Challenges in evaluating features of new premium intraocular lenses

Premium intraocular lenses (IOL) have been consolidating their place in cataract and refractive surgery in recent decades. These devices have challenged the entire industry and professionals, as they must be precisely manufactured, suitable for the new wave of microincision implantation, and require accurate parameter selection and implantation. Today, advanced nomograms and semi-customized eye models enable accurate refractive results to be obtained that are consistent with the high expectations of patients1.

With the recent advances in toric and/or multifocal IOLs (MIOLs), the challenges are even greater, and the new frontier is in the evaluation of methodologies to assess their effects and the potential advantages of some designs over their competitors. It is also necessary, when possible, to be able to assess these features not only in the research field, but in clinical practice as well. Defocus curves help to evaluate the depth of focus with the multifocal devices2.

The information below shows our research group’s results for visual performance with two MIOLs and one monofocal lens. The MIOLs analyzed in this case were a diffractive trifocal lens (FineVision, PhysIOL, Liège, Belgium) and a new extended depth of focus (EdF) lens (Symfony, AMO-Abbott, Santa Ana, CA, USA). Figure 1 shows the defocus curve with a high visual performance at distance for both lenses, when compared with the monofocal lens. For intermediate vision, Symfony achieved a better level of visual acuity (VA) that is highly compatible with today’s dynamic lifestyles, where intermediate vision ranges are needed. In near vision, FineVision provided a good level of VA when compared with the other lenses.

Figure 2 shows the comparative or even better performance of Symfony lenses compared with monofocal aspheric IOLs and FineVision lenses in the contrast sensitivity function, especially in the high and medium frequencies tested.

While these new methodologies have been developed and are widely applied in routine research, some of them are scarcely applicable in clinical practice, mainly due to the time-consuming nature of some of these processes and their suitability to reflect real-life conditions. New clinically applicable methodologies based on paradigms similar to the real-life conditions of patients will eventually result in quantitative metrics that better explain the patient’s complaints and allow the clinician to assess any improvement/worsening of the condition over time. No less relevant is the usefulness of such metrics in assisting the industry to “shape” the new medical devices and optimize their performance, even before they are produced or launched on the market.

Figure 1. Binocular defocus curve. Symfony (n = 14) & FineVision (n = 22) vs. monofocal IOLs (n = 18).

Figure 2. Contrast sensitivity function curve. Symfony (n = 14) & FineVision (n = 22) vs. monofocal IOLs (n = 18).
Our multidisciplinary research team is committed to achieving these major goals, and is applying psychometric and psychophysical tools in addition to through-focus visual and refractive evaluation; as a result, compared to other devices, the level of light distortion in realistic conditions can be captured in a very short period of time. The application of such metrics is providing relevant information, even when compared with other purely objective devices that are not able to reflect what the patient really feels. The application and standardization of psychometric questionnaires of visual quality in our population also allows us to capture the subjective sensation of the patient, quantify it and follow it up over time.

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REFERENCES


