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Keratoconjunctivitis Caused By *Dieffenbachia* Plant Sap: A Case Series

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Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
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Case series
Patients: **Male, 55-year-old • Female, 58-year-old • Male, 56-year-old**
Final Diagnosis: **Keratoconjuctivis caused by *Dieffenbachia* plant sap**
Symptoms: **Eye pain • irritation • tearing**
Clinical Procedure: **—**
Specialty: **Ophthalmology**

Objective: **Mistake in diagnosis**

Background: Over 5000 plant species produce milky latex sap utilized in decoration and various industries. Sap exposure, however, can elicit toxic reactions, including acute keratoconjunctivitis and corneal stromal infiltration. The common ornamental plant *Dieffenbachia* can cause acute keratoconjunctivitis and the deposition of fine blue crystals within the corneal stroma. This report analyzes 3 cases of *Dieffenbachia*-induced keratitis and reviews existing literature on plant-induced keratitis.

Case Reports: Three patients presented with ocular irritation, pain, and redness following accidental exposure to *Dieffenbachia* sap. Clinical examination revealed chemosis and corneal edema in all cases. Slit-lamp microscopy identified fine, needle-like oxalate crystals located within the epithelial and stromal layers of the inferior cornea. The 3 patients received conservative management: ocular irrigation, topical antibiotics, and localized anti-inflammatory agents. The treatment protocol was altered, depending on the clinical ocular response. When symptoms gradual improved, anti-inflammatory medication was decreased by 1 to 2 doses after 1 to 2 weeks, throughout a treatment duration of 4 to 8 weeks. Complete resolution of crystal deposits in the cornea was observed after a 4- to 8-week follow-up period. All patients retained satisfactory visual acuity and exhibited no corneal opacities.

Conclusions: Patients with keratitis caused by *Dieffenbachia* sap typically achieve full recovery without complications, but the potential for crystal deposition in the cornea must be recognized. Safety measures, including protective eyewear, gloves, and long-sleeved clothing during plant maintenance are essential. Comprehensive knowledge of the pathogenesis and clinical trajectory of ocular *Dieffenbachia* exposure will enable ophthalmologists to optimize treatment strategies.

Keywords: **Keratitis • Keratoconjunctivitis • Eye Diseases**

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Introduction

There are 12 families, 20 genera, and over 5000 species of plants with milky latex sap worldwide. They are used as patio decoration, food, medicine, and various industrial uses [1]. Case reports have shown that milky sap from a variety of trees can cause toxic ocular reactions manifested by acute keratoconjunctivitis, epithelial defects, and stromal infiltration. *Dieffenbachia* is an ornamental plant widely found in home gardens and commercial plantations (**Figure 1**). Toxicity caused by contact with the *Dieffenbachia* plant has been known as early as the 17th century [2,3]. The signs of ocular injury include conjunctival chemosis, corneal abrasion, keratoconjunctivitis, and the formation of fine blue crystals in the stroma [2]. Keratoconjunctivitis induced by plant sap is a rare clinical entity, albeit with several cases documented in the global literature [2,4,5]. The condition is characterized by a history of accidental exposure to plant sap, followed by the deposition of fine, blue-tinted, needle-like crystals within the corneal stroma. This clinical presentation is distinct from other forms of crystalline keratopathy [2]. Furthermore, the clinical course is typically benign and highly responsive to topical therapy. Resolution of the stromal crystals is generally complete, leaving no residual corneal scarring within a period of 4 to 8 weeks [2,4,5].

Here, we report 3 cases of keratoconjunctivitis caused by *Dieffenbachia* plant sap treated in Ho Chi Minh City Eye Hospital, and review other articles on this condition.

Figure 1. The *Dieffenbachia* plant, which is known as "Van Nien Thanh" in Vietnamese.

Case Reports

Case 1

A 55-year-old man with no significant ocular history presented with a 2-day history of pain and redness in his right eye following accidental contact with *Dieffenbachia* sap while gardening. Before admission, the patient self-irrigated the affected eye with tap water and purchased some pain relief medication. Upon examination, visual acuity was 2/10, with eyelid swelling, conjunctival chemosis, and corneal edema. Slit-lamp examination revealed fine needle-like crystals in the epithelial and stromal layers. The left eye was completely normal (**Figure 2**).

The patient was initially misdiagnosed with "multiple corneal foreign bodies". However, following consultation, the diagnosis was corrected to "keratitis caused by plant crystals". Management included ocular irrigation and a conservative regimen: oral methylprednisolone 16 mg, 2 tablets daily; topical levofloxacin 1.5%, 6 times daily; prednisolone acetate 1%, 6 times daily; and artificial tears. After 3 days, symptoms improved and visual acuity reached 5/10 (**Figure 3**).

Anterior segment optical coherence tomography on the right eye did not show hyperreflectivity in the corneal layers at the region containing the oxalate crystals (**Figure 4**). The patient was dicharged from the hospital on day 4, with the same treatment prescribed. On day 11, when he returned to the outpatient department, all of his symptoms were resolved, visual acuity was 7/10, and intraocular pressure was normal. Slit-lamp examination revealed normal conjunctiva, clear cornea, and a reduction of crystals in the corneal stroma (**Figure 5**). Because of his positive clinical response, observed after 1 week, the frequency of prednisolone acetate was reduced to 4 times daily.

Subsequent tapering should be individualized based on the resolution of patient symptoms and the patient status of the eyelids, conjunctiva, and cornea, typically reducing the dosage by 1-2 drops per week. In this case, systemic corticoid usage was also reduced to 1.5 tablets (oral) daily, and subsequent tapering was also based on the patient's symptoms and clinical finding status. In line with typical cases, the dosage was reduced by 0.5 tablets per week for 2 weeks.

The crystals had disappeared from the cornea when he was reviewed 1 month later. He maintained good visual acuity (10/10) and no corneal opacity was noted (**Figure 6**).

Case 2

A 58-year-old woman presented with a 2-day history of *Dieffenbachia* sap splashing into her left eye, with complaints of ocular pain and tearing. Upon examination, her visual acuity was 4/10, and her other signs were similar to those in Case 1, including conjunctiva congestion, mild corneal edema, corneal punctate epithelial lesions, and tree sap crystal deposits

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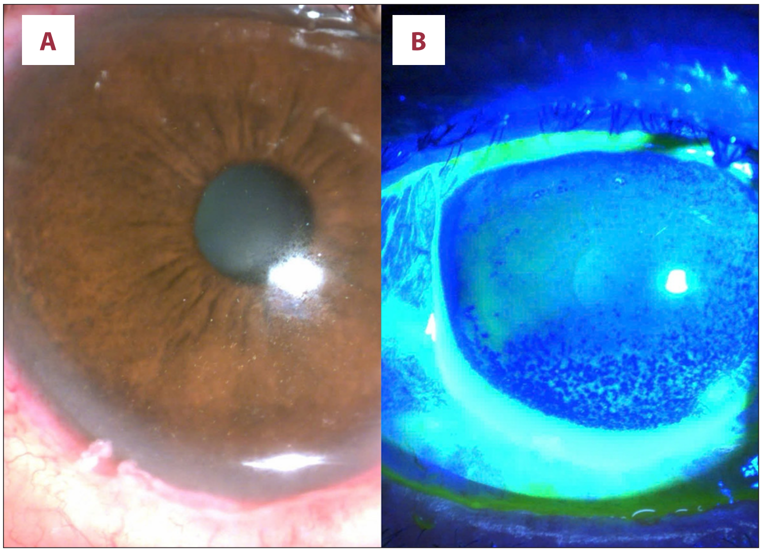

Figure 2. Case 1: Initial slit-lamp examination. (**A**) Conjunctival chemosis, corneal edema, and fine, needle-like oxalate crystals deposited within the corneal epithelium and stroma. (**B**) Superficial punctate keratitis visualized under fluorescein staining.

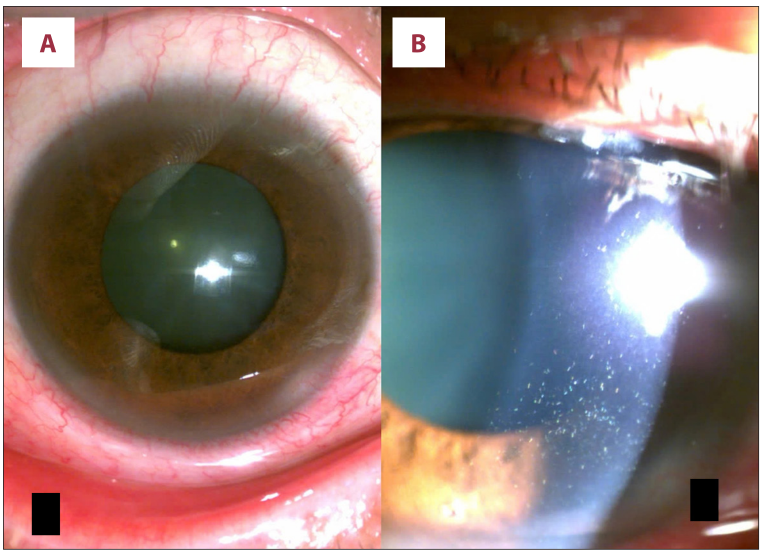

Figure 3. Case 1: Slit-lamp examination, 3 days after admission. (**A**) Resolution of conjuctival chemosis and corneal edema. (**B**) Needle-like crystals deposited within the corneal stroma.

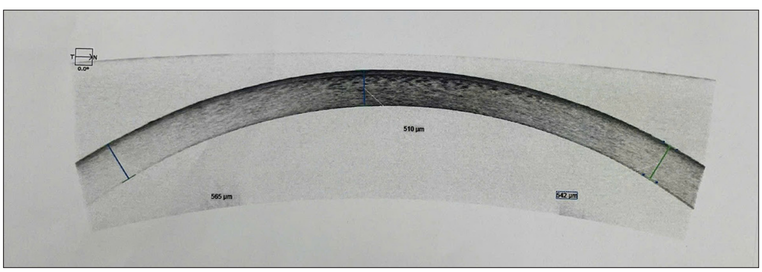

Figure 4. Case 1: Anterior segment optical coherence tomography.

in the anterior stroma (**Figure 7**). Initially, irrigation was performed in the left eye. She was treated conservatively, with a similar protocal to that used in Case 1, with prednisolone acetate 1%, 6 times daily and moxifloxacin 0.5%, 6 times daily. The tapering protocal was also similar to that used in Case 1.

During outpatient follow-up, under the conservative management protocol similar to Case 1, the clinical signs (eyelid edema, conjunctival hyperemia, and intracorneal crystals) progressively resolved. The patient's visual acuity improved to 6/10 at 1 week and reached 8/10 after 8 weeks, by which point the symptoms had almost entirely subsided. Stroma calcium oxalate crystals and other ocular findings gradually decreased and eventually disappeared after 8 weeks, and no further complications were noted.

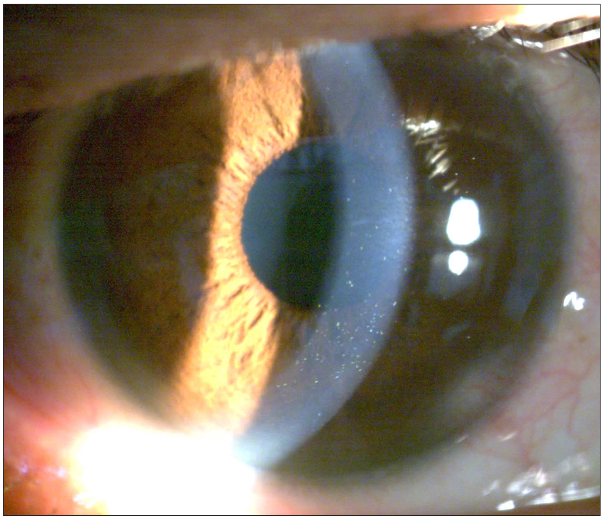

Figure 5. Case 1: Slit-lamp examination on day 11. The cornea appears clear, with a significant reduction in crystalline deposits.

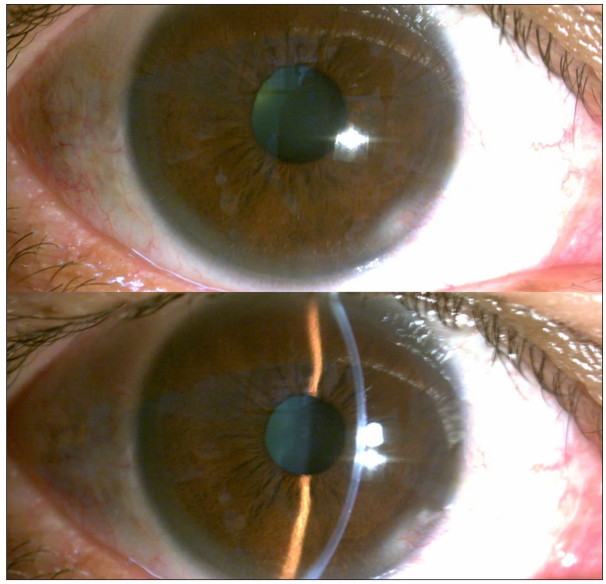

Figure 6. Case 1: Slit-lamp examinationat the 4-week follow-up visit. The crystals had completely resolved.

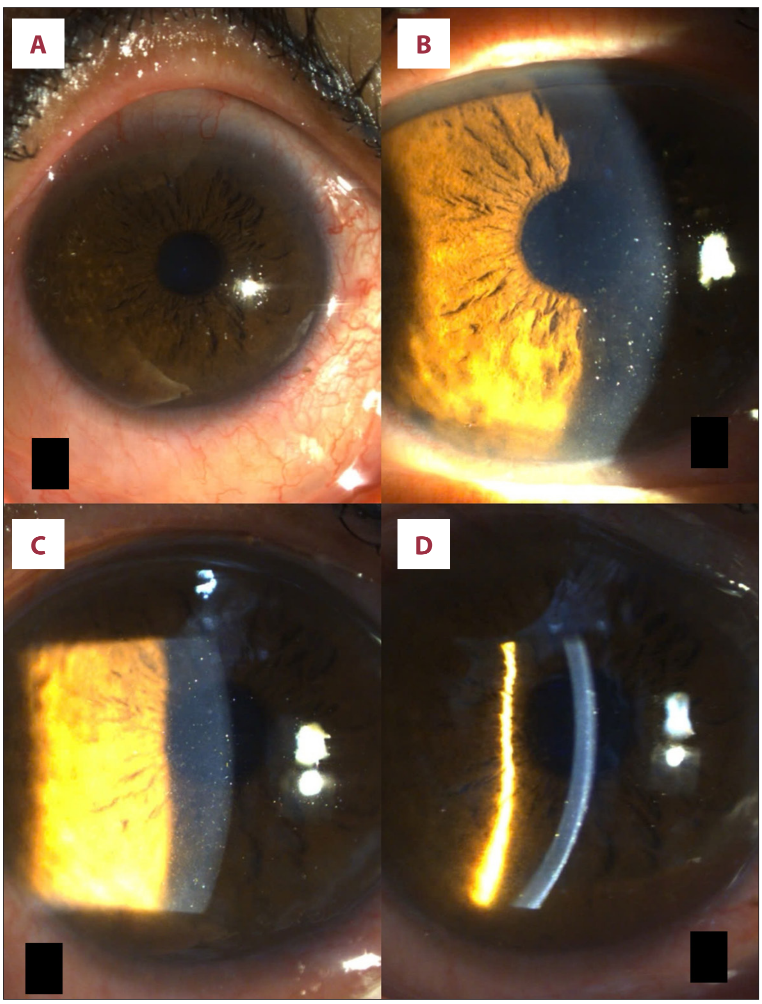

Figure 7. Case 2: Initial slit-lamp examination. (**A**) Chemosis. (**B, C**) Corneal punctate appearance. (**D**) Fine, needle-like oxalate crystals deposited within the cornea.

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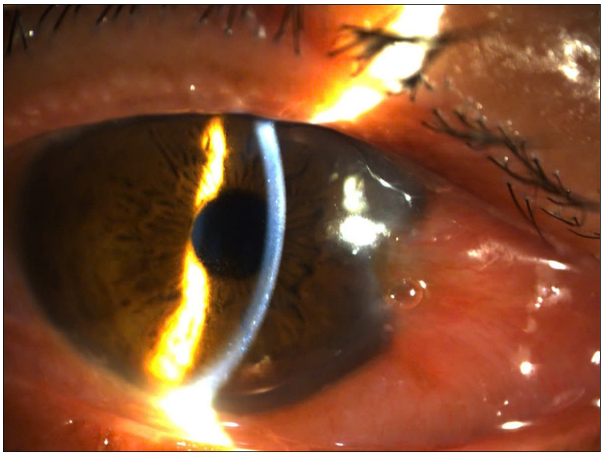

Figure 8. Case 3: Initial slit-lamp examination shows conjunctival chemosis and fine, needle-like crystalline deposits within the cornea.

Case 3

A 56-year-old male farmer presented with acute pain and irritation in the right eye after plant sap exposure. Examination showed visual acuity was 5/10, with chemosis and characteristic needle-like oxalate crystals (**Figure 8**). Following irrigation, he was treated with topical loteprednol 0.5%, 6 times daily, and moxifloxacin 0.5%, 6 times daily.

At the 1-week follow-up visit, the patient's visual acuity was 7/10, accompanied by progressive resolution of clinical symptoms and a reduction of intracorneal stromal crystals. Consequently, the medication dosage was tapered, following the same protocol as in Cases 1 and 2. By the 4-week follow-up, the patient's visual acuity had reached 10/10, all symptoms had completely resolved, and the cornea was clear with no remaining crystalline deposits.

Discussion

Dieffenbachia is a common ornamental plant belonging to the Araceae family. It is known for its toxicity and its ability to induce irritation, swelling, and excessive secretion upon contact of its sap with the skin or mucous membranes. The plant is also commonly referred to as "dumb cane," as exposure of the sap to the oral cavity may cause tongue swelling, hypersalivation, and transient loss of speech ability.

Globally, there are 12 families, 20 genera, and more than 5000 species of plants containing white latex. Several toxic components have been identified in this type of sap, including essential oils, alkaloids, amino acids, cyanogenic glycerides, cardiotonic glycerides, furanocoumarins, and plant acids. Direct ingestion or dermal exposure to these toxic substances can lead to irritative symptoms such as urticaria, vesiculation, and erythema. Gastrointestinal exposure may result in vomiting, diarrhea, and dehydration. Ocular contact may cause allergic conjunctivitis, keratitis, or uveitis [1]. In the genus *Dieffenbachia*, the latex contains proteolytic enzymes and calcium oxalate crystals, which contribute to the characteristic clinical manifestation of green birefringent raphides within the corneal stroma [3,6].

All plant crystals are the result of biogenic mineralization processes. Among these, calcium oxalate crystals represent the most common system, with more than 74% of flowering plant families containing calcium oxalate [7]. Calcium oxalate crystals in plants have been documented in 5 distinct morphologies: needle-shaped crystals (raphides), aggregate crystals (druses), prism-shaped crystals (prisms), elongated styloid crystals (styloids), and granular crystal sands [8]. Raphides are characterized by sharp, needle-like morphology and lengths ranging from approximately 16 µm to 300 µm in certain species [9,10]. In Rauber's investigation of calcium oxalate morphology in *Dieffenbachia*, the predominant crystal types observed were raphides and druses [11].

In the present article, emphasis is placed on the role of raphides, as we posit that needle-shaped raphides have greater potential for inducing corneal epithelial damage compared with druses, which Rauber suggested may only damage oral mucosa due to their coarse surface texture [11]. Raphides are thought to function as defensive structures against herbivory through both active and passive mechanisms [12]. Active defense occurs when crystals physically penetrate herbivore tissues, causing mechanical injury, whereas passive defense refers to their structural role in reinforcing plant cell architecture, thereby enhancing resistance to mechanical or chemical damage [12]. Furthermore, proteolytic enzymes and other biologically active toxic compounds often surround raphides at the moment of discharge, allowing the raphides to act as toxin delivery systems that exacerbate corneal injury beyond mere mechanical damage [3,13-16]. To conceptualize this process, one may envision raphides as toxin-coated darts launched by idioblast cells into the cornea, penetrating the epithelial layer with their sharp crystalline tips while concurrently inducing inflammatory injury via associated chemical toxins (**Figure 9**).

The pathogenesis of crystalline keratitis resulting from contact with *Dieffenbachia* sap remains controversial; however, it is generally considered to involve 2 principal mechanisms: mechanical and chemical (described below).

Mechanical Mechanism

As mentioned above, *Dieffenbachia* species contain biforine cells capable of discharging raphide crystals upon mechanical

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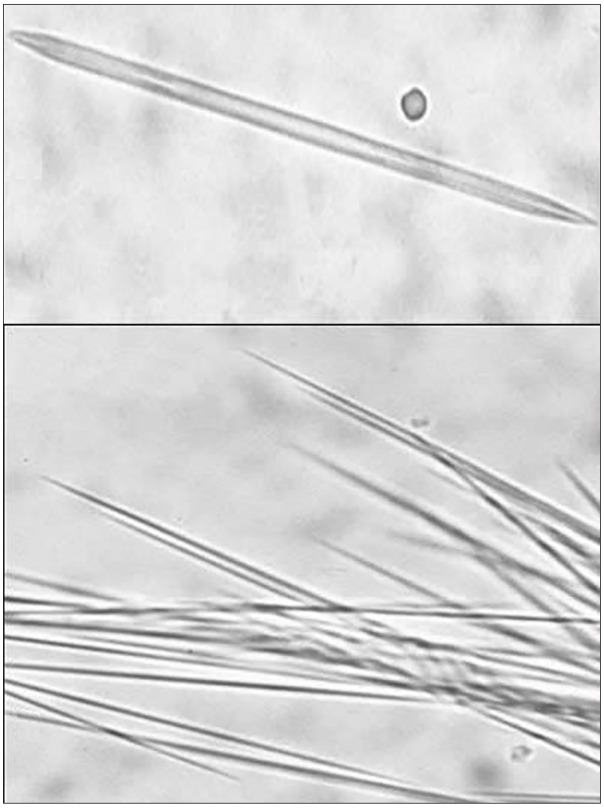

Figure 9. Upper: Raphide calcium oxalate crystal.
Lower: Multiple raphide crystals.

stimulation (such as pressure or compression), thereby producing local injuries (on mucosa or skin) through penetration.. This mechanism is considered crucial, as certain plant species containing raphides but lacking idioblast cells are non-toxic [10,11,17]. Furthermore, a study by Fochtman et al supports the role of idioblasts in corneal injury, as the experimental findings indicated no observable corneal changes following topical instillation of a 5% calcium oxalate solution in rabbit eyes [13]. When the plant is cut, cell fragments from the stem or sap secretions may contain biforine cells that can come into contact with the cornea. Under substantial mechanical impact or compression applied to the stem or biforine cells, these cells can discharge needle-shaped crystals that are propelled into the eye, penetrating the corneal epithelium and producing superficial punctate epithelial defects. Subsequently, these needle-like crystals may migrate deeper, becoming deposited within the corneal stroma, forming the characteristic fine blue calcium oxalate crystals visible in the anterior stroma within the first 24 hours, with possible deeper stromal penetration over the following 48 hours [6]. Owing to this mechanism, stromal crystal deposits typically correspond in location to sites of epithelial injury. All 3 cases in our report exhibited needle-shaped calcium oxalate crystals in the cornea, corresponding to epithelial defects from mechanical penetration, supporting the mechanical mechanism.

Chemical Mechanism

Proteolytic enzymes and other toxic substances contribute to significant pain and cause edema of the eyelids and conjunctiva [3,13-16]. In Ellis at al [3], rabbit corneas exposed to *Dieffenbachia* sap exhibited clinical signs of keratoconjunctivitis. Histopathological examination revealed infiltration of polymorphonuclear leukocytes in the epithelial layer extending into the stroma, with no observed damage to Descemet's membrane or the endothelium. This condition gradually improved over 7 to 10 days. Notably, in the same study, keratoconjunctivitis and corneal lesions visualized with fluorescein staining persisted even after exposure to sap that had been filtered to remove calcium oxalate crystals [3]. Further, research by Fochtman et al [13] highlighted species-dependent toxicity, showing that sap from *Dieffenbachia exotica* caused less keratoconjunctival damage in rabbits compared with sap from *Dieffenbachia picta*, despite higher calcium oxalate concentrations in *D. exotica* sap. The severity of keratitis may therefore depend on the specific species' toxicity, the concentration of toxins present in the sap, and the duration of exposure [1]. All of the patients in our report experienced pain and conjunctival edema. This suggests chemical inflammation, consistent with proteolytic enzyme toxicity in the literature.

Most corneal crystals resolve spontaneously within 4 to 8 weeks of basic medical treatment (topical antibiotics, anti-inflammatory agents, and artificial tears) without the need for surgical intervention [1-3,18]. The mechanism by which the cornea clears these deposited crystals remains unclear, but one hypothesis suggests that monocytes reacting to calcium oxalate crystals act as "clean-up" agents. Specifically, in the experiments reported by Kusmartsev et al [19], monocytes responded to calcium oxalate crystals by producing pro-inflammatory cytokines such as tumor necrosis factor-alpha (TNF-α), IL-1β, IL-6, and chemokines including CCL2. These signals activate and recruit circulating monocytes and tissue macrophages to promote calcium oxalate clearance [19].

While the 2 aforementioned mechanisms provide a preliminary understanding of the disease's pathogenesis, both are primarily derived from animal models and in vitro studies. There remains a significant lack of in vivo clinical research on human corneal tissue utilizing high-resolution imaging modalities, such as in vivo confocal microscopy.

A list of differential diagnoses for crystalline keratopathy includes Bietti crystalline dystrophy, Schynder corneal dystrophy, infectious crystalline keratopathy and drug-induced crystalline keratopathy. Additionally, there are several systemic conditions that cause crystalline keratopathy such as hyperuricemia, tyrosinemia, cystinosis, and multiple myeloma [2]. Infectious crystalline keratitis is usually present in patients

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with an immunocompromised corneal state and in patients with long-term topical steroid therapy. Physical examination may reveal anterior stromal, needle-like, branching, white-grey crystals with an intact epithelium [20]. Schnyder corneal dystrophy has a bilateral involvement, autosomal dominant inheritance, progressive course and presence of raphides crystals in the subepithelium only [2]. In contrast to these other causes of crystalline ocular keratopathy, keratitis caused by *Dieffenbachia* plant sap will be associated with a clear history of plant sap exposure, and can be distinguished by blue needle-shaped calcium oxalate crystals with a superficial punctate appearance.

In our 3 clinical cases involving accidental ocular exposure to milky sap from the *Dieffenbachia* family plant, all patients presented with common symptoms of conjunctival inflammation, ocular pain, and irritation. Clinical examination consistently revealed superficial punctate keratopathy and, most characteristically, fine bluish crystals deposited from the anterior to the posterior corneal stroma. These clinical manifestations are highly consistent with previously reported cases of *Dieffenbachia* sap keratopathy worldwide [2,4,5].

In all 3 of our cases, conservative management was employed, including ocular irrigation, topical antibiotics, and topical corticosteroids. Notably, the first case also received systemic corticosteroid therapy. Consistent with other literature, primary treatment modalities predominantly involved topical corticosteroids and prophylactic antibiotics [2,4,5].

All 3 cases achieved favorable clinical outcomes; visual acuity was fully recovered, and the cornea remained clear without scarring or neovascularization within a 4- to 8-week period of treatment. Similarly to our findings, the existing literature also indicates that patients typically regain maximal visual acuity without permanent corneal complications [2,4,5].

Limitations

The quality of anterior segment optical coherence tomography imaging at our facility was insufficient to clearly visualize the intra-corneal crystals or raphides within the stromal layers. Additionally, the unavailability of confocal microscopy further limited our ability to provide high-resolution cellular-level clinical imagery. This study also did not perform a quantitative chemical analysis of the plant sap or the corneal crystals, nor did it measure the concentrations of proteolytic enzymes or inflammatory markers in the tear film. Consequently, the pathogenesis presented in this article is primarily based on a synthesis of existing literature and pathophysiological inference rather than direct experimental evidence from these specific cases. Finally, this single-center, small-sample study lacked long-term follow-up. Future multicenter studies with laboratory assays could further elucidate the pathogenesis of this condition.

Conclusions

Keratoconjunctivitis induced by *Dieffenbachia* plant sap is a multifactorial disease involving mechanical injury from calcium oxalate raphides and chemical inflammation from proteolytic enzymes, with a partially unclear pathogenesis. Slit-lamp examination reveals, typically, a fine, blue, needle-like crystalline deposit in the corneal stroma, right under punctate epithelial lesions. Plant sap-induced keratitis responds favorably to conservative topical treatment, with patients achieving full recovery without complications within 4 to 8 weeks. Ophthalmologists should have knowledge about the presentation of crystalline keratopathy to make the correct clinical decision. Regarding prevention, health education, and public awareness, hose handling or caring for these plants are important. In addition to using gloves and long-sleeved clothing during plant maintenance, the use of protective eyewear is a critical measure. The major limitation of this study is its small sample size, which is limited to a case series of only 3 patients. Further studies on the chemical constituents of the tree sap would be necessary to clarify the pathology of crystalline keratopathy.

Department and Institution Where Work Was Done

The work was done in the Cornea Department at Ho Chi Minh City's Eye Hospital in Vietnam, Ho Chi Minh City, Vietnam.

Patient Consent

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

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AI Disclosure

During the preparation of this manuscript, the authors used Google Gemini solely for language editing and grammar correction. The final copy of the manuscript was fully revised and written by the authors.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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