Section: Ophthalmology

Case Series

CASE SERIES ON CHEMICAL INJURIES OF EYE - MADAR JUICE KERATITIS, PODOPHYLLIN KERATITIS, FLOOR CLEANER EXPOSURE & ADHESIVE EXPOSURE

T. G. Uma Maheshwari[1], S. Kavya[2]

[1]Associate Professor, Government Stanley Medical College & Hospital, India.
[2]Post Graduate, Government Stanley Medical College & Hospital, India.

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Corresponding Author:
Dr. S. Kavya
Post Graduate, Government Stanley Medical College & Hospital, India.
Email: kavyasath01@gmail.com

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ABSTRACT

Chemical injuries to the cornea are ocular emergencies that may lead to significant visual morbidity if not managed promptly. Apart from acid and alkali burns, plant-derived and topical toxic agents can produce atypical toxic keratitis. This case series highlights four uncommon causes of toxic corneal injury: Madar juice keratitis, podophyllin toxin keratitis, floor cleaner exposure, and adhesive (Feviquick) exposure. Patients presented with acute pain, redness, watering, photophobia, and diminution of vision following accidental exposure. Slit-lamp examination revealed conjunctival congestion, punctate epithelial erosions, epithelial defects, stromal oedema, Descemet's folds, and keratoconjunctivitis. Madar juice exposure predominantly caused toxic endotheliitis with corneal oedema, while podophyllin toxicity showed epithelial and stromal involvement. Management included immediate ocular irrigation, topical lubricants, cycloplegics, prophylactic antibiotics, and corticosteroids when indicated. Early diagnosis and prompt treatment resulted in symptomatic relief and visual recovery without significant sequelae.

Keywords: Chemical injury, toxic keratitis, Madar juice keratitis, Calotropis, podophyllin toxicity, corneal injury, ocular surface disorder, toxic keratopathy.

INTRODUCTION

Chemical injuries of the eye constitute true ophthalmic emergencies and may lead to severe ocular morbidity depending on the nature, duration, and severity of exposure. Ocular chemical injuries are most commonly caused by acids and alkalis; however, plant-derived toxins and herbal compounds represent uncommon but clinically significant causes of toxic keratitis. Damage occurs through epithelial toxicity, stromal inflammation, limbal ischemia, and endothelial dysfunction.

Calotropis procera (commonly known as Aak, Sodom apple, or Madar) is a xerophytic shrub whose milky latex contains potent alkaloids such as calotropin, catotoxin, and gigantin. This latex is recognized for its caustic and cytotoxic properties, which can induce severe ocular inflammation and corneal endothelial damage upon accidental exposure. In the Indian cultural context, particularly during religious festivals such as Ganesh Chaturthi, the flowers and leaves of Calotropis are frequently used for devotional offerings, increasing the risk of accidental ocular exposure in the community. Calotropis latex acts primarily on corneal endothelial cells, possibly through disruption of tight junctions and Na+/K+-ATPase pump function, resulting in transient endothelial decompensation. The sap's inherent anaesthetic property may mask pain, leading to delayed presentation and potential endothelial damage[1]

Podophyllin is a resin derived from podophyllum species and is widely used for treatment of viral warts. The toxin possesses antimitotic activity by inhibiting microtubule formation, resulting in cytotoxic epithelial injury. Accidental ocular exposure may lead to toxic keratitis, conjunctival inflammation, epithelial defects, stromal oedema, and photophobia.

Most household and industrial floor cleaners contain alkaline agents, detergents, surfactants, ammonia, sodium hydroxide, or disinfectant chemicals, which

can produce severe ocular surface toxicity. Alkalis are lipophilic and rapidly penetrate the corneal epithelium. Hydroxyl ions cause saponification of fatty acids in cell membranes. This leads to epithelial cell destruction, stromal hydration, collagen disruption, liquefactive necrosis

Due to the rarity of these injuries, diagnosis may be delayed or misinterpreted as infective keratitis. We report four cases of uncommon toxic ocular surface injuries caused by Madar juice, podophyllin toxin, Floor cleaner & Adhesive Exposure, highlighting their clinical manifestations, management, and outcomes.

Case 1:

A 55-year-old gentleman reported to ophthalmology outpatient department with complaints of blurring of vision, redness, pain, foreign body sensation, and intolerance to light in the right eye for two days. The patient gave a history of accidental eye contact with the sap of the Calotropis plant while he was applying Madar juice for swelling in his right hand.

In the right eye, the uncorrected visual acuity was 1/2/60 and there was no improvement with pin hole. The left eye vision was 6/36.

On slit lamp examination of right eye, the anterior segment showed circumcorneal congestion, and the cornea showed epithelial defect involving the entire cornea [figure.1], corneal oedema with Descemet membrane folds.

The anterior chamber showed 2+ cells and moderate flare. Intraocular pressure (measured by the non-contact tonometry) was normal. The left eye Anterior segment and fundus examination was normal.

Fundus examination of the right eye had no view on the day 1 due to dense corneal oedema.

Fundus examination on follow-up revealed hazy media due to lens changes, the optic disc was normal, the cup:disc ratio was 0.3, the NRR was healthy, the macula was normal, the foveal reflex was present.

The patient was started on 1% prednisolone eye drops hourly, 0.5% moxifloxacin hourly, 2% homatropine BD, and lubricating eyedrops two hourly. On day 1, there was improvement in the visual acuity of the right eye. On anterior segment examination the epithelial defect was partially healed and there was reduction in the corneal oedema and Descemet's membrane folds.

The same medications were continued. Fluorescein staining was done daily to monitor epithelial defect healing.

Steroids were tapered over a period of 2 weeks. On day 7, slit lamp examination conjunctiva and cornea were clear with a quiet anterior segment [figure.5]

The patient's vision during follow up was 6/36.

Case 2:

A 25-year-old patient presented to the Ophthalmology Outpatient Department with complaints of sudden blurring of vision, redness, pain, watering, foreign body sensation, and photophobia in the right eye for one day. The patient gave a history of accidental ocular exposure to podophyllin toxin while applying topical podophyllin preparation over a wart located on the upper eyelid. Soon after application, the medication inadvertently entered the right eye, following which the patient developed irritation and progressive diminution of vision.

On examination, the uncorrected visual acuity in the right eye was 6/36, with no significant improvement on pinhole testing. The left eye visual acuity was 6/6. Slit-lamp examination of the right eye revealed circumciliary congestion with marked superior corneal stromal oedema [figure.7] Mild conjunctival congestion was present. AC was clear.

Pupillary reactions were normal, and the lens was clear. Intraocular pressure measured by non-contact tonometry was within normal limits. Fundus examination showed no posterior segment abnormality. Examination of the left eye was within normal limits.

The patient was diagnosed with toxic keratoconjunctivitis secondary to accidental podophyllin toxin exposure. Treatment was initiated with Moxifloxacin with dexamethasone (Antibiotic Steroid) drops hourly, 2% Homatropine BD, Lubricating eye drops two hourly. The patient was advised strict avoidance of further exposure and was kept under close follow-up to monitor progression of corneal oedema.

On subsequent follow-up visits, there was gradual symptomatic improvement with reduction in pain, photophobia, and redness. Slit-lamp examination showed progressive resolution of superior corneal oedema Visual acuity improved progressively over the following days. At one-week follow-up, the cornea was significantly clearer, and the patient's best-corrected visual acuity improved to 6/9 in the affected eye. No residual corneal opacity was noted on subsequent follow up.

Case 3:

A 50-year-old female presented to the Ophthalmology Outpatient Department with complaints of redness, watering, foreign body sensation, and mild burning sensation in the left eye following accidental exposure to R2 floor cleaner liquid while performing household cleaning activities. The symptoms developed immediately after exposure, and the patient presented within a few hours of the incident.

On examination, the uncorrected visual acuity in the right eye was 6/9 and in the left eye was 6/12, with no significant improvement on pinhole testing. The right eye examination was within normal limits. Slit-lamp examination of the left eye revealed conjunctival congestion [figure.10]. The cornea was clear with no epithelial defect or stromal oedema. The anterior chamber was well formed and quiet, with no cells or flare. Pupillary reactions were normal, and the lens was clear. Intraocular pressure measured by non-contact tonometry was within normal limits in both eyes. Fundus examination of both eyes was within normal limits,

The patient was diagnosed with chemical conjunctivitis secondary to accidental exposure to R2

floor cleaner liquid. Immediate ocular surface irrigation had been performed prior to examination. The patient was treated with topical 0.5% Moxifloxacin eye drops 2 hourly and preservative-free lubricating eye drops 6times per day. She was advised regarding ocular hygiene and avoidance of further chemical exposure.

On follow-up after one week, the patient showed significant symptomatic improvement with resolution of conjunctival congestion and watering. The cornea remained clear, and visual acuity was maintained without any ocular sequelae.

Case 4:

An 11-year-old boy presented to the Ophthalmology Outpatient Department with complaints of redness, watering, and foreign body sensation in the right eye for one day following accidental exposure to Feviquick glue (ethyl cyanoacrylate adhesive). The symptoms developed immediately after exposure, and the patient was brought to the outpatient department within 24 hours of the incident.

On examination, the uncorrected visual acuity in the right eye was 6/12 with no improvement on pinhole testing, while the left eye had a visual acuity of 6/6. Slit-lamp examination of the right eye revealed diffuse bulbar conjunctival congestion [figure.11] The cornea was clear with no epithelial defect, stromal oedema, or corneal infiltrate. Eversion of the eyelids showed a clear palpebral conjunctiva with no retained glue particles or foreign body. The anterior chamber was well formed and quiet, with no cells or flare. Pupillary reactions were normal, and the lens was clear. The left eye examination was within normal limits.

Immediate and thorough ocular surface irrigation with normal saline was performed to remove any residual chemical material and reduce ocular surface irritation. The patient was diagnosed with chemical conjunctivitis secondary to accidental ocular exposure to ethyl cyanoacrylate adhesive. He was treated with topical Tobramycin eye drops six times per day along with preservative-free lubricating eye drops six times per day. The patient and attendants were advised regarding ocular hygiene and avoidance of further exposure to adhesive substances.

On follow-up after one week, the patient showed marked symptomatic improvement with resolution of redness, watering, and foreign body sensation. Visual acuity in right eye was 6/6 and slit-lamp examination revealed a quiet conjunctiva with a clear cornea and no evidence of ocular sequelae.

Figure 1: Madar juice keratitis - fluorescent staining showing epithelial defect, Day 1

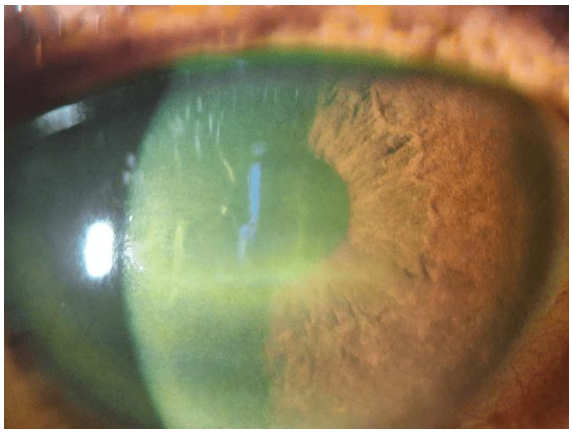

Figure 2: Madar juice keratitis - fluorescent staining, Day 3

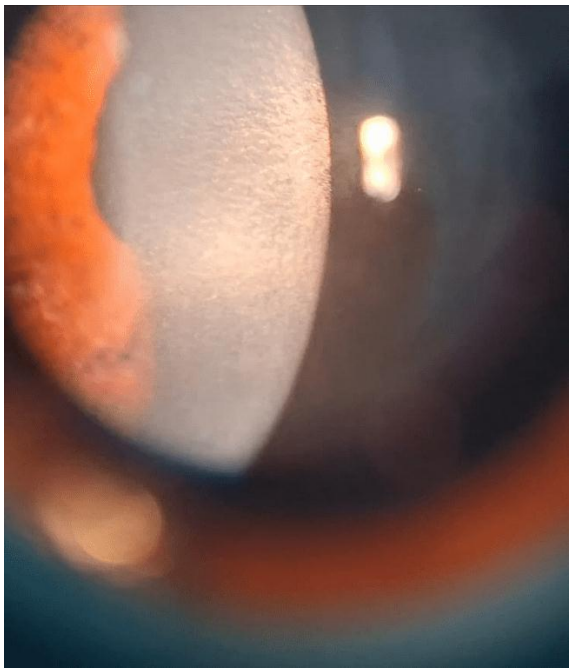

Figure 3: Madar juice keratitis - Slit lamp examination - Day 3

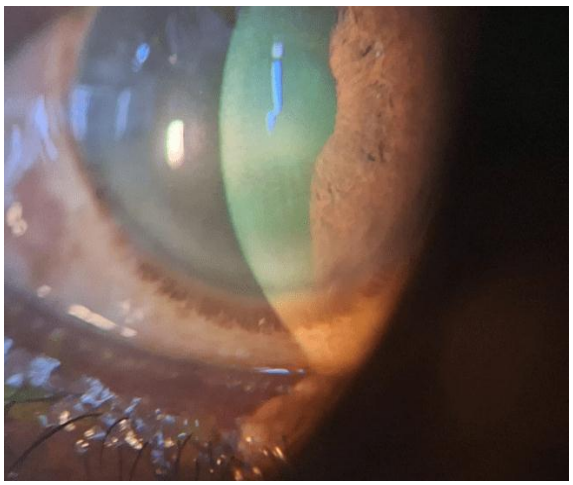

Figure 4: Madar juice keratitis-fluorescent staining, Day 5

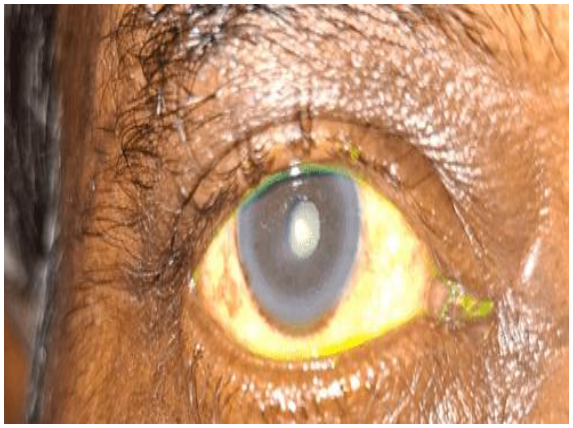

Figure 5: Madar juice keratitis - Day 7

Figure 6. Podophyllin keratitis - Day 1

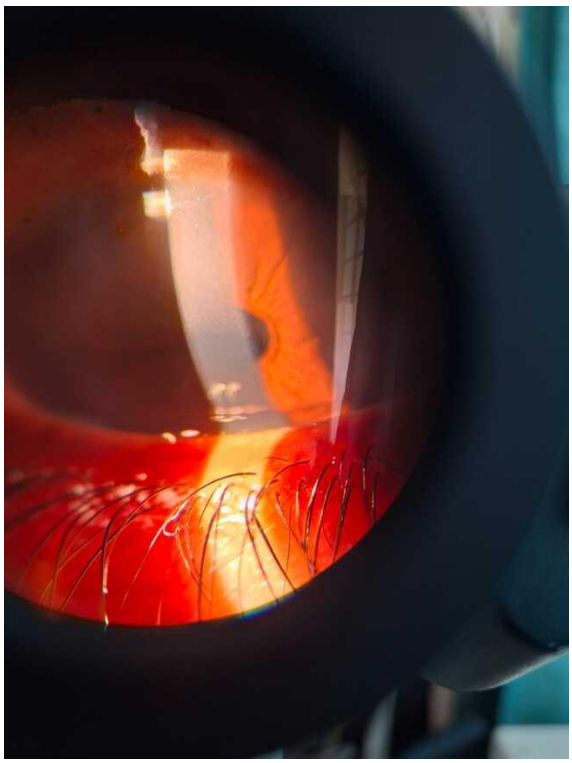

Figure 7. Podophylline Keratitis - Slit lamp examination on day 1 showing superior corneal oedema

Figure 8. Podophyllin keratitis - Day 3

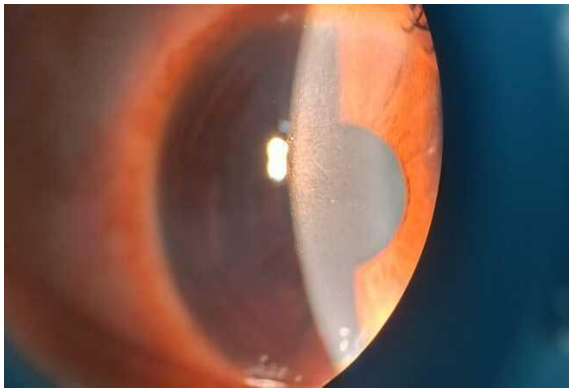

Figure 9. Podophyllin keratitis - slit lamp examining on day 3

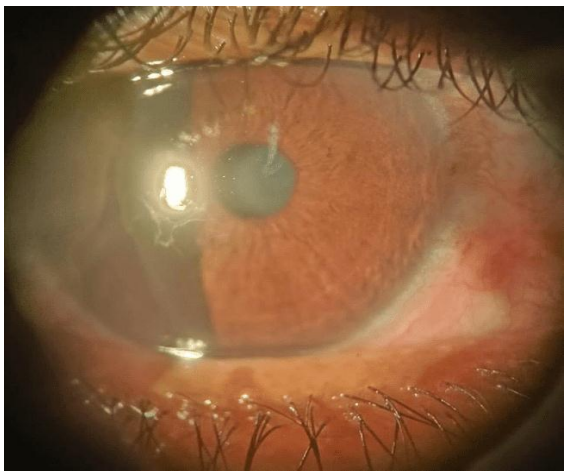

Figure 10: R2 floor cleaner exposure - Slit lamp examination showing conjunctival congestion

Figure 11: Adhesive exposure - Slit lamp examination showing conjunctival congestion

DISCUSSION

Chemical injuries from plant-derived toxins are uncommon compared with conventional acid and alkali burns but may produce substantial ocular surface damage. The severity depends upon the toxic composition, duration of contact, and promptness of irrigation and treatment.

Madar juice keratitis results from exposure to latex of Calotropis gigantea. The latex contains cardenolides, calotropin, histamine, and proteolytic enzymes that exert toxic effects on the corneal endothelium and epithelium. Standard ophthalmology literature describes stromal oedema with relatively mild epithelial involvement as a characteristic feature. Corneal oedema is believed to result from endothelial pump dysfunction rather than direct stromal destruction. Patients typically present with sudden diminution of vision, photophobia, lacrimation, conjunctival congestion, and corneal oedema. Most cases respond favourably to conservative treatment with topical corticosteroids, lubricants, antibiotics, and cycloplegics. A notable debate persists in the timing of corticosteroid initiation. Some surgeons advocate starting topical corticosteroids, on day one, aiming to mitigate endothelial cell loss and reduce stromal oedema early. Conversely, other surgeons prefer to delay steroid therapy until after the resolution of the epithelial defect, in order to avoid potential delays in wound healing or risk of infection. This ongoing controversy highlights the need for individualized clinical judgment, as well as further evidence from prospective studies

Podophyllin keratitis is less frequently reported but represents a significant toxic epithelial injury. Podophyllin acts by inhibiting mitosis and cellular replication, leading to epithelial cell necrosis and inflammatory ocular surface damage. Clinical findings may include punctate epithelial erosions, epithelial defects, stromal oedema, conjunctival chemosis, pain, and photophobia. The mechanism resembles toxic keratopathy induced by antimitotic agents. Immediate irrigation and supportive therapy are critical to reduce toxin contact time and prevent stromal complications.

All our cases demonstrated favourable outcomes following early diagnosis and prompt conservative management. No permanent stromal scarring or limbal stem cell deficiency was observed. These cases emphasize the importance of detailed exposure history in patients presenting with acute keratitis of unclear aetiology.

Awareness regarding uncommon toxic ocular injuries is especially important in developing countries where traditional medicinal plants and topical preparations are frequently used. Public education regarding safe handling of such substances may reduce preventable ocular morbidity.

CONCLUSION

Madar juice, podophyllin toxin, floor cleaner & adhesive exposure are rare but important causes of toxic keratitis and ocular surface injury. These agents may produce corneal epithelial damage, stromal oedema, endothelial dysfunction, and significant visual symptoms[2]. Early recognition, prompt ocular irrigation, and appropriate medical therapy can result in excellent visual recovery and prevent long-term sequelae. Ophthalmologists should maintain a high index of suspicion for plant-derived and toxin-mediated keratitis in patients presenting with acute ocular inflammation and relevant exposure history.

In conclusion, this case series underscores the diverse mechanisms by which chemical agents can induce ocular injury and highlights the critical need for preventive measures. First, with Madar juice, public awareness campaigns are essential to educate communities that it has no medicinal value and must never be applied near the eyes. Second, in the case of podophyllin toxin exposure, patients must be counselled on safer alternatives—such as physical removal by a specialist—rather than the use of caustic ointments near the eyelids. Third, occupational safety measures are crucial; individuals handling floor cleaners or other chemicals must be

provided with appropriate protective equipment, such as gloves and goggles, to prevent accidental splashes. Exposure to adhesive material, paediatric patients are particularly vulnerable, and protective supervision in children's environments is imperative. By integrating these preventive strategies, we can significantly reduce the incidence of chemical eye injuries and their potentially devastating consequences.

Suggested keywords

Chemical injury; toxic keratitis; Madar juice keratitis; Calotropis; podophyllin toxicity; corneal injury; ocular surface disorder; toxic keratopathy.

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