

Incorrect Ablation

BY STEVEN J. DELL, MD; JOHN F. DOANE, MD; AND LOUIS E. PROBST, MD

CASE PRESENTATION

A 34-year-old male presented for a refractive surgery evaluation. He was deemed an excellent candidate for LASIK based on a complete workup, including refraction, topography, an evaluation with the Pentacam Comprehensive Eye Scanner (Oculus, Inc., Lynnwood, WA), and an ocular examination. His preoperative refractive error was -6.00 D OD and -6.25 D sphere OS. Central corneal pachymetry measured 534 μm OU by ultrasound (Figure 1).

The surgeon planned a -6.00 D treatment for both eyes and programmed a Visx Star S4 laser (Advanced Medical Optics, Inc., Santa Ana, CA) for conventional bilateral LASIK. The ablation began on the patient's right eye after the uncomplicated creation of 75- μm -thick flap. Approximately 60% of the way through the ablation, the surgeon realized that the process was taking longer than expected. In addition, he noted that the fluorescence pattern of the ablation was in the peripheral cornea. The procedure was stopped. Upon close inspection of the entered parameters on the laser, the surgeon saw that +6.00 D had been inadvertently programmed for both eyes instead of -6.00 D. He aborted the original procedure after 568 of 968 pulses had been delivered to the peripheral cornea of the patient's right eye.

The surgeon replaced the flap and reprogrammed the laser for the correct parameters for the patient's right eye.

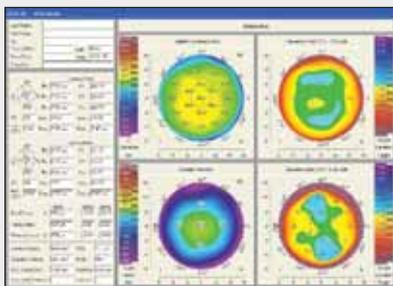


Figure 1. The topography of the patient's right eye was evaluated preoperatively with the Pentacam.

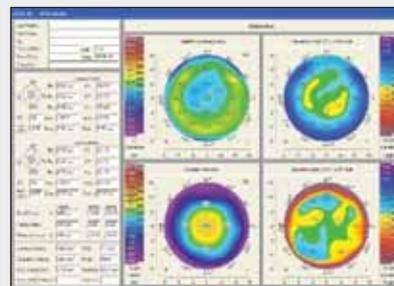


Figure 2. The topography of the same eye was analyzed with the Pentacam 1 day postoperatively.

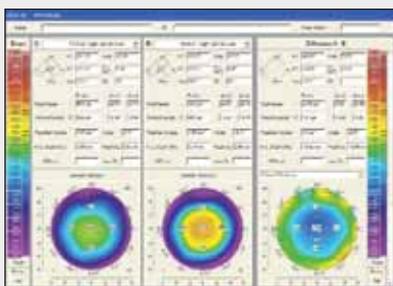


Figure 3. The difference map for the patient's right eye is shown.

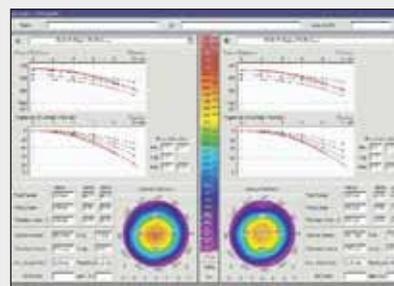


Figure 4. The eye was re-evaluated with the Pentacam 1 week after LASIK surgery.

Then, he lifted the flap and proceeded to perform an ablation of -6.00 D. The left eye's flap and ablation were completed uneventfully.

On the first postoperative day, the patient had UCVA of 20/counts fingers in his right eye and 20/25 OS. The refraction in his right eye was -4.50 +1.50 X 35 = 20/20. The central corneal pachymetry was 440 μm . Figure 2 provides the topography, and Figure 3 shows the difference map.

At 1 week, the patient's refraction was -3.50 +1.00 X 78 = 20/15 in his right eye. Figure 4 shows an evaluation with the Pentacam.

How would you have proceeded upon recognizing the programming error, and how would you approach the visual rehabilitation of the patient's right eye?

STEVEN J. DELL, MD

Although things are bad, they could have been worse. For example, a planned +3.00 D treatment incorrectly executed as -3.00 D would be much tougher to address. In this case, the right cornea has a relatively bizarre residual shape from the removal of central and midperipheral tissue. Positive spherical aberration is present and is combined with the unusual situation of a peripheral trough of removed tissue, resulting in a midperipheral area of relative elevation, as shown on the anterior float map of the Pentacam.

Although one often desires to correct iatrogenic situations such as this one quickly, the stability of the

refractive outcome should be established, which could take months. The patient could use a soft contact lens in the interim to deal with his anisometropia. The thinnest central postoperative pachymetry reading was obtained with ultrasound. Using this worst-case scenario of 440 μm , a 75- μm flap would leave 388 μm of residual central stroma. The Pentacam's pachymetric data also indicate sufficient peripheral stroma to allow an enhancement.

Regardless of whatever method was used to create the flap, I would feel more comfortable performing surface ablation. If the surgeon used a femtosecond laser for the original procedure, a 15- μm deviation in the

ADMITTING AN ERROR**BY STEVEN J. DELL, MD**

There are many situations in medicine that require judgment calls. In other cases, we can clearly state that an error has been made. Incorrectly entering +6.00 D instead of -6.00 D when treating the right eye of the patient in this case obviously falls into the latter category. When I reviewed the case presentation, the first thing that jumped into my mind was what the surgeon should say to the patient immediately postoperatively.

A surprising number of physicians believe that any admission of fault or responsibility in a situation like this one should be avoided at all costs and that vague or noncommittal statements are preferable. Somehow, they believe that disclosing the truth weakens their position. In my opinion, this stance is flat out wrong strategically as well as totally unethical.

In a case such as the one presented in this article, I believe the physician should immediately disclose that a human error was made. If this had been my patient, I would have stated that, regardless of the source of the error, I was ultimately the one in charge and take full responsibility. I would have said that, if possible, the error would be corrected, and, if I were unable to make the correction, I would reach out to my colleagues for assistance. It would also be important to express regret that the patient was having difficulty postoperatively with his vision. Patients do not hear such an empathetic response often enough in situations like this one.

I think it is best to have a conversation such as I described in the presence of a family member so that the message is not lost on the patient in the emotional aftermath of the event. Full disclosure may seem like a danger-

ous strategy to some surgeons, but I believe it is much less likely to result in litigation. Ultimately, the patient may blame the surgeon for a poor outcome, regardless of the level of disclosure. By fully revealing the truth, however, surgeons lose nothing that has not been lost already, and they stand to gain a great deal. Most people understand that physicians are not infallible, and honesty combined with a plan for addressing the problem is critical to maintaining a rapport with patients.

With an obvious and undeniable mistake such as the one made in this case, the patient either will or will not sue the surgeon. This decision will largely depend on the patient's personality and the relationship the surgeon maintains with him as well as his final visual outcome. I believe that deception tilts the odds substantially toward litigation and increases the chance that the surgeon will lose at trial. It will be very difficult to face a jury once it is ultimately revealed that the ophthalmologist withheld the truth from the patient. I would greatly prefer to face a jury and testify that, lacking infallibility, I made an honest mistake that I fully disclosed immediately. I would then outline the steps I had taken to prevent any similar occurrences in the future and would describe my attempts to help this particular patient. In comparing that scenario with one in which an error was made that the surgeon intentionally concealed, it is clear that the latter situation would be untenable for the defendant.

Juries and the legal system in general do not require surgeons to be infallible, but they are required to exercise reasonable care. A typographical error in data entry could happen to anyone. What juries will not tolerate is lying and deception on the part of doctors.

flap's thickness is still possible, which could mean that the flap is very near Bowman's membrane. Even if this flap is exactly 75 μm , one should recognize that approximately 60 of its 75 μm are epithelium and Bowman's membrane. The limits in the accuracy of subtraction pachymetry give me little confidence that this flap is sufficiently thick to be lifted safely. The flap's diameter is not stated. With the unplanned hyperopic ablation, however, this eye has probably received peripheral epithelial ablation. In my hands, it would be associated with an increased risk of epithelial ingrowth with relifiting, probably due to the photoactivation of these epithelial cells.

If reliable wavefront maps could be obtained, I would perform a wavefront-driven enhancement followed by an application of mitomycin C 0.02% for 20 seconds. I would carefully ensure that the planned ablation depth made sense given the refractive error involved.

JOHN F. DOANE, MD

This patient has had quite a refractive experience. Originally a -6.00 D myope, he had an approximately +3.60 D ablation followed sequentially by a -6.00 D ablation. When his refraction stabilizes, I would expect it to be approximately -3.50 D. At 1 week postoperatively, the eye's spherical equivalent, not by chance, is -3.00 D. The math is holding up thus far. The residual stromal bed at present for this patient is 534 μm - 75 μm (flap) - 84 μm (6.00 D X 14 μm per diopter [liberally]) = 375 μm . The residual stromal bed is on target, as the pachymetry measurement 1 day postoperatively was 440 μm (the flap is 75 μm , and the residual stromal bed was 375 μm [ie, 450 μm is quite close]).

It is highly unlikely that this patient will have any structural instability of the cornea despite the inadvertent error. If he were averse to further surgery, a soft contact lens would be the best option for refractive correction and treating the asthenopic symptoms likely occurring from the 3.00 D of anisometropia. If he were accepting of further corrective eye surgery, I would recommend either LASIK or PRK 3 months postoperatively. Importantly, I would wait for refractive stability to occur, around 8 to 12 weeks postoperatively at the earliest.

LOUIS E. PROBST, MD

I would not have reversed the laser treatment of the patient's right eye or treated his left eye. Rather, I would have stopped and explained the problem to the patient (see *Admitting an Error*). I would closely monitor the refractive outcome for his right eye and see the patient frequently in order to build a strong relationship. Once

his refraction stabilized, I would perform a customized enhancement on his right eye at no charge. After achieving a satisfactory correction, I would discuss a LASIK procedure for the patient's left eye with him.

The surgeon in this case has been lucky. The patient's myopic outcome is correctable to 20/15 at 1 week. Because I use the Orbscan topographer (Bausch & Lomb, Rochester, NY) rather than the Pentacam, I am less familiar with the maps shown in Figures 1 to 4, but they do not seem to demonstrate any major problems. Until the refraction in the patient's right eye fully stabilized in approximately 6 months, I would have him wear a soft contact lens.

Based on the case presentation, this patient would likely achieve an excellent result with a customized PRK enhancement for the residual refractive error. I would not perform a LASIK enhancement, because there is insufficient tissue in the stromal bed and there has already been an enormous amount of peripheral and central ablation. For the customized PRK enhancement, I would remove the epithelium with alcohol to avoid disturbing the flap. I would carefully evaluate the depth of the treatment in an effort to avoid having the ablation go through the flap. The depth could be decreased by reducing the optical zone of the customized treatment to as low as 5.5 mm. After the ablation, I would apply mitomycin C to prevent haze. ■

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