

# Point/Counterpoint: Will We Need an Excimer

This technology is still superior to a femtosecond laser for a variety of refractive needs.

BY OSAMA IBRAHIM, MD



The past 30 years have seen the development of RK and astigmatic keratotomy, lamellar corneal refractive procedures, excimer laser ablation, and refractive lenticule extraction (ReLEx; Carl Zeiss Meditec AG). Excimer laser ablation

itself passed through a period of development from surface ablation (PRK) to standard LASIK, with innovations ranging from small optical zone ablation to customized topography- and wavefront-guided ablation and from mechanical microkeratomes to femtosecond lasers. Most of the aforementioned techniques and technologies are still used today in different parts of the world.

Since its introduction, the ReLEx procedure has been influenced by technological innovation (200- to 500-Hz lasers) and has evolved from femtosecond lenticule extraction (flex) to the minimally invasive small-incision lenticule extraction (smile). I have been involved in the development of ReLEx since its infancy and have performed more than 1,000 procedures for myopia and astigmatism ranging from -1.25 to -14.00 D of sphere and up to 5.00 D of cylinder. In my experience, the surgery is safe, accurate, stable, and predictable, and it has many advantages over LASIK.

Despite the excellent results and further expected refinements during the next decade, however, I firmly believe that many ophthalmologists will still be using an excimer laser in the year 2022 for several reasons.

## HYPEROPIA AND MIXED ASTIGMATISM

Managing hyperopia and mixed astigmatism with ReLEx remains a problem to be solved. Initial results with the procedure for these eyes are less successful than for myopia due to the architecture of the lenticule and a more difficult extraction. Hyperopic correction with an excimer laser currently achieves much better outcomes.

## CUSTOMIZATION

Compared with ReLEx, excimer laser ablation is also a superior option for creating customized profiles, either guided by topography or wavefront measurements. Such individualized profiles are necessary for managing complex cases with abnormal topography or highly aberrated

wavefront maps after ocular trauma or previous refractive surgery. Eyes with decentered ablations, irregular astigmatism, and scarring, for example, are better suited to customized treatment with an excimer laser.

## RESIDUAL REFRACTIVE ERROR

Managing residual ametropia after ReLEx is a challenge. Either surgeons must lift the flex flap and perform excimer laser ablation of the bed, or they must convert a smile cap into a flap, lift it, and perform excimer laser ablation. At present, the creation of a second lenticule lacks accuracy and precision for the correction of such small errors.

In the few cases in which I have treated residual ametropia after a smile procedure, surface ablation with an excimer laser and mitomycin C have been the best option.

## PRESBYOPIA

For the femtosecond laser to replace the excimer laser, other sophisticated profiles such as laser blended vision for presbyopia will have to be incorporated into the lenticule design. So far, the excimer laser is a far superior option for presbyopic correction.

## EXPENSE

The economic burden of a femtosecond laser system, both the initial investment and the running cost of consumables such as patient interfaces, is an obstacle to its adoption. In many parts of the world, mechanical microkeratomes are still the standard of care and will continue to be so for the foreseeable future.

## CONCLUSION

For the reasons I have outlined, I expect surgeons to continue to use the excimer laser—for surface ablation or LASIK—for at least 2 more decades.

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# Laser in 2022?

The technology should be obsolete by then.

BY RUPAL SHAH, MD



Most LASIK surgeons today use two lasers, a femtosecond platform for creating the flap and an excimer platform for reshaping the cornea (femto-LASIK). The need for two lasers significantly raises operating costs, owing to the expense of two machines, two licenses for them, and two service contracts as well as workflow costs related to shifting the patient from one machine to the other. Executing all treatments with a single laser would produce substantial economic savings. ReLEx smile (refractive lenticule extraction using the small-incision lenticule extraction technique; Carl Zeiss Meditec AG) is on the verge of allowing just that, and it offers other benefits as well.

## CLINICAL ADVANTAGES

No flap is created during ReLEx smile, which eliminates the risk of displacement, either immediately or months and years postoperatively.

The procedure is also more accurate than excimer laser ablation, with more than 95% of patients achieving a result that is  $\pm 0.50$  D of the intended correction.<sup>1</sup> Cutting a lenticule with a femtosecond laser does not depend on corneal hydration characteristics, the humidity in the atmosphere in the OR, or ablation levels at different depths of the cornea. In my experience, this leads to greater predictability than with an excimer laser, especially in high myopia.

The total amount of laser energy used in ReLEx smile is a fraction of that used in femto-LASIK. In my experience, the result is a smaller inflammatory response and greater stability after the former procedure.

A small incision cuts fewer corneal nerves, which probably leads to less dry eye disease.

Unlike with an excimer laser, there is no peripheral fluence loss with a femtosecond laser. For that reason, ReLEx smile induces less spherical aberration without the need for a special profile.

Finally, femtosecond lasers are more robust than excimer lasers. The former are fiber lasers, which, by

their solid-state nature, do not require high-voltage components and are more efficient in terms of power. In my experience, femtosecond lasers require fewer service visits. Mine has not required a single service intervention (except software upgrades and a mandatory yearly calibration) in the past 2.5 years. Unlike with an excimer laser, no gas needs to be changed, and it is also quicker to start a surgical day, because it needs no warm-up time.

## MY EXPERIENCE

In my practice, I already do not require an excimer laser to correct myopia and myopic astigmatism of between  $-0.75$  and  $-10.00$  D. I treat all of my premium patients (85% of those in my practice) with ReLEx smile.

When do I use an excimer laser? I currently need it for hyperopic patients. Moreover, I treat a fair number of presbyopic patients with a laser blended vision profile not currently available with ReLEx smile. In addition, I need an excimer laser for customized treatments guided by wavefront measurements or topography. Finally, I use an excimer laser for enhancements.

I have no reason to believe, however, that profiles with acceptable results will not be developed for the ReLEx technique to address both hyperopia and customized cases within a few years. Enhancements are a trickier issue; 99% of my current ReLEx patients (with the latest software) are within  $\pm 0.50$  D of their targeted correction at 1 year, so a few enhancements are still necessary. Provided that the manufacturer and investigators can address this problem, an excimer laser will become obsolete. ■

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