Case Report

Scleral Contact Lens to Preserve a Corneal Graft in Chronic Lagophthalmos

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Abstract

Facial burns involving the periorbital region may lead to cicatricial ectropion and lagophthalmos, causing severe exposure keratopathy and eventually blindness if uncorrected. In these patients, it is critical to provide aesthetic and functional surgical correction to protect the ocular surface from chronic desiccation in addition to visual rehabilitation. Conventional methods may not be sufficient to provide visual rehabilitation in complex cases. Scleral lenses can be a multipurpose alternative for these patients. Herein, we present the challenging case of a patient who developed cicatricial lagophthalmos and exposure keratopathy after facial transplantation due to gasoline burns and received a scleral contact lens for visual rehabilitation.

Keywords: Cicatricial lagophthalmos, ectropion, exposure keratopathy, facial burn, scleral contact lens

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Introduction

Severe burns involving the periorbital and facial area are infrequent but potentially devastating injuries. Facial burn lesions lead to physical and psychosocial morbidities.[1,2,3] Periorbital and ocular injuries are present in 20% of facial burns.[4] Injury to the globe, eyelids, orbit, and ocular adnexa predispose these patients to eyelid deformities, conjunctival scarring, and corneal disease, leading to visual impairment and blindness.[5,6,7]

Face transplantation is an effective reconstructive option aiming for functional and aesthetic results in extensive facial burns involving the periorbital region.[8,9] The majority of face transplantations performed to date have included periorbital components, and postoperative ocular and periocular complications are common. Therefore, ophthalmologists have an essential role in the long-term care of such patients.[6] These patients are predisposed to develop cicatricial ectropion and lagophthalmos due to burn contractures secondary to the original trauma as well as consequent surgical trauma. These conditions can lead to exposure keratopathy and corneal ulcers, resulting in serious consequences such as keratitis and even endophthalmitis.[6,7]

Therefore, it is critical to provide visual rehabilitation and protect the ocular surface by conventional methods or other options such as scleral lenses if conventional methods are insufficient.

Herein we present a case in which a scleral contact lens was used to protect the ocular surface and provide visual rehabilitation in a facial transplant recipient who underwent penetrating keratoplasty for fungal keratitis scar and tarsorrhaphy for cicatricial lagophthalmos.

Case Report

A 60-year-old woman presented in September 2018 to the Cornea Division of the Ophthalmology Department of Dokuz Eylül University Faculty of Medicine with complaints of pain

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and redness in the left eye for 4 days. She had undergone face transplantation due to severe gasoline burns involving the entire face in 2000. Her medical history revealed that she had multiple revisional reconstructive procedures within 5 years, including blepharoplasty, canthopexy, and eyelid repair. Macroscopic examination of the patient revealed extensive scarring in the face and neck region. There was pronounced deformation due to previous surgeries and burn trauma. Periocular scars and related cicatricial ectropion and lagophthalmos were observed bilaterally, worse in the left eye (Figure 1). Best corrected visual acuity (BCVA) was 1.0 Snellen decimal in the right eye and counting fingers at 2 meters in the left eye. Slit-lamp examination of the left eye revealed bulbar conjunctival hyperemia, corneal edema, 5x7 mm white infiltration in the center of the cornea, and adjacent inferior temporal thinning (Figure 2). Intraocular pressure (IOP) was normal in both eyes. After obtaining smears, treatment with fortified ceftazidime (Orion Pharma, Bangladesh) and fortified vancomycin drops (Koçak Farma, Türkiye) (every 2 hours), cyclopentolate drops (Abdi İbrahim İlaç, Türkiye) (3 times daily), oral doxycycline (Deva İlaç, Türkiye) (100 mg twice daily), and vitamin C (Bayer, Germany) (1000 mg/day) was initiated for the diagnosis of infectious keratitis due to exposure keratopathy secondary to cicatricial lagophthalmos. Cultures revealed Aspergillus fumigatus; the fortified antibiotics were tapered rapidly and topical amphotericin B (Gilead Sciences, USA) and systemic intravenous amphotericin B (3 mg/kg) were ordered. The patient also received three intracorneal voriconazole (Polifarma İlaç, Türkiye) and amphotericin B injections 3 days apart. In order to prevent exposure and facilitate epithelialization after face transplantation due to gasoline burns, lateral tarsorrhaphy was performed in September 2018 (Figure 3a). Amniotic membrane transplantation was performed in November 2018 to support healing and revert thinning (Figure 3b). The infiltrate regressed and healed without complications, leaving a central scar. Penetrating keratoplasty was performed for the corneal scar in December 2018 (Figure 4). BCVA in the left eye was 0.5 decimal (-6.00 diopters sphere, -1.00 diopters cylinder x 95°) at 6 months. No recurrent infection or rejection was noted. IOP was normal and the graft remained transparent. The patient did not agree to keep the tarsorrhaphy, therefore persistent inferior corneal staining despite aggressive lubrication raised the concern for infection or keratinization during long-term follow-up. The right eye was emmetropic and considering the anisometropia and lagophthalmos,

Figure 1. Multiple scars and deformation of the entire face due to previous surgery and burn trauma. Cicatricial ectropion and lagophthalmos were observed bilaterally, worse in the left eye

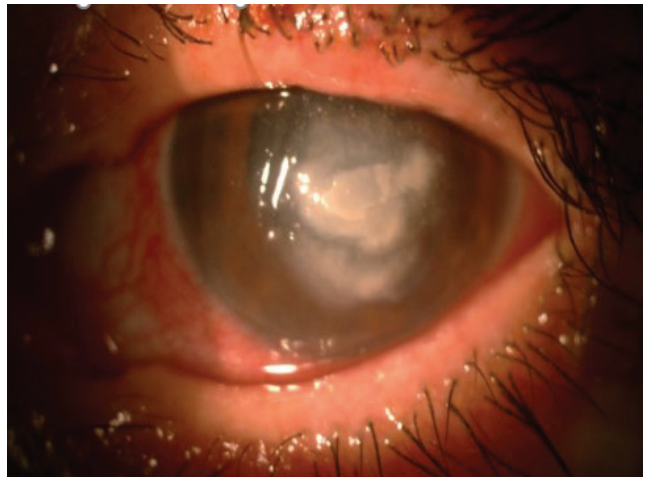

Figure 2. A 5x7 mm area of white infiltration in the center of cornea and adjacent thinning of the inferior temporal cornea in the left eye

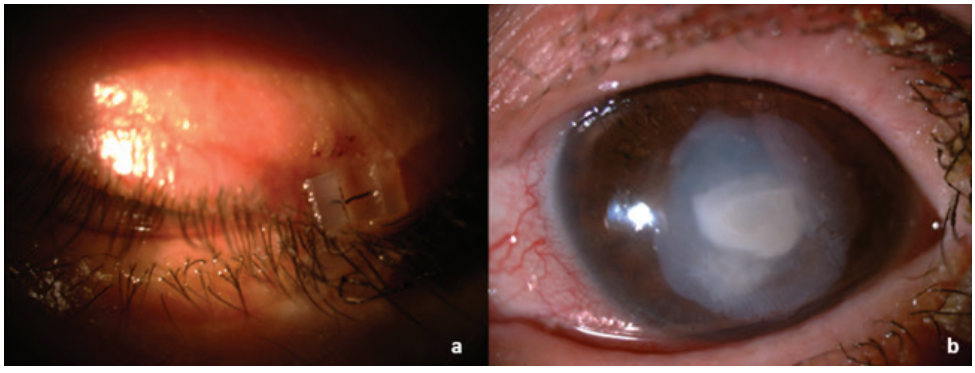

Figure 3. Lateral tarsorrhaphy (a) and amniotic membrane transplantation (b) in the left eye

we recommended a scleral contact lens. The left eye was fit with a Mini Misa® (Microlens, Netherlands) (base curve: 7.80 mm, diameter: 16.5 mm, vault: 400 µm, landing zone Z 12 N, power: -3.00 diopters) in 2019 (Figure 5) and BCVA increased to 1.0 decimal. The patient was encouraged to obtain and wear the lens for 4-6 hours a day. No complications were observed in the following year of use.

Discussion

Burns can directly or indirectly affect the face and periorbital region, causing significant acute morbidity of the lids and ocular surface with severe consequences. Contraction and deformation of the periorbital soft tissue can lead to eyelid dysfunction, trichiasis cicatricial entropion or ectropion, and lagophthalmos, which pose a serious threat to the cornea.[3,4] Chronic desiccation and epithelial trauma can give rise to serious infections and permanent scarring, resulting in visual impairment. Long-term follow-up is often mandatory due to potentially significant medical and psychological problems.[1,6] Goals in the treatment of periorbital burns are preserving vision, preventing future complications, and achieving an acceptable aesthetic result.

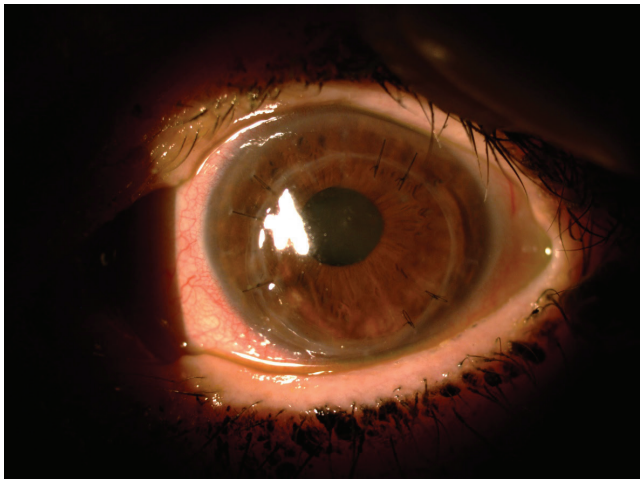

Figure 4. Penetrating keratoplasty in the left eye. Clear corneal graft after selective suture removal

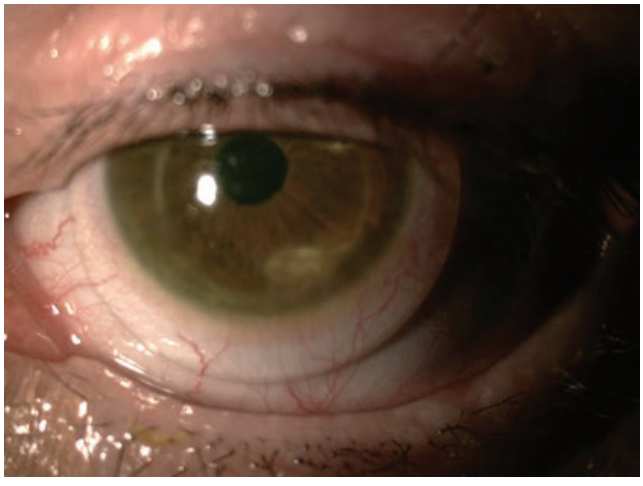

Figure 5. Scleral contact lens fitting in the left eye

Face transplantation can address facial and periorbital deformity with satisfactory functional and aesthetic outcomes in these patients. However, timely consideration and management of postoperative complications is critical to ensure a healthy ocular surface and optimal visual acuity. More than half of all face transplants performed to date involved periorbital components, and available data suggest that postoperative ocular and periorbital issues are common and frequently require revisional procedures, as in our patient.[2,5,6] Therefore, a multidisciplinary approach with closely scheduled ophthalmological follow-up examinations is recommended to manage possible complications in the postoperative period.[6]

Late complications of eyelid burns include ectropion and lagophthalmos as a result of secondary burn contractures. If left untreated, exposure keratopathy due to lagophthalmos can result in corneal thinning, scarring, and ulceration, potentially leading to corneal blindness as well as perforation and endophthalmitis.[1,2,3]

Our patient had fungal keratitis secondary to cicatricial ectropion and lagophthalmos. Our first aim was to control the corneal infection and prevent perforation or endophthalmitis. Lateral tarsorrhaphy and amniotic membrane transplantation were performed after aggressive topical and systemic antifungal therapy and intrastromal injections.

After restoring the integrity of the ocular surface, a penetrating keratoplasty was performed because of the corneal scar. A stable ocular surface is generally requisite to achieve a successful corneal transplant. One of the difficulties we encountered in our patient was poor wetting in the inferior temporal quadrant of the corneal graft. Readjusting the tarsorrhaphy or lid surgery was not an effective plan due to the tight scar in the lower lid. Therefore, we chose to apply a scleral lens to protect the corneal graft from the traumatic effect of the scarred upper lid, to improve vision and to provide ocular surface wetting.

The main purpose in the treatment of cicatricial lagophthalmos is to prevent exposure keratitis and restore eyelid function. There are various medical and surgical options to protect the ocular surface from the effects of exposure, such as ocular surface lubrication, amniotic membrane grafting, tarsorrhaphy, and upper eyelid reanimation techniques.[10,11] In addition to the exposure effect, the traumatic effect of the cicatrized eyelid with blinking may also cause conventional methods to be insufficient in these patients. Scleral lenses are another option that provide a barrier to trauma from the lid and a moist chamber to preserve the cornea.[11,12]

Medical and surgical conventional methods may not be sufficient to provide visual rehabilitation in complicated cases. Scleral lenses can provide constant hydration and protection of the ocular surface in addition to rehabilitation of vision, as in our patient.

Scleral lenses of various designs are currently used for the management of severe ocular surface diseases.[13,14] The Prosthetic Replacement of the Ocular Surface Ecosystem (PROSE) scleral lens (Boston Foundation for Sight, Needham, MA) is a large-diameter lens that ranges from about 17.0 to 23.0 mm, vaults the cornea and limbus, and holds a saline reservoir that can mask surface irregularities and create a moist ecosystem while acting as a liquid bandage.[13,14]

In the treatment of complex cases in which conventional therapies are not sufficient, PROSE treatment has been successfully used to maintain the integrity of the ocular surface while improving visual acuity at the same time.[10,12] PROSE treatment can also be used in conjunction with other medical and surgical interventions, as in our patient.

There are some reports in the literature showing the benefits of PROSE treatment in patients with lagophthalmos and exposure keratopathy. Chahal et al.[12] evaluated the utility of PROSE scleral lenses in 26 eyes of 18 patients with exposure keratopathy and found them to be effective in improving both visual acuity and function, as well as ocular surface integrity. Their results revealed that PROSE scleral lens therapy is effective in patients with exposure keratopathy who had failed conventional therapies and can serve as an alternative to lid surgery.

Another case report by Gire et al.[10] described four patients who were successfully treated for lagophthalmos and exposure keratopathy with the PROSE device.

Gervasio et al.[13] compared baseline characteristics and visual acuity outcomes in patients treated with PROSE versus other standard-of-care (SOC) treatments for postsurgical lagophthalmos and exposure keratopathy. They found that PROSE treatment provided rapid and substantial visual improvement within 1 month of use compared with SOC. Their findings in conjunction with previous studies support that PROSE is a viable alternative or adjunct therapy to SOC in the most severe cases of postsurgical lagophthalmos and exposure keratopathy.

Unfortunately, PROSE is not currently available in our country. Therefore, we opted to use the Mini Misa® in our patient. We selected a lens with a diameter of 16.5 mm because it offered good protection of the keratinization area in the lower limbus and was easier for the patient to use than large-diameter scleral lenses. Compared to large-diameter scleral lenses, scleral lenses in the 14-17 mm diameter range are classified as mini scleral lenses and offer more practical application in patients with corneal disorders.[15,16,17] As in our case, mini scleral lenses can be used to improve vision and protect the ocular surface in exposure keratopathy patients, similar to PROSE scleral lenses.[18]

Ocular surface disease resulting from periorbital burn scars is a challenging problem. Sequential surgical and medical treatment plans should be customized according to each patient's unique features. Especially complex cases require a multidisciplinary approach involving both a plastic surgeon and an ophthalmologist, who is crucial in every step of reconstructive procedures to restore ocular integrity and protect vision.

Ethics

Informed Consent: Obtained.

Authorship Contributions

Surgical and Medical Practices: Z.Ö., Concept: Z.Ö., I.K., Design: Z.Ö., I.K., Data Collection or Processing: Z.Ö., I.K., Analysis or Interpretation: Z.Ö., I.K., Literature Search: I.K., Writing: Z.Ö., I.K.

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References

1. Fitzgerald O'Connor E, Frew Q, Din A, Pleat J, Ashraff S, Ghazi-Nouri S, El-Muttardi N, Philp B, Dziewulski P. Periorbital burns – a 6 year review of management and outcome. Burns. 2015;41:616-623.
2. Grigos MI, LeBlanc É, Rifkin WJ, Kantar RS, Greenfield J, Diaz-Siso JR, Rodriguez ED. Total Eyelid Transplantation in a Face Transplant: Analysis of Postoperative Periorbital Function. J Surg Res. 2020;245:420-425.
3. Grosu-Bularda A, Andrei MC, Mladin AD, Ionescu Sanda M, Dringa MM, Lunca DC, Lascar I, Teodoreanu RN. Periorbital lesions in severely burned patients. Rom J Ophthalmol. 2019;63:38-55.
4. Bizrah M, Yusuf A, Ahmad S. An update on chemical eye burns. Eye (Lond). 2019;33:1362-1377.
5. Christensen JM, Shanbhag SS, Shih GC, Goverman J, Pomahac B, Chodosh J, Ehrlichman RJ. Multidisciplinary Treatment to Restore Vision in Ocular Burns. J Burn Care Res. 2020;41:859-865.
6. Greenfield JA, Kantar RS, Rifkin WJ, Sosin M, Diaz-Siso JR, Patel P, Fleming JC, Iliff NT, Lee BW, Rodriguez ED. Ocular Considerations in Face Transplantation: Report of 2 Cases and Review of the Literature. Ophthalmic Plast Reconstr Surg. 2019;35:218-226.
7. Demirel S, Cumurcu T, Fırat P, Aydogan MS, Doğanay S. Effective management of exposure keratopathy developed in intensive care units: the impact of an evidence based eye care education programme. Intensive Crit Care Nurs. 2014;30:38-44.
8. Sosin M, Mundinger GS, Dorafshar AH, Fisher M, Bojovic B, Christy MR, Iliff NT, Rodriguez ED. Eyelid transplantation: lessons from a total face transplant and the importance of blink. Plast Reconstr Surg. 2015;135:167-175.
9. Cabalag MS, Wasiak J, Syed Q, Paul E, Hall AJ, Cleland H. Risk Factors for Ocular Burn Injuries Requiring Surgery. J Burn Care Res. 2017;38:71-77.
10. Gire A, Kwok A, Marx DP. PROSE treatment for lagophthalmos and exposure keratopathy. Ophthalmic Plast Reconstr Surg. 2013;29:38-40.
11. Wolkow N, Chodosh J, Freitag SK. Innovations in Treatment of Lagophthalmos and Exposure Keratopathy. Int Ophthalmol Clin. 2017l;57:85-103.
12. Chahal JS, Heur M, Chiu GB. Prosthetic Replacement of the Ocular Surface Ecosystem Scleral Lens Therapy for Exposure Keratopathy. Eye Contact Lens. 2017;43:240-244.
13. Gervasio KA, Godfrey KJ, Marlow ED, Lee MN, Lelli GJ Jr. Prosthetic Replacement of the Ocular Surface Ecosystem (PROSE) Versus Standard of Care for Postsurgical Lagophthalmos and Exposure Keratopathy: Trends in Visual Outcomes. Ophthalmic Plast Reconstr Surg. 2019;35:281-285.
14. Parra AS, Roth BM, Nguyen TM, Wang L, Pflugfelder SC, Al-Mohtaseb Z. Assessment of the Prosthetic Replacement of Ocular Surface Ecosystem (PROSE) scleral lens on visual acuity for corneal irregularity and ocular surface disease. Ocul Surf. 2018;16:254-258.

15. Ye P, Sun A, Weissman BA. Role of mini-scleral gas-permeable lenses in the treatment of corneal disorders. Eye Contact Lens. 2007;33:111-113.
16. Yuksel E, Bilgihan K, Novruzlu Ş, Yuksel N, Koksal M. The Management of Refractory Dry Eye With Semi-Scleral Contact Lens. Eye Contact Lens. 2018;44:10-12.
17. Asena L, Altınörs DD. Clinical outcomes of scleral Misa lenses for visual rehabilitation in patients with pellucid marginal degeneration. Cont Lens Anterior Eye. 2016;39:420-424.
18. Zaki V. A non-surgical approach to the management of exposure keratitis due to facial palsy by using mini-scleral lenses. Medicine (Baltimore). 2017;96:e6020.