

# Multifocal LASIK for Myopia

We have found that a myopic laser treatment overcorrected by 1.50 D plus a hyperopic laser treatment of 1.50 D is a good presbyopia correction technique.

BY JÉRÔME C. VRYGHEM, MD

**M**ypopic patients older than 45 years still do not have a lot of options for presbyopic correction, unless they are ready to cope with the unbalanced vision offered by monovision. Since 2002, our preferred presbyopia treatment in patients with myopia of -5.00 D or less is a multifocal ablation. This treatment includes superposition of a hyperopic ablation profile over an initial myopic ablation profile. The resulting multifocal ablation profile has more prolate characteristics compared with a standard monofocal treatment and results in good distance vision, a relative independence of reading spectacles, and improved contrast sensitivity. Patients are happy, and the procedure is safe.

## PATIENT SELECTION

I came to these ablation patterns by accidentally overcorrecting myopic presbyopic patients, retreating the overcorrection, and then discovering good distance vision and astonishing reading abilities.

In our practice, we conducted a prospective study of 22 patients (44 eyes), older than 45 years (average age, 51 years; range, 46 years to 57 years), who underwent laser vision correction for myopia. Patient requirements included (1) an interest in spectacle independence, (2) an interest in avoiding the unbalanced vision associated with monovision, and (3) having enough corneal tissue that allowed for a safe laser treatment.

## TWO SUBSEQUENT TREATMENTS

Each patient received a subsequent application of myopic laser treatment overcorrected by 1.50 D (eg, -3.00 D is treated as -4.50 D) and hyperopic laser treatment of +1.50 D. Twenty patients (40 eyes) were available for follow-up. Mean follow-up for this patient

population was 1 year.

The optical zone selection was identical for the myopic and hyperopic corrections, being 6.5 mm. Both ablation profiles were centered on the pupil. We used the WaveLight Allegretto Eye-Q 400 excimer laser (WaveLight Laser Technologie, AG, Erlangen, Germany) and performed a wavefront-optimized treatment with its prolate ablation profile: This profile induces less spherical aberrations compared with other nonwavefront-optimized treatments by other lasers.

Pre- and postoperative asphericity was measured by corneal topography (Allegretto Wave Topolyzer; WaveLight Laser Technologie AG). We used the Q-factor at 20° (average value in a normal population, -0.2 to -0.3). We also tested for postoperative changes in BCVA and UCVA in distance and near vision. The contrast sensitivity in photopic and mesopic conditions was tested with the Contrast Sensitivity Tester 1800 Digital (Vision Sciences Research Corp., San Francisco). Aberrometry was performed using ray-tracing (i-Trace; Tracey Technologies, Corp., Houston).

The average pre- and postoperative spherical equivalents were  $-3.88 \pm 1.93$  D (range, -8.00 D to -2.00 D) and  $-0.17 \pm 0.31$  D (range, -1.25 D to 0.13 D), respectively. Two patients—both retreated—had a bilateral overcorrection, and one patient had an undercorrection in their dominant eye, followed by a retreatment. Only one patient was unsatisfied with reading ability, and we corrected him to obtain monovision.

In 93% of patients, the refractive outcome was within  $\pm 0.50$  D of the intended correction. Only 20% of patients lost one line in BSCVA, signifying the safety of this procedure. Approximately 75% of patients were able to read Parinaud 2 or better uncorrected; all read Parinaud 3 or better.

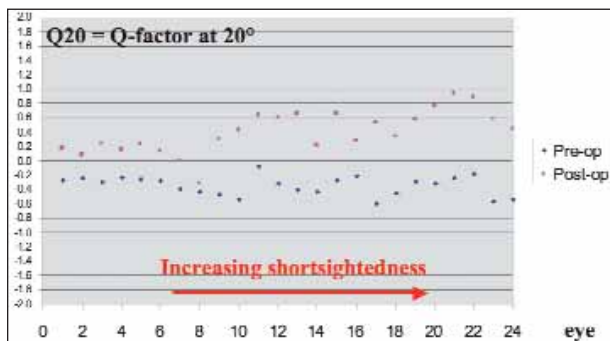


Figure 1. The standard wavefront-optimized LASIK for myopia.

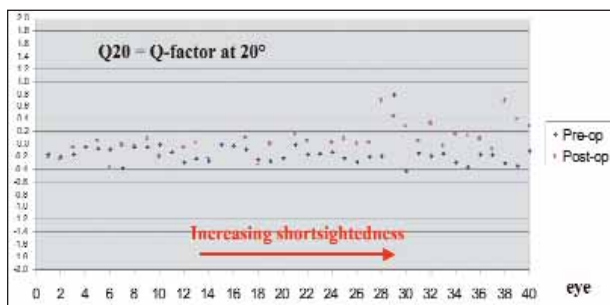


Figure 2. Multifocal LASIK for myopia.

We compared the asphericity (ie, Q20 value, as measured on the WaveLight Topolyzer) of these multifocal corneas with corneas from a similar group of patients who underwent a monofocal treatment. The shift toward oblateness (+0.20 or even more positive values), induced by a standard myopic laser treatment (Figure 1), is shown to be greatly reduced by the multifocal treatment (Figure 2), especially when the original shortsightedness does not exceed -5.00 D. Furthermore, contrast sensitivity, both in photopic and scotopic conditions, was improved compared with the preop data. (Figure 3).

## MINIMAL VISUAL DISTURBANCES

Our subjective evaluation showed that 10% of patients experienced some halos and 10% some glare; fewer than 10% experienced moderately disturbing double vision; and approximately 15% experienced some night vision problems. Approximately 80% of patients described their distance vision as better than before surgery, whereas fewer than 15% described it as worse.

Near vision, however, did not have such a distinct break, with approximately 40% of patients experiencing better vision compared with their preoperative correction and 35% experiencing worse vision. Nearly no patients were still spectacle dependent for distance

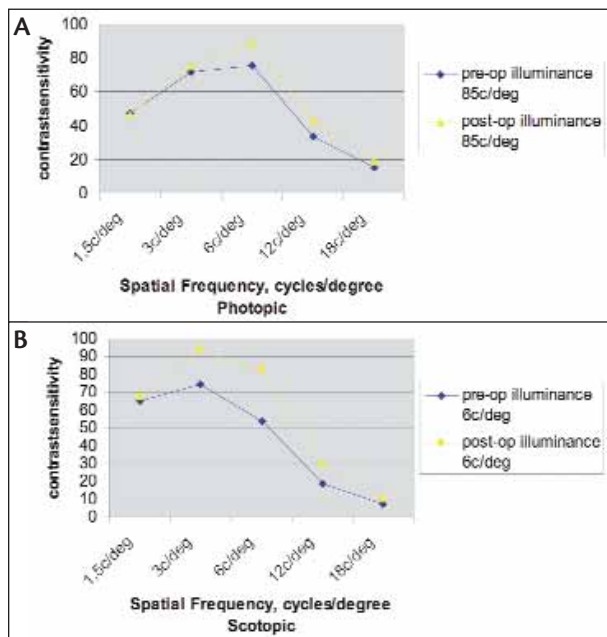


Figure 3. The contrast sensitivity in photopic conditions (A) and scotopic conditions (B) improved postoperatively.

vision. For reading, however, 65% of patients were using reading spectacles in more than 50% of their near activities. Still, the average global patient satisfaction rate was high: 85/100 (range, 75/100 to 100/100).

## PROLATE ABLATION PROFILES

This procedure is still my preferred treatment option in all myopic (not higher than -5.00 D) and presbyopic patients who are not ready to cope with monovision, as long as their preop corneal thickness allows for treatment in safe circumstances.

In the near future, we believe that even more prolate ablation profiles with multifocal properties will be performed. The F-CAT software provided by WaveLight Laser Technologie AG allows for customized determination of the target asphericity. Recently, the company released a new version that allows us to target for a Q-factor as high as -1.0. We are building up experience with that software. Once the nomogram has been adapted, we hope to obtain even better and/or more predictable results. ■

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