PresbyMAX Treatment to Restore Near Vision

The degree of presbyopic compensation is based on the age of the patient.

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The main goal for surgical procedures that correct presbyopia is to enhance not only distance and near visual acuity but also the patient's range of clear vision. Presbyopia-correcting techniques can be broadly categorized as follows: systems that mimic the crystalline lens, and bi- or multifocal techniques that enhance depth of focus, including monovision.

Patients may rate an intervention highly even though it degrades essential features of their normal visual perception. For example, patients accept monovision despite its inherent compromise to binocular vision.[1] Measuring depth of focus is a useful marker, but measures of visual acuity at typical near vision distances may be more closely related to patients' expectations and concerns.[2]

The performance of various IOLs (eg, refractive, diffractive, pseudoaccommodating, and multifocal) is constantly improving,[3,4] but currently these lenses decrease near vision contrast sensitivity.[5] Reported patient satisfaction with monovision LASIK is high; Goldberg[6] and Miranda[7] reported 96% and 92% satisfaction rates, respectively. Contact-lens monovision and LASIK-induced monovision traditionally use a nomogram for near addition, with the degree of anisometropia increasing from approximately -1.50 D for a 45-year-old patient to -2.50 D for a 65-year-old patient.[8]

We prefer presby-LASIK, a term describing procedures that use the principles of LASIK to create a multifocal corneal surface, correct visual defects for distance, and reduce spectacle dependence for near vision in presbyopic patients.[9,10] Presby-LASIK constitutes the next step in the correction of presbyopia after monovision LASIK.[11,12]

There are two techniques for presby-LASIK, both of which create a multifocal pseudoaccommodative corneal surface. One, central presby-LASIK, creates a central area for near vision and a peripheral area for distance vision;[13] the other, peripheral presby-LASIK, creates a central area for distance vision and a mid-peripheral area for near vision.[14] (Some authors argue that peripheral presby-LASIK is not well defined.[15])

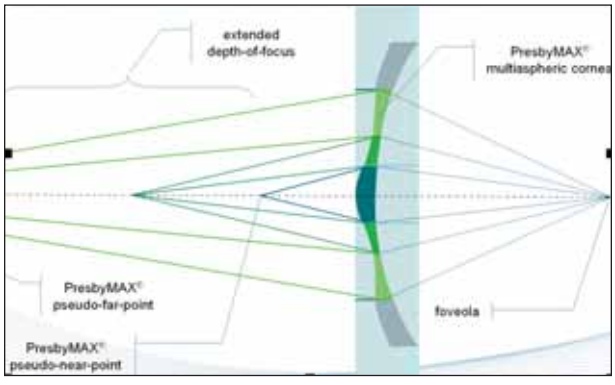

Figure 1. The concept behind PresbyMAX.

Reinstein et al[16] recently described the use of a micro-monovision protocol, with an intended postoperative refraction of plano for the dominant eye and between -1.00 and -1.50 D for the nondominant eye, irrespective of patient age. The investigators determined that the near eye had a beneficial effect on binocular distance UCVA when compared with the monocular distance UCVA of the dominant (distance) eye.

Pinelli et al[14] investigated the correction of hyperopic presbyopic patients using peripheral multifocal LASIK. *(For more information on Dr. Pinelli's technique, see his article,* P-Curve Presbyopic LASIK, *page 54.)* This treatment creates a multifocal corneal profile in a 6.5-mm diameter zone by combining a positive ablation (performed over a

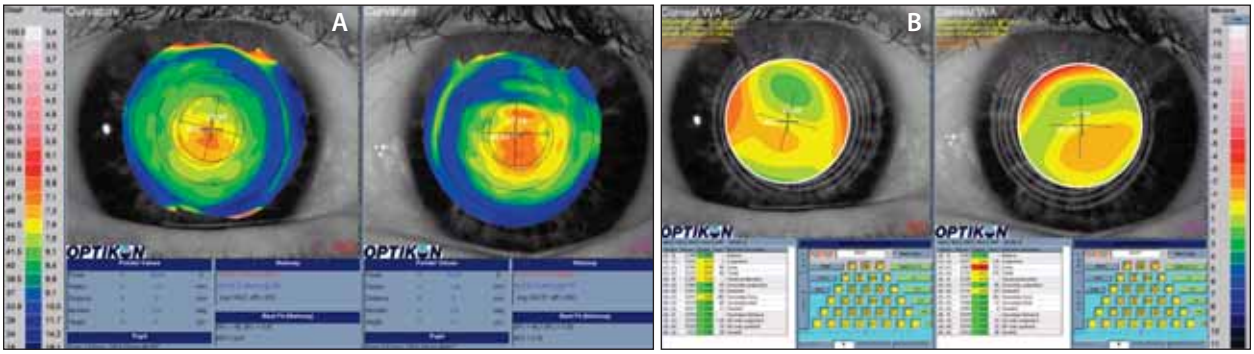

Figure 2. (A) Topographical corneal surface after PresbyMAX presbyopic-refractive correction. (B) Postoperative corneal wavefront after presby-refractive correction.

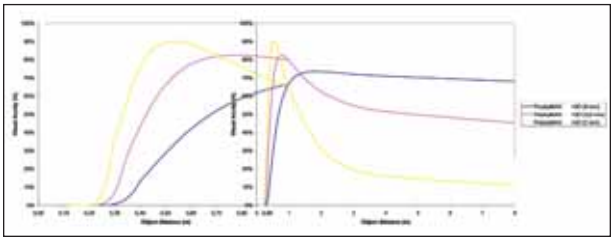

Figure 3. Simulation of visual acuity as a function of the object distance after 3.00 D reading add was corrected using PresbyMAX.

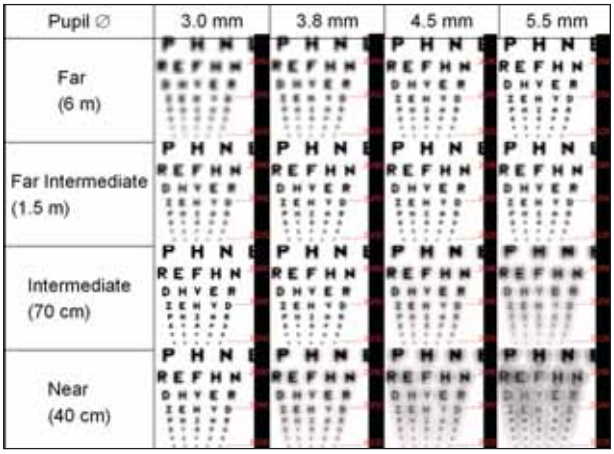

Figure 4. Simulation of visual performance after PresbyMAX.

6.5-mm zone) and a negative ablation (performed over an optical zone no smaller than 5 mm). The hypothesis is that the ring between the 5- and 6.5-mm optical zones provides multifocality.

In several reports,[13,16] Alió et al have demonstrated the efficacy, predictability, stability, safety, and visual quality of central presby-LASIK in presbyopic patients with hyperopia. In another study,[17] they reported a correlation between clinical results with presby-LASIK and a theoretical predictive model.

TRUE ACCOMMODATION

Presbyopia cannot be cured, but advances on the horizon will specifically address the restoration of true accommodation. Treatment methods based on pseudoaccommodation and extended depth-of-focus will reach a maturity in which the compromises in distance and near visual acuities will reach a minimum and provide simultaneous vision. With the help of better-suited aberrometry, including adaptive optics technology, we hope to fully understand what patients need and determine whether we can offer them a solution to meet these needs.

Neither pseudoaccommodation nor multifocality can correct presbyopia, restore accommodation, or slow or stop the progress of presbyopia. If the lens cannot accommodate preoperatively, it will not accommodate after any pseudoaccommodative or multifocal approach. However, PresbyMAX (Schwind eye-tech-solutions, Kleinostheim, Germany; Figure 1) combines pseudoaccommodation and multifocality to reduce dependence on reading spectacles and provide controlled, extended depth of focus. The software, developed in cooperation with the Vissum and OCIVIS groups at the University of Alicante, Spain, delivers biaspheric multifocal ablations to prevent the onset of latent presbyopic symptoms and delay the need for reading spectacles as presbyopia progresses (Figure 2). Ablations may be repeated with minimum risk if the need for reading spectacles returns. If no cataract is present but refractive

TAKE-HOME MESSAGE

- Presby-LASIK creates a multifocal pseudoaccommoative corneal surface.
- Current treatments do not have the ability to cure presbyopia; however, they can restore near vision.
- PresbyMAX reduces spectacle dependence and provides extended depth of focus to compensate for presbyopia.

TABLE 1. MEDIAN VALUES AFTER PRESBYMAX (N=150 PATIENTS)		
	Monocular	**Binocular**
Distance UCVA	+0.2 logMAR (20/32 or 0.63)	+0.1 logMAR (20/25 or 0.80)
Near UCVA	+0.2 logRAD (J3 or 0.63)	+0.1 logRAD (J2 or 0.80)
Distance BCVA	+0.1 logMAR (20/25 or 0.80)	0.0 logMAR (20/20 or 1.00)
Defocus	-0.50 D	N/A
Astigmatism	0.25 D	N/A
Near distance-corrected visual acuity	+0.3 logMAR (J5 or 0.50)	+0.2 logMAR (J3 or 0.63)
Near BCVA	+0.1 logRAD (J2 or 0.80)	0.0 logRAD (J1 or 1.00)
Add	1.00 D	N/A

defects exist, PresbyMAX corrects far-distance refraction and alleviates symptoms of presbyopia, offering spectacle-free vision at all distances (Table 1).

PresbyMAX provides compensation for presbyopia based on the patient's age. Wavefront diagnostic data and presbyopic compensation are combined to produce the advantages of both techniques (ie, improved visual outcome through wavefront-guided correction[18,19] and enhanced pseudoaccommodation). The technology offers controlled multifocal vision. The corneal profile is made multifocal; the central cornea is corrected for near and the periphery for far vision, with an optimized biaspheric profile that adds a precalculated amount of higher-order aberrations. After PresbyMAX, patients have excellent distance vision, good near (Figure 3) and intermediate vision, and the best possible compromise for the whole distance range (Figure 4).

CONCLUSION

Certain individuals are best suited for PresbyMAX. A trials with multifocal contact lenses or trial frames that creates slightly defocused images to the retina can be used to simulate postoperative visual impressions and verify patient acceptance. Ask patients about their profession, hobbies, and expectations to understand whether the postoperative visual performance of PresbyMAX can meet their individual needs.

The aim of PresbyMAX is spectacle-free vision in usual day-to-day situations. Spectacles may be required for reading or distance, in the case of special demands. Well-lit conditions provide the best near performance, and dimmed conditions are optimal for distance. Centering of the ablation on the corneal vertex[20] is essential; it helps reduce induction of unwanted higher-order aberrations, especially disturbing asymmetrical aberrations such as coma. ■

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