Myopic Femto-LASIK

An aberration-free profile can help to achieve excellent results.

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Poor visual quality and reduced contrast sensitivity can be attributed to optical aberrations in the eye.[1,2] Although the two main contributors to optical aberrations are the cornea and lens, an abnormal tear film or vitreous can also cause an increase in aberrations.

Conventionally, aberrations are divided into lower-order (sphere and cylinder) and higher-order (spherical aberration, coma, and trefoil). Laser vision correction has been extremely successful at treating lower-order aberrations (LOAs); however, a minority of patients experience visual degradation as a result of higher-order aberrations (HOAs).

AN ABERRATION-NEUTRAL APPROACH

With the maturing of excimer laser technology and the ability to routinely achieve good postoperative visual acuity, attention has turned to improving visual quality by treating existing ocular aberrations or minimizing their induction during laser vision correction. Techniques that focus on minimizing induced aberrations have been demonstrated to be safe, predictable, and efficacious.[3,4]

Patients with a preoperative BCVA of 20/20 or better do not have significant HOAs that degrade visual quality. This group represents the majority of patients who present for laser vision correction, and in these patients it is more appropriate to focus attention on performing an aberration-neutral procedure. The goals are to achieve an excellent refractive outcome and to preserve visual quality by not inducing glare and reduced contrast sensitivity.

The aspheric aberration-free ablation profiles created by the Schwind Amaris 750S excimer laser system (Schwind eye-tech-solutions) result in excellent refractive outcomes and minimize induction of HOAs. These profiles include large optical zones, multidynamic aspheric transition zones, compensation for aberration and focus shift caused by tissue removal, pseudomatrix-based spot positioning, and intelligent thermal effect control. The randomized flying-spot ablation pattern and local repetition rate controls minimize the thermal effect of tissue removal to produce a smooth ablation with no risk of thermal damage.

MYOPIC FEMTO-LASIK

Currently we use the Amaris' aberration-free profile for myopic femtosecond LASIK (femto-LASIK) treatments in eyes with up to -10.00 D of sphere and -5.00 D of cylinder. We recently reviewed 2,862 consecutive cases with complete pre- and postoperative data at 3 months (Table 1). Our retrospective analysis omitted exclusion criteria that would limit enrollment in a prospective study.

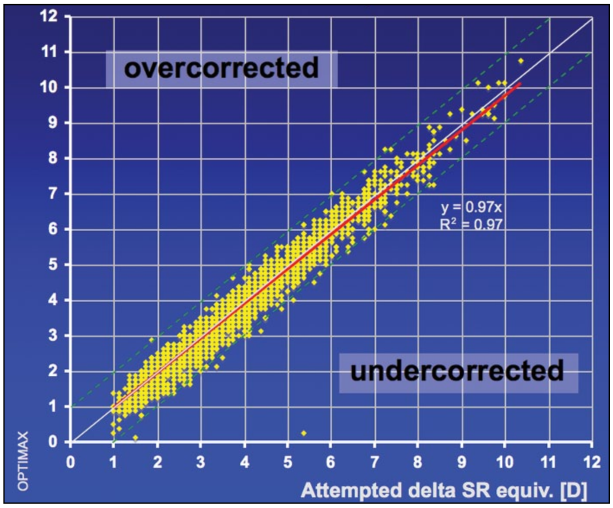

Figure 1. Attempted versus achieved manifest refraction spherical equivalent.

Manifest refractive spherical equivalent (MRSE). We found a close relationship between attempted and achieved MRSE (Figure 1). Additionally, 79% of patients achieved a UCVA of 20/20 or better and 26% achieved 20/16 or better; all patients achieved the United Kingdom Driving Standard of 20/40.

Refractive outcomes. In our study, 95% of patients were within ±0.50 D of emmetropia, and 100% were within ±1.00 D (Figure 2). No eye lost more than 2 lines of

TAKE-HOME MESSAGE

- In patients with a BCVA of 20/20 or better, the goals are to achieve an excellent refractive outcome and to preserve visual quality by not inducing glare and reduced contrast sensitivity.
- It may be more appropriate to focus attention on performing an aberration-neutral procedure in this group of patients rather than try to reduce HOAs.

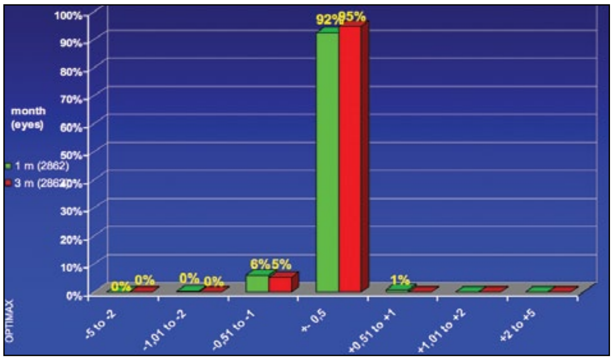

Figure 2. Postoperative spherical equivalent.

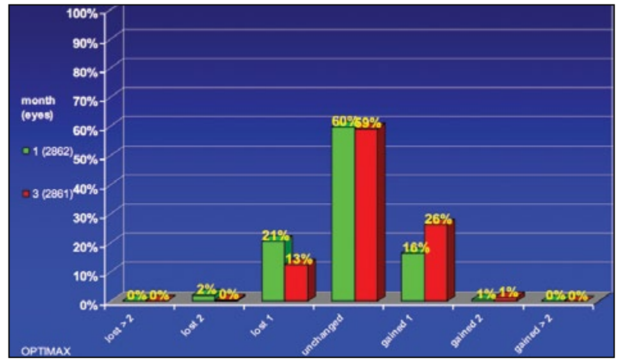

Figure 3. Safety of treatments, demonstrated by change in BCVA.

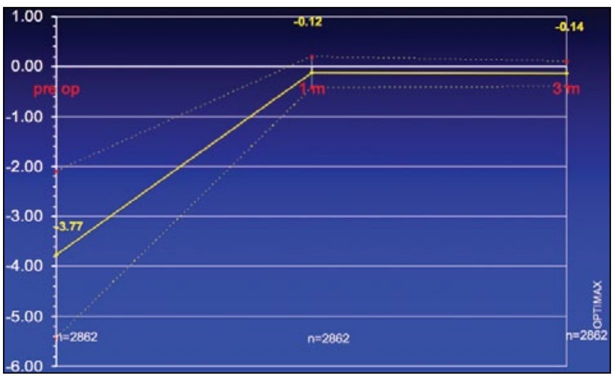

Figure 4. Stability of treatments: achieved correction of spherical equivalent over time.

BCVA (Figure 3), 26% gained 1 line, and 1% gained 2 lines. The outcomes were stable through 3 months (Figure 4).

Corneal wavefront aberrations. We compared pre- and postoperative mean HOAs, spherical aberration, and coma. The root-mean-square (RMS) HOAs did not change significantly from pre- to postoperatively (preoperative: 0.30 ±0.12 µm; range, 0.15–0.84 µm; postoperative: 0.35 ±0.13 µm; range, 0.13–0.85 µm). Pre- and postoperative mean spherical aberration were 0.16 ±0.07 µm (range, 0.03–0.40 µm) and 0.18 ±0.10 µm (range, 0.02–0.49), respectively. Mean pre- and postoperative coma were 0.18 ±0.11 µm (range, 0.03–0.75 µm) and 0.21 ±0.12 µm (range, 0.03–0.75), respectively.

Our results demonstrated that the aberration-free aspheric ablation profiles of the Schwind Amaris750S were indeed aberration-neutral.

TABLE 1. PATIENT DEMOGRAPHICS

	Average	Range
Age (years)	33	18 to 68
Preoperative Spherical Equivalent (D)	-3.77 ±1.67	-10.00 to -1.00
Preoperative Sphere (D)	-3.41 ±1.66	-9.75 to -0.50
Preoperative Cylinder (D)	-0.71 ±0.68	-5.00 to 0.00
Postoperative Spherical Equivalent (D)	-0.12 ±0.31	-1.13 to 1.00
Postoperative Sphere (D)	0.02 ±0.30	-1.00 to 1.00
Postoperative Cylinder (D)	-0.28 ±0.26	-2.25 to 0.00

CONCLUSION

Achieving good refractive outcomes with high levels of safety and patient satisfaction is crucial. The speed of laser treatments with the aberration-neutral profiles of the Schwind Amaris 750S provides an exceptional patient experience, and we have yet to receive a complaint of glare and halos due to the large optical treatment zones and resultant prolate corneas. The laser's 6-dimensional tracking function has also ensured accurate treatments, with no evidence of decentration thus far. ■

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