Advanced Surface Laser Ablation: A True No-Touch Technique

This single-step ablation is the best choice for surface correction of refractive errors.

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TransPRK by SCHWIND (SCHWIND eye-tech-solutions GmbH, Kleinostheim, Germany) is the only transepithelial single-step treatment that avoids the eye coming into contact with any instrument. The clinical application of TransPRK, an advanced surface laser ablation (ASLA) treatment, uses the excimer laser to remove the epithelium, resulting in a more precise and more uniform treatment than what is achieved with either manual or alcohol-assisted debridement. TransPRK was introduced in September 2009, and since then this treatment has gone through various evolutions. TransPRK-ASLA, performed with the SCHWIND AMARIS laser system, applies an epithelial thickness profile that resembles a slight hyperopic treatment (less than 0.75 D). The resultant epithelium is thinner in the center, thereby avoiding or at least reducing hyperopic shift. Because ASLA applies the laser beam directly over the epithelium, it acts as a smoothing agent for the residual stromal bed. Treating refractive errors with ASLA has several advantages.

The single-step approach allows simultaneous ablation of the epithelium and the stroma to shorten the overall treatment time and minimize the risk of corneal dehydration. Beside a faster surgical time, epithelial tissue removal has been optimized to avoid myopic-like corrections (approximately -0.75 D). This new approach treats refractive errors by superimposing a defined epithelial thickness profile of approximately 55 µm at the center and 65 µm at the periphery (4 mm radially from center) with a corneal aspheric ablation profile. Additionally, the diameter of epithelial removal is calculated to match the ablation zone, thus decreasing the wound surface and speeding up the healing process.

ABLATION PROFILE AND OPTICAL ZONES

Transepithelial approaches allow maximum correspondence between the corneal topography and the ablation profile. Despite the slight difference in photoablative rates of the stroma and the epithelial tissue (approximately 20% higher in the epithelium), the AMARIS software is set up to compensate for this. TransPRK profiles on the AMARIS system are safe and effective, and the high-speed laser reduces variability from stromal hydration effects. ASLA yields good visual, optical, and refractive results and has the potential to replace other surface ablation procedures.

Transepithelial ASLA with the AMARIS offers additional safety, because there is no corneal flap and thus no enduring weakening of the cornea. ASLA patients have lower pain scores, functional visual outcomes are achieved earlier than with alcohol-assisted epithelial ablation, and patients remain stable. Additionally, the AMARIS creates large optical zones and smart blend zones to avoid edge effects, especially in eyes with coma and spherical aberration. The size of the optical zone should generally be at least the size of the scotopic pupil diameter.[1] In hyperopic eyes, an optical zone of 7.0 mm is preferred because it minimizes the risk for regression and halos.

CASES FOR ASLA

ASLA in combination with corneal wavefront is preferable for patients who need retreatment after radial keratotomy or corneal transplantion.[2] Moreover, it can be used to treat haze, scarred corneal tissue, and keratoconus before corneal collagen crosslinking (CXL). When used as a keratoconus treatment, we aim to minimize the ablation and smooth the existing astigmatism. Compatability with the preoperative initial corneal thickness is important.

The ASLA technique is useful in all cases where a difficult epithelial flap is expected or when the epithelium covers corneal irregularities of the stromal tissue. Our approach is treating refractive errors sequentially with a corneal wavefront-guided aspheric ablation followed by a defined epithelial thickness profile, without masking fluid, to remove residual epithelium from the center or in the periphery of the treated area.

VERSATILITY

We performed a study comparing ASLA with alcohol-assisted PRK. The resulting outcomes were com-

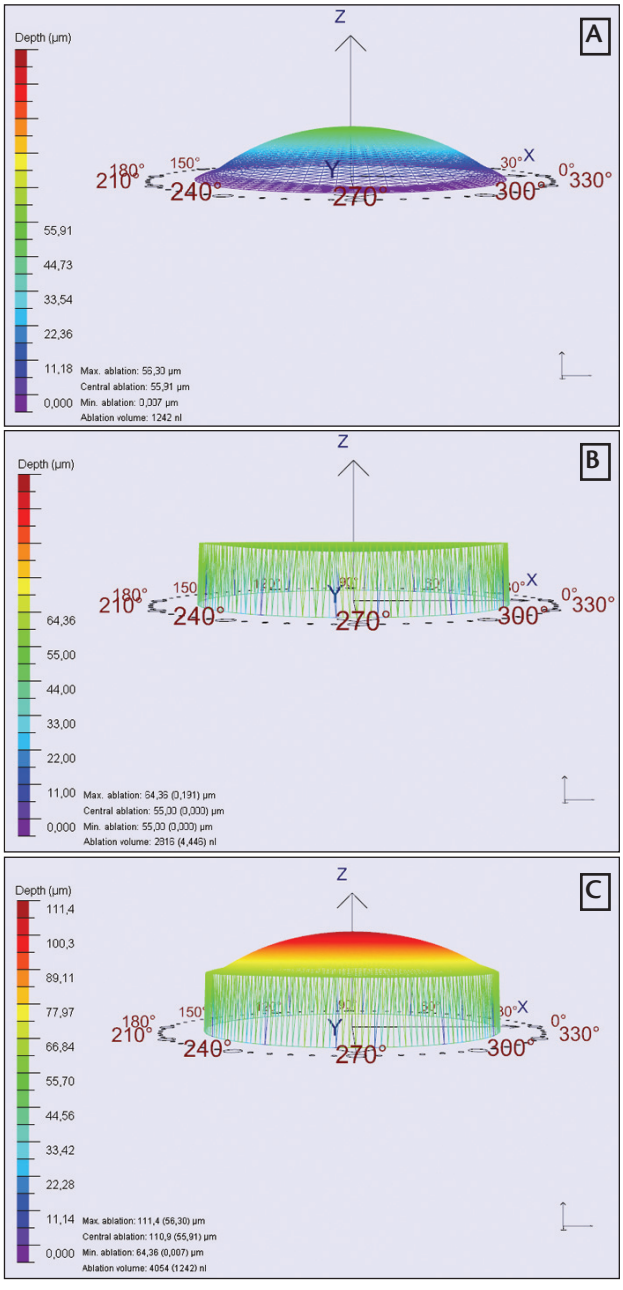

Figure 1. Composition of a ASLA myopic profile. (A) PRK component; (B) epithelial component; and (C) resulting ASLA profile.

parable UCVA and BCVA. In terms of aberrations, preoperative and 1 and 3 months postoperatively, the results are comparable across the spherical, coma, and trefoil groups. In terms of intra- and postoperative pain, the ASLA patients have a lower score and the difference in pain between an alcohol-assisted PRK and an ASLA patient is more marked on the third postoperative day, when ASLA-treated eyes show better healing and epithelialization. This is also demonstrated by a higher percentage of alcohol-treated patients requiring replacement of bandage contact lens on day 3 as compared to the ASLA-treated group, where only a very small percentage (less than 10%) required replacing the bandage contact lens because of residual epithelial defect.

Furthermore, the levels of haze (measured on the Fantes scale) in the ASLA group are about 60% lower than in the alcohol group. It has not exceeded grade 2 in any case at 6-month follow-up.

CONCLUSION

ASLA is a versatile approach, allowing treatment of pathologic corneas as well as combined therapies such as CXL plus ASLA. Results are at least comparable to, if not even better than, alcohol-debrided PRK. With ASLA, pain scores and days to contact lens removal are lower and the healing process (haze and visual acuity recovery) is conveniently shorter.

In addition to the study, we have performed ASLA on more than 150 patients with at least 6 months' follow-up. All patients have excellent results thus far, with all ASLA outcomes are comparable to alcohol-assisted PRK outcomes in terms of final BCVA and UCVA, stability and long term safety.

When ASLA profiles are applied to regular corneas using the AMARIS system, the outcome is efficacious, safe, stable, and reliable results. ASLA preserves the eye's natural aberrations just as well as alcohol-assisted PRK does. ■

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** Editorial Note: Personal communication: The Emmetropia data relative to our randomized control study are currently being submitted for publication and cannot be fully disclosed.*