

# LASIK Versus Surface Ablation: Comparison of Efficacy

One-year data suggest that both surgical approaches are safe and effective in myopic eyes.

**BY ARTHUR B. CUMMINGS, MB ChB, FCS(SA), MMed (OPHTH), FRCS(EDIN)**

**M**ost refractive surgeons who perform corneal laser surgery use both LASIK and surface laser procedures such as LASEK, PRK, and advanced surface ablations (ASA). I know experienced LASIK surgeons who are now performing surface treatments more regularly, and, conversely, colleagues who once favored ASA who are now doing more LASIK. I doubt that the majority of surgeons will ever do only one procedure exclusively. Instead, most choose to incorporate both LASIK and ASA into their surgical armamentariums to achieve the best results in the safest, most effective manner.

In my experience, LASIK is typically the preferred surgical option because of its quick recovery time and the absence of significant discomfort for patients. ASA is typically done when the cornea is too thin to support the intended treatment with a flap-based procedure and still leave a satisfactory residual corneal thickness, in eyes that are dry, in patients who participate in contact sports or hold occupations in which they have an increased risk of eye injury, and in patients who may adversely affect the flap-making process due to excessive anxiety.

It is important for surgeons to have an idea of how their LASIK and ASA outcomes compare over the long term. In this article, I discuss 1-year results of a large study I conducted that compares the outcomes of LASIK and surface ablation. For the purposes of this article, ASA refers to LASEK or PRK with the adjuvant use of mitomycin C in a 0.02% concentration applied for 30 seconds.

## METHODS

All procedures were performed with the 200-, 400-, or 500-Hz WaveLight Allegretto Wave excimer laser

(Alcon Laboratories, Inc., Fort Worth, Texas). LASIK flaps were made with the Hansatome or Hansatome XP (Bausch + Lomb, Rochester, New York) or the WaveLight Rondo (Alcon Laboratories, Inc.) mechanical microkeratome, or with the WaveLight FS200 femtosecond laser (Alcon Laboratories, Inc.). All procedures were performed at the Wellington Eye Clinic by either me or my partner Mr. Richard Corkin. Only eyes with at least 1-year follow-up have been included in this report. The outcomes for hyperopia are not included because we perform very few hyperopic ASA cases, and, when we do, they are typically for low hyperopia (less than 2.50 D).

## RESULTS

During the 5-year study, 9,657 myopic eyes were treated. Of those with at least 3-month follow-up, 6,184 were with treated with LASIK and 1,115 with ASA. Of those with at least 6-month follow-up, 5,042 were treated with LASIK and 880 with ASA. Of those with 1-year follow-up, 2,523 underwent LASIK and 467 ASA.

The demographics of the two cohorts were similar. Preoperative mean distance UCVA was 0.13 (range, 0.001 to 1.6 Snellen) in the LASIK group and 0.17 (range, 0.001 to 1.25) in the ASA group.

## TAKE-HOME MESSAGE

- In this study, both LASIK and ASA with the WaveLight excimer laser were effective and safe in patients with high myopia.
- LASIK was slightly more stable over 12 months than ASA, making it the procedure of choice when possible.

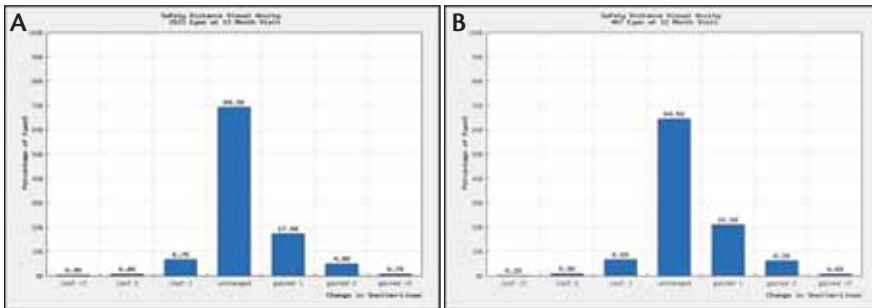


Figure 1. Safety profile of (A) LASIK and (B) ASA in myopic eyes at 1 year.

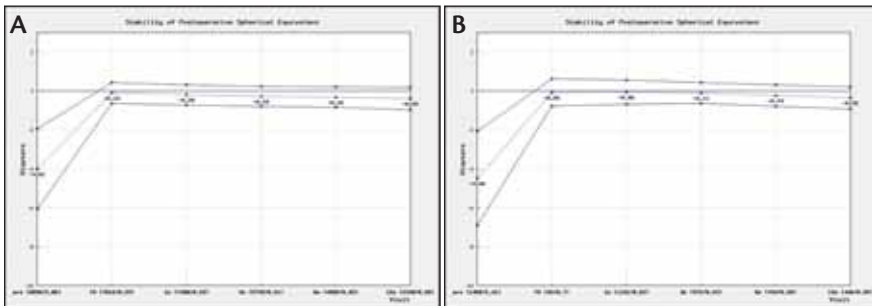


Figure 2. Stability of (A) LASIK and (B) ASA.

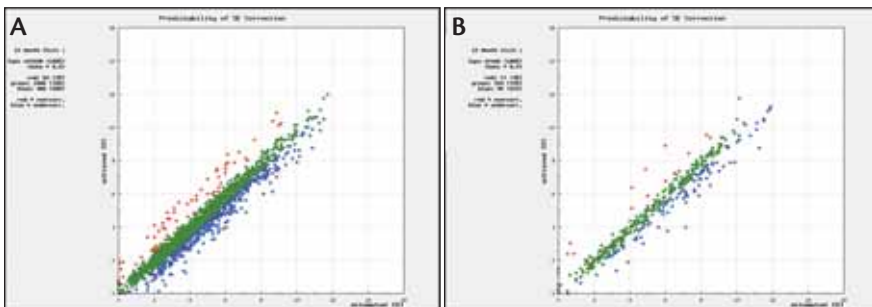


Figure 3. Predictability for (A) LASIK and (B) ASA for myopic eyes at 1 year.

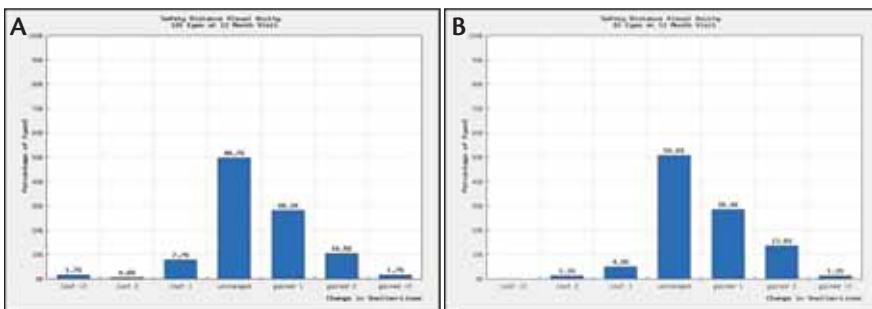


Figure 4. Safety of (A) LASIK and (B) ASA in eyes with high myopia at 1 year.

The US Food and Drug Administration (FDA) allows up to 5% of eyes to lose 2 or more lines of BCVA to be deemed safe. Based on this parameter, the results of this study suggest that both LASIK and ASA performed with this laser are safe procedures in this range of refractive error, with only 7% of LASIK and ASA eyes losing 1 line or more of BCVA (Figure 1). In the LASIK group, 16% of eyes gained 1 line of BCVA and an additional 3% gained

2 lines. In the ASA group, 20% gained 1 line of BCVA and an additional 5% gained 2 lines. This suggests that ASA is fractionally safer in this cohort than LASIK.

UCVA is a poor metric to use to compare procedures or technologies in a group in which the patients are all-comers and not selected by predetermined minimum BCVA preoperatively. Nevertheless, the postoperative UCVA in the two cohorts were similar, with 73% of LASIK eyes and 75% of ASA eyes achieving 20/20 UCVA. This includes the entire range from low myopia up to -12.00 D. Similarly, 94% of LASIK eyes and 92% of ASA eyes achieved 20/20 BCVA.

In terms of stability, the spherical equivalent (SE) refractions in LASIK-treated eyes were -4.10 D preoperatively, -0.30 D at the 3-month interval, -0.30 D at the 6-month interval, and -0.40 D at the 12-month interval. In ASA-treated eyes, the SE refractions were -4.80 D preoperatively, -0.10 D at the 3-month interval, -0.20 D at the 6-month interval, and -0.40 D at the 12-month interval. In both groups, the 12-month visit yielded a SE of -0.40 D (Figure 2).

Predictability was also similar in both groups, with 86% of LASIK patients and 81% of ASA patients achieving within  $\pm 0.50$  D of the targeted refraction (Figure 3). Cylinder outcomes were almost identical in both groups.

Taken together, the outcomes for myopic patients were generally indistinguishable between these two groups of patients.

## HIGH MYOPIA

Patients with high myopia (-8.00 to -11.75 D) often do not have enough corneal tissue to allow laser refractive procedures. For these patients, we typically

# Long-Term Data Show Both PRK and LASIK to be Safe, Effective

BY JENNIFER KREATSOULAS, PhD, SENIOR EDITOR

**P**RK and LASIK outcomes were safe, stable, and predictable in a large series of low, intermediate, and high myopic eyes, according to 10-year follow-up data published in 2008 by Jorge L. Alió, MD, PhD, and colleagues.<sup>1-4</sup>

The study included approximately 500 PRK-treated eyes and 300 LASIK-treated eyes. Mean preoperative spherical equivalent (SE) was -6.50 D in the PRK group and -11.80 D in the LASIK group. All procedures were performed with the VISX 20/20 excimer laser (Abbott Medical Optics Inc., Santa Ana, California), and patients were followed at 3 months and 1, 2, 5, and 10 years. No retreatments were performed until at least 6 months after surgery.

## PRK OUTCOMES

Of 225 PRK-treated eyes with a preoperative SE of less than -6.00 D, 169 were within  $\pm 1.00$  D and 207 were within  $\pm 2.00$  D of the targeted refraction at 10 years. Retreatments were performed in 95 eyes due to over-correction, regression, or both. The mean SE decreased slightly over 10 years, with a mean magnitude of  $-0.10 \pm 1.08$  D (myopic regression,  $-0.01 \pm 0.11$  D per year). An increase in BCVA from preoperative levels was seen in 41 of 225 eyes after 10 years; one eye lost 8 lines due to cataract, and two eyes lost vision due to posterior segment-related complications. The mean corneal haze score gradually decreased from  $0.22 \pm 0.39$  at 3 months to  $0.01 \pm 0.09$  at 10 years.

In 267 eyes with more than -6.00 D of myopia, 156 were within  $\pm 1.00$  D and 209 were within  $\pm 2.00$  D of the targeted refraction at 10 years. Retreatments were performed in 124 eyes due to over-correction, regression, or both. The mean SE decreased in eyes that did not undergo retreatment, with a mean magnitude of  $-1.33 \pm 2.00$  D over 10 years (myopic regression,  $-1.13 \pm 0.20$  D per year). BCVA improved from preoperative levels in 121 eyes, and eight eyes lost lines of BCVA due to cataract and posterior segment-related complications. The mean corneal haze score decreased gradually from  $0.48 \pm 0.69$  at 3 months to  $0.09 \pm 0.33$  at 10 years.

## LASIK OUTCOMES

At 10 years, of 97 eyes undergoing LASIK for myopia of up to -10.00 D, 71 were within  $\pm 1.00$  D, and 89 were within  $\pm 2.00$  D of the targeted refraction. Retreatments were performed in 20 eyes due to over- or under-correction, regres-

sion, or both. The mean SE decreased slightly over 10 years, with a mean myopic regression of  $-0.12 \pm 0.16$  D per year. BCVA improved in 54 eyes. Corneal ectasia was not observed in any of the eyes, and three eyes lost more than 2 lines of BCVA due to complications that were not attributable to the LASIK procedure.

At 10 years, of 196 eyes undergoing LASIK for myopia of more than -10.00 D, 82 were within  $\pm 1.00$  D and 119 were within  $\pm 2.00$  D of the targeted refraction. Retreatments were performed in 54 eyes due to over-correction, under-correction, regression, or both. Myopic regression occurred over time in eyes that did not undergo retreatment at a mean rate of  $-0.25 \pm 0.18$  D per year. Eleven eyes lost more than 2 lines of BCVA, and 78 eyes had postoperative UCVA of 20/40 or better.

Complications after PRK included 10 cases of central islands, four cases of corneal leukoma, and two corneal ulcers. Complications after LASIK included 13 cases of corneal epithelial problems, eight cases of moderate corneal melting, six cases with symptomatic ocular surface syndrome, four cases of severe corneal striae, and two cases of corneal scarring at the interface. Corneal ectasia developed in two eyes in the LASIK group with more than 15.00 D of myopic correction. The authors noted that myopic regression slowed over time in eyes that underwent LASIK.

## LOOKING AHEAD

In an e-mail to *CRST Europe*, Dr. Alió said that he and colleagues are now collecting 15- to 20-year follow-up data. "Since our initial study in 1998, outcomes have improved due to better patient selection and technology," he said. "The future of these patients is excellent, as predictability has improved twofold compared with what we originally reported. We are now performing LASIK in myopia up to -13.00 D with excellent safety and predictability." These results, Dr. Alió said, will soon be published in the *American Journal of Ophthalmology*. ■

1. Alió JL, Muftuoglu O, Ortiz D, et al. Ten-year follow-up of photorefractive keratectomy for myopia of less than -6 diopters. *Am J Ophthalmol*. 2008;145(1):29-36.
2. Alió JL, Muftuoglu O, Ortiz D, et al. Ten-year follow-up of photorefractive keratectomy for myopia of more than -6 diopters. *Am J Ophthalmol*. 2008;145(1):37-45.
3. Alió JL, Muftuoglu O, Ortiz D, et al. Ten-year follow-up of laser in situ keratomileusis for myopia of up to -10 diopters. *Am J Ophthalmol*. 2008;145(1):46-54.
4. Alió JL, Muftuoglu O, Ortiz D, et al. Ten-year follow-up of laser in situ keratomileusis for high myopia. *Am J Ophthalmol*. 2008;145(1):55-64.

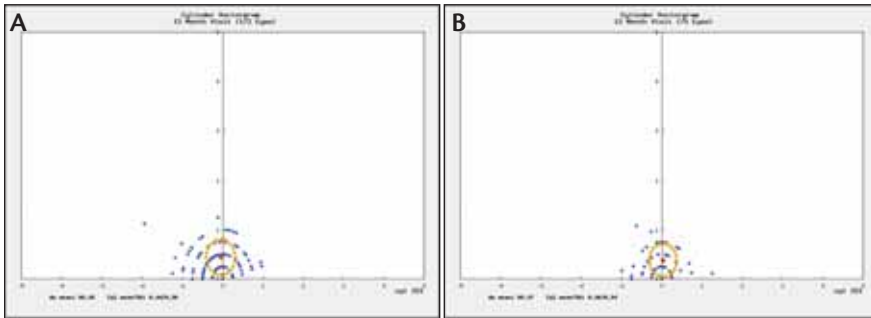


Figure 5. Vectorgram analysis of (A) LASIK and (B) ASA in eyes with high myopia at 1 year.

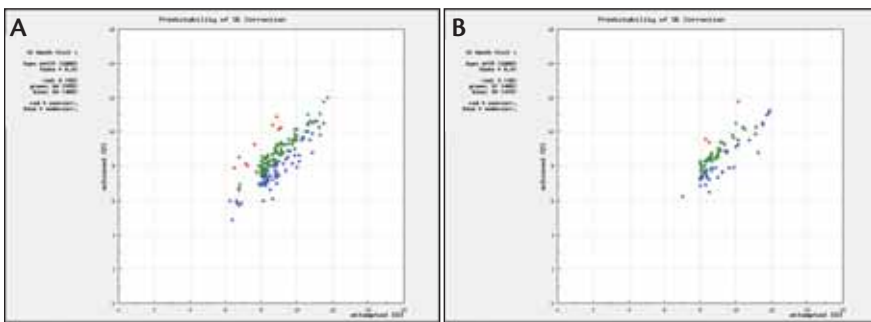


Figure 6. Predictability of (A) LASIK and (B) ASA in eyes with high myopia at 1 year.

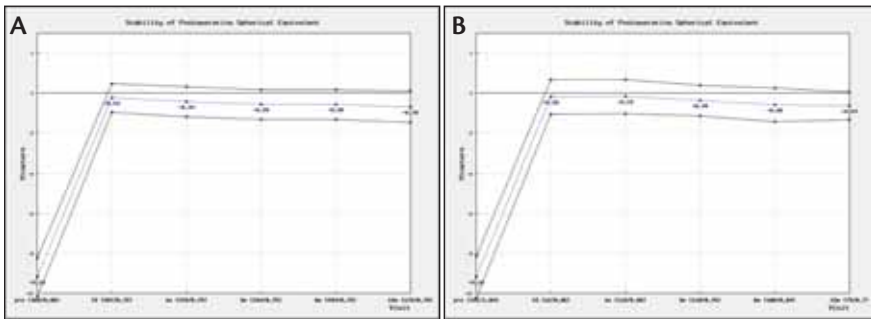


Figure 7. Stability of (A) LASIK and (B) ASA in eyes with high myopia.

eyes in the ASA group lost 1 line of BCVA. More eyes in the ASA-treated group gained 1 line of BCVA compared with the LASIK-treated group (31% vs 24%). Two-line gains were similar between groups, with 7% in the LASIK group and 6% in the ASA group. One eye in the ASA group and 3% of eyes in the LASIK group gained more than 2 lines (Figure 4).

Astigmatic outcomes were similar between the groups, even though the ASA group started out with significantly higher mean cylinder (Figure 5). In both groups, the residual astigmatism was less than 0.50 D with a standard deviation of less than 0.40 D.

Sixty-four percent of LASIK eyes and 61% of ASA eyes were within 0.50 D of targeted refraction (Figure 6). Stability was slightly better in the LASIK group (Figure 7). Fewer LASIK eyes lost lines of BCVA compared with ASA eyes.

**CONCLUSION**

These data suggest that, for -8.00 D and higher, LASIK is the preferred method if the preoperative corneal thickness is sufficient. In this series,

both LASIK and ASA with the WaveLight excimer laser were effective and safe procedures for patients with high myopia. LASIK was slightly more stable over 12 months than ASA, making it the procedure of choice when possible. ■

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implant phakic IOLs or perform refractive lens exchange. I was interested to see the outcomes for the subset of myopes higher than -8.00 D in this series. Surprisingly, more eyes in this subset gained lines of BCVA compared with the whole study population; however, more eyes lost lines as well.

Of 403 eyes with high myopia, 6-month data was available for 259 LASIK-treated eyes and 89 ASA-treated eyes. The LASIK group was -10.03 D on average, with a mean 0.93 D of cylinder. The ASA group was -9.83 D on average, with a mean 1.52 D of cylinder.

Postoperatively, 45% of LASIK eyes and 49% of ASA eyes achieved a UCVA of 20/20, and 84% of LASIK eyes and 83% of ASA eyes achieved a BCVA of 20/20.

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