

Editorial

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Trifocal Lenses for Cataract Surgery

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Since the introduction of the first intraocular lens in 1949, many technological advances have been made in order to optimize its design and construction. Owing to a number of recent advances and development of modern lenses, it has now become possible to not only correct post-operative aphakia but also provide good visual acuity for far, intermediate and near distances by decreasing or eliminating eye glasses or contact lenses in majority of cases.

Apart from the above, modern intraocular lenses also reduce eye aberrations and protect the retina from ultraviolet (UV) radiation and the toxicity of blue light that are important factors to be taken care of in visual health.

Trifocal intraocular lenses surfaced for the 1st time in 2012 and continue to evolve and provide benefits to patients. Currently, we have 3 trifocal intraocular lenses which include:

- AT LISA tri 839MP (Carl Zeiss Meditec AG, Jena, Germany);
- PhysiOL (Finevision, Liège, Belgium);
- AcrySof[®] IQ PanOptix[®] (Alcon Research Ltd., Texas, USA).

These lenses have been approved by the European Union for use in adult patients with and without presbyopia who have cataracts and wish to reduce their dependency on eye glasses for far, intermediate and near distances.

We must know that both the PhysiOL and the AT LISA tri are hydrophilic lenses, whereas the AcrySof[®] IQ is hydrophobic. Although, the 3 trifocal lenses have the same functional characteristics to improve the visual acuity in the 3 distances, and thus reduce the use of optical aids, it is important to address the differences between them.

PanOptix[®] is a hydrophobic lens. Understanding the benefits and drawbacks of this characteristic the surgeon can accordingly choose the best suitable lens. Based on this, the 1st 2 lenses i.e. PhysiOL and the AT LISA tri can be implanted by 1.6 mm incisions while the hydrophobic needs a 2.2 mm incision but reduces the rate of post-operative capsular opacification. Hydrophilic lenses have shown less light scattering than the hydrophobic ones. While the PanOptix[®] lens has filters for blue light, no statistically significant differences were found in the published studies when compared to conventional lenses for light scattering.

An interesting concept is that of intermediate vision, which is a major point of difference in directing the choice of these lenses compared to the previous multifocal lenses. The PhysiOL and AT LISA tri have an intermediate focal point at 80 cm, while the PanOptix[®] lens has a focal point at 60 cm. Undoubtedly, the intermediate distance of 60 cm is much more user-friendly (than that of 80 cm) for computer users, allowing greater comfort in performing medium distance tasks among people who are in the working age or lead an active life.

With respect to the pre-surgical astigmatism that our potential patients may have experienced, we must know that the PhysiOL and AT LISA tri currently have toric options, which play a significant role in reducing the visual alterations that occur following the surgical intervention. However, since the patients were treated properly, they did not want to depend on post-operative air eyeglasses. Although, the PanOptix[®] lens has an excellent platform, known

by many as Acrysoft (fully tested with excellent results), it has no correction for astigmatism yet. Probably in the close future, Alcon will include the PanOptix® Toric models.

On the other hand, PanOptix® facilitates a greater transmission of light towards the retina since it allows 88% of the light to reach a pupil of 3 mm diameter in comparison with the PhysIOL lens that transmits 86% of the light to the same pupillary diameter. There is no data supporting this point with the AT LISA tri lens for that pupil size. This data is of great significance when assessing the contrast sensitivity and quality of vision observed by using these intraocular implants. Only one of the 3 trifocal lenses that comes preloaded is the AT LISA tri facilitating the loading maneuvers and avoiding contamination among the surgeons who prefer it.

Finally, although the 3 lenses are diffractive, one important difference is that the PanOptix® lens has a diffractive zone of 4.5 mm relative to the 5.0 mm zone of the other 2 trifocals. The 4.5 mm diffractive zone reduces the dependence of PanOptix® on the pupil size and/or brightness conditions to enable proper focusing on objects and to ensure normal vision.

There are some publications comparing results between bifocal lenses, extended range lenses (ABBOTT Symfony) and trifocal lenses.

The extended range lenses do not reach a near vision of quality relative to conventional bifocals or to modern trifocals as has been demonstrated in most studies, and is a common observation among the patients. Extended-range lenses work very well at intermediate and far distance but often fail to close when compared to other multifocal lenses.

There is a possibility that trifocal lenses will replace bifocals as they provide technological improvements, new designs, optimized platforms, and add an important intermediate focal point in operated patients who are in working and socially active conditions. A study published by Lee et al¹ showed that the patients who were operated with PanOptix® had better optical quality relative to those operated with the Restor +3 lens.

All lenses that have rings in their body generate similar discomforts in the form of halos, glare, etc., and the patients usually adapt to them. Thus, necessitating a good selection of the lenses.

AT LISA tri, in a study using a model eye of spherical aberration (with a 5 mm diameter pupil), indicated a large number of halos, although in clinical practice, there are no significant differences with respect to the adverse effects between the 3 trifocal lenses. Both halos and flashes tend to diminish over time, and generally after 6 months of surgery (or even much earlier), patients no longer complain about such discomforts, thus implicating the restoration of normal vision. The specialty offered by this clinical practice allows the recovery of the patient and the ability to see well at all distances, without any correction.

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