

Challenging Cases in Refractive Surgery

Surgeons discuss their tips and tricks for managing specific complications.

As refractive surgeons, it is safe to say we have all had our share of challenging cases. For this issue, *Cataract & Refractive Surgery Today* and I asked several editorial board members and other top surgeons to address a wide variety of interesting refractive complications, including suction break with the Intralase FS Laser (Intralase Corp., Irvine, CA), a lost LASIK flap, and the implantation of a Tecnis IOL (Advanced Medical Optics, Inc., Santa Ana, CA) with inaccurate outcomes.

When facing a difficult case, it is imperative to choose the right approach that allows the surgery to proceed efficiently. The real skill is “shifting gears” and getting back to a good result. The following articles share valuable lessons that we may all learn from for our own difficult cases.

—Stephen G. Slade, MD, FACS



49 **Epithelium Within the Interface**
BY STEPHEN G. SLADE, MD, FACS



53 **Managing Suction Break With the Intralase FS Laser**
BY PERRY S. BINDER, MS, MD



50 **Managing Microstriae in a Thin LASIK Flap**
BY ROGER F. STEINERT, MD



53 **Second Surface Ablation With MMC**
BY DOUGLAS D. KOCH, MD



50 **Lost LASIK Flap**
BY KARL G. STONECIPHER, MD



54 **Tecnis IOL Implanted With Inaccurate Outcomes**
BY LOUIS E. PROBST, MD



52 **Enhancement Following Epi-LASIK**
BY WILLIAM B. TRATTLER, MD



56 **The Reoperation of Previous RK Followed by LASIK**
BY LEE T. NORDAN, MD

Epithelium Within the Interface

BY STEPHEN G. SLADE, MD, FACS

FREQUENT INTERFACE DILEMMA

Causes

Epithelium in the interface is the most common interface problem and may be caused by several different mechanisms (Figure 1). Often associated with an epithelial defect, ingrowth most likely occurs at the cut host edge, where a solid sheet of host epithelium grows beneath the flap instead of meeting the epithelium on the flap and merging. Poor surgical technique and the delayed adhesion of the flap are the most frequent causes of this type of ingrowth. The epithelium can also form an island of cells that is presumably implanted during surgery by the keratome blade as it cuts across the bed. Cells may also become dislodged and be washed or implanted in the interface. A third, more unusual means by which ingrowth occurs is during lamellar surgery over previous incisional corneal surgery. When a flap is cut across incisions that have epithelial plugs, the epithelium can spread from the plug laterally into the interface.

How to Spot Ingrowth

An effective technique for detecting epithelial ingrowth is to dilate the pupil and retro-illuminate the cornea. The epithelium will stand out clearly with this method. It is often possible to view the full extent of the spread and the clear halo of the epithelium beyond the foamy central islands. Epithelial ingrowth in the interface can also be viewed with topography, which shows astigmatism where the thickness of the epithelium elevates the edge of the flap. If in doubt, one can lift the suspect edge of the flap at the slit lamp and



Figure 1. In a classic case of epithelium in the interface, with the slit beam showing the location just below the flap, the patient's vision was reduced due to the central location of the cells, which blocked the visual axis. Dr. Slade successfully removed the ingrowth.

simply look for the epithelium, characterized by a very smooth bed.

Motives for Mending the Epithelium

Repairing the epithelium in the interface is recommended for the following reasons. First, the complication may be causing tissue loss; stroma sandwiched between two layers of epithelium can melt. Second, a sheet of epithelium can actually block the visual axis and decrease vision or create astigmatism, as described earlier. One should attempt repair in any case where the epithelium is progressing.

“Poor surgical technique and the delayed adhesion of the flap are the most frequent causes of this type of ingrowth.”

—Stephen G. Slade, MD, FACS

Removing the Epithelium

Epithelial removal is typically simple and quick. However, with a quiet, small island of epithelium that does not affect vision, the patient may be safer with observation than treatment. Ophthalmologists may use photographs to document the position of the epithelium and place them in the patient's chart for review during subsequent examinations. To remove the epithelium, the surgeon should first note its full extent and location. The visible foamy cell or islands of epithelium are often surrounded by a clear halo that extends farther out and is difficult to visualize. When lifting the flap, one should try to cut the epithelial edge to avoid large tears or flaps. After scraping the epithelium out with a blunt blade or comparable instrument, the surgeon should replace the flap with the standard technique of fluid control and minimal handling. Finally, in some cases where the epithelium has grown completely across the bed and there is a lot of wrinkling and stromal melt present, the best course might be to remove the flap and allow the epithelium to heal over, as in PRK.

Take-Home Pearls

One important pearl is always to address any epithelial ingrowth in the interface before re-treating a LASIK bed. Part of the error could be the mass of epithelium, which can range from 30 to 70 μ m in thickness and may therefore create astigmatism or an undercorrection.

A second tip is always to check the undersurface of the flap for cells, although most of the epithelium is typically present on the bed. For example, a failure to heal may be due to a thin edge of superior flap epithelium that has grown around the edge of the flap and onto its underside.

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Managing Microstriae in a Thin LASIK Flap

BY ROGER F. STEINERT, MD

MICROSTRIAE

Clinical Signs

Most microstriae are not clinically significant, but some are sufficiently elevated to disrupt the anterior epithelial smoothness and therefore the patient's tear film and vision. Microstriae are most readily viewed with retro-illumination, and a clinically significant disruption in the corneal optics is best seen as "negative staining" with fluorescein in the tear film. The elevated microstriae will look dark compared with the fluorescence of the thicker tear film between the microstriae. Another clinical sign is subtle, fine irregularity of the Placido mires used in corneal topography. If the physician is still unsure whether microstriae are responsible for a patient's visual problems, a test with contact lenses is helpful. A relatively thick soft contact lens will mask fine irregularities, and a rigid lens will optically neutralize all striae. This test does not differentiate between microstriae and irregularities such as higher-order aberrations, however.

Management

In my hands, refloating, stretching, stroking, hydrating, heating, and suturing the LASIK flap have all been unreliable means of alleviating established microstriae. Although corneal irregularity sometimes improves, it worsens in other eyes with the development of new striae. Surgeons can markedly and reliably improve microstriae through transepithelial phototherapeutic keratectomy (PTK).

PTK

PTK is possible in the US only with the Visx platform (Advanced Medical Optics, Inc.), although several other laser systems have the PTK capability internationally.

The basic technique for PTK with the Visx laser begins with transepithelial ablation at the maximum 6.5-mm optical zone. I program a total of 300 pulses, activate the eye tracker, and deliver 200 transepithelial pulses. In most cases, the first 200 pulses will remove most of the epithelium and begin the process of smoothing, because the epithelium itself acts like a masking agent. Thereafter, the striae will be much more exposed. After turning off the eye tracker, I instruct the patient to look at the fixation light. I then apply five or six pulses, wipe the interface, apply another five or six pulses, etc. For wiping, I use a debris-free surgical spear

moderately moistened with a medium-viscosity artificial tear such as Refresh Plus (Allergan, Inc., Irvine, CA). The masking fluid film should look wet but not make the elevated striae disappear. If the bed appears to be dry, the film is too thin. If the film obscures the striae, if the laser's sound is more a thud than a snap, or if the film bubbles with laser pulses, then the film is too thick.

"If the physician is ... unsure whether microstriae are responsible for a patient's visual problems, a test with contact lenses is helpful."

—Roger F. Steinert, MD

The endpoint is either the completion of 300 pulses or an earlier marked improvement in the appearance of the corneal smoothness. The goal is not the elimination of all striae but rather a reduction in elevation to the point where the regrown epithelium can optically mask the remainder. Not exceeding 300 pulses minimizes the tendency for a hyperopic shift and the development of haze.

Outcomes

At the end of the PTK, I apply drops of a fourth-generation fluoroquinolone antibiotic and 1% prednisolone acetate and place a soft bandage contact lens. The patient uses the medications at least q.i.d. until re-epithelialization occurs, typically at 4 days. I examine the patient, at minimum, on the first and fourth postoperative days. Any hint of diffuse lamellar keratitis prompts me to increase the steroid's dose. After the removal of the bandage contact lens, the patient is instructed to use unpreserved artificial tears at least q2h for the first month, with the dosage tapered as clinically appropriate. Most patients' vision will improve within several weeks, but maximal visual recovery is often at 6 to 8 weeks. Patients should know what to expect.

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Lost LASIK Flap

BY KARL G. STONECIPHER, MD

While visiting New Orleans, I received a frantic phone call from one of the physicians covering for me while I was away.

A patient's pet goat had reared its head suddenly, and one of its horns had struck the woman's right eye. She described sudden pain but no other findings. She had immediately presented to the eye center, and my partner asked me how to proceed.

CASE HISTORY

The patient's preoperative manifest refraction had been -8.25D sphere OU. Her pachymetry readings were 505 μ m OD and 510 μ m OS prior to surgery. Her original LASIK procedure had been uneventful, and her UCVA had measured 20/20 OD and 20/30 OS during her last visit prior to the current injury. I had targeted her left eye for -0.75D sphere in order to achieve modified monovision. As measured during her previous visit, the patient's manifest refraction was -0.25D OD and -1.00 +0.50 X 085 OS.

CASE PRESENTATION

Upon examination, my partner noted that the goat's horn had entirely removed the LASIK flap, which had been created by an Automated Corneal Shaper microkeratome (Bausch & Lomb, Rochester, NY) with a 160- μ m head. A clean, 7-mm epithelial defect was present, but no pathology aside from a few cells in the anterior chamber was evident.

I asked my partner to place a Kontour 55 lens (Kontour Kontakt Lens Co., Richmond, CA) of 18mm in diameter on the patient's injured eye and said that I would see her upon my return. The patient visited the office for daily follow-up, and she took Pred Forte 1% (Allergan, Inc.) and Zymar 0.3% (Allergan, Inc.) q2h. Two days after the injury, her eye had essentially re-epithelialized. Her UCVA was count fingers, and the refraction was unreliable. Pachymetry measured 405 μ m OD. Her BCVA improved to 20/50 with a hard-contact-lens overrefraction. She and I discussed all of her options, and I felt that the best choice was to replace the flap.



Figure 2. No abnormalities are noticeable for this 6.8-mm flap other than a hypertrophic scar at its edges.

SURGICAL COURSE

With a No. 64 Beaver blade (BD Ophthalmic Systems, Franklin Lakes, NJ), I removed the patient's epithelium under topical anesthesia. Before preparing the patient's eye, I placed a whole donor cornea obtained from an eye bank onto the Automated Corneal Shaper without the stopper in place, and I created a flap that measured 6.8mm in diameter. I positioned the donor flap over the stromal bed without sutures. After waiting 5 minutes to ensure the flap's adherence, I placed an 18-mm Kontour 55 lens. The patient continued taking Pred Forte 1% and Zymar 0.3% q2h for 2 weeks postoperatively (Figure 2).

OUTCOME

I removed the patient's contact lens 1 week after surgery. At 1 month postoperatively, her right eye had a UCVA of 20/100 and a BCVA of 20/30. The keratometry reading was 44.23@078/43.43@168. Her manifest refraction was -4.50 +2.50 X 097, and pachymetry measured 500 μ m.

"Two days after the injury, her eye had essentially re-epithelialized."

—Karl G. Stonecipher, MD

Roughly 1 year later, the patient requested a LASIK enhancement. Her refraction had stabilized, and she wore a contact lens to correct her ametropia. The enhancement was uneventful. I lifted the donor flap and performed laser ablation with the Visx Star S3 laser (Advanced Medical Optics, Inc.) based on the manifest refraction just described. At her most recent visit, the patient's right eye had a UCVA of 20/20, a keratometry reading of 40.62@50/39.62@140, and a manifest refraction of -0.25 +0.50 X 165.

CONCLUSION

Replacing the LASIK flap and subsequently performing an enhancement procedure is an option in cases such as this one, provided sufficient stromal tissue is available. The alternative is advanced surface ablation with chemotherapeutic modulation using mitomycin C (MMC). Advanced technology such as the Moria ALTK system (Moria, Antony, France) and the Intralase FS laser allows surgeons to fashion donor corneas of various diameters and thicknesses for complicated cases that require the flap's replacement.

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Enhancement Following Epi-LASIK

BY WILLIAM B. TRATTLER, MD

For laser vision correction patients, my current procedure of choice is wavefront-guided Epi-LASIK with the Visx laser. I am fortunate to have used the epikeratomes from Norwood Eyecare, Inc. (Duluth, GA), Moria, and Gebauer Medizintechnik GmbH (Neuhausen, Germany). I had an excellent experience with all three units.

EPI-LASIK

Advantages

Surface ablation offers high-quality visual results with a very low risk of complications. The procedure is particularly useful for patients with thin corneas, dry eyes, or other conditions that might make them poor candidates for LASIK. Among the available techniques I opt for Epi-LASIK when possible to avoid the use of alcohol, and to take advantage of faster healing and greater comfort compared to alcohol-assisted PRK or LASEK. Epi-LASIK is contraindicated in patients who have previously undergone corneal surgery, including RK and LASIK.

Controlling Discomfort

Epi-LASIK causes more discomfort than LASIK. Surgeons can increase patients' comfort by using a topical nonsteroidal anti-inflammatory drug, applying frozen BSS during the procedure, placing an advanced bandage contact lens such as the Acuvue Oasys (Vistakon Pharmaceuticals, LLC, Jacksonville, FL), and aggressively treating dry eye before and after surgery.

What About Enhancements?

One unique aspect of Epi-LASIK is that surgeons cannot repeat the primary procedure if an enhancement is necessary. Because Bowman's layer was ablated in the primary procedure, no reliable pathway remains for epithelial separation. My technique of choice to enhance Epi-LASIK is therefore an alcohol-assisted, wavefront-guided surface ablation.

Objective data on Epi-LASIK enhancements are limited because the procedure is relatively new. My enhancement rate with surface ablation is lower than my center's enhancement rate for LASIK. There are many possible reasons for a lower enhancement rate with surface ablation. On the positive side, the quality of vision can be better with surface ablation compared to LASIK, because higher-order aberrations are lower with surface ablation. Of course, the recovery process is longer and less comfortable following surface ablation, so fewer patients may be willing to undergo enhancements for low amounts of residual refractive error. As one might expect, the enhancement

rate is highest in higher myopes.

Sometimes, what appears to be an over- or undercorrection can be resolved without another laser ablation. For example, the epithelial layer of the cornea may continue to heal for as long as 6 months in some patients. For this reason, I recommend waiting at least 6 months after a surface ablation before performing an enhancement.

Recognizing and Treating Dry Eyes

I believe in aggressively investigating and treating dry eye. Not only does dryness exacerbate patients' postsurgical discomfort, but I also find that underlying dry eye is often responsible for their dissatisfaction with their visual acuity following surgery. To optimize the ocular surface, I prescribe Restasis (Allergan, Inc.) for all my laser vision correction patients and often perform punctal occlusion as well.

"Epi-LASIK is contraindicated in patients who have previously undergone corneal surgery, including RK and LASIK."

—William B. Trattler, MD

Once I am certain that ongoing healing and underlying dry eye are not confounding the visual results, I confirm that sufficient tissue remains for an excimer laser enhancement. In primary cases, I try to leave at least 330µm in the residual bed so there will be room for an enhancement. If the epithelium is not very adherent, I may be able to move it to the side with a spatula. Generally, however, I apply diluted alcohol for 20 to 30 seconds to loosen the epithelial sheet for easier removal prior to treatment.

Preventing Haze

As with primary surface ablation procedures, one should recommend appropriate prophylactic measures to avoid haze, including oral vitamin C and the use of sunglasses postoperatively. Intraoperative MMC 0.02% can also be considered in cases where there is a higher risk of haze.

With these tips in mind, surgeons should be able to achieve excellent results with wavefront-guided surface retreatment of Epi-LASIK cases.

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Managing Suction Break With the Intralase FS Laser

BY PERRY S. BINDER, MS, MD

SUCTION LOSS

Mechanical Microkeratomes Versus Intralase

Unlike the potentially adverse outcomes of suction break with mechanical microkeratomes (buttonhole or flap laceration with an incomplete flap), suction failure with the Intralase FS laser poses a lesser risk for the loss of BSCVA.

Lost Suction Near the End of the Side Cut

If suction breaks within 3 seconds of the side cut's termination, the surgeon can usually proceed as if nothing happened. The ophthalmologist may easily enter the interface with his standard technique.

Lost Suction During the Side Cut

If suction is lost during the side cut after the raster pass has been completed, but within 6 to 8 seconds of the side cut's termination, then the surgeon may attempt entering the peripheral wound with a sharp instrument. If the entry is easy, he can lift the flap with a blunt and/or sharp dissection instrument. If he is unable to enter the interface, the surgeon can only repeat the side cut using the side cut only mode.

Lost Suction During the Raster Pass

If suction is lost near the end of the raster pass, but immediately before the side cut, the surgeon can reapply suction with the same cone and settings and only attempt a side cut. He should pay careful attention to the centration of the side cut. If the surgeon is unsure of the centration, it is advisable to decrease the attempted diameter by 0.3- to 0.4mm so as not to create a side cut outside of the previous raster pass. Otherwise, "slivers" of uncut corneal stroma may result.

If suction is lost anytime during the raster pass, the surgeon should reapply suction with the same cone and settings and begin the raster pass from the start. The software allows the surgeon to pause and to begin again where the raster pass stopped at the time of the suction break. If the surgeon decides to restart, an area of uncut stroma may exist, however, due to cyclotorsion and/or decentration from the primary raster pass. Uncut tissue can adversely affect refractive outcomes. A surgeon can restart the raster pass immediately, or he can wait until the gas bubbles clear and repeat the process. Because gas bubbles can potentially interfere with incoming laser energy, I recommend waiting until they dissipate before performing the raster pass.

Finally, after completing an Intralase case with raster pass and side cut, it is possible to lift the flap at 1 day, 1 week, 1 month, or, in my experience, up to 5 months postoperatively without having to repeat the laser treatment. One may proceed as if for an enhancement case. This approach is advantageous when treating patients who are about to undergo a refractive lens implant. The Intralase flap can be created days prior to the implant, and then it can be easily lifted weeks after the implant to perform any residual refractive error correction.

"In most cases, a loss of suction during the Intralase procedure usually occurs more than 30 seconds after the suction fixation ring's application."

—Perry S. Binder, MS, MD

Conclusion

In most cases, a loss of suction during the Intralase procedure usually occurs more than 30 seconds after the suction fixation ring's application. With the original 10-KHz and newer 15-KHz engines, the suction loss would most likely have occurred during the raster pass or later. The newest 30-KHz engine can make a full 9-mm flap in 22 seconds using a 10 X 10 μ m spot and line separation with no pocket software. As a result, surgeons can expect even fewer problems with flap creation.

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Second Surface Ablation With MMC

BY DOUGLAS D. KOCH, MD

USE OF MMC

Indications

When repeating surface ablation, should one use MMC again? There is no clear answer to this important question. Clinical experience with MMC suggests that it is extremely safe when used judiciously in patients undergoing surface ablation. However, animal data suggest potential corneal, particularly endothelial, toxicity.¹

I have used MMC twice in a few patients without any apparent problems. My indications for using this agent a

"Clinical experience with MMC suggests that it is extremely safe when used judiciously in patients undergoing surface ablation."

—Douglas D. Koch, MD

second time include (1) patients who develop haze after the first procedure despite the use of MMC, (2) depths of greater than 20µm with the second ablation, and (3) patients who underwent corneal surgery prior to their first PRK (eg, prior RK, corneal transplantation, or LASIK).

Technique

I apply MMC with a minimally damp sponge for 12 seconds and liberally irrigate the eye immediately. Prior to surgery, patients receive a consent form outlining the potential risks of MMC and the uncertain long-term prognosis. Clearly, long-term studies of clinical outcomes are needed to allay concerns about toxicity, although all clinical data to date support the antibiotic's efficacy and safety.

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1. Chang SW. Early corneal edema following topical application of mitomycin-C. *J Cataract Refract Surg.* 2004;30:1742-1750.

Tecnis IOL Implanted With Inaccurate Outcomes

BY LOUIS E. PROBST, MD

POSTOPERATIVELY Symptoms

In the case of a Tecnis IOL implanted with inaccurate outcomes, it seems probable that the patient now has a minimal refractive error due to an incorrect estimation of the IOL power required for the implantation of the lens.

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Course of Action

If the residual refractive error were between -6.00 and +3.00D of sphere with up to -3.00D of astigmatism, I would offer a LASIK enhancement, assuming there is adequate corneal thickness and a normal Orbscan (Bausch & Lomb). I prefer corneal refractive enhancements to any intraocular intervention, as customized LASIK carries the lowest risk for complications (1/1000 risk of serious complications with LASIK requiring surgical intervention compared to 1/100 risk of serious complications of intraocular surgery) and the greatest refractive accuracy. An IOL exchange would be required for a greater refractive error, and I would refer a case of this severity to an intraocular surgeon, because I am a corneal refractive surgeon.

Customized LASIK

I would aim to perform a customized LASIK enhancement with the Visx Star S4 excimer laser (Advanced Medical Optics, Inc.) as I have found the customized results with this system to be consistently good. However, other surgeons have reported excellent results using other systems as well. Because of the prior Tecnis IOL implantation, I would be

"Intralase is now my method of choice for flap creation because of the predictability of the flap's depth and the increased surgical control."

—Louis E. Probst, MD

very careful to ensure that the Visx Wavescan (Advanced Medical Optics, Inc.) refraction matched the manifest refraction before proceeding. The refractive endpoint could be further adjusted with the help of a contact lens trial prior to the procedure.

Although I have no personal experience with customized LASIK with a previous Tecnis implantation, I would approach this case in the same manner as I would with customized LASIK after an implantation of other IOLs. I would create the flap with the Intralase FS laser 30-KHz system. I have used a microkeratome to successfully create the flap for LASIK enhancements in the past. However, Intralase is now my method of choice for flap creation because of the predictability of the flap's depth and the increased surgical

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control. To maximize the refractive results, I would use the Visx S4 tracker and Iris Registration (Advanced Medical Optics, Inc.). However, I would monitor the tracking during the procedure on the infrared tracking monitor to ensure that it was not misdirected by reflections from the IOL, although I have not experienced this problem when performing LASIK enhancements after IOL implantation with the Technolas 217Z laser (Bausch & Lomb), the Ladarvision System (Alcon Laboratories, Inc., Fort Worth, TX), or the Visx Star S4 laser.

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The Reoperation of Previous RK Followed by LASIK

BY LEE T. NORDAN, MD

Performing another refractive surgery procedure on a cornea that has previously undergone RK, and subsequently LASIK, is reasonable and usually effective. In my opinion, there is little doubt that the retreatment of such a cornea should involve PRK, immediately followed by the topical application of MMC.

FLAP COMPLICATIONS

Management

It is virtually impossible to remove a flap that contains RK incisions without tearing some of them. Introducing a spatula into the center of the corneal interface from the periphery and attempting to cleave the flap/host plane, with the spatula perpendicular to the RK incisions from the center outward, will almost always result in a "pizza pie" corneal flap. These triangular pieces of corneal flap cannot be sutured together, because a tight suture uniting the edges of the two pieces causes a secondary gaping on the outer side of each piece.

Avoid Further Flap Disruption

The temptation to cut a new flap should be suppressed, because doing so greatly increases the risk of dislodging the old flap or creating long-term ectasia. Irregular corneal astigmatism often ensues after attempts to reposition this multi-piece flap. The epithelium helps to smooth the optical surface of the cornea, but the risk of epithelial ingrowth is heightened because of the corneal defects created by the RK incisions.

PRK

Advantages

PRK effectively avoids flap-related difficulties. In addition, myopic PRK treatments greater than 20 μ m in depth reduce irregular corneal astigmatism that may be present from the original RK/LASIK surgeries.

"Refractive surgery routinely requires multiple procedures through the years if a patient desires excellent distance vision."

—Lee T. Nordan, MD

Technique

I prefer to remove the epithelium by debridement, while keeping the blade perpendicular to the RK incisions. Debridement allows me to view the degree of tenting of Bowman's membrane (irregular astigmatism). Additionally, a surgeon can intraoperatively observe the reduction in the height of the ridges accomplished by PRK. However, any method of epithelial removal that does not dislodge the flap is acceptable.

MMC USE

Because the potential complication of PRK is corneal haze, MMC should be used in all cases of retreatment PRK for the correction of previous refractive surgeries. The risk of corneal haze is proportional to the original refractive error, rather than to the refractive error that is being treated during the retreatment surgery. In other words, a -9.00D eye that has undergone RK/LASIK and is being treated for a residual of -2.00D has the tendency to develop corneal haze as though the primary surgery were PRK for the correction of -9.00D. In these cases, myopic undercorrections should be treated for 100% of the refractive error, whereas hyperopic corrections should only be treated for 67% of the residual refractive error in order to obtain 100% of the correction.

CONCLUSION

Refractive surgery routinely requires multiple procedures through the years if a patient desires excellent distance vision. The goal for each surgery is to maximize the benefit and minimize the risk. PRK fulfills these goals in cases of previous RK and LASIK.

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