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Case Report

Visual Rehabilitation Using Corneo-Scleral Contact Lenses After Penetrating Keratoplasty

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Abstract

Purpose: To determine the clinical outcomes of corneo-scleral lenses with diameter of 14.50 mm to improve vision in patients after penetrating keratoplasty (PK) for visual rehabilitation.

Case Presentation: Two young patients who had undergone penetrating or lamellar keratoplasty before one year were treated with Scleral contact lens and were observed for improvement in best corrected visual acuity after treatment with 14.50 mm Mc-Asfeer corneo-Scleral lens.

Result: A maximum keratometry value of patient A and B were 52.50 D and 58.25 D at their first visit to our clinic. Both patients were successfully fit with Mc-Asfeer corneo-Scleral lens, showing adequate central corneal clearance of about 260 µm (Patient A) and 310 µm (Patient B) with no corneal touch on AS-OCT and sufficient limbal clearance of about 120 µm with good edge clearance. After the lens insertion, BCVA improved to 6/6. The patient reported an immediate improvement in visual quality and a reduction in ghosting. Subjective comfort was also noted, with no significant discomfort.

Conclusion: This case report illustrates the successful fitting of a Corneo-Scleral contact lens in a patient following keratoplasty. Corneo-Scleral lenses should be considered as a valuable option for visual rehabilitation in post-keratoplasty patients with irregular corneal surfaces.

Keywords: *Keratoplasty; High Astigmatism; Scleral Contact Lens*

Introduction

Keratoplasty - either penetrating or lamellar - has many indications which are mostly optical. Management of highly irregular corneas such as advanced stages of keratoconus or repaired cornea after full-thickness laceration is challenging with few options available other than keratoplasty [1]. Unfortunately, the unaided visual result of keratoplasty in a significant percentage of these patients is still far from satisfactory. Up to 4 diopter (and even more) astigmatism, both regular and irregular, is very common. Mc Asfeer Corneo- Scleral GP Lens (Silver Line Laboratories) with their potential to vault the whole cornea, can correct refractive errors and even many higher-order aberrations resulting from the irregularity of the anterior corneal surface in challenging situations such as advanced keratoconus, and post-PK patient [2]. Fitting these lenses is relatively easy and because of their large diameter (12.50 - 14.50 mm), they are very well-centered in the eye and usually well-tolerated [3]. Here we reported the results of Corneo-Scleral lenses for correcting unsatisfactory vision

and comfort of post corneal graft patients. The study protocol was approved by the Research Management Committee of the Himalaya Eye Hospital. Informed consent was obtained from both patients to publish their case details and associated images.

Case Presentation

Patient A - 25 years old patient

A 25-year-old male had a history of advanced keratoconus followed by full-thickness corneal grafts with deep anterior lamellar grafts (DALK). Post-surgery, the patient experienced significant visual distortions due to high irregular astigmatism. Standard eyeglasses and soft contact lenses provided minimal visual improvement. The preoperative uncorrected visual acuity (UCVA) was 6/36 and the best-corrected visual acuity (BSCVA) was 6/18 with subjective refraction of -3.50Ds/-7.00Dc@015. Figure 1A shows the corneal topography of his right eye using The Topcon CA-800 Corneal Analyzer. Simulated keratometry (simK in D) was assessed at the flattest and steepest meridians. His simK values were 48.09D @ 018/54.64D @ 108, resulting approximately 7 D of astigmatism between Flat and Steep meridian. To address the post-keratoplasty refractive error, Mc Asfeer Corneo-Scleral contact lens was fitted (Figure 1). Boston® XO2 (hexafocon B) is a gas permeable contact lens material composed of siloxanyl fluoromethacrylate copolymer with DK value of 141. An 7.00/4.58/-2.50/14.50 mm) base curve lens was selected based on the basis of manufacturer guideline as provided by silver line laboratories. A lens diameter of 14.50 mm, large enough to vault over his white-to-white without corneal apical or limbal touch, was selected. The corneal apical clearance was measured after 1 hour of lens insertion by observing the space between the anterior surface of cornea and posterior surface of the lens on slit-lamp with fluorescein. The lens was move slightly (about 0.5 mm) on pushed up by slightly pressing conjunctiva with a finger. Good limbal clearance (approximately 100 µm) was evaluated by noting fluorescein extending beyond the limbus and Scleral landing zones were assessed subjectively at the slit-lamp by diffuse white light for impingement or blanching of blood vessels. Then the optimum clearance at around 320 µm after lens settling was confirmed using AS-OCT (OptoVue Avanti OCT-A) (Figure 1). After fitting the lens, patient was asked to visit on the first day, 1 week and 1 month consecutively. Fortunately, there were no any symptoms of redness or any discomfort and it was recommended to wear it for up to 8 hours per day. At the 1-month post lens visit, his visual acuity was found to be 20/20 with adequate central clearance, limbal clearance and edge alignment. Finally, consecutive follow-up assessments show how Corneo-Scleral lens fitting has enabled Patient A to achieve improved visual acuity and enhanced quality of life.

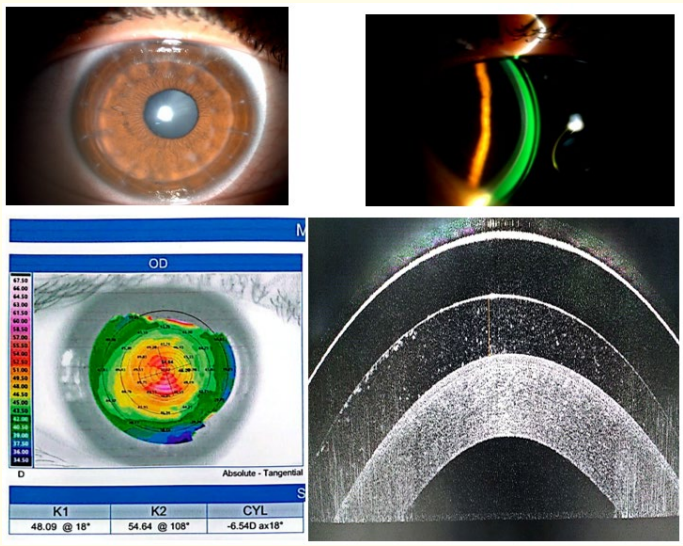

Figure 1: *Cornea of the patient A after full thickness keratoplasty, central corneal vaulting (320 µm), corneal topography(before fitting) and OCT image after fitting Mc-Asfeer Corneo-Scleral contact lens (7.00/4.58/-2.50/14.50 mm) respectively.*

Patient B - 28 years old patient

A 28-year-old female underwent lamellar keratoplasty for the treatment of corneal scarring secondary to an ocular injury. Post-surgery, the patient exhibited irregular astigmatism and high anisometropia. Her reliance on glasses and standard soft contact lenses for vision correction proved unsatisfactory. The preoperative uncorrected visual acuity (UCVA) was 6/24 and the best-corrected visual acuity (BSCVA) was 6/12 with subjective refraction of -4.50Ds/-6.50Dc@045. Figure 2A shows the corneal topography of her right eye using the Topcon CA-800 Corneal Analyzer and resulting approximately 7 D of astigmatism between Flat and Steep meridian. In order to correct the post refractive error, Mc Asfeer Corneo-Scleral contact lens was fitted (Figure 2) with lens material composed of siloxanyl fluoromethacrylate copolymer with DK value of 141. An 6.90/4.74/-3.50/14.50 mm) base curve lens was selected based on the basis of manufacturer guideline as provided by silver line laboratories. Then the optimum clearance at around 210 µm after lens settling was confirmed using AS-OCT (OptoVue Avanti OCT-A) (Figure 2). Good limbal clearance (approximately 100 µm) was evaluated by noting fluorescein extending beyond the limbus with and Scleral landing zones were assessed subjectively at the slit-lamp by diffuse white light for impingement or blanching of blood vessels. After fitting the lens, patient was asked to visit on the first day, 1 week and 1 month consecutively. Fortunately, there were no any symptoms of redness or any discomfort and it was recommended to wear it for up to 8 hours per day. At the 1-month post lens visit, his visual acuity was found to be 20/20 with adequate central clearance, limbal clearance and edge alignment. These case descriptions within the case series demonstrate the applicability and benefits of Corneo-Scleral contact lenses in achieving improved visual rehabilitation and quality of life for patients following keratoplasty.

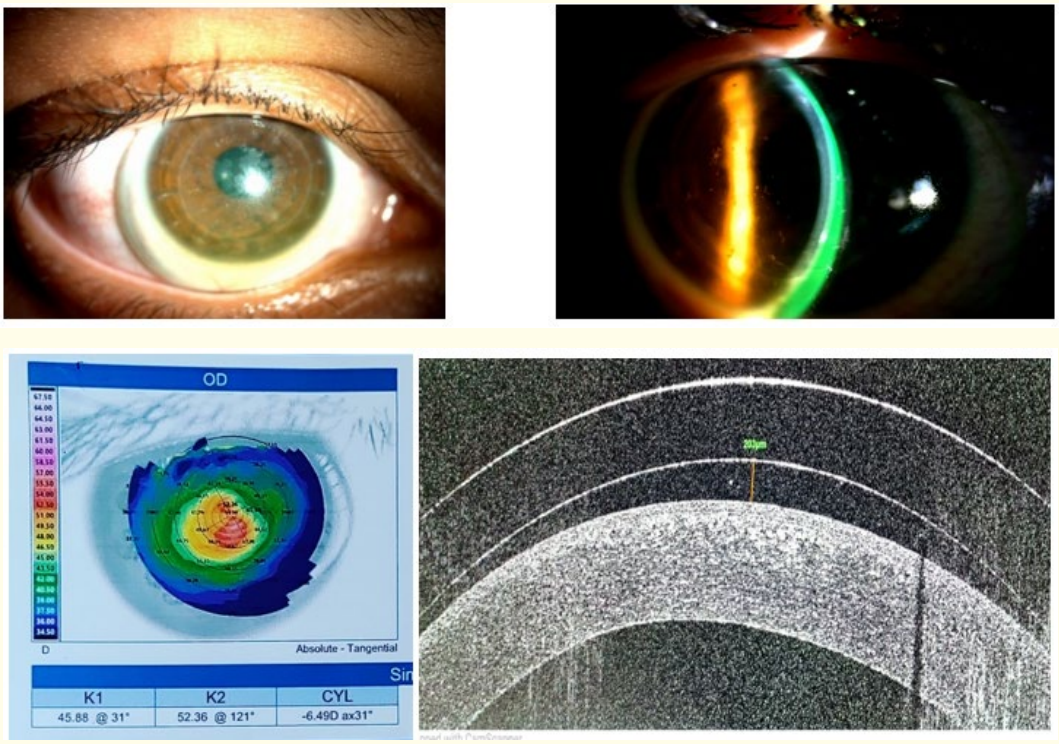

Figure 1: *Cornea of the patient A after full thickness keratoplasty, central corneal vaulting (320 µm), corneal topography(before fitting) and OCT image after fitting Mc-Asfeer Corneo-Scleral contact lens (7.00/4.58/-2.50/14.50 mm) respectively.*

Discussion

The outcomes of this study, where corneo-scleral lenses significantly improved the best-corrected visual acuity (BSCVA) in post-keratoplasty patients, are consistent with and supported by existing literature on the topic [2]. The observed improvement in BSCVA with Corneo-Scleral lenses aligns with numerous studies that have investigated the use of specialty contact lenses in post-keratoplasty patients [1-5]. Corneo-scleral lenses, with their ability to vault the cornea, can effectively address irregular corneal surfaces and high-order aberrations. This outcome is in agreement with findings in studies conducted by Romero-Jiménez., *et al*. (2017) and Penbe A., *et al*. (2021), which also reported significant improvements in visual acuity following the use of scleral lenses post-keratoplasty [5,6]. The achievement of an ideal lens that fits all eyes included in this study reinforces the idea that Corneo-Scleral lenses can offer a comfortable and stable visual correction option for post-keratoplasty patients. This is corroborated by the work of Romero-Jiménez., *et al*. (2010) which found that properly fitted Corneo-Scleral lenses provided optimal comfort and lens centration in keratoconus eyes [4].

Conclusion

The findings of this study, highlighting the substantial enhancement in best-corrected visual acuity (BSCVA) achieved through the application of Corneo-Scleral lenses in two distinct post-keratoplasty cases, resonate with a growing body of literature in this field. Patient A, who had a history of advanced keratoconus and full-thickness corneal grafts with deep anterior lamellar grafts (DALK), and Patient B, with a history of superficial traumatic corneal scarring followed by anterior lamellar grafts (DALK).

Ethical Approval

Ethical approval was taken from Himalaya Eye Hospital.

Consent

Written informed consent was obtained from the patient for the publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Sources of Funding

No funding was received for the study.

Authors' Contribution

A.S. and M.M. conceptualized the study, reviewed and A.P. and B.G. edited the manuscript, and were in charge of the case.

Conflict of Interest Disclosure

Authors have no conflict of interest to declare.

Guarantor

Arjun Sapkota.

Data Availability Statement

All the required data are available in the manuscript itself.

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