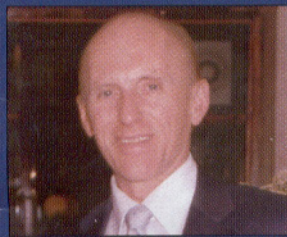


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## REFRACTIVE FRONTIERS

OSN Europe/Asia-Pacific Edition Associate Editor Jorge L. Alió, MD, PhD, says that the field of refractive surgery is now focused on functional vision, quality of vision and quality of life.

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# The frontiers of refractive surgery are expanding

As scientific knowledge grows, refractive surgery moves beyond a 'cosmetic specialty' to focus on functional vision, quality of vision and quality of life.

by Jorge L. Alió, MD, PhD

OSN EUROPE/ASIA-PACIFIC EDITION  
ASSOCIATE EDITOR

Refractive surgery is a subspecialty of ophthalmology that is well-based in science. The cross-fertilization between technology and clinical science has produced an enormous amount of new information about the anatomy, physiology, biological response and biomechanics of the cornea, optics and visual performance of the eye.

Refractive surgical procedures currently account for the largest number of ophthalmic surgical procedures after cataract surgery. The scientific relevance and potential of this subspecialty is evident. Peer-reviewed journals devoted to this area, such as the *Journal of Refractive Surgery* and the *Journal of Cataract & Refractive Surgery*, have made more of an impact on this subspecialty than other peer-reviewed journals on their respective subspecialties. Based on these facts, we must acknowledge that refractive surgery in 2005 is a driving force in ophthalmology.

The scope and perspective of refractive surgery are expanding moment by moment. New understandings of the anatomy, physiology and optics of the cornea and the interior of the eye, as well as studies of the aging process of the lens, are bringing forth not only relevant new scientific information, but also new opportunities to improve vision. Refractive surgery, formerly considered a cosmetic specialty devoted to eliminating the use of spectacles, is now approaching visual improvement scientifically.

The new target of refractive surgery is to improve patients' quality of vision by calculated manipulation of the optics of the eye. To accomplish this goal, we can today see that there are several frontiers of refractive surgery that will be important for the expansion of our understanding.

### Frontier 1: Excimer laser remodeling of the cornea

Improving the optics of the eye with excimer laser surgery is the first challenge. Corneal remodeling techniques such as sophisticated wavefront-oriented customized treatment are being used in normal, albeit aberrated eyes to improve their optics. We also have the therapeutic option to create a more regular corneal surface in irregular astigmatism, which can now be performed without corneal

grafting in most cases.

The primary and therapeutic indications of excimer laser wavefront-oriented surgery are now the gold standards in LASIK and corneal refractive surgery.



Jorge L. Alió

### Frontier 2: Adaptive intraocular optics

A new generation of intraocular optics is being generated. These IOLs can be used in the phakic and aphakic eye to improve patients' quality of vision. Customized optics, formerly used extensively in

telescopes and astronomy, are now creating an exciting area of interest in our specialty. Adaptive optics, free from aberrations or adequately customized to the existing aberrations of the eye, are definitely offering a new and unlimited perspective in cataract and lens surgery.

Moreover, the improvements that can be obtained in contrast sensitivity with the use of specific filters can decrease glare and improve the optical performance of the eye, especially in those with disease. In the phakic eye, IOLs can be exchanged to adapt to specific visual needs over the lifetime of the patient.

### Frontier 3: Corneal surgery and addition techniques

Corneal tissue technologies are a special area of future interest. A completely new generation of synthetic inlays, rings, segments and new corneal graft technology is rapidly emerging. The new technologies will aim not only to improve the refraction of the eye, but also to address therapeutic indications for keratoconus and corneal ectasia, among other diseases. The use of femtosecond laser technology in association with new biomaterials, initially proposed for refractive purposes, will offer not only refractive improvement but also therapeutic alternatives to many patients and will create a new avenue for corneal transplantation techniques aiming simultaneously for corneal replacement and refractive predictability.

### Frontier 4: Changing the paradigm in lens surgery

Perhaps the most relevant frontier in refractive surgery is the change in paradigm of lens removal that we are now facing. New examination devices can perform sophisticated studies on the performance of the crystalline lens in the absence of cataract. These devices

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# Frontiers

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can provide early detection of declining optical performance and can make the alternative of lens removal prior to cataract formation attractive. This may be particularly desirable if the IOL that replaces the natural lens offers better optics and performance and eliminates the need for near-vision spectacles by improving accommodation or inducing multifocality of visual field.

The aging lens will be the future target of lens removal. A new generation of IOLs will offer new alternatives for

patients affected by refractive errors and presbyopia in the immediate future. To allow patients to enjoy these options with less traumatic surgery, new technologies for lens removal are being developed that will change our practice dramatically.

### Frontier 5: Better understanding of accommodation and presbyopia correction

Last but not least is presbyopia. Near vision, formerly attended to by clinicians only when near-vision spectacles had to be prescribed, was once a routine and uninteresting topic. It is now one of the challenges of refractive surgery. Science is uncovering a great amount of knowledge about the accommodation process and the role of pseudoaccommodation in our near-vision performance. Surgical procedures that treat presbyopia by modifying the corneal optics, either by corneal excimer laser remodeling or intracorneal inlays, are now approaching. Scleral surgery, still a mystery, still attracts the interest of industry and surgeons. Most important, accommodating IOLs are being developed that can

change the power of the eye with real changes in the lens optic related to ciliary body performance. Moreover, neural adaptation is also being challenged by these technologies, as some of them change our process of accommodation in a precalculated way. New multifocal lenses based on different options will also improve our surgical outcomes by increasing depth of field.

Refractive surgery is expanding its frontiers and is aiming to improve patients' quality of vision and quality of life. Its limits are, at this moment, expanding to new areas related to functional improvement of normal and diseased eyes. Functional vision is the future of refractive surgery, and its frontiers will continue to grow as science continues to increase its depth of knowledge. OSN

### For Your Information:

Jorge L. Alió, MD, PhD, is professor and chairman of ophthalmology and medical director of the VISSUM/ Instituto Oftalmológico de Alicante, Universidad Miguel Hernández, Alicante, Spain. He can be reached at VISSUM, Instituto Oftalmológico de Alicante, Avda. de Denia, s/n, 03016 Alicante, Spain; +34-965-150-025; fax: +34-965-151-501; e-mail: jlalio@vissum.com.

## Correction:

In the August 2005 issue of OCULAR SURGERY NEWS

Europe/Asia-Pacific Edition, in the article, "Multinational panel lends guidance in pediatric cataract cases" (page 10), a picture of one of the panelists appeared incorrectly. The correct photo of M. Edward Wilson, MD, appears at the right.

OCULAR SURGERY NEWS regrets the error.



M. Edward Wilson

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