

IT'S COMPLICATED: PREVENTION AND MANAGEMENT OF SURFACE ABLATION COMPLICATIONS

Several potential issues, though uncommon, warrant close attention.

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Refractive surgery with PRK and its surface ablation variants has been in use for almost 30 years. Although some studies have suggested greater postoperative discomfort and worse efficacy and safety results with surface ablation than with LASIK,^{1,2} this approach is relatively safe, and outcomes have improved over time.^{3,4} Laser delivery

technology has advanced to enable smoother ablations, translating to fewer issues with wound healing. Wound healing is also better understood today than it was in the past, further reducing the occurrence of complications.

Although relatively uncommon, surface ablation complications can still occur. They may be related to the ablation itself, the epithelial defect, wound healing, or perioperative medications. This article summarizes five complications that are particularly pertinent and details strategies for their prevention and management.

FUNDAMENTAL 1 IRREGULAR ASTIGMATISM CAN BE AN ABLATION-RELATED COMPLICATION

Decentrations. Irregular astigmatism can occur due to decentration of the optical aspect of the laser ablation. This may be caused by misalignment of the ablation, poor patient fixation, or malfunctioning of the laser. Decentration may result in complaints of glare or halos, and, in severe cases, may lead to loss of BCVA.

To prevent decentration, surgeons must understand the alignment process for their laser equipment and verify

proper patient fixation on the target of the laser. Pupil-tracking technology has improved, but it has not yet eliminated decentration.

Decentrations can be detected using topography once the epithelium has healed and stabilized after surface ablation. Typically, wavefront analysis will show large amounts of coma in an eye with a decentration. Symptoms are generally greater in patients who have larger amounts of decentration or deeper ablations.

Wavefront-guided ablation may reduce the amount of decentration because it takes into consideration changes in pupil centration from bright to dim light. Most



AT A GLANCE

- Refractive surgery with PRK and its surface ablation variants is relatively safe, and outcomes have improved over time.
- Surface ablation complications can still occur and may be related to the ablation itself, the epithelial defect, wound healing, or perioperative medications.
- Addressing issues preoperatively, understanding which patients are at risk, educating patients and setting expectations, and proceeding with the appropriate techniques are vital keys to effective prevention and successful management of surface ablation complications.

wavefront-guided systems attempt to center the optical aspect of the distance correction on the dim-light pupil, rather than on the bright-light pupil center under which the laser treatment occurs. This may reduce small amounts of error in patient alignment.

Irregular ablation. An uneven ablation can occur when fluid, sponge material, or residual epithelium blocks the laser treatment. It is important to ensure that the epithelium is completely removed in the area of the ablation and that no excess fluid blocks the ablation of the laser. Other debris such as sponge material or meibomian gland secretions should be removed from the surface of the eye prior to the ablation.

Often, irregular astigmatism can improve over time through epithelial remodeling. Waiting 6 to 12 months for this to occur is often helpful in mitigating symptoms. Glasses may help in patients with mild irregular astigmatism, and rigid contact lens wear can be effective in patients with more severe irregular astigmatism. A prescription for a miotic may be beneficial in some cases. Wavefront- and topography-guided laser vision correction can be performed in patients who have significant irregular astigmatism and desire surgical improvement.

Ectasia is not common after surface ablation, but it may occur. In patients with irregular astigmatism, ectasia should be ruled out as a cause by reviewing past topographies, if available. It is also important to determine whether there are other issues related to the irregular astigmatism, such as corneal haze or dryness, basement membrane dystrophy, or preexisting corneal scarring.

Patients with fixation errors during original treatment may exhibit variable fixation on postoperative testing, such as corneal topography or wavefront analysis, and may be more prone to variable fixation on retreatment.

FUNDAMENTAL 2 CORNEAL HAZE IS UNIQUE

Corneal haze is relatively uniquely a complication of surface ablation. Subepithelial corneal haze typically appears in the first few months after PRK, with a peak intensity at 2 months, and then usually improves over 6 to 12 months. Topical steroids are often used after surface ablation to reduce the incidence of haze. Preoperatively, I screen patients carefully for dry eye disease (DED) and other risk factors for corneal scarring and haze.

The use of mitomycin C (MMC) to reduce the incidence of haze has become a well-entrenched practice with PRK. Surgeons have used MMC in varying concentrations for varying lengths of time, and there is no clear evidence favoring one specific dosing. Effective concentrations appear to be from 0.02 mg/cc (0.002%) to 0.20 mg/cc (0.02%), applied for between 10 and 120 seconds.⁵ The safety profile of MMC appears to be excellent.

Depending on the risk of haze, I like to apply MMC using a sponge and move it around on the central cornea; this helps

“ Many patients will have an increase in DED symptoms and findings after corneal surgery.



the patient fixate on the light intermittently. I utilize copious irrigation to rinse out the MMC after application. Some surgeons use a well for application, but I prefer to use the sponge so that I can easily remove it if the patient starts to lose fixation.

If haze occurs, mechanical removal can be attempted, followed by laser removal with MMC. Postoperative topical steroids can often improve haze significantly. The need to perform keratoplasty for haze is rare.

FUNDAMENTAL 3 DRY EYE DISEASE IS COMMON

DED is extremely common in patients seeking refractive surgery.⁶ Many individuals desire laser vision correction due to contact lens intolerance, much of which stems from aqueous deficiency or meibomian gland dysfunction.

Preoperative identification of these patients allows appropriate management of their DED. Patients should be educated about the chronicity of the condition. Many patients will have an increase in DED symptoms and findings after corneal surgery. Lid hygiene, artificial tears, and supplementation with oral omega-3 fatty acids are often helpful. In patients with severe DED, topical cyclosporine, lubricant ointments, and oral doxycycline may be useful.⁷

Typically, tear function and epithelial health will return to baseline between 6 and 12 months postoperatively. However, some patients who return to baseline may still

be dissatisfied if they were unaware that they originally had a problem with their tear film. Again, proper preoperative patient education is crucial.

FUNDAMENTAL **4** INFILTRATIVE KERATITIS CAN OCCUR POSTOPERATIVELY

Sterile or infectious infiltrates can be found after surface ablation. Careful monitoring of the cornea can help to detect the occurrence of these issues.

In suspected infectious keratitis, culturing and prescription of antibiotics tailored to the infection can help to resolve the infectious process and hopefully minimize scarring that might affect long-term vision. Sterile infiltrates can occur due to the overuse of topical nonsteroidal drugs or in patients with significant ocular rosacea or staphylococcal marginal keratitis.

FUNDAMENTAL **5** STEROID RESPONSE PROBLEMS MAY OCCUR

Topical steroids can cause elevated IOP in some patients. The surgeon should perform a preoperative optic nerve health assessment in all patients; this could just involve a look at the optic nerve head and analysis of cup-to-disc ratio, but, in some patients, OCT analysis of the nerve fiber layer and visual field testing can be helpful. Although an elevated IOP response is uncommon, postoperative

IOP monitoring can aid in detecting any potential steroid response pressure problems.

CONCLUSION

Surface ablation procedures are very safe, but potential complications exist. Addressing issues preoperatively, understanding which patients are at risk, educating patients and setting expectations, and proceeding with appropriate techniques as described here are vital keys to effective prevention and successful management of these complications. ■

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