Multifocal Intraocular Lenses: The Challenges

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Jorge L. Alió and Joseph Pikkel

The evolution of cataract surgery and intraocular lens (IOL) implantation over the last decade has been focused on improving quality of vision and quality of life of patients. Near vision and, more recently, intermediate vision have been acknowledged by patients as reasons for quality of life impairment. Today, we operate on younger patients, who have better visual acuity, even without cataracts, using refractive lens exchange procedures, which are growing in popularity among cataract and refractive surgeons. In such cases, patients are less tolerant of visual disabilities; moreover, the positive advances in refractive surgery, sometimes overestimating the potential outcomes of refractive surgical procedures, have informed their request for independence from spectacles. Nowadays, independence from spectacles can be successfully achieved, but in patients with presbyopia, obtaining good and stable near and intermediate vision is still a problem. The restoration of accommodation is still a dream, and there is no chance in the short term of obtaining real and applicable techniques for the general presbyopic population. In this environment, we have to allocate clinically the role of and the opportunities for multifocal IOLs today.

The main challenge of multifocal lenses is to use a nonphysiological optical method to improve near vision. Multifocal lenses, by definition, divide light into different foci, and this causes a dispersion of the energy of the light entering into the eye and, consequently, distributing the light in different foci. This causes a change in the physiology of vision as the light follows a different focal performance at the level of the visual axis and, consecutively, at the level of the retina. It is necessary to activate neuroprocessing, the capability of the brain to adapt to changes, to adjust the neurophysiology to the changes that are induced in the quality of the retinal image by the dispersion of light. Moreover, the overlapping of different foci is neither physiological nor normal in the evolution of humans or animals. To the best of our knowledge, no visual system is multifocal in nature in any of the prominent mammal species, including humans, even through evolution. For this reason, neuroprocessing is the main challenge for multifocal IOLs. The new technologies emerging in recent years have been aimed at smoothing the changes in visual perception and making a much more

J.L. Alió, MD, PhD, FEBO (✉)
Division of Ophthalmology,
Miguel Hernandez University,
Alicante, Spain

Vissum Corporation,
Alicante, Spain
e-mail: jlalio@vissum.com

J. Pikkel, MD
Department of Ophthalmology,
Ziv Medical Center, Safed, Israel

Bar Ilan University Faculty of Medicine,
Safed, Israel

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physiological division of light, but even under these conditions, the efficacy of the technologies has to be demonstrated and confirmed by an improvement in the subjective quality of the patient's vision. The main issue of this book, therefore, is how the practical ophthalmologist and ophthalmic surgeon can select a suitable multifocal IOL, how to differentiate among the different technologies, how to identify the best available on the market, and how to use evidence in selecting what is best for the patients.

We have identified a lack of adequate medical education and an insufficient amount of independent, well-sustained information on this topic in recent literature. For this reason, we, as authors, have undertaken the commitment and task of gathering all the information available on the different technologies used in the multifocal IOL arena today, up until publication of this book. We not only show all the different technologies available, but also the most relevant clinical studies carried out and the experiences of distinguished, reputable, and independent clinical researchers in using the technologies within the scope of clinical research with adequate, standardized methods, independent opinion, and evidence-based clinical guidance. We hope that the reader will find this book useful for the purpose for which it was created: to raise independent opinion and credibility, and to provide unbiased information about modern multifocal IOLs. If we achieve these goals, the time dedicated to writing this book will have been well used.

Compliance with Ethical Requirements Jorge L. Alio and Joseph Pikkel declare that they have no conflict of interest.

No human studies were carried out by the authors for this article.

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