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Warfighter Refractive Eye Surgery Program & Research Center at Fort Belvoir

Comparison of Visual Outcomes After Wavefront-Guided and Wavefront-Optimized LASIK and PRK

Bruce A. Rivers[1], Rose K. Sia[1], Denise S. Ryan[1], Joseph F. Pasternak[2], Richard D. Stutzman[2], Kraig S. Bower[3]

[1]Warfighter Refractive Eye Surgery and Research Center at Fort Belvoir, Fort Belvoir, VA, USA
[2]Walter Reed National Military Medical Center, Bethesda, MD, USA
[2]The Wilmer Eye Institute, Johns Hopkins University, Baltimore, MD, USA

The authors have no financial interest in the subject matter of this poster.
This work is supported by U.S. Army Medical Research and Materiel Command
Grant # W81XWH-09-2-0018.

Purpose

- To compare visual outcomes after wavefront guided (WFG) and wavefront optimized (WFO) LASIK and photorefractive keratectomy (PRK).

- Off label use: This presentation includes discussion of the off-label use of the VISX Star S4 CustomVue and the Wavelight Allegretto WAVE Eye Q excimer laser systems for PRK.

Methods

- This is a prospective study of 196 patients with myopia or myopic astigmatism undergoing either LASIK or PRK, as selected by patient and surgeon.
- Patients were randomized to undergo either WFG or WFO treatment.
- Subjective manifest refraction, uncorrected and corrected distance visual acuities were determined preoperatively and at 6 months postoperatively.

Methods

LASIK technique:

- A superior-hinged, 120 micron thick, 9.0 mm diameter corneal flap was created using the Intralase femtosecond laser system (Abbott Medical Optics, Santa Ana, CA).
- Photoablation: WFG ablation was performed using the VISX STAR S4 Excimer Laser System (Abbott Medical Optics, Santa Ana, CA) while WFO ablation was performed using the Wavelight Allegretto WAVE Eye Q Excimer Laser System (Alcon Surgical, Fort Worth, TX).

PRK technique:

- The corneal epithelium was removed using a rotary brush (Amoils, Innovative Excimer Solutions, Toronto, Canada)
- Photoablation: WFG ablation was performed using the VISX STAR S4 Excimer Laser System and WFO ablation was performed using the Wavelight Allegretto WAVE Eye Q Excimer Laser System.
- Prophylactic use of mitomycin C (MMC) was based on the study sites' standard operating procedures.
- For all WFG treatments, MMC was used on eyes with central ablation depth of greater than 49.5 microns or cylinder >1.25D.
- For all WFO treatments, MMC was used on eyes with central ablation depth of greater than 75 microns.

Methods

The following postoperative topical medications were used:

LASIK	PRK
▪Moxifloxacin 0.5% 4x daily for 1 week	▪Moxifloxacin 0.5% 4x daily for 1 week or until complete re-epithelialization
▪Prednisolone acetate 0.1% 1 drop every two hours for the first 3 days, then 1 drop 4x daily for 1 week	▪Fluorometholone 0.1% 4x daily for 4 weeks followed by a 6-week taper
▪Preservative-free carboxymethylcellulose 0.5%1 drop every hour for the first 2 weeks, then at least every 2 hours or more for several months	Preservative-free carboxymethylcellulose 0.5% 1 drop every hour for the first week, then at least every 2 hours or more for several months
▪Preservative-free ketorolac 0.5% up to 4x daily for 48 hours	▪Preservative-free ketorolac 0.5% up to 4x daily for 48 hours

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Results

Demographic data and baseline clinical characteristics

	WFG LASIK	WFG PRK	WFO LASIK	WFO PRK	P-value*
N (participants/eyes)	40/80	55/110	48/96	53/106	
Age (years)	31.7 ±7.7	30.4 ±6.6	32.3 ±7.0	30.1 ±6.0	0.08
Sex (% male)	77.50%	80%	79.20%	75.50%	-
UCVA (logMAR)	1.09 ±0.32	1.10 ±0.47	1.14 ±0.41	1.10 ±0.42	0.87
Manifest sphere (D)	-3.33 ±1.41	-3.22 ±1.72	-3.37 ±1.53	-3.12 ±1.46	0.65
Manifest cylinder (D)	-0.56 ±0.52	-0.76 ±0.61	-0.73 ±0.68	-0.63 ±0.52	0.06
Spherical equivalent (D)	-3.56 ±1.41	-3.60 ±1.74	-3.74 ±1.55	-3.43 ±1.52	0.58
CDVA (logMAR)	-0.10 ±0.05	-0.10 ±0.05	-0.10 ±0.03	-0.11 ±0.05	0.18
Abalation depth (microns)	59.25 ±18.6	58.45 ±22.5	58.9 ±21.1	53.3 ±19.9	0.14
Mitomycin C use (%)	-	62.7%	-	39.6%	-

*One-way Analysis of Variance; $p<0.05$, statistically significant. Data are presented as mean ±standard deviation
D = Diopters

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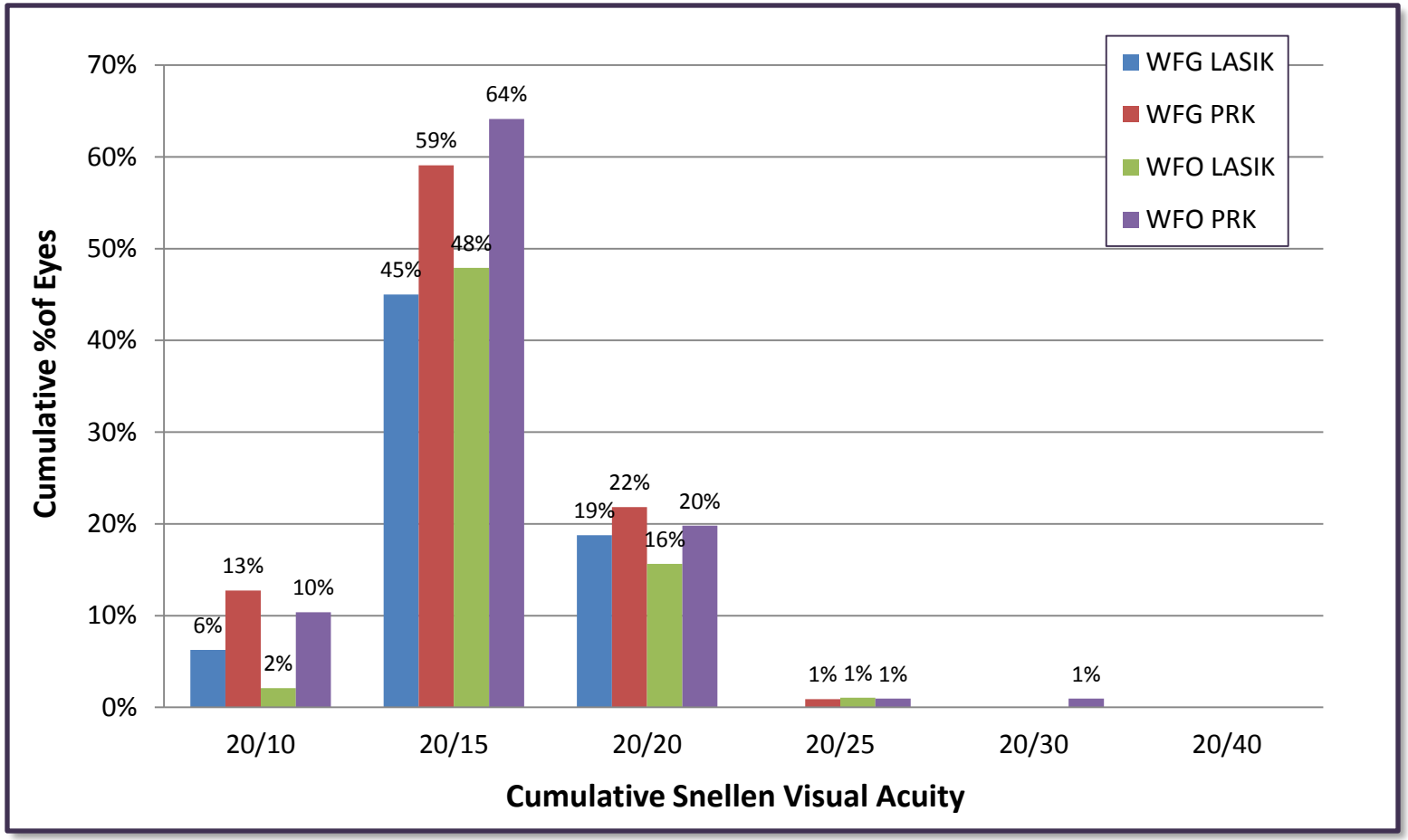

Uncorrected Distance Visual Acuity at 6 months postop

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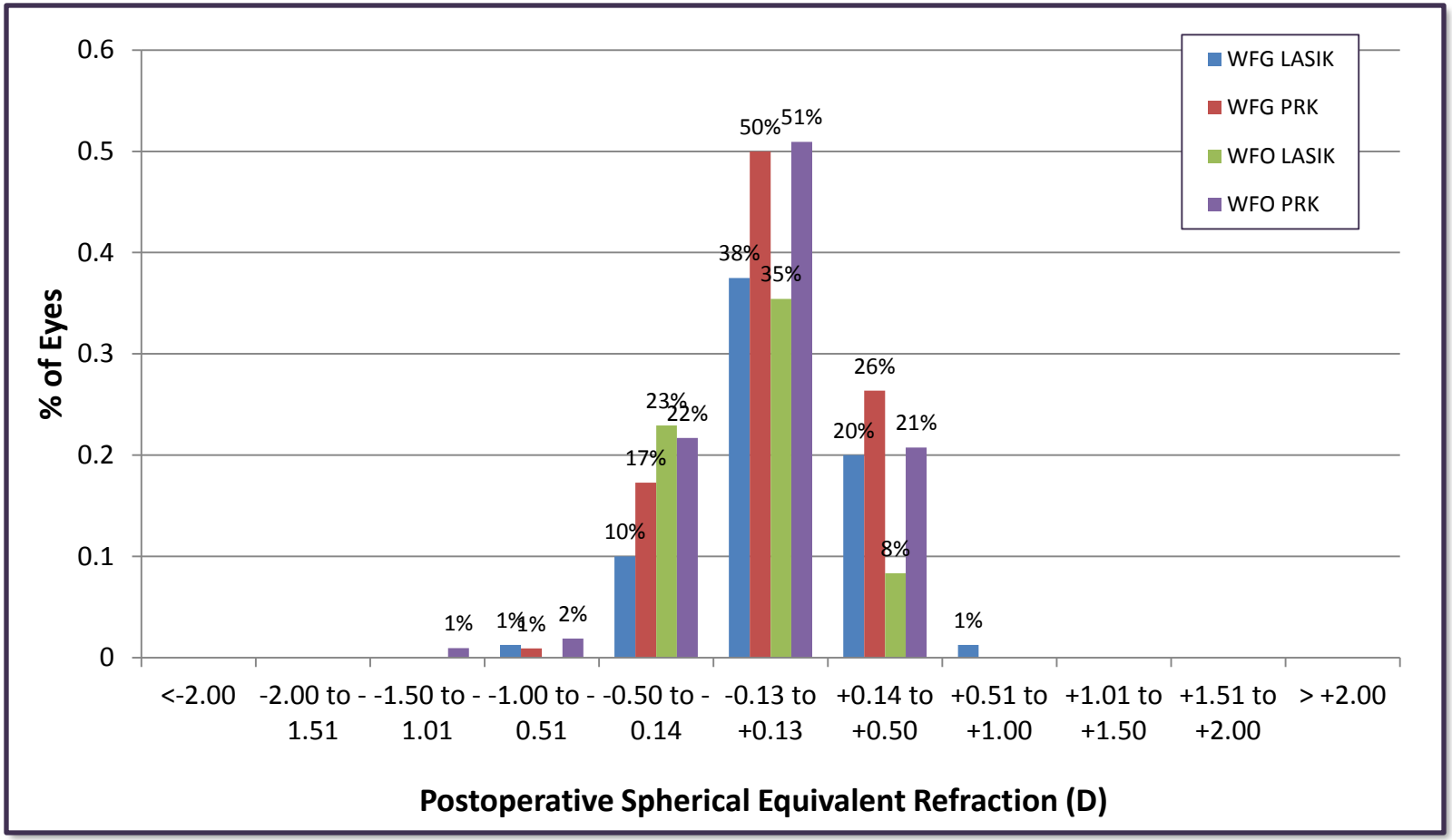

Postoperative Spherical Equivalent Refractive Accuracy at 6 months postop

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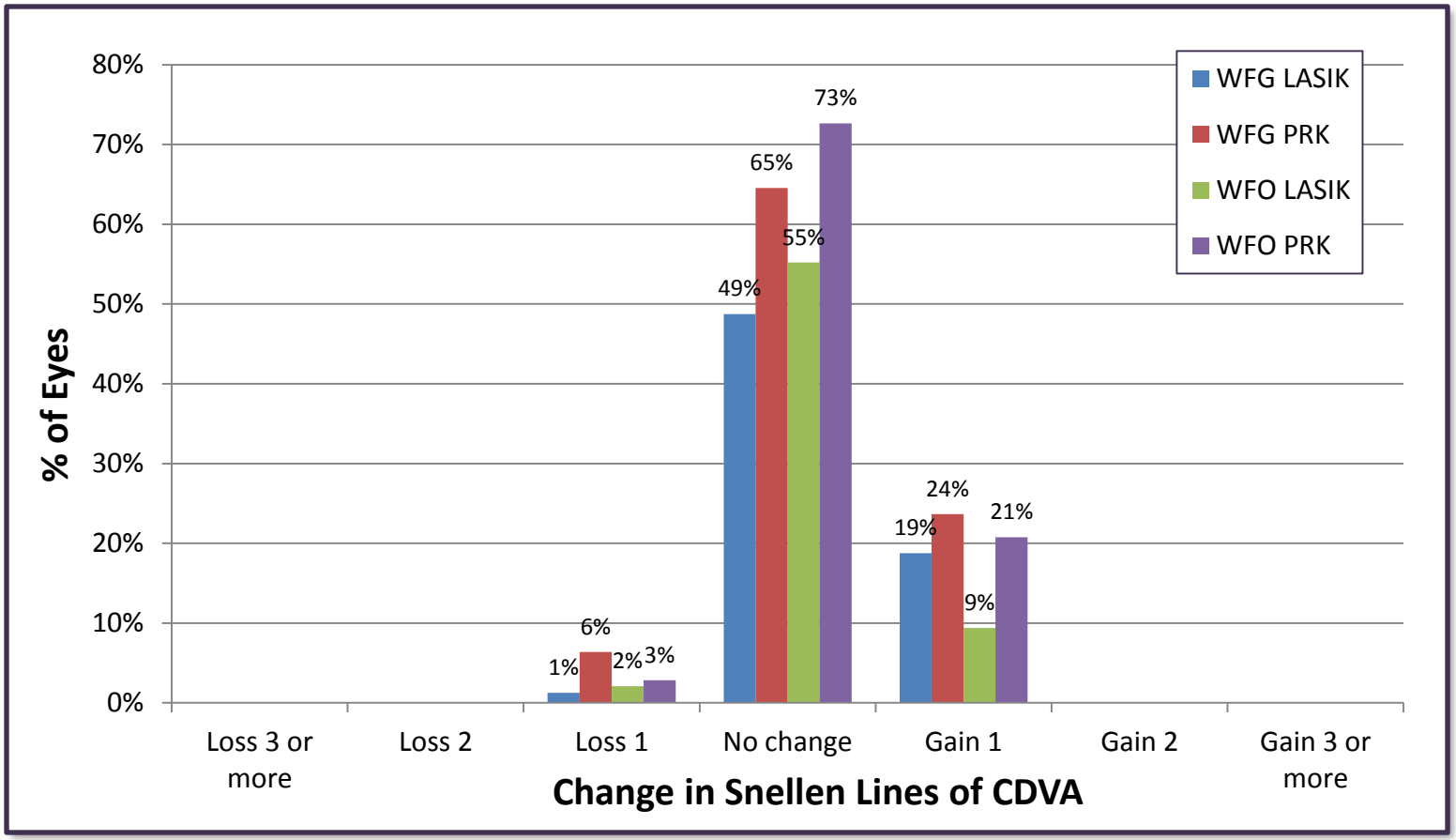

Change in Corrected Distance Visual Acuity at 6 months postop

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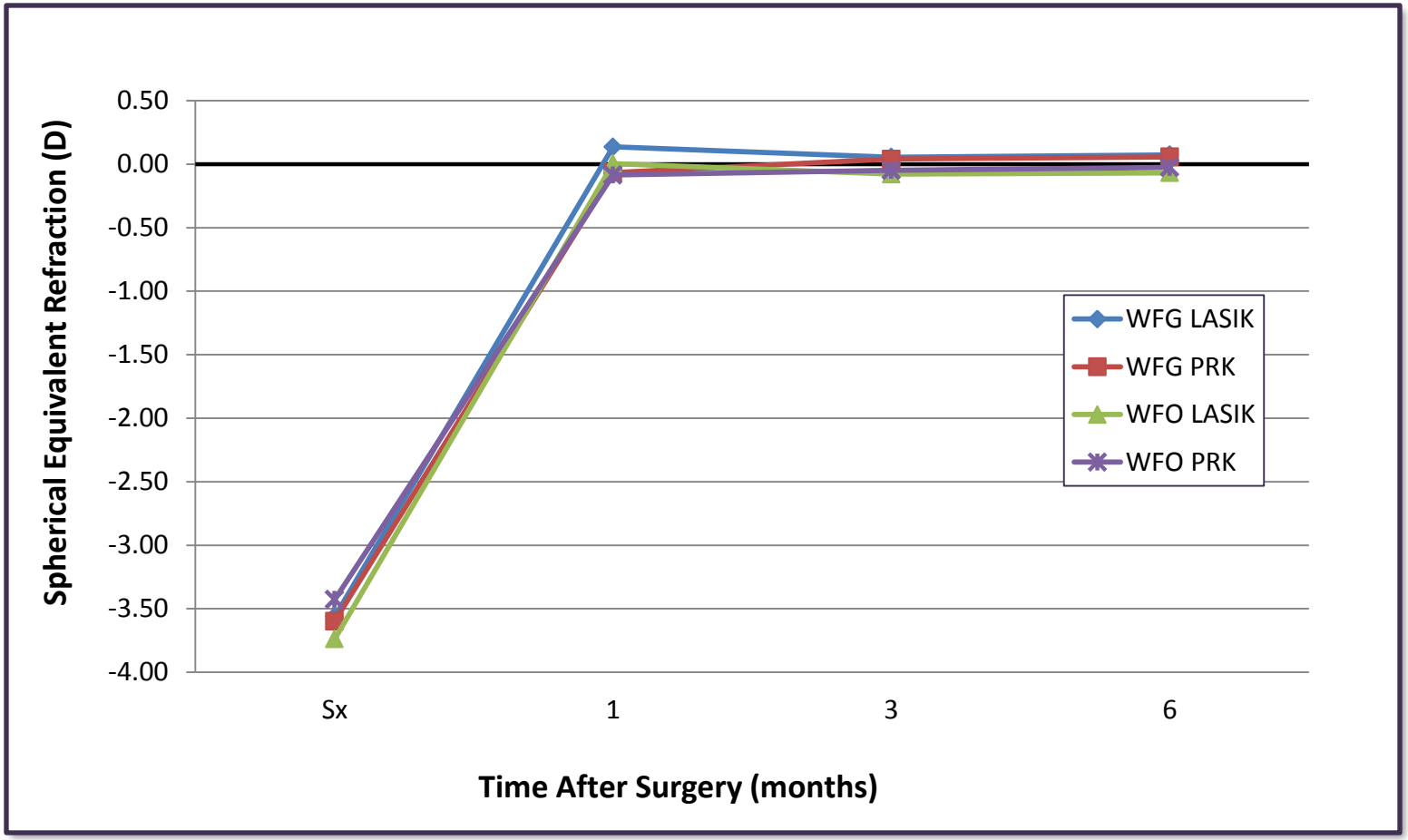

Stability of Spherical Equivalent Refraction

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Results

Summary of Visual Outcomes at 6 months after surgery

	WFG LASIK	WFG PRK	WFO LASIK	WFO PRK	P-value*
UDVA 20/15 or better	41 (73%)	79 (76%)	48 (75%)	79 (78%)	0.98
UDVA 20/20 or better	56 (100%)	103 (99%)	63 (98%)	100 (98%)	0.82
MSE within ±0.50 D of emmetropia	52 (93%)	97 (93%)	64 (100%)	97 (95%)	0.19
2 or more CDVA lines lost	0	0	0	0	-
MSE change within 0.50 D (between 1 and 6 months)	45 (80%)	80 (77%)	62 (97%)	84 (82%)	0.06

*Loglinear analysis, $p<0.05$, statistically significant. Data are presented as number of eyes and percentage.
UDVA = Uncorrected Distance Visual Acuity; CDVA = Corrected Distance Visual Acuity; MSE = Manifest Spherical Equivalent; D = Diopters

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Conclusion

Visual outcomes following either LASIK or PRK using either wavefront-guided or wavefront optimized technology were excellent and comparable.