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Case Report

Anterior Segment Reconstruction in Graft Ectasia after Penetrating Keratoplasty for Keratoconus

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Abstract

A 61-year-old female presented with corneal graft ectasia 20 years after penetrating keratoplasty for keratoconus. Scheimpflug tomography and anterior segment optical coherence tomography (OCT) were used to assess the degree of ectasia and to plan the surgical procedure. A wedge resection technique was performed followed by femtosecond laser-assisted cataract surgery (FLACS) with a toric intraocular lens (IOL) 6 months later. Distance-corrected visual acuity was 20/40 with a manifest refraction of -4.25 -8.00@170 preoperatively and remained 20/40 with a manifest refraction of -1.50 -1.25@90 10 months postoperatively.

Keywords: *Corneal Ectasia; Corneal Wedge Resection; Femtosecond Laser-Assisted Cataract Surgery*

Introduction

Topographic findings of corneal graft ectasia due to recurrence of keratoconus (KC) may be similar to wound dehiscence and trauma [1]. Recurrent ectasia after penetrating keratoconus (PK) in KC usually manifests 20 years after the initial surgery, typically at the inferior cornea and may be associated to the host cellular structure, such as changes in Bowman layer and stromal thinning, corneal biochemical and biomechanical factors [1].

Surgical and non-surgical methods have been described to manage astigmatism following penetrating keratoplasty (PK). Less invasive options include spectacle correction and the use of rigid gas permeable contact lenses (RGP). Surgical options include arcuate keratotomy (AK), femtosecond laser-assisted arcuate keratotomy (FLAAK), photorefractive keratectomy (PRK), wedge resection, and repeat keratoplasty.

Wedge resection, first described by Troutman in 1967 as a method to treat high residual astigmatism after PK, is a viable option to manage cases of progressive keratoconus following corneal transplant. Removal of residual diseased cornea halts further progression of ectasia improves thinning at the site of progression and corrects irregular astigmatism. We report a case in which post PK graft ectasia was managed with the combination of wedge resection and subsequent femtosecond laser-assisted cataract surgery (FLACS) with toric intra-ocular lens (IOL) to treat residual corneal astigmatism.

Case Report

A 61-year-old female with a history of bilateral PK for KC 20 years ago presented for evaluation of decreased visual acuity and anisеikonia in her right eye. Uncorrected visual acuity (UCVA) was count fingers (CF) in the right eye and 20/50 in the left eye. Distance corrected visual acuity (DCVA) was 20/40 in the right eye and 20/30 in the left eye with a manifest refraction (Mrx) of -4.25 -8.00@170° and

-1.50-2.25@61°, respectively. The patient had a history of RGP intolerance. On examination, both grafts were optically clear, endothelial cell count (ECC) was 1025 cells/mm^2 in the right eye and 1012 cells/mm^2 in the left eye, respectively. Graft ectasia at the graft-host junction was observed in the right eye, without signs of rejection (Figure 1). Nuclear sclerosis was noted bilaterally. Scheimpflug tomography (Figure 2 and 3A) (Pentacam® HR, Oculus) showed irregular astigmatism of the right eye (7.5 D@153.5°, Kmax of 92.5D) with corneal thickness at the thinnest point of 419 µm.

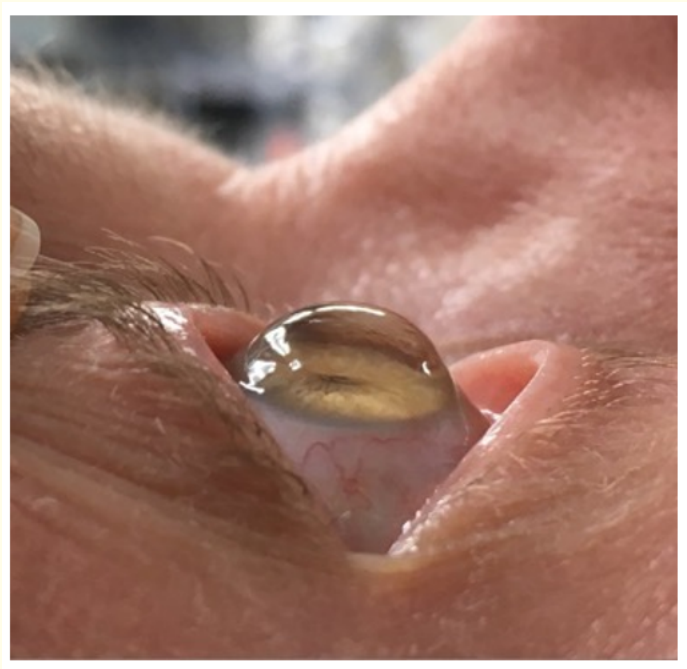


Figure 1: *External photography of preoperative ectasia, temporal view.*

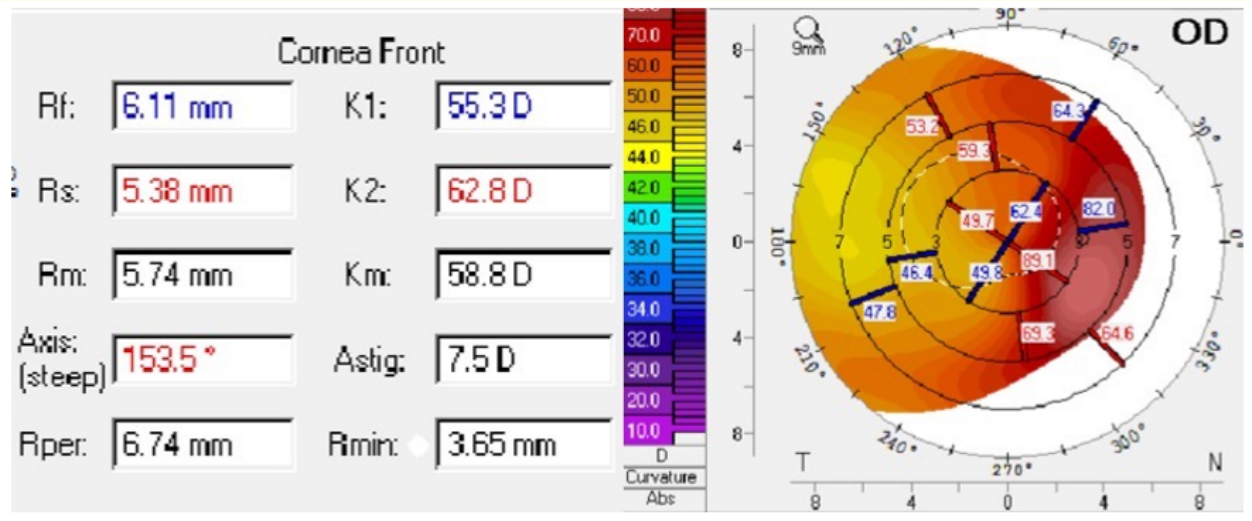
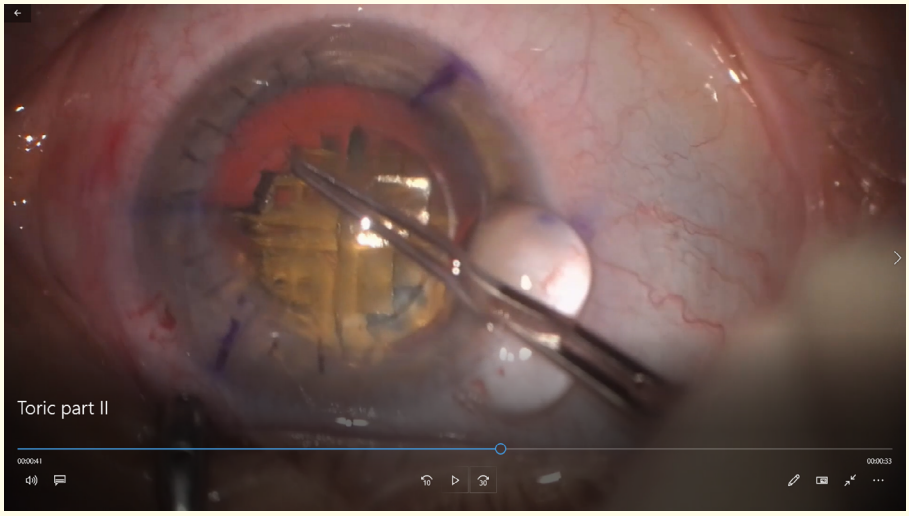


Figure 2: *Scheimpflug tomography showing irregular astigmatism consistent with corneal graft ectasia.*

Corneal wedge resection was performed to repair the ectasia and flatten the affected area (Video 1). A 1.5 mm 80% depth corneal wedge was resected at the border of the graft-host junction from 6 to 12 o'clock nasally. Partial thickness 10-0 nylon sutures were used to close the defect at the graft-host junction. Improvement in graft ectasia was appreciated on gross visual inspection intraoperatively. Two weeks postoperatively, UCVA in the right eye was 20/150 and DCVA was 20/70 with manifest refraction of -3.00-6.00@120°. Scheimpflug tomography showed improvement of ectasia (Figure 3B). Scheimpflug topography showed flattening in the periphery with significant improvement in ectasia at 1 month (Figure 4A) and 4 months postoperatively (Kmax improved from 92.5 D to 60.5 D, and corneal astigmatism improved from 7.5 D to 6.5 D). Four months postoperatively Scheimpflug tomography and manifest refraction were stable (K1: 46.9D, K2: 53.5D@53.3°, Kmax 59.6D, manifest refraction -3.25 -5.75@120°). (Figure 4B).



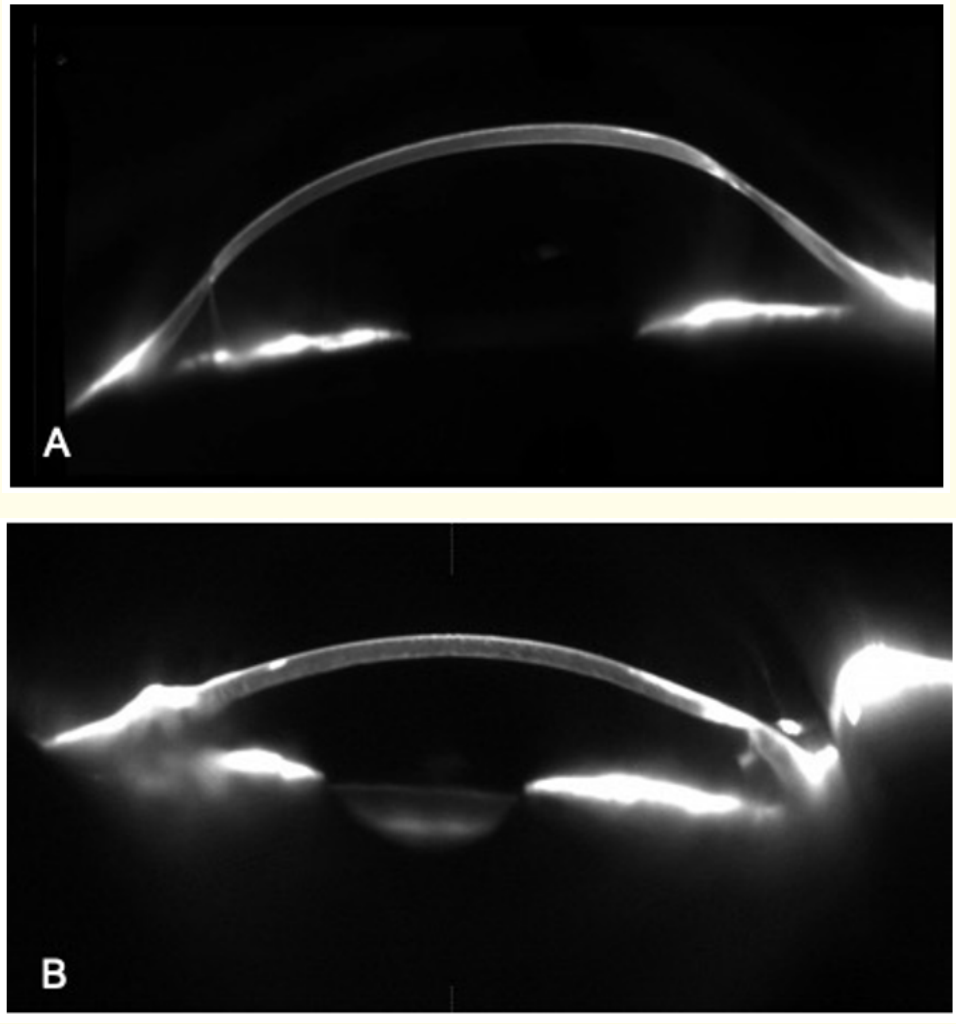


Figure 3: *Scheimpflug tomography. A) Preoperative image demonstrating corneal graft ectasia and thinning of the graft-host junction; B) Postoperative image demonstrating a more regular cornea, with resolution of the localized thinning.*

Corneal topography and tomography revealed a relatively regular astigmatism within the visual axis at 50° 6 months after the wedge resection (Figure 4C). Patient underwent FLACS (Catalys Precision Laser System, J&J Vision; settings: spiral 400 µm, vertical spot spacing 15 µm, pulse energy 8 µJ, horizontal spot spacing 5µm, grid spacing 600µm) with Optiwave Refractive Analysis (ORA™ System® with VerifEye+™, Alcon Surgical, Inc. USA) and a toric IOL (SN6AT9 13.0 D, axis 51, Alcon Labs). Six weeks postoperatively, UCVA in the right eye was 20/60 and DCVA was 20/40 with manifest refraction of -1.75-1.25@95°. Six months postoperatively we observed resolution of anisometropia and aniseikonia. UCVA in the right eye was 20/60, DCVA was 20/40 with a manifest refraction of -1.50-1.25@90° at 10 months postoperatively (Figure 4D).

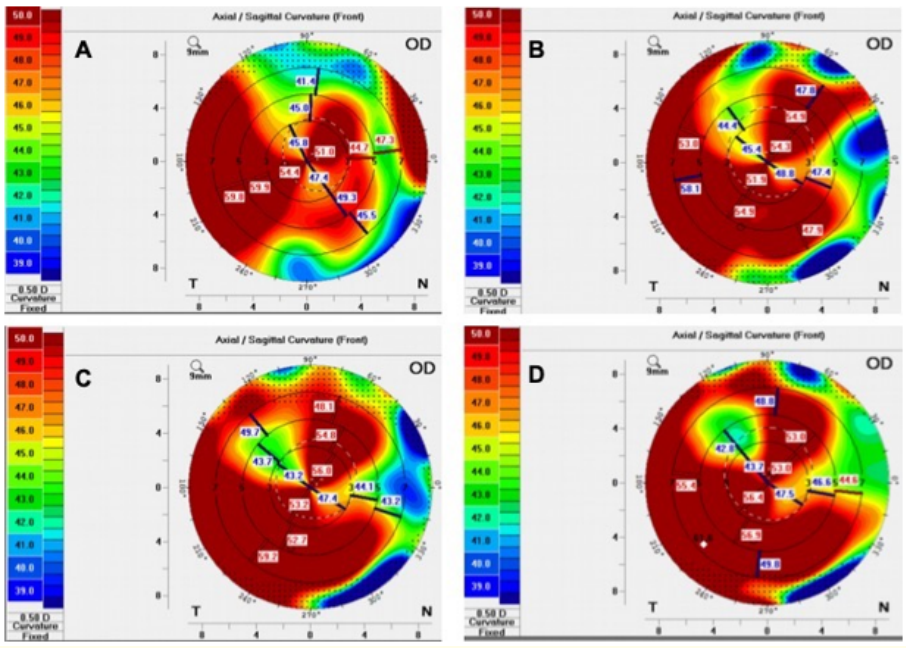


Figure 4: *Corneal tomography after wedge resection. A) 2-weeks postoperatively (K1: 46.6D, K2: 53.0D; Km: 49.6D; Astigmatism: 6.6D); B) 4 months postoperatively (K1: 46.9; K2: 53.5D, Km: 50.0D, Astigmatism: 6.6D); C) 6 months postoperatively (K1: 45.4D, K2: 55.0D, Km: 49.7D, Astigmatism: 9.7D); D) 10 months postoperatively (K1: 47.0D, K2L 54.7D, Km: 50.5, Astigmatism: 7.7D).*

Discussion

Graft survival rates in KC patients are approximately 94% at 20 years after initial surgery [2]. Most patients experience approximately 3.0 to 5.0 D of residual astigmatism, although 15 - 20% have 5.0 D or more [3]. Progression of astigmatism decades after PK and recurrence of the disease has been described [4,5].

Keratoconus recurrence has been confirmed both clinically and histologically and may play a role in worsening astigmatism years after surgery [5]. Wedge resection provides a viable surgical correction to improve residual astigmatism and to simultaneously treat ectasia and thinning. Corneal wedge resection consists of removing a partial thickness wedge of corneal tissue at the flattest meridian, followed by reapproximation of the edges of the incision [3,6]. Steepening of the central cornea at the surgical meridian and flattening at the opposite meridian are expected [7]. Ilary and Daya described a case series of three patients with ectasia from progressive keratoconus after PK treated successfully with wedge resection. The patients had a 10.4 D, 5.75 D, and 8.75 D reduction in topographic cylinder with the ability to achieve DCVA of 20/25, 20/30, and 20/30 respectively. All three patients were able to comfortably resume contact lens wear [5]. Maria de la Paz., *et al*. [5] in a 2010 retrospective study, demonstrated that wedge resection led to reduction of 57.5% of refractive astigmatism, 68.97% of topographic astigmatism, and 53.01% keratometric cylinder at 3 years of follow up [8,9].

In this case, the area of steepening was caused by graft ectasia at the graft-host junction. We then removed the diseased wedge of tissue at the steepest meridian to achieve flattening at the graft-host junction. We observed a 54% reduction in refractive cylinder at 10 months postoperatively, and a relatively regular astigmatism within the visual axis (Figure 3D). The patient was educated on the possibility of a future change in corneal astigmatism should her wedge resection sutures break or there is progression of ectasia. She understood this

would decrease the functionality of the IOL but accepted this risk as she had demonstrated intolerance to RGPs and wanted to achieve best possible UCVA. She underwent FLACS with intraoperative aberrometry (ORA, WaveTec Vision Systems Inc) and implantation of a toric IOL (SN6AT9 power 13.0D at 51 degrees, Alcon Labs). Refractive outcomes were stable at 10 months postoperatively.

Conclusion

Wedge resection is a resourceful technique to treat graft ectasia and high residual astigmatism after PK. It may be an alternative to repeat keratoplasty in patients with clear corneal grafts and adequate endothelial cell count. FLACS can be successfully performed after keratoplasty.

Bibliography

1. Patel SV., *et al*. "Recurrent ectasia in corneal grafts and outcomes of repeat keratoplasty for keratoconus". *British Journal of Ophthalmology* 93.2 (2009): 191-197.

2. Pramanik S., *et al*. "Extended long-term outcomes of penetrating keratoplasty for keratoconus". *Ophthalmology* 113.9 (2006): 1633-1638.

3. Ghanem R and Azar D. "Femtosecond-laser arcuate wedge-shaped resection to correct high residual astigmatism after penetrating keratoplasty". *Journal of Cataract and Refractive Surgery* 32.9 (2006): 1415-1419.

4. Ilari L and Daya SM. "Corneal wedge resection to treat progressive keratoconus in the host cornea after penetrating keratoplasty". *Journal of Cataract and Refractive Surgery* 29.2 (2003): 395-401.

5. De la paz M., *et al*. "Wedge Resection for High Astigmatism After Penetrating Keratoplasty for Keratoconus: Refractive and Histopathologic Changes". *Cornea* 29.6 (2010): 595-600.

6. Troutman R. "Corneal wedge resections and relaxing incisions for postkeratoplasty astigmatism". *International Ophthalmology Clinics* 23.4 (1983): 161-168.

7. Du J., *et al*. "Long-term outcomes of wedge resection at the limbus for high irregular corneal astigmatism after repaired corneal laceration". *International Journal of Ophthalmology* 9.6 (2016): 843-847.

8. Feizi S and Zare M. "Current approaches for management of postpenetrating keratoplasty astigmatism". *Journal of Ophthalmology* (2011): 708736.

9. Weisbrod DJ., *et al*. "Outcomes of repeat penetrating keratoplasty and risk factors for graft failure". *Cornea* 22.5 (2003): 429-434.

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