ARTICLE

Visual outcomes after wavefront-guided photorefractive keratectomy and wavefront-guided laser in situ keratomileusis: Prospective comparison

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PURPOSE: To compare visual outcomes between wavefront-guided photorefractive keratectomy (PRK) and wavefront-guided laser in situ keratomileusis (LASIK).

SETTING: Academic center, Salt Lake City, Utah, USA.

METHODS: In this randomized prospective study, myopic eyes were treated with wavefront-guided PRK and or wavefront-guided LASIK using a Visx Star S4 CustomVue platform with iris registration. Primary outcome measures were uncorrected (UDVA) and corrected (CDVA) distance visual acuities and manifest refraction. Secondary outcome measures were higher-order aberrations (HOAs) and contrast sensitivity.

RESULTS: The PRK group comprised 101 eyes and the LASIK group, 102 eyes. At 6 months, the mean UDVA was −0.03 logMAR ± 0.10 [SD] (20/19) and 0.07 ± 0.09 logMAR (20/24), respectively ($P = .544$). In both groups, 75% eyes achieved a UDVA of 20/20 or better ($P = .923$); 77% of eyes in the PRK group and 88% in the LASIK group were within ±0.50 diopter of emmetropia ($P = .760$). There was no statistically significant difference between groups in contrast sensitivity at 3, 6, 12, or 18 cycles per degree. The mean postoperative HOA root mean square was 0.45 ± 0.13 μm in the PRK group and 0.59 ± 0.22 μm in the LASIK group ($P = .012$), representing an increase factor of 1.22 and 1.74, respectively.

CONCLUSIONS: Wavefront-guided PRK and wavefront-guided LASIK had similar efficacy, predictability, safety, and contrast sensitivity; however, wavefront-guided PRK induced statistically fewer HOAs than wavefront-guided LASIK at 6 months.

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Improvement in visual outcomes after laser refractive surgery can be attributed to advances in wavefront sensing and laser technology. These advances incorporate more sensitive parameters than traditional conventional excimer laser treatments, which only correct lower-order aberrations (LOAs) such as spherical and cylindrical refractive errors. Wavefront-guided treatment targets both LOAs and higher-order aberrations (HOAs) to create a custom ablation profile for each patient. The relationship between HOAs and visual outcomes and between HOAs and manifest and cycloplegic refraction remains poorly understood. Studies[1–3] show that photorefractive keratectomy (PRK) and laser in situ keratomileusis (LASIK) increase total HOAs. These increases, in particular spherical and coma-like aberrations, are thought be a reason for patient dissatisfaction, even when the uncorrected distance visual acuity (UDVA) is 20/20 or better.[2,4–6] Studies[1,7,8] also report better overall visual outcomes with wavefront-guided PRK and wavefront-guided LASIK than with their respective conventional platforms. This has led to optimistic expectations about the ability to improve overall patient satisfaction.[9]

Photorefractive keratectomy was first used in 1987 but was largely replaced by LASIK during the mid

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1990s because the latter decreased recovery time and postoperative discomfort and because of concern over the corneal haze associated with PRK. Laser in situ keratomileusis is now the most common refractive surgery in the United States, with an estimated 1.3 million procedures performed each year.[10] However, LASIK is associated with flap complications, postoperative ectasia, diffuse lamellar keratitis, and chronic dry eye. Wavefront-guided ablations typically remove more tissue per diopter of correction than conventional ablations.[11] The increased concerns over postoperative ectasia have resulted in many clinicians being conscious of preserving the residual stromal bed. With the advent of improved bandage contact lenses and topical nonsteroidal antiinflammatory drugs, postoperative pain has been significantly decreased following PRK. Furthermore, with effective tapering regimens of topical corticosteroids, advances in laser technology leading to smoother ablations surfaces,[12] and the routine use of mitomycin-C (MMC) for higher corrections, the incidence of postoperative corneal haze has been significantly reduced. As a result, many surgeons are performing more PRK.

This prospective study compared the overall safety, efficacy, predictability, and HOA outcomes between wavefront-guided PRK and wavefront-guided LASIK using a laser platform that incorporates iris registration.

PATIENTS AND METHODS

This prospective randomized study evaluated data from myopic eyes with or without astigmatism that had primary PRK or primary LASIK with the Visx Star S4 CustomVue platform with iris registration (Abbott Medical Optics, Inc./Visx Inc.). All surgeries were performed by 1 of 2 surgeons (M.M., M.D.M.) at the John A. Moran Eye Center between February 2007 and February 2008. The University of Utah Hospital Institutional Review Board (IRB number NCT00714922,25516) approved the study. Research Randomizer software[A] was used to randomize patients to wavefront-guided PRK or wavefront-guided LASIK.

All included patients met the U.S. Food and Drug Administration guidelines for LASIK with the laser platform used in the study.[B] Exclusion criteria were a cornea thinner than 500 μm, significant asymmetry on topography, clinically significant lens opacity, previous corneal or intraocular surgery, keratoconus, unstable refraction, autoimmune disease, pregnancy or breastfeeding, and currently on immunosuppressive therapy. Soft contact lenses were discontinued 2 weeks before screening and rigid gas-permeable contact lenses, 6 weeks before screening. Successful iris registration during surgery was also required for inclusion in the study.

The attempted refractive correction was based on the wavefront scan that most closely matched the patient's manifest refraction. A physician-adjustment factor was used based on previously established Moran Laser Center wavefront-guided LASIK and PRK nomograms for the laser system used for surgery. The nomograms were generated using Datagraph-med refractive outcomes software (version 3.20a, Ingenieurbüro Pieger GmbH).

All patients had a preoperative examination including uncorrected distance visual acuity (UDVA), corrected distance visual acuity (CDVA), cycloplegic refraction, tonometry, slitlamp evaluation of the anterior segment, and dilated fundus evaluation. Manifest refraction was repeated at 2 separate preoperative visits to ensure reliability and stability. Corneal topography and thickness were measured using an Orbscan II device (version 3.0, Bausch & Lomb). All eyes received 5 preoperative wavefront analyses with the Visx WaveScan aberrometer (version 3.67 Fourier, Abbott Medical Optics, Inc.). These measurements were taken without pharmacologic intervention under mesopic conditions with a minimum pupil diameter of 6.0 mm. Contrast sensitivity testing was an optional outcome measurement and was performed using a CSV 1000 device (VectorVision) under mesopic conditions.[5]

For PRK, ethanol diluted to 20% in sterile water was placed in an 8.5 mm Camellin-style LASEK alcohol fixation well (Katena Products, Inc.) for 35 seconds. Epithelial removal was performed with a Sloane LASEK epithelial micro hoe (Katena Products, Inc.). Custom ablation was completed with the excimer laser system. For stromal ablations greater than 65 μm (n = 17), a circular sponge soaked in MMC 0.02% was applied for 20 seconds. The eye was then immediately flushed with 15 cc of a chilled balanced salt solution, after which a bandage contact lens (Acuvue Advance, BC 8.3, −0.50 D, 14.0 mm, Johnson & Johnson) was placed.

At the completion of the PRK procedure, 1 drop each of gatifloxacin 0.3%, prednisolone acetate 1.0%, and ketorolac tromethamine 0.4% was instilled. Ketorolac tromethamine 0.4% was administered 4 times a day for the first 72 hours and then discontinued. Gatifloxacin 0.3% was continued 4 times a days until complete epithelial healing, at which time the bandage contact lens was removed. Prednisolone acetate 1.0% was administered 4 times a day for the first postoperative month. Fluorometholone ophthalmic 0.1% was administered 3 times a day, twice a day, and once a day in the second, third, and fourth postoperative months, respectively. Patients were examined postoperatively at 1, 4, 7, and 14 days and 1, 2, 3, and 6 months.

For LASIK, flaps were created with an IntraLase femtosecond laser (IntraLase Corp.) at 60 kHz in a raster pattern with

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a bed energy of 1.15 μJ, pulse separation of 8 × 8, side-cut energy of 2.00 μJ, and the pocket enabled. All flaps were 110 μm with a superior hinge, 50-degree hinge angle, 70-degree side-cut angle, and 8.7 to 9.0 mm diameter. Patients were instructed to keep their eyes closed for 5 to 15 minutes after flap creation to ensure complete resolution of the opaque bubble layer. No patient proceeded to iris registration and ablation until complete resolution of the opaque bubble layer. Iris registration was performed under mesopic conditions before the flap was lifted while focusing at the level of the tear film. Custom ablation was completed with the excimer laser system. At the completion of the LASIK procedure, each eye received 1 drop each of gatifloxacin 0.3%, prednisolone acetate 1.0%, and ketorolac tromethamine 0.4%. Gatifloxacin 0.3% was administered 4 times a day for 7 days. Prednisolone acetate 1.0% was continued every hour on the day of surgery and then 4 times a day for 7 days. Patients were examined postoperatively at 1 day, 1 week, and 1, 3, and 6 months.

At each postoperative visit, the UDVA and CDVA were assessed using a standard Snellen eye chart and contrast sensitivity was measured under mesopic conditions. At the 6-month visit, HOAs, including the normalized Zernike coefficients of coma Z(3,1), trefoil Z(3,3), and spherical aberration Z(4,0), were measured using the same aberrometer as preoperatively and calculated based on a 6.0 mm pupil.

Table 1. Comparison of preoperative characteristics.

Parameter	PRK (n = 101)	LASIK (n = 102)	*P* Value*
CDVA			.855
Mean logMAR ± SD	−0.04 ± 0.07	0.04 ± 0.06	
Snellen equivalent	~20/18	~20/18	
SE refraction (D)			.907
Mean ± SD	−4.31 ± 2.01	4.27 ± 2.21	
Range	−8.07 to −1.53	−9.11 to −0.36	
Sphere (D)			.954
Mean ± SD	−4.78 ± 2.03	−4.77 ± 2.22	
Range	−8.75 to −1.50	−10.0 to −0.25	
Cylinder (D)			.708
Mean ± SD	0.96 ± 0.78	1.00 ± 0.80	
Range	0.00 to 3.00	0.00 to 3.50	
Age (y)			.120
Mean ± SD	32.5 ± 12.2	34.9 ± 8.67	
Range	20 to 54	21 to 57	
Pachymetry (μm)			.835
Mean ± SD	549 ± 25.5	550 ± 26.1	
Range	510 to 630	503 to 630	
Keratometry (D)			.169
Mean ± SD	44.3 ± 1.67	44.0 ± 1.40	
Range	40.05 to 48.50	39.80 to 47.65	
Mean total RMS (μm) ± SD	6.31 ± 2.79	6.10 ± 3.05	.603
Mean total HOA RMS (μm) ± SD	0.37 ± 0.11	0.34 ± 0.12	.698

CDVA = corrected distance visual acuity; HOA = higher order; LASIK = laser in situ keratomileusis; PRK = photorefractive keratectomy; RMS = root mean square; SE = spherical equivalent
*Student *t* test

Haze in the PRK group was evaluated using the Miyata[13] and Seiler[14] grading systems.

Statistical analysis was performed using the Student *t* or Pearson chi-square test and SPSS software (SPSS, Inc.). The analysis determined the significance of the difference between the 2 groups in visual acuity, refractive error, and HOA results.

RESULTS

The study evaluated 203 eyes of 104 patients. The mean age of the 51 women and 53 men was 33.70 years (range 20 to 57 years). All eyes had stable myopia between −0.25 and −10.00 diopters (D) and astigmatism between 0.00 D and 3.50 D. Of the eyes, 101 had PRK and 102 had LASIK. The preoperative visual characteristics and demographics, including sphere, cylinder, age, pachymetry, and keratometry, were similar between the 2 groups (Table 1).

Two hundred three eyes (101 PRK, 102 LASIK) were evaluated at 3 months and 118 eyes (61 PRK, 57 LASIK), at 6 months. One hundred seven eyes (54 PRK, 53 LASIK) had custom wavefront measurements at 6 months. Of the 59 eyes in each group that had preoperative contrast sensitivity testing, 55 PRK eyes and 51 LASIK eyes completed contrast sensitivity testing at 6 months. Wavefront analysis was performed 6 months

Table 2. Comparison of 3-month postoperative data.

Parameter	PRK (n = 101)	LASIK (n = 102)	*P* Value*
Predictability			
SE refraction (D)			.338
Mean ± SD	0.04 ± 0.37	0.08 ± 0.36	
Range	−0.75 to 1.25	−0.63 to 1.38	
Sphere (D)			.171
Mean ± SD	−0.13 ± 0.38	−0.06 ± 0.36	
Range	−1.25 to 1.00	−1.00 to 1.25	
Cylinder			
Mean (D) ± SD	0.35 ± 0.39	0.28 ± 0.40	.276
Range (D)	0.00 to 1.50	0.00 to 2.50	
Within ±0.25 D†, n (%)	63 (62)	71 (70)	.364
Within ±0.50 D†, n (%)	86 (85)	91 (89)	.119
Efficacy			
UDVA			
Mean logMAR ± SD	−0.06 ± 0.10	−0.02 ± 0.11	.764
Snellen equivalent	20/17	20/19	
20/15 or better, n (%)	28 (27)	27 (26)	.330
20/20 or better, n (%)	81 (80)	82 (80)	.861
CDVA 20/20 or better, n (%)	97 (96)	99 (97)	.683

CDVA = corrected distance visual acuity; LASIK = laser in situ keratomileusis; PRK = photorefractive keratectomy; SE = spherical equivalent; UDVA = uncorrected distance visual acuity
*Student *t* test
†Of emmetropia

Table 3. Comparison of 6-month postoperative data.

Parameter	PRK (n = 61)	LASIK (n = 57)	*P* Value*
Predictability			
SE refraction (D)			.124
Mean ± SD	0.08 ± 0.35	0.002 ± 0.33	
Range	−0.75 to 1.50	−0.75 to 1.00	
Sphere (D)			.219
Mean ± SD	−0.10 ± 0.35	−0.17 ± 0.36	
Range	−1.00 to 1.25	−1.00 to 0.75	
Cylinder			
Mean (D) ± SD	0.36 ± 0.37	0.34 ± 0.45	.831
Range (D)	0.00 to 1.25	0.00 to 2.50	
Within ±0.25 D†, n (%)	41 (67)	43 (75)	.652
Within ±0.50 D†, n (%)	47 (77)	50 (88)	.760
Efficacy			
UDVA			
Mean logMAR ± SD	−0.03 ± 0.10	−0.07 ± 0.09	.544
Snellen equivalent	~20/19	~20/24	
20/15 or better, n (%)	18 (30)	11 (19)	.288
20/20 or better, n (%)	46 (75)	43 (75)	.923
Safety			
CDVA, n (%)			
20/20 or better	52 (85)	46 (81)	.556
Lost 1 line	8 (13)	11 (19)	—
Lost 2 lines	1 (2)	0	—

CDVA = corrected distance visual acuity; LASIK = laser in situ keratomileusis; PRK = photorefractive keratectomy; SE = spherical equivalent; UDVA = uncorrected distance visual acuity
*Student *t* test
†Of emmetropia

postoperatively in 107 of 203 eyes, 54 (53%) in the PRK group and 53 (52%) in the LASIK group. No patient had an enhancement during the study.

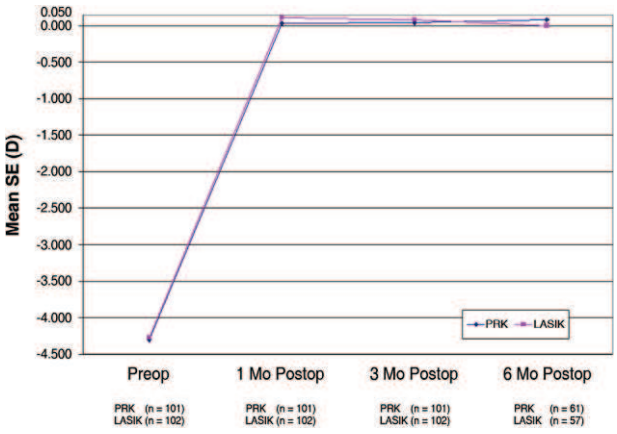

Figure 2. Stability of refraction over time (LASIK = laser in situ keratomileusis; PRK = photorefractive keratectomy; SE = spherical equivalent).

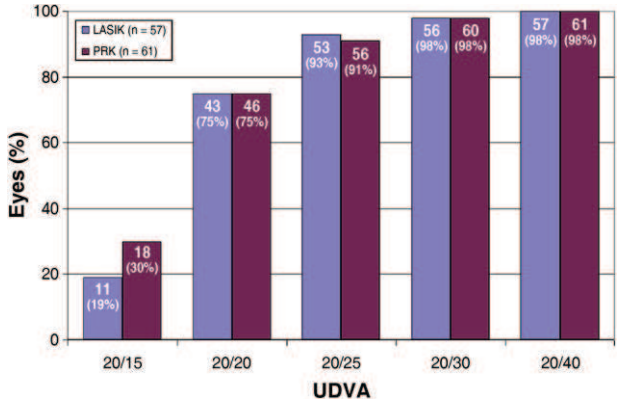

Figure 1. Percentage of eyes achieving uncorrected Snellen acuity values at 6 months (LASIK = laser in situ keratomileusis; PRK = photorefractive keratectomy; UDVA = uncorrected distance visual acuity).

Efficacy and Stability

Table 2 shows the 3-month postoperative results and Table 3, the 6-month results. There were no significant differences between the PRK group and LASIK group in any parameter, including the mean logMAR UDVA or the percentage of patients who achieved a UDVA of 20/20 or better (P = .923) or of 20/15 or better (Figure 1). Most eyes had a UDVA of 20/25 or

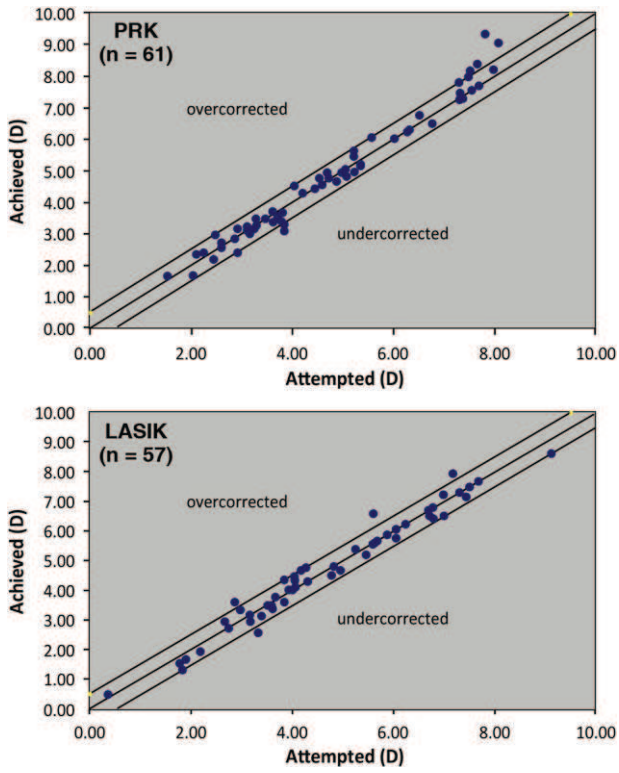

Figure 3. Scattergram of the ability to achieve emmetropia at 6 months (LASIK = laser in situ keratomileusis; PRK = photorefractive keratectomy).

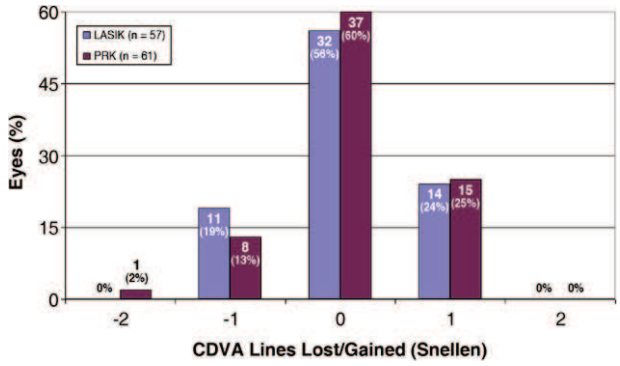

Figure 4. Six-month safety by CDVA (CDVA = corrected distance visual acuity; LASIK = laser in situ keratomileusis; PRK = photorefractive keratectomy).

better. The stability of refraction was similar in the 2 groups (Figure 2).

Predictability

Tables 2 and 3 also show the predictability at 3 months and 6 months, respectively. There were no significant differences between the PRK group and LASIK group in the percentage of eyes within ±0.25 D or ±0.50 D of emmetropia at 3 months ($P = .364$ and $P = .119$, respectively) or at 6 months ($P = .652$ and $P = .760$, respectively) (Figure 3).

Safety

Figure 4 shows the lines of CDVA lost or gained as well as the percentage of eyes with no change at 6 months. The loss of 1 line of CDVA in the PRK group was clinically attributed to A2/D3 superficial punctuate keratitis per the Miyata grading system (5 cases) or 0.5 corneal haze per the Seiler grading system (3 cases). The loss of 1 line of CDVA in the LASIK group was clinically attributed to superficial punctuate keratitis A2/D3 (7 cases) or flap microstriae (4 cases). Six months postoperatively, 1 eye (2%) in the PRK group had a persistent central island and maintained a loss of 2 lines of CDVA, from 20/15 to 20/25. No eye in the LASIK group lost 2 lines of CDVA, and no eye in either group had a CDVA worse than 20/25 (Table 3).

Contrast Sensitivity

Figure 5 shows the preoperative and 6-month postoperative contrast sensitivity log values for wavefront-guided PRK and Figure 6, for wavefront-guided LASIK. The difference between the preoperative and postoperative contrast sensitivity was not statistically significant in either group at any cycle. Furthermore, the difference between the 2 groups in the change in contrast sensitivity from baseline was not statistically significant at 3 cycles per degree (cpd), 6 cpd, 12 cpd, or 18 cpd ($P = .547$, $P = .435$, $P = .642$, and $P = 0.788$, respectively).

Wavefront Analysis and Higher-Order Aberrations

The mean total root mean square (RMS) decreased from 6.31 µm preoperatively to 0.86 µm 6 months postoperatively in the PRK group and from 6.10 µm to 1.31 µm, respectively, in the LASIK group; the decrease was statistically significant in both groups ($P < .005$). There was no statistically significant difference between the PRK group and LASIK group in the decrease in total RMS ($P = .574$). The mean postoperative HOA RMS value was 0.45 ± 0.13 µm in the PRK group and 0.59 ± 0.22 µm in the LASIK group ($P = .012$), representing a factor increase of 1.22 and 1.74, respectively (Figure 7). The mean total change in HOA RMS values was 0.102 µm in the PRK group and 0.265 µm in the LASIK group ($P = .005$) (Figure 8). However, when patients were stratified by eyes with a preoperative HOA value less than 0.2 µm, from 0.2 to 0.4 µm, or greater than 0.4 µm, there did not appear to be a trend between the groups.

In the PRK group, coma increased from 0.223 µm preoperatively to 0.275 µm 6 months postoperatively ($P = .120$), trefoil decreased from 0.189 µm to 0.136 µm ($P = .004$), respectively, and spherical aberration

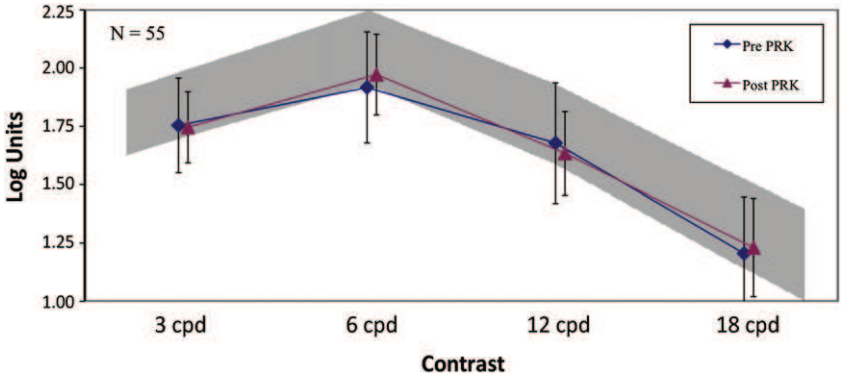

Figure 5. Mean contrast sensitivity log values over time in the PRK group (cpd = cycles per degree; PRK = photorefractive keratectomy).

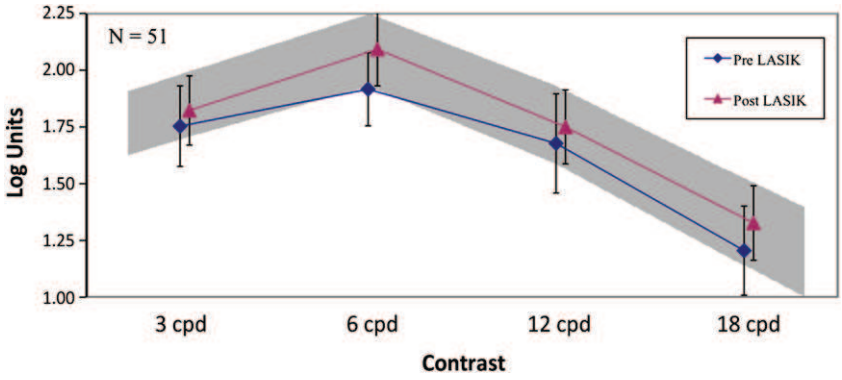

Figure 6. Mean contrast sensitivity log values over time in the LASIK group (cpd = cycles per degree; LASIK = laser in situ keratomileusis).

increased from 0.048 µm to 0.244 µm, respectively ($P = <10^{-5}$). In the LASIK group, coma increased from 0.160 µm preoperatively to 0.307 µm 6 months postoperatively ($P = .002$), trefoil increased from 0.170 µm to 0.177 µm ($P = .675$), respectively, and spherical aberration increased from 0.070 µm to 0.292 µm, respectively ($P = <10^{-5}$) (Figure 7). Figure 8 compares the absolute changes in coma, trefoil, and spherical aberration between the PRK group and the LASIK group.

DISCUSSION

Although several clinical trials have found better visual acuity, decreased night-vision complaints, and improved contrast sensitivity with wavefront-guided refractive surgery than with conventional methods, few studies have directly compared wavefront-guided PRK and wavefront-guided LASIK.[1,4] One such study by Wallau and Campos[15] found that wavefront-guided PRK produced better UDVA and induced less of an increase in HOAs than wavefront-guided LASIK using the LADARWave4000 platform (Alcon, Inc.). Our study compared the visual outcomes between wavefront-guided PRK and wavefront-guided LASIK using version 5.10 Fourier software and the Visx Star S4 CustomVue laser system platform with iris registration.

We found the 6-month efficacy of PRK and LASIK to be comparable in achieving a UDVA better than 20/20 in both groups ($P = .923$). The percentage of eyes achieving UDVA better than 20/15 was similar in the PRK group and the LASIK group ($P = .238$). Although the difference between groups was not statistically significant in our study, Wallau and Campos[15] did find significantly better UDVA in the PRK group. This could be because Wallau and Campos used a mechanical microkeratome to create the LASIK flaps and we used a femtosecond laser. In contrast to the Wallau and Campos study, in which MMC was used in all cases, we administered MMC only to PRK ablations deeper than 65 µm (17 of 101 PRK eyes). Although some studies[16,17] report changes in refractive outcome predictability with the use of MMC in PRK, the results

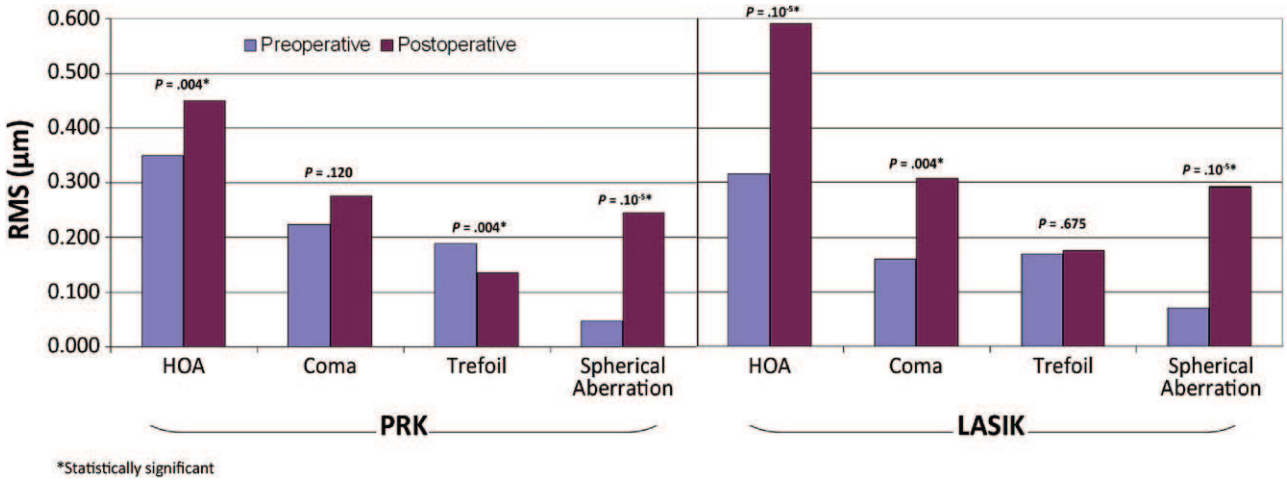

Figure 7. Absolute preoperative to postoperative changes in HOA at 6 months (HOA = higher-order aberration; PRK = photorefractive keratectomy, n = 54; LASIK = laser in situ keratomileusis, n = 53).

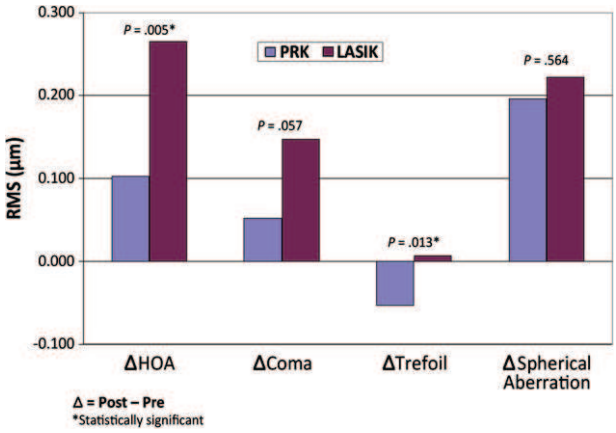

Figure 8. Absolute changes in HOA values in each group at 6 months (PRK = photorefractive keratectomy, n = 54; LASIK = laser in situ keratomileusis, n = 53; RMS = root mean square).

remain controversial. We did not stratify MMC cases in our analysis; therefore, we cannot support or dispute the finding that routine use of MMC leads to improved visual outcomes in wavefront-guided PRK.

Several patients in both groups lost 1 Snellen line of CDVA, which can be attributed to known complications related to both procedures. Limited CDVA was the result of superficial punctuate keratitis and corneal haze in PRK patients and superficial punctuate keratitis and flap microstriae in LASIK patients. One patient in the PRK group had a persistent central island at 6 months that resulted in a loss of 2 Snellen lines of CDVA.

Visual outcomes based on visual acuity alone do not give the clinician insight to the visual quality of patients. The relationship between HOAs and visual function is complicated and not fully understood. It is thought that contrast sensitivity is a more sensitive parameter to assess quality of vision and to better understand the impact of HOAs, especially coma-like aberrations.[5] Despite the postoperative increase in total mean RMS HOA, coma, and spherical aberration in both groups in our study, there was no statistically significant difference in contrast sensitivity testing. All changes in contrast sensitivity were small and within the range of normal values.

Although total HOAs were significantly higher at 6 months in both our groups, the induction was significantly lower in the PRK group (0.102 µm PRK, 0.265 µm LASIK; $P = .005$). These findings are consistent with those in other studies in the literature.[15,18] Coma significantly increased (by approximately 2-fold) in the LASIK group only; the increase is a known phenomenon of wavefront-guided LASIK.[11] Trefoil decreased significantly (by a factor of 0.72) in the PRK group. If there is any clinical significance of this finding, it is yet to be described. Theories on why the increase in HOAs is greater after LASIK than after PRK are related to flap creation and the smaller ablation transition zone in conventional LASIK.[3,18–20] We targeted similar ablation zones (8.0 mm) in the PRK group and LASIK group; therefore, we believe the flap was a major determinant of the higher HOA induction in the LASIK group.

A recent study[21] stratified patients based on higher preoperative total HOA values and found a 13.8% decrease after conventional LASIK and a 48.5% decrease after laser-assisted subepithelial keratectomy. In fact, similar results using other platforms are well documented.[11] Although none of the studies involved wavefront-guided PRK, the findings suggest that patients with larger preoperative HOA values may derive the greatest benefit from wavefront-guided technology.[11] However, when we stratified the preoperative total HOA RMS values to groups of less than 0.2 µm, 0.2 to 0.4 µm, and greater than 0.4 µm, there did not seem to be a trend in increase or decrease in postoperative total HOA RMS. Unfortunately, we did not have a significant number of patients with large preoperative HOAs and thus were unable to perform a statistical analysis of the data.

Our study had several limitations. Although 203 eyes were analyzed at the start of the study, only 118 eyes (58%) were available for analysis at 6 months. Loss to follow-up is a limitation of prospective studies. A decrease in sample size runs the risk for masking minor differences, such as refractive outcomes and contrast sensitivity. Contrast sensitivity testing was a secondary outcome measure and was not obtained in all screened patients preoperatively. Only 106 of 203 eyes, representing 54% of all PRK eyes and 50% of all LASIK eyes, completed contrast sensitivity testing at 6 months. Again, the smaller sample size could have concealed a difference in contrast sensitivity between preoperatively and 6 months postoperatively in both groups. Our study found no statistical significance between the 2 groups. Only 107 of 203 eyes, representing 53% of all PRK eyes and 52% of all LASIK eyes, had wavefront aberrometry measurements at the 6-month endpoint, limiting the wavefront-data analysis. One may argue that we did not obtain vector analysis or stratification of RMS with a 3.0 mm pupil; however, that was not the primary goal of this study, and the 2 groups had similar levels of astigmatism preoperatively and postoperatively. Also, a subjective patient questionnaire for assessment of symptoms (eg, glare, halos, patient comfort, patient satisfaction) was not administered. This information may have added valuable data in our attempt to determine whether the statistically significant HOA differences between the PRK group and the LASIK group had clinical significance.

Laser in situ keratomileusis remains the procedure of choice for most patients; the most commonly cited reasons for this are rapid visual recovery and little postoperative pain. A large review of the overall effectiveness of conventional PRK and LASIK[22] found the 2 techniques to be comparable in all aspects of visual acuity; however, the study did not evaluate HOAs. We did evaluate HOAs, and our findings indicate that wavefront-guided PRK may not only be equivalent to wavefront-guided LASIK but may also be associated with decreased induction of HOAs. Although we were not able to determine whether the finding had clinical significance, it may serve to bolster the rising interest in surface ablation. Despite the increased risk for corneal haze, postoperative discomfort, and longer visual recovery period with PRK, the decreased risk for postoperative ectasia, the absence of flap complications, and fewer induced HOAs may make PRK more enticing to patients and surgeons alike.

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