



## REFRACTIVE SURGERY

OCULAR SURGERY NEWS EUROPE EDITION February 1, 2011

# Despite economic crisis, presbyopia surgery thrives around the world

While many areas of the ophthalmic practice have suffered the consequences of the economic crisis, in the niche of presbyopia correction, refractive surgery has still been sought.

“Unlike other refractive procedures, presbyopia surgery has not been subject to the price war,” Alain Telandro, MD, a pioneer in LASIK presbyopia correction, said. “Typically, the customer for this surgery is someone with stable means and well-prepared to invest money on life quality. Exciting options are emerging just at the right time to meet the emerging needs of a huge population.”

Dr. Telandro’s busy practice in Cannes, France, was already renowned for both cornea-based and lens-based presbyopic procedures. Surgeries performed there have recently increased by 45% with the introduction of intrastromal correction (IntraCor, Technolas Perfect Vision). Whenever a new technique for presbyopia is launched, the attraction and attention to it are great, Dr. Telandro said.

H. Burkhard Dick, MD, OSN Europe Edition Chairman of the Editorial Board, works in a university setting that is a center of excellence for the treatment of presbyopia in Germany.

“Patients come to us from far specifically for our expertise in this field. As the various techniques become increasingly reliable, the number of patients increases. There is a lot happening around presbyopia. Industries are making huge investments, and the market is very hot,” he said.

Mark Tomalla, MD, senior physician at a specialized refractive surgery clinic in Duisburg, Germany, said that 50% to 60% of his refractive patients now ask for presbyopic procedures. Jorge L. Alió, MD, OSN Europe Edition Board Member, said that presbyopia correction represents 25% of the total volume of surgical procedures at the Vissum Institute in Alicante, Spain.

“We have now the return wave of so many patients who were implanted with monofocal IOLs and want presbyopic treatments. They are mainly professionals like doctors and lawyers and business people,” Dr. Alió said.

In developing countries in Asia, the presbyopia surgery market is growing at an even faster rate. An emerging middle class views refractive surgery as a status symbol and a lifestyle choice.

“Young urban professionals who hit 40 do not want to be encumbered with near glasses. They are mainly information technology professionals, students and young entrepreneurs who spend many hours a day in front of a computer screen,” Cyres K. Mehta, MD, OSN Asia-Pacific Edition Board Member, said.



**H. Burkhard  
Dick**



**Mark  
Tomalla**

“Europe is a developed market where the penetration of presbyopic LASIK is still percentage-wise higher, but I feel that in coming years the action will be in China and India, due to the huge population and their growing buying power,” he said.



**Cyres K.  
Mehta**

## **Presbyopic LASIK**

In 2001, Dr. Telandro developed his method of multi-zone presbyopic LASIK and designed, in collaboration with Nidek engineers, the Nidek PAC software for the Nidek 5000 laser. The idea was that creating a progressive aspheric lens on the corneal surface would provide a flatter optical zone in the center for distance vision and a progressive change of curvature toward the periphery for intermediate and near vision.

“At the time, this was the only technique we had, and indications were not so clear. Since then, presbyopia surgery has made giant steps. We have now several techniques and more precise indications,” Dr. Telandro said.

For patients who have a clear crystalline lens and normal best corrected visual acuity, he uses either multi-zone LASIK or IntraCor. While the latter is limited to presbyopic patients with low hyperopia and mild astigmatism, multi-zone LASIK can be used in a wide range of refractive error.

“I operate on presbyopic myopes up to  $-7$  D without problems, and results are excellent. Some of my patients have now a follow-up of 10 years during which they have aged from their mid-40s to the mid-50s. They still have good vision for distance and near. Vision has even improved over the years, with no more perception of aberrations or night halos,” Dr. Telandro said.

With presbyopic hyperopes, he has lowered his limits to  $+3$  D because high hyperopes were too disturbed by spherical aberration at distance and visual quality was poor.

With high hyperopes, as well as with patients who have lost crystalline lens clarity, multifocal implants are the best solution, he said.

In recent years, several excimer laser platforms have incorporated presbyopic LASIK applications. With Schwind, Dr. Alió has developed the PresbyMax software using the Amaris platform. His presbyLASIK approach is the reverse of Dr. Telandro’s, with a central zone for near and periphery for distance.

“This technique is still in development. Over the last 4 years, we have progressively upgraded the software. We are now at the third version, and results are increasingly better. We use PresbyMax with any type of refraction, from  $-7$  D to  $+4$  D, with astigmatism up to 2 D,” Dr. Alió said.

The aim is to compensate 2 D of presbyopia, equivalent to 3 D of an IOL. The treatment is performed bilaterally, which makes 2 D sufficient to address intermediate and advanced presbyopia.

Dr. Telandro’s technique is widely used in Asian countries, such as Singapore, the United Arab Emirates and Malaysia.

PresbyMax is also used in Asia, particularly in India. For Dr. Mehta, it is the procedure of choice for patients in the 40- to 49-year age range when there is no evidence of cataract. He said that patients must be warned that distance vision will be suboptimal for the first few months after surgery and that the near add might decrease slightly over time.

“Also, I don’t perform it in patients who drive long distances at night. It is definitely not the best option for night drivers in India, due to the congested roads with oncoming headlights,” he said.

Other laser platforms offer treatment solutions for presbyopia. The Custom Q module of the Allegretto Wave (Alcon), the laser blended vision procedure of the Mel 80 (Carl Zeiss Meditec) and the CustomVue technology of Visx (Abbott Medical Optics) are designed for peripheral presbyLASIK.

## **Lenses**

In patients older than 60 years, Dr. Alió performs refractive lens exchange (RLE) or cataract surgery with implantation of a multifocal lens. The lenses he uses are, in order of preference, the Lentis Mplus (Oculentis), the Acri.Lisa and the toric Acri.Lisa (both Carl Zeiss Meditec). He also uses the accommodating Crystalens (Bausch + Lomb) and dual-optic Synchrony (AMO) in a minority of cases.

“I prefer multifocal rather than accommodative lenses because they provide a wider range of correction,” he said. “As the technology evolves, accommodative IOLs might eventually be the winners because they are a more physiological concept, but for now the outcomes of multifocal IOLs are better.”

Dr. Dick said he prefers accommodating lenses for his patients.

“The multifocal concept is definitely a compromise, and it’s not my favorite solution. Photic phenomena cannot be avoided. They are inherent to the system, and some patients accept them, some do not,” he said.

Of the 4,000 cataract patients who are annually treated in Dr. Dick’s clinic, 5% to 8% are implanted with accommodating or multifocal IOLs.

He offers multifocal lenses — the ReZoom, the Tecnis one-piece and three-piece (all AMO), the M-flex (Rayner), the ReSTOR (Alcon) and the Lentis Mplus — to patients who want to be 100% spectacle independent.

“With accommodative lenses, patients should know they might need a little add for near tasks like reading books. However, they are perfect for those who want to be spectacle independent for computer work rather than reading,” he said.

Dr. Dick has 5 years of follow-up experience using the Synchrony lens and 1 year with the Crystalens AO.

“Both lenses have weaknesses and strength. With the Synchrony, [posterior capsule opacification] rate is very low and you can achieve an accommodative amplitude of 1.75 D,” he said. “I have implanted about 130 of these lenses, and patients are extremely satisfied. Certainly it is quite a bulky IOL that needs a fairly large 3.6- to 3.8-mm incision, mandatorily posterior or sclerocorneal, if you want to avoid astigmatism. The Crystalens needs a smaller 2.2-mm incision in clear cornea, but accommodation is slightly less and some patients need a near add.”

Monovision LASIK is his alternative for patients with a clear lens and low ametropia. With more than +3 D, RLE is better because high hyperopes are good candidates for RLE and bad candidates for LASIK, he said.

Because of the amount of sunlight exposure in India, early cataract occurring around the age of 50 years is common, Dr. Mehta said.

"I offer multifocal lenses to all these patients. I also perform RLE in patients with a clear lens who are not good candidates for corneal laser surgery, like night drivers. My favorite lenses for this subgroup of patients are the diffractive ReSTOR +3 D and the new generation of refractive multifocals from Rayner," he said.

"I ask patients what they do every day, and if they use the computer a lot, I implant the Crystalens HD. If they have different ways of using vision and need all distances, I go for IntraCor," Dr. Tomalla said.

## **Intrastromal correction**

The IntraCor procedure provides flapless intrastromal correction using the Femtec femtosecond laser (Technolas Perfect Vision) to reshape the cornea without affecting the surface. The refractive power of the cornea is locally changed, leading to significantly improved near vision and good intermediate vision with a little sacrifice of distance vision.

"You induce a myopic shift and therefore the technique should be used only in presbyopic hyperopes," Dr. Tomalla said.

In approximately 80% of patients, he performs IntraCor only in the nondominant eye. To test if patients will adapt to monovision, a contact lens is fitted a few hours before the procedure.

In about 20% of patients, Dr. Tomalla also performs the procedure in the contralateral eye 3 to 6 months later.

"This is when they ask to have it in the other eye because they need to smarten up their intermediate vision. These patients are usually working a lot on the computer," he said.

Dr. Telandro performs IntraCor simultaneously in both eyes. He sees it as a bilateral technique and does not want to create alternating monovision.

IntraCor is currently performed by a small number of surgeons worldwide, Dr. Telandro said. About 35 surgeons have the Femtec laser, and one-third do not use it for IntraCor yet.

"It's a technique with great potential," Dr. Telandro said. "You do it in less than 30 seconds, without opening the eye, without ablating tissue, without scars, without pain, with a recovery time of no more than 2 hours and immediate return to normal life."

Dr. Tomalla said the technique still needs fine-tuning. He was one of the first users of IntraCor in Europe and is involved in a CE multicenter study of the treatment. He has so far treated about 200 patients.

"Patients have a very variable response in terms of lines gained, and we don't know why," he said. "We have developed different energy modules that seem to work better and to allow a higher predictability with stable myopic shift for all patients."

## **Inlays**

Emmetropic patients who want to be independent of reading spectacles at the onset of presbyopia are eligible candidates for corneal inlays.

"It's a minimally invasive, reversible approach based on monovision. You don't remove tissue, don't change the anatomy of the eye and you can remove the inlay at any time without affecting the eye at all," Ioannis Pallikaris, MD, OSN Europe Edition Board Member, said.

“The Flexivue Microlens (Presbia) is the inlay I personally use. It’s a thin lens made of highly biocompatible hydrophilic polymer, easy to implant within a pocket created by femtosecond laser. The procedure does not require any special skill and lasts no more than 1 minute,” he said.

Previously, the pocket was created by a microkeratome, and more than 300 patients implanted with this method have now had follow-up of more than 3 years. Results were excellent, Dr. Pallikaris said.

The protocol is currently focused on emmetropic presbyopes, but according to Dr. Pallikaris, the inlay can be used in all eyes if ametropia is corrected with other means.

“Currently Flexivue is my procedure of choice for presbyopes with a clear lens,” he said.

The Kamra inlay (AcuFocus) is an opaque micro-disc with a circular aperture in the center, exploiting the pinhole effect to increase depth of field.

Dr. Dick uses the Kamra inlay in a select minority of emmetropic presbyopes.

“I use the femtolaser and a special mask to implant the device into the cornea at a depth of about 220  $\mu\text{m}$ . For cosmetic reasons, I use it only in patients with brown eyes, and results are very good,” he said.

Other currently available inlays are the InVue (BioVision) and the PresbyLens (ReVision Optics).

## **Scleral approach**

LaserACE, another technique that addresses the “pure” presbyopic patient, is based on a different approach. Instead of aiming for an optical compensation of presbyopia, it addresses the causes of the weakening of accommodative power and aims to restore the normal mechanism of accommodation.

“The theory behind it has been developed by AnnMarie Hipsley, DPT, PhD, and lies on the consideration that the loss of accommodation is correlated with increased rigidity, and compression over the ciliary muscle, of the sclera,” Paolo Fazio, MD, head of refractive surgery at Catania Hospital, Italy, said.

A diamond pattern of nine diamond-shaped full-thickness scleral ablations is made using the VisioLite Er:YAG laser in four oblique-oriented quadrants of the anterior part of the scleral wall to release the pressure and restore the flexibility of the sclera.

“The improvement of accommodation is immediate. One day after the procedure, all patients are able to see J1 binocularly with no loss of distance vision,” Dr. Fazio said.



**Paolo Fazio**

He noted that LaserACE is, however, a niche procedure for the few presbyopic emmetropes who are prepared to undergo a safe but complicated and long surgical procedure.

## **Into the future**

Presbyopia is, to date, the refractive condition with the widest range of treatment options. However, none of these options is entirely satisfying, and all entail varying degrees of visual compromise.

“Multifocal implants cause photic phenomena and lead to a loss of contrast sensitivity. Presbyopic LASIK strategies can lead to decreased distance vision, and monovision leads to decrease in stereopsis. The ideal strategy, I feel, will be refillable lenses or accommodating IOLs and probably not a corneal solution,” Dr. Mehta said.

“There are techniques that seem promising in early trials, such as the customized near add procedure with the Light Adjustable Lens (Calhoun Vision), where a small add zone is written in the central part of the lens and can be changed to adjust to the patient’s requirements before being locked in,” Dr. Dick said. “The add-on lens technology is also interesting, and there is a huge number of new lenses for presbyopia coming up. It’s very impressive.”

However, current techniques, when appropriately selected to meet the requirements of individual patients, can effectively bridge the gap between today’s reality and tomorrow’s hopes, according to Dr. Telandro.

“With the three techniques I use, I can answer to all needs and have an overall patient satisfaction of 80% to 85%,” he said. “Current methods have achieved high standards and, technically speaking, there is very little we can further improve. What we can still improve is results, with good indications and by selecting our patients carefully.” – *by Michela Cimberle*

---

#### **POINT / COUNTER**

Does mix and match improve quality of vision?

#### **References:**

- Alió JL, Amparo F, Ortiz D, Moreno L. Corneal multifocality with excimer laser for presbyopia correction. *Curr Opin Ophthalmol*. 2009;20(4):264-271.
- Alió JL, Chaubard JJ, Caliz A, Sala E, Patel S. Correction of presbyopia by technovision central multifocal LASIK (presbyLASIK). *J Refract Surg*. 2006;22(5):453-460.
- Alió JL, Elkady B, Ortiz D, Bernabeu G. Clinical outcomes and intraocular optical quality of a diffractive multifocal intraocular lens with asymmetrical light distribution. *J Cataract Refract Surg*. 2008;34(6):942-948.
- Dick HB. Accommodative intraocular lenses: current status. *Curr Opin Ophthalmol*. 2005;16(1):8-26.
- Dick HB, Dell S. Single optic accommodative intraocular lenses. *Ophthalmol Clin North Am*. 2006;19(1):107-124.
- Epstein RL, Gurgos MA. Presbyopia treatment by monocular peripheral presbyLASIK. *J Refract Surg*. 2009;25(6):516-523.
- Holzer MP, Mannsfeld A, Ehmer A, Auffarth GU. Early outcomes of INTRACOR femtosecond laser treatment for presbyopia. *J Refract Surg*. 2009;25(10):855-861.
- Ortiz D, Alió JL, Bernabéu G, Pongo V. Optical performance of monofocal and multifocal intraocular lenses in the human eye. *J Cataract Refract Surg*. 2008;34(5):755-762.
- Patel S, Alió JL, Feinbaum C. Comparison of Acri. Smart multifocal IOL, crystalens AT-45 accommodative IOL, and Technovision presbyLASIK for correcting presbyopia. *J Refract Surg*. 2008;24(3):294-299.
- Pinelli R, Ortiz D, Simonetto A, Bacchi C, Sala E, Alió JL. Correction of presbyopia in hyperopia with a center-distance, paracentral-near technique using the Technolas 217z platform. *J Refract Surg*. 2008;24(5):494-500.

- Ruiz LA, Cepeda LM, Fuentes VC. Intrastromal correction of presbyopia using a femtosecond laser system. *J Refract Surg.* 2009;25(10):847-854.
- Telandro A. Pseudo-accommodative cornea: a new concept for correction of presbyopia. *J Refract Surg.* 2004;20(5 Suppl):S714-S717.
- Telandro A. The pseudoaccommodative cornea multifocal ablation with a center-distance pattern: a review. *J Refract Surg.* 2009;25(1 Suppl):S156-S159.
- Telandro AP, Steile J 3rd. Presbyopia: perspective on the reality of pseudoaccommodation with LASIK. *Ophthalmol Clin North Am.* 2006;19(1):45-69.

- 
- Jorge L. Alió, MD, PhD, can be reached at Vissum Corporation, Avenida de Denia, s/n, 03016 Alicante, Spain; +34-965150025; fax: +34-965151501; e-mail: [jlalio@vissum.com](mailto:jlalio@vissum.com).
  - H. Burkhard Dick, MD, can be reached at Center for Vision Science, Ruhr University Eye Hospital, In der Schornau 23 – 25, DE-44892 Bochum, Germany; +49-234-2993101; fax: +49-234-2993109; e-mail: [burkhard.dick@kk-bochum.de](mailto:burkhard.dick@kk-bochum.de).
  - Paolo Fazio, MD, can be reached at Centro Catanese di Medicina e Chirurgia, Via Riso 33, 95128 Catania, Italy; +39-95-448210; e-mail: [pa.fazio@gmail.com](mailto:pa.fazio@gmail.com).
  - Cyres K. Mehta, MD, can be reached at International Eye Centre, Mistry Chambers, Ground Floor, Brahmakumaris Marg, Mumbai 400005, India; +91-22-652-61579; e-mail: [cyresmehta@yahoo.com](mailto:cyresmehta@yahoo.com).
  - Ioannis Pallikaris, MD, PhD, can be reached at University Hospital of Heraklion, Ophthalmological Clinic, P.O. Box 1352, Voutes, Heraklion, CR-71003 Crete, Greece; +30-81-392351; fax: +30-81-394653; e-mail: [pallikar@med.uoc.gr](mailto:pallikar@med.uoc.gr).
  - Alain Telandro, MD, can be reached at Cannes-Ophthalmologie, 69-71 Avenue du Roi Albert 1er, Résidence Saint-Michel Valetta, 06400 Cannes, France; +33-4-92188990; fax: +33-4-92188999; e-mail: [ateland@club-internet.fr](mailto:ateland@club-internet.fr).
  - Mark Tomalla, MD, can be reached at Clinic Niederrhein, Fahrnerstr. 133-135, 47169 Duisburg, Germany; +49-203-5081711; fax: +49-203-5081713; e-mail: [mark.tomalla@ejk.de](mailto:mark.tomalla@ejk.de).
  - Disclosures: Dr. Alió is a consultant for Schwind Amaris, with a consultancy agreement and royalties from PresbyMax. He is a consultant and researcher for Oculentis. He is a clinical investigator of Carl Zeiss Meditec's toric and Acri.Lisa lenses. He has no financial interest in the Crystalens but is a consultant for Bausch + Lomb. He is a clinical investigator for Abbott Medical Optics in the Visiogen project and a clinical investigator for AcuFocus and Presbia. Dr. Dick has received research grants and is a consultant for Abbott Medical Optics. He is a clinical investigator for the Crystalens AO and the Kamra inlay. He holds stock options in the Light Adjustable Lens (Calhoun Vision). He has no other direct financial interest in products discussed in this article, nor is he a paid consultant for any other companies. Dr. Fazio holds some stock in the LaserACE company. Dr. Mehta has no direct financial interest in the products discussed in this article, nor is he a paid consultant for any companies mentioned. Dr. Pallikaris is chairman of Presbia's Medical Advisory Board. Dr. Telandro has no direct financial interest in the products discussed in this article, nor is he a paid consultant for any companies mentioned. Dr. Tomalla is not a paid consultant for the Femtec laser, but he is a clinical investigator of the technology. He has no direct financial interest in the products discussed in this article, nor is he a paid consultant for any companies mentioned.