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Contents

Advanced Outcomes With a New Ablation Profile

The Triple-A ablation profile for the MEL 90 represents a new generation of excimer laser advancements from ZEISS.

BY BERTRAM MEYER, MD

In my long-term experience with the aberration smart ablation (ASA) and tissue-saving ablation (TSA) profiles designed for the MEL 80 excimer laser (Carl Zeiss Meditec), patients typically experienced good refractive and visual outcomes. But with the latest ablation profile, the Triple-A (Advanced Ablation Algorithm), my results are even better than they were with either of the other profiles. Below is a review of the three profiles and my rationale for preferring the Triple-A.

THREE ABLATION PROFILES

The ASA, TSA, and Triple-A profiles are all compatible with the MEL 90 excimer laser, the latest offering from Carl Zeiss Meditec, and each has a unique ablation depth. The Triple-A profile has the shallowest ablation depth, followed by the TSA profile and lastly the ASA profile. Below I review each individual profile.

ASA profile. The ASA profile is an aspherically optimized profile; however, it does consume more of the patient's corneal tissue in the process as compared with the TSA profile.

Although the ASA profile provides patients with good refractive and visual outcomes, it does have some shortcomings. First, ASA was best suited for higher diopter ranges of correction, as it tends to result in overcorrection in eyes presenting with less than -3.00 D of myopia. The higher asphericity in low diopters results in more tissue ablation. Additionally, this profile does not adequately address preexisting astigmatism, oftentimes resulting in undercorrection. Undercorrection can also result when the ASA profile is selected for hyperopic and mixed astigmatism treatments.

Our rule at the AOC Center in Cologne, Germany, is to use the ASA profile for eyes that require a correction of more than -3.00 D. It is also important to note that we do make adjustments and have our own nomogram to prevent overcorrection for low diopter ranges.

TSA profile. The TSA profile is designed to preserve tissue. In order to achieve optimal results, the surgeon must switch between these profiles. Another concern with the TSA profile is that it does not always adequately correct asphericity. The TSA profile was opimized for lower correction cases as derivative from the ASA profile.

Triple-A profile. The Triple-A profile represents an improvement from the ASA profile. There is an enhanced projection error compensation function (Figure 1A), better control of the target asphericity with an increased correction parameter using an aspherically optimized profile (Figures 1B and 1C), and the central ablation depth remains constant. The beauty of the newest profile for the MEL 90 is that it is designed to correct not only diopters but also the aspherical part of the intended correction. It includes

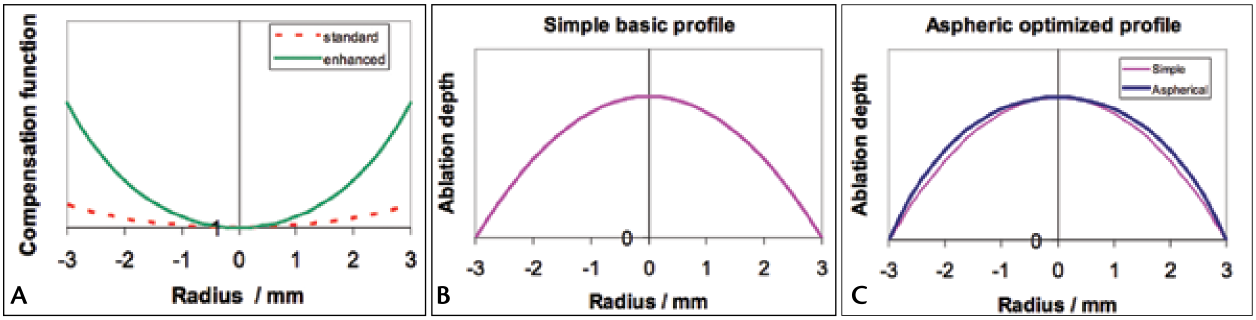

Figure 1. Enhanced projection error compensation function with the Triple-A profile (A). Ablation depths of a simple basic profile (B) and an aspherically optimized profile (C).

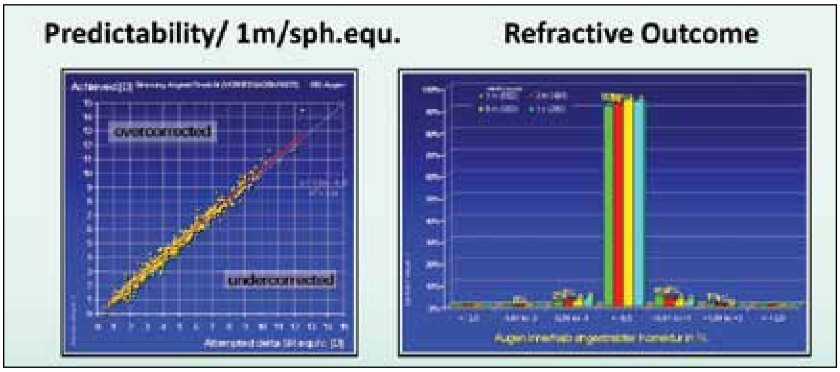

Figure 2. Predictability and refractive outcomes at 1 month.

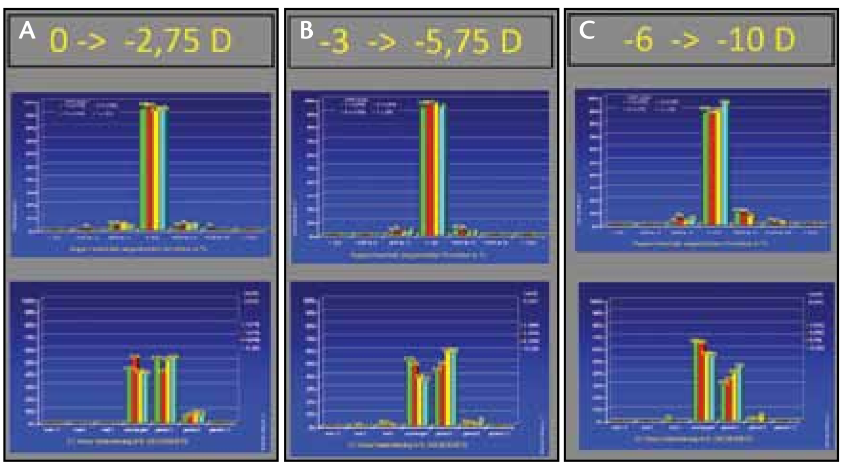

Figure 3. Visual outcomes in patients with low myopia (A), moderate myopia (B), and high myopia (C).

the tissue-saving properties of the TSA profile and the aspherical-optimization properties of the ASA profile in a single profile, for the complete treatment range.

All laser ablations induce spherical aberrations, especially the z 4/0 component into the optical system; however, this new profile is designed to compensate for these induced spherical aberrations.

OTHER ADVANTAGES

Other advantages of the Triple-A profile are that it does not waste corneal tissue, it optimizes compensation of the induced spherical aberrations at higher corrections (z 4/0), and, with only a single profile, there is no need to switch between two functions.

What is most appealing to me, however, is that the results are convincing across all ranges, including low, medium, and high myopic diopters. Additionally, this profile achieves almost full correction of the astigmatic component, and we are doing it all while saving corneal tissue. Also, an advantage with the new MEL 90 is that it has large optical zones due to enhanced projection error compensation.

PERSONAL EXPERIENCE

I have been using the Triple-A profile for approximately 4 years and have treated a total of 768 eyes with myopia or myopic astigmatism and 224 eyes with hyperopia.

The Triple-A profile is now commercially available with the newest-generation excimer laser, the MEL 90, which was unveiled at the 2013 European Society of Cataract and Refractive Surgeons (ESCRS) meeting in Amsterdam, the Netherlands.

STUDY RESULTS

We used a study version of the MEL excimer laser for all treatments. In patients with myopia or myopic astigmatism undergoing refractive surgery with the Triple-A profile (mean age, 36 years; range, 19-56 years), we treated a mean sphere of -4.43 ±2.10 D (range, -1.50 to -10.50 D) and a mean cylinder of -1.14 ±-0.88 D (range, up to -4.50 D). The mean flap diameter was 8.5 ±0.26 mm (range, 7.9-8.7 mm), and the mean flap thickness was 115 ±5 µm (range, 100–120 µm). There were no intraoperative complications and no significant side effects of note. The predictability and refractive outcomes at 1 month are shown in Figure 2.

Regardless of the level of correction, the visual outcomes in patients with myopia or myopic astigmatism were excellent. In total, 179 eyes were treated for low myopia (Figure 3A), 240 for moderate myopia (Figure 3B), and 131 for high myopia (Figure 3C). Among these, 92.93% were within ±0.50 D of intended correction at 3 months, with similar results at 6 months and 1 year, and the majority of patients (95%) achieved a nearly complete correction of astigmatism, within 0.25 D of intended correction. Additionally, about 50% of patients did not experience any change in BCVA, and the other half gained at least 1 line of BCVA. Through 3 years of follow-up in this population, there have been no complications or adverse events.

Among the patients we treated with hyperopia or mixed astigmatism (mean age, 43 years; range, 20–58 years), we treated a mean sphere of 2.07 ±1.30 D (range, 0.50–7.50 D) and a mean cylinder of -2.51 ±1.88 D (range, up to -7.50 D). The mean flap diameter was 8.7 mm and

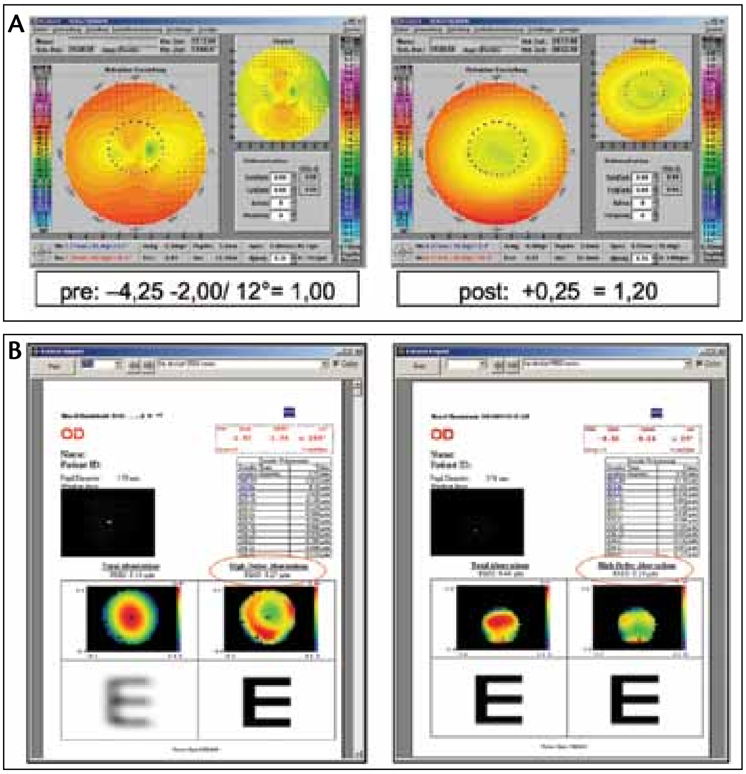

Figure 4. Pre- and postoperative corneal topography (A) and wavefront findings (B) in eyes that underwent refractive correction with the Triple-A profile, now available on the MEL 90.

the mean flap thickness was 115 µm. At 1 month, 73% of patients were within ±0.50 D of intended correction, and the percentage of patients who were within ±0.50 D of intended correction continued to increase at 3, 6, and 12 months.

Compared with the ASA profile, our results showed that the Triple-A profile was more predictable and safer and that there were no significant changes in spherical aberrations postoperatively. However, we did note a mild increase of spherical aberrations in patients undergoing treatment for high refractive errors. Figure 4 shows an example of pre- and postoperative corneal topography and wavefront findings in eyes that underwent refractive correction with the Triple-A profile.

I also conducted a direct comparison of the Triple-A and the ASA profiles for high diopters. For a matched group of patients between -6.00 and -9.00 D, more than 95% of patients in the Triple-A group were within ±0.50 D of intended corrections. With the ASA profile, however, only 85% were within ±0.50 D of intended correction. So the Triple-A profile is much more accurate, and we also have a greater capability of providing tailor-made treatments for our patients.

CONCLUSION

The new Triple-A profile for femtosecond LASIK is a wavefront-optimized aspheric profile that produces less tissue ablation than the previous ASA profile. This profile is able to treat all ranges, is easy to perform, and results in excellent refractive outcomes for all ranges of correction. It is safe, predictable, and effective, with good stability through 3 years of follow-up. Additionally, it induces less higher-order aberrations than other ablation profiles, provides large optical zones, and requires a reduced ablation depth compared with the ASA and TSA profiles.

I recently received the MEL 90 in my practice. Although I have early personal experience with this laser, I do feel as if I have been using it for a longer time than I have, as its usability is very straightforward, including many workflow benefits that have already been proven in the MEL 80. The key difference between both is that the MEL 90 allows me to choose between a frequency of 250 and 500 Hz. The advantage of having a faster frequency is the speed and efficacy of treatments for higher corrections. I look forward to gaining more experience with this exciting technology. ■

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The Demands of an Ablation Profile

Comparison of the new aspherical-optimized Triple-A profile with standard ablation profiles.

BY PATRICK VERSACE, MD

Ablation profiles are interesting. Functionally, the aim of ablation profiles is simple: to correct refractive and corneal higher-order aberrations (HOAs). To do so predictably, without causing biomechanical weakening of the cornea or inducing unwanted side effects including halos, glare, and haze, however, is not as easy.

To accomplish this, two surgical components—hardware and software—must work together flawlessly. The hardware aspect of refractive surgery is the excimer laser system itself, which is responsible for delivering the ablation to the cornea and removing the corneal tissue. The software aspect is more abstract; it is computer programming designed to direct the laser system on how much corneal tissue to remove across different points. The objective of both aspects is creating a more desirable shape in the cornea.

QUALITY OF OUTCOMES

In some ways, it is the improvements in software over the past 15 years that have made the biggest differences in the quality of outcomes after LASIK and other kinds of refractive surgery procedures. Also, surgeons now have personal nomograms built into their software to account for a wide array of variables that can affect treatments. This, too, allows patients to achieve predictable outcomes and quality vision.

In the early days of LASIK and with some laser systems more than others, a considerable amount of surgeon input was required to achieve good postoperative outcomes. Essentially, it was up to the surgeon to make most of the treatment-planning decisions by looking at the patient's preoperative examination and deciding what ablation profile was best. As refractive surgery technology improved over the years, companies started designing software to determine the most appropriate ablation profile for a particular patient based on preoperative measurements including topography and aberrometry. At this stage, the quality and predictability of visual outcomes began to really improve.

Today, most excimer laser platforms have several ablation profiles. For example, the MEL 80 (Carl Zeiss

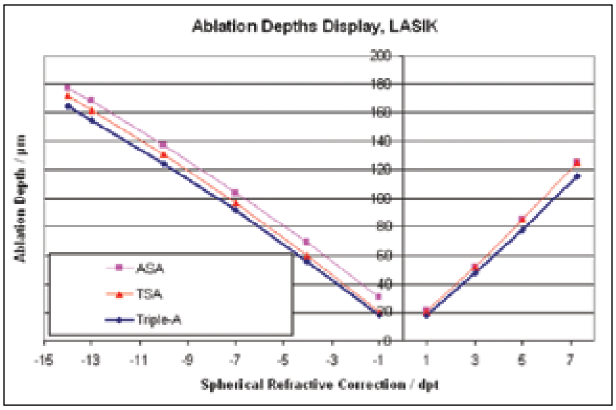

Figure 1. Reduced ablation depth for all treatments with the Triple-A profile.

Meditec) offers five different ablation profiles for the surgeon to choose from—a topographic-based profile, a wavefront-based profile, an aspheric profile, a tissue-saving profile, and a presbyopia-correcting profile. The latest excimer laser from Carl Zeiss Meditec, the MEL 90, adds one more profile to choose from, a new universal profile called the Advanced Ablation Algorithm (Triple-A). This profile works for all patients regardless of their level of refractive error.

REFRACTIVE PREDICTABILITY

A surgeon should be able to expect refractive predictability regardless of the ablation profile he or she uses. Likewise, removal of the least amount of tissue possible to achieve a specific outcome is also expected of any ablation profile. What is a bit more challenging to expect from any profile is control of induced spherical aberration.

Ideally, an ablation profile should include linear, preemptive correction for any spherical aberration induced with the laser treatment. Carl Zeiss' new Triple-A profile is a linear profile that combines the features of the four other profiles to create a universal profile that is specifically intended to control spherical aberration.

With this profile, the more myopia being corrected, the more compensation there is for spherical aberration.

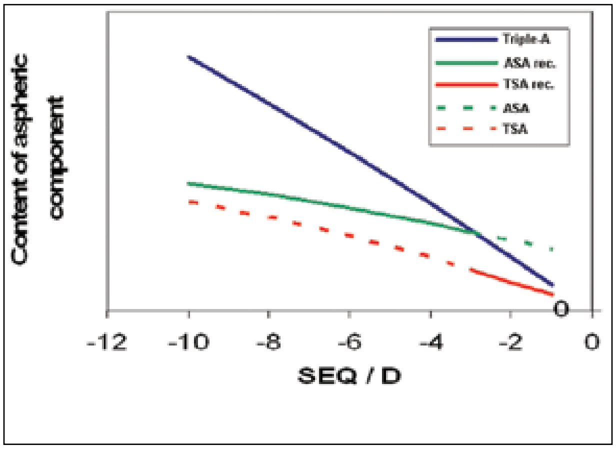

Figure 2. Comparison of the different Zeiss ablation profiles and how they compensate for spherical aberration.

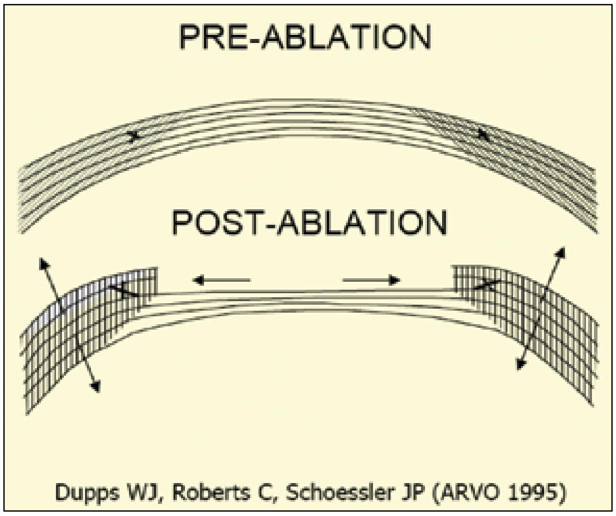

Figure 3. Biomechanical response as a cause of induced spherical aberration with laser refractive correction.

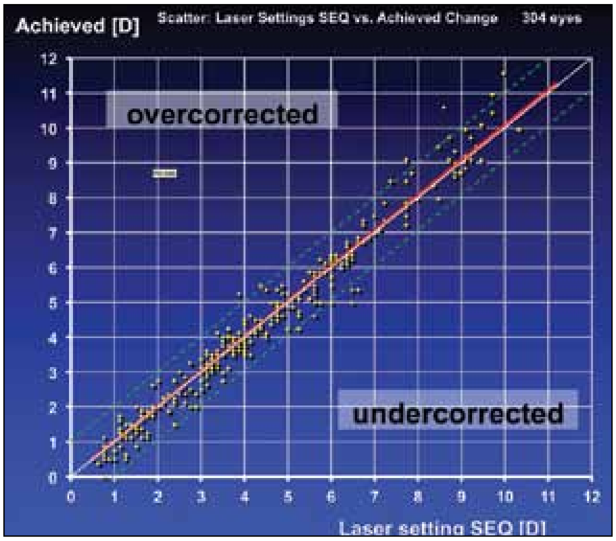

Figure 4. Refractive predictability with Triple-A profile for a broad range of treated refractive errors (Pooled data from several sites).

The result is increased quality of vision for patients. As an example, if we use the Triple-A profile on a highly myopic patient (eg, -7.00 D), this profile will have minimal impact on his or her spherical aberration. The result is better quality of vision, particularly at night and under low-contrast conditions.

Carl Zeiss Meditec constantly refines its ablation profiles and makes sure that each one can achieve predictable refractive outcomes in order to minimize enhancement rates as well as the amount of corneal tissue that is ablated as part of the treatment.

PERSONAL EXPERIENCE

I was involved with the first wavefront-guided refractive surgery treatments in Australia and the Southern Hemisphere, back in the days of Zyoptix (Bausch + Lomb). At that time, the general trend with wavefront was to aim for full correction of preexisting HOAs. Fast forward to the present: A wavefront-based strategy has little merit unless the patient has a lot of preexisting HOAs. Most wavefront-optimized treatments now aim to avoid the induction of new HOAs—particularly spherical aberration.

I have used various ablation profiles over the years, but most recently I was drawn to the Triple-A profile because I wanted tighter control over the potential induction of spherical aberration. This is now the profile I use to treat all patients presenting for LASIK. In the past, we might have chosen a different profile for a low myope versus a high myope or for a patient with significant astigmatism versus one with little or no astigmatism. Now, all of these patients can be treated with the Triple-A profile.

There are still choices to make, however. For example, I may perform PRESBYOND Laser Blended Vision for presbyopia correction in a 50-year-old patient, or I may choose to perform a topographic- or wavefront-based treatment for a patient who has significant HOAs on wavefront measurement. These cases account for the minority of patients, however; we are talking about 2% of patients, not the 98% we can treat with the Triple-A profile.

Thus far in my experience, the Triple-A profile has good refractive predictability, whether the patient is hyperopic, myopic, or has a lot of astigmatism. Additionally, we have a low enhancement rate, at approximately 3%. When an enhancement is required, I often use the same profile again. In some cases, I may prefer a topographic-based treatment to correct significant induced spherical aberration, however.

In terms of controlling spherical aberration, anecdotally, Triple-A is a good ablation profile. Currently, we are conducting an ongoing study to determine just how well it controls for spherical aberrations, both corneal and total. At the conclusion, we will compare our results with a control group that has undergone laser surgery with previous nomograms to determine how much better the Triple-A profile is at controlling spherical aberration. In theory, the way it is designed, it should give really good tight control. Unfortunately, it is too early to share our results.

CONCLUSION

We can always do better with preemptively solving the problems we cause during laser ablation by finding better ways to compensate for them in our treatments. However, I also think it makes sense to move away from selecting different profiles based on the patient's refractive errors and toward use of a universal ablation profile for all patients.

In my opinion, the future of all these profiles—whether topographic, wavefront-based, or presby-LASIK—is that they all get rolled into one. Ideally, we should be able to input aberrometry and topography measurements into computer software that will then determine how the patient should be treated; it will take all the knowledge it has from all the profiles and select the appropriate treatment automatically.

At present, however, the surgeon is applying his or her judgment to selecting the appropriate treatment—when a computer can do it much better. There is a lot of art in refractive surgery, and there will continue to be. But this will become less important as we develop more sophisticated software and nomograms, and this is a good thing. Moving toward the use of a universal ablation profile, like the Triple-A, is not only appropriate at this time but also the future of refractive surgery treatments. ■

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PRESBYOND Laser Blended Vision

A solution for presbyopia in emmetropic, myopic, and hyperopic patients.

BY DAN Z. REINSTEIN, MD, MA(CANTAB), FRCSC, DABO, FRCOPHTH, FEBO

The ideal solution for presbyopia is to restore accommodation; however, no procedure up to now has been able to reinstate the natural dynamic focusing mechanism of the eye. Although research on dynamic solutions is ongoing, clinical applications such as fully functional accommodating IOLs or lens refilling (ie, phaco ersatz) will probably not be commercially available for quite some time. Current treatments for presbyopia rely on splitting the refractive power for distance and near within the same eye, as in multifocality, or between eyes, as in monovision, or by using a pinhole corneal inlay solution. Unfortunately, these treatment modalities require compromise from the patient.

The ideal solution, from a patient's standpoint, would be a procedure that achieves good binocular vision at far, intermediate, and near while also maintaining good optical quality, contrast sensitivity, night vision, and stereoacuity. Preferably the procedure should be reversible and repairable if complications arise. This was the set of goals I established when developing our method of modified monovision, now commercially available as PRESBYOND Laser Blended Vision. This software module for the treatment planning station CRS-Master (Carl Zeiss Meditec) can be used with the MEL 80 and MEL 90 excimer lasers.

THE PRESBYOND CONCEPT

The human visual cortex is inherently capable of filtering spherical aberration, an abnormality that occurs naturally in the human eye and increases naturally both with age and during accommodation. Introducing spherical aberration into the eye's optical system disseminates the retinal image focusing point, creating a wider range of distances at which the focus is equivalent although slightly reduced. Although the retinal image may be degraded by the naturally occurring spherical aberration, the brain filters it to produce a sharp, unaberrated image.

Our approach to presbyopia correction, in essence, is to utilize the inherent neural processing capability of the human visual cortex as a dynamic pseudoaccommodating solution (Figure 1). Thus, LASIK is used to modulate spherical aberration on the cornea and increase the depth of focus of the entire visual system. Working within the natural processing range of cortical image sharpening, this strategy does not affect the quality of the image the brain perceives.

Our results with this technique have demonstrated an increased depth of field, with better-than-expected distance vision in the near eye (ie, the nondominant eye) of patients targeted for a nominal refraction of -1.50 D. The mean visual acuity was about 20/45, whereas 20/80 would be expected for a nascent -1.50 D refraction.[1-3]

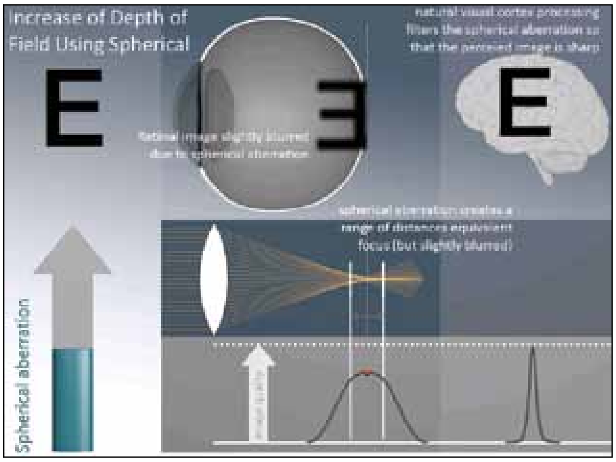

Figure 1. Diagram showing increase in depth of field using filtering of spherical aberration.

On the other hand, if there is too much ocular spherical aberration for the visual cortex to fully process, aberration-related quality of vision symptoms can result. Our research led us to conclude that we could use spherical aberration modulation to increase depth of field by approximately 1.50 D; increasing spherical aberration beyond this level results in overloading neural cortical filters and loss of contrast sensitivity. Therefore, spherical aberration modulation cannot be used to produce 3.00 D of accommodation and, hence, this strategy alone cannot provide full presbyopic correction without compromising safety.

The solution we have come up with is to combine this 1.50 D of increased depth of field with micro-monovision, which achieves good near vision with a lower degree of anisometropia than traditional monovision.

As with spherical aberration, monovision is also based on natural processes—namely neural binocular rivalry (interocular, not intraocular, rivalry), neuronal summation, (but not suppression as in monovision). This strategy creates a blend zone of vision between eyes at intermediate distances. As a result, less suppression is required than in traditional monovision, and there is no dissociation but rather fusion between the images of each eye. Patients retain a functional level of uncorrected stereoacuity, proving that they have binocular functionality.

This blend zone method provides a solution to the common limitations of traditional monovision, including loss of fusion due to anisometropia, poor intermediate vision, poor distance vision in the near eye, reduced binocular contrast sensitivity, and reduced or absent stereoacuity.

RECENT RESULTS

In planning PRESBYOND Laser Blended Vision treatments, a number of factors are considered, including age, accommodative amplitude, preoperative wavefront, tolerance to anisometropia, and amount of refractive error. The software combines these factors to generate an ablation profile that leaves the patient with an appropriate level of spherical aberration, thereby maximizing depth of field without compromising contrast sensitivity, stereoacuity, or night vision.

We recently analyzed results in 136 myopic, 111 hyperopic, and 148 emmetropic patients who underwent PRESBYOND Laser Blended Vision treatment. One year postoperatively, binocular distance and near UCVAs were 20/20 or better and J2 or better, respectively, in 95% of myopic patients (up to -8.50 D with astigmatism), 77% of hyperopic patients (up to 5.75 D with astigmatism), and 95% of emmetropic patients (within ±0.88 D). These outcomes are superior to intraocular and corneal multifocal solutions published to date in the peer-reviewed literature.[1-7] No eye lost more than 1 line of distance BCVA, and contrast sensitivity values were either the same or slightly better than preoperative values.

Eyes treated with this strategy can undergo future enhancement safely if shifts in refraction occur. With spherical aberration modulation centered on the visual axis, the resulting corneal depth of field can be combined with high-quality monofocal IOLs when patients later develop cataracts.

OTHER APPROACHES

Multifocality. Multifocal approaches to presbyopia correction require a patient to adjust to the unnatural situation of differentiating between two images in the same eye. Because a significant increase in aberrations is required to achieve two focal points, it is no surprise that multifocal procedures are associated with loss of contrast sensitivity and BCVA and with night vision disturbances.

Multifocality has been induced in the cornea by discontinuous excimer laser ablation profiles, femtosecond cylindrical intrastromal keratotomy incisions, and corneal inlays, and intraocular multifocality has been achieved by clear lens or cataract extraction and implantation of a multifocal IOL. Despite significant improvements in corneal and intraocular multifocal solutions over the years, multifocality will always rely on a patient's ability to adapt to a new and unnatural intraocular rivalry. Multifocal corneal treatment options are usually limited to a small range of refractive errors and are difficult to reverse; intraocular solutions involve the relatively higher risk of implant-exchange procedures.

Pinhole inlay. A pinhole inlay technology has been available worldwide since 2005 and, at the time this article was published, is in final phase US Food and Drug Administration (FDA) clinical trials. Implantation of this device deep in the corneal stroma of one eye produces an increased depth of field that can significantly improve reading vision in emmetropic or low myopic eyes, while retaining good distance acuity. However, the technique must be combined with LASIK for correction of presbyopia with ametropia. Furthermore, because the pinhole mechanism inherently reduces the amount of light entering the eye, and hence luminosity (along with contrast sensitivity to a certain degree), it does not provide comfortable reading vision in low lighting conditions.

SUMMARY

PRESBYOND Laser Blended Vision is a solution for presbyopia that, for patients who are candidates for LASIK, meets all the goals of good binocular vision at all distances. This technique minimizes any compromise in safety, contrast sensitivity, or night vision and results in binocular vision with retention of functional stereoacuity. PRESBYOND Laser Blended Vision is immediately and intermittently reversible simply with spectacle wear or permanently reversible by performing a standard retreatment ablation, with the advantage of maintaining its induced increase in depth of field. These benefits can be achieved in emmetropic presbyopic patients as well as patients with a wide range of refractive errors, including astigmatism. ■

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Capitalizing on the High Demand for Presbyopia-Correction Procedures

How I expanded my patient base and treatment potential with PRESBYOND Laser Blended Vision.

BY YVES GULDENFELS, MD

I work in a private ophthalmology practice in Strasburg, France, with five other partners. Although we treat patients for different ocular conditions, our overall goals are the same: to provide patients with the best care possible and for patients to achieve optimal outcomes after treatment.

As a refractive surgeon, one of the treatments I perform with the most regularity is for presbyopia correction. Today, these procedures are becoming more popular, especially in France where approximately 50% of the population is presbyopic. At our clinic specifically, 45% of patients who present for refractive surgery inquire about presbyopia correction. In order to provide them with the best care possible, it is my duty to find and offer the best solutions and to manage the ever-growing expectations of these patients. In terms of security, stability, reproducibility, and predictability, I believe that the ideal solution is PRESBYOND Laser Blended Vision.

THE ADVANTAGES OF THIS CONCEPT

The Expert Vision Center was one of the first centers in France to offer Laser Blended Vision. After performing this technique of presbyopia correction for more than 3 years, it now accounts for half of the procedures we perform in our refractive surgery center. It represents the first treatment that is successful for the vast majority of our presbyopic patients, including emmetropic patients as well as those with myopia and hyperopia.

As I see it, the main advantage of PRESBYOND Laser Blended Vision is threefold: (1) PRESBYOND Laser Blended Vision is the first branded software that allows us to treat all ametropias with excellent results, (2) it is a fully reversible procedure and we can test the intended outcome preoperatively, and (3) results are very good in almost every case. Our patients have no loss of near or distance BCVA, they see clearly, and, for many patients, visual acuity is much better than it was with presbyopic contact lenses.

The PRESBYOND Laser Blended Vision technique, developed by Dan Z. Reinstein, MD, MA(Cantab), FRCSC, DABO, FRCOphth, FEBO, of London, is based on micro-monovision, where the dominant eye is corrected for far vision to almost plano, the nondominant eye is targeted for a nominal refraction of -1.50 D, and a wavefront-optimized ablation profile is used in both eyes to achieve increased depth of field. Because micro-monovision and the increase in depth of field are age independent, there is long-term stability postoperatively.[1]

EXPANDING INDICATIONS

Initially, we used PRESBYOND Laser Blended Vision to treat patients with higher levels of ametropia. After favorable analyses of these results, we expanded our indications to include patients with lower levels of ametropia as well as emmetropic patients. We were surprised with our patients' positive feedback and the number of word-of-mouth referrals these treatments produced. In fact, I had to reorganize the operating room schedule to accommodate the influx of patients presenting for presbyopia-correcting surgery with PRESBYOND Laser Blended Vision.

Today, our definition of the ideal patient for PRESBYOND Laser Blended Vision is anyone over the age of 40 years who is spectacle dependent, does not have any contraindications to LASIK, and whose range of ametropia is between -8.00 and +2.00 D with no more than 2.00 D of cylinder. This group of patients tends to have disposable income and, therefore, is willing to pay a premium price for presbyopia correction in return for comfort and spectacle independence.

KEYS TO SUCCESS

All patients who elect correction with PRESBYOND Laser Blended Vision must undergo preoperative testing. In some cases, a contact lens trial is performed to demonstrate the effects of binocular vision. Patients must also understand the concept of micro-monovision (ie, one eye corrected for distance vision and the other for near) before undergoing surgery and be reminded that they should not compare postoperative vision in their right and left eyes.

Patients are more likely to achieve favorable results when these criteria are met, increasing their chances of referring friends and family for the procedure. I also find it helpful to schedule surgery within 3 weeks of preoperative evaluation.

RECENT RESULTS

A few weeks ago, we upgraded our CRS-Master platform (Carl Zeiss Meditec) to include the newest version of PRESBYOND Laser Blended Vision. This latest software allows us to import the preoperative wavefront data and functional age of the patient. In addition to the results we have had at Expert Vision Center, a retrospective multicenter analysis was recently conducted to determine the predictability and reproducibility of PRESBYOND Laser Blended Vision. Five participating centers in France—Strasbourg, Chambery, Nancy, Lille, and Paris—were equipped with the same refractive platform comprised of the VisuMax femtosecond laser, the MEL 80 excimer laser (both by Carl Zeiss Meditec), and Laser Blended Vision software. Treatments ranged from +5.75 to -9.00 D, with astigmatism up to 6.00 D; emmetropic patients were also permitted to undergo treatment.

A total of 654 patients were divided into three groups: myopic (correction of less than -0.75 D), emmetropic (correction between -0.75 and +0.75 D), and hyperopic (more than +0.75 D) patients. All patients had undergone ocular dominance and micro-monovision testing before surgery, and refraction and visual acuity testing was performed preoperatively and at 1 week as well as 1 and 3 months postoperatively.

At 1 week assessment, near UCVA was J2 or better in 98% of patients. By 3 months, all patients were able to read J3. Additionally, 94% of patients were able to read 20/25 or better and J2 or better. This high level of near vision was achieved with only -1.50 D of anisometropia, which to most patients translates to very comfortable binocular vision. Additionally, 96% of patients achieved a distance UCVA of 20/25 and 89% of 20/20 or better at 1 week. Continued follow-up showed that all patients had an improvement in distance UCVA during the 3-month follow-up; however, a small number of patients (12.4%) did not achieve spectacle independence for distance vision and elected retreatment. Across all groups, the retreatment rate was 15.3% and occurred most frequently in emmetropic and myopic patients. There was no loss of BCVA.

CONCLUSION

The femtosecond LASIK technique of PRESBYOND Laser Blended Vision helps patients to achieve excellent visual outcomes with good reproducibility. This safe and accurate method of presbyopia correction can be proposed to nearly all patients, including emmetropic patients as well as those with myopia and hyperopia.

In our experience to date, patients have been extremely satisfied after surgery with PRESBYOND Laser Blended Vision, and our word-of-mouth referrals as well as the number of surgeries performed in our refractive surgery center have increased. Today, this procedure accounts for 45% of our refractive treatments, and I predict this number will increase even more in the near future. ■

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Exploration of the Refractive Landscape

How the new MEL 90 fits into my refractive practice.

BY RAINER WILTFANG, MD

When I look at the ZEISS logo, I automatically think "high-quality." From its optics to its diagnostic and surgical devices, the offerings of ZEISS are nothing short of the best in the ophthalmic market. I am fully confident that, by filling my refractive practice with these products, I can provide my patients with the best possible care and postoperative results.

My experience using ZEISS products runs the gamut. I began using its CRS-Master to perform surface ablation treatments many years ago; unfortunately, too many patients experienced pain intraoperatively. Then I began performing LASIK, initially using a mechanical microkeratome and later on the VisuMax femtosecond laser. Although the technology is excellent, there was always the possibility for flap complications. Now I am using the VisuMax femtosecond laser to perform SMILE with ReLEx, a pinhole procedure that I believe is the next logical step in refractive corrections.

PERSONAL EXPERIENCE

At the moment, my procedure of choice is SMILE, and we were among the first clinics in Europe—and the very first in Munich, Germany—to incorporate this procedure into our practice. By adding SMILE to our armamentarium, our volume of refractive treatments increased about 20% in the first 5 months of 2013 compared with 2012. Generally speaking, the refractive surgery market in Germany has decreased, and so with these numbers we have already achieved more than we ever expected. Although this increase in refractive surgical volume is a temporary effect that will last only until other laser sites in our area start offering the SMILE procedure, right now we have a distinct advantage. In essence, we are one step ahead of everyone else in our market. If you look down the road to 5 years from now, however, it is very likely that the majority of practices and surgeons will prefer SMILE or other intrastromal refractive surgery treatments over LASIK.

Approximately 3 years ago, we started offering FLEx with ReLEx. The procedure was promising, and our results continued to improve over those first 3 years. We then transitioned to SMILE, and currently we use this procedure for approximately 75% to 80% of all myopic treatments. If you take the time to explain to patients the differences between femtosecond LASIK and SMILE, what we have found is that most patients end up choosing SMILE. There are so many advantages, including improved biomechanical stability. There is no flap, and therefore no flap-related complications, and you do not have to open the cornea to perform the treatment.

Patients' reactions to the procedure are amazing. I like to look at it the same way I do arthroscopic treatment for a knee or a shoulder: A small incision, in this case a pinhole, is preferred over a large incision. I think this treatment is the main reason that our refractive numbers have increased over the past 3 to 6 months, compared with or refractive volume of 1 or 2 years ago.

At the moment, we use SMILE to treat a broad range of patients with myopia (-2.00 D to -10.00 D) and up to 4.00 D of astigmatism. We do not use it for hyperopic patients, and we personally do not use it to treat myopia below -1.50 D, because the lenticule is too thin and can lead to problems with extraction.

ACQUIRING THE MEL 90

Up until a couple of months ago, we used the MEL 80 for all LASIK treatments. In July 2013, however, we obtained the MEL 90 excimer laser (Figure 1) and transitioned to using the laser rather quickly. As the latest offering from Carl Zeiss Meditec, the MEL 90 continues to provide everything we liked from the MEL 80 but is faster. It can also switch between speeds of 250 and 500 Hz.

The MEL 90 is designed for the needs of a modern refractive surgeon, like myself, as it has all of the proven safety parameters of the MEL 80 with added options for individual configurations. Some of the key features of this new system are its FLEXIQUENCE switch functions, which allows the surgeon to flexibly choose between a frequency of 250 and 500 Hz; the new Triple-A (Advanced Ablation Algorithm), which is a universal ablation profile that can be used for a wide range of spherocylindrical corrections and that also

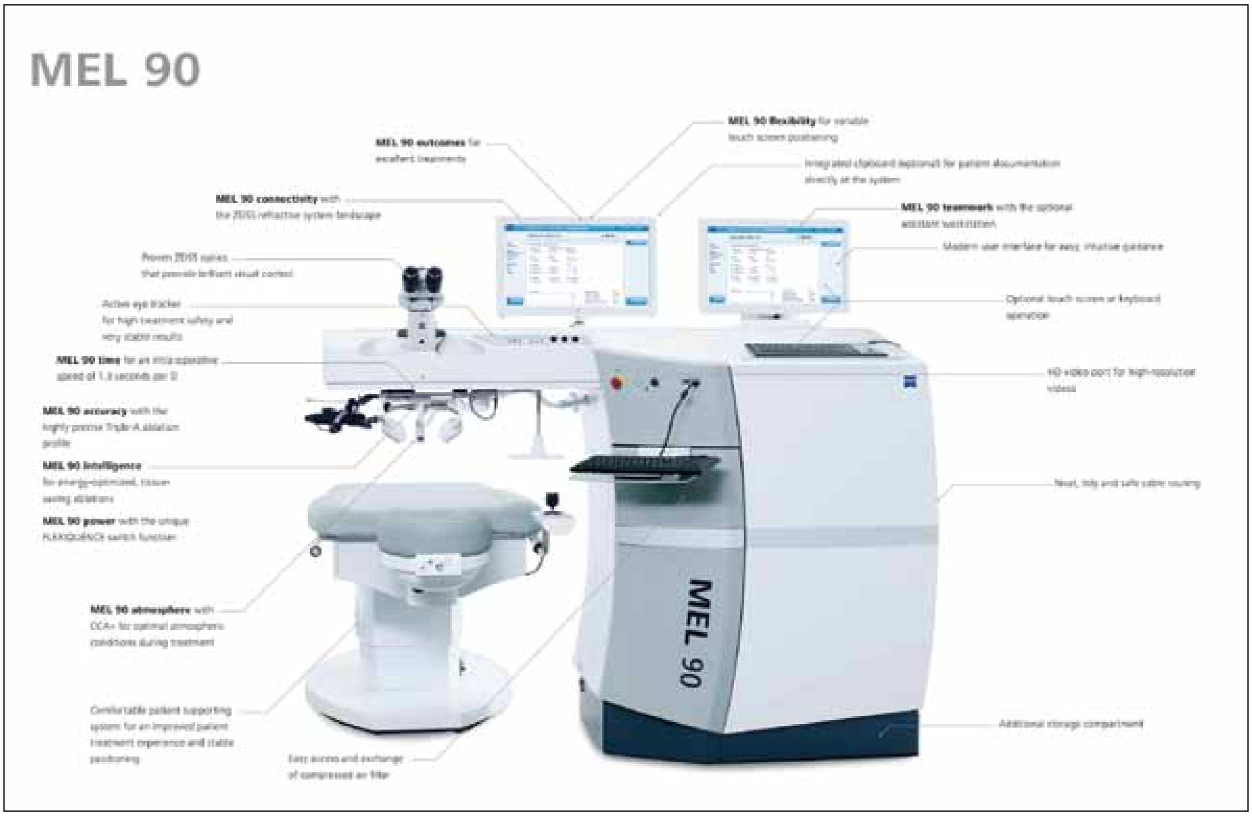

Figure 1. The MEL 90 can switch between speeds of 250 and 500 Hz.

saves corneal tissue; an intraoperative ablation speed up to 1.3 seconds per diopter; and an advanced guidance system that has a simple and intuitive graphic user interface to support fast treatments. Additionally, I can choose to make my entries with either a touchscreen or keyboard, and there is seamless transfer of patient data between the MEL 90, the VisuMax, and the CRS-Master.

Although the MEL 90 has become the main excimer laser in our clinic, unfortunately it is too early to share any clinical results at this time. What I do know, however, is that incorporating the MEL 90 has already increased our range of treatment options, because we can treat low corrections (-0.25 to 4.00 D) with slower speed (250 Hz) and higher corrections (up to -2.00 D), with higher speed (500 Hz). Performing a higher-speed treatment avoids thermal problems with larger ablations, and performing a lower-speed treatment has tissue-saving advantages in my hands. With the Triple-A profile, however, there are tissue-saving properties regardless of the treatment speed. If you have the opportunity to shorten the treatment time, it can slightly increase the efficacy and safety of your results.

Currently, we use the MEL 90 for all of the applications we previously used the MEL 80 for; this includes phototherapeutic keratectomy, PRK, LASEK, and femtosecond LASIK. We use it in myopes, hyperopes, and in patients with astigmatism and mixed astigmatism. Essentially, this laser can be used for the complete spectrum of refractive ablation treatments.

PATIENT COUNSELING

Every surgeon has his or her system for patient education and counseling. I always start by discussing surface ablation, which in our clinic the preference is for LASEK. I convey the advantages of the procedure, including good corneal stability and no cutting of the cornea, as well as the disadvantages, including pain and delayed recovery of visual acuity. This is a good refractive treatment option for low to moderate myopes with low astigmatism.

The next procedure I explain is femtosecond LASIK. The advantages of this procedure include faster visual recovery compared with surface ablation and no pain; the disadvantages include slight instability of the cornea due to the creation of the LASIK flap and the risk of flap dislocation and striae.

Last, I tell patients that the SMILE procedure is the latest development in refractive surgery. I explain that it has all the advantages associated with surface ablation and LASIK, and it also has the advantage of ease of enhancement. There are two options for enhancements. First, we can open the cap, make it a flap, and perform femtosecond LASIK. This is not our preference, however, as we always aim to provide patients with a flapless procedure. Our recommendation would be a LASEK surface enhancement.

As I mentioned previously, most patients select SMILE as their procedure of choice. If you step back and look at treatment options from their perspective, it is a flapless procedure that has all the advantages of surface ablation and all the advantages of LASIK. It would be like PRK without pain and LASIK without a flap, something that Rupal Shah, MD, said to me 2 years ago.

CONCLUSION

SMILE is a flapless, bladeless, noiseless, odorless procedure. My patients are amazed at how quickly the procedure is over, as it takes only 28 seconds. If we do an excimer procedure, we have now the MEL 90 excimer laser and can switch between 250 and 500 Hz, we can perform treatments in a wider array of patients. Perhaps this will equate to another significant increase in the volume of refractive surgery treatments we perform at Smile Eyes. ■

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