

# Clinical Review

## Maximizing Outcomes With NearVision CK

Preoperative pearls for postoperative success.

BY BRADLEY BLACK, MD

I initially decided to get involved with NearVision CK (Refractec, Inc., Irvine, CA) because of what I call "The Promise of CK." I wanted to fill a void in my practice, because we had no other minimally invasive vision correction procedure to offer the 45- to 55-year-old presbyope besides glasses or contact lenses. I have always said that I do not perform refractive surgery to make money, but rather to make people happy. With CK, I make them very

happy (and make a little extra money besides!). Because of CK's minimal initial investment and low overhead costs per case, the profitability of each treatment is higher than with just about any other procedure I offer. However, the CK surgeon cannot be a passive investor. The procedure requires spending time with the patient pre- and post-operatively, and any physician considering adopting the technology must be prepared for this commitment.

### CK RE-ENERGIZED

The new LightTouch technique, to me, is the greatest thing that has happened to CK. It is not new technology but a new technique, so it costs the physician nothing more to adopt—an unusual concept in today's environment. My results with LightTouch have been dramatically better in terms of patients' satisfaction, the speed of postoperative effect (the "wow" factor), and less  
(MAXIMIZING continued on p. 4)

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## Building a Thriving NearVision CK Practice

Marketing pearls for maximizing the procedure's effect.

BY SARAH CWIAK, MBA

Dr. Black's practice in Louisville, Kentucky, began marketing NearVision CK (Refractec, Inc., Irvine, CA) when he adopted the procedure approximately 2 years ago. Although the LightTouch revolution has not changed our approach to external marketing, it has drastically

increased our word-of-mouth referrals. The new technique has delivered the "wow" factor that was lacking with the traditional CK technique. Our patients now leave our practice enthusiastic and excited to show off their new near vision.  
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TABLE 1. PATIENT DEMOGRAPHICS FOR LASIK AND CK

LASIK	CK
• Ages 30+	• Ages 45+
• Household income = \$75,000 +	• Household income = \$100,000+
• Average surgery cost = \$4,000	• Average surgery cost = \$1,750
• 58% will finance*	• Under 20% finance*
• Most walk in ready for surgery	• 3 months to surgical action
<b>Conclusion</b>	
CK patients have a higher income and a less expensive procedure. However, they take longer to schedule.	
* Vision Fee Plan/Health Care Finance statistic.	

## The Evolution of NearVision CK With LightTouch

How the LightTouch Technique came to be, and its impact on my practice.

BY H.L. "RICK" MILNE III, MD

It is easy to forget how new the NearVision CK (Refractec, Inc., Irvine, CA) procedure is. Its FDA trials for hyperopia were conducted in 1999, and the procedure was approved for treating hyperopia in April 2002. NearVision CK gained FDA approval as a presbyopic treatment in 2004 and currently remains the only procedure with this distinction.

I believed in the procedure and had enough happy patients that I stuck with it.

A little more than 1 year ago, I  
(EVOLUTION continued on p. 7)

### DISCOVERING LIGHTTOUCH

When I adopted CK in May 2002, I treated 50 eyes in the first month, and my results were undercorrected compared with those of the FDA trial. I induced more cylinder than I expected, and I had to treat approximately one-third of my patients with either another ring or additional treatment spots. Nevertheless,

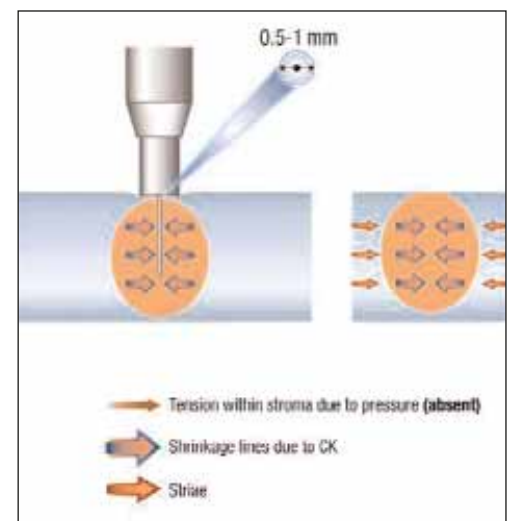


Figure 1. This image demonstrates the LightTouch technique.

# The Optics of NearVision CK

The science behind the procedure's effectiveness in treating presbyopia.

BY JACK T. HOLLADAY, MD, MSEE, FACS

Numerous investigators have found that NearVision CK (Refractec, Inc., Irvine, CA) provides very good near acuity with much less compromise in distance vision than one would expect from a monovision procedure. The reasons for this blended vision effect with NearVision CK, however, have not been well understood. Recent analysis with a new tomography-imaging device provides answers regarding the optics of conductive keratoplasty.

Topographers all have a 1.1- to 2.0-mm "blind spot" in the center of the cornea for which they must extrapolate data based on measurements in the paracentral zone. The Pentacam (Oculus USA Inc., Lynnwood, WA) produces a three-dimensional image of the front and back surfaces of the cornea and its thickness throughout. Most importantly, the device provides true elevation data over the entire transparent cornea, including the 1.5-mm central area. The Pentacam images the anterior segment of the eye with a Scheimpflug camera that rotates around a common axis, taking 50 three-dimensional image slices with the same center point. This approach allows all of the slices to be reregistered by their common point so that the normal attentive-fixation saccadic eye movements do not affect the precision of the result.

Pentacam images of normal, emmetropic eyes reveal that the normal cornea has the well-known prolate shape, but also a previously unreported flat spot in the center of its curve, like a bell curve, that falls within the blind spot of topographers. With the Pentacam, I was able to determine that CK maintains the

optics of the eye in part by preserving this flat zone in the central 1.5mm of the cornea as well as by creating an exaggerated prolate shape in the paracentral and midperipheral zones. This shape helps to maintain distance vision while also improving near vision.

## CK'S EFFECT ON CORNEAL SHAPE AND POWER

A Pentacam image of the anterior surface of a CK-treated eye shows exactly where the corneal flattening and steepening occur. In Figure 1, eight white spots were superimposed on the image at the 7-mm optical zone, exactly where the treatment spots were located anatomically. The treatment caused the cornea to contract and flatten near the application ring. Interestingly, the area of flattening extends farther peripherally than centrally. The treatment spots are positioned almost at the inner edge of the flattened band. Closer to the cornea's center, the paracentral zone steepens, exaggerating the prolate shape of the cornea in the 3.0- to 4.5-mm area while preserving the flatter area in the central cornea.

A refractive power map (Snell's Law in diopters) reinforces these topographical findings (Figure 2). After a NearVision CK procedure, the 1.5-mm area of the central cornea in this particular eye has a power of 43.80D. Preoperatively, its power was 42.10D. Therefore, the difference map shows an increase of +1.70D in the central corneal power on the anterior surface. Moving out to the paracentral zone, there is an even greater increase in power, of 2.00 to 2.20D, on the anterior surface. As the cornea flattens toward the periphery, the change in power drops off. At approximately

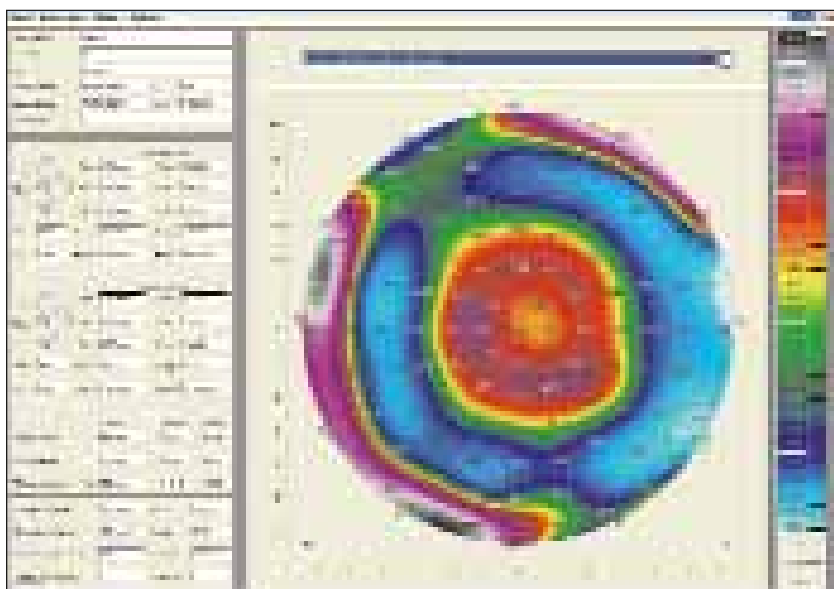


Figure 1. A Pentacam image shows the anterior surface of an eye treated with CK.

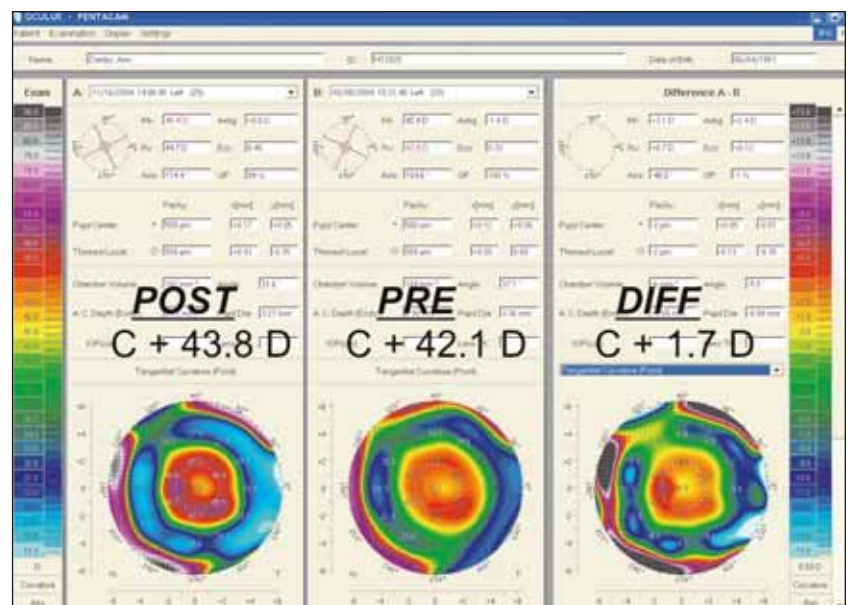


Figure 2. A refractive power map shows the changes in an eye treated with CK.

6.0 to 6.5mm—just slightly inside the 7.0-mm CK treatment ring—there is no change in power.

## BACK-SURFACE AND NET CHANGE IN CORNEAL POWER

To calculate the net change in corneal power after a NearVision CK treatment, we must also know the change in power of the back surface of the cornea. Back-surface changes that are similar in shape but somewhat lesser in strength than that of the front surface yield an optically beneficial result. Remember that the back surface of the cornea has negative power, the front surface has positive power, and the sum of the two is the net power of the cornea. For example, the average cornea is +50.00D on the front and -5.00D on the back for a +45.00D cornea.

In Figure 3, the back surface of the cornea steepens slightly after a CK procedure. Postoperatively, it has a power of -5.70D, compared with its preoperative power of -5.10D. Combining this refractive change of -0.60D with the front surface's change of +1.70D yields an increase of approximately +1.25D in net power in the central cornea and an increase of +1.80 to 2.00D in the net power in the paracentral zone.

If the back surface of the cornea underwent a change in power that were equal to or greater than that on the front surface, it would subtract from the positive power of the cornea and reduce the effect of the treatment.

## A MORE PROLATE CORNEA

We know that making the cornea more prolate (more bullet-shaped, as opposed to oblate, which resembles

the top half of a hamburger bun) improves the optics of the eye by reducing ocular spherical aberration. The three procedures known to make the cornea more prolate are NearVision CK, hyperopic LASIK, and Intacs (Addition Technology, Inc., Des Plaines, IL). Of these three, CK most exaggerates the prolate shape of the cornea. As a result, it offers the greatest gain in near vision with the least loss of distance vision.

Making the cornea more prolate has an important effect on spherical aberration, which is why CK works so well in the presbyopic age group. The young human eye has negative lenticular spherical aberration that is balanced by positive corneal spherical aberration. As we age, the cornea retains its positive spherical aberration, but that of the lens becomes increasingly positive. The resulting positive spherical aberration of the entire eye is the biggest cause of halos and night driving difficulties in the presbyopic population.

Exaggerating the prolateness of the cornea with a CK procedure causes the corneal spherical aberration to become less positive, or even slightly negative, thus restoring the balance of spherical aberration between the cornea and crystalline lens and improving the optics of the eye. By reducing or eliminating the positive spherical aberration in the presbyopic cornea, NearVision CK produces a clearer image on the retina for better near and distance vision and an improved depth of field.

## TAKING ADVANTAGE OF THE SYNKINETIC REFLEX

Finally, NearVision CK serendipitously (OPTICS continued on p. 8)

# A New Dimension in CK Surgery

Treating IOL undercorrections with NearVision CK.

BY LAURA HARRIS, MD, FACS

Although right now the idea of using NearVision CK (Refractec, Inc., Irvine, CA) to enhance IOL implantation is novel, within 1 year, it will become important, as more surgeons adopt high-technology IOLs. According to the FDA studies for the Crystalens Accommodative IOL (Eyeonics, Inc., Aliso Viejo, CA) and the Acrysof Restor IOL (Alcon Laboratories, Inc., Fort Worth, TX), both lenses undercorrect a certain percentage of patients: 25% of Crystalens patients and 20% of Restor patients still need glasses postoperatively. I have had great success treating slightly undercorrected IOL patients with NearVision CK (Figure 1).

I began performing CK in June 2003. My CK practice has been very straightforward; I treat the average presbyope who needs no more than +0.75D of correction. I find that the treatment is most effective in that middle range. The average age of my CK patients is 53 years. I perform both unilateral and bilateral treatments. I also add bonus spots for patients who have small amounts of cylinder and are experiencing some shadowing, because I find that CK can make their vision quite crisp.

NearVision CK is invaluable to my practice, because otherwise I would have nothing to offer presbyopes. I anticipate additional new applications for CK such as after LASIK, LASEK, or Epi-LASIK in addition to after IOL surgery. High-technology IOLs are only going to increase in availability and demand, and they often have associated over- and undercorrections. For certain postoperative problems, such as poor reading vision after IOL implantation, NearVision CK is the best treatment, and surgeons who adopt this IOL technology would be wise to consider adopting CK.

## IOL EXPERIENCE

My experience with the Crystalens is more than 1 year. I like the idea of a single-focus lens and have had minimal problems with glare. Also, I have begun implanting the Acrysof Restor IOL. I have not used the Rezoom or Array IOLs (both from Advanced Medical Optics, Inc., Santa Ana, CA).

My outcomes with the Crystalens have mirrored those of the FDA trials: 75% of my patients have great results, but 25% of them need readers for near vision. Out of all my Crystalens surgical patients, only three of them have needed additional treatment for near. Although I am impressed with the capabilities of the Crystalens tech-

nology, I do not think that the IOL is as effective in hyperopes as it is in myopic or plano patients. I would neither perform a refractive lens exchange with the Crystalens nor piggyback a lens on top of it. Without CK, all that is available for a hyperopic surprise is LASIK or a contact lens.

## CK CASE STUDIES

In the following three cases, the patients achieved excellent biometry and best-corrected distance results with the Crystalens without any surgical complications, but they were very unhappy with their reading vision. Although I had not heard any reports about ophthalmologists' using CK after Crystalens implantation, I had used it for hyperopic surprises after IOL implantations with success, so I attempted this indication.

### Case 1

A 42-year-old female hyperope underwent Crystalens implantation because she had been wearing extended-wear monovision contact lenses for 7 days at a time and was developing infections. She could not tolerate glasses or bifocals. Preoperatively, her UCVA was 20/50 at distance and 20/200 at near. Postoperatively, she developed a mild overcorrection: blended vision of 20/20 at distance and 20/200 at near in her left eye. Her near vision in that eye never changed during the first 3 postoperative months. The reason could have been latent hyperopia in that eye or the fact that the Crystalens sits somewhat posteriorly in the bag. Even with accurate preoperative measurements, there may be situations in which the Crystalens is malpositioned intraocularly, with no way to reposition it.

I performed an eight-spot NearVision CK treatment on the patient's left eye with the LightTouch technique. That eye achieved 20/20 vision at distance blended to 20/70 at near. This outcome still was not excellent, so I placed a loose contact lens on her left eye and added an extra CK treatment spot to her right eye. When I placed a higher prescription over her left eye to test her need for more treatment, she disliked the effect, and the loose lens over her right eye did not seem to affect her distance vision much. Therefore, I delivered a second eight-spot treatment with the conventional amount of pressure to her left eye, because at that point I had not sufficiently developed my LightTouch nomogram for such a circumstance. The patient's final outcome was -1.50

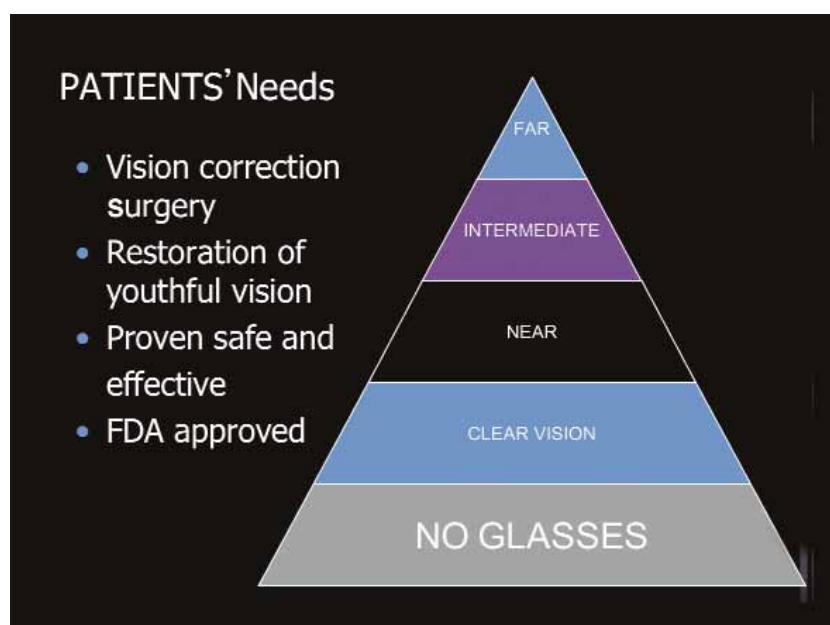


Figure 1. A chart shows CK patients' greatest surgical goals.

+0.25 X 32 OD and plano +0.50 X 25 OS. She has 20/20 distance vision and 20/30 near vision. Two days after this procedure, she entered my office smiling for the first time.

### Case 2

A 52-year-old hyperopic female presented with a prescription of +2.50D OD and +2.25 OS as well as a UCVA of 20/100 at distance and 20/400 at near OU. I dislike performing hyperopic LASIK on a 52-year-old, because I think the treatment does not provide enough correction and also regresses. I thought this patient would be an excellent candidate for Crystalens implantation. She had a very good result, although she was mildly overcorrected within a reasonable range. Her vision was still 20/70 at near. When she returned 3 months later, she had regressed by 1.50D in both eyes. This result was unexpected, one that I had never before experienced with the Crystalens. I performed an Nd:YAG laser capsulotomy, which produced zero change in the patient's prescription. She then agreed to try an eight-spot application of NearVision CK with LightTouch, and her result was very good. She had slight astigmatism in her left eye and wanted a bonus treatment spot. Now, this nondominant eye has excellent vision. I performed routine LASIK on her right eye, because I was unsure of how much effect a CK treatment would have on it. The patient is quite happy with her blended vision, which is 20/25 at distance and 20/20 at near OS and 20/20 at distance and 20/70 at near OD. Performing LASIK in both eyes would have left her overcorrected, whereas CK in her left eye

provided a much better outcome.

### Case 3

A 63-year-old female hyperope was perfectly plano 3 months after a Crystalens implantation, but she still could not read. Her prescription, plano +0.50 X 50 OD and -0.25 +0.25 X 56 OS, was a little too hyperopic for conventional NearVision CK. An excimer laser treatment yielded no improvement, so at 6 months, I performed an eight-spot NearVision CK procedure with LightTouch. Afterward, her UCVA was 20/20 at distance and 20/20 at near, and her prescription was -1.00D OD and -0.25 +0.25 X 56 OS. This patient is thrilled with her outcome.

## IN CONCLUSION

Refractive lens patients pay a lot of money to see well and expect an excellent outcome. Without NearVision CK, I would have no other option for helping these patients achieve their targeted vision. I think that post-IOL applications are a fabulous opportunity for using this technology. NearVision CK is an extremely effective treatment for the underperformance of an accommodating IOL, because it maintains distance vision while adding near-vision performance. I consider the procedure necessary for anyone implanting refractive IOLs. ■

Laura Harris, MD, FACS, is Co-Surgical Director of Brown Harris Laser Eye Care in Wilmington, North Carolina. She is a paid consultant for Refractec, Inc., but states that she holds no other financial interest in the company or its products. Dr. Harris may be reached at (910) 796-8600; laura@bhlec.com.

(MAXIMIZING continued from p. 1) induced astigmatism postoperatively. With this technique, which requires fewer spots than the conventional approach, patients seem to have less discomfort. Before switching to LightTouch approximately 1 year ago, I had become somewhat disenchanted with my results, and my patient-satisfaction levels were not as high as I had hoped or expected. The LightTouch technique has indeed rejuvenated CK in my practice.

**NEARVISION CK AS A CORRECTIVE PROCEDURE**

As an unexpected bonus, we have discovered that CK is a great “rescue” procedure for patients who have suffered less-than-satisfactory results from refractive or lenticular surgery. I began to use it to improve results in eyes that were slightly overcorrected on the hyperopic side, both in pseudophakes and postoperative excimer laser patients. For example, we have learned from experience that a -6.00D PRK or LASIK patient who is approximately 1.00D overcorrected is much happier with a CK correction. This is especially true in the presbyopic age as a result of the blended vision CK provides, which gives patients much better near vision than a second excimer laser procedure would. Many surgeons are also using CK after IOL implantation, both to correct minor hyperopic overcorrections as well as to enhance near vision in the nondominant eye.

**THE RIGHT PATIENT**

My staff and I target plano presbyopes—those who are quite frustrated with their reading glasses. They include post-LASIK and post-IOL patients, who represent a large subset of potential candidates in our practice. We have discovered that the three primary factors in successfully integrating CK into one’s practice are patient selection, patient selection, and patient selection (Table 1). First, the patient must have proper expectations for the procedure. He should not think that he will regain the vision he had at age 25 or be able to read the stock reports in dim lighting conditions. Second,

the patient must have an appropriate occupation and hobbies. Although studies show that NearVision CK does not affect depth perception, it may not be the best procedure for a professional golfer who needs both eyes for distance vision or an engineer who relies on precise, close-range vision. Most importantly, patients must understand that CK is what I call “a permanent solution for a part-time problem,” meaning that the results truly are monovision, albeit a modified or unique form of it. They must be willing to accept some blurring in their distance vision out of that particular eye.

**SCREENING**

Naturally, proper screening is important with the NearVision CK procedure to make it successful in your practice. For instance, an Orbscan (Bausch & Lomb, Rochester, NY) map might demonstrate that a patient has adequate peripheral corneal thickness (>560µm) as well as confirm that he has no signs of corneal ectasia. It is also imperative to make sure that the patient has undergone no previous corneal incisional surgery such as radial keratotomy or astigmatic keratotomy, has minimal astigmatism (ie, <1.00D), and is not a latent hyperope. I use Cyclogyl (Alcon Laboratories, Inc., Fort Worth, TX) refractions on patients who are in their mid-to-upper 40s to identify poor candidates and avoid chasing hyperopia later on.

One useful, standard tool to evaluate patients for NearVision CK is a screening form that not only inquires about their ophthalmic history and lifestyle but also their hobbies, work habits, and expectations. Having a record of their visual demands is quite helpful when discussing their expectations and may be useful to refer to postoperatively.

Another screening tool upon which I rely is a chart describing five different “zones of vision,” developed by William Maloney, MD, of Vista, California. The chart categorizes ranges of vision into five zones, from fine print all the way to nighttime distance vision. Patients select any three

CRITICAL PREOPERATIVE SUCCESS FACTORS
Patient selection • Proper patient profile
Patient selection! • Appropriate patient expectations
Patient selection!! • Monovision-tolerant

consecutive zones of vision they would most like to have. With CK, they will likely achieve more than three zones, but they must understand, for instance, that if they pick zones 2, 3, and 4, they will probably not have fine-print vision. After a NearVision CK procedure, the patient may be very excited about his immediate vision; however, we often use the chart to remind him of his visual goals. This is especially important if the patient experiences an initial overcorrection before his eyes adjust to his desired reading distance.

In addition to dominance testing for near and distance vision, we also assess patients’ monovision tolerance. This step is very important with the LightTouch technique, which is more robust than conventional CK and distorts distance vision more. It is crucial for the staff to discuss monovision tolerance with patients from the very beginning. The effect is particularly strong during the first few postoperative months and may not begin to “soften” for 3 to 6 months. There are three main tests for monovision screening—the Murphy Phoropter test, the Strauss Loose Lens Screening, and a contact lens trial—all of which are designed to better determine a patient’s candidacy for the CK procedure. We also use these tests when deciding on enhancement procedures with CK to be certain we are not going to worsen a patient’s distance vision at the expense of his near acuity.

Although many physicians believe that a monovision contact lens trial is not an effective tool, I personally feel many patients are much more comfortable after trying it. Even if a patient decides that he prefers to wear the contact lens instead of undergoing CK, he will still be happy. One often can determine within a few hours whether the patient will be satisfied with CK. My staff and I try to have patients wear the contact lens for a couple of days and perform different tasks such as golfing, driving at night, and computer work to see if they will truly tolerate the correction. This is a classic example of underselling and overdelivering, as a patient’s distance vision will likely be better with CK than with a monovision contact lens.

STANDARDIZED PATIENT SCREENING TOOL
Five-Zone Vision Wish List <sup>1</sup>
Zone 1: Medicine labels
Zone 2: Magazine or newspaper print
Zone 3: Computer screen
Zone 4: Distance (day)
Zone 5: Distance (night)
<small>1. Maloney WF. Let the patient, not the technology, guide approach in presbyopia correction. <i>Ocular Surgery News</i>. 2004;22:16:10-12.</small>

**THREE CAVEATS**

Handling patients’ complaints has been different with LightTouch than with conventional CK. Although we hear fewer complaints with LightTouch CK, it is important to stress the procedure’s initial overcorrection to patients. I explain that to get the desired end result, we must first overcorrect and then allow the cornea to settle in over a period of weeks or months.

Also, patients’ refractions may not necessarily correlate with their visual results. For this reason, my staff and I focus on the patient’s subjective perception of his vision rather than his refraction.

I routinely prescribe Restasis (Allergan, Inc., Irvine, CA) for my CK patients, not because the procedure causes dryness, as does LASIK, but because I want to prevent any problem that may negatively affect their near vision. In fact, many patients who present for a possible enhancement may be “cured” by addressing their dry eye problem.

**CLOSING THOUGHTS**

In summary, NearVision CK has been a wonderful procedure for our practice. It is a highly profitable, minimally invasive surgery that offers a solution for a specific and otherwise hard-to-treat patient demographic. The new LightTouch technique has revived our CK practice through much improved results and the “wow” factor, both for the patient and the surgeon. Recently, within 2 hours of one postoperative patient’s returning home, two of his friends called and scheduled consultations. The results are that dramatic. ■

*Bradley Black, MD, is Medical Director of Dr. Brad Black’s Eye Associates in Louisville, Kentucky. He is a consultant for Refractec, Inc., but states that he holds no financial interest in any product or other company mentioned herein. Dr. Black may be reached at (812) 284-0660.*

**TABLE 1. DR. BLACK’S PROFITABILITY WITH CK**

Patient pays	\$1,582	Patient pays	\$1,582
Cost of card	\$175	Cost of card	\$175
Cost of disposables	\$25	Cost of disposables	\$25
Marketing per patient	\$201	Marketing per patient	\$201
Per case net	\$1,181	Per case net	\$1,181
10 eyes per month	\$11,810	20 eyes per month	*\$23,620
Annual Net	\$141,720	Annual Net	*\$283,440

Five eyes/month = \$70,860  
\*Excludes cost of machine

TABLE 2. CK EXTERNAL MARKETING COSTS VERSUS VOLUME

	152	182	1,195	850	562	315	201	154
Calls	152	182	1,195	850	562	315	201	154
Marketing	\$3,664	\$3,804	\$46,225	\$56,178	\$58,208	\$16,166	\$3,605	\$4,251
Procedures	62	58	162	164	154	135	125	125

(BUILDING continued from p. 1)

#### THE NEARVISION CK PATIENT VERSUS THE LASIK PATIENT

Our ideal candidate is over 40 years of age, has good distance vision, and wears readers. From a marketing standpoint, we target women, because they generally make many more medical decisions than men do. Consequentially, we have found that the 45-year-old female patient is very influential in bringing other patients into the practice, such as her parents who have cataracts and her children who need LASIK. These patients are an important demographic to target, because they seem to be the key decision makers for multiple familial tiers.

Women over 40 are self-prescribers; they are confident enough to buy their readers at the local drug store and to diagnose their family and friends. LASIK patients, because of their younger age, seem to be a little more reserved and less likely to push their friends and family to undergo a procedure. They also seem to be faster-paced decision makers than CK patients. Forty-year-old women are averse to risk, so they ask a lot more questions and do not respond well to sales tactics. They prefer to take their time and make up their own minds. We had to learn to relax our strategy and become comfortable answering a lot of questions (Table 1), but the reward is that our CK patients leave

TABLE 3. DR. BLACK'S RETURN ON INVESTMENT WITH CK

Total spent: \$195,000	ROI
Cost per call: \$54.90	\$195,000 invested
Cost per case: \$201	\$1,405,989 in revenue
	\$1,210,989 marketing ROI

incredibly happy and refer in a lot more patients than our LASIK patients do.

The first year we marketed NearVision CK, we advertised no other procedure in our practice, and our LASIK volume rose by more than 40%. Some of this conversion rate was the result of interested individuals' being good candidates for monovision or LASIK instead of CK. The majority of this increased volume, however, was due to a simple fact that we have learned: making a 45-year-old woman happy grows the practice.

#### ADDRESSING CONCERNS

Risk-averse CK patients do not like surprises, which they equate with deceit. Therefore, we are careful to discuss the potential risks of CK. For example, we tell them that they might feel some discomfort postoperatively, which 50% of CK patients do. The 50% of patients who do not experience postoperative discomfort are ecstatic, because they feel as though they had a great outcome. The patients who do have some discomfort accept it, because they expect it. Our philosophy is to underpromise and overdeliver. It works well, because if this group gets excited, they will talk about their experience.

#### EXTERNAL AND INTERNAL MARKETING TACTICS

Externally, we use direct mail, television, and billboards to market CK. Radio advertising in our market is very expensive, but I would certainly recommend other media in other markets. For the cost point, television is a great value for us, and direct mail works very well (Tables 2 and 3).

Internally, we integrated CK into our practice's daily activity (Figure 1). In the front office, we

place a Post-It note on the front of the health history of every patient over the age of 40 that asks them: (1) do you use readers? (2) do you have problems with distance vision? (3) do you have dry eyes? and (4) does anyone else in your family use reading glasses? (If they answer yes to question 4, we send that person a postcard to visit us.) We also use visual props to encourage patients to ask about CK. Our technicians have a can of tomato soup in every lane. When patients ask what it is for, the technicians ask them if they can read the grams of fat listed on the nutrition label. If the patient cannot read it, the technicians say, "Dr. Black has a procedure to improve near vision. It is not very invasive, and it is usually done in just one eye." Finally, we give our optometrists incentives to promote CK.

#### LIGHTTOUCH MARKETS ITSELF

Again, the LightTouch technique introduced a "wow" factor to the NearVision CK procedure. With the conventional technique, patients did not reach their targeted vision for approximately 3 weeks. With LightTouch, they can read their phones and watches immediately postoperatively, and they cannot wait to get home and call their friends. This "wow" factor works to our advantage, because we encourage these patients to brag about us. A happy patient is better than advertising. Once a patient has sent us a referral, we send him a gift certificate to Macy's and a hand-written thank-you note from the surgeon. ■

*Sarah Cwiak, MBA, is Director of Marketing for the Vision Companies in Louisville, Kentucky. She may be reached at (812) 396-7235; scwiak@vision-plus.com.*

**Please help us to better understand your ocular needs by answering the following questions:**

Do you use reading glasses?

Yes       No

Do any members of your family use reading glasses?

Yes       No

Do you have problems seeing at a distance?

Yes       No

Have you experienced dry eyes in the past 6 months?

Yes       No

Figure 1. The author uses various in-office materials to identify and target CK patients.

# CK as a LASIK Enhancement

Initial results and experience with this new application.

BY STEPHEN E. PASCUCCI, MD

When my staff and I began offering traditional NearVision CK (Refractec, Inc., Irvine, CA) 3 years ago, per the procedure's FDA-approved indication, we treated only hyperopic patients. We quickly discovered a broader patient base with the plano presbyopes and thus redirected our marketing focus for CK to target these patients. Indeed, we made more patients happy. Then, I took a suggestion to offer CK as a post-LASIK treatment for near vision enhancement. We had a fair number of LASIK patients in our practice, and I thought that their previous acceptance of refractive surgery and of me as their surgeon made them prime candidates for CK. My staff and I drafted a letter that we sent to approximately 500 of our former LASIK patients who were older than 50. We were unprepared for the response: we had to assign three people to answer the phones for 2 days, during which we booked 6 weeks' worth of CK consultations. For a while, I ceased accepting virgin eyes for treatment because of our volume of post-LASIK cases. In addition, these patients' husbands and wives were emmetropic presbyopics who were extremely envious of their spouses' new independence from glasses. Thus, our CK practice continued to grow. These patients in turn generated even more business: we treat their children with LASIK and their friends with CK. In fact, we experienced a "tipping point" for our refractive practice.

Needless to say, the procedure has been a wonderful addition to our practice. We continue to grow our patient base by holding seminars on NearVision CK specifically targeted to post-LASIK patients.

## BENEFITS OVER A LASIK ENHANCEMENT

Performing CK as a follow-up procedure to LASIK is a wonderful alternative to relifting a LASIK flap, because it eliminates flap-related complications such as epithelial ingrowth. I consider a secondary hyperopic LASIK treatment to be somewhat inferior to a primary LASIK procedure, because the former demands an optimal flap diameter from the first surgery. In addition, our studies have demonstrated that a patient's quality of vision is better with CK after LASIK than with a LASIK enhancement because of the blended vision CK provides.

## TRANSITIONING TO POST-LASIK CK

Whether refocusing your CK offerings to target post-LASIK patients or adopting this indication for the first time, applying CK on top of a LASIK procedure must be done cautiously. The approach for this off-label indication is not the same as for CK for emmetropic presbyopia with the LightTouch technique, nor as simple as cutting the nomogram in half and proceeding.

Because Daniel Durrie, MD, of Overland Park, Kansas, and I performed the first formal trials for the indication of CK after LASIK, I was able to share those data with my patients to ease any concerns, and other surgeons will be able to cite our experience. We now understand the amount of treatment to deliver and the parameters for a good surgical candidate. It is worth noting that my staff and I include a special addendum to the consent form that patients have to sign before undergoing CK for this indication. To paraphrase, it reads, "I understand that CK is an FDA-approved procedure but has not been specifically approved for post-IOL or post-LASIK applications, and I consent to have the procedure done." I highly recommend this practical measure to any surgeon who adopts CK for this purpose.

## TRIAL PARAMETERS

Dr. Durrie and I began our trial with the post-LASIK indication for CK cautiously (Table 1). We only operated on patients who had sufficiently thick corneal beds to ablate if necessary. The average age (53 years old) of the patients in our CK post-LASIK study was typical of emmetropic presbyopic CK patients. We aimed for conservative treatments of J3 rather than 1.50 to 1.70D, although I believe even better vision is possible. It is best to err on the light side of correction for post-LASIK patients, because their eyes respond more dramatically to the treatment than emmetropic eyes.

Preoperatively, most patients in our study were at or near plano. One word of caution: pay attention to whether patients had an initial undercorrection with their LASIK treatment. An individual who was myopic and did not receive a complete correction with LASIK may be -0.75D and will need a customized CK treatment using a larger optical zone.

TABLE 1. CLINICAL STUDY PARAMETERS

Number of patients/eyes	27 (25 post-LASIK, 2 post-PRK)
Time since excimer laser surgery	Mean: 50 ±28 months Range: 11 to 143 months Now all presbyopic
Age	53 ±4 years Range: 44 to 59
Treatment (nondominant eye)	Eight-spot CK at 7.5mm OZ Conventional Pressure CK
Target refraction	-1.00D
Questionnaires	Pre- and postoperatively

We used the conventional amount of pressure (not the LightTouch technique) and knew to cut the nomogram in half to eight treatment spots, but we had no idea at what diameter to deliver the spots. We tried a range of treatment rings of between 6 and 8mm. We quickly learned that diameters of 7mm and smaller were too small, and 8mm fell just short of the mark, achieving corrections of 0.50D to 0.75D. Thus, by default, we settled on the 7.5-mm diameter with a conventional amount of pressure.

It is with this nomogram that we currently have the greatest amount of data, although other practitioners are in the process of accumulating data on using NearVision CK with LightTouch on post-LASIK patients. We are currently examining this recommendation in a formal manner and could possibly refine our nomogram slightly in another 12 months. To play it safe, I suggest eight treatment spots at 7.5mm with conventional pressure, because you may always alter your technique going forward. I consider a conventional amount of pressure to be a dimple of approximately 4 to 5mm in diameter. You neither want to press on the iris, nor do you want zero pressure.

Dr. Durrie and I further considered whether a patient's preoperative refractive error would affect his postoperative outcome. We originally thought that hyperopes would respond more like emmetropic presbyopes and that myopes would experience a greater effect. We were correct as far as extreme cases of hyperopia

and myopia: the patients in our study who had errors of up to -10.00D responded much more robustly than those who were -2.00 or -3.00D preoperatively. Over time, we conservatively limited our treatment range to between +3.00 and -6.00D.

We also discussed how much time we should wait after a patient's LASIK procedure before performing CK. We treated within a range of 3 months to 5 years. My ultraconservative recommendation would be to allow the flap to heal for 1 year to avoid disturbing it with the CK application, although many surgeons would proceed at 6 months. I also avoid highly myopic eyes, which tend to have unpredictable outcomes.

Performing CK on a post-LASIK patient requires a pachymetric thickness of 6mm, although it is a lesser issue with myopic LASIK patients than with previously hyperopic LASIK patients. Before treating a patient with CK who underwent LASIK with another surgeon, investigate what his residual in-the-bed thickness is, because you do not want to have to relift the flap. You must weigh the risk of treating a patient who has less than 400µm of residual tissue in the stromal bed, because you will not be able to refine an outcome that is too myopic with an excimer laser.

In my opinion, epithelial ingrowth is an absolute contraindication to performing CK on a post-LASIK patient. Radiofrequency causes an ingrowth to bubble up, creating an asymmetry in the cornea and induc-

(CK continued on p. 8)

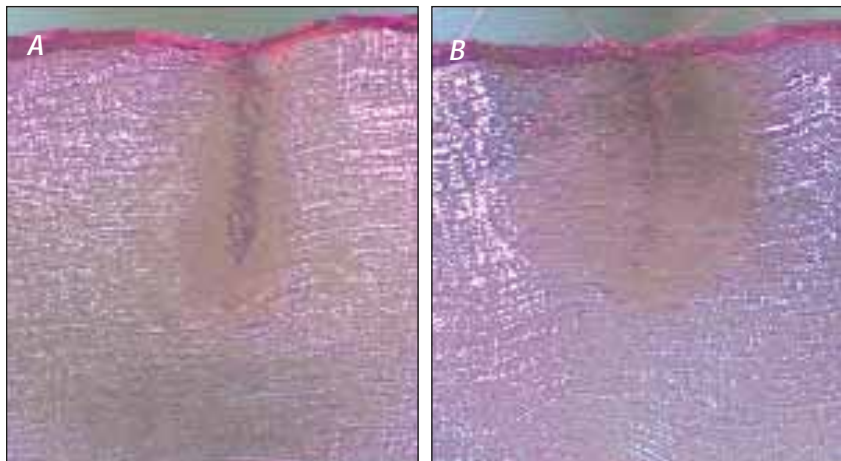


Figure 2. The epithelium shows more scarring with the conventional CK technique (A) than with the LightTouch technique (B).

(EVOLUTION continued from p. 1) performed my first CK procedure with the LightTouch technique, quite by accident. The patient had shallow anterior chambers, so I decided preoperatively that I would not compress his cornea with the CK probe, because I did not want to push his cornea toward his iris. I performed a 16-spot treatment with this more gentle approach. At the 1-week postoperative visit, the patient's refraction was a surprising -4.25D. Afterward, I began treating every CK patient in this manner, and each one experienced a robust response. I changed my approach to delivering just eight spots at 7mm, and my patients continued to respond positively.

#### BENEFITS OF LIGHTTOUCH VERSUS CONVENTIONAL CK

##### Predictability

My biggest complaint with conventional CK had been its poor predictability—induced cylinder in approximately one-third of my patients. Also, my patients' level of satisfaction varied. With the LightTouch technique, however, predictability has greatly improved, and only 10 eyes of 250 experienced significant induced astigmatism. Of these 10 patients, only five required an enhancement spot. The other five possessed good UCVA's and were happy with their results.

##### Postoperative Comfort

I find that patients undergoing any procedure are much happier postoperatively if you tell them what to expect. In my experience with LightTouch, my patients have fewer postoperative complaints compared with those who underwent conventional CK, although I warn them that they may experience ocular scratchiness and photosensitivity postoperatively. Therefore, I have begun prescribing low doses of steroid drops for patients to use three to four times per day, and the course has worked well.

##### Quicker Visual Recovery

I did not see my conventional CK patients until after the first postopera-

tive week. Now, with LightTouch, I follow a routine that I learned from Forrest Murphy, MD, from La Jolla, California. After the patient sits up from the procedure, I hand him his CK patient treatment card and ask him to read it. Or, I will ask the patient to read his watch. Visual recovery is that immediate.

#### THE TECHNIQUE

With conventional CK, users were instructed to push the probe down on the cornea to the point of creating a 5- to 7-mm dimple. This pressure mechanically stretched the corneal fibers and prevented the cornea from being drawn up around the probe's tip to receive the full radiofrequency (RF) energy delivery, thus limiting the treatment's effect. With the LightTouch technique, you seat the probe into the cornea in the same manner as with the conventional technique. Then, release the pressure until the striae are no longer visible around the probe's tip and you see a 1- to 2-mm dimple (Figure 1). The key to the LightTouch technique is to apply consistent pressure for each treatment spot (Figure 2).

Be careful, however, not to pull the probe away from the corneal surface once you begin delivering the RF pulse. The heat from RF energy shrinks organic tissue, and shallow spots may occur if the probe is not seated sufficiently. If this happens, the patient will show more regression than normal within 1 month. I bounce the probe a few times to make sure I have not pulled it away from the epithelium. Each surgeon's nomogram will be different; monitor yours to achieve the most predictable results.

#### THE FINER POINTS OF LIGHTTOUCH

Centration and marking with the LightTouch technique are the same as with the conventional technique. Centration is important: position the probe on the center of the visual axis (the pupil), not on the light reflex or the center of the cornea.

The goal is to keep the probe as

perpendicular to the corneal surface as possible as it enters the tissue. Do not enter the cornea off-angle, because with a treatment spot placed at 6mm, the probe's tip falls inside the 5.5-mm zone within the tissue where it first delivers energy. Also, it is important to place the treatment spots at equal intervals.

Another critical point is that, during the entire pulse delivery, you must keep the probe at a depth of 450 $\mu$ m (the length of the tip). If the probe does not remain at full depth for each pulse, then the patient will regress more than normal. With each pulse, watch for the cornea to retract from the probe, and then follow the cornea gently down throughout the RF energy delivery without overly compressing the cornea.

A steady hand is crucial. I triangulate on the instruments using a two-handed technique to steady my hands as much as possible. I also believe it is important to tell patients to hold their eyes still during the procedure. With the LightTouch technique, any unintentional eye movement will affect the treatment.

#### OPTIMAL SPOT PLACEMENT

In the FDA clinical trials of conventional CK for presbyopia, 91% of 180 eyes had J3 vision postoperatively, and 90% achieved within 1.00D of the intended refraction. Only 12% of the patients had greater than 1.00D of induced cylinder. Interestingly, the patients in the trial who did the best had received the fewest treatment spots. Those with only eight spots of treatment at 7mm had less induced cylinder and more predictable results versus those who received 16-spot treatments at 6 and 7mm or 24 spots at 6, 7, and 8mm.

The advantage of placing eight spots of treatment at 7mm was confirmed by a study that Daniel S. Durrie, MD, of Kansas City, Missouri, and Stephen E. Pascucci, MD, of Scranton, Pennsylvania, conducted on enhancing post-LASIK eyes with

NearVision CK. They treated 29 eyes with eight spots each. Only one eye had induced cylinder of greater than 1.00D.

#### RE-TREATMENTS

To re-treat a patient with induced cylinder from a previous CK procedure, apply one treatment spot in the flattest zone within the original treatment optical zone. Then, see how the eye responds after 1 to 2 weeks. I have not had to deliver a second re-treatment spot to any eye.

I do not treat eyes that over-respond to the LightTouch technique for at least 6 months, because the effect will regress somewhat. If needed, I would treat these patients with PRK only. I have not had haze with these patients, so I do not think mitomycin C is necessary.

#### IMPACT ON MY PRACTICE

Over the past 6 months, I have averaged at least 90 new refractive procedures per month as a result of performing the LightTouch technique. During this time, 28% of these new, paying patients have been NearVision CK cases. This is a much higher percentage than what I had attracted (5% to 6%) prior to performing the LightTouch technique. I have not marketed the NearVision CK procedure any differently to patients. To help bolster word-of-mouth referrals, at the 1-week follow-up visit, I ask patients how happy they are with their vision. As they are leaving, I shake their hand and ask them to brag about my practice to their friends and family, and they do.

In short, I am very pleased with what the NearVision CK with LightTouch evolution has done for my practice. ■

*H.L. "Rick" Milne III, MD, is in private practice at the Eye Center, P.A., in Columbia, South Carolina. He receives travel expenses and speaking honoraria from Refractive, Inc. Dr. Milne may be reached at (803) 256-4733; hmilne@aol.com.*

## Poll Shows CK Gaining Ground

The following two questions were asked of the 192 attendees of Cataract & Refractive Surgery Today's State of the Art CME technology symposium held on April 16, 2005, during the ASCRS meeting.

1. Do you anticipate performing the Refractive Conductive Keratoplasty (CK) procedure within the next 12 months?  
Yes: 42%  
No: 58%

2. If you were a 55-year-old emmetrope, which technology would you choose?

1. AMO Rezoom	5%
2. Eyeonics Crystalens	0%
3. Alcon Acrysof Restor	15%
4. Visx Multifocal Ablation	16%
5. Refractive CK	64%

TABLE 2. VISUAL ACUITY RESULTS, CK POST-LASIK

	Pre-CK N=27	1 Month Post-CK N=27
UCVA distance		
Mean	20/22	20/48
Range	20/12.5 to 20/40	20/12.5 to 20/160
UCVA near		
Mean	20/69	20/39
Range	20/25 to 20/150	20/20 to 20/125
BSCVA		
Mean	20/17	20/17
Range	20/12.5 to 20/25	20/12.5 to 20/20

(CK continued from p. 6) ing astigmatism. We also excluded patients with significant striae or post-LASIK diffuse lamellar keratitis in an effort to eliminate potential complications.

#### PATIENT SELECTION AND MANAGEMENT FOR POST-LASIK CK

Patients considering undergoing a CK treatment after having LASIK must understand and accept the possibility of an overshoot and a greater monovision effect than is expected with emmetropic presbyopic treatments. CK after LASIK entails a 60- to 90-day period of adaptation, during which patients will experience more blur at distance than traditional

CK patients. The good news—and we always try to leave a positive impression in patients' minds—is that in the long run, LASIK patients will likely experience a longer-lasting and higher-quality result with better near vision than emmetropic presbyopes, although they may still need glasses to read fine print. One novel idea for presenting the CK treatment option to a LASIK patient is to use the Murphy phoropter test to show the patient his potential postoperative result and judge whether he is suitable for the procedure.

Our current nomogram, eight spots at 7.5mm with conventional pressure, applies to the plano patient. Surgeons must be cognizant of details such as the patient's prescription, how

long ago he underwent LASIK, how his prescription has changed since then, and how much tissue is present in the stromal bed. This is an artistic procedure, and close attention to detail will translate into the best possible results.

#### CLINICAL FINDINGS

Dr. Durrie and I have seen a significant reduction in patients' need for spectacles for near vision and no increase in their need for spectacles at distance. Rarely, a post-LASIK CK patient may need glasses for nighttime driving during the first postoperative month or two, although this rate is well under 3% and can easily be reduced through careful patient selection (in terms of their pre-excision refractive error). We did not find a change in the rate of glare, halos, or clarity of vision at distance with these patients pre-versus postoperatively (Table 2). These data further support the case for not relieving the LASIK flap for a re-treatment.

#### ADDITIONAL CONSIDERATIONS

Decide preoperatively whether you will use conventional pressure or the LightTouch technique. I recommend beginning with the former, unless you already have experience with the latter and are comfortable with your

results. Over time, one can easily transition to using LightTouch, which is an extremely predictable approach that allows the user to work at larger optical zones. Realize, however, that there will be a point when you will have to expand beyond the 7.5-mm ring of treatment. You will have to begin using a lighter hand and moving the treatment out to 8mm simultaneously.

NearVision CK is also well suited for a patient who is myopic after undergoing LASIK and then becomes hyperopic over time. Also, those with IOL surprises may benefit from this procedure as opposed to a complicated IOL exchange or piggy-back procedure. I find CK to be a wonderful, safe alternative for secondary refractive procedures that helps the surgeon look like a hero in his patients' eyes. ■

*Stephen E. Pascucci, MD, is the founder and Medical Director of Eye Consultants of Bonita Springs in Bonita Springs, Florida. He holds the academic position of Affiliate Assistant Professor of Ophthalmology at The University of South Florida in Tampa. He is a clinical investigator and paid consultant for Refract, Inc., but he states that he holds no other financial interest in the company or its products. Dr. Pascucci may be reached at (239) 949-2021, sep@bonitaeye.com.*

(OPTICS continued from p. 2)

tously takes advantage of the synkinetic reflex in a way that provides good visual performance at both distance and near in dim, moderate, and bright light.

Three things, known together as the *synkinetic reflex*, happen when the human eye looks at a near object: (1) the pupil gets smaller; (2) the eye accommodates; and (3) the two eyes converge. In bright light, pupillary miosis provides a pinhole effect for greater depth of field, so the 1.25 to 1.50D increase in the central corneal power provided by CK creates very good near vision.

In dim lighting, the pupil still becomes smaller with accommodation, but not as small as in bright light. Remember that the 3.0- to 4.5-mm paracentral cornea actually has greater power after undergoing a NearVision CK treatment. Thus, in a dimly lit restaurant, for example, the post-CK patient is still able to read a menu.

When driving at night, the presbyopic patient's pupil may dilate up to 6mm, to the zone where CK has no effect and there is no increase in power. In this situation, the individual receives distance-focusing power both from the unchanged periphery

of the cornea and from its central, flatter area that is also unchanged by the procedure. When the person's gaze shifts to a close-range object, such as a dashboard, their pupil naturally constricts again so that there is more contribution from the paracentral zone. Optically, this phenomenon explains why the post-CK cornea is able to perform so well at different light levels and distances. It also gives us some insight toward ensuring that CK treatments can always take advantage of the synkinetic reflex. The average presbyopic pupil naturally dilates to between 5.5 and 6.0mm, well within the zone affected by a 7-mm CK treatment ring. However, an individual with a 7-mm scotopic pupil will experience halos at night from the 7-mm treatment spots' lying within his scotopic pupil. For this reason, the CK treatment ring should always be approximately 1mm larger than the patient's pupillary diameter in dark conditions. If more effect is needed, an additional treatment ring can be added outside the first, but it should never invade the scotopic pupil.

#### IN SUMMARY

The optics of NearVision CK

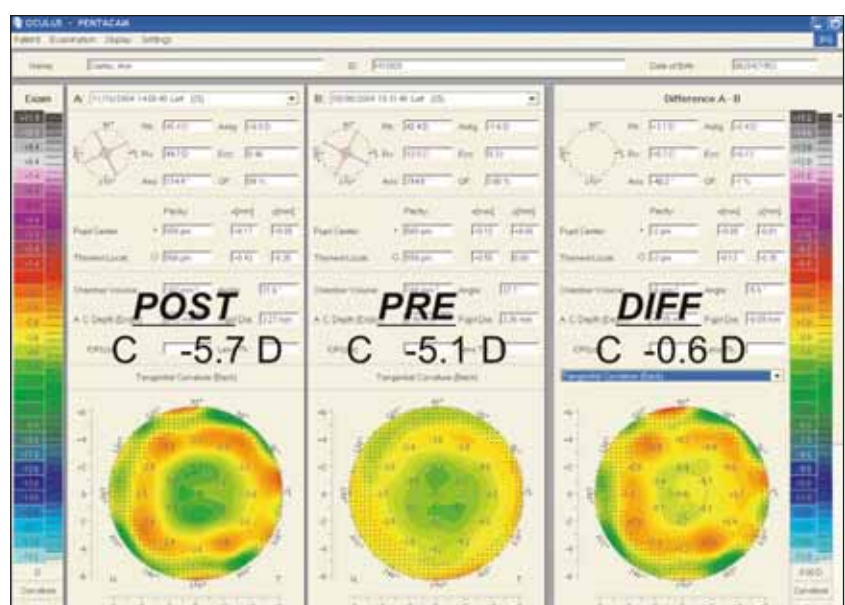


Figure 3. A Pentacam image shows the back surface of a cornea treated with CK.

appear to be ideal for creating a pupil-dependent, multifocal prolate cornea. The procedure's FDA clinical trial demonstrated that 80% of patients received a seven- to nine-line increase in near visual acuity with only a two-line drop in distance acuity. The fact that the procedure (1) increases the prolateness of the paracentral cornea, (2) preserves the flatter area in the central zone, and (3) most of the effect takes place on the front surface of the cornea

provides good near vision with the least effect on distance acuity of any presbyopic procedure thus far. ■

*Jack T. Holladay, MD, MSEE, FACS, is Clinical Professor of Ophthalmology at Baylor College of Medicine in Houston and President of the Holladay LASIK Institute in Bellaire, Texas. He states that he holds no financial interest in any product or company mentioned herein. Dr. Holladay may be reached at (713) 668-7337; holladay@docholladay.com.*