

# Half-Depth Corneal Scar After PRK

A laser malfunction left a linear scar extending into the optical zone.

BY MASSIMO BUSIN, MD; JOSE L. GÜELL, MD; FRANCIS W. PRICE JR, MD;

AND A. JOHN KANELLOPOULOS, MD

## CASE PRESENTATION

In June 2005, a 24-year-old woman underwent PRK in both eyes for correction of an initial myopia of -4.50 D. The excimer laser the surgeon used was part of a mobile unit that was carried on a truck and moved from one refractive center to another.

Treatment of the right eye was uneventful. During treatment of the left eye, however, a malfunction of the mirrors inside the laser system resulted in the application of laser spots concentrated along one horizontal line in the prepupillary area (Figure 1). The resulting scar extended halfway into the stroma (Figure 2) and caused a notable loss in BCVA (0.4 with a refraction of  $-1.75 -2.25 \times 100^\circ$  in December 2007), blurriness, and double vision. Corneal topography revealed a reversed central island (Figure 3). The central corneal pachymetry was  $467 \mu\text{m}$ .

What would you suggest to improve the situation in this patient's left eye?

*Case presented by Jérôme C. Vryghem, MD.*

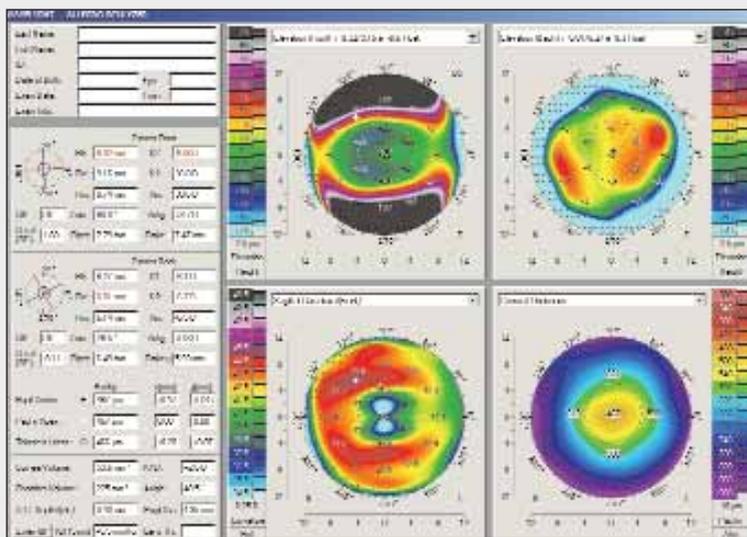
**Figure 3. Corneal topography revealed a reversed central island.**



**Figure 1. A horizontal line of laser spots extended into the prepupillary area.**



**Figure 2. The resulting scar extended to half of the stromal depth.**

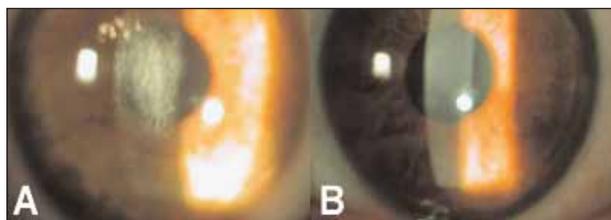


## MASSIMO BUSIN, MD

This case presents the typical indication for a superficial automated lamellar keratoplasty (SALK). In SALK, a dedicated microkeratome with a  $130\text{-}\mu\text{m}$  head (Moria, Antony, France) is used to create a free cap that includes the superficial scar. If the cornea is thick enough, as in this specific case, a  $200\text{-}\mu\text{m}$  head can be

used to perform a deeper keratectomy and entirely eliminate even a scar reaching more deeply.

A donor lamella is obtained using the same microkeratome, always mounting the  $130\text{-}\mu\text{m}$  head, regardless of the amount of tissue removed from the host. This type of thin graft can simply be laid on the recipient bed, and either a therapeutic contact lens or overlay sutures



**Figure 4. Central corneal scar recurring after treatment for post-PRK opacity (A). The scarring disappears after superficial automated lamellar keratoplasty is performed (B).**

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can be used to secure it into position. To fixate thicker grafts, conventional radial sutures are required; they must be kept in place for months. This considerably slows down visual recovery.

Overlay sutures can be removed within 1 week after surgery, and the corneal shape stabilizes in 4 to 6 weeks.

In the presence of sufficient thickness in the host cornea, residual refractive error can be managed by simply lifting the free cap graft (as early as 2 to 3 months after SALK) and performing laser ablation on the recipient bed surface. In this way, an unsuccessful PRK can be converted into successful LASIK (Figures 4A and B).

SALK is an effective, simple, and standardized technique. It removes diseased corneal tissue independent of its structural or optical homogeneity, thus offering a significant advantage over phototherapeutic keratectomy, which has been reported to produce mixed results in cases such as the one presented herein. Finally, unlike with conventional penetrating keratoplasty, visual rehabilitation is rapid, and stabilization of the corneal architecture can occur in just a few weeks.

#### **JOSE L. GÜELL, MD**

Before deciding on a therapeutic approach, I would first want to have two additional diagnostic assessments, a Visante OCT (Carl Zeiss Meditec AG, Jena, Germany) or confocal microscopy study to properly evaluate the depth of the scar, and visual and refractive evaluation with a rigid contact lens (RCL). With this information, we may imagine several scenarios:

- BCVA with an RCL is 20/25 or better. (Irregular astigmatism is the main problem.) In this case, I would definitely attempt a topography-guided treatment (transepithelial PRK) with the MEL 80 excimer laser (Carl Zeiss Meditec AG). The prescription of an RCL could also be an option in this case, if acceptable to the patient.

- BCVA with the RCL is 20/40 or worse. (Opacity is the main problem.) In this case, I would recommend

deep anterior lamellar keratoplasty. My preferred option would be a pre-Descemet's membrane manual dissection. If a femtosecond laser lamellar cut is used, we must be certain to design a cut that goes below the scar. Several months after lamellar surgery, we should be able to correct residual refractive error either with corneal or intraocular (phakic IOL) refractive surgery or a combination of both.

- BCVA with the RCL is between 20/40 and 20/25. The choice of approach will depend on the patient's subjective complaints/needs, eye dominance, and the patient's final realistic expectations.

#### **FRANCIS W. PRICE JR, MD**

Since the surgery was performed more than 2 years ago, the linear scar appears to have had enough time to fade or undergo epithelial recontouring, which might have minimized the distortion. Therefore, the visual result will be permanent if not corrected. If the scar is half-thickness, then a phototherapeutic keratectomy would not be helpful, because the cornea would be left too thin.

As there appears to still be a significant amount of surface irregularity, a microkeratome dissection may not provide sufficient improvement in the visual result. I would recommend either a deep anterior dissection or big-bubble technique with full-thickness donor grafting to correct the scarring. The patient should be advised that she will most likely still need laser refractive surgery at a later date to correct residual myopia and astigmatism.

#### **A. JOHN KANELLOPOULOS, MD**

I have encountered several similarly irregular corneas secondary to infection, irregular ablation, and/or trauma. Keeping penetrating keratoplasty in mind as the definitive final treatment if everything else fails, I would employ our experience over the past 6 years with topography-guided ablation and collagen cross-linking.

Topography-guided surface ablation can be used to smooth the irregularity. I would treat 75% of manifest sphere and cylinder. The WaveLight AG (Erlangen, Germany) excimer laser platform has the longest and most successful results with this treatment modality.

In conjunction with this treatment, at the same sitting, I would perform collagen cross-linking on this cornea for several reasons: (1) to reduce corneal scarring (cross-linking eliminates keratocytes for about 6 months to a depth of 300  $\mu\text{m}$ ), (2) to reduce the chance of scarring from the PRK, and (3) to stabilize the potentially thinner cornea postoperatively.

Figures 5 and 6 illustrate our experience with this



**Figure 5.** Eye with contact lens–related corneal scarring and vascularization.

treatment combination in a case similar to the one presented here. The patient’s eye had contact lens–related corneal scarring and vascularization with BCVA of 20/100 (Figure 5). Pentacam-guided (Oculus Optikgeräte, Wetzlar, Germany) PRK and collagen cross-linking (0.1% riboflavin plus 7 mW/cm<sup>2</sup> UV light exposure for 15 minutes) were performed (Figure 6). The postoperative result can be seen in Figure 3.

In a case such as this, I would be pleased with a result of 20/40 or better, which compares favorably with the average corneal graft results. The procedure can be further complemented with a second PRK in the future, if needed. ■

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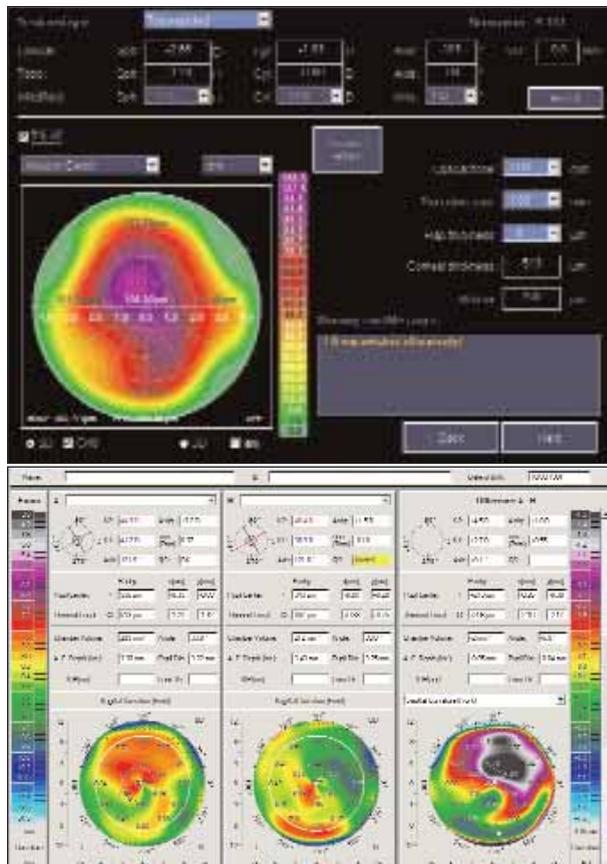
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**TAKE-HOME MESSAGE**

- Superficial automated lamellar keratoplasty, deep anterior lamellar keratoplasty, deep anterior dissection or big bubble technique, and cross-linking are suggested treatments for this refractive complication.



**Figure 6.** Topography-guided PRK and collagen cross-linking were performed.

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