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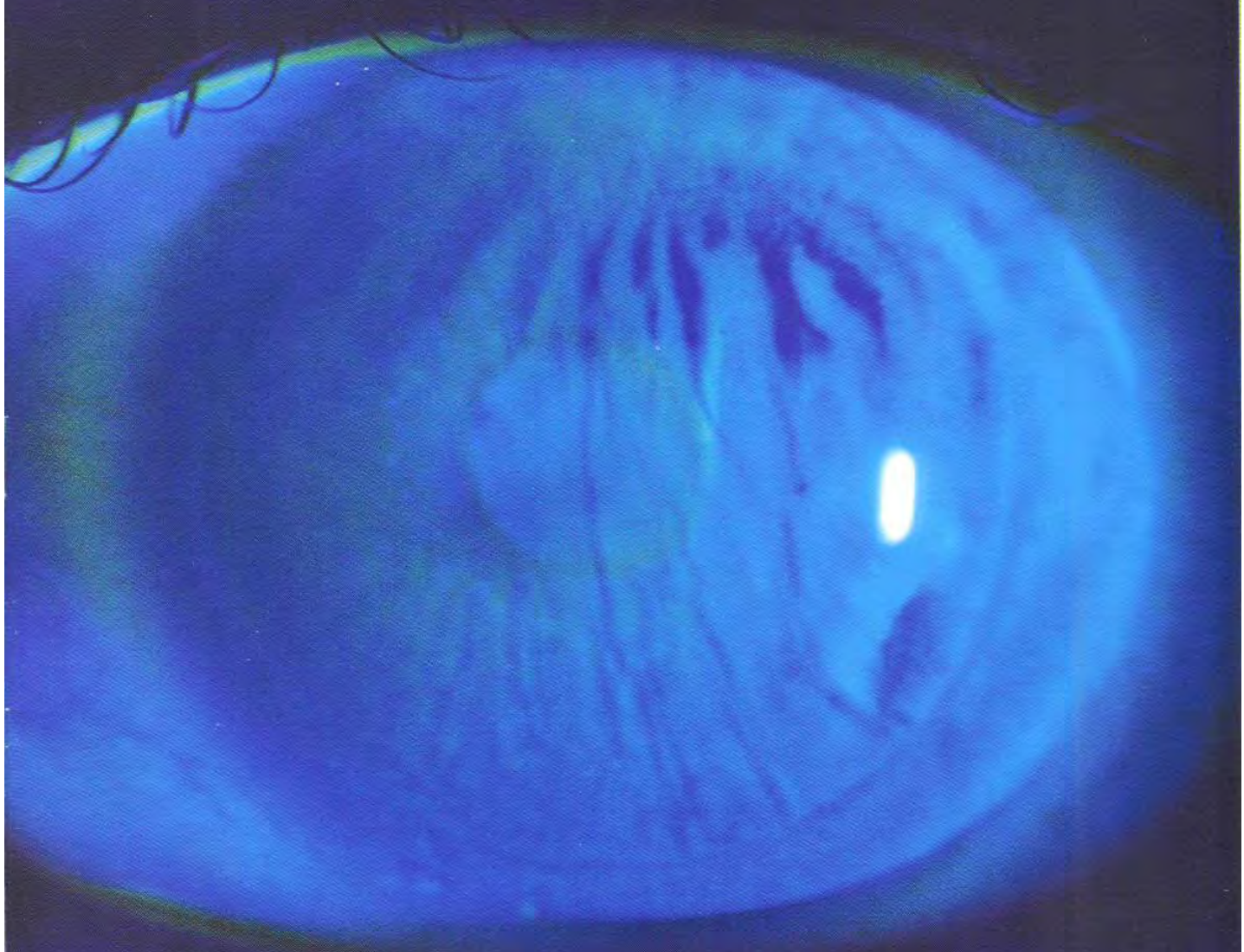

LASIK and the Law

Supplement to
REVIEW of Ophthalmology

LASIK Hones Acuity

By A. John Kanellopoulos, MD; Eric D. Donnenfeld, MD; Gregory J. Pamel, MD

In this, the first in a two-part series, LASIK is explored as a reasonable option to sharpen acuity in pseudophakic and PKP eyes.

In addition to treating myopia, hyperopia, and astigmatism, LASIK can be important in the visual rehabilitation of patients following previous ocular surgery. Surgeons are exploring LASIK to improve visual acuity following penetrating keratoplasty (PKP), incisional keratotomy, and cataract, glaucoma, and scleral buckle surgeries. Published reports of LASIK following such surgical procedures are limited, and it may be some time before we see data from large series of patients.

A search of the scientific literature yielded few reports of LASIK following other surgical procedures. Most describe LASIK following penetrating keratoplasty[1-10] and LASIK after pseudophakia.[11]

"The objective is not emmetropia, but to improve functionality."

The patients described in this article should be viewed differently than those in the typical refractive surgery practice.

Unlike a primary LASIK, in which the goal is emmetropia, the objective of LASIK on previously operated eyes is to improve functionality. Primary indications for LASIK as an enhancement procedure are high degrees of ametropia, astigmatism, and/or anisometropia, especially in spectacle or contact lens intolerance cases. Success seldom means eliminating spectacle lens wear. Rather, a successful outcome is one that makes it possible for the patient to be fitted in a more practical prescription.

Our accuracy with primary LASIK procedures has improved so that enhancements are required in less than 10% of cases, the enhancement rate is much higher when LASIK is performed to correct the refractive error induced by a prior surgical procedure. It is important, therefore, to counsel patients on

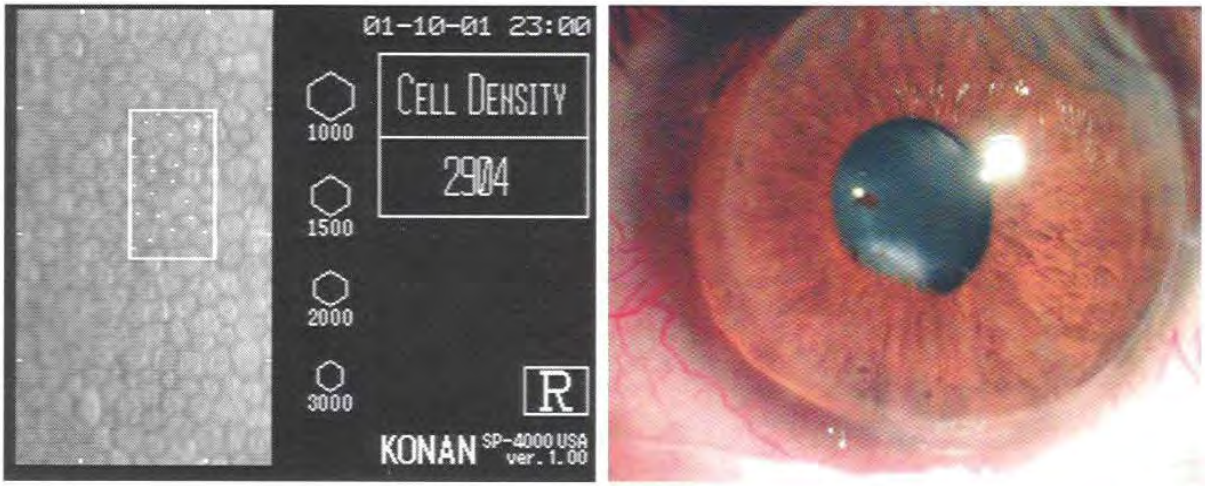

Figure 1a *Figure 1b*

Figure 1. A 34-year-old male two years status post therapeutic keratoplasty for a contact lens-related microbial ulcer. 1a shows the preoperative cell count in the graft. 1b is the eye that had the penetrating keratoplasty and is status post LASIK now.

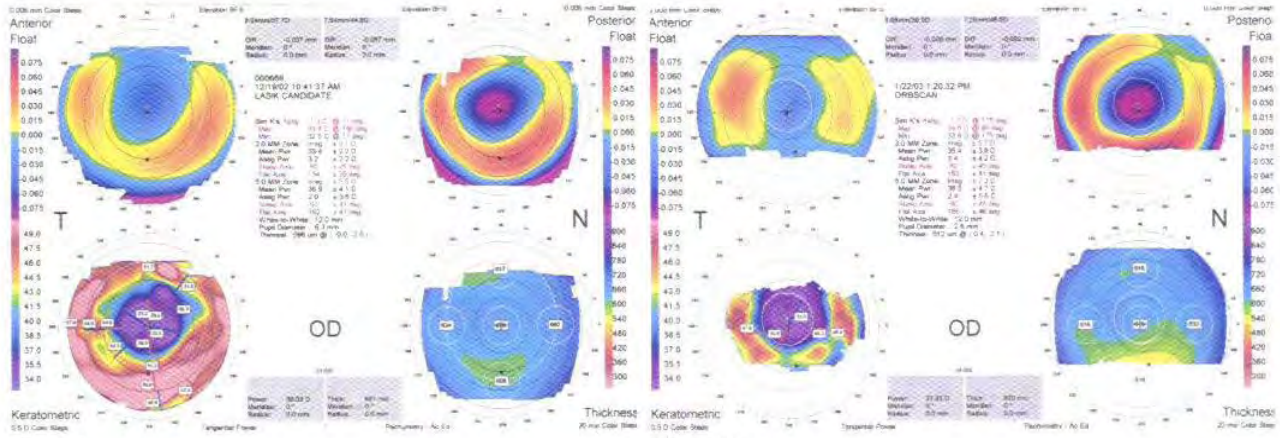

Figure 2a *Figure 2b*

Figure 2. OrbScan topography of a 46-year-old male 10 years after RK for a refractive error of about a –3 D with –1.50 D of astigmatism, and an unknown axis that has subsequently had a hyperopic shift. The maps show irregular astigmatism in two ways: the effects of the four-incision RK on the anterior float, posterior float, and corneal topography.

reasonable expectations for the surgical outcome.

Corneal thickness and overall ocular health must be factored in when considering LASIK secondary to another procedure. Contraindications are better addressed on a surgery-specific basis.

LASIK in pseudophakes

In pseudophakes, LASIK's goal is the elimination or reduction of dependency on eyeglasses and/or contact lenses. Obvious indications for LASIK range from significant, debilitating anisometropia to the correction of mild refractive errors. Patients with a posterior chamber intraocular lens (PC-IOL) can be evaluated in a similar fashion as those interested in correcting refractive errors on an unoperated eye.

It is important to carefully evaluate endothelial cell function; endothelial dysfunction around the phaco wound site may predispose the patient to flap slippage and poor adhesion and may increase postop complications. In addition, for patients with a PC-IOL not within the capsular bag, movement of a sulcus-fixated IOL or a poorly fixated PC-IOL and ruptured capsular bag may change the postop refractive error, leading to a possible refractive surprise post-LASIK. Therefore, special attention should be given to the actual position and stability of the PC-IOL.

We prefer that patients obtain a contact lens preview in our office to give them an idea of their potential vision. For example, patients with mild myopia who believe their vision will improve after laser correction may discover that while their driving vision improves, their reading vision deteriorates. Temporary contact lenses, even if only for an hour with-

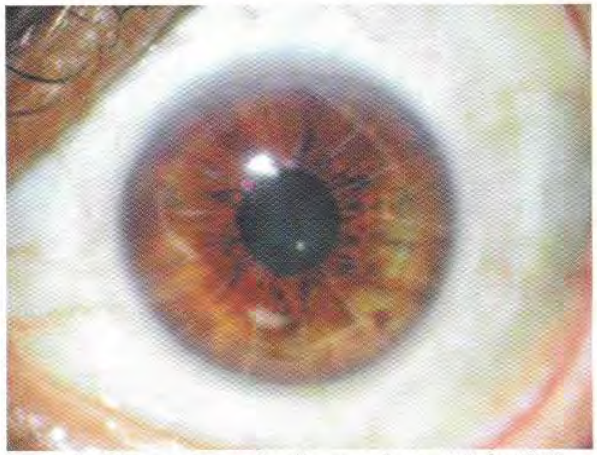

Figure 2c. The eye six months after wavefront-guided LASIK.

in our office, gives them an idea of their postop vision. A one- or two-day contact lens trial is ideal.

In anterior chamber intraocular lenses (AC-IOL), the concern is whether the implant will touch the corneal endothelium during the microkeratome pass. While this is debatable, obviously the distance of the AC-IOL and its stability in terms of the corneal endothelium is a significant factor. In general, if the distance of the AC-IOL and the corneal endothelium is less than 2 mm, we perform PRK. Otherwise, all the parameters are similar to LASIK in an eye with natural emmetropia.

LASIK after PKP

Fixing residual refractive errors following PKP is LASIK's most common therapeutic application. Although PKP enjoys high success rates, vision quality is compromised by anisometropia or astigmatism, with an average 4 D post-PKP astigmatism. Patients with high degrees of anisometropia or astigmatism who are spectacle or contact lens intolerant are suitable candidates for LASIK, provided the graft is quiet, clear, and well-healed. One should wait at least six months after all sutures have been removed (typically 18 months after the PKP) to ensure the graft is well adhered and the refraction and topography are stable.

When performing LASIK on the post-PKP eye, it is generally best to place the flap entirely within the graft, with the flap gutter approximately 1 mm from the graft-host junction. The donor tissue should be healthy and it will respond more predictably than host tissue. Host tissue can be problematic for a variety of reasons. In patients who have had transplants because of keratoconus, for example, the host tissue may have some irregular thinning, increasing the chance of complications during flap creation. If pseudophakic bullous keratopathy and/or Fuchs'

endothelial dystrophy was the reason for the patient's transplant, one can expect the host tissue to have a very weak endothelial cell pump. A healthy endothelial cell pump is needed for good flap adhesion.

If a flap includes both donor and host tissue, adhesion will likely be delayed within the host tissue portion. This creates a higher risk for flap slippage, striae, and epithelial ingrowth. (Figure 1) Preoperative assessment of the donor tissue's endothelial cell pump function through pachymetry or endothelial cell count, is advisable. The microkeratome pass should be swift to keep suction time to an absolute minimum. The longer the eye remains under suction, the greater the chance of wound dehiscence at the graft-host junction. Flap complications (free cap, incomplete flap) that occur during resection are treated in the same way as those that occur during primary LASIK.

Allowing the flap to adhere for five minutes is helpful to avoid the increased risk of flap dislocation. Often, patients with corneal transplants for bullous keratopathy and Fuchs' dystrophy have peripheral corneal edema. In these eyes, the flaps should be as small as possible to avoid the flap overriding the stromal bed into the peripheral recipient bed, which can be edematous. The endothelial dysfunction decreases the adherence of the flap and can result in flap slippage.

LASIK in the post-PKP eye is an injury to graft tissue, and patients should be placed on corticosteroids for one month and then tapered. Wound dehiscence at the host-graft junction is the most feared complication but, to our knowledge, has not been described.

There are two schools of thought when the ablative component of the LASIK procedure should be performed on post-PKP eyes. There is some evidence that simply creating a flap can significantly impact astigmatism and, possibly, the refractive error. Accordingly, some surgeons prefer to create the flap, then wait a month to perform the ablation based upon the patient's modified refraction. My own preference and recommendation is for immediate ablation. According to the literature, 30% to 35% of post-PKP patients need an enhancement after the first LASIK. This means there is a 70% to 75% chance that one LASIK will achieve the targeted improvement. We prefer to take those odds and spare the majority of our patients a second procedure.

We have performed LASIK in eyes following penetrating keratoplasty for more than eight years, with excellent results.[10] Our review of eight publications reported in the literature included 110 eyes undergoing LASIK following PKP with follow-up times ranging from six to 12 months.[8,10,12-15] The mean myopic preoperative spherical equivalent was approximately –8.50 D. Myopia treatment range was –0.25 D to 15.25 D.

The mean preoperative cylinder was approximately –5 D, and the preoperative cylinder ranged from –2 D to –15 D. The results indicated a mean postop sphere of about –0.67, with a range from +1.25 to –5 D. The mean postop cylinder was about 2 D, and the range was –0.25 D to –7 D. A case in point is a patient from our clinical practice, a 34-year-old male who is two years status post therapeutic keratoplasty for a contact lens-related microbial ulcer. The preoperative prescription was –4.50 –5.50 at 56°. The treatment was performed with the Allegretto-Wave excimer laser (WaveLight, Germany) and with a Moria M2 microkeratome (Moria, France). At three months postop, his UCVA was 20/25. His refraction was +0.25 –0.50 at 50 degrees, with which he sees 20/20.

Another special concern is performing LASIK following keratoconus grafts. We are concerned that there may be an increased risk of progressive ectasia, and have begun using PRK with mitomycin in managing many of these patients. In our experience, there are no other significant peculiarities in regard to LASIK following penetrating keratoplasty.

Conclusions

Realistic expectations are absolutely essential. Particular care must be taken to set reasonable patient expectations prior to surgery. It is vital that these patients understand their LASIK is not the same as that on a healthy eye. The expectation of near 20/20 uncorrected vision and rapid visual recovery is appropriate for primary LASIK in healthy eyes, but highly inappropriate for patients whose corneas are compromised by prior surgery. Patients and surgeons need to understand this substantial difference.

Success with these patients is measured not by the percentage who are 20/20 or better, but the increase in patients' day-to-day functionality. With intelligent preoperative selection and surgical planning, LASIK can be a superb tool for the visual rehabilitation of patients who have significant ametropia, astigmatism, or anisometropia following ocular surgery. Although the number of procedures performed remains modest, it is clear that LASIK can be performed safely and with good results on patients who have had PKP and cataract surgery. While there are exclusion factors, surgical considerations, and postoperative concerns peculiar to each type of post-surgical patient, one generally observes the same inclusion criteria (e.g., adequate corneal thickness, healthy ocular surface) as with primary LASIK. The setting of appropriate patient expectations is key, especially because many patients have preconceived notions of what LASIK can achieve based on what LASIK has done for friends with healthy eyes. Patients need to understand that the goal of surgery is improved visual function and that success will be determined by the degree of improvement in best-spectacle corrected acuity. RRS

(The authors have presented the course "LASIK following previous eye surgery" at the AAO meeting for the last three years. At this year's meeting it will be held from 2:00 p.m. to 4:15 p.m. on Tuesday, November 18th, HIL-E1 Capitan A.)

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All images courtesy A. John Kanellopoulos

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