

Bilateral Symmetric Circular Toxic Corneal Epitheliopathy Caused by Residual Disinfectant on an A-Scan Ultrasound Biometry Probe: A Case with Transient Visual Acuity Reduction

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Abstract

We report a rare case of bilateral, symmetric circular toxic corneal epitheliopathy caused by residual disinfectant solution (contains a foam from combination of citric acid and sodium chlorite) on an A-scan ultrasound biometry probe, producing transient visual acuity reduction. A 61-year-old woman underwent routine preoperative A-scan biometry prior to cataract surgery, minutes later, she presented with striking bilateral circular 5.5 - 6 mm central epithelial lesions containing dense necrotic precipitates. Visual acuity dropped unexpectedly from 0.7/0.6 pre-biometry to 0.4 OU. Although the optician initially stated that the probe had been dried, further questioning revealed that drying was inadequate, allowing residual disinfectant to remain on the probe tip. The patient works as a denture technician but denied any prior chemical or foreign-body exposure or previous contact lens use. Intensive lubrication and mild topical steroid led to complete recovery within 7 days. Disinfectant-induced corneal toxicity can occasionally produce substantial yet transient visual impairment when necrotic epithelium obstructs the visual axis. Perfect bilateral symmetry strongly supports instrument-mediated chemical transfer. Proper and optimal drying of A-scan probes is essential to prevent avoidable iatrogenic injury.

Keywords

A-Scan Biometry, Bilateral Circular Epitheliopathy, Cataract Patients, Chemical Corneal Injury, Disinfectant Residue, Iatrogenic Corneal Toxicity, Pre Operative Evaluation, Toxic Keratopathy, Transient Visual Loss

1. Introduction

Chemical epitheliopathy from inadequately rinsed or dried ophthalmic instruments is well described, especially with applanation tonometry. Reports specifically involving A-scan biometry probes are rare. This case highlights a perfectly symmetric bilateral injury, with a notable transient drop in vision [1].

Corneal epitheliopathy refers to damage of the corneal epithelial layer that can appear in several different patterns and is associated with non-specific symptoms like foreign-body sensation, photophobia, discomfort, and excessive tearing. It is presented with a circular-like defect in the form of the contact object, like the tonometer, which is known as the target sign due to residual chemical disinfectants. Therefore, ensuring proper drying of the objects after disinfection is essential as it is important to allow the probability of effective sterilization and in addition avoid chemical injury to the corneal epithelium. The preferable management for these cases is the use of preservative-free lubricants and surface protection [1].

Contact pachymetry can be a vehicle and a cause of infection transmission due to its risk of contamination [2].

In Addition to Chemical epitheliopathy, the risk of infectious agents which could be included are adenovirus 8 and 19, herpes simplex virus (HSV) 1 and 2, human immunodeficiency virus 1, hepatitis C virus, enterovirus 70, and variant Creutzfeldt-Jakob disease. In some studies, it was revealed that adenovirus 8 was eliminated after sodium hypochlorite disinfectant, otherwise it was revealed that all viable viruses were eradicated with isopropyl alcohol. On the other hand, mechanical cleaning lacks the ability to remove the cellular debris completely. The corneal injury could be due to this residual chemical, otherwise the effect of disinfectant at the head of the tonometer may present as swelling of tonometer tips and cracks due to dissolving the glue that holds the hollow tips together [3].

In Terms of recommendations, advised disinfection of the tonometer and pachymetry tip using solutions such as hydrogen peroxide, dilute sodium hypochlorite, or isopropyl alcohol rather than wiping it with alcohol. However, alcohol wipes alone may not reliably eliminate certain viruses, including hepatitis B and C. Therefore, when hydrogen peroxide is used, the disinfected tip or fundus lens must be carefully rinsed and dried immediately before use, instead of assuming that this was already performed adequately during preparation [4].

2. Case Presentation

A 61-year-old woman presented for final preoperative assessment before left-eye cataract surgery. She works as a denture technician but explicitly denied exposure to chemicals, foreign bodies, or trauma before her appointment. Best-corrected visual acuity (BCVA) documented same day earlier, prior to biometry was OD 0.7/OS 0.6 (decimal).

Minutes after doing a routine A-scan biometry performed by an optician, the patient was noted to have striking bilateral symmetric circular central corneal ep-

ithelial lesions $\approx 5.5 - 6$ mm in diameter, on slit-lamp examination, with dense whitish necrotic epithelial precipitates, sharp margins, and mild surrounding epithelial edema (**Figure 1**, **Figure 2**). Fluorescein staining showed intense, well-demarcated circular uptake confined to the epithelium, with no stromal involvement. (no available figures).

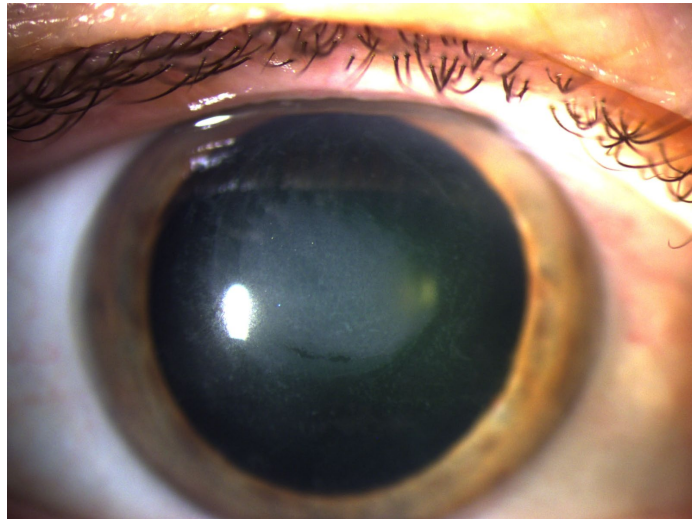


Figure 1. OD in Mydriasis, Slit-lamp photographs with showing bilateral perfectly symmetric circular corneal epithelial defects with central whitish necrotic precipitates ($\approx 5.5 - 6$ mm diameter), sharp borders, and minimal stromal involvement.

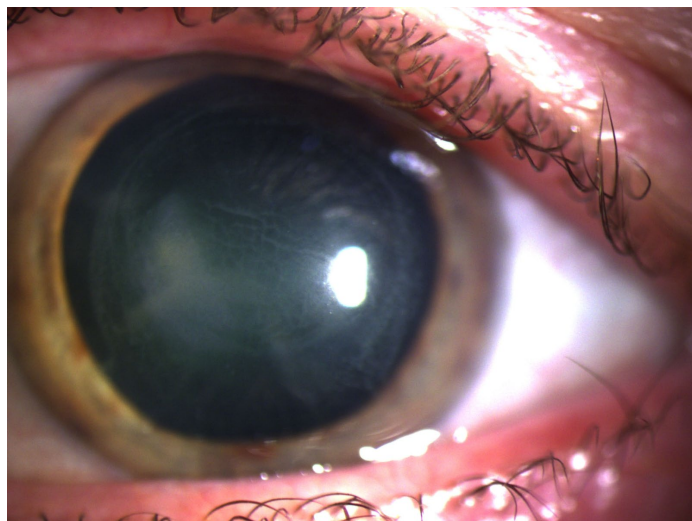


Figure 2. OS in Mydriasis, Slit-lamp photographs with showing bilateral perfectly symmetric circular corneal epithelial defects with central whitish necrotic precipitates ($\approx 5.5 - 6$ mm diameter), sharp borders, and minimal stromal involvement.

Repeat visual acuity testing in clinic: dropped significantly to approximately 0.4 OU - a finding that initially surprised the examiner given the pre-biometry BCVA of 0.7/0.6 and the severity of the corneal changes.

Despite the dramatic corneal changes on the slit-lamp examination, the patient

reported only mild foreign body sensation, without severe pain or photophobia.

A detailed history excluded contact lens use, recent infection, new topical medications, trauma, or occupational chemical exposure. The perfect bilateral symmetry and identical morphology rendered natural bilateral corneal pathology highly improbable and strongly implicated an iatrogenic cause related to the immediately preceding A-scan biometry. Upon direct questioning, the optician admitted removing using the probe after disinfecting (with a foam of combination of citric acid and sodium chlorite) and applied it to both corneas without wiping, well drying or rinsing with distil water.

The patient was treated with intensive preservative free hyaluronate gel hourly and topical dexamethasone 1mg/ml twice daily. Complete corneal epithelial healing with restoration of baseline visual acuity was observed within 7 days, and cataract surgery uneventfully done two weeks later (**Figure 3**, **Figure 4**).

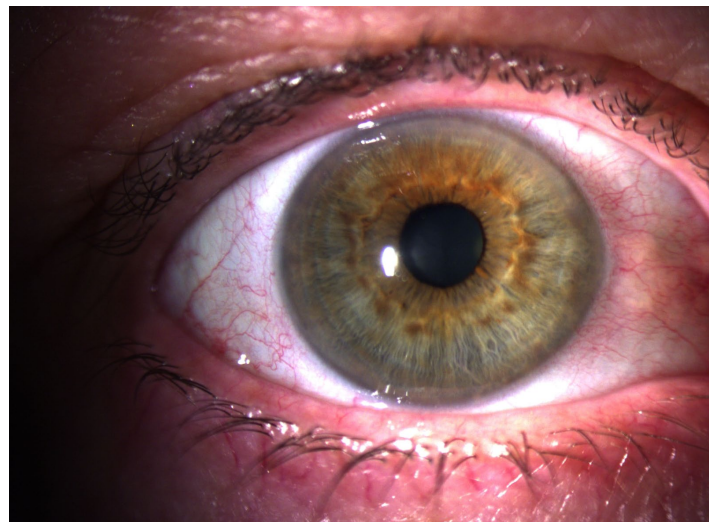


Figure 3. OD, Slit-lamp photographs with showing bilateral clear corneas 1 week after management.

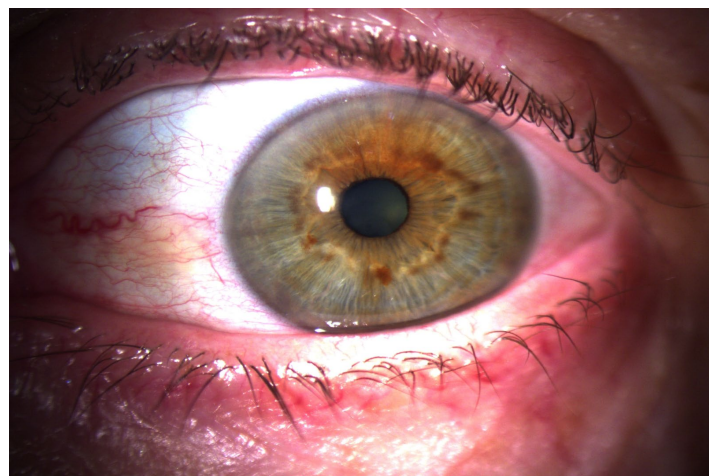


Figure 4. OS, Slit-lamp photographs with showing bilateral clear corneas 1 week after management.

3. Discussion

Povidone-Iodine and Polyhexanide showed cytotoxic effects on corneal and conjunctival epithelial cell lines (hTCEpi and hCjE), regardless of exposure time or concentration. Otherwise, exposure to these antiseptics for clinically relevant pre-operative times did not affect cPARP1 or Ki67 expression. Overall, the findings indicate that while isolated epithelial cells are highly susceptible to Povidone-Iodine and Polyhexanide toxicity, intact tissue models and porcine corneas show no significant adverse changes after short-term exposure [5].

Ocular surface toxicity can be due to long-term exposure to hydrogen peroxide, which can lead to keratoconjunctival inflammation with scar formation similar to ocular cicatricial pemphigoid. This can necessitate penetrating keratoplasty combined with amniotic membrane transplantation [6].

This case is particularly instructive due to the rare documentation of significant transient visual acuity reduction in disinfectant-induced toxic epitheliopathy - a condition typically associated with paradoxically preserved vision despite alarming slit-lamp findings. The initial clinical surprise ("How can she see 0.7/0.6 with this cornea?") was resolved upon repeat testing, which confirmed an acute drop to 0.4 OU, directly attributable to the dense central necrotic epithelium obstructing the visual axis.

Inadequate drying or cleaning with distal water can leave enough disinfectant residue to produce epithelial necrosis. Rapid desquamation of the toxic layer - facilitated by intensive lubrication and mild anti-inflammatory therapy - resulted in immediate restoration of optical clarity and return to baseline BCVA within 7 days.

The perfect bilateral symmetry remains the diagnostic cornerstone, being virtually pathognomonic for instrument-mediated chemical transfer when applied sequentially to both eyes.

Although similar circular lesions are well-described with contaminated Goldmann tonometer tips, reports involving A-scan probes are exceedingly rare, making this case a valuable addition to the literature.

4. Conclusions

When pre-injury visual acuity records appear incongruent with severe corneal findings, repeat acuity testing is mandatory. Perfect bilateral symmetry in epithelial lesions should prompt immediate investigation of instrument disinfection protocols, because it is essential to prevent iatrogenic chemical injuries. This case underscores both the diagnostic power of symmetry and the potential for transient but significant visual impairment in chemical epitheliopathy, with excellent prognosis when promptly managed.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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Disclosures

Human Subjects

Informed consent for treatment and open access publication was obtained or waived by all participants in this study.

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All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

Conflicts of Interest

All the authors declare no conflict of interest related to this study research report.

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