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Review Article

Corneal Ulcer due to a Grade 1 Chemical burn Managed Successfully with Combined Tobramycin 3% and Dexamethasone 1% eye drops: A Case Report and Review of the Literature

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Abstract:

Chemical cornea injury is a true ocular emergency and requires immediate intervention. Diagnoses rely on clinical assessment and classification. Treatment is directed to improve the epithelial integrity and stromal stability, reduce undue inflammation and prevent or timely manage complications.

Case presentation: A 45-year-old male presented with chemical injury to his left eye from a painting agent. He was classified as Grade 1 ocular surface chemical burn with a large central corneal ulcer and spared limbal area and conjunctiva, treated successfully with the administration of combined dexamethasone and tobramycin eye drops to the standard treatment starting from the second day, with complete healing after 5 days.

Conclusion: Grade 1 ocular surface chemical burn with a large central corneal ulcer can be treated successfully with combined dexamethasone and tobramycin eye drops.

Key words: grade 1 ocular chemical burn; central corneal ulcer; combined dexamethasone and tobramycin eye drops

Introduction

Chemical injuries to the eye represent between 11.5% and 22.1% of ocular traumas. About two-thirds of these injuries occur in young men and children aged 1 -2 years are particularly at risk. Most injuries occur in the workplace as a result of industrial accidents. Alkaline materials are commonly found in building materials and cleaning agents. It occurs more frequently than acid injuries and is more harmful than Acids. [1]

Chemical injuries to the cornea and conjunctiva are a true emergency and require immediate intervention because they can lead to extensive damage, leading to permanent visual impairment and disfigurement. The severity of the ocular injuries depends on four factors:

1- Toxicity of the chemical.

2- Duration of contact with the eye.

3- Depth of penetration.

4- Area of involvement.

Irrigation is the cornerstone of managing chemical burns, and it should be initiated according to established standards, continuing throughout the transfer of the patient between the EMS, ED physician, and the ophthalmologist. Irrigation aims to remove the offending substance and restore physiological pH levels. Suggested guidelines recommend that

irrigation should continue for a minimum of 30 minutes, using 1-3 litres of fluid, or until the physiological pH is reached. [2]

The physical examination should be used to assess the extent and depth of the ocular injury. Two major classification schemes for ocular chemical burns are the Roper–Hall (modified Hughs) and Dua classifications. The Roper–Hall classification is based on the degree of corneal and conjunctival involvement and limbal ischemia [6] 3. The Dua classification is based on an estimated limbal involvement (in clock hours) and the percentage of the conjunctival involvement. [4] Patient with mild to moderate injuries (Grades 1 and 2) has a good prognosis with medical therapy aiming to enhance corneal epithelial integrity and stromal stability, reduction of undue inflammation and prevention and timely management of complications. Steroid eye drops can help to calm the inflammation and prevent further corneal breakdown, with the caution of maintaining the balance between collagen synthesis and collagen breakdown. [5]

Case report:

A forty-five-year-old Sri Lankan male presented to the ophthalmology clinic in PHCC with a history of chemical injury to his left eye by the entrance of a painting substance during his work five hours before his presentation. Irrigation to the left eye started in the emergency department and continued in the ophthalmology clinic for 30 minutes with about two litres of normal saline solution, following the installation of topical anaesthetic eye drops and the patient was advised to blink frequently. The patient complained of blurred vision, a foreign body sensation, tearing, and mild swelling of the upper eyelid of his left eye. There was no complaint in the right eye, and no history of systemic illness. On physical examination, the best corrected visual acuity (BCVA) in the right eye was 6/6, and in the left eye 6/9, with no improvement with pinhole. Slit lamp examination showed the right eye was normal for both the anterior and posterior segments. The left eye exhibited mild diffuse oedema of the upper lid, conjunctival hyperemia with ciliary congestion, and examination of the fornices for any material. There was a central large superficial corneal ulcer (with fluorescein uptake) covering about three-quarters of the corneal surface, with epithelial cell condensation at the peripheral ulcer margin and free limbal involvement (Figure 1).

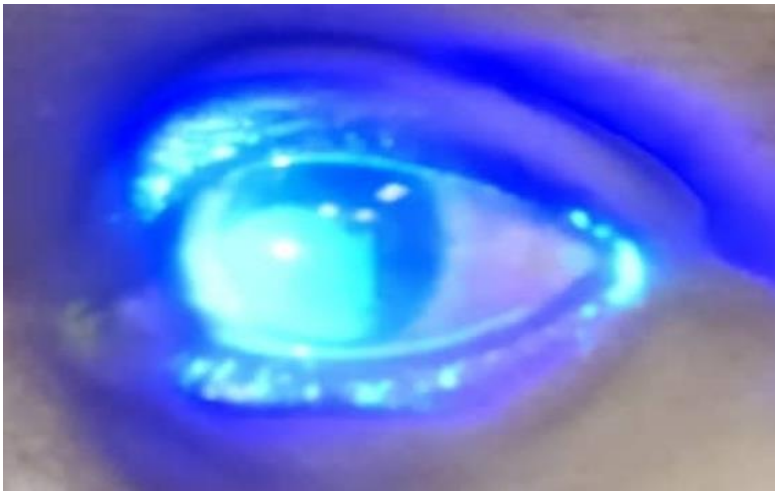

Figure 1: Patient presented with a left eye central corneal ulcer with a free limbal area as shown by fluorescein staining

This corresponds to a Grade 1 chemical ocular injury according to the Roper-Hall classification. The anterior chamber was clear, with no cells detected; intraocular pressure was normal on digital assessment, and fundus examination was slightly hazy but showed a normal optic nerve and central retina. The treatment commenced with the protocol of antibiotics, mydriatics and lubrication. 0.5% Moxifloxacin eye drops applied four times a day, Cyclopentolate eye drops three times a day, and preservative-free lubricants five times daily on the first day. On the second day of follow-up, there was no improvement in the patient's symptoms or visual acuity; the conjunctival hyperemia persisted, and the corneal ulcer remained unchanged in size. The anterior segment examination did not reveal any differences from the day one examination. These findings are against the expected prognosis for this grade 1 chemical burn with the ordinary treatment used (antibiotics, mydriatics and lubrication), with expected improvement after 24 hours. Also, no clinical signs of secondary microbial contamination and the presentation of the patient is a direct case of chemical injury in normal eye, so no need for corneal scraping for smear and culture. I decided to start inflammation control by steroid; the recommended steroid is prednisolone eye drops. But I decided to use dexamethasone eye drops so that I need a more superficial potent effect with less penetration to the corneal layers. This is my unique treatment approach to start directly with dexamethasone rather than prednisolone acetate eye drops. I started adding combined tobramycin 3% dexamethasone 1% eye drops with QID frequency to concentrate on the superficial corneal inflammation control due to low penetration of the dexamethasone rather than prednisolone, which has more corneal penetration so mostly effective in deep inflammation control, with continuation of the same previous medications. Combination of dexamethasone with tobramycin as antibiotic for more antimicrobial prophylaxis approach with moxifloxacin to protect the injured corneal from secondary bacterial infections. On the third day of follow-up, the patient reported improvement in symptoms, lid swelling decreased, the conjunctiva was less hyperemic, and the corneal ulcer started to reduce in size for about ½ of the corneal surface. The intraocular pressure, checked with non-contact tonometry, was 11 and 12 in the right and left eye, respectively. The pupil was dilated pharmacologically to 5 mm. The patient continued on the same treatment plan. On the sixth day of follow-up, the symptoms have resolved completely, the corrected visual acuity is 6/6 for both eyes, the conjunctiva was quiet, the corneal ulcer completely healed with mild scattered punctate epithelial erosions with faint fluorescein uptake, the pupil is dilated pharmacologically to 5 mm. I planned to stop the antibiotic and cyclopentolate eye drops and start steroid tapering to TID Follow up after 5 days, the patient was asymptomatic with corrected visual acuity of 6/6 in both eyes, clear cornea, no fluorescein uptake, IOP was 11 and 12 for right and left eye, respectively. Planned to complete the tapering of dexamethasone eye drops every 5 days and continue on lubricants. Figure [2] Follow-up after 3 months, both eyes were normal with 6/6 BCVA and IOP, clear cornea in both eyes and normal anterior and posterior segments in both eyes.

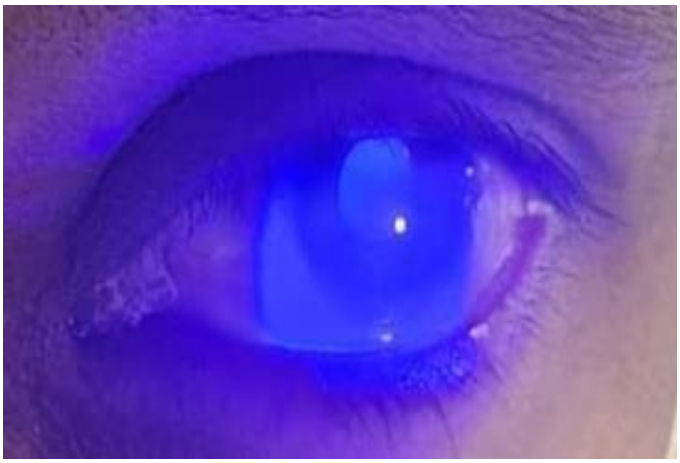

Figure 2: Complete healing of the central corneal ulcer after treatment on day 11 with no fluorescein stain uptake

Discussion:

Chemical injury to the cornea is a true ocular emergency and requires immediate interventions and close follow-up. Alkaline injury is more harmful to the cornea due to its rapid tissue penetration, and it causes more tissue damage. Our patient reported within 5 hours after injury with an Alkali substance (painting agent) with mild vision loss, pain, redness and tearing. After frequent irrigation, the patient was diagnosed as grade 1 ocular injury with a large central corneal ulcer and free limbal area, The patient was planned to be treated with antibiotics, cycloplegics and lubricants, but without improvement on the second day. The addition of combined tobramycin 3% and dexamethasone 1% eye drops leads to patient recovery within 3 days. Our novelty and contribution in this case is based on the immediate decision of early intervention for controlling the corneal inflammation response to the chemical injury on the second day, if no signs of early improvement within 24 hours of ordinary treatment with antibiotics, mydriatics and lubrication. On the other hand, the selection of dexamethasone as a steroid is superior to prednisolone acetate eye drops for its potent effect in inflammation control with less penetration into the corneal layer, so it is better for superficial corneal inflammation control. Combination of dexamethasone with tobramycin as antibiotic for more antimicrobial prophylaxis approach with moxifloxacin to protect the injured corneal from secondary bacterial infections. In a study by Huda et. al, the composition of active compounds in the Calotropis latex was analyzed with the help of phytochemical screening. It was found that the latex contains several alkaloids, which are poisonous. It was concluded that the stromal keratitis was due to inflammation triggered by these toxins. The use of corticosteroids helps in the resolution of the keratitis and supports this theory. [6] In a study by Pandey and Sahu, 25% of the patients had epithelial defects, stromal oedema, and Descemet's folds were persistent when steroid was withheld in patients with epithelial defects; they started to resolve once topical steroids were started. It was concluded that striate keratitis resolves with topical steroids. [7] In a case study by Apurva Prabhudesai et.al, Cureus 2024, chemical injury by Calotropis plant sap called latex, can affect the vision significantly if left untreated. Treatment with systemic antibiotics, topical steroids and lubricant drops immediately leads to recovery in a short period. [8] In our case, the patient was treated with topical steroids, antibiotics and cycloplegics, and he was completely recovered within 5 days. In a case study by Waikar and Srivastava, their patient was treated similarly and recovered in two days. Conjunctival staining and Descemet membrane folds persisted for two more days. [9]

Conclusion:

This case highlights how the early treatment with a combination of dexamethasone and tobramycin eye drops, along with the standard treatment, can significantly enhance the healing of Grade 1 chemical burns with extensive corneal ulcers.

Limitations of this study:

This case report concerns a single patient; therefore, the results cannot be generalized. Additionally, the study was conducted in a resource–limited setting at a primary care level, where the clinical image clarity is limited to using a mobile phone camera for documentation, as no slit-lamp fixed camera is available in our clinic. Also, certain investigations, such as ocular PH checking papers, are unavailable, along with specific interventions like Diphtheriae amphoteric solutions for irrigation to normalize the ocular pH and improve healing.

Conflict of interest:

The author declares no conflicts of interest

Consent for publication

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Ethical approval:

Ethical approval was obtained from the local ethical committee/research, PHCC, Qatar

Financial Support:

No funding was received for this study.

Research Registration:

Not applicable

Provenance and peer review:

The research was peer-reviewed and approved by the PHCC Institutional Review Board (IRB)

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