical antibiotics, and antifungals. This outcome highlights the effectiveness of early intervention, particularly copious irrigation, in mitigating venom-induced ocular injury. Additionally, it underscores the importance of accessible ophthalmic care and protective eyewear in high-risk environments to prevent similar incidents. Such measures are essential in rural areas with limited healthcare resources, where snake encounters and ocular injuries are prevalent.

References

1. Pliny the Elder. The Natural History of Pliny. John Bostock, H.T. Riley, editors. London: H.G.Bohn; 1855. 1857.
2. Bosman W. A New and Accurate Description of the Coast of Guinea, Divided into the Gold, the Slave, and the Ivory Coasts. Sir Alfred Jones; 1705.
3. Lanzetta MA, Cirtita M, Aziebu E, Cham M, Lanzetta P. Ophthalmia Secondary to Cobra Venom Spitting in the Volta Region, Ghana: A Case Report. Case Rep Ophthalmol. 2017 Jan 16;8(1):99–103.
4. Salve PS, Vatavati S, Hallad J. Clustering the envenoming of snakebite in India: The district level analysis using Health Management Information System data. Clin Epidemiol Glob Health. 2020 Sep 1;8(3):733–8.
5. Chippaux JP. Snakebite envenomation turns again into a neglected tropical disease! Vol. 23, Journal of Venomous Animals and Toxins Including Tropical Diseases. BioMed Central Ltd.; 2017.
6. Alcoba G, Ochoa C, Martins SB, de Castañeda RR, Bolon I, Wanda F, et al. Novel transdisciplinary methodology for cross-sectional analysis of

snakebite epidemiology at national scale. PLoS Negl Trop Dis [Internet]. 2021 Feb 1 [cited 2024 Oct 24];15(2):e0009023. Available from: https://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0009023

7. Musah Y, Ameade EPK, Attuquayefio DK, Holbech LH. Epidemiology, ecology and human perceptions of snakebites in a savanna community of northern Ghana. PLoS Negl Trop Dis [Internet]. 2019 [cited 2024 Oct 24];13(8):e0007221. Available from: https://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0007221

8. Alirol E, Sharma SK, Ghimire A, Poncet A, Combescure C, Thapa C, et al. Dose of antivenom for the treatment of snakebite with neurotoxic envenoming: Evidence from a randomised controlled trial in Nepal. PLoS Negl Trop Dis [Internet]. 2017 May 16 [cited 2024 Oct 24];11(5): e0005612. Available from: https://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0005612

9. Punguyire D, Baiden F, Nyuzaghl J, Hultgren A, Berko Y, Brenner S, et al. Presentation, management, and outcome of snake-bites in two districts hospitals in Ghana. Pan African Medical Journal [Internet]. 2014 [cited 2024 Oct 24];19(1). Available from: https://www.ajol.info/index.php/pamj/article/view/134145

10. Mensah EK, Karikari K, Aikins M, Vanotoo L, Sackey S, Ohuabunwo C, et al. Secondary analysis of snake bite data in the Western Region of Ghana: 2006-2010. Ghana Med J [Internet]. 2016 Jul 18 [cited 2024 Oct 24];50(2):103–6. Available from: https://www.ajol.info/index.php/gmj/article/view/139777

11. Gilkes Brighton MJ. SNAKE VENOM CONJUNCTIVITIS*. Brit J Ophthal. 1959;638.

12. Pugh RNH, Theakston RDG, Reid HA, Bhar IS. Malumfashi Endemic Diseases Research Project, XIII. Ann Trop Med Parasitol [Internet]. 1980 [cited 2024 Oct 24];74(5):523–30. Available from: https://www.tandfonline.com/doi/abs/10.1080/00034983.1980.11687380

13. Westhoff G, Tzschätzsch K, Bleckmann H. The spitting behavior of two species of spitting cobras. J Comp Physiol A Neuroethol Sens Neural Behav Physiol [Internet]. 2005 Oct 9 [cited 2024 Oct 24];191(10):873–81. Available from: https://link.springer.com/article/10.1007/s00359-005-0010-8

14. Kao PH, Chen KC, Lin SR, Chang L Sen. The structural and functional contribution of N-terminal region and His-47 on Taiwan cobra phospholipase A2. Journal of Peptide Science. 2008 Mar;14(3):342–8.

15. Wang C, Liu J, Lee S, Hsiao C, Biological WWJ of, 2006 undefined. Glycosphingolipid-facilitated membrane insertion and internalization of cobra cardiotoxin: the sulfatide · cardiotoxin complex structure in a membrane-like environment. ASBMB [Internet]. 2005 [cited 2024 Oct 24]; Available from: https://www.jbc.org/article/S0021-9258(19)47844-7/abstract

16. Ismail M, Ellison AC. Ocular Effects of the Venom from the Spitting Cobra (Naja Nigricollis). J Toxicol Clin Toxicol [Internet]. 1986 [cited 2024 Oct 24];24(3):183–202. Available from: https://www.tandfonline.com/doi/abs/10.3109/15563658608990457

17. Hansen EA, Stein EA, Mader TH, Mazzoli RA. Spitting cobra ophthalmia in United Nations forces in Somalia. Am J Ophthalmol. 1994;117(5):671.

18. Ridley Oldham -harold, Major HAROLD RIDLEY B, Mc FR. Snake venom ophthalmia. ncbi.nlm.nih.govH RidleyThe British Journal of Ophthalmology, 1944•ncbi.nlm.nih.gov [Internet]. 1942 [cited 2024 Oct 24];XX:10. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC510436/

19. Kasturiratne A, Wickremasinghe AR, De Silva N, Gunawardena NK, Pathmeswaran A, Premaratna R, et al. The Global Burden of Snakebite: A Literature Analysis and Modelling Based on Regional Estimates of Envenoming and Deaths. PLoS Med [Internet]. 2008 Nov [cited 2024 Oct 24];5(11): e218. Available from: https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.0050218

20. Gutiérrez JM, Calvete JJ, Habib AG, Harrison RA, Williams DJ, Warrell DA. Snakebite envenoming. Nature Reviews Disease Primers 2017 3:1 [Internet]. 2017 Sep 14 [cited 2024 Oct 24];3(1):1–21. Available from: https://www.nature.com/articles/nrdp201763

21. Chippaux JP. Estimate of the burden of snakebites in sub-Saharan Africa: A meta-analytic approach. Toxicon. 2011 Mar 15;57(4):586–99.

22. Liu PY, Shi ZY, Lin CF, Huang JA, Liu JW, Chan KW, et al. Shewanella infection of snake bites: a twelve-year retrospective study. Clinics [Internet]. 2012 [cited 2024 Oct 24];67(5):431–5. Available from: https://www.scielo.br/j/clin/a/bSxSnK3Ss3KrcVPXZbKpmTK/?format=html

23. Lin CC, Chaou CH, Tseng CY. An investigation of snakebite antivenom usage in Taiwan. Journal of the Formosan Medical Association. 2016 Aug 1;115(8):672–7.

24. Tsai TH, Lin CC, Mao YC, Hung CL, Yang YC, Yang CC, et al. Naja atra venom-spit ophthalmia in Taiwan: An epidemiological survey from 1990 to 2016. Journal of the Chinese Medical Association [Internet]. 2020 Jan 1 [cited 2024 Oct 24];83(1):77–83. Available from: https://journals.lww.com/jcma/fulltext/2020/01000/naja_atra_venom_spit_ophthalmia_in_taiwan__an.14.aspx

25. Burin SM, Menaldo DL, Sampaio S V., Frantz FG, Castro FA. An overview of the immune modulating effects of enzymatic toxins from snake venoms. Int J Biol Macromol. 2018 Apr 1;109:664–71.

26. Avella I, Barajas-Ledesma E, Casewell NR, Harrison RA, Rowley PD, Crittenden E, et al. Unexpected lack of specialisation in the flow properties of spitting cobra venom. Journal of Experimental Biology [Internet]. 2021 Apr 1 [cited 2024 Oct 24];224(7). Available from: https://dx.doi.org/10.1242/jeb.229229

27. Ismail M, Ellison AC. Ocular Effects of the Venom from the Spitting Cobra (Naja Nigricollis). J Toxicol Clin Toxicol [Internet]. 1986 [cited 2024 Oct 24];24(3):183–202. Available from: https://www.tandfonline.com/doi/abs/10.3109/15563658608990457

28. Warrell DA, Ormerod LD. Snake venom ophthalmia and blindness caused by the spitting cobra (Naja nigricollis) in Nigeria. Am J Trop Med Hyg [Internet]. 1976 May 1 [cited 2024 Oct 24];25(3):525–9. Available from: https://europepmc.org/article/med/1084700

29. Chu ER, Weinstein SA, White J, Warrell DA. Venom ophthalmia caused by venoms of spitting elapid and other snakes: Report of ten cases with review of epidemiology, clinical features, pathophysiology and management. Toxicon. 2010 Sep 1;56(3):259–72.

30. Chang KC, Huang YK, Chen YW, Chen MH, Tu AT, Chen YC. Venom Ophthalmia and Ocular Complications Caused by Snake Venom. Toxins 2020, Vol 12, Page 576 [Internet]. 2020 Sep 8 [cited 2024 Oct 24];12(9):576. Available from: https://www.mdpi.com/2072-6651/12/9/576/htm

31. medicine RJTJ of emergency, 2009 undefined. Ophthalmic exposure to crotalid venom. Elsevier [Internet]. [cited 2024 Oct 24]; Available from: https://www.sciencedirect.com/science/article/pii/S0736467907009079

32. Lorch JM, Knowles S, Lankton JS, Michell K, Edwards JL, Kapfer JM, et al. Snake fungal disease: an emerging threat to wild snakes. Philosophical Transactions of the Royal Society B: Biological Sciences [Internet]. 2016 Dec 5 [cited 2024 Oct 24];371(1709). Available from: https://royalsocietypublishing.org/doi/10.1098/rstb.2015.0457

33. Mccauley LA, Lasarev MR, Higgins G, Rothlein J, Muniz J, Ebbert C, et al. Work Characteristics and Pesticide Exposures among Migrant Agricultural Families: A Community-Based Research Approach [Internet]. Vol. 109, Environmental Health Perspectives •. 2001. Available from: http://ehpnet1.niehs.nih.gov/docs/2001/109p533-538mcccauley/abstract.html

34. Quandt SA, Feldman SR, Vallejos QM, Schulz MR, Verma AB, Fleischer AA, et al. Vision Problems, Eye Care History, and Ocular Protection Among Migrant Farmworkers. Arch Environ Occup Health [Internet]. 2008 Apr 1 [cited 2024 Oct 24];63(1):13–6. Available from: https://www.tandfonline.com/doi/abs/10.3200/AEOH.63.1.13-16

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