Premium lenses: present and future

There is no doubt that, for some years now, cataract surgery has evolved into what is known as "phaco-refractive surgery", probably driven by the good outcomes obtained with excimer laser surgery for the correction of all types of ametropia and the massification of these results globally.

Patients armed with information gathered from the internet and the websites of various intraocular lens manufacturers are pushing us to have vision similar to the one they had at 25 years of age, i.e. a full range of vision at all distances, with high quality, no loss of contrast and, needless to say, with no visual disturbances such as haloes and glare. For our part, we are committed to providing high patient satisfaction, thanks to the reliability of the results, with few complaints, good outcomes and, hopefully, time for extra consultations or minor refractive adjustments.

We must therefore make every effort to ensure that the patient has a realistic understanding of the outcomes, is well informed of the alternatives for correction, eventual side effects, and the best options according to each particular case.

Since the advent of monofocal lenses, it has undoubtedly become easier for us to obtain better vision at all distances. Although the monovision still widely used today is an alternative for improving near vision, it is not ideal, as it gives poor quality distance vision with an eye focused for near vision. Thus, the development of so-called "Premium" lenses has resulted in better visual outcomes, achieving good distance and near focal length, with better binocular perception and greater depth of focus. The emergence of various multifocal and diffractive bifocal lens platforms, such as the Abbott Tecnis One, Alcon ReSTOR, Zeiss AT LISA 800, etc., has brought us closer to reaching these visual goals for some years now, but they are not free from adverse effects, as they have two main focal points inside the eye, with the brain responsible for merging the images. We have also gone through an era of "accommodative" lenses which, despite very good initial outcomes for both near and distance vision, invariably failed as the capsular bag became fibrosed, consequently reducing the accommodation capacity that enabled near vision.

Today, the introduction of new lenses such as "trifocals", together with "extended vision" lenses, has made a difference in terms of improving visual outcomes, with fewer dysphotopsias and better patient acceptance.

The platforms most commonly used worldwide today that have shown the best results include "trifocal diffractive" lenses with fixed light distribution, such as the PanOptix from Alcon with Enlighten (ENhanced LIGHT ENergy) technology, the Zeiss AT LISA 839 and the Fine Vision lens by PhysIOL, which has variable light distribution. In all these cases, we have a good focus for distance, intermediate and near vision, with satisfactory defocus curves that, while not identical, are similar. These undoubtedly improve the quality of vision at all distances, and elicit fewer complaints of halos and glare.

To these we can add the Abbott Symfony lens or "extended vision" lens, which obtain better intermediate and distance vision through the use of echelettes and achromatic technology that reduces the chromatic aberration and improves the focus. However, these lenses, while superior to monofocal lenses, generally require a micro-monovision of –0.50 to –0.75 D in the non-dominant eye to achieve better near vision at 40 cm.

Although there are numerous models on the market, the lenses described above are those that have positioned themselves in most countries. All incorporate toric platforms, allowing us to further improve our outcomes.

The most important factor for achieving the best outcome begins with good patient selection, choosing the best intraocular lens for the patient's needs and precisely calculating the lens power.

Candidates for premium lenses should have realistic expectations for near vision, as we know that most patients will likely require an additional air lens to be able to read smaller letters under low ambient light conditions. They should also be candidates for bilateral lens implants, notwithstanding some exceptions, such as the case of young people with a unilateral cataract in whom we can leave a lot of near anisometropia when we insert a monofocal lens.

Implantation of these lenses should be carefully considered in emmetropic patients, as it can affect the quality of their distance vision.

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Candidates should undergo a thorough tear study in the preoperative period, as patients with poor tear film quality will not obtain good visual outcomes. We must be very cautious in ruling out significant phorias, microtropias or tropias that will later bring various complaints of poor vision. Patients with concomitant eye diseases, such as irregular corneal astigmatisms, keratoconus, ectasias, radial and astigmatic keratotomy, previous photoablations and previous corneal surgeries for presbyopia should also be excluded.

Care must be taken too with risk situations such as high ametropia, which make it difficult to accurately calculate the intraocular lens power. Cases of amblyopia or marked anisometropia, optic nerve diseases such as glaucoma with visual field damage, ischaemic optic neuropathies and ocular trauma must be likewise be discarded.

These patients should ideally undergo a preoperative examination with corneal topography to rule out irregular astigmatisms, which would prevent us from making a refractive adjustment if there is a residual error in the postoperative period. Macular optical coherence tomography is also useful to avoid surprises such as a neovascular membrane, which alters the visual outcomes in the postoperative period.

The lens calculation should be done with optical interferometry (IOL Master, Lenstar etc.). This gives us a more precise measurement, since it has good macular fixation, avoids error in measurement of the axial axis, corneal compression and tear film variations.

In the case of toric premium lenses, it is very important that the keratometric values agree as regards the determination of the axis and magnitude of the astigmatism, as these lenses are very sensitive to residual astigmatism. A toric premium lens of around 0.75 D to 1 D of cylinder should generally be implanted. Currently in the precision of astigmatism measurement, we also have new pre- and intraoperative measuring instruments such as the Zeiss Callisto, Alcon Verion and True Vision, and Bausch & Lomb Holos. The Alcon ORA aberrometer is also helpful in precision of the intraocular lens implant as regards the power and axis.

The new intraocular lens calculation platforms that incorporate astigmatism of the posterior surface of the cornea and other variables help us to improve our results even further, with the Barrett calculator and the Panacea developed by Dr. David Flikier both contributing greatly.

The use of premium lenses must be ruled out in the case of intraoperative complications with no capsular stability, except in some cases in which a 3-piece intraocular lens such as the ReSTOR MN 6 AD 1 can be implanted.

As regards postoperative expectations, there is a period of adaptation to multifocality, with improvement in near focus and a reduction in halos and glare, within the so-called process of neuroadaptation. The patient must wait for stabilisation of any postoperative residual astigmatism before rushing into refractive correction with laser.

New generations of lenses will emerge in the future, such as the Mini WELL progressive lens from SIFI, which combines refractive and diffractive optics; the FluidVision lens from Alcon, with fluid in the haptics that enters and modifies the optics with the accommodation; the LiquiLens, with fluids of different viscosity in the optics that change the refractive power of the lens in the downward gaze; and the Lumina lens from Akkolens/Oculentis, with moveable surfaces that are moved by the action of the ciliary muscle.

Also under development are custom wavefront-guided corrected lenses that can be made to measure for each patient on a digital printer, light-adjustable lenses that can be adjusted from an external UV source, lenses with interchangeable optics, and finally, the Elenza Saffire, the first lens with artificial intelligence. Made from hydrophobic acrylic, this lens has hermetically sealed electronics, is programmable, adjustable and allows near focus of up to 3 D; it also has a battery that will last up to 50 years.

The innovations and constant advance of crystalline lens refractive surgery will undoubtedly enable us to correct ametropia with increasing efficacy, precision and safety, but the criteria and medical ethics when selecting our patients and the surgical indication, together with very well informed consent, continue to take precedence.

Dr. Miguel Srur A.

Centro de la Visión, Clínica Las Condes
Associate Professor of Ophthalmology University of Los Andes
Past President of the Latin American Society of Cataract and Refractive Surgeons (ALACCSA-R)
Santiago de Chile