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Corneal Remodeling Disorder Induced by Prolonged Wear of a Bandage Contact Lens: A Case Report

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Case Report

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Abstract

Purpose

To report a rare case of reversible non-inflammatory corneal remodeling induced by unintentional prolonged wear of a bandage contact lens (BCL) after pterygium surgery.

Methods

A 56-year-old woman presented with progressive visual loss in her left eye for 2 months. She had undergone pterygium excision with conjunctival autograft more than 2 years earlier and was fitted with a silicone hydrogel BCL postoperatively. She was lost to follow-up, resulting in long-term retention of the lens.

Results

The BCL was retained continuously for over 2 years. Slit-lamp examination showed severe conjunctival congestion, wavelike corneal irregularity, and an annular scleral indentation. Pentacam topography revealed irregular corneal deformation with a maximum keratometry (Kmax) of 52.7 D and central corneal thickening to 587 μm. Anterior segment OCT demonstrated marked epithelial undulation. After BCL removal and topical anti-inflammatory and lubricant treatment, visual acuity improved from counting fingers to 20/40 within 1 week. Corneal topography, thickness, and epithelial morphology returned to normal and were comparable to the fellow eye.

Conclusions

Prolonged and misfitted BCL wear can cause reversible corneal remodeling due to chronic mechanical stress and relative hypoxia. Strict follow-up and patient education are essential to prevent such complications. This case expands the non-infectious complication spectrum of therapeutic BCL use.

1.Introduction

The therapeutic bandage contact lens (BCL) is a soft contact lens designed to protect the ocular surface and aid in the treatment of corneal and ocular surface disorders. As an essential adjuvant therapy in ophthalmology, BCL is widely used in the treatment of corneal injuries, pterygium excision, and other ocular surface diseases, with the advantages of relieving pain, promoting epithelial healing, and maintaining ocular surface stability [1]. Characterized by high oxygen permeability, excellent anti-deposition properties, and superior wearing comfort, modern BCLs are typically fabricated from highly oxygen-permeable silicone hydrogel materials. These materials help mitigate hypoxia-related complications such as corneal edema, neovascularization, conjunctival hyperemia, and inflammation [1].

In addition, BCL can relieve pain caused by corneal injuries, promote epithelial healing, maintain ocular surface hydration, and enable ocular drug delivery [2]. However, prolonged wear beyond the recommended period—often resulting from inadequate follow-up—may lead to visual deterioration and other ocular complications, including both infectious and non-infectious types. Clinical studies and case reports on BCL-related complications have mainly focused on infectious keratitis caused by lens contamination, improper care, or prolonged wear, such as acanthamoeba keratitis and bacterial corneal ulcer. While previous reports have described corneal distortion or warpage associated with retained BCLs, the full spectrum of reversible, non-inflammatory corneal remodeling—along with its distinct biomechanical pathogenesis—has not been systematically characterized. A 56-year-old woman presented with progressive visual decline in her left eye lasting over two months. Two years prior, she had undergone left eye pterygium excision with conjunctival autograft and was fitted with a BCL. The patient was lost to follow-up, resulting in long-term retention of the lens. Following its removal, her uncorrected distance visual acuity improved from counting fingers to 20/40. One week after treatment, all examined parameters—intraocular pressure, corneal endothelial density, keratometry, corneal thickness, and topography—returned to normal and were comparable to the contralateral eye. This case report describes this rare clinical situation, clarifies the clinical characteristics and therapeutic effect of reversible corneal remodeling abnormalities induced by long-term BCL wear, and highlights the importance of adherence to follow-up protocols to prevent related morbidity, thereby providing further evidence and clinical insights for understanding non-infectious complications associated with BCL use.

2.Patient and Methods

A 56-year-old female patient was admitted on July 15, 2024, with a 2-month history of progressive visual decline in the left eye. She had undergone left eye pterygium excision with conjunctival autograft at our hospital more than two years prior and was fitted with a therapeutic bandage contact lens (BCL) postoperatively. Due to nonadherence to scheduled follow-up visits, the BCL was retained long-term. The contralateral eye had not undergone any surgical intervention.

Intraocular pressure measured by non-contact tonometry was within normal limits. Ophthalmic examination of the left eye revealed best-corrected visual acuity (BCVA) of counting fingers (CF), prominent bulbar conjunctival congestion (Fig. 1A), and an arcuate conjunctival proliferation nasally. The cornea showed wavelike surface irregularities with mild nasal opacity, though stromal transparency remained preserved. A circular indentation was observed on the sclera approximately 2 mm from the limbus (Fig. 1B). Anterior segment examination indicated normal anterior chamber depth; the pupil was round, 3 mm in diameter, with slight lens opacification. Fundus examination was unremarkable. Fluorescein staining revealed characteristic wavy pooling over the corneal surface (Fig. 1C).

Pentacam corneal topography demonstrated irregular corneal deformation with loss of the normal bowtie configuration. The maximum keratometry value (Kmax) showed a significant abnormal elevation to 52.7 diopters (D), with the steep area (hot spot) was located in the temporal side of the cornea and exhibits an asymmetric distribution (Fig. 1D). Central corneal thickness increased from 557 μm

preoperatively to 587 μm (Fig. 1E), while that of the right eye decreased from 548 μm to 538 μm over the same period. Corneal endothelial cell density (ECD) in the left eye declined from 2986 cells/mm² preoperatively to 2072 cells/mm²; the right eye decreased from 2483 cells/mm² to 2394 cells/mm². The anterior segment optical coherence tomography (AS-OCT) examination revealed prominent wavelike irregular alterations in the left corneal epithelium (Fig. 1F).

The patient was diagnosed with prolonged retention of a therapeutic bandage contact lens (BCL) in the left eye, accompanied by secondary corneal remodeling disorder, conjunctivitis, and a post-surgical state following pterygium excision.

Treatment involved removal of the retained BCL under topical anesthesia (0.5% promecaine hydrochloride eye drops). Post-removal management included a regimen of 0.1% fluorometholone eye drops (3 times daily, for 14 days) to address inflammation and 0.2% carbomer eye gel (3 times daily, for 14 days) for ocular surface lubrication and protection. All procedures were performed in accordance with the Declaration of Helsinki, and written informed consent to participate was obtained from the patient.

3.Results

The removed therapeutic bandage contact lens exhibited distinct morphological changes, presenting with a light yellow discoloration (Fig. 1J) and demonstrating an irregular surface topography. Tactile evaluation revealed significant lens hardening compared to a new, unused lens.

Clinically, the patient showed marked improvement in visual acuity, progressing from counting fingers (CF) to 20/40 uncorrected visual acuity after one week of therapeutic intervention. Ocular examination revealed substantial reduction in bulbar conjunctival hyperemia.

Corneal evaluation demonstrated significant resolution of the previously observed surface irregularities, with maintenance of excellent corneal transparency and complete epithelial integrity (Fig. 1H). Fluorescein staining patterns confirmed epithelial healing, showing absence of the characteristic wavelike accumulation typically seen in epithelial defects (Fig. 1I).

Pentacam corneal topography of the left eye demonstrated improved corneal regularity and reduced surface steepness. The axial map displayed a more symmetric and regular “bow-tie” pattern compared to earlier examinations. The maximum keratometry (Kmax) value decreased by 8.1 D relative to the previous measurement (Fig. 1J). Central corneal thickness recovered from 587 μm at the initial postoperative follow-up to 556 μm (Fig. 1K), closely approximating the preoperative baseline of 557 μm. Comparative Scheimpflug imaging analysis (Fig. 1L) further revealed that the previously observed undulating epithelial irregularities had markedly resolved, with the corneal surface morphology becoming notably smoother and more regular.

4.Discussion

The confirmed case was wearing Bausch and Lomb PureVision (Balafilcon A) bandage contact lenses. The lens parameters are: diameter 14 mm, made of silicone hydrogel material, with a water content of 36%.According to research by Arora et al., PureVision contact lenses were found to be safe and efficacious for continuous wear therapeutic use to a maximum of 90 days[3]. The long-term wear of soft contact lenses can lead to the accumulation of deposits on the lens surface, including proteins, lipids, mucus, and various electrolytes (such as chloride ions, potassium ions, calcium ions, etc.)[4]. The deposition not only potentially compromises optical performance but may also induce ocular irritation symptoms and significantly elevate the risk of infectious keratitis onset[5].

In this case, two years of continuous bandage contact lens (BCL) wear was associated with marked but reversible alterations in corneal morphology. These changes included wavelike deformations, annular scleral indentations, and irregular astigmatism, as evidenced by topographic imaging.Extended wear of BCL is a well-recognized risk factor for microbial complications, including keratitis and corneal ulcers [6–9]. In contrast, the present case reveals a predominantly non-inflammatory, biomechanical pathology. We propose that chronic mechanical stress from a lens with incompatible curvature parameters is the primary driver of this distinct morphological alteration.The prescribed Bausch and Lomb PureVision lens had a base curve (BC) of 8.6 mm, which was notably steeper than the patient's mean corneal curvature (7.95 mm, equivalent to 42.5 D). This substantial disparity between the lens BC and the flatter cornea led to poor fitting of the BCL on the corneal surface; during blinking, the lens generated persistent, uneven mechanical pressure on the corneal surface, resulting in abnormal redistribution of the corneal epithelial layer, mild deformation of the superficial stroma, and the formation of wavelike surface irregularities and scleral annular indentations.Furthermore, Although pure hypoxia is less likely with high-Dk/t silicone hydrogels,prolonged, continuous wear might still create a relative hypoxic microenvironment or elicit similar epithelial stress responses, as seen in classical hypoxic injury [10, 11].Even with high-oxygen permeability materials, long-term wear can lead to tear circulation disturbance, reducing the oxygen supply on the corneal surface from atmospheric oxygen (21%) to tear oxygen (5%), thereby triggering epithelial cell metabolic stress, a process that further contributes to the development of corneal pathological changes. Of particular relevance, concentric wavy distortions induced by long-term wear of hydrogel soft contact lenses have been reported in a previous case by Christy J et al [12]. Similarly, Gupta described an elderly monocular patient who retained a BCL for more than two years and presented with typical rings of corneal warpage and a folded lens with whorl-like deposits, which is highly consistent with the morphological features observed in the present case. [13]

The rapid and complete reversal of these corneal alterations following BCL removal underscores their reversible nature. This reversal is mechanistically akin to the epithelial redistribution seen in orthokeratology, albeit with a distinct etiology and morphological pattern [14–17]. It is important to note that there is an essential distinction between the corneal morphological changes induced by BCL in this case and the epithelial redistribution caused by Orthokeratology: Orthokeratology achieves temporary and reversible epithelial redistribution of the cornea through a controllable lens design, whose purpose is to correct refractive errors, and the process of change can be regulated by adjusting lens parameters; in contrast, in this case, the mechanical pressure caused by the mismatched curvature parameters of BCL

is long-term and uncontrollable, ultimately leading to pathological remodeling of the corneal epithelium and stroma, rather than controllable physiological morphological adjustment, which also highlights the clinical particularity of this case.This case has significant clinical uniqueness. Consequently, this case highlights the risk of unintended iatrogenic corneal molding from chronically misfitting therapeutic lenses, shifting the clinical concern beyond infectious complications. It thereby underscores the imperative for meticulous parameter verification and strict adherence to prescribed replacement schedules in BCL management.

This case highlights a critical gap in patient adherence to bandage contact lens (BCL) wear and replacement protocols, which led to a prolonged period of unrecognized corneal compromise. The delay in seeking care, despite the presence of complications, underscores potential challenges in patient recognition of BCL-related symptoms or in access to timely ophthalmic care.To mitigate such risks, we recommend that BCL fitting and management protocols be reinforced. Specifically, clinicians should:1. Conduct structured and personalized health education when prescribing BCLs, using illustrated brochures combined with video explanations, along with clear and jargon-free instructions, to explicitly inform patients of the BCL removal time and follow-up nodes, and emphasize the importance of strictly complying with the wear schedule and recognizing the signs of potential complications. 2. Establish mandatory pre-scheduled regular follow-up appointments instead of relying on symptom-driven visits. 3. Consider implementing an automatic hospital SMS/WeChat reminder system and conducting joint follow-up with primary community doctors to provide dual reminders for patients to replace lenses and complete follow-up visits.These measures aim to transcend barriers in health literacy and access, ensuring patient safety regardless of individual background.

In summary, the clinical significance of this case lies in highlighting a rare phenotype of reversible, non-inflammatory corneal remodeling abnormalities induced by prolonged and continuous wear of misfitting bandage contact lenses (BCL).This case supplements the non-infectious and biomechanical complication spectrum beyond the infectious complications that have been the focus of previous studies, thereby enriching the overall complication profile of BCL use. Meanwhile, it confirms the reversibility of such corneal morphological changes (corneal curvature, thickness, and epithelial morphology all recovered one week after surgery), providing a therapeutic basis for the clinical management of such cases (timely removal of BCL combined with local anti-inflammatory and lubricating treatment). Its clinical significance lies in its important warning role for clinicians, emphasizing the necessity of strict follow-up after BCL wear; even for high-oxygen permeability materials, long-term wear is not advisable, and it is necessary to strengthen health education for primary clinicians and patients. Additionally, it provides a reference for the clinical application of BCL, suggesting that clinicians should attach importance to the personalized selection of BCL base curve, ensure its accurate matching with the patient's corneal curvature, avoid corneal mechanical damage caused by an overly steep or flat base curve, further standardize the clinical management of BCL, and ensure the safety of patients' eye use.

Declarations

Funding

No funding was received for this work.

Ethics approval and consent to participate

Ethical approval was waived by the Ethics Committee of Yan'an Hospital Affiliated to Kunming Medical University. The study was performed in accordance with the Declaration of Helsinki. Written informed consent to participate was obtained from the patient.

Consent for publication

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

Availability of data and materials

All data generated or analysed during this case report are included in this published article. The raw clinical datasets supporting the conclusions of this study are available from the corresponding author upon reasonable request, subject to protection of patient confidentiality.

Author Contribution

C.Z. Guo conceived and performed the investigation, analyzed the data, prepared the figures and tables, and wrote the original draft. L. Ma contributed to the data collection and investigation. A.N. He contributed to the data analysis and interpretation, and assisted in preparing the figures. R. Zhang contributed to the data collection and reviewed the manuscript. Y.X. Li contributed to the statistical analysis and revised the manuscript. C.S. Tan contributed to the resources, the interpretation of results, and manuscript review. D.D. Zhao conceived and designed the study, acquired funding and resources, supervised the project, and critically revised the manuscript. All authors reviewed and approved the final manuscript. D.D. Zhao is the corresponding author.

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Figures

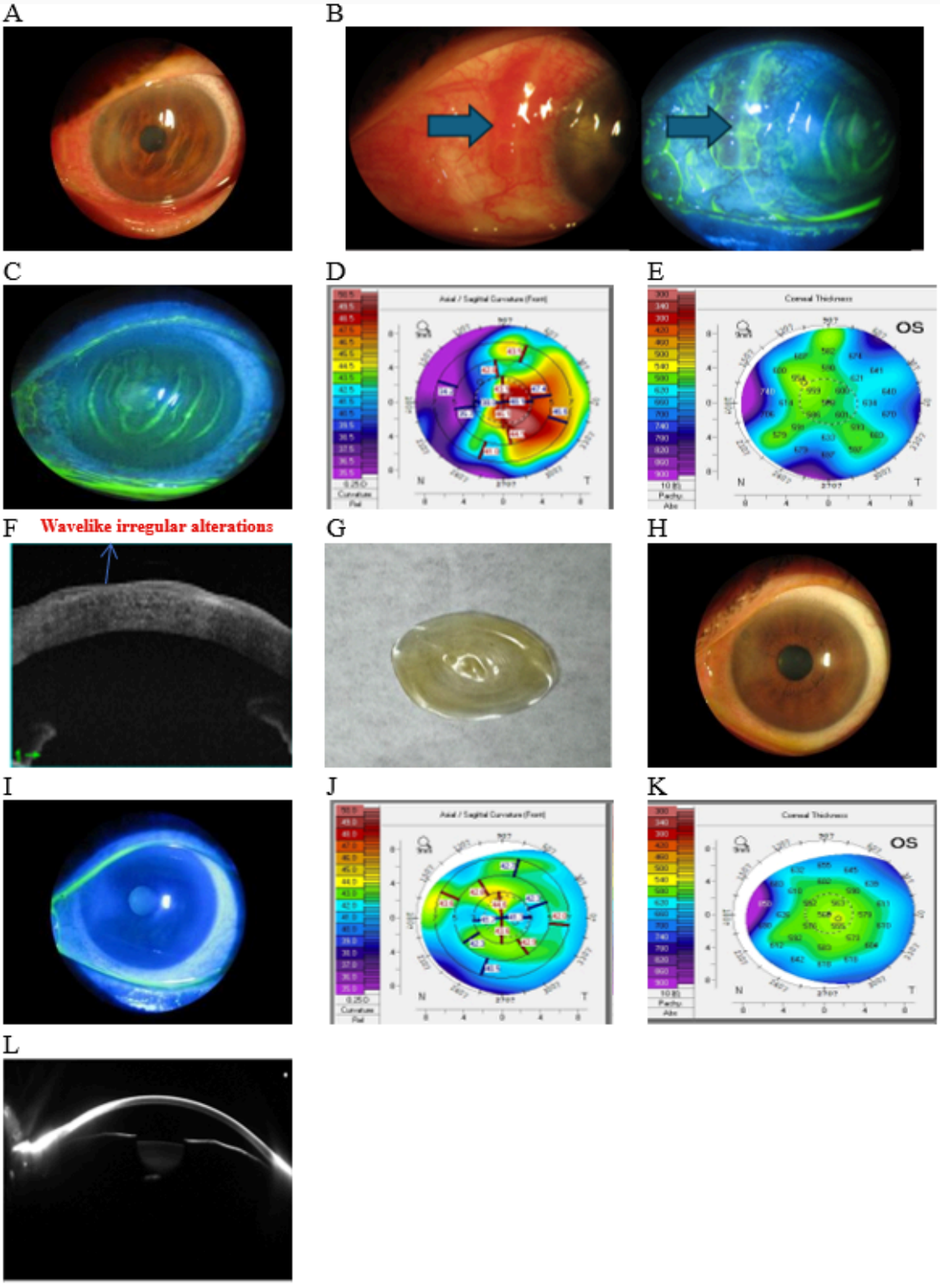


Figure 1

Before removal of the bandage contact lens showed Obvious bulbar conjunctival congestion was observed and wavy irregular deformation of the cornea.(A)visible annular indentation of the sclera. (B)The characteristic wavy pooling of fluorescein staining is observed at the cornea.(C)Irregular corneal deformation with increased curvature in the left eye.(D) The central corneal thickness increased from the preoperative 557 μm to 587 μm.(E)prominent wavelike irregular alterations in the left corneal epithelium.

(F)The bandage contact lens was rigid and light yellow in color.(G)One week after treatment:The degree of conjunctival hyperemia showed significant improvement, with marked regression of corneal undulating irregular deformation.(H)Fluorescein staining shows no obvious wavelike accumulation. (I)Corneal regularity increased and steepness decreased.(J)The central corneal thickness recovered to 556 μm.(K)The morphology of the left corneal epithelium tended towards smooth and regular.(L)