Buletin SK 10(2)(2026): 128-131
https://doi.org/10.17576/bsk-2026-10(2)-05 ISSN 2250-1852

Laporan Kes / Case Report

Management of Inferior Corneal Staining Associated with Partial Blinking Using Bandage Contact Lenses and Forced Blink Exercises

Pengurusan Pewarnaan Kornea Inferior Berkait dengan Kelipan Separa Lengkap dengan Kanta Lekap Pembalut dan Latihan Kelipan Mata Secara Paksa

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Received date: 10 September 2026
Revised date: 6 October 2026
Accepted date: 8 October 2026
Published date: 10 October 2026

ABSTRACT

Partial blinking can disrupt tear film stability, leading to inferior corneal desiccation and staining. This case report presents the clinical management of a 19-year-old female who presented to the UKM Optometry Clinic with bilateral grade 3 inferior corneal staining associated with an incomplete blinking pattern. The patient was treated using a combination of therapeutic silicone hydrogel bandage contact lenses (Biofinity) and forced blink exercises. Following intervention, the inferior corneal staining resolved significantly to minimal superficial staining. Although transient complications, including a hordeolum and early corneal neovascularization (grade 0.5), occurred due to compliance issues and extended wear, modifying the wear schedule and improving lid hygiene resolved these findings. This case highlights the clinical efficacy of combining bandage contact lenses with targeted blinking therapy to restore corneal integrity, while reinforcing the critical importance of patient compliance in contact lens management.

Keywords: incomplete blinking pattern, inferior corneal staining, bandage contact lens

ABSTRAK

Kelipan mata separa lengkap boleh menyebabkan masalah pengeringan permukaan kornea dan membawa kepada pewarnaan kornea inferior. Laporan kes ini mendokumentasikan pengurusan seorang wanita berumur 19 tahun yang datang ke Klinik Optometri UKM dengan pewarnaan kornea inferior gred 3 pada kedua-dua belah mata yang disebabkan oleh corak kelipan mata separa lengkap. Pesakit diuruskan menggunakan gabungan terapi kanta lekap pembalut (silikon hidrogel Biofinity) dan senaman kelipan mata secara paksa. Selepas rawatan, pewarnaan kornea inferior berkurangan secara signifikan kepada gred superfisial minimal. Walaupun pesakit mengalami komplikasi sementara seperti ketumbit dan tanda awal neovaskularisasi kornea gred 0.5 disebabkan oleh isu pematuhan dan tempoh pemakaian, modifikasi jadual pemakaian serta amalan kebersihan kelopak mata yang betul telah menyelesaikan komplikasi tersebut. Kes ini menonjolkan keberkesanan gabungan kanta lekap pembalut dan senaman kelipan mata dalam memulihkan integriti permukaan kornea, di samping menekankan peranan penting pematuhan pesakit terhadap arahan penjagaan

Kata kunci: kelipan mata separa lengkap, pewarnaan kornea inferior, kanta lekap balutan

INTRODUCTION

Tear film integrity plays an essential role in protecting the ocular surface against microbial pathogens, nourishing the corneal epithelium, and maintaining a smooth, clear optical surface. Complete and regular blinking spreads tears evenly across the cornea to prevent localized desiccation. However, individuals exhibiting a partial blinking pattern experience inadequate tear distribution, specifically over the inferior corneal quadrant. This localized drying often manifests clinically as inferior superficial punctate corneal staining when visualized with fluorescein dye.

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Partial blinking is a major contributing factor to ocular surface desiccation, evaporative dry eye, and contact lens discomfort. Management strategies generally focus on restoring the tear film, encouraging epithelial healing, and re-educating the palpebral musculature. High oxygen transmissibility bandage contact lenses provide a mechanical shield over damaged epithelium, protecting the ocular surface from palpebral friction while maintaining sufficient oxygenation for re-epithelialization (Gromacki 2012).

Concurrently, forced blinking exercises help promote full meibomian gland expression and ensure complete tear coverage across the corneal apex and inferior margin (Kim et al. 2020). This case report evaluates the therapeutic efficacy of combining bandage soft contact lenses with structured blinking exercises in a young patient presenting with partial blinking and severe inferior corneal desiccation.

METHODOLOGY AND DIAGNOSTIC PROCEDURES

Baseline distance visual acuity (VA) was measured using a Snellen chart at 6 meters, showing an uncorrected VA of 6/9 in both eyes, which improved to 6/6 with spectacle correction. Ocular surface integrity and tear film stability were evaluated using a slit-lamp biomicroscope. To assess corneal desiccation, a sodium fluorescein strip moistened with sterile saline was applied to the lower bulbar conjunctiva, and staining was examined under cobalt blue light. Corneal staining was graded from 0 to 4 based on lesion density and location, revealing Grade 3 horizontal band-like staining isolated to the lower 3 mm of both corneas. Blinking patterns were evaluated by observing spontaneous complete versus incomplete eye closure during natural conversation over 2 minutes.

Treatment involved fitting the patient with monthly silicone hydrogel bandage contact lenses (Biofinity, Dk/t = 160) to protect the cornea from eyelid friction while maintaining sufficient oxygen supply and correcting her vision. Additionally, the patient was instructed to perform forced blinking exercises (15 full closures held for 2 seconds, 3 times daily) to encourage complete lid closure and improve tear distribution. Follow-up examinations were conducted at 2 weeks, 3 weeks, 7 weeks, and 10 months. Each visit included VA re-assessment, slit-lamp evaluation of corneal staining, upper lid checks for papillae, and monitoring for complications such as hordeola or corneal neovascularization.

CASE PRESENTATION

PATIENT HISTORY AND INITIAL VISIT

A 19-year-old Malay female presented to the UKM Optometry Clinic for a routine comprehensive ocular examination. The patient reported no history of systemic diseases or prior ocular conditions and presented without active visual or ocular complaints. Family history was unremarkable except for refractive errors corrected with spectacles. Slit-lamp biomicroscopy with sodium fluorescein dye revealed bilateral, horizontal band-like inferior corneal staining (Grade 3) measuring approximately 3 mm in width. Assessment of the patient's blink mechanics confirmed a distinct partial blinking pattern. Anterior segment evaluation revealed no other systemic or ocular abnormalities. The patient was instructed to do forced blinking exercises to re-educate her palpebral closure.

FOLLOW-UP 1 (2 WEEKS LATER)

Upon the first follow-up, upper palpebral conjunctival examination revealed bilateral papillae (Grade 0.5). Inferior corneal staining had worsened in both eyes, with greater severity in the left eye compared to the right eye. Blink evaluation demonstrated that the patient continued to exhibit an incomplete blinking habit.

To facilitate corneal epithelial healing and correct her underlying refractive error, therapeutic bandage contact lenses were indicated. Monthly silicone hydrogel soft contact lenses (Biofinity) were fitted. The lenses improved both visual performance and cosmetic confidence without requiring spectacles. The patient was instructed to continue the forced blink exercises in tandem with lens wear.

FOLLOW-UP 2 & MANAGING COMPLICATIONS

Following one week of bandage contact lens wear combined with blinking exercises, inferior corneal staining significantly decreased, particularly in the left eye. An extended-wear lens was initially advised. However, at the subsequent follow-up, the patient reported temporarily discontinuing lens wear due to growth of an acute hordeolum on her left upper eyelid. Slit-lamp evaluation confirmed marked reduction in inferior corneal staining despite the palpebral lesion.

Following complete resolution of the hordeolum, the patient returned for follow-up. Minimal superficial corneal staining (Grade 1) remained inferiorly in both eyes. The wear schedule was adjusted to daily wear (maximum 12 hours per day, excluding sleep). The patient was prescribed a daily regimen of forced blinking drills consisting of 3 sessions per day (15 repetitions per session).

At the 4-week follow-up, inferior corneal staining showed improvement. However, early-stage corneal neovascularization (Grade 0.5) was noted at the inferior cornea of the left eye. Lens wear

was immediately paused for 4 days. Re-evaluation after 4 days showed complete regression of the neovascularization, allowing resumption of daily contact lens wear.

FINAL OUTCOMES (10 MONTHS REVIEW)

Due to scheduling constraints, the patient returned for her final follow-up 10 months later. She had transitioned to an occasional wear schedule. Slit-lamp biomicroscopy revealed minimal, trace superficial corneal staining in the inferior region of both eyes. Evaluation of blink pattern demonstrated marked improvement, approaching a complete palpebral closure pattern.

DISCUSSION

Sodium fluorescein dye assessment using a cobalt blue filter and a Wratten yellow filter is a standard clinical method for evaluating corneal epithelial integrity (Bandamwar et al. 2012). In this patient, significant horizontal inferior corneal staining was linked to partial blinking habits. Incomplete palpebral closure compromises tear film stability across the inferior ocular surface and lower meniscus (Guillon et al. 1990; Begley et al. 1996). Studies demonstrate that up to 90.9% of partial blinkers exhibit corneal staining, compared to lower rates in complete blinkers (Ishak et al. 2020). Complete blinking promotes full lipid layer distribution from the meibomian glands, reducing tear evaporation and protecting the ocular surface (Osuagwu 2017).

Conversely, in soft contact lens wearers, incomplete blinking restricts lens movement, leading to localized desiccation beneath and around the lens matrix (Osuagwu 2017, Ishak et al. 2020). Re-educating eyelid motion facilitates full lipid spread, prevents meibomian orifice clogging, and improves tear film renewal (Osuagwu 2017). Practising structured blinking exercises (e.g., 10 to 15 full blinks per session across multiple daily sets) yields significant clinical improvement in dry eye metrics within 3 to 6 weeks (Kim et al. 2020).

Several clinical considerations highlighted both the therapeutic benefits and potential complications of this management approach:

- Mechanism of Bandage Lenses: Silicone hydrogel bandage lenses possess high oxygen transmissibility (Dk/t), ensuring adequate corneal epithelial oxygenation while shielding damaged tissue from palpebral mechanical friction during blinks (Gromacki 2012; Chen et al. 2019).
- Management of Hordeolum: The development of a staphylococcal hordeolum during therapy was attributed to hygiene oversights during lens application or disinfection routines (Contact Lens Eyecare Gallery 2021). Standard conservative management - warm compresses, diluted infant shampoo lid scrubs, and artificial tear supplementation - successfully restored palpebral health and corneal smoothness (Zhang et al. 2018).
- Neovascularization Risk: Extended lens wear can induce localized hypoxia, leading to early vascular engagement (Grade 0.5). Prompt discontinuation of overnight wear and capping daily wear time to under 12 hours effectively reversed hypoxia-induced neovascularization.

CONCLUSION

Accurate localization and grading of corneal staining are essential clinical steps, as specific staining patterns point to distinct underlying etiologies. Silicone hydrogel bandage contact lenses combined with structured forced blink exercises provide an effective non-surgical approach to treating inferior corneal desiccation secondary to incomplete blinking. Proper lens hygiene education, routine follow-up monitoring, and strict compliance with wear schedules are paramount to avoiding complications such as hordeola or corneal neovascularization and ensuring long-term ocular surface health.

ACKNOWLEDGEMENT

We would like to sincerely thank the staff of UKM Optometry Clinic for their assistance and support.

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